Appendix D1

Avifauna Baseline Study

Appendix D1

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List of Acronyms & Abbreviations

Abbreviation	Definition
AC CDC	Atlantic Canada Conservation Data Centre
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CR	Critically endangered
DD	Data Deficient
ECCC	Environment and Climate Change Canada
ELC	Ecological Land Classification
EN	Endangered
EW	Extinct in the Wild
GPS	Global positioning System
ID	Identification
IUCN	International Union for Conservation of Nature
LAA	Local Assessment Area
LC	Least Concern
LP	Limited Partnership
MBCA	Migratory Birds Convention Act
MBR	Migratory Birds Regulations
NAR	Not at Risk
NE	Not Evaluated
NL	Newfoundland and Labrador
NL ESA	Newfoundland and Labrador Endangered Species Act
NL WD	Newfoundland and Labrador Wildlife Division
NT	Near Threatened
PCMP	Post Construction Monitoring Plan
POA	Port of Argentia
SAR	Species at Risk
SAR IMMP	Species at Risk Impacts Mitigation and Monitoring Plan
SARA	Species at Risk Act
SCC	Species of Conservation Concern
SSAC	Species Status Advisory Committee
VU	Vulnerable
WD	Wildlife Division
XT	Extinct

1.0 Introduction

The Avifauna Baseline Study has been developed by Argentia Renewables Wind LP (Argentia Renewables), an affiliate of Pattern Energy Group LP (Pattern Energy) for the Argentia Renewables Project (the Project), which entails the development, construction, operation and maintenance, and eventual decommissioning and rehabilitation of an onshore wind energy generation facility (Argentia Wind Facility) and a green hydrogen and ammonia production, storage, and export facility (Argentia Green Fuels Facility). The wind energy facility (i.e., wind turbine farm) will be mostly located on what is known as the Argentia Backlands, a largely uninhabited, forested area with scattered relic military sites and variable habitat types. The Argentia Green Fuels Facility will be located on the Argentia Peninsula, a brownfield industrial complex. The Port of Argentia (POA) owns both the Argentia Backlands property and property on the Argentia Peninsula. The two, along with a Project Interconnect Line, comprise the Argentia Renewables Project Area. This baseline study focuses on summarizing the existing conditions for avifauna in the Project Area, and to some extent, in the Local Assessment Area (LAA).

Surveys were designed to ensure a comprehensive list of species using the Project Area in each season of the year (including both migratory and resident birds). Resident and migratory species of birds in Newfoundland include representatives from the bird Orders Anseriformes (Waterfowl), Galliformes (Gamebirds), Gaviiformes (Loons), Accipitriformes (Raptors), Charadriiformes (Shorebirds), Columbiformes (Doves), Gruiformes (Rails), Strigiformes (Owls), Caprimulgiformes (Nightjars), Coraciiformes (Kingfishers), Piciformes (Woodpeckers), and Passeriformes (Perching birds). Many Families of birds are protected by the Federal **Migratory Birds Convention Act** (MBCA), including all waterfowl species and many perching birds. Raptors and Owls are protected under provincial legislation. SAR are protected under the Newfoundland and Labrador **Endangered Species Act** (NL ESA) and the Federal **Species at Risk Act** (SARA).

Surveys were conducted throughout the Project Area to ensure coverage of all habitat types, with a particular focus on terrestrial species, and some supplementary marine/coastal surveys. Surveys were designed to create a species inventory (and some estimates of relative abundance) for the Project Area, to determine which water-associated birds used the coast and marine environment adjacent to the Project Area, and to ensure that raptors were adequately surveyed using drones and on-the-ground surveys. Surveys included spring migration, breeding season, fall migration, and winter residents.

This document will be updated prior to commencement of construction to reflect additional field surveys.

1.1 Regulatory Context

Federal and provincial regulations for avifauna are outlined in the subsequent sections.

1.1.1 Federal

The MBCA was implemented to protect migratory bird individuals, populations, and their nests. In addition, the **Migratory Birds Regulations** (MBR) prohibit the capture, kill, take, injury, or harassment of a migratory bird, and protects migratory bird nests with species-specific measures. Species protected under the MBCA and MBR include warblers, thrushes, chickadees, sparrows, flycatchers, waterfowl, swallows, gulls, and terns, among others. In Newfoundland and Labrador (NL), almost all bird Families are federally protected by this legislation.

Migratory birds that are Species at Risk (SAR) are further protected under SARA. SARA was implemented to protect endangered or threatened wildlife from becoming more “at risk” or extinct. Species are listed and protected by SARA based on recommendations by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Species protected under the SARA, that are known to occur in NL, are listed in Table D1-1.1.1-1 below. Species with the potential to occur in the Project Area and/or LAA are discussed in more detail in Section 3.1.3.5 of the Registration Document and in Appendix R (Species at Risk Mitigation and Monitoring Plan).

Table D1-1.1.1-1 SARA Schedule 1 Species in Newfoundland and Labrador.

Common Name	Scientific Name	COSEWIC Status	SARA Status (S1)	IUCN Red List
Red Crossbill *percna*	*Loxia curvirostra percna*	Threatened (2016)	Threatened (2019)	Least Concern
Bank Swallow	*Riparia riparia*	Threatened (2013)	Threatened (2017)	Least Concern
Barn Swallow	*Hirundo rustica*	Special Concern (2021)	Threatened (2017)	Least Concern
Barrows Goldeneye	*Bucephala islandica*	Special Concern (2011)	Special Concern (2003)	Least Concern
Bobolink	*Dolichonyx oryzivorus*	Threatened (2010)	Threatened (2017)	Least Concern
Chimney Swift	*Chaetura pelagica*	Threatened (2018)	Threatened (2009)	Vulnerable
Common Nighthawk	*Chordeiles minor*	Special Concern (2018)	Threatened (2010)	Least Concern
Eskimo Curlew	*Numenius borealis*	Endangered (2009)	Endangered (2003)	Critically Endangered
Evening Grosbeak	*Coccothraustes vespertinus*	Special Concern (2016)	Special Concern (2019)	Vulnerable
Harlequin Duck	*Histrionicus histrionicus*	Special Concern (2013)	Special Concern (2003)	Least Concern

Common Name	Scientific Name	COSEWIC Status	SARA Status (S1)	IUCN Red List
Ivory Gull	*Pagophila eburnea*	Endangered (2006)	Endangered (2003)	Near Threatened
Olive-sided Flycatcher	*Contopus cooperi*	Special Concern (2018)	Special Concern (2023)	Near Threatened
Peregrine Falcon	*Falco peregrinus tundrius/antum*	Not At Risk (2017)	Special Concern (2012)	Least Concern
Piping Plover	*Charadrius melodus melodus*	Endangered (2013)	Endangered (2003)	Near Threatened
Red Knot (rufa) (South America wintering)	*Calidris canutus rufa*	Endangered (2020)	Endangered (2012)	Near Threatened
Red-necked Phalarope	*Phalaropus lobatus*	Special Concern (2014)	Special Concern (2019)	Least Concern
Ross's Gull	*Rhodostethia rosea*	Endangered (2021)	Threatened (2003)	Least Concern
Rusty Blackbird	*Euphagus carolinus*	Special Concern (2017)	Special Concern (2009)	Vulnerable
Short-eared Owl	*Asio flammeus*	Threatened (2021)	Special Concern (2012)	Least Concern

1.1.2 Provincial

The NL ESA provides provincial protection for species designated as Endangered, Threatened, or Vulnerable in NL. The NL ESA ranks species based on the recommendations of the provincial Species Status Advisory Committee (SSAC) and the SARA, which is based on the reporting efforts of COSEWIC. There are eighteen avian SAR protected under the NL ESA, listed in Table D1-1.1.2-1 below.

Table D1-1.1.2-1 NL ESA Species List.

Common Name	Scientific Name	Provincial Status
Red Crossbill *percna*	*Loxia curvirostra percna*	Threatened (2022)
Bank Swallow	*Riparia riparia*	Threatened (2022)
Barrows Goldeneye	*Bucephala islandica*	Vulnerable (2000)
Bobolink	*Dolichonyx oryzivorus*	Vulnerable (2015)
Chimney Swift	*Chaetura pelagica*	Threatened (2007)
Common Nighthawk	*Chordeiles minor*	Threatened (2007)
Eskimo Curlew	*Numenius borealis*	Endangered (2000)
Evening Grosbeak	*Coccothraustes vespertinus*	Vulnerable (2022)
Harlequin Duck	*Histrionicus histrionicus*	Vulnerable (2001)
Ivory Gull	*Pagophila eburnea*	Endangered (2006)
Newfoundland Grey-Cheeked Thrush	*Catharus minimus minimus*	Threatened (2015)
Olive-Sided Flycatcher	*Contopus cooperi*	Threatened (2009)
Peregrine Falcon	*Falco peregrinus tundrius/antum*	Vulnerable (2007)
Piping Plover	*Charadrius melodus melodus*	Endangered (2000)

Common Name	Scientific Name	Provincial Status
Red Knot (rufa) (South America wintering)	*Calidris canutus rufa*	Endangered (2007)
Red-necked Phalarope	*Phalaropus lobatus*	Vulnerable (2022)
Rusty Blackbird	*Euphagus carolinus*	Vulnerable (2007)
Short-eared Owl	*Asio flammeus*	Vulnerable (2008)

2.0 Methods

2.1 Desktop Review

A comprehensive data and literature review was conducted to gather information on bird species known to occur within or near the Project Area, and throughout the region. First, a review of the Atlantic Canada Conservation Data Centre (AC CDC) results within a 5 km radius of the Project Area was undertaken. The results from that data query helped to inform surveys for SAR and SCC in the Project Area. Sensitive habitats present in the Project Area were identified through this process and by using the Ecological Land Classification (ELC) map (Appendix D3). Field survey maps were then generated using ArcGIS with demarcated Project Area boundaries and habitat types.

2.2 Field Studies

A wide variety of survey methods were necessary to encompass such a vast biodiversity of birds occupying so many different niches, from the terrestrial passerine species occupying myriad habitat types and which are most easily surveyed by song/call, to raptors and owls, which require drone efforts and ground transects, to water birds that require scans of marine and freshwater environments with high-resolution scopes. In addition, autonomous recording units (i.e., SongMeters) supplemented the field surveys with additional information.

2.2.1 Acoustic Monitoring

Two Wildlife Acoustics™ SongMeter SM4 Acoustic Recorders (SongMeters) were placed in the Argentia Backlands in 2023. The recorders were deployed from April 22 to October 18, 2023. They were set to record for 60 minutes three times a day: once before sunrise, once before sunset, and once during the night. Sunset and sunrise comprise prime bird activity periods and dominant singing periods, and nighttime recordings aim to capture nocturnal species such as owls.

The sites selected for acoustic monitoring represented multi-habitat transitional areas to maximize the variety of birds detected from different ecological niches. SongMeter 1 was placed near a small stream discharging from Gull Pond, where it passes through a coniferous thicket and forms a pool near a marsh

wetland (UTM 22T, 278693 E, 5240214 N). This area provided a variety of habitats suitable for species such as forest birds, waterbirds, shorebirds, and wetland species. Additionally, due to its relatively high elevation, SongMeter 1 had the potential to record calls from bird flyovers, including from raptors.

SongMeter 2 was placed at an intermediate elevation near a transition between mature coniferous forest and pond, riparian, and wetland habitats (UTM 22T, 275827 E, 5240933 N). In addition, the location was proximate to anthropogenically-created shrub and meadow habitat around Argentia Pond.

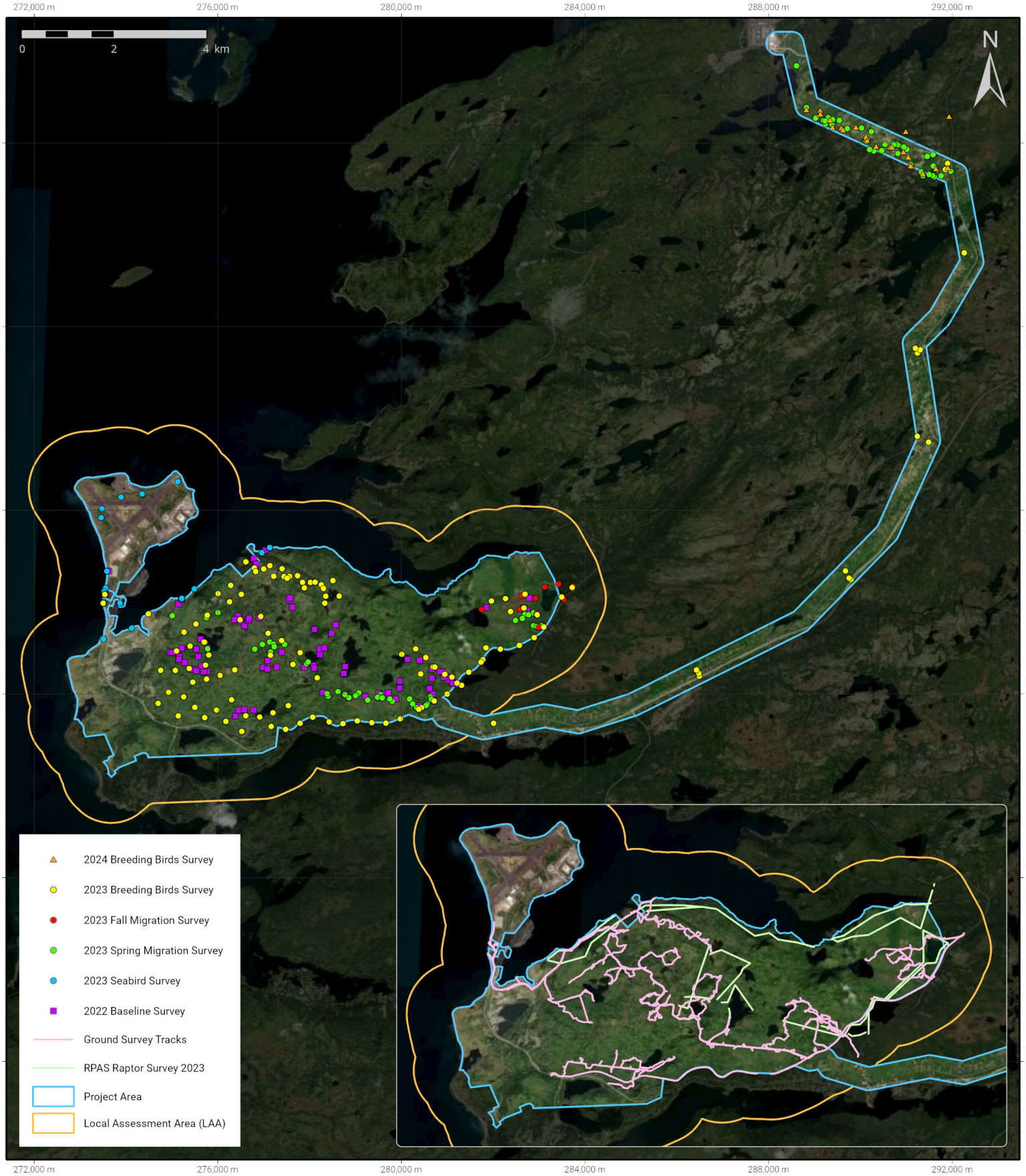
All data obtained from the six-month deployment was processed and incorporated into a dataset for analysis using the Kaleidoscope Pro Analysis software. Analytical processing classified signals and identified each call or song to species. This dataset, given the long deployment (encapsulating spring migration, breeding season, and fall migration), ensured that the species inventory of birds using the Project Area was as complete as possible.

2.2.2 Bird Surveys

Bird surveys were conducted throughout the Project Area beginning in fall 2022 and continuing through all of 2023 and 2024. A combination of survey techniques was required to survey the diversity of species in the Project Area and LAA, including point count surveys, transect surveys, scans of wetlands and waterbodies, and sky scans for migratory raptors. Survey effort was stratified proportionally by habitat type, with emphasis on specialized habitats like wetlands due to their suitability for several of the bird SAR. Survey effort is demonstrated in the following map (Figure D1-2.2.2-1).

Bird surveys are ongoing throughout 2024, and further information will be available once the study is complete. These surveys follow the same methodology as previous years and are being conducted in consultation with regulatory authorities.

Surveys were not conducted during inclement weather (e.g., excessive wind, rain or snow) as such conditions can reduce the detectability of birds and result in the under-representation of bird presence. As per E guidance, wind was tracked using the Beaufort scale and visibility was used as an indicator of weather conditions that would limit bird activity levels (ECCC, 2023). Height data was gathered for spring and fall surveys to facilitate the effects assessment section of the Registration document.



Pattern | Argentia Renewables	FIGURE NUMBER: D1 - 2.2.2 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Bursey	DATE: 24/07/26
	FIGURE TITLE: Survey Effort for Avifauna 2022-2024	NOTES: RPAS - Remotely Piloted Aircraft System	REVIEWED BY:	
	PROJECT TITLE: Argentia Renewables		APPROVED BY:	sem

SEM MAP ID: 238-005-GIS-152-Rev1

Data recorded across all bird survey types included:

- Date;
- Waypoint/Survey Location ID;
- GPS Coordinates;
- Habitat of Location/Key Features;
- Weather;
- Significant Weather Previous to Survey;
- Time;
- Sex (where possible);
- Number of Species Observed;
- Observation Type (auditory, visual, and appropriate breeding indications where applicable);
- Position (i.e., Ground, Perched, Flying including height above ground); and,
- Direction of Travel (where possible).

Survey types are discussed in more detail below.

Point Counts

Point count surveys are often used in terrestrial environments to obtain a measure of species richness and relative abundance. Ten-minute point counts were conducted during breeding season at predetermined GPS points that represented several habitat types, with a subset focused on habitats suitable for SAR. Each survey was conducted by a biologist experienced in auditory and visual identification of birds in this region. Observations included songs, calls, breeding displays, drums (for woodpeckers), and other behaviours (e.g., tail-pumping, food carrying, etc.). All terrestrial ecotypes (from the ELC) in the Project Area were surveyed and effort was stratified according to the significance of each habitat.

Opportunistic point counts were also conducted as one-off surveys during other field work (e.g., rare lichens surveys), to bolster coverage of large areas and provided an enhanced opportunity to encounter and record species that may have been difficult to observe during predetermined point counts (e.g., species with quieter vocalizations).

Atlassing Transects

In addition to point counts, systematic “atlassing” transects were conducted throughout the Project Area, recording visual and auditory observations, combined with “pishing” to encourage observations (a

technique widely used by birders to increase proximity to birds). Survey transects extended throughout the Project Area and focused coverage proportionally according to habitat type. Habitat suitability was informed by the ELC (Appendix D3). The walking pace varied based on habitat type, topography, and the number of detections (i.e., bird activity). Transects began shortly after sunrise (or as early as was logistically feasible) and they were concluded depending on the level of bird activity observed. These transects are less rigid than point counts in that the observer can leave the transect to seek more information and can use techniques like pishing or playbacks to bolster observations. More information on habitat use can often be obtained from atlassing transects than from point counts (point counts focus heavily on singing males).

Raptor Scans

Raptor scans were conducted opportunistically along atlassing transects or between point count stations and using high-resolution binoculars and scopes. Raptor scans were conducted by choosing a high vantage point with a large swath of open sky visible, such as in the rocky outcrops of the Argentia Backlands, or throughout the open expanse of the Argentia Peninsula. For a selected period (10 or 30 minutes, depending on activity and weather), the observer scanned the sky for raptors. In addition to dedicated opportunistic raptor scans, any raptor observations during other field surveys were also recorded.

Seabird Surveys

Shoreline point count surveys were conducted for seabirds at predetermined locations and opportunistically during other surveys. These surveys were typically completed bi-weekly on the Argentia Peninsula and along the west and northwest shores of the Argentia Backlands. Seabirds in flight were identified by sight using high-quality optics. Scans were also made along the surface of the water. The altitude and direction of travel for flying seabirds were observed and recorded in addition to estimates of the number of individuals.

2.2.2.1 2022 Fall Bird Surveys

In fall 2022, bird surveys were conducted bi-weekly between September 26 and December 8, 2022. Atlassing transects and opportunistic point counts were distributed throughout the Argentia Backlands and other sections of the Project Area. Observations compiled during other terrestrial surveys (e.g., rare lichens, ELC) also contributed to incidental data for fall birds. This supplementary data was used to inform dedicated efforts for SAR, and to plan 2023 surveys. Raptor scans were also conducted opportunistically.

Seabird surveys were conducted with point counts along the coastline of the Project Area. Point locations were designated on either side of the Argentia Peninsula where access was possible, and within Cooper

Cove. Each point count was 30 or 60 minutes, depending on conditions and activity. High-quality binoculars and long-range scopes were used to assist in seabird detection, allowing for observations up to 1000 m from the observers.

2.2.2.2 2023 Bird Surveys (All Seasons)

Bird surveys were conducted throughout 2023, starting with bi-weekly surveys throughout winter to observe winter residents and then weekly surveys during spring migration. Breeding bird surveys were conducted daily in June with point counts and atlassing transects. Seasons, dates, and survey frequency for all bird surveys in 2023-2024 are listed in Table D1-2.2.2-1.

Table D1-2.2.2-1 Bird Survey Seasonal Windows, 2023.

Season	Survey Dates	Survey Frequency
Spring Migration	May 7 – June 7, 2023	Weekly
Breeding Season	June 7 – June 27, 2023	Daily intensive survey
Fall	September 26, 2023 – January 3, 2024	One day survey, bi-weekly
Winter*	January 3 – March 31, 2024	One day survey, bi-weekly
NOTES *results for winter 2024 are currently being analyzed and will be included in a report in late 2024.		

Spring Migration 2023

Spring surveys incorporated ten (10) point counts across a range of habitat types. Surveys aimed to collect data across the progression of bird species migration in the Project Area throughout the season. Point count locations were positioned in the eastern, coniferous forest-dominated zone of the Project Area, and within a large wetland in a Mixedwood portion of the Argentia Backlands. Point counts were conducted once weekly.

Breeding Bird Surveys 2023

Ninety-six breeding bird point count surveys were conducted daily from June 7 to June 27, 2023, which coincided with peak breeding season in insular Newfoundland. Counts were stratified by habitat type to ensure sampling across ecological niches.

In addition to seeking relative abundances for each species using the Project Area (through point counts), effort was also placed on detecting nests and breeding bird behavioural cues (e.g., carrying nest material, courtship behavior, food carrying, etc.) via atlassing transects. All birds observed during these surveys were documented, regardless of whether their breeding status was known.

Fall Migration 2023

Fall bird surveys were conducted to assess bird migration through the Project Area, an important consideration for the effects assessment of wind projects on avifauna. Eight-point count locations were established in 2022 across several ecological niches (e.g., forest, wetland, marine, etc.), and were repeated in 2023 every two weeks to establish whether the Project Area appeared to be important to any migratory species (and migratory SAR bird species) as stopover habitat.

3.0 Results

3.1 Desktop Review

Several sources of information were researched to compile a list of potential bird species, including SAR and SCC, for the Project Area and the LAA. Results are discussed below by information source.

3.1.1 AC CDC Results

Fifteen S-ranked species (from a 5 km radius around the center of the Project Area) were listed in the results of the AC CDC data query. The AC CDC observation records indicated that several known rare birds have been documented in the Project Area. The rare birds known for the Project Area are listed in Table D1-3.1.1-1. Their S-ranks (measures of species rarity developed by AC CDC) are provided in Appendix D1.1. A map of the GPS points associated with the AC CDC observations is presented as Figure D1-3.1.1-1 below.

Table D1-3.1.1-1 AC CDC Results for rare birds known from a 5 km radius of the center of the Project Area.

Common Name	Scientific Name	S Rank (2015)	Years Observed	Location
American Golden-plover	*Pluvialis dominica*	S3M	2020	Unknown
Black-Bellied Plover	*Pluvialis squatarola*	S3M	2020, 2021	Unknown
Gray-cheeked Thrush	*Catharus minimus*	S2B, SUM	1991	Dunville
Greater Yellowlegs	*Tringa melanoleuca*	S3B, S4M	2021	Unknown
Harlequin Duck	*Histrionicus histrionicus*	S3B, S2N, SUM	1974	Argentia
Horned Lark	*Eremophila alpestris*	S3B, SUM	2021	Unknown
Lesser Yellowlegs	*Tringa flavipes*	S3M	2021	Unknown
Northern Goshawk	*Accipiter gentilis*	S3	2002	Unknown
Northern Harrier	*Circus cyaneus*	S3B, SUM	2002, 2020, 2021	Unknown
Sanderling	*Calidris alba*	S3M	2020	Unknown
Short-eared Owl	*Asio flammeus*	S3B, SUM	1991, 2019, 2021	Argentia Peninsula

Pattern | Argentia Renewables	FIGURE NUMBER: D1 - 3.1.1 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: J. Crocker	DATE: 24/07/27
	FIGURE TITLE: AC CDC Rare Fauna Results in the Project Area	NOTES: Data retrieved from the Atlantic Canada Conservation Data Centre (AC CDC).	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-148-Rev0

3.1.2 Breeding Bird Atlas

The Project Area falls within the Atlas Region 7 of the Newfoundland Breeding Bird Atlas, under map numbers 22TBT74 and 22TBT84 (Birds Canada, 2023). These square regions comprise the entirety of the Project Area. Of the 126 breeding species reported for the Avalon Peninsula (Birds Canada, 2023), map 22TBT74 (comprising the largest portion of the Project Area) reports 103 breeding birds. One SAR was known from these data to breed in the Project Area, the Red Crossbill *percna* subspecies. Other significant findings from these data included breeding pairs of Northern Harrier and Northern Goshawk, two raptor species which each warrant setback buffers around nests.

3.2 Field Studies

3.2.1 Acoustic Monitoring

To supplement survey data, automated recording units (SongMeters) were deployed at two locations for spring, summer, and fall of 2023. The results of both SongMeters are presented in Figure D1-3.2.1-1.

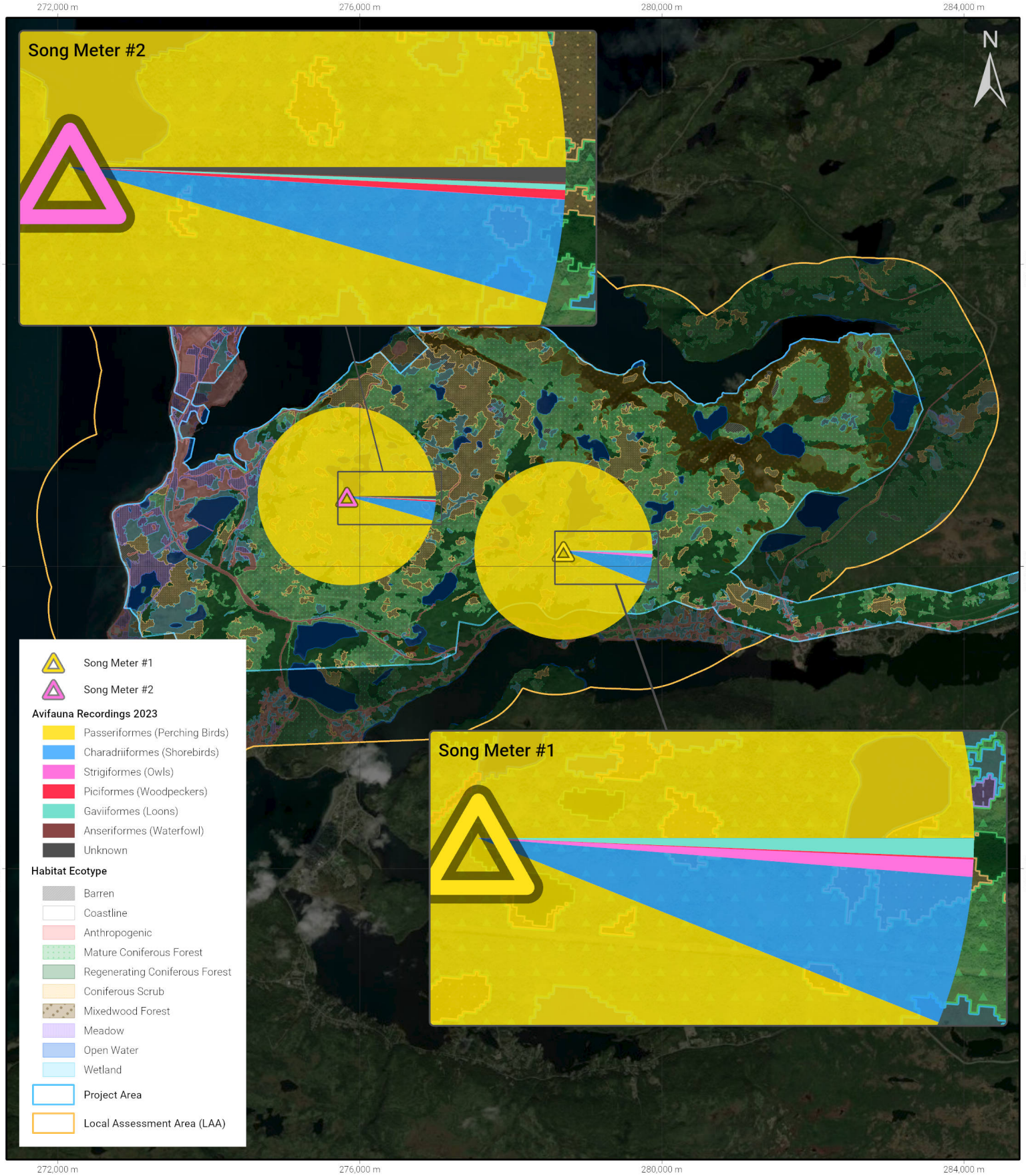


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	FIGURE TITLE: Acoustic Monitoring Results	NOTES:	REVIEWED BY:	
	PROJECT TITLE: Argentia Renewables		APPROVED BY:	sem

SEM MAP ID: 238-005-GIS-149-Rev0

3.2.1.1 SongMeter 1

SongMeter 1 was deployed from April 22 to October 18, 2023. The most detected species was the White-throated Sparrow, followed by Blackpoll Warbler, American Robin, Yellow-bellied Flycatcher, and Fox Sparrow. The total acoustic observations from SongMeter 1 are listed in Table D1-3.2.1-1 below. The acoustic observations from SongMeter 1 results are further expanded to show total observations per month in Appendix D1.2.

Table D1-3.2.1-1 SongMeter 1 Acoustic Observation Totals, 2023.

Common Name	Scientific Name	Number of Acoustic Observations
White-throated Sparrow	*Zonotrichia albicollis*	100,860
Blackpoll Warbler	*Setophaga striata*	86,384
American Robin	*Turdus migratorius*	49,932
Yellow-bellied Flycatcher	*Empidonax flaviventris*	44,417
Fox Sparrow	*Passerella iliaca*	28,918
Wilson's Snipe	*Gallinago delicata*	18,431
Yellow-rumped Warbler	*Setophaga coronata*	11,763
Dark-eyed Junco	*Junco hyemalis*	9,824
Black-and-white Warbler	*Mniotilta varia*	8,309
Northern Waterthrush	*Parkesia noveboracensis*	9,174
Hermit Thrush	*Catharus guttatus*	7,111
Swamp Sparrow	*Melospiza georgiana*	5,699
Boreal Chickadee	*Poecile hudsonicus*	4,248
Ruby-crowned Kinglet	*Regulus calendula*	3,462
Common Loon	*Gavia immer*	2,511
Magnolia Warbler	*Setophaga magnolia*	2,268
Great Horned Owl	*Bubo virginianus*	2,246
American Crow	*Corvus brachyrhynchos*	1,675
Pine Grosbeak	*Pinicola enucleator*	1,000
White-winged Crossbill	*Loxia leucoptera*	674
Greater Yellowlegs	*Tringa melanoleuca*	550
Red Crossbill *percna*	*Loxia curvirostra percna*	368
Mourning Warbler	*Geothlypis philadelphia*	268
Northern Flicker	*Colaptes auratus*	152
Winter Wren	*Troglodytes hiemalis*	86
Woodpecker spp. (Drum)	*Picidae spp.*	84
Herring Gull	*Larus argentatus*	80
Black-throated Green Warbler	*Setophaga virens*	52
Golden-crowned Kinglet	*Regulus satrapa*	32
Black-capped Chickadee	*Poecile atricapillus*	12
Mallard	*Anas platyrhynchos*	7
Gray Jay	*Perisoreus canadensis*	6

3.2.1.2 SongMeter 2

SongMeter 2 was deployed from April 22 to October 18, 2023. The most detected species was the American Robin, followed by the White-throated Sparrow, Ruby-crowned Kinglet, Yellow-rumped Warbler, and Fox Sparrow. The total acoustic observations from SongMeter 2 are listed in Table D1-3.2.1-1. The acoustic observations from SongMeter 2 results are further expanded to show total observations per month in Appendix D1.3.

Table D1-3.2.1-1 SongMeter 2 Acoustic Observation Totals, 2023.

Common Name	Scientific Name	Number of Acoustic Observations
American Robin	*Turdus migratorius*	36,923
White-throated Sparrow	*Zonotrichia albicollis*	29,174
Blackpoll Warbler	*Setophaga striata*	18,728
Ruby-crowned Kinglet	*Regulus calendula*	5,709
Yellow-rumped Warbler	*Setophaga coronata*	4,806
Fox Sparrow	*Passerella iliaca*	3,929
Wilson's Snipe	*Gallinago delicata*	3,795
Swamp Sparrow	*Melospiza georgiana*	2,761
Northern Waterthrush	*Parkesia noveboracensis*	2,526
Savannah Sparrow	*Passerculus sandwichensis*	1,948
Yellow-bellied Flycatcher	*Empidonax flaviventris*	1,458
Black-and-white Warbler	*Mniotilta varia*	949
Hermit Thrush	*Catharus guttatus*	930
American Crow	*Corvus brachyrhynchos*	859
Northern Waterthrush	*Parkesia noveboracensis*	755
Boreal Chickadee	*Poecile hudsonicus*	651
Gray Jay	*Perisoreus canadensis*	594
Black-capped Chickadee	*Poecile atricapillus*	365
Dark-eyed Junco	*Junco hyemalis*	362
Northern Flicker	*Colaptes auratus*	361
Spotted Sandpiper	*Actitis macularius*	337
White-winged Crossbill	*Loxia leucoptera*	311
Common Loon	*Gavia immer*	284
Wilson's Warbler	*Cardellina pusilla*	188
Gull Spp.	*Larinae spp.*	150
Yellow Warbler	*Setophaga petechia*	125
Common Raven	*Corvus corax*	102
Mallard	*Anas platyrhynchos*	90
Red Crossbill *percna*	*Loxia curvirostra percna*	52
American Goldfinch	*Spinus tristis*	45

Common Name	Scientific Name	Number of Acoustic Observations
Palm Warbler	*Setophaga palmarum*	39
Golden-crowned Kinglet	*Regulus satrapa*	26
Greater Yellowlegs	*Tringa melanoleuca*	21
Great Horned Owl	*Bubo virginianus*	15
Red-breasted Nuthatch	*Sitta canadensis*	6

3.2.2 Bird Surveys

Field surveys conducted throughout the Project Area in 2022 and 2023, with a focus on the Argentia Backlands (the proposed site of the turbines, and presumably the area with the highest potential for interaction with birds), resulted in the identification of 62 species.

3.2.2.1 Fall 2022 Survey Results

Surveys conducted bi-weekly in the fall of 2022 yielded the results shown in Table D1-3.2.2-1. The most detected species were the common and loud-singing White-throated Sparrow, American Robin, Yellow-rumped Warbler, Golden-crowned Kinglet, and Boreal Chickadee.

Table D1-3.2.2-1 Fall Bird Survey Totals, 2022.

Fall Bird Survey Totals, September 26 – December 8, 2022		
Species Common Name	**Latin Name**	**Count of Species**
White-throated Sparrow	*Zonotrichia albicollis*	76
American Robin	*Turdus migratorius*	63
Yellow-rumped Warbler	*Setophaga coronata*	41
Golden-Crowned Kinglet	*Regulus satrapa*	62
Boreal Chickadee	*Poecile hudsonicus*	56
Dark-Eyed Junco	*Junco hyemalis*	31
Black-Capped Chickadee	*Poecile atricapillus*	29
Canada Jay	*Perisoreus canadensis*	23
American Goldfinch	*Spinus tristis*	21
White-Throated Sparrow	*Zonotrichia albicollis*	18
American Crow	*Corvus brachyrhynchos*	18
Red Breasted Merganser	*Mergus serrator*	19
Northern Flicker	*Colaptes auratus*	16
Blue Jay	*Cyanocitta cristata*	12
Red Crossbill *percna*	*Loxia curvirostra percna*	11
Semipalmated Plover	*Charadrius semipalmatus*	10
Herring Gull	*Larus argentatus*	6
Swamp Sparrow	*Melospiza georgiana*	5
Long-Tailed Duck	*Clangula hyemalis*	5

Fall Bird Survey Totals, September 26 – December 8, 2022		
Species Common Name	**Latin Name**	**Count of Species**
Common Raven	*Corvus corax*	4
American Robin	*Turdus migratorius*	4
White-Winged Crossbill	*Loxia leucoptera*	4
Bald Eagle	*Haliaeetus leucocephalus*	3
Pine Siskin	*Pinus sinus*	3
Fox Sparrow	*Passerella iliaca*	3
Wilson's Snipe	*Gallinago delicata*	3
Black Guillemot	*Cepphus grylle*	2
Pine Grosbeak	*Pinicola enucleator*	2
Sharp-Shinned Hawk	*Accipiter striatus*	1
Greater Black-Backed Gull	*Larus marinus*	1
Glaucous Gull	*Larus hyperboreus*	1
Savannah Sparrow	*Passerculus sandwichensis*	1
Common Loon	*Gavia immer*	1
Greater Yellowlegs	*Tringa melanoleuca*	1
Hermit Thrush	*Catharus guttatus*	1

3.2.2.2 2023 Survey Results

Spring Migration

Spring 2023 (May 7-May 25) weekly surveys resulted in the observation of 41 bird species, with a focus on the Argentia Backlands (where the turbines are proposed to be located). The most detected birds were the White-throated Sparrow, American Robin, Yellow-rumped Warbler, Fox Sparrow, and Wilson's Snipe. Of note was one observation of the Red Crossbill *percna*, which is listed as Threatened both provincially and federally. Bird survey totals were a sum of observations based on point counts and atlassing transects (Table D1-3.2.2-1).

Table D1-3.2.2-1 Spring Bird Survey Totals, 2023.

Spring Bird Survey Totals, May 7 – May 25, 2023		
Species Common Name	**Latin Name**	**Count of Species**
White-throated Sparrow	*Zonotrichia albicollis*	76
American Robin	*Turdus migratorius*	63
Yellow-rumped Warbler	*Setophaga coronata*	41
Fox Sparrow	*Passerella iliaca*	35
Wilson's Snipe	*Gallinago delicata*	35
Hermit Thrush	*Catharus guttatus*	31
Dark-eyed Junco	*Junco hyemalis*	28
Northern Waterthrush	*Parkesia noveboracensis*	27

Spring Bird Survey Totals, May 7 – May 25, 2023		
Species Common Name	**Latin Name**	**Count of Species**
Northern Flicker	*Colaptes auratus*	24
Ruby-crowned Kinglet	*Regulus calendula*	19
Boreal Chickadee	*Poecile hudsonicus*	18
American Crow	*Corvus brachyrhynchos*	17
Ruffed Grouse	*Bonasa umbellus*	16
Blackpoll Warbler	*Setophaga striata*	12
Blue Jay	*Cyanocitta cristata*	9
Common Raven	*Corvus corax*	8
Black-capped Chickadee	*Poecile atricapillus*	7
Savannah Sparrow	*Passerculus sandwichensis*	6
Purple Finch	*Haemorhous purpureus*	6
Herring Gull	*Larus argentatus*	6
Gull spp.	*Larus spp.*	6
Black and White Warbler	*Mniotilta varia*	5
Gray Jay	*Perisoreus canadensis*	5
Hairy Woodpecker	*Leuconotopicus villosus*	4
Pine Grosbeak	*Pinicola enucleator*	4
Common Loon	*Gavia immer*	4
Bald Eagle	*Haliaeetus leucocephalus*	3
Common Tern	*Sterna hirundo*	3
Woodpecker Spp.	*Picidae spp.*	2
Wilson's Warbler	*Cardellina pusilla*	2
Black-backed Woodpecker	*Picoides arcticu*	2
Golden-crowned Kinglet	*Regulus satrapa*	2
Greater Yellowlegs	*Tringa melanoleuca*	2
American Goldfinch	*Spinus tristis*	1
Red Crossbill *percna*	*Loxia curvirostra percna*	1
Pine Siskin	*Spinus pinus*	1
Swamp Sparrow	*Melospiza georgiana*	1
Blue-headed Vireo	*Vireo solitarius*	1
Brown Creeper	*Certhia americana*	1
Northern Harrier	*Circus hudsonius*	1
White-winged Crossbill	*Loxia leucoptera*	1

In spring 2023, the heights of birds observed in the Project Area were recorded, as different ecological niches may interact differently with the Project infrastructure. Most Passeriformes and Other Perching Birds were observed at 0-15 m high, which is typical for this group, as they tend to use the vertical structure associated with forest, shrubs, and the ground for foraging. Raptors were observed in the higher

height categories, but the sample size was very small (n=3). Waterfowl were observed most often in the 60-100 m category (Table D1-3.2.2-2).

Table D1-3.2.2-2 Bird Observation Heights by Bird Group, Spring 2023.

Bird Group	Height of Observation	Percentage of Observations at Height (%)	Number of Observations
Passeriformes and Other Perching Birds	Unknown	8.70	40
	0-15 m	85.30	391
	15-30 m	0.90	4
	30-60 m	2.60	12
	60-100 m	2.60	12
	100+ m	0	0
Raptors	Unknown	0	0
	0-15 m	33.30	1
	15-30 m	0	0
	30-60 m	0	0
	60-100 m	33.30	1
	100+ m	33.30	1
Waterfowl and Waterbirds	Unknown	8.77	5
	0-15 m	47.37	27
	15-30 m	7.02	4
	30-60 m	7.02	4
	60-100 m	28.07	16
	100+ m	1.75	1
Seabirds	Unknown	33.30	5
	0-15 m	20.00	3
	15-30 m	0	0
	30-60 m	0	0
	60-100 m	33.30	5
	100+ m	13.30	2

Breeding Season

Bird surveys conducted during the breeding season of 2023 resulted in the observation of 38 different bird species, mostly terrestrial species in the Argentia Backlands (where turbines are proposed). The most detected species were Northern Waterthrush, Blackpoll Warbler, White-throated Sparrow, Yellow-bellied Flycatcher, and Fox Sparrow. Of note were four observations of Red Crossbill *percna*, a SAR listed as Threatened provincially and federally. Breeding season bird observation data is presented in Table D1-3.2.2-3.

Table D1-3.2.2-3 Breeding Season Bird Survey Totals, 2023.

Breeding Season Bird Survey Totals, June 7 – June 27, 2023		
Species Common Name	**Latin Name**	**Count of Species**
Northern Waterthrush	*Parkesia noveboracensis*	118
Blackpoll Warbler	*Setophaga striata*	103
White-throated Sparrow	*Zonotrichia albicollis*	97
Yellow-bellied Flycatcher	*Empidonax flaviventris*	73
Fox Sparrow	*Passerella iliaca*	60
American Robin	*Turdus migratorius*	47
Hermit Thrush	*Catharus guttatus*	37
Black-and-white Warbler	*Mniotilta varia*	29
Yellow-rumped Warbler	*Setophaga coronata*	27
Wilson's Snipe	*Gallinago delicata*	25
Ruby-crowned Kinglet	*Regulus calendula*	24
Dark-eyed Junco	*Junco hyemalis*	24
Boreal Chickadee	*Poecile hudsonicus*	19
Swamp Sparrow	*Melospiza georgiana*	9
Black-capped Chickadee	*Poecile atricapillus*	7
Blue Jay	*Cyanocitta cristata*	7
American Crow	*Corvus brachyrhynchos*	6
Canada Jay	*Perisoreus canadensis*	5
Ruffed Grouse	*Bonasa umbellus*	5
Common Yellowthroat	*Geothylypis trichas*	4
Red Crossbill *percna*	*Loxia curvirostra percna*	4
Gull species	*Larus spp.*	4
Common Raven	*Corvus corax*	3
Downy Woodpecker	*Picoides pubescens*	3
Wilson's Warbler	*Cardellina pusilla*	3
Swainson's Thrush	*Catharus ustulatus*	3
Black-throated Green Warbler	*Setophaga virens*	3
Northern Flicker	*Colaptes auratus*	3
Gray-cheeked Thrush	*Catharus minimus*	3
Common Loon	*Gavia immer*	2
Magnolia Warbler	*Setophaga magnolia*	1
Blue-headed Vireo	*Vireo solitarius*	1
Sharp-shinned Hawk	*Accipiter striatus*	1
Black-backed Woodpecker	*Picoides arcticus*	1
Golden-crowned Kinglet	*Regulus satrapa*	1
Palm Warbler	*Setophaga palmarum*	1
Tree Swallow	*Tachycineta bicolor*	1
Hairy Woodpecker	*Leuconotopicus villosus*	1

Fall Migration

Fall 2023 surveys resulted in the observation of 37 different bird species. The most detected bird species during this season were the White-winged Crossbill, Pine Siskin, Boreal Chickadee, Black-capped Chickadee, and American Robin. Twenty-six observations of Red Crossbill *percna* were recorded, the only SAR observed. Fall bird survey totals are presented in Table D1-3.2.2-4 below.

Table D1-3.2.2-4 Fall Migration Bird Survey Totals, 2023.

Fall Bird Survey Totals, September 26, 2023 – January 3, 2024		
Species Common Name	**Latin Name**	**Count of Species**
White-winged Crossbill	*Loxia leucoptera*	227
Pine Siskin	*Pinus spinus*	185
Boreal Chickadee	*Poecile hudsonicus*	70
Black-capped Chickadee	*Poecile atricapillus*	34
American Robin	*Turdus migratorius*	27
American Crow	*Corvus brachyrhynchos*	27
Red Crossbill *percna*	*Loxia curvisrostra percna*	26
American Goldfinch	*Spinus tristis*	25
Golden-crowned kinglet	*Regulus satrapa*	23
Northern Flicker	*Colaptes auratus*	18
Dark-eyed Junco	*Junco hyemalis*	18
Black Scoter	Melanitta americana	16
Common Raven	*Corvus corax*	11
Blue Jay	*Cyanocitta cristata*	10
Canada Jay	*Perisoreus canadensis*	10
Common Redpoll	*Acanthis flammea*	9
Savannah Sparrow	Passerculus sandwichensis	6
White-throated Sparrow	*Zonotrichia albicollis*	5
Wilson's Snipe	Gallinago delicata	4
Ruffed Grouse	*Bonasa umbellus*	4
Sharp-shinned Hawk	*Accipiter striatus*	2
Yellow-rumped Warbler	*Setophaga coronata*	3
Swamp Sparrow	*Melospiza georgiana*	3
Purple Finch	*Haemorhous purpureus*	2
Duck spp.	Anas spp.	2
American Black Duck	*Anas rubripes*	2
Downy Woodpecker	*Picoides pubescens*	2
Fox Sparrow	*Passerella iliaca*	2
Pine Grosbeak	Pinicola enucleator	2
Red-breasted Nuthatch	Sitta canadensis	1
Tennessee Warbler	*Leiothlypis peregrina*	1

Fall Bird Survey Totals, September 26, 2023 – January 3, 2024		
Species Common Name	**Latin Name**	**Count of Species**
Common Loon	*Gavia immer*	1
Hermit Thrush	*Catharus guttatus*	1
Song Sparrow	*Melospiza melodia*	1
Blue-headed Vireo	*Vireo solitarius*	1
Merlin	*Falco columbarius*	1
Northern Goshawk	*Accipiter gentilis*	1

Ninety-five percent of birds observed in the fall were Passeriformes and Other Perching Birds. Table D1-3.2.2-5 lists the heights of observations.

Table D1-3.2.2-5 Bird Observation Heights by Bird Group, Fall 2023.

Bird Group	Height of Observation	Percentage of Observations at Height
Passeriformes and Other Perching Birds	0-15 m	31.81%
	15-30 m	52.67%
	30-60 m	7.38%
	Unknown	8.14%
Raptors	0-15 m	50.00%
	15-30 m	25.00%
	30-60 m	25.00%
	Unknown	0.00%
Waterfowl and Water Birds	0-15 m	76.47%
	15-30 m	23.53%
	30-60 m	0.00%
	Unknown	0.00%

3.3 Species at Risk

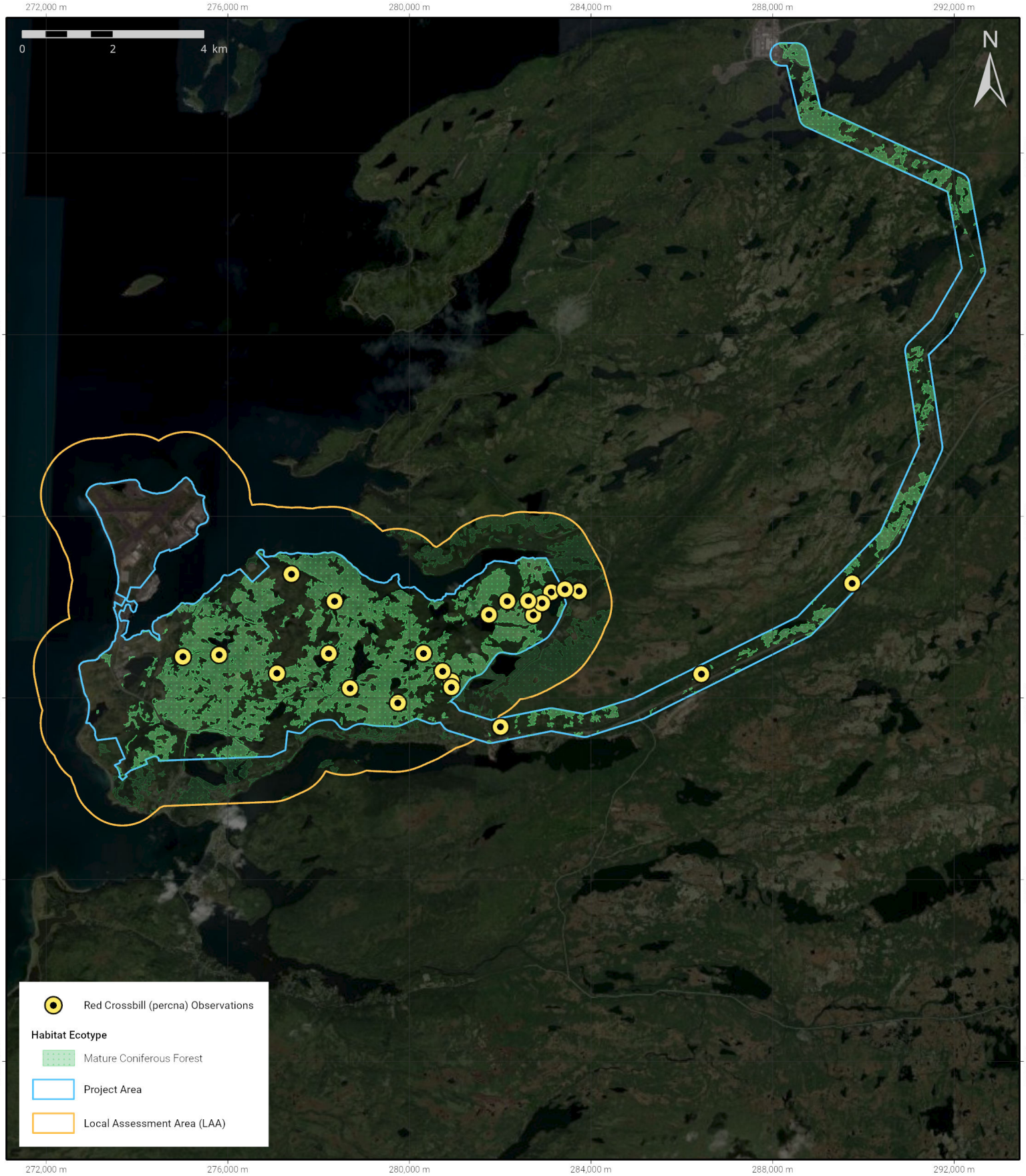
Red Crossbill *percna*

The Red Crossbill *percna* subspecies is listed as Threatened under the NL ESA and the SARA. This subspecies was once listed as Endangered but was downlisted in 2016 (COSEWIC, 2016). Red Crossbill *percna* was thought to be endemic to Newfoundland until recently, when it was observed on Anticosti Island in Quebec (COSEWIC, 2016). Red Crossbill *percna* inhabit and rely on coniferous forests as a main source of food, as they are specially adapted to eat cone-obligate seeds (COSEWIC, 2016).

The Red Crossbill *percna* was observed in the Project Area during fall surveys in 2022 (11 detections) and 2023 (27 detections), see Figure D1-3.3-1. In addition, there were a total of 420 identifications from

the two SongMeters (SongMeter 1: 368 detections over 166 days of deployment; SongMeter 2: 52 detections over 155 days of deployment). Only four detections occurred during breeding season surveys. A map of Red Crossbill *percna* observation sites and suitable habitat is presented in Figure D1-3.3-2. Habitat suitability, as for all the SAR, was derived from the Ecological Land Classification (ELC) (Appendix D3).

Figure D1-3.3-1 Red Crossbill *percna* male in the Project Area, December 2023.



Pattern | Argentia Renewables	FIGURE NUMBER: D1 - 3.3 - 2	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/26
	FIGURE TITLE: Red Crossbill *percna* Observations and Suitable Habitat	NOTES:	REVIEWED BY:	
	PROJECT TITLE: Argentia Renewables		APPROVED BY:	sem

SEM MAP ID: 238-005-GIS-107-Rev1

Evening Grosbeak

Evening Grosbeak was observed twice (by sound) at sites near the yellow birch Mixedwood Forests in the northern section of the Argentia Backlands. Evening Grosbeak breed in mature to old coniferous forests and mixedwood forests across Canada (ECCC, 2022). They are listed as Special Concern on the SARA and are listed as Vulnerable on the NL ESA.

Gray-cheeked Thrush

Gray-cheeked Thrush *minimus* subspecies (*Catharus minimus minimus*) is a Newfoundland subspecies listed as Vulnerable under the NL ESA. This subspecies was designated as Threatened by COSEWIC in 2023 (COSEWIC, 2023); however, the subspecies is not currently listed on the SARA. Gray-cheeked Thrush in Newfoundland prefers windswept coastal conifer thickets, conifer scrub, and regenerating clearcuts of balsam fir (*Abies balsamea*) (Dalley *et al*., 2005). Suitable habitat exists in the Project Area in the form of Regenerating Coniferous Forest thickets throughout the Backlands, and coastal windswept Coniferous Scrub along the Argentia Peninsula.

The low abundance of this species in Newfoundland appears to correlate inversely with the abundance of red squirrel (*Tamiasciurus hudsonicus*) (Dalley *et al*., 2005), which were observed often during bird surveys. However, three observations of Gray-cheeked Thrush were recorded during the breeding bird surveys (all three were songs, on June 8, 15, and 18, 2023). Interestingly, all three observations were at elevations $\leq$100 m, which contrasts with recent research indicating that the species is now essentially absent below 350 m (Robineau-Charette *et al*., 2023).

Short-eared Owl

The Short-eared Owl is classified as Vulnerable under the NL ESA and is listed as Special Concern on SARA Schedule 1. Minimal habitat exists for the Short-eared Owl in the Project Area, aside from the wetland complexes, which are marginal due to their saturation levels. The brownfield sections of the Project Area (on the Argentia Peninsula) may provide habitat suitable for foraging and nesting, as well as some areas of the Backlands.

While no observations of the Short-eared Owl were recorded during the surveys in the Project Area, AC CDC records indicate that this species has been observed on the Argentia Peninsula. Surveys in mid-July 2024 have not produced any observations of this species. Another survey will be conducted in early August on the peninsula and within appropriate habitats of the Backlands.

Harlequin Duck

Harlequin Duck spends most of the year in coastal waters before heading inland along fast-flowing streams to breed on the shorelines of turbulent waters (Environment Canada, 2007). Breeding habitat does exist within the Project Area for Harlequin Duck, and the coastal habitat adjacent to the Project Area (within the LAA) may be suitable wintering habitat. The species is generally known to use Placentia Bay outside of breeding season. One record from Argentia in 1974 was listed in the AC CDC query. Harlequin Duck was not observed during any bird surveys at any time of year.

4.0 Discussion

Bird surveys were conducted year-round throughout the Project Area, and to some extent the Local Assessment Area (i.e., the marine environment and coastline). In addition, SongMeters were deployed from April to October,2023. The suite of species detected was consistent with expectations for this area from other data, range maps, and experience conducting surveys in the region. Most of the species detected were Passeriformes, a result that was anticipated given that efforts focused on the Argentia Backlands (where the proposed turbines would be located).

Three SAR birds were observed from surveys, Red Crossbill *percna*, a Mature Coniferous Forest specialist, Gray-cheeked Thrush, a specialist of Scrub and/or thick young forest, and Evening Grosbeak, a highly irruptive species that breeds in Mature Coniferous Forest or mature Mixedwood Forest habitats.

Argentia Renewables is a steward of bird conservation and is committed to a robust Species at Risk Impacts Mitigation and Monitoring Plan (SAR IMMP) (note: this document is a draft and requires approval by NL WD) (Appendix R) and a comprehensive Post Construction Monitoring Plan (PCMP) (Appendix S). Bird surveys will continue throughout 2024, in addition to the surveys planned for the SAR IMMP and PCMP.

5.0 References

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Appendix D1.1
Legislative and Organizational Species at Risk Classifications

The NL ESA provides special protection for plant and animal species considered to be Endangered, Threatened, or Vulnerable. This legislation applies to species, sub-species and populations that are native to Newfoundland and Labrador but does not include marine fish, bacteria, and viruses. Designation under the Act follows recommendations from the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and/or the Species Status Advisory Committee (SSAC) on the appropriate assessment of a species. Classifications of the NL ESA are outlined below.

NL ESA Classifications

Classification	Description
Extinct	No longer exists.
Extirpated	No longer exists in the wild, but exists elsewhere (e.g., exists in another province, a zoo, or a botanical garden).
Endangered	Faces imminent extirpation or extinction. For example, taxon in this category can have a declining total population size, a very small population (<250 mature individuals), an area of occupancy of less than 500 km2, and/or occur at five or less locations. Without intervention, this taxon is likely to become Extirpated from the province.
Threatened	Is likely to become endangered if nothing is done to reverse the factors limiting its survival. For example, taxon in this category can have a declining total population size, a very small population (<1000 mature individuals), an area of occupancy of less than 2000 km2, and/or occur at 10 or less locations.
Vulnerable	Has characteristics which make it particularly sensitive to human activities or natural events such as susceptibility to catastrophic events (e.g., oil spill) or restricted habitat or food requirements that are themselves under threat. This category may also be used to identify a wildlife species that has recovered from Threatened or Endangered status, but which is not yet secure. Species in this category are likely to become threatened or endangered if not managed effectively.
Data Deficient	All sources of available information have been investigated but the information in the status report is insufficient to determine risk of extinction based on distribution and/or population status. Listing in this category indicates that more information is required, and future research may show another classification is appropriate.
Not At Risk	Generally applied to widespread and abundant taxa unlikely to fit the criteria for Vulnerable, Threatened or Endangered in the near future.

The **Species at Risk Act** (SARA) was proclaimed in June 2003, to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of wildlife species that are Extirpated, Endangered or Threatened as a result of human activity, and to manage species of Special Concern to prevent them from becoming endangered or threatened. In addition, it complements existing laws and agreements to provide for the legal protection of wildlife species and the conservation of biological diversity. The Act aims to prevent wildlife species from becoming extinct and to secure the necessary actions for their recovery. It applies to all federal lands in Canada, all wildlife species listed as being at risk, and their critical habitat. Descriptions of SARA classifications can be found below.

SARA Classifications

Classification	Description
Extinct	A wildlife species that no longer exists
Extirpated	A wildlife species that no longer exists in the wild in Canada, but exists elsewhere in the wild
Endangered	A wildlife species that is facing imminent Extirpation or Extinction
Threatened	A wildlife species that is likely to become Endangered if nothing is done to reverse the factors leading to its Extirpation or Extinction
Special Concern	A wildlife species that may become a Threatened or an Endangered species because of a combination of biological characteristics and identified threats

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is an independent advisory panel to the Minister of Environment and Climate Change Canada that assesses the status of wildlife Species at Risk. Members are wildlife biology experts from academia, government, non-governmental organizations, and the private sector. COSEWIC designations are regarded as recommendations to the federal government, where the government makes the final decision on whether species will be listed under the SARA. Descriptions of COSEWIC classifications can be found below (COSEWIC, 2021).

COSEWIC Classifications

Classification	Description
Extinct (X)	A wildlife species that no longer exists
Extirpated (XT)	A wildlife species that no longer exists in the wild in Canada, but exists elsewhere in the wild
Endangered (E)	A wildlife species that is facing imminent extirpation or extinction
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed
Special Concern	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats
Data Deficient (DD)	A category that applies when the available information is insufficient (a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction.
Not At Risk (NAR)	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.

The Atlantic Canada Conservation Data Centre (AC CDC) provides provincial lists of flora and fauna and assigns a conservation status rank (S-rank) for each species in the province. The AC CDC maintains S-ranks for all terrestrial vertebrates, vascular plants, bryophytes, macrolichens and many invertebrate groups. It should be noted that S-ranks do not have any legislative protections, and for this reason are often referred to as Species of Conservation Concern (SCC), for species with S-ranks of S1 to S3. However, the AC CDC also provides the corresponding SAR information for those species that are both a SCC and SAR. AC CDC S-rank definitions are provided below.

AC CDC S-Rank Definitions

S-rank	Definition
SX	Presumed Extirpated - Species or community is believed to be extirpated from the province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
S1	Critically Imperiled - Critically imperiled in the province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the province.
S2	Imperiled - Imperiled in the province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the province.
S3	Vulnerable - Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer), 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 province.
SNR	Unranked - Provincial conservation status not yet assessed.
SU	Unrankable - Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
SNA	Not Applicable - A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
S#S#	Range Rank - A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).
SH	Possibly Extirpated (Historical)—Species or community occurred historically in the province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become SH without such a 20-40 year delay if the only known occurrences in a province were destroyed or if it had been extensively and unsuccessfully looked for. The SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.
Not Provided	Species is not known to occur in the province.

The International Union for Conservation of Nature (IUCN) Red List of Threatened Species maintains a categorized list of global species of conservation concern. This database provides species' conservation status alongside robust and reliable information. The IUCN Red List is used by a wide variety of organizations, including government bodies. IUCN Red List categories are defined below (IUCN Species Survival Commission, 2012).

IUCN Red List Categories

Category	Description
Extinct (X)	A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual.
Extinct in the Wild (EW)	A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual.
Critically Endangered (CR)	A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see Section V), and it is therefore considered to be facing an extremely high risk of extinction in the wild.
Endangered (EN)	A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see Section V), and it is therefore considered to be facing a very high risk of extinction in the wild.
Vulnerable (VU)	A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Section V), and it is therefore considered to be facing a high risk of extinction in the wild.
Near Threatened (NT)	A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
Least Concern (LC)	A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.
Data Deficient (DD)	A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat.
Not Evaluated (NE)	A taxon is Not Evaluated when it has not yet been evaluated against the criteria.

Appendix D1.2
SongMeter 1 Monthly Acoustic Observation Totals, 2023

Table D1.1-1 SongMeter 1 Monthly Acoustic Observation Totals, 2023.

	Apr '23	May '23	Jun '23	Jul '23	Aug '23	Sep '23	Oct '23	SPECIES TOTAL
White-throated Sparrow	38	14,611	42,918	34,736	3,507	4,604	446	**100,860**
Blackpoll Warbler	0	8,836	58,330	15,010	3,200	1,000	8	**86,384**
American Robin	77	5,855	25,496	17,744	259	408	93	**49,932**
Yellow-bellied Flycatcher	0	1,560	28,888	11,666	2,015	249	39	**44,417**
Fox Sparrow	104	4,156	12,454	11,023	813	353	15	**28,918**
Wilson's Snipe	62	3,996	8,313	6,228	0	0	0	**18,599**
Yellow-rumped Warbler	0	3,452	4,351	3,445	336	173	6	**11,763**
Dark-eyed Junco	0	1,411	6,379	2,034	0	0	0	**9,824**
Northern Waterthrush	0	988	5,834	2,210	142	0	0	**9,174**
Black-and-white Warbler	0	939	6,323	945	72	30	0	**8,309**
Hermit Thrush	11	1,646	2,469	1,375	549	778	283	**7,111**
Swamp Sparrow	0	1,904	2,456	1,288	36	15	0	**5,699**
Boreal Chickadee	32	762	2,016	1,153	23	1	5	**3,992**
Ruby-crowned Kinglet	30	474	2,755	188	6	9	0	**3,462**
Common Loon	0	109	881	1,181	193	108	39	**2,511**
Magnolia Warbler	0	228	1,764	276	0	0	0	**2,268**
Great Horned Owl	0	0	0	0	319	1,787	140	**2,246**
American Crow	0	90	86	43	565	781	110	**1,675**
Pine Grosbeak	14	121	589	276	0	0	0	**1,000**
White-winged Crossbill	1	22	0	0	530	117	4	**674**
Greater Yellowlegs	0	35	192	185	48	77	13	**550**
Red Crossbill	0	26	110	232	0	0	0	**368**
Mourning Warbler	0	5	243	20	0	0	0	**268**
Chickadee spp.	0	0	0	0	183	47	6	**236**
Northern Flicker	14	59	56	23	0	0	0	**152**
Winter Wren	0	13	22	51	0	0	0	**86**
Woodpecker spp. (drum)	8	76	0	0	0	0	0	**84**
Gull spp.	0	80	0	0	0	0	0	**80**
Black-throated Green Warbler	0	8	27	17	0	0	0	**52**
Golden-crowned Kinglet	0	0	0	0	19	7	6	**32**
Unknown	0	30	0	0	0	0	0	**30**
Black-capped Chickadee	0	0	0	0	11	0	1	**12**
Mallard Duck	0	0	0	0	1	6	0	**7**
Shorebird spp.	0	7	0	0	0	0	0	**7**
Canada Jay	0	0	0	0	1	5	0	**6**
MONTHLY SPECIES TOTAL	**391**	**51,499**	**212,952**	**111,349**	**12,828**	**10,555**	**1,214**	

Appendix D1.3
SongMeter 2 Monthly Acoustic Observation Totals, 2023

Table D1.1-1 SongMeter 1 Monthly Acoustic Observation Totals, 2023.

	Apr '2	May '23	Jun '23	Jul '23	Aug '23	Sep '23	Oct '23	Nov '23	SPECIES TOTAL
American Robin	493	17,718	16,585	13	628	808	678	0	**36,923**
White-throated Sparrow	123	11,895	8,400	31	4,207	3,452	1,055	11	**29,174**
Blackpoll Warbler	0	6,124	7,528	24	3,144	1,604	304	0	**18,728**
Ruby-crowned Kinglet	1	4,208	1,500	0	0	0	0	0	**5,709**
Yellow-rumped Warbler	1	4,395	347	0	56	6	1	0	**4,806**
Fox Sparrow	266	1,568	848	1	68	221	950	7	**3,929**
Wilson's Snipe	277	1,720	1,791	6	0	0	0	0	**3,794**
Northern Waterthrush	0	607	955	0	1,595	74	50	0	**3,281**
Swamp Sparrow	0	1,903	857	1	0	0	0	0	**2,761**
Savannah Sparrow	121	1,150	677	0	0	0	0	0	**1,948**
Yellow-bellied Flycatcher	0	15	28	0	1,273	105	37	0	**1,458**
Black-and-white Warbler	0	697	217	0	34	1	0	0	**949**
Hermit Thrush	0	31	5	0	73	327	494	0	**930**
American Crow	0	248	398	4	110	64	35	0	**859**
Canada Jay	0	1	16	0	161	209	198	9	**594**
Unknown	24	473	0	0	30	41	23	0	**591**
Chickadee Spp.	2	69	0	0	281	94	15	5	**466**
Dark-eyed Junco	6	4	0	0	237	84	31	0	**362**
Northern Flicker	8	190	43	3	41	39	37	0	**361**
Boreal Chickadee	0	0	0	0	216	115	10	0	**341**
Spotted Sandpiper	0	90	247	0	0	0	0	0	**337**
White-winged Crossbill	0	0	0	0	257	53	1	0	**311**
Common Loon	66	218	0	0	0	0	0	0	**284**
Black-capped Chickadee	0	171	39	0	0	0	0	0	**210**
Wilson's Warbler	0	2	186	0	0	0	0	0	**188**
Gull Spp.	34	116	0	0	0	0	0	0	**150**
Yellow Warbler	0	0	125	0	0	0	0	0	**125**
Common Raven	0	10	92	0	0	0	0	0	**102**
Mallard Duck	0	0	0	0	62	15	13	0	**90**
Red Crossbill*	0	0	0	0	3	5	44	0	**52**
American Goldfinch	0	8	37	0	0	0	0	0	**45**
Palm Warbler	0	33	6	0	0	0	0	0	**39**
Golden-crowned Kinglet	0	20	6	0	0	0	0	0	**26**
Greater Yellowlegs	0	3	18	0	0	0	0	0	**21**
Great Horned Owl	0	0	0	0	0	13	2	0	**15**
Red-breasted Nuthatch	0	6	0	0	0	0	0	0	**6**
MONTHLY SPECIES TOTAL	**1,422**	**53,693**	**40,951**	**83**	**12,476**	**7,330**	**3,978**	**32**	

Appendix D2

Bat Baseline Study

Appendix D2

Bat Baseline Study

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List of Acronyms and Abbreviations

Abbreviations	Definitions
BCI	Bat Conservation International
AC CDC	Atlantic Canada Conservation Data Centre
CO2	Carbon Dioxide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
ECCC	Environment and Climate Change Canada
ELC	Ecological Land Classification
NL ESA	Endangered Species Act
GIS	Geographic Information Systems
GPS	Global Positioning System
ID	Identification
SAR IMMP	Species at Risk Impacts Mitigation and Monitoring Plan
IUCN	International Union for Conservation of Nature
KHz	Kilahertz
LP	Limited Partnership
NCC	Nature Conservancy Canada
NL	Newfoundland and Labrador

PCMP	Post Construction Monitoring Plan
POA	Port of Argentia
SAR	Species at Risk
SARA	Species at Risk Act
UTM	Universal Transverse Mercator
NL WD	Newfoundland and Labrador Wildlife Division
WNS	White Nose Syndrome

1.0 Introduction

The Bat Baseline Study has been developed by Argentia Renewables Wind LP (Argentia Renewables), an affiliate of Pattern Energy Group LP (Pattern Energy) for the Argentia Renewables Project (the Project), which entails the development, construction, operation and maintenance, and eventual decommissioning and rehabilitation of an onshore wind energy generation facility (Argentia Wind Facility) and a green hydrogen and ammonia production, storage, and export facility (Argentia Green Fuels Facility). The wind energy facility (i.e., wind turbine farm) will be mostly located on what is known as the Argentia Backlands, a largely uninhabited, forested area with scattered relic military sites and variable habitat types. The Argentia Green Fuels Facility will be located on the Argentia Peninsula, a brownfield industrial complex. The Port of Argentia (POA) owns both the Argentia Backlands property and property on the Argentia Peninsula. The two, along with a Project Interconnect Line, comprise the Argentia Renewables Project Area. This baseline study focuses on the presence/absence (and, based on acoustic detections, a weak inference of relative abundance) of bat species in the Project Area, including a broad-scale assessment of habitat use.

Baseline bat surveys and desktop reviews were carried out in 2022 and 2023. Initial studies in the fall of 2022 detected three bat species in the Project Area, including the migratory silver-haired bat (*Lasionycteris noctivagans*). Longer-duration surveys (i.e., spring to fall) were conducted in 2023 to determine the species type, abundance of calls, and timeline for the detection of bats in the Project Area. Four species of bats were observed from calls in the Project Area in 2023. The little brown myotis (*Myotis lucifugus*) is relatively common in Newfoundland and was expected to be present within the Project Area. This species, along with Northern myotis (*Myotis septentrionalis*) are highly susceptible to White-nose Syndrome (WNS), a fungal disease that causes bats to arise early from hibernation and die from starvation and freezing (COSEWIC, 2013). Due to this threat, both species were emergency-listed as Endangered in Canada by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2013 (COSEWIC, 2013), and on the federal **Species at Risk Act** (SARA) in 2014. The little brown myotis was listed as Endangered by the International Union for Conservation of Nature (IUCN) in 2018, and Northern myotis was listed as Near Threatened (Solari, 2018a; Solari, 2018b). WNS was discovered in Newfoundland in 2018 (NL Fisheries and Land Resources, 2018), and both species were listed as Endangered under the Newfoundland and Labrador **Endangered Species Act** (NL ESA) in 2021. The other two bat species were unexpected for the Project Area, the hoary bat (*Lasiurus cinereus*) and the silver-haired bat. These species are migratory and spend the summer months in southern Canada before returning further south to overwinter (COSEWIC, 2023). These bats are not susceptible to WNS; however, they are at an increased risk of windmill collisions during migration (COSEWIC, 2023; Frick *et al.,* 2017; Allison *et al.,* 2019; Kunz *et al.,* 2007; Lawson, 2013). Resident bats and migratory bats may each interact with the Project in different ways, according to migratory strategy (e.g., migratory bats may

typically occupy higher airspace than the resident species that primarily forage in the airspace just above wetlands/waterbodies, or within the forest). Each are described briefly below.

1.1 Resident Bats

Little brown myotis are found in almost every province and territory across Canada (Nature Conservancy Canada [NCC], 2024). These bats typically weigh between 7-9 grams (NCC, 2024). Little brown myotis are insectivores, and while they feed on a large range of insects, they are preferential to aquatic insects (Bat Conservation International [BCI], 2020). Like almost all bat species, little brown myotis are nocturnal, and hibernate in the winter (NCC, 2024). Northern myotis (i.e., Northern long-eared bat), like little brown myotis, are nocturnal and feed exclusively on insects (BCI, 2024a). They are common in central-eastern Canada (COSEWIC, 2012), and typically weigh between 5-8 grams (BCI, 2024a). They have longer ears than other myotis species, which grants them an advantage in hunting moths (BCI, 2024a). Northern myotis tend to forage in forested areas, preying on moths, spiders, and a variety of other insects (Broders *et al.,* 2010). They can be difficult to visually distinguish from little brown myotis, as the two species are very similar and often share hibernacula in the winter (COSEWIC, 2012).

1.2 Migratory Bats

Silver-haired bats are a migratory species that can be found across Canada during the summer and fall (COSEWIC, 2023). Most silver-haired bats overwinter south of Canada (COSEWIC, 2023). They are insectivorous and eat a wide variety of insects, although they tend to prefer smaller, softer insects (BCI, 2024b). Silver-haired bats have dark fur with silver or grey tips, and are larger than local bats, typically weighing between 8-11 grams (Kunz, 1982). Hoary bats are a migratory species found across Canada (COSEWIC, 2023), and are the most widespread bat species across the Americas (BCI, 2017). They migrate north during the summer, where they prefer to roost in mature deciduous and coniferous trees (BCI, 2017). These insectivorous bats prefer to eat moths, though they will feed on other insects (BCI, 2024c). They are the largest of the bat species discovered in the Project Area, weighing between 20-35 grams (BCI, 2024c).

2.0 Methods

2.1 Desktop Review

A thorough desktop investigation and literature review were conducted to compile existing information on bats for the Project Area (and region) and to facilitate the determination of potential interactions between bats and the Project. The research focused on the bat species known to the area and their specific interactions with wind turbine developments. In addition, an Atlantic Canada Conservation Data Centre

(AC CDC) request was made for a 5 km radius of the Project Area; however, no records of bats were included in the results, ostensibly due to a lack of survey effort reported in the area.

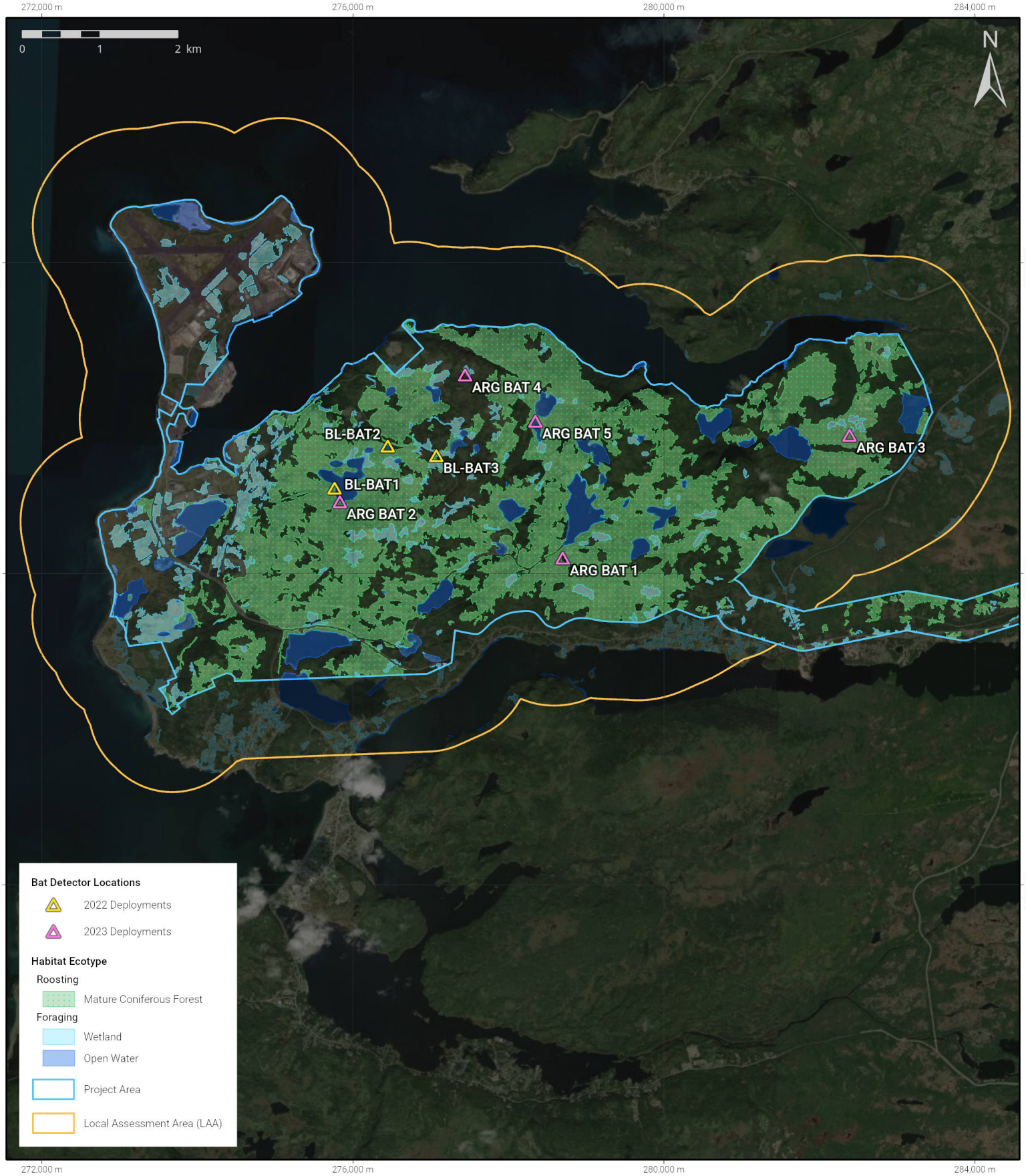
2.2 Habitat Suitability Mapping

The Ecological Land Classification (ELC) study (Appendix D3) was used to inform the bat baseline study in identifying suitable bat habitat throughout the Project Area. The ELC study consisted of a desktop review and numerous surveys throughout the Project Area. An intensive GIS and public database review was undertaken to gain an understanding of the ecotypes associated with the Project Area and their potential for bat use. Of the ten ecotypes found within the Project Area, three ecotypes present characteristics that are ideal for bat habitat. The Wetland and Open Water ecotypes were considered suitable foraging habitat while Mature Coniferous Forest was considered suitable roosting habitat. During field surveys for the ELC, observations of sites that displayed high potential to support roosting bats (e.g., rocky outcrops with shale rock, mature forest with roosting trees, or abandoned military bunkers that were moderately enclosed/protected) were recorded. The habitat suitability study informed the acoustic monitoring work undertaken, illustrated where turbine locations would impede highly suitable bat habitat, and informed the potential bat mortality estimates post-Construction Phase.

2.3 Acoustic Monitoring

Acoustic data acquisition was carried out using Titley Scientific Anabat Swift™ full spectrum passive bat detectors; three in 2022, and five in 2023 (Figure D2-2.3-1). Bat detectors collect ultrasonic bat calls with a transducer/microphone and store the sound files on SD cards for analysis. Acoustic detectors such as Anabat are used to detect calls from bats and are a relatively effective tool for identifying the species present in an area, but do not provide a clear picture of abundance (e.g., a single bat may heavily utilize an area or a group of bats may pass through an area, resulting in substantially similar detections). Regular visits were conducted to each site to collect data and batteries were monitored and changed as needed (Anabat Swift detectors are weather-proof and hold enough battery power to sustain operation for two months). As recommended by the manufacturer, the units were set to a sensitivity level of 16, and the recording format was set to full spectrum.

Detectors were mounted approximately 3 m high on trees adjacent to waterbodies, and GPS locations were recorded. Data was collected from September 9 to October 3, 2022, and from April 18 to November 16, 2023. The detectors were set to record throughout the period from a half hour before sunset to a half hour after sunrise, thereby encompassing the daily temporal window of activity. The Project Area was assessed to find locations spatially effective at detecting different bat species. Once these areas were identified using aerial imagery, ground surveys were conducted to determine precise locations where the detectors would be most effective. These areas comprised wetlands with high water tables, wetlands with open water, and water bodies where flying insects are abundant.



Pattern | Argentia Renewables	FIGURE NUMBER: D2 - 2.3 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 5/17/2024
	FIGURE TITLE: Bat Detector Locations for Baseline Studies	NOTES:	REVIEWED BY:	
	PROJECT TITLE: Argentia Renewables		APPROVED BY:	

SEM MAP ID: 238-005-GIS-108-Rev0

The detectors are small and compact, which allows for them to be mounted directly onto trees with bungee cords. They were mounted to be easily accessed for maintenance as batteries and SD cards were regularly replaced. Microphones were attached to the detectors directly or via extendable cords to ensure optimal positioning. The microphones were placed anywhere from 2.5 – 3.5 m above ground, either on the face of the detector or on tree branches that extended outward over a potential foraging area for bats. When microphones were attached to tree branches, they were pitched slightly upward. This orientation ensured that the microphone could record bats in flight above the selected area.

Detectors were deployed strategically to encompass the entire active season for bats (Figure D2-2.3-1). The myotis genus bats emerge from their hibernaculum in early spring (COSEWIC, 2013; Koch *et al.*, 2023). Females form maternity colonies and raise their young in the early summer (COSEWIC, 2013). Swarming/breeding season occurs in the fall, after which time bats return to hibernacula (Sunga *et al.*, 2022). Bats regularly forage and move about their habitats during the entire active season.

Bat call identification was conducted using Anabat Insight™ 1.8.6. (Titley Electronics, Ballina, NSW, Australia) and Kaleidoscope software. The software was used to classify the bats into species based on spectrograms (i.e., visualizations of vocal calls) and frequency ranges which are species-specific. Spectrograms display the sound frequency and time on the X and Y-axis respectively while also recording the intensity of the sound with color. For each call, the slope, maximum frequency (i.e., the highest frequency), minimum frequency (i.e., the lowest frequency), and duration were noted to determine species. Each variable was then compared with a library of reference calls collected from individual bats that had been identified to the species level. A bat call (call) was defined as a single, recognizable vocalization from one bat. A bat pass (pass) was defined as one or more sequential calls, representing calls from a single bat, recorded in one Anabat digital file. Little brown myotis have a peak call power (Fc) within the frequency range of 35-40 KHz, and Northern myotis have an Fc of 35-45KHz (McBurney & Segers, 2021). The migratory bats occupy a lower frequency range, with an Fc of 15-30KHz for hoary bats and an Fc of 25-30KHz for silver-haired bats (McBurney & Segers, 2021). The calls were categorized into three separate types (McBurney & Segers, 2021):

1) Search Calls (looking for prey);
2) Approach Calls (homing in on detected prey); and
3) Feeding Buzz (fine-tuning before capture of prey).

Each detector was equipped with a microphone capable of detecting bat calls between 10 kHz and 250 kHz, which encompasses all possible bat species' frequency ranges. Bat pass monitoring was designed based on the protocols described in Bats and Wind Turbines: Pre-siting and Pre-construction Protocols (Lausen *et al.*, 2010). Bat species calls are usually distinguishable based on the characteristics of the geometry of the frequency/time graphs. However, call recordings sometimes lack sufficient detail to allow species-level identification due to factors such as background noise, distance from the detector, weather,

and other environmental factors. Any partial or fragmented calls that could not be identified to species were classified as unidentified bats (i.e., records were identified as bat calls, but species could not be determined).

An additional acoustic detection study is taking place in 2024, following the same methodology as described for previous years and in consultation with regulatory authorities. The 2024 study will involve the deployment of nine bat detectors. Further information will be provided after the study is complete.

2.3.1 Detector Locations 2022

During the baseline studies in 2022, three bat detectors were placed at the locations listed in Table D2-2.3.1-1. These locations represented foraging sites selected via aerial imagery and following site habitat review during baseline surveys for the Ecological Land Classification (ELC) (Appendix D3).

Table D2-2.3.1-1 Bat Detector Locations, Project Area, Argentia Backlands, 2022.

Detector ID	Coordinates (UTM, Zone 22T)		Habitat Type	Deployment Date	End Date	Detector Nights
BL-BAT1	275763 E	5241109 N	Pond - Wetland	Sept 9	Oct 3	24
BL-BAT2	276447 E	5241650 N	Pond - Wetland	Sept 9	Oct 3	24
BL-BAT3	277072 E	5241526 N	Wetland	Sept 9	Oct 3	24

BL-BAT 1 was placed on a tree overlooking Argentia Pond facing northeast where a riparian meadow/wetland complex exits the pond over a spillway. This area consists of wetland, stream, and pond habitats. These wetlands and waterways attract insects for bats to forage on.

BL-BAT 2 was placed in a tree facing south over a small pond which was part of a large wetland waterbody complex running along a large, flat, wet valley. The still-water in this pond combined with the diverse wetland habitat surrounding the pond provided suitable foraging habitat.

BL-BAT 3 was placed in a tree facing northeast over a small pond in the northeastern portion of the wetland complex where detector BL-BAT 2 was also located. This area represents a continuous wetland habitat that includes one of the larger waterbodies of the Project Area. Two detectors were placed here to provide ample coverage of this highly suitable foraging habitat.

2.3.2 Detector Locations 2023

During the baseline studies in 2023, five bat detectors were placed in the Project Area. To encompass a broad range of suitable bat habitats, detector locations were selected for effective spatial distribution,

highly suitable habitat, and potential flight pathways. The 2022 surveys allowed for the identification of specific, highly suitable habitats where detectors would be deployed. The locations of bat detectors in 2023 and their habitat descriptions are listed below (Table D2-2.3.2-1).

Table D2-2.3.2-1 Bat Detector Locations, Project Area, Argentia Backlands, 2023.

Detector ID	Coordinates (UTM, Zone 22T)		Habitat Type	Deployment Date	End Date	Detector Nights
ARG BAT 1	278696.71 E	5240209.97 N	Stream Pool - Wetland	Apr 18	Nov 16	212
ARG BAT 2*	275831.09 E	5240934.08 N	Pond	Aug 9	Nov 16	99
ARG BAT 3	282385.42 E	5241787.64 N	Wetland - Bog	Apr 18	Nov 16	212
ARG BAT 4	277441.53 E	5242563.84 N	Pond - Wetland - Bog	Jun 27	Nov 16	142
ARG BAT 5	278344.89 E	5241968.77 N	Pond - Wetland	Jun 27	Nov 16	142
*The original detector in this location was stolen, so the deployment of a new detector occurred later than the others.						

ARG BAT 1 was placed on a tree standing alone over a small pond created in the meander of a small stream from the spillway dyke of Gull Pond (Figure D2-2.3.2-1). At ARG BAT 1 the water slows and deepens, with abundant aquatic vegetation growing at the periphery of the central flow of water. The slow movement and depth of the waters, surrounded by forested habitat and wetlands, creates an area of highly suitable flying insect habitat. The microphone was placed three or four feet higher than the detector and slanted slightly upward to get better coverage for detection. The detector's microphone was facing southwest to encompass the entire small pond and the wetland (Fen) which extended southwest beyond the pond.

Figure D2-2.3.2-1 ARG BAT 1 Detector location – Small Pond / Wetland.

ARG BAT 2 was deployed in a slightly altered location to BL BAT 1 on Argentia Pond. Detector placement was based on results from the 2022 baseline studies. ARG BAT 2 was placed east, across the stream from the previous location, in a tree overlooking a small cove in the southeast corner of the pond. This updated position reduced wind interference in the microphone. The detector microphone was extended up the tree and attached facing slightly upward and northeast across a vegetated section of the pond.

ARG BAT 3 was placed on the opposite side of the Argentia Backlands in a large wetland in the northernmost portion of the Project Area (Figure D2-2.3.2-2). This location represented one of the larger and more segregated wetland complexes in the Argentia Backlands. This region of the Project Area is heavily forested with coniferous trees and has a high variation in elevation. The detector was placed facing north over a wetland (Bog-Fen) with a high-water table but no standing waterbodies.

Figure D2-2.3.2-2 ARG BAT 3 Detector Location, Wetland.

ARG BAT 4 was deployed in a central location in the Project Area in a highly suitable habitat including a basin bog wetland with two small, still-water ponds. These bog ponds are likely to produce large numbers of flying insects and hence serve as a highly suitable forage site for bats. The detector's microphone was extended along a large protruding branch of a tree facing northeast over the bog and still-water ponds.

ARG BAT 5 was placed in a central, inland location in the Argentia Backlands where runoff from surrounding slopes creates a valley with two moderate-sized ponds. These ponds are connected by a small stream and riparian wetland. The bat detector was placed in the riparian zone of the southern pond at the northwest corner where the stream exits the pond, in a treed wetland (Figure D2-2.3.2-3). The detector was mounted in a tree facing southeast.

Figure D2-2.3.2-3 ARG BAT 5 Detector Location, Pond Riparian.

3.0 Results

3.1 Desktop Review

3.1.1 Resident Bats

The desktop investigation and literature review confirmed that the resident little brown myotis and Northern myotis were likely the most abundant bat species within the Project Area. Both species have been greatly affected by WNS in eastern North America (COSEWIC, 2013). A study by Cheng *et al*. (2021) found a population decline of more than 90% in little brown myotis, Northern myotis, and tricolored bats (*Perimyotis subflavus*) since the emergence of WNS. Both little brown myotis and Northern myotis are slow to reproduce, which increases the vulnerability of their populations (COSEWIC, 2018). It is unknown whether WNS has affected bats in the Project Area, but it is known that WNS is present in Newfoundland (NL Fisheries and Land Resources, 2018).

3.1.2 Migratory Bats

The hoary bat was observed in Gros Morne via bat detectors (Washinger *et al.*, 2020), and the NL WD advised that two occurrences of silver-haired bats have been confirmed in Newfoundland (NL WD, personal communication, 2022). Based on this information, it was considered possible that these species could visit the Project Area during migration. However, they were generally unexpected to be observed in the Project Area, given the limited reports of migratory bat species' presence in Newfoundland. Neither of these two species was listed under any conservation status when studies commenced in 2022; however, in 2023, COSEWIC listed them as Endangered (COSEWIC, 2023).

3.1.3 AC CDC Results

The AC CDC request returned a list of rare fauna within a 5 km radius of the Project Area; however, no bats were listed, ostensibly due to a lack of survey effort in the region.

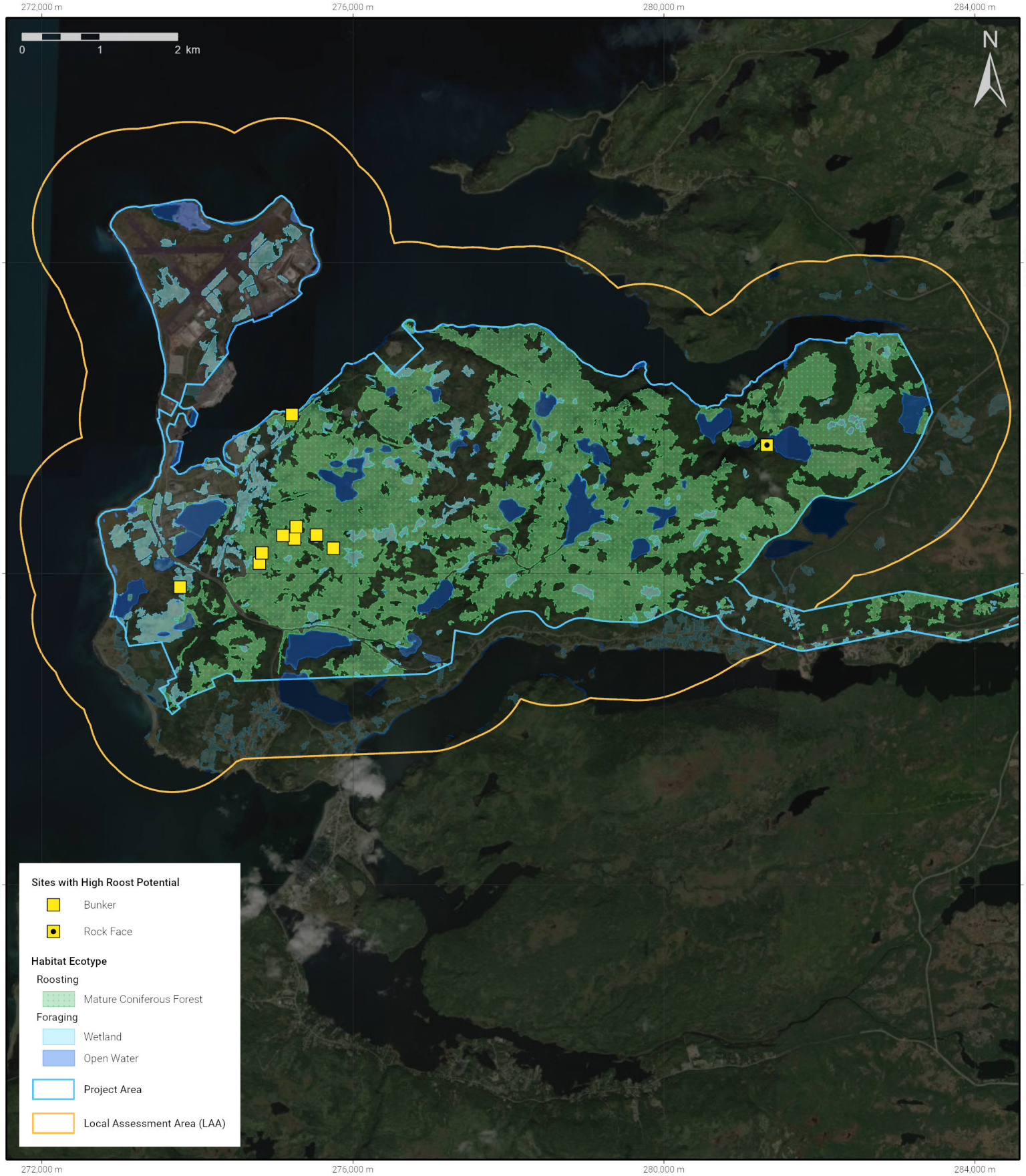
3.2 Habitat Suitability Mapping

The Project Area is approximately 4,811 ha (including a 250 m buffer from the proposed Project Interconnect Line centerline) and comprises a wide variety of ecotypes. As discussed in the ELC (Appendix D3), there are 10 ecotypes in the Project Area, with Mature Coniferous Forest occupying the greatest amount of area (1,683 ha), or 33% of the Project Area. Wetlands occupy approximately 369 ha (7% of the Project Area). These habitat types may be the most important for the bats within the Project Area (at least the resident species). A large portion of the Project Area can be defined as suitable foraging habitat for the little brown myotis and Northern myotis, with large wetlands and open water bodies scattered across the Argentia Backlands, and abundant mature forest (for Northern myotis).

Although there were no confirmed observations of bat hibernacula within the Project Area, some habitat suitable for roosting and hibernaculum use was observed. Any potential or confirmed hibernacula must be reported to NL WD, and high-potential sites cannot be entered except by approved officials trained in WNS decontamination protocols. Steeper rocky outcrops that have crevices or talus slopes below their cliffs may be suitable for daytime roosts, and it is possible that larger cavities and caves suitable for hibernaculum use exist (Neubaum, 2018). Mature forests such as the balsam fir-dominated forests throughout the Project Area could provide large snags (i.e., dead standing trees) suitable for daytime roost sites or perhaps maternity roosts in the spring (COSEWIC, 2013). Mixedwood Forests are dominated by large yellow birch (*Betula alleghaniensis*) and white birch (*Betula papyrifera*), which can form roost sites for bats. Rolled, peeling bark, hollow crevices, and deciduous snags are often ideal roost sites for species like little brown myotis (Randall *et al.,* 2014). These habitats provide suitable characteristics for bats, with dense forests between more open foraging sites. Anthropogenic infrastructure, such as relic military bunkers and abandoned mine sites, may also provide habitat suitable

for roosting or hibernacula use. There are some buildings within the Project Area (e.g., pumphouses) which present a range of potential roost sites for bats (e.g., external crevices behind siding or weatherboarding, inside wall cavity spaces, under ridge vents on the roof) (Fagan *et al.,* 2017). The bunkers pictured in Figure D2-3.2-1 were observed in the Project Area and may provide suitable roosting habitat. Figure D2-3.2-2 illustrates the composition of suitable habitat for bats in the Project Area, including potential bat roosts (e.g., bunkers and exposed rocky cliffs).

Figure D2-3.2-1 Relic Military Bunkers Which Could Have Potential as Bat Roost Sites.



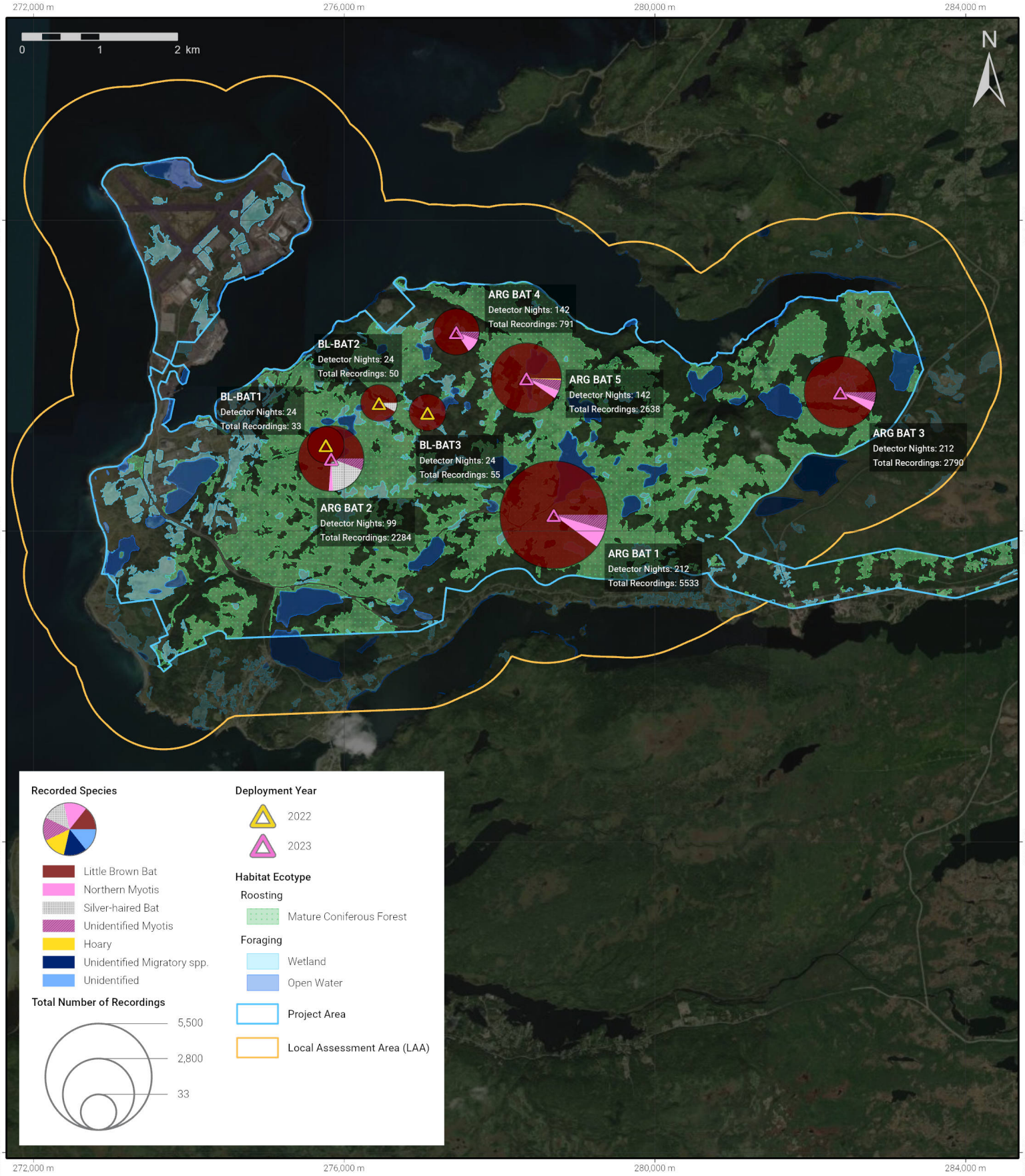
Pattern | Argentia Renewables

FIGURE NUMBER: D2 - 3.2 - 2	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 23/05/2024
FIGURE TITLE: Suitable Bat Habitat and Sites with High Roost Potential	NOTES: Sites with a high potential to support roosting bats were identified throughout various field programs in 2022, 2023, and 2024.	REVIEWED BY:	
PROJECT TITLE: Argentia Renewables		APPROVED BY:	sem

SEM MAP ID: 238-005-GIS-110-Rev0

3.3 Acoustic Monitoring

The map below (Figure D2-3.3-1) provides a visual overview of the acoustic recordings collected at each detector site throughout 2022 and 2023. Results from the acoustic monitoring efforts for both years are presented in further detail following the map.



Pattern | Argentia Renewables	FIGURE NUMBER: D2 - 3.3 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 23/05/2024
	FIGURE TITLE: Acoustic Monitoring Results Overview	NOTES:	REVIEWED BY:	
	PROJECT TITLE: Argentia Renewables		APPROVED BY:	

SEM MAP ID: 238-005-GIS-118-Rev0

3.3.1 Baseline Bat Observations, Fall 2022

The initial deployment of detectors took place in the fall of 2022 (September 9 to October 2), and a total of 138 echolocation calls were recorded from three Anabat Swift™ bat detectors over the sampling period (Table D2-3.3.1-1). BL BAT 3 had 55 recordings, BL BAT 2 had 50 recordings, and BL BAT 1 had 33 recordings. From the echolocation calls recorded, 97% of observations were of little brown myotis, with four recordings of silver-haired bat, an uncommonly observed migratory species with an unknown range in Newfoundland. Three recordings taken on September 27, and one taken on October 2, were produced by silver-haired bats. The distinguishing features of the spectrograph of a silver-haired bat call versus a little brown myotis call are illustrated in the figure below (Figure D2-3.3.1-1).

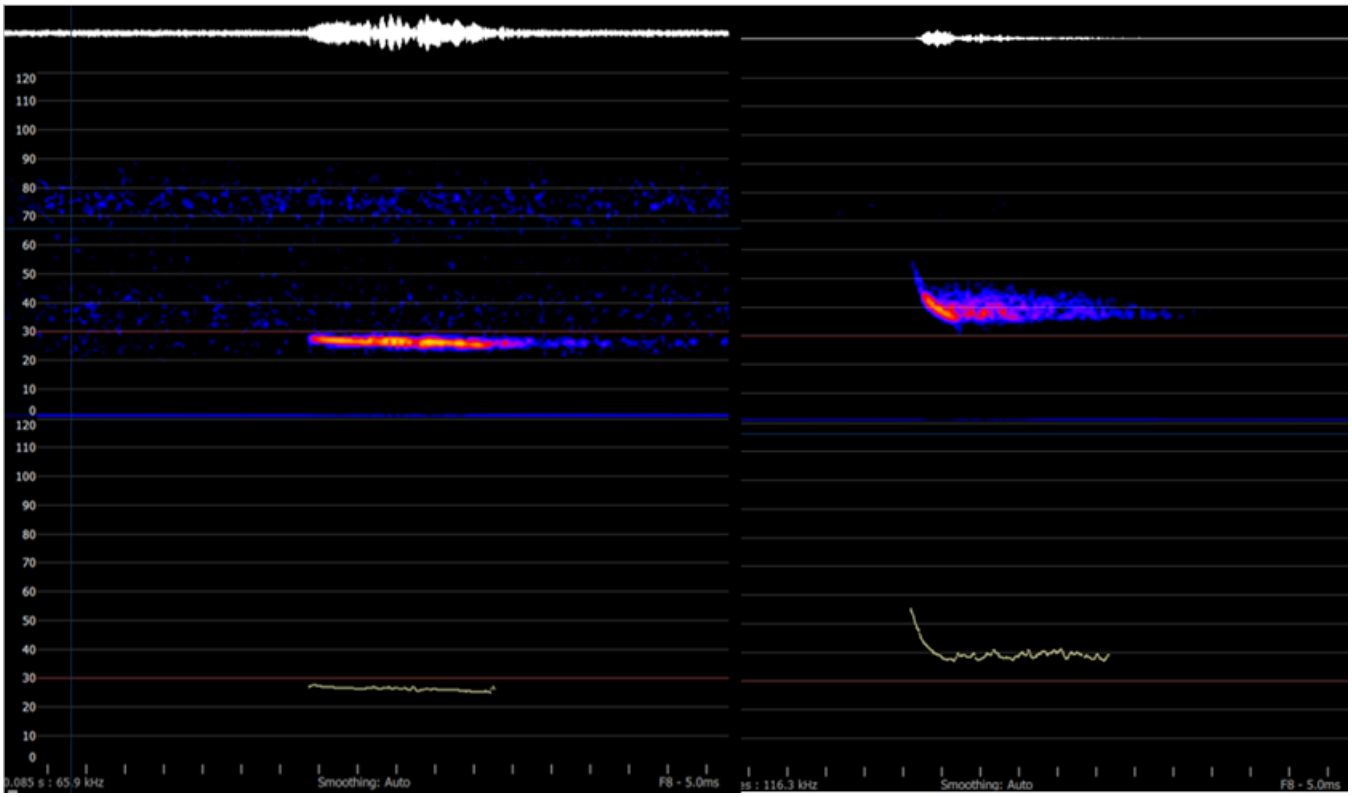


Figure D2-3.3.1-1 Silver-haired Bat (left) vs. Little Brown Myotis (right) Spectrographs, 2022.

Bat activity was highest in mid-September, based on detection frequency over time. Figure D2-3.3.1-2 illustrates how many calls were recorded on each day of the survey, with the peak number of calls on September 14, 2022, ostensibly in the middle of the swarming period. Figure D2-3.3.1-3 examines the results of September 14, 2022, by breaking down the results by detector to show the regions with a higher volume of calls.

Table D2-3.3.1-1 Bat Detection Results by Species, 2022.

Species	Migratory	Detector ID			
		BL Bat 1	BL Bat 2	BL Bat 3	Species Total
Little brown (*Myotis lucifugus*)	No	33	46	55	134
Northern myotis (*Myotis septentrionalis*)	No	0	0	0	0
Silver-haired (*Lasionycteris noctivagans)*	Yes	0	4	0	4
Detector nights		23	23	23	23
Average per detector night		1.43	2.17	2.39	6.00

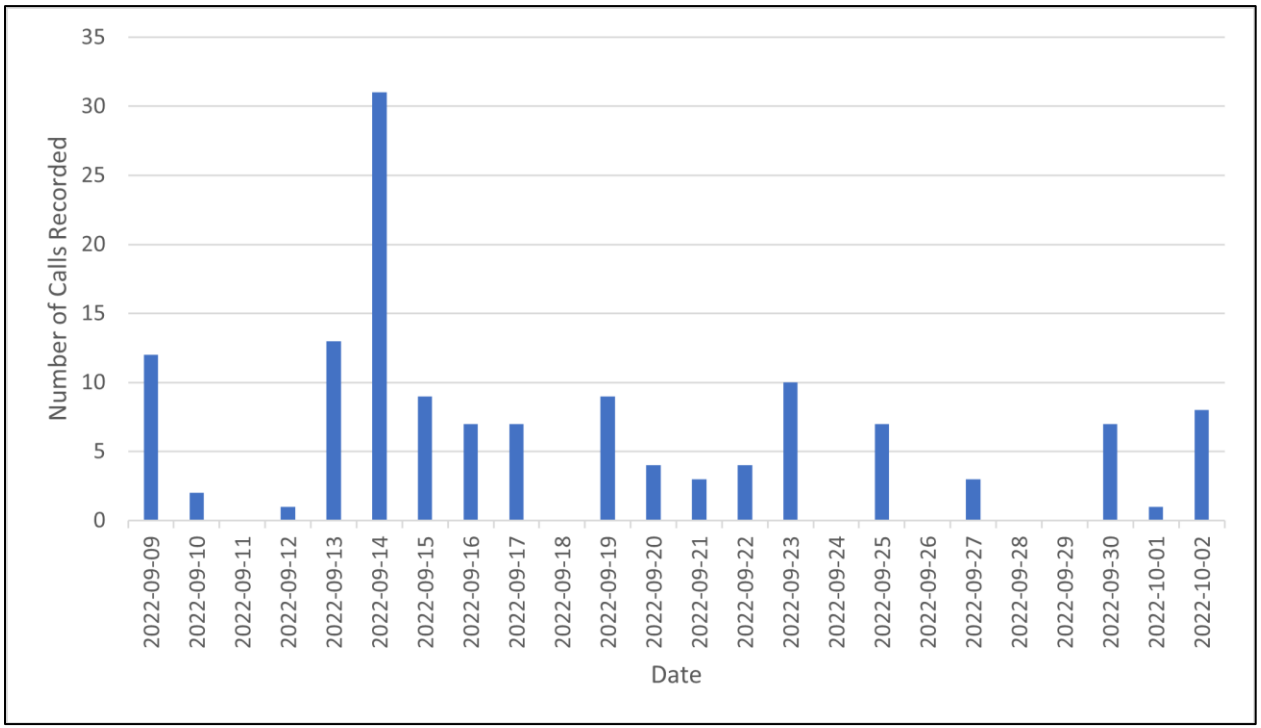


Figure D2-3.3.1-2 Daily Bat Recordings, Project Area, Argentia Backlands, 2022.

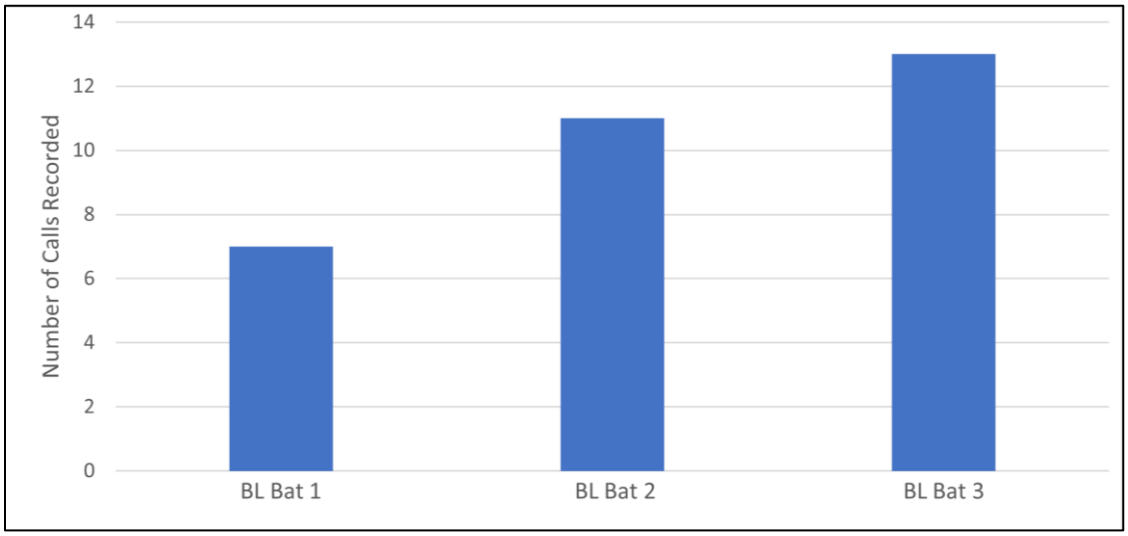


Figure D2-3.3.1-3 Bat Detections Across Three Detectors, September 14, 2022.

3.3.2 Baseline Bat Observations, Spring to Fall 2023

Four species of bats were detected from five detectors during the 2023 bat surveys. The little brown myotis was the most frequently observed species by a large factor (>87% of all detections), while Northern myotis was second (4.6% of all detections). The detections of Northern myotis regularly occurred over the expected bat activity window. Silver-haired bats were mainly detected over three days at ARG BAT 2 and ARG BAT 5, toward the end of the deployment in the fall. It is possible that the individual(s) were migrating through the Project Area and possibly only using local habitats in this migration window. Bat activity was highest in late July and early August with the peak on July 26, 2023 (biased heavily towards little brown myotis). Table D2-3.3.2-1 demonstrates the summary of all the bat detections for 2023.

Table D2-3.3.2-1 Bat Detection and Species Data, Baseline Detectors, Project Area, 2023.

Species	Migratory	Detector ID					Total
		ARG Bat 1	ARG Bat 2	ARG Bat 3	ARG Bat 4	ARG Bat 5	
Little brown (*Myotis lucifugus*)	No	4973	1687	2551	666	2380	12,257
Northern myotis (*Myotis septentrionalis*)	No	306	47	114	80	96	643
Silver-haired (*Lasionycteris noctivagans)*	Yes	0	421	0	0	5	426
Hoary (*Lasiurus cinereus*)	Yes	0	0	0	0	15	15
Myotis (unidentified)	No	254	129	123	44	134	684
Unidentified	Unknown	0	0	2	1	0	3
Unidentified Migratory spp.	Yes	0	0	0	0	8	8
Detector nights		212	99	212	142	142	
Average per detector night		26.10	23.07	13.16	5.57	18.58	

Wind Speed vs. Bat Activity

The ECCC meteorological station in Argentia collected data consistently throughout 2023. Temperature and wind speed data were collected from the Environment and Climate Change Canada (ECCC) database and compared with bat detection data collected during the study. Both temperature (positively) and wind speed (negatively) were correlated with bat detections. Bats were seldom detected when wind speeds rose above 9.5 m/s, with most bat detections occurring during wind speeds below 4.5 m/s (Figure 3.3.2-1).

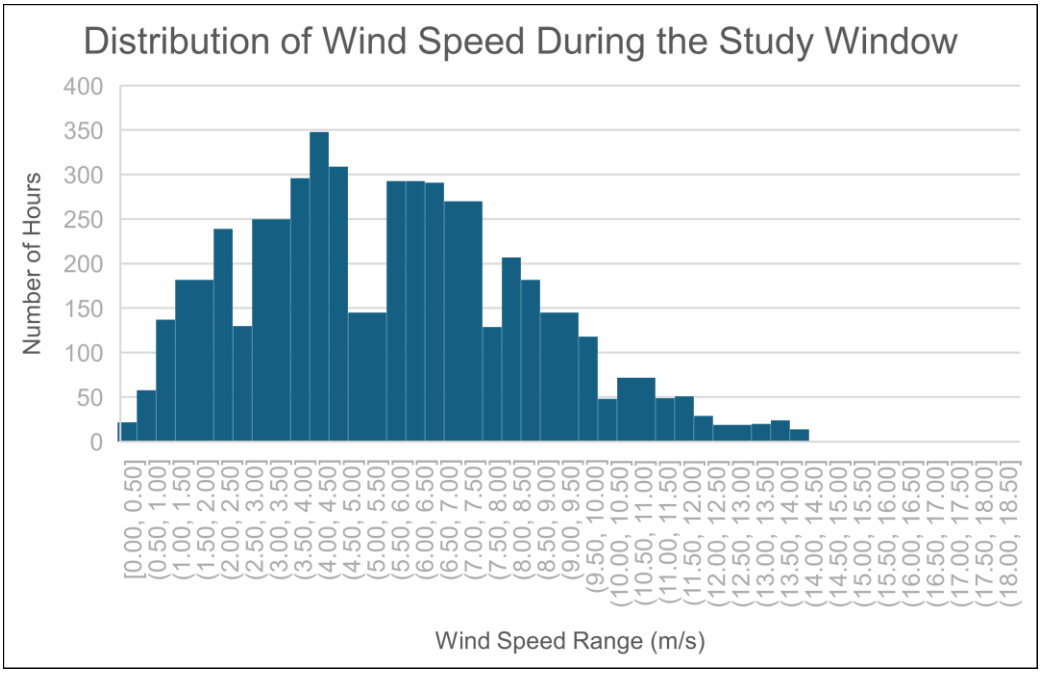


Figure D2-3.3.2-1 Distribution of Wind Speed During the Study Window, 2023.

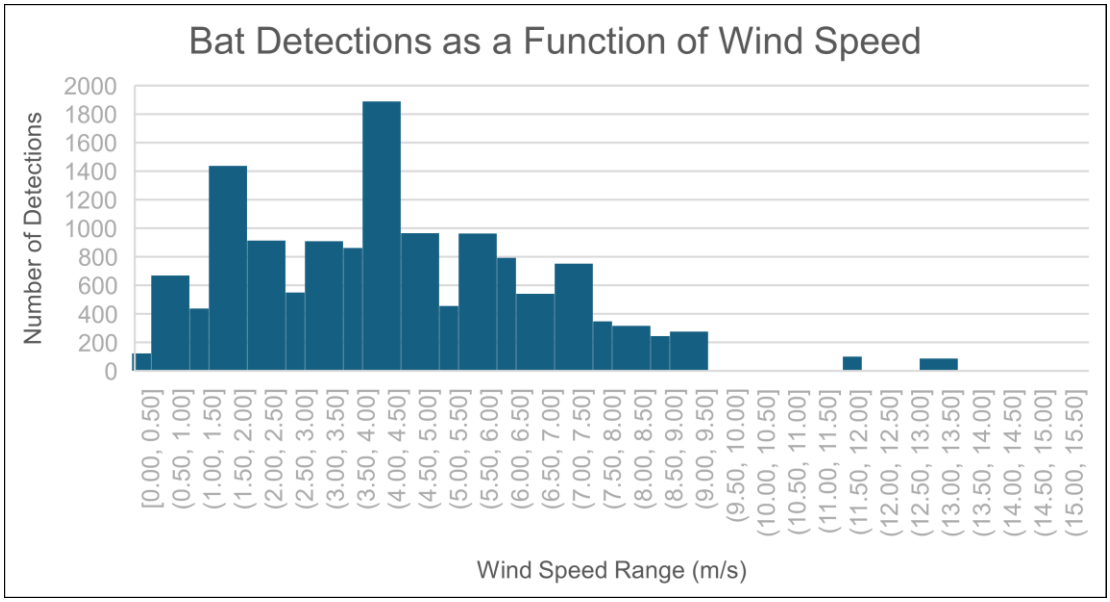


Figure D2-3.3.2-2 Bat Detections as a Function of Wind Speed, 2023.

Bats were detected most often at temperatures above 14 degrees Celsius (Figures D2-3.3.2-3 and D2-3.3.2-4). Bat detections declined at temperatures below 6.5° Celsius.

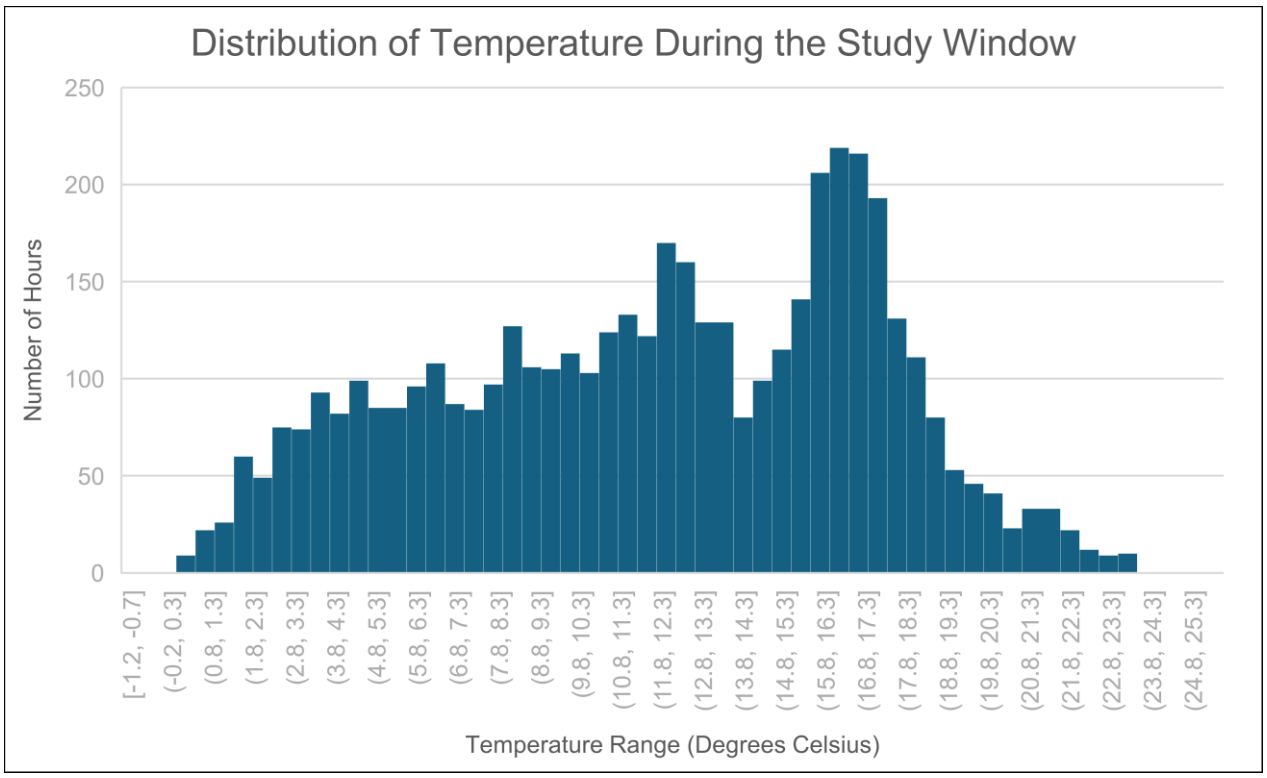


Figure D2-3.3.2-3 Distribution of Temperature During the Study Window, 2023.

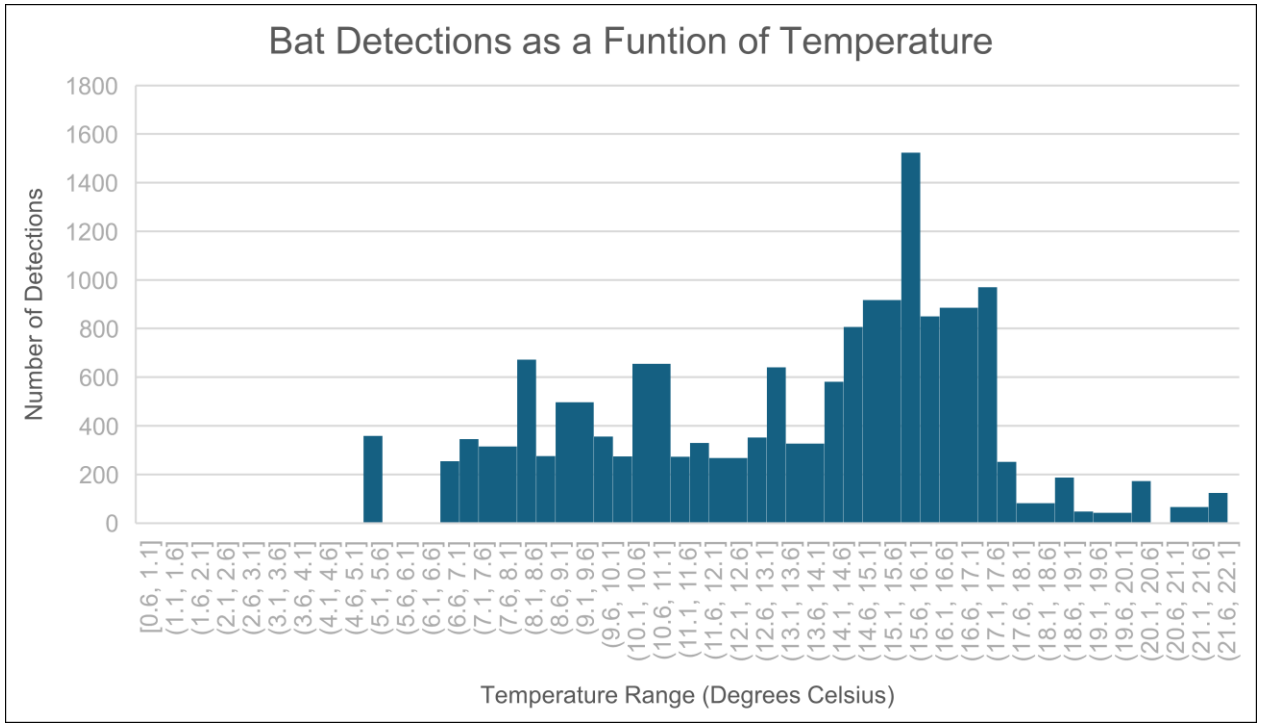


Figure D2-3.3.2-4 Bat Detections as a Function of Temperature, 2023.

4.0 Discussion

Four bat species were detected in the Project Area: the little brown myotis and Northern myotis, which are historically relatively well-known in Newfoundland, and the silver-haired and hoary bats, which are migratory species, and for which very little is known. Most bats recorded from these surveys were little brown myotis, an anticipated result. The observations of migratory silver-haired bats were not predicted as they were only recently confirmed to visit Newfoundland (Wildlife Division, personal communication, 2022) and the extent of their occurrence in Newfoundland is still unknown. The timing and short stay of the silver-haired bats during both 2022 and 2023 suggests that they use the Project Area only as a migratory stopover as they head south for the winter. The Project Area is north of the established range for this species (COSEWIC, 2023).

Bats were detected at all sites in both fall 2022 and in 2023. Much of the Project Area is suitable for bats, especially little brown myotis, which benefit from wide-open foraging areas such as ponds and wetlands near quality roosting areas (Burns *et al.,* 2015). Little brown myotis readily nests within buildings and other human developments suitable for roosting (Burns *et al.,* 2015), and may find suitable roosting habitat in remnant abandoned military infrastructure around the Project Area (surveying these structures, except cursorily, was outside the scope of this Project). In addition, the Project Area has potential roosting habitat within crevices between rocks, or caves, or in the patches of mature forest including large yellow birch, which can provide excellent areas for bat roosting (COSEWIC, 2013; COSEWIC, 2023).

It is difficult to draw conclusions based on one year of data (plus fall 2022), but an interesting finding was that the detector ARG BAT 1 with the most little brown myotis and Northern myotis detections, located adjacent to a small fen, had no migratory bat species detections. These smaller myotis species, especially the Northern myotis, benefit from having a cluttered foraging area (McBurney & Segers, 2021). Such small clearings likely provide these bats with abundant food and a secure foraging area paired with nearby trees. Alternatively, the greatest number of migratory bat detections were adjacent to a large, open pond (ARG BAT 2). This open habitat may be more suited for the larger migratory bats and less appealing to the smaller myotis species (McBurney & Segers, 2021). Future deployments of bat detectors will take this into account.

One of the major stressors for little brown myotis and Northern myotis is White-nose Syndrome (WNS) (COSEWIC, 2013). This fungus has detrimental effects on hibernating bats and most often results in death. Hibernacula affected by WNS have seen more than a 90% decrease in bat populations (Cheng *et al.,* 2021). WNS was first reported on the west coast of Newfoundland in 2018 (NL Fisheries and Land Resources, 2018). Given that WNS is expected to have a catastrophic impact on the myotis spp. in Newfoundland, additive mortality from development projects may lead to cumulative effects on these species. Argentia Renewables is a steward of bat conservation and commits to a robust Species at Risk Impacts Mitigation and Monitoring Plan (SAR IMMP) (note: this document is a draft and requires approval by NL WD) (Appendix R), in addition to a Post Construction Monitoring Plan (PCMP) (Appendix S).

Silver-haired and hoary bats travel large distances between summer foraging and overwintering areas (McGuire *et al.,* 2012). The migration habits of migratory bats are poorly understood (McGuire *et al.,* 2012). Migratory bat species are affected by operational wind turbines, and the continued development of wind energy poses a threat to migratory bat populations (COSEWIC, 2023; Frick *et al.,* 2017; Allison *et al.,* 2019; Kunz *et al.,* 2007; Lawson, 2013). Although the number of detections of migratory bats was relatively low, mitigations and monitoring for migratory bats has been included in the SAR IMMP and PCMP.

Myriad suitable roosting and foraging habitats, combined with the bat activity detected during the study, demonstrate that the Project Area has the amount of bat activity that would be expected for the myotis spp., and more silver-haired detections than was expected (the hoary bat may have been one individual blown off the migratory pathway, given the very few detections, on one occasion). Appropriate mitigation measures are required to protect these species; a comprehensive literature review, combined with Pattern Energy's vast experience in this field, was employed to develop a list of meaningful mitigations for this Project. These are presented in Chapter 4 (Section 4.5) of the Registration document. Acoustic monitoring work will continue through further studies in 2024.

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Appendix D3

Ecological Land Classification Baseline Study

Appendix D3
Ecological Land Classification (ELC)

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List of Acronyms and Abbreviations

Abbreviations	Definitions
ATV	All Terrain Vehicle
COSEWIC	Committee on the Status of endangered Wildlife in Canada
CWCS	Canadian Wetland Classification System
DBH	Diameter at Breast Height
ELC	Ecological Land Classification
GPS	Global Positioning System
LIDAR	Light Detection and Ranging
LP	Limited Partnership
NL	Newfoundland and Labrador
RPAS	Remotely Piloted Aircraft System
SAR	Species at Risk

1.0 Introduction

An Ecological Land Classification (ELC) has been developed by Argentia Renewables Wind LP (Argentia Renewables), an affiliate of Pattern Energy Group LP (Pattern Energy) for the Argentia Renewables Project (the Project), which entails the development, construction, operation and maintenance, and eventual decommissioning and rehabilitation of an onshore wind energy generation facility (Argentia Wind Facility) and a green hydrogen and ammonia production, storage, and export facility (Argentia Green Fuels Facility). The wind energy facility (i.e., wind turbine farm) will be mostly located on what is known as the Argentia Backlands, a largely uninhabited, forested area with scattered relic military sites and variable habitat types. The Argentia Green Fuels Facility will be located on the Argentia Peninsula, a brownfield industrial complex. The Port of Argentia owns both the Argentia Backlands property and the Argentia Peninsula. The two, along with a Project Interconnect Line, comprise the Argentia Renewables Project Area.

The ELC has been developed as a map that demonstrates the ecotypes across the Project Area. To create the map, high-resolution colour imagery was acquired using remotely piloted aircraft systems (RPAS), leading to the compilation of an imagery dataset. This dataset was then used in conjunction with ArcGIS software to perform an aerial imagery analysis to identify ecotypes. Ground-truthing surveys were undertaken throughout the Project Area in 2022 and 2023. This resulted in the acquisition of GPS and vegetation composition data. The resulting detailed ELC map facilitated the planning of field surveys for avifauna, bats, rare lichens, and rare plants.

The ELC differentiates ten main ecotypes: Wetlands, Open Water, Mature Coniferous Forest, Mixedwood Forest, Coniferous Scrub, Barrens, Regenerating Coniferous Forest, Meadows, Anthropogenic areas, and Coastline. The Mature Coniferous Forest ecotype primarily represented mature balsam fir (*Abies balsamea*) forest and encompassed some areas of treed bog. Coniferous forests including mature forest, regenerating coniferous forest, and coniferous scrub dominated the Project Area. The mature Mixedwood Forest ecotype represented upwards of 34 ha of the Argentia Backlands, comprised of mature yellow birch (*Betula alleghaniensis*) forests with balsam fir regeneration. Mixedwood forests were most dominant in the northern portion of the Argentia Backlands. Balsam fir comprised most of the Regenerating Coniferous Forest ecotype, whereas black spruce (*Picea mariana*) dominated the Coniferous Scrub ecotype (i.e., smaller, densely growing mature spruce stunted by poor growing conditions and/or wind). Coniferous Scrub was often found on the fringes of wetlands, exposed hilltops, and on the edges of rocky outcrops, in the transitional zones between mature forests and open habitats. Most of the open habitats in the Project Area were classified under the Wetland ecotype (i.e., fens, bogs, swamp, and marsh habitat). Wetlands are abundant throughout the Project Area, and most often occupy valleys or depressions in topography. Coastline was primarily comprised of beach (i.e., slightly sloped rocky, eroded plains within 10-50 m of the vegetation line), sometimes infringed upon by eroding dirt banks.

Cladonia lichens, heath, and shrubs dominate the natural habitat in areas of high elevation where upland dry conditions exist. These areas are classified under the Barren ecotype and are often associated with rocky outcrops. Barren habitats were also associated with wetlands when bowl-shaped depressions in rock formed wet pockets, creating barren-to-wetland transition zones with wetland and barren species mixing at the transition point. Anthropogenically altered (i.e., developed) habitats and structures form the Anthropogenic ecotype. Areas of historic anthropogenic influence, including relic military infrastructure in the Argentia Backlands and the largely developed (brownfield) Argentia Peninsula, have led to the development of the Meadow ecotype. White spruce (*Picea glauca*) and balsam fir grow between meadow gaps and are the dominant megaflora of the treed areas in meadows. Herbs, meadow grasses, and shrubs dominate the substrate layer and are often seen in the southwestern portion of the Argentia Backlands, where anthropogenic development persists or historically existed.

2.0 Methods

2.1 Ecotype Identification

A comprehensive literature review and data compilation exercise was conducted to compile existing information on the Project Area and to find open-sourced LiDAR imagery. Processes established by Meades & Moores (1994) for identifying Newfoundland habitats were used to develop specific habitat delineations. Next was the preparation of a detailed mapping of the Project Area using high-resolution colour imagery collected with a SenseFly eBee remotely piloted aircraft system (RPAS), as shown in Figure D3-2.1-1.

Figure D3-2.1-1 RPAS Imagery of Project Terrain.

The resulting imagery dataset was comprised of high-resolution digital images (3.3 cm/pixel) captured directly from the sensor onboard the RPAS. The orthorectified imagery was imported into ArcGIS for interpretation. ArcGIS and the various layers available were used to obtain slopes, moisture levels, and vegetation cover based on morphology and coloration of habitat features on the map layers.

Unique fine-scale habitats tend to have elevated potential for the occurrence of rare flora species, and many such species have specific habitat associations. Ecotypes were therefore used to determine areas of heightened potential for the occurrence of rare species. Habitat polygons were interpreted at a scale of 1:5,000 using digital imagery and information gathered from ground-truthing efforts in the field. Information was captured consistently based on a static zoom level with the interpreter defining homogeneous regions for each targeted ecotype. Digitization of polygons was supplemented by a point file within ArcGIS that was populated with attribute information related to each vegetation polygon. This centroid point data was entered based on the interpreter's field experience and familiarity with regional ecotypes and field data.

2.2 Ecotype Classification and Vegetation Survey

Ecotype classification surveys were conducted in 2022 and 2023. Ecotypes were verified in the field by sampling predetermined points plotted during the boundary interpretation stage. Field verification facilitated ecotype characterization, including species composition (Figure D3-2.2-1). Information gathered in the field was used to refine ecotype boundaries and aggregate ecotypes based on similar characteristics.

Figure D3-2.2-1 Biologist Conducting Vegetation Surveys.

Vegetation surveys were completed at each site within a 10 m radius plot surrounding the observer. The vegetation species presence and relative abundance in comparison to other species were documented. All species from the herbaceous layer (including non-vascular bryophytes), shrub layers, and canopy, were recorded to document the entire vegetation composition of each specific ecotype. The indicator of abundance for each species was relative to the surrounding species and expressed on a scale of 1 - 100% dominance of the 10 m survey area. Components that contribute to habitat suitability mapping for fauna include dominant canopy and ground cover species, ecotype, and observations of additional species that occur in the area (e.g., prey fauna).

Baseline vegetation inventories were supplemented with the observation of abiotic habitat features (i.e., rocky terrain, moisture level, closed-canopy shade, or open conditions). These details aided in classifying the habitat in more detail and supplementing constraint mapping and potential mitigation measures. Photos were taken for future reference. A selection of example pictures is included in this report, all taken within the Project Area. At every sampling location, GPS data was recorded, and GPS points were used to develop the ELC map using ArcGIS.

2.3 GPX Overlay

After the habitat and vegetation surveys were complete, all data, GPS waypoints, and tracks (GPX) were compiled. Spreadsheets were produced to correlate the GPS coordinates to each ecotype assessment and vegetation survey. These GPS waypoints were overlaid onto the desktop ELC map, checked for accuracy and then provided as supplementary data to support the production of a highly detailed map.

3.0 Ecological Land Classification Results

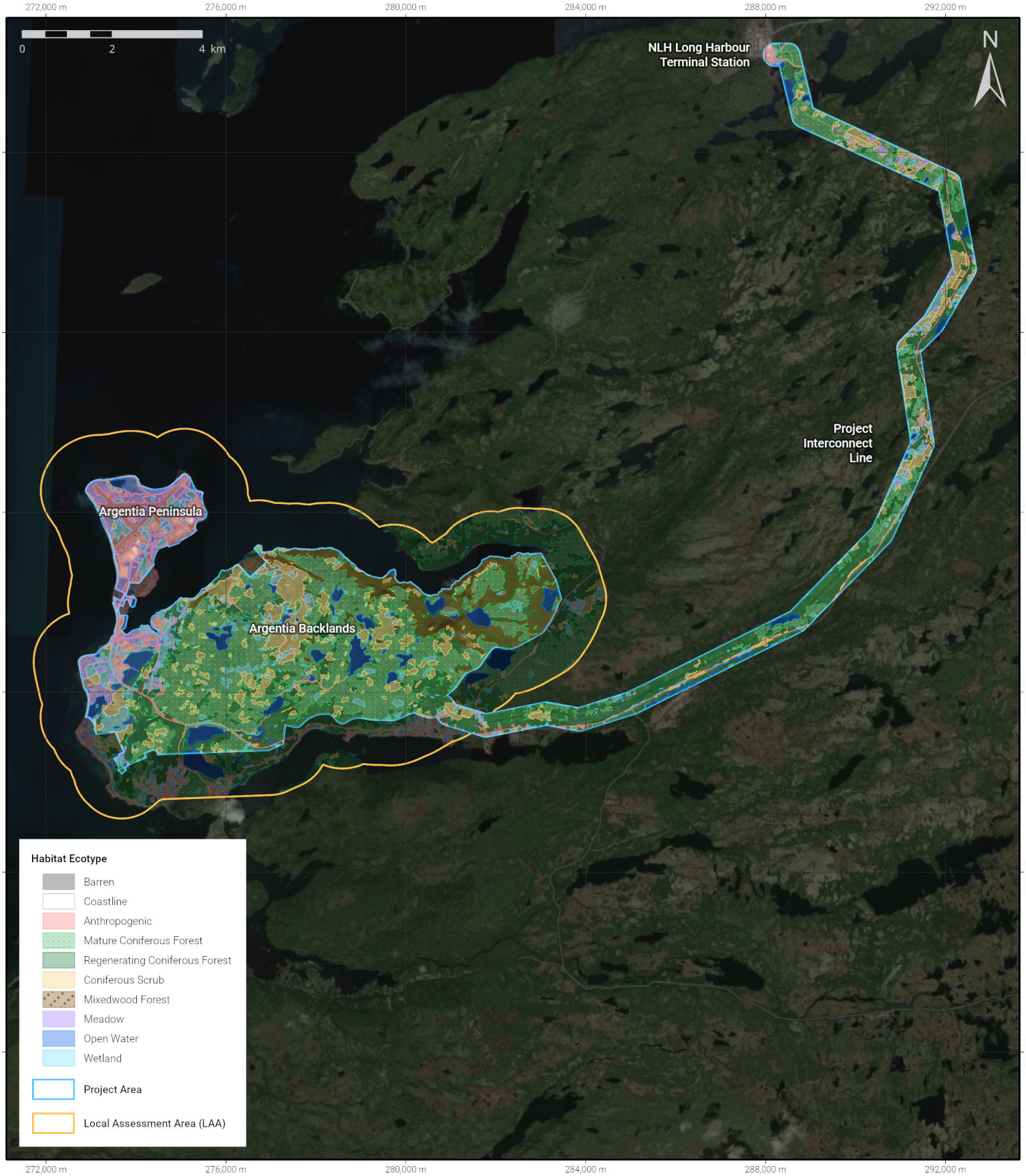
The ELC comprised a thorough generalized land classification for the Project Area. The ELC map (Figure D3-3.0-1) is provided in Table D3-3.0-1 below. This ELC represents broader ecotypes as an overview of the Project Area. Finer differentiation is discussed in sections to follow covering each ecotype. Note that the Open Water ecotype was assessed as part of the aquatic baseline studies (see Registration Appendix B1). The following were the main ecotypes identified in the Project Area:

- Barren (Section 3.1);
- Coastline (Section 3.2);
- Regenerating Coniferous Forest (Section 3.3);
- Mature Coniferous Forest (Section 3.4);
- Coniferous Scrub (Section 3.5);
- Mixedwood Forest (Section 3.6);
- Wetland (Section 3.7);
- Meadow (Section 3.8);

- Anthropogenic (Section 3.9); and
- Open Water (Registration Appendix B1).

Table D3-3.0-1 Ecotype Composition, Project Area, 2023.

Ecotype	Area (ha)	Percentage of Project Area (%)
Barren	96	1.88
Coastline	75	1.47
Anthropogenic	500	9.78
Mature Coniferous Forest	1,683	32.92
Meadow	255	4.99
Mixedwood Forest	35	0.68
Regenerating Coniferous Forest	1,031	20.16
Coniferous Scrub	804	15.72
Open Water	266	5.20
Wetland	368	7.20
Total	**5,113 ha**	**100%**



Pattern | Argentia Renewables	FIGURE NUMBER: D3 - 3.0 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/26
	FIGURE TITLE: Ecological Land Classification	NOTES:	REVIEWED BY:	
	PROJECT TITLE: Argentia Renewables		APPROVED BY:	
			sem	

SEM MAP ID: 238-005-GIS-112-Rev1

3.1 Barren

Barren areas are represented by shrub-level heath, upland mosses, and stunted coniferous trees such as black spruce and fir. The Upland Barren Ecotype of the Argentia Backlands is shown in Figure D3-3.1-1. This leads to elevated bare rock habitat with mosses, *Cladonia* lichens, and ericaceous shrubs. High-elevation barrens may host species found commonly in alpine areas and atypical of lowland forested habitats (Figure D3-3.1-2).

Figure D3-3.1-1 Upland Barren Ecotype, Argentia Backlands.

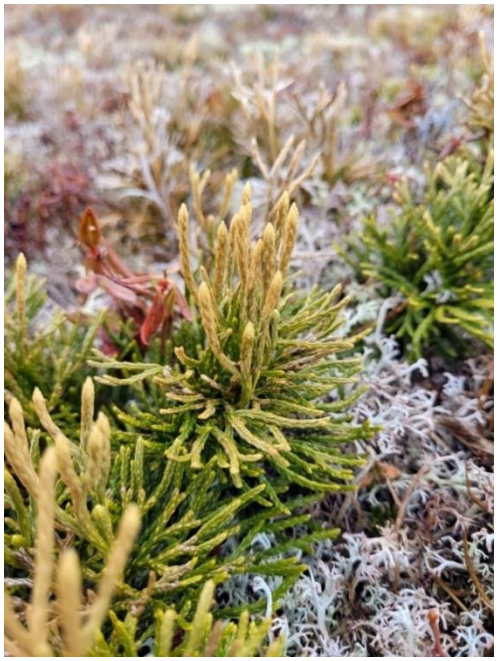


Figure D3-3.1-2 *Diphasiastrum complanatum* in Barren Ecotype.

3.2 Coastline

The Coastline ecotype for the Project Area was primarily represented by beach (i.e., slightly sloped rocky, eroded plains within 10-50 m of the vegetation line). The vegetation line varied along Project Area shorelines due to the erosion of high dirt banks by waves. Beaches were often dominated by solid bedrock or eroded beach rocks. Much of the coastline in the southern portion of the Project Area has been anthropogenically influenced, with numerous developments altering the vegetation composition. On the northern end of the Argentia Peninsula, natural beach rock dominates the substrate, and sparse beach vegetation like beach grasses (*Ammophila* spp.) grows on elevated banks of eroded beach rock. Small, skinny rock beaches (10-15 m) with slight slopes (10-15% grades) lead to dramatic slopes of much higher grades with coniferous thickets protruding upwards to the plateaus. Bare bedrock cliffs devoid of vegetation occur where the grade is too steep for soil development.

3.3 Regenerating Coniferous Forest

Regenerating Coniferous Forest occurs throughout the Project Area. The ecotype is comprised mainly of densely growing juvenile balsam fir, the primary colonizing species of gaps formed by blowdown events, ice damage, or insect infestation (Morin, 1994). In the Project Area, blowdown has been the main driver of gap dynamics. The coastal, hilly terrain of the Project Area contains large swaths of mature forests exposed to wind gusts. Most of the Argentia Backlands are patchy, with mature intact forest bisected by large patches of Regenerating Coniferous Forest (Figure D3-3.3-1). Fir and spruce are known to be highly susceptible to wind damage and blowdown (Rich *et al*., 2007).

Figure D3-3.3-1 **Balsam Fir Regenerating Coniferous Forest with Blowdown Mature Trees and Dense Regeneration Fir Growth.**

3.3.1 Balsam Fir Thicket

Balsam fir thickets were identified throughout the Project Area, mostly on sloped terrain, near valley streams, and on the hillsides of large hills (Figure D3-3.3.1-1). These thickets represent a balsam fir-dominated forest that is transitional between regenerating forests and mature forests, where trees are densely packed with a closed canopy. Thickets represent forests that have reached the age where many understory trees are dying or have already diminished due to the process of faster-growing trees closing off the canopy, known as “self-thinning” (Huang *et al*., 2013). The lack of light and soil moisture reduces the capability of slower-growing trees beneath the canopy to grow to adult sizes, and they begin to die off and thin out the forest stand as it matures (Huang *et al*., 2013). The closed canopy and high stem density of the thicket reduces biodiversity in the shrub and herbaceous layer. Some areas were observed to lack ground-covering species, where the forest floor appears as pure organic compacted soil with leaf and needle litter (e.g., steep hillside thickets).

Figure D3-3.3.1-1 Trailside Balsam Fir Thicket.

3.4 Mature Coniferous Forest

Mature Coniferous Forest was the most prevalent ecotype in the Project Area (33%), found only on the Argentia Backlands portion and along the Project Interconnect Line to Long Harbour. It does not occur on the Argentia Peninsula. The mature coniferous stands were mostly comprised of medium to large-diameter balsam fir trees with some interspersed black spruce.

3.4.1 Mature Balsam Fir – Feathermoss

Feathermosses are upland carpeting moss species including Schreber's moss (*Pleurozium schreberi*), shaggy moss (*Rhytidiadelphus triquetrus*), haircap moss (*Polytrichum commune*), broom moss (*Dicranum scoparium*.), plume moss (*Ptilium crista-castrensis*), and stair-step moss (*Hylocomium splendens*). The balsam fir-feathermoss forests in this ELC form part of a larger group of balsam fir forests classified by Meades & Moores (1994). Mature balsam fir-feathermoss habitat typically occurs at mid to upper-level slopes (Meades & Moores, 1994) (Figure D3-3.4.1-1). This habitat may be suitable for epiphytic lichens depending on humidity and tree maturity. Such lichen species tend to occur in humid forests near wetlands (within 80 m) and are associated with forests within 25 km of the Atlantic coast (Cameron *et al*., 2013). Lichens such as boreal felt lichen (*Erioderma pedicellatum*) and graceful felt lichen (*Erioderma mollissimum*) mostly occur within mature balsam fir-feathermoss forests near wetlands, especially where the forest meets a transition point with mature balsam fir-sphagnum forests.

Figure D3-3.4.1-1 Mature Balsam Fir-Feathermoss Forest Habitat.

3.4.2 Mature Balsam Fir – Sphagnum

At the mid to lower level of slopes, or in slightly upland area surrounding wetlands, mature balsam fir forests exist with transitional characteristics contrasting those of the more upland balsam fir-feathermoss forests (Figure D3-3.4.2-1). One main difference between balsam fir-feathermoss and sphagnum forests is that the dominant herbaceous layer of the latter is mainly sphagnum moss, a typical wetland moss. Other species more representative of wetlands, such as rushes (*Juncus spp*.), graminoid spp., sedges (*Carex spp*.) and others, may occur in wetter areas or lowland mature balsam fir-sphagnum forests near or within wetlands.

Figure D3-3.4.2-1 Mature Balsam Fir-Sphagnum Forest Adjacent to a Wetland.

3.5 Coniferous Scrub

Coniferous Scrub is identified as low, densely growing coniferous trees, shrubs, or species less than 5 m in height that would typically grow larger but are dense and stunted due to environmental conditions (Meades & Moores, 1994). The two types of Coniferous Scrub identified in the Project Area are black spruce scrub and coastal scrub.

3.5.1 Black Spruce Scrub

Black Spruce Scrub includes black spruce-dominated habitat on the fringes of wetlands where growing conditions are sufficient to support the acid-tolerant species like black spruce and ericaceous shrubs (Figure D3-3.5.1-1). It also describes areas where uplands are occupied by smaller, stunted fir or spruce.

Figure D3-3.5.1-1 Black Spruce Scrub on the Fringes of a Fen Complex.

3.5.2 Coastal Scrub

Several areas of coastal scrub exist on the Argentia Peninsula. This wind-swept habitat is associated with low-growing vegetation including herbs, small shrubs, heath, and upland lichen and moss species at the substrate layer (Figure D3-3.5.2-1). These areas were often immediately adjacent to the coastline (e.g., beaches) and were exposed to coastal erosion, high winds, and anthropogenic influence. Several areas of native coastal heath species were intermixed with anthropogenically introduced species where land had been altered historically.

Figure D3-3.5.2-1 Coastal Scrub Dominated by Tuckamore Balsam Fir and Heath.

3.6 Mixedwood Forests

This ecotype is classified based on the characteristics of the dominant mature canopy, where deciduous trees comprise a significant ratio to coniferous (i.e., neither coniferous nor deciduous comprises more than 75% of the canopy). However, for the purposes of this ELC, relatively pure mature yellow birch was grouped with Mixedwood Forest.

Mixedwood Forests in the Project Area consisted of mature yellow birch as the main deciduous species (Figure D3-3.6-1). Some areas of immature white birch existed as birch-Dryopteris forests, but mature mixedwood forests dominated by yellow birch were much more prevalent.

Figure D3-3.6-1 Mixedwood Forest.

3.6.1 Mature Yellow Birch

Mature yellow birch dominated forest constituted roughly 34 hectares of the Project Area. These closed-canopy habitats were dominated by large, mature yellow birch with an average DBH (diameter at breast height) of more than 40 cm. Tree bark often hosted healthy lichen growth, and several blue felt lichen (*Degelia plumbea*) thalli were observed to exist on a large mature specimen of birch in this ecotype (see Figure D3-3.6.1-1). Yellow birch is known as the main phorophyte of blue felt lichen and provides a suitable habitat when it exists within areas of coastal humid zones such as those represented by the Argentia Backlands (COSEWIC, 2010).

In many areas it was observed that black spruce, white spruce, and balsam fir shared the sub-canopy, occupying slightly less than 50% of the canopy cover. The understory in areas with intact closed-canopy conditions is less biodiverse due to broadleaf cover producing shade throughout the summer months. Young birch and fir can be seen sporadically throughout the forest stand with a low diversity of feathermosses. The mature yellow birch in the Project Area reach upwards of 16 m in height and more than 30 cm in DBH. This habitat type is relatively uncommon on the Avalon Peninsula and exists mainly in the northern section of the Argentia Backlands in the large valley surrounding Big Shalloway Pond and Outer Shalloway Pond.

Figure D3-3.6.1-1 Large Mature Yellow Birch Hosting Blue Felt Lichen Thalli.

3.6.2 Birch – Fern

Birch-fern forest represents a very small portion of the Project Area. This habitat type occupies moist upland areas and encompasses characteristics of both Dryopteris-Birch and Gaultheria-Kalmia-Birch forest types as described by Meades & Moores (1994). Ferns of the genus Dryopteris, accompanied by bunchberry (*Cornus canadensis*) and graminoid species make up most of the herbaceous vegetation, and open white birch dominates the tree or canopy layer (Figure D3-3.6.2-1). Graminoids dominate the forest floor. This habitat type would be formed through gap dynamics when windthrow areas are colonized by the pioneer white birch instead of balsam fir.

Figure D3-3.6.2-1 White Birch Fern Forest Habitat in the Western Hillsides of the Project Area.

3.7 Wetland

Wetlands were abundant throughout the Project Area (Figure D3-3.7-1). Fens, bogs, treed fens and bogs, and some limited marshy areas near waterbody-wetland transitions existed throughout. Wetlands in NL can be characterized into five classes (according to the Canadian Wetland Classification System (CWCS)): (i) bog; (ii) fen; (iii) swamp; (iv) marsh; and (v) shallow water wetlands (National Wetlands Working Group, 1997); however, for the purposes of the ELC, this level of resolution was not required. Sphagnum moss (*Sphagnum sp.*), accompanied by sedges (*Carex sp.*) make up most of the herbaceous vegetation in wetlands, with increased diversity where the wetland approaches riparian vegetation and meadows.

Based on preliminary design, the quantity of habitat that will be altered for turbine pad/laydown area and road construction is outlined in Table R-3.1.1-1 of Appendix R. This calculation excluded collector lines, the Project Gen-Tie, and the Interconnect Line, as such the ELC habitat data excluded the Project Interconnect Line right-of-way. At the time of this calculation, Project infrastructure is estimated to alter 4.32 ha of wetland, however, the Project maintains the goal to minimize their effects on wetlands. This is calculated currently by the use of a preliminary Project layout and ELC mapping (Appendix D3) for this modelling. The Project layout will still undergo micro-siting adjustments prior to construction to avoid minimize effects on wetlands in the Project Area where practicable.

Figure D3-3.7-1 Wetland Ecotype in the Project Area.

3.8 Meadow

Meadow was classified as any open habitat with low-growing graminoids, herbs, shrubs, and heath. Treed meadows include sparse coniferous tree growth (often white spruce or balsam fir) throughout open areas. The Meadow ecotype in the Project Area is comprised of anthropogenically-altered land on the Argentia Peninsula, meadows west and southwest in the Argentia Backlands, and meadows near military infrastructure such as bunkers, and along roadsides and ATV trails (Figure D3-3.8-1). These meadows are comprised mainly of graminoid spp., herbs such as hawkweed (*Hieracium caespitosum*), goldenrod (*Solidago* spp.), thistle (*Cirsium* spp.), Canada burnet (*Sanguisorba canadensis*), and strawberry (*Fragaria vesca*). Meadows were often sparsely populated with large white spruce or balsam fir at the periphery. Other species that may occupy the ground cover in these habitats include dryland mosses such as Schreber's moss, hair cap moss, and clovers (*trifolium* spp.).

The anthropogenically-disturbed coastal meadows on the Argentia Peninsula are comprised of similar meadow species but are interspersed with patches of stunted coniferous trees associated with exposure to coastal winds and salt air (Figure D3-3.8-2). Substrate is dominated by graminoids and herbs in areas of previous disturbance and between roadways. In areas with conifer growth, crowberry makes up the most abundant ground-covering species. This habitat could be classified as heathland, but for now will be encompassed by the Meadow ecotype. Differences in specific vegetation cover may be analyzed to further differentiate these ecotypes.

Figure D3-3.8-1 **Meadow Habitat Surrounding Historical Access Road and Current ATV Trail in the Argentia Backlands.**

Figure D3-3.8-2 Anthropogenically Disturbed Meadow on the Argentia Peninsula.

3.9 Anthropogenic

The Anthropogenic ecotype represents all areas that are currently occupied by human development and infrastructure, and areas where natural habitat does not exist. Paved roads, crushed stone roads, buildings, docks, wharves, and other working equipment (e.g., platform, runway, and crane on the Argentia Peninsula) are anthropogenic and are encompassed within this ecotype.

4.0 Discussion

The Project Area is diverse, ranging from relatively untouched mature forests to highly disturbed landscapes with anthropogenically affected vegetation. The ELC facilitated the identification of ecotypes, which aided in planning the field efforts for various baseline studies, including Species at Risk (SAR) surveys. With an understanding of the ecotypes present in the Project Area and their use by SAR, Project design can incorporate precise habitat features, especially to avoid important/sensitive habitat and potentially minimize habitat fragmentation.

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Appendix D4

Mammals Baseline Study

Appendix D4

Mammals Baseline Study

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List of Tables

List of Acronyms and Abbreviations

AC CDC	Atlantic Canada Conservation Data Centre
CMA	Caribou Management Area
ELC	Ecological Land Classification
GPS	Global Positioning System
LP	Limited Partnership
NL	Newfoundland and Labrador
NL ESA	Newfoundland and Labrador Endangered Species Act
NL WD	Newfoundland and Labrador Wildlife Division
SAR	Species at Risk
SARA	Species at Risk Act
SCC	Species of Conservation Concern

1.0 Introduction

The Mammals Baseline Study has been developed by Argentia Renewables Wind LP (Argentia Renewables), an affiliate of Pattern Energy Group LP (Pattern Energy) for the Argentia Renewables Project (the Project), which entails the development, construction, operation and maintenance, and eventual decommissioning and rehabilitation of an onshore wind energy generation facility (Argentia Wind Facility) and a green hydrogen and ammonia production, storage, and export facility (Argentia Green Fuels Facility). The wind energy facility (i.e., wind turbine farm) will be mostly located on what is known as the Argentia Backlands, a largely uninhabited, forested area with scattered relic military sites and variable habitat types. The Argentia Green Fuels Facility will be located on the Argentia Peninsula, a brownfield industrial complex. The Port of Argentia owns both the Argentia Backlands property and the Argentia Peninsula. The two, along with a Project Interconnect Line, comprise the Argentia Renewables Project Area. This baseline study focuses on the presence/absence of mammals in the Project Area and potential interactions resulting from Project development.

Given the extensive coverage of the Project Area for rare lichens, avifauna, and Ecological Land Classification (ELC) surveys, the most effective and efficient way to compile mammal observations was on an opportunistic basis. In total, approximately 34 km of land was surveyed for mammal observations in various habitat types. In addition, an Atlantic Canada Conservation Data Centre (AC CDC) data query was submitted to determine if there were any historical records of rare or Species at Risk (SAR) fauna in the area. Zero records were returned for mammals.

Mammals from the orders Artiodactyl (split-hoofed, such as caribou and moose), Carnivora (carnivores such as foxes, coyotes, and otters), Rodentia (rodents such as beavers and voles), Insectivora (insect-eaters such as shrews), and Lagomorpha (hare forms such as rabbits and hares) were all considered during this baseline study. Note that the order Chiroptera (bats) are the subject of a bat-specific baseline study (Appendix D2) and will not be discussed in this baseline study.

2.0 Methods

2.1 Desktop Review

A comprehensive desktop review was conducted to determine the potential presence and habitat use of mammal species that may occur in the Project Area. A review was also conducted of the SAR and Species of Conservation Concern (SCC) for the Project Area through an AC CDC request. Generalized research was conducted regarding the potential effects of wind turbine operations on mammal species. In addition, local communities were consulted on the Project on several occasions, and comments and concerns were recorded pertaining to mammals and hunting in the area.

2.2 Field Surveys

Original field surveys were conducted to facilitate the confirmation of species presence in the Project Area. Numerous baseline surveys (e.g., avifauna, rare lichens, ELC) were undertaken throughout the Project Area, and incidental mammal observations were collected during each survey. Approximately 34 km of the Project Area was surveyed throughout all seasons for mammal observations in the various ecotypes of the Project Area (see Appendix D3 for the ELC). Mammal observations were also noted during other types of routine fieldwork in the Project Area (e.g., maintenance of bat detectors). This approach enabled coverage of most of the Project Area, with an emphasis on the Argentia Backlands, where most of the proposed turbines will be located. Mammal observations were compiled in the form of auditory calls, visual observations of individuals, tracks, browsing evidence, and scat. The following data was collected for each observation:

- Observation type (visual, tracks, calls, etc.);
- Date and time;
- GPS location;
- General habitat description;
- Number of individual observations; and
- Additional notes (e.g., behaviour, carrying prey, etc.).

A muskrat (*Ondatra zibethicus*) survey is being planned for fall 2024 (depending on regulatory requirements). This survey will help establish the extent to which muskrat use the Project Area. Muskrat surveys will take place in an eligible subset of ponds, which will be chosen based on habitat suitability (e.g., presence of vegetation, water depth, etc.). Further information will be provided after the study is complete. An American marten (*Martes americana atrata*) hair snag survey will be undertaken as per discussions with NL Wildlife Division (NL WD) and in following with NL WD's guidance document (Herdman, 2014). In addition, avifauna surveys conducted throughout the Project Area in 2024 will also include mammal incidentals.

3.0 Results

Eight mammal species were observed in the Project Area: moose (*Alces alces*), red fox (*Vulpes vulpes*), short-tailed weasel (*Mustela erminea*), coyote (*Canis latrans*), beaver (*Castor canadensis*), snowshoe hare (*Lepus americanus*), meadow vole (*Microtus pennsylvanicus*), masked shrew (*Sorex cinereus*), and red squirrel (*Tamiasciurus hudsonicus*). Moose and red squirrel were the most frequently observed species.

The Project may interact with mammal species in the form of habitat fragmentation and other disturbance such as noise and light (Helldin *et al*., 2012; Scholl & Nopp-Mayr, 2021). Operational wind turbines do

not pose any identified mortality risk to mammal species (aside from bats, discussed in Appendix D2). The Project Area does not overlap with any of the four mammal species listed under the Newfoundland and Labrador **Endangered Species Act** (NL ESA). Details of the results are discussed in the sections below.

3.1 Desktop Review

A literature review into the affects of wind turbines on mammals revealed that development leads to habitat fragmentation and loss, and various other disturbances (Helldin *et al*., 2012; Scholl & Nopp-Mayr, 2021). A recent study by Tolvanen *et al*. found that several mammal species avoid wind turbine sites, leading to displacement (2023). However, other mammal species were observed to be undisturbed (Tolvanen *et al*., 2023). Other literature concludes that larger mammals, such as moose and reindeer, appear to be neutral to the presence of wind turbines (Berndt *et al*., 2021; Flydal *et al*., 2004). For reindeer, it has been found that access roads pose a greater risk of inducing avoidance behaviour near wind farms than the wind turbines themselves (Colman *et al*., 2013). However, behavioural responses to wind turbines vary between studies and appear to be species-specific. The paucity of literature on the long-term effects of wind turbine operations on mammals constitutes a knowledge gap (Helldin *et al*., 2012; Scholl & Nopp-Mayr, 2021).

The AC CDC data query yielded no reports of any rare or SAR mammals within 5 km of the center of the Project Area, and similarly, the literature search of available government documents, range maps, etc., also produced no results of rare or SAR mammals. There are currently four mammals (excluding bats) listed under the NL ESA: the American marten (*Martes americana*), the polar bear (*Ursus maritimus*), the wolverine (*Gulo gulo*), and the woodland caribou (*Rangifer tarandus caribou*) (Labrador population). While not listed under the NL ESA, the Newfoundland caribou population is listed as Special Concern under the federal **Species at Risk Act** (SARA). The northern extent of the Cape Shore Caribou Management Area (CMA 77) begins at the intersection of Route 100 and Route 91, it follows along Route 91 until the intersection with Route 92 where it and continues south to Branch and completes the loop following Route 100 to the point of commencement. The Project Area, while relatively close to CMA 77, is outside of the caribou's historical range and does not contain much high-quality caribou habitat (Weir *et al*., 2014). Therefore, caribou were not considered to be of any significant concern for the Project. Similarly, at the start of this baseline study the Project Area was outside of the historic range of American marten subspecies (*Martes americana atrata*) and all other SAR mammals for the province, and thus these mammals were not considered further. However, since then, the American marten distribution has been expanded to include the Project Area with a 10-60% probability of occurrence (Hearn and Durocher, 2023). Therefore, additional surveys will be conducted in fall 2024 to assess their presence or absence in the Project Area.

The Project Area was deemed to have suitable habitat for the following mammals:

- Moose (*Alces alces*);
- Lynx (*Lynx canadensis*);
- Red Fox (*Vulpes vulpes*);
- Coyote (*Canis latrans*);
- Ermine (*Mustela erminea*);
- Mink (*Neovison vison*);
- Otter (*Lontra canadensis*);
- Beaver (*Castor canadensis*);
- Muskrat (*Ondatra zibethicus*);
- Meadow Vole (*Microtus pennsylvanicus*);
- Red-backed Vole (*Myodes gapperi*);
- Red Squirrel (*Tamiasciurus hudsonicus*);
- Deer Mouse (*Peromyscus maniculatus*);
- Norway Rat (*Rattus norvegicus*);
- House Mouse (*Mus musculus*);
- American Marten (*Martes americana atrata*)
- Snowshoe Hare (*Lepus americanus*); and
- Masked Shrew (*Sorex cinereus*).

However, three of these are unlikely given the wild natural environments (i.e., American marten, house mouse, Norway rat), except for some potential habitat on the Argentia Peninsula.

3.2 Field Studies

Baseline surveys and other fieldwork conducted throughout the Project Area yielded observations of nine different mammal species. Table D4-3.2-1 below lists the mammals that were observed in the Project Area, and observation types. Most mammal observations were recorded while performing transects and point counts for avifauna and rare lichens, and during ELC ground-truthing surveys. Additional incidentals were recorded while moving through the Project Area for routine tasks such as maintaining bat detectors.

The most successful observation period for mammals was during surveys conducted shortly after snowfall. The snow preserved tracks well and allowed for many mammal track observations.

Table D4-3.2-1 Mammal Observations in the Project Area.

Species	Latin Name	Visual	Tracks	Other
Moose	*Alces alces*	Yes	Yes	Droppings and shed antlers
Red Fox	*Vulpes vulpes*	Yes	Yes	droppings
Short-tailed Weasel	*Mustela erminea*	Yes	Yes	-
Coyote	*Canis latrans*	-	Yes	-
Beaver	*Castor canadensis*	-	-	Chewed branches and dam building
Snowshoe Hare	*Lepus americanus*	Yes	Yes	Droppings
Meadow Vole	*Microtus pennsylvanicus*	-	Yes	-
Masked Shrew	*Sorex cinereus*	Yes	Yes	-
Red Squirrel	*Tamiasciurus hudsonicus*	Yes	Yes	Nests, calls

Moose and red squirrel were the most observed species. Scat and feeding evidence for these species are conspicuous, and these are relatively ubiquitous species in natural environments in NL. Species that are very likely using the Project Area, but which were not detected during surveys, include lynx, mink, otter, muskrat, red-backed vole, and deer mouse. Some of these species would require dedicated surveys to establish presence/absence or any measure of relative abundance.

4.0 Discussion

In addition to the eight mammal species observed, it is expected that otter, muskrat, and mink live in the streams, ponds and river habitats present in the Project Area. There is also a high probability that the Canada lynx utilizes the Project Area. However, no observations of these species were made in the 2022 and 2023 surveys. The high abundance of moose can be explained by the large quantity of open wetlands and regenerating young balsam fir. Many of these young fir patches were heavily browsed by moose. Moose observations were recorded in most regions of the Project Area, excluding the Argentia Peninsula, where no mammal observations were recorded.

The mammals identified in this baseline study are likely to interact with one or more elements of the Project. The construction and maintenance of roads and turbine pads throughout the Argentia Backlands will create disturbance and habitat fragmentation (Helldin *et al*., 2012; Scholl & Nopp-Mayr, 2021). The long-term effects of wind turbine developments on mammal species are not well-studied (Helldin *et al*., 2012; Scholl & Nopp-Mayr, 2021) but aside from the fragmentation and avoidance behaviour associated with the Construction Phase, and potential avoidance of turbines during Operation and Maintenance, the interactions with mammals may be relatively minimal.

Through consultations with the NL WD, Argentia Renewables has been made aware of concern for declining muskrat populations in the province. Biologists sought observations of muskrat, particularly in the Wetland ecotype, but no observations of muskrat or muskrat evidence (e.g., scat, tracks) were

recorded. Surveys are planned for the fall of 2024 to help establish the extent to which muskrat uses the Project Area.

Also, through consultations with the NL WD, Argentia Renewables has been made aware of recent changes to the American Marten distribution in the province. Surveys are planned for the fall of 2024 to help establish the extent to which American Marten uses the Project Area. The project will adhere to the methodology provided by the NL WD.

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Appendix D5

Rare Lichen Baseline Study

Appendix D5

Rare Lichens Baseline Study

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List of Abbreviations

Abbreviations	Definitions
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
LiDAR	Light Detection and Ranging
ELC	Ecological Land Classifications
NL ESA	Newfoundland and Labrador Endangered Species Act
GIS	Geographical Information Systems
GPS	Global Positioning System
IUCN	International Union for Conservation of Nature
LP	Limited Partnership
NL	Newfoundland and Labrador Endangered Species Act
SAR	Species at Risk
SARA	Species at Risk Act
UTM	Universal Transverse Mercator

1.0 Introduction

The Rare Lichens Baseline Study has been developed by Argentia Renewables Wind LP (Argentia Renewables), an affiliate of Pattern Energy Group LP (Pattern Energy) for the Argentia Renewables Project (the Project), which entails the development, construction, operation and maintenance, and eventual decommissioning and rehabilitation of an onshore wind energy generation facility (Argentia Wind Facility) and a green hydrogen and ammonia production, storage, and export facility (Argentia Green Fuels Facility). The wind energy facility (i.e., wind turbine farm) will be mostly located on what is known as the Argentia Backlands, a largely uninhabited, forested area with scattered relic military sites and variable habitat types. The Argentia Green Fuels Facility will be located on the Argentia Peninsula, a brownfield industrial complex. The Port of Argentia owns both the Argentia Backlands property and the Argentia Peninsula. The two, along with a Project Interconnect Line, comprise the Argentia Renewables Project Area. This baseline study focuses on the presence/absence of rare lichen species in the Project Area and potential interactions resulting from Project development.

Newfoundland is one of the few known global locations for three rare lichen Species at Risk (SAR): boreal felt lichen (*Erioderma pedicellatum*), vole ears lichen (i.e., graceful felt lichen) (*Erioderma mollissimum*), and blue felt lichen (*Degelia plumbea*). As epiphytic lichens, these species require a phorophyte (i.e., a vegetative host), often a specific tree species (Schmitt & Slack, 1990). Of the three, only boreal felt lichen was initially considered to have high potential for occurring in the Project Area based on an abundance of balsam fir adjacent to wetlands. That assumption pre-dated the discovery of ample amounts of yellow birch in some parts of the Project Area, which elevated the potential for blue felt lichen.

Boreal felt lichen is listed as Vulnerable under the Newfoundland and Labrador **Endangered Species Act** (NL ESA), as a species of Special Concern under the federal **Species at Risk Act** (SARA), and as Critically Endangered by the International Union for Conservation of Nature (IUCN) (Scheidegger, 2003). Newfoundland has more than 95% of the remaining global population of boreal felt lichen (Wiersma & Skinner, 2011). The central Avalon Peninsula hosts one of the largest known populations of this lichen (Environment Canada, 2010). A boreal felt lichen population is also known to inhabit southeast Placentia (Environment Canada, 2010). Proximity to other populations and an abundance of suitable habitat in the Project Area indicated that this species was likely to be found during surveys.

Vole ears lichen is listed as endangered under the SARA and the NL ESA. COSEWIC has recommended the protection of this species based on the rarity of known thalli in Newfoundland (COSEWIC, 2008). Thalli have been identified on only nine trees in two different areas of the Avalon Peninsula (COSEWIC, 2008). One of the two known locations is amongst the boreal felt lichen population in southeast Placentia (COSEWIC, 2008).

Both boreal felt lichen and vole ears lichen (*Erioderma spp.*) use mature balsam fir (*Abies balsamea*) as their main phorophyte (COSEWIC, 2008; Environment Canada, 2010). The Argentia Backlands consists mainly of coniferous forests with balsam fir dominating the canopy. Mature balsam fir forests adjacent to wetlands, surrounded by wetlands, or adjacent to waterbodies create moisture regimes suitable for healthy lichen growth and reproduction.

Blue felt lichen is listed as Vulnerable under the NL ESA and is listed as Special Concern under the SARA. This species prefers mature deciduous trees, particularly maples and yellow birch (*Betula alleghaniensis*) (COSEWIC, 2010). Historical observations near the Project Area include Sir Robert Bond Park in Whitbourne where blue felt lichen exists on non-native species such as Norway maple (*Acer platanoides*), and native yellow birch (COSEWIC, 2010). Most known thalli in Newfoundland exist on non-native trees; however, within natural forests they are known to be present on yellow birch with a select few observations on white spruce (*Picea glauca*) (COSEWIC, 2010). Yellow birch is present within the Argentia Backlands of the Project Area as small patches of Mixedwood Forest with large, mature yellow birch dominating the canopy. Some such stands also occur in proximity to wetlands, open waterbodies, or streams, elevating the potential for occurrence due to the bolstered moisture levels. Blue felt lichen is sensitive to any reduction in humidity that could result from the opening of the forest due to windfallen trees, cutting/clearing, or browsing of young trees associated with their typical habitat (COSEWIC, 2010).

2.0 Methods

The detection of rare lichens started with a thorough literature review and desktop analysis that focused on the habitat types associated with each lichen. A review of the Ecological Land Classification (ELC) habitat mapping of the Project Area was then used to identify survey locations with heightened potential.

2.1 Habitat Suitability Mapping

The ELC (Appendix D3) informed the desktop component of the rare lichens study by facilitating the identification of potential suitable habitats. The ELC study consisted of a desktop review and numerous surveys throughout the Project Area. An intensive GIS and public database review was undertaken to gain an understanding of the ecotypes associated with the Project Area and their potential for lichen use. In 2022 and 2023, baseline surveys were conducted throughout the Project Area to support production of the ELC map. These surveys were also used to note the habitat potential for rare lichen species. The resulting observations and coordinate collections were then compiled and developed into lichen habitat suitability maps of the Project Area. Open-sourced LiDAR and aerial imagery combined with ArcGIS software were used to create the maps. These maps were then used to direct rare lichen field surveys.

2.2 Field Surveys

Field surveys were undertaken to confirm the presence, location, and number of individuals of lichen SAR in the Project Area. The survey team had experience conducting rare lichen surveys and were educated about the habitats, indicator species, and host species for relevant lichens. Survey teams visited areas with a high potential for rare lichen presence, as identified in the habitat suitability maps. At each site, the habitat type was identified and ranked to determine its suitability as lichen habitat. Key variables included dominant canopy vegetation and maturity level, proximity to water and/or humidity condition, followed by indicator species and thorough surveys of each suitable tree.

When searching an area of high suitability, each tree (trunk and branches) was examined on all sides from base to approximately 4 m from the ground (i.e., as high as could be visually assessed by surveyors). High-quality optics allowed for the detection of any suspected thalli (e.g., white tipped undersides of boreal felt lichen) located high in trees. When thalli were identified, the following information was collected:

- Date and time;
- GPS location (Easting and Northing);
- Tree species;
- Tree diameter (i.e., diameter at breast height);
- Location of lichen on tree (e.g., height above ground, side of tree, branch vs. trunk);
- Habitat description;
- Photographs; and
- Lichen species and abundance.

In addition to designated rare lichen surveys, during all other field activities (e.g., ELC surveys) incidental observations were sought. Any findings were then documented as per the dedicated survey methods.

2.2.1 Survey Indicators

Survey indicators were developed to determine whether a habitat may be suitable for rare lichens. These indicators included forest species composition, diameter at breast height, maturity, and presence of lichen or liverwort indicator species.

The primary phorophyte for boreal felt lichen is mature balsam fir, but it also requires a suitable substrate for growth on the tree, which is a liverwort species, *Frullania asagrayana* (Cornejo & Scheidegger, 2016). The water sacs of *Frullania* host Rhizonema, the cyanobacteria partner which associates with the fungal hyphae of the boreal felt lichen to create a viable, synthesizing lichen (Cornejo & Scheidegger, 2016). *Frullania* grows within closed canopy mature conifer forests and, like boreal felt lichen, requires a phorophyte host such as balsam fir (Cornejo & Scheidegger, 2016). Salted shell lichen (*Coccocarpia palmicola*) (Figure D5-2.2-1) can also be an effective indicator species and occupies a niche like boreal felt lichen. Where vole ears lichen shares the same phorophyte as boreal felt lichen, these indicator species can be used for both.

Figure D5-2.2-1 *Coccocarpia palimcola* Growing on a Mature Balsam Fir in the Project Area.

Blue felt lichen prefers mature deciduous species for phorophyte hosts. In Newfoundland, many of these known lichens exist on non-native red maple (*Acer rubrum*), but native phorophyte hosts are often mature yellow birch. Deciduous stands of significant size and age, proximal to humid conditions, are a good indicator of potential blue felt lichen presence. Indicator species such as those in the genus *Coccocarpia* can also indicate the presence of blue felt lichen (COSEWIC, 2010).

3.0 Results

3.1 Habitat Suitability Mapping

From the ELC it was evident that a large portion of the Project Area was dominated by Mature Coniferous Forest, which had the potential to contain suitable boreal felt lichen or vole ears lichen habitat. The Mature Coniferous Forest ecotype comprised 1,640 ha (34%) of the entire Project Area, although incorporating proximity to wetlands, water, and canopy species composition reduced the total amount of potential area.

Mixedwood Forests were limited in the Project Area in preliminary versions of the ELC; however, high-resolution imagery, open-sourced LiDAR data, and field observations were used to refine the amount of Mixedwood Forest in the ELC. These areas often included deciduous trees upwards of 15 m in height. Sites were also identified as potential lichen habitats (specifically blue felt lichen) based on the composition of deciduous trees and their proximity to humid conditions (e.g., water, wetlands). The Mixedwood forest habitat type was estimated at 369 ha (8%) of the total Project Area.

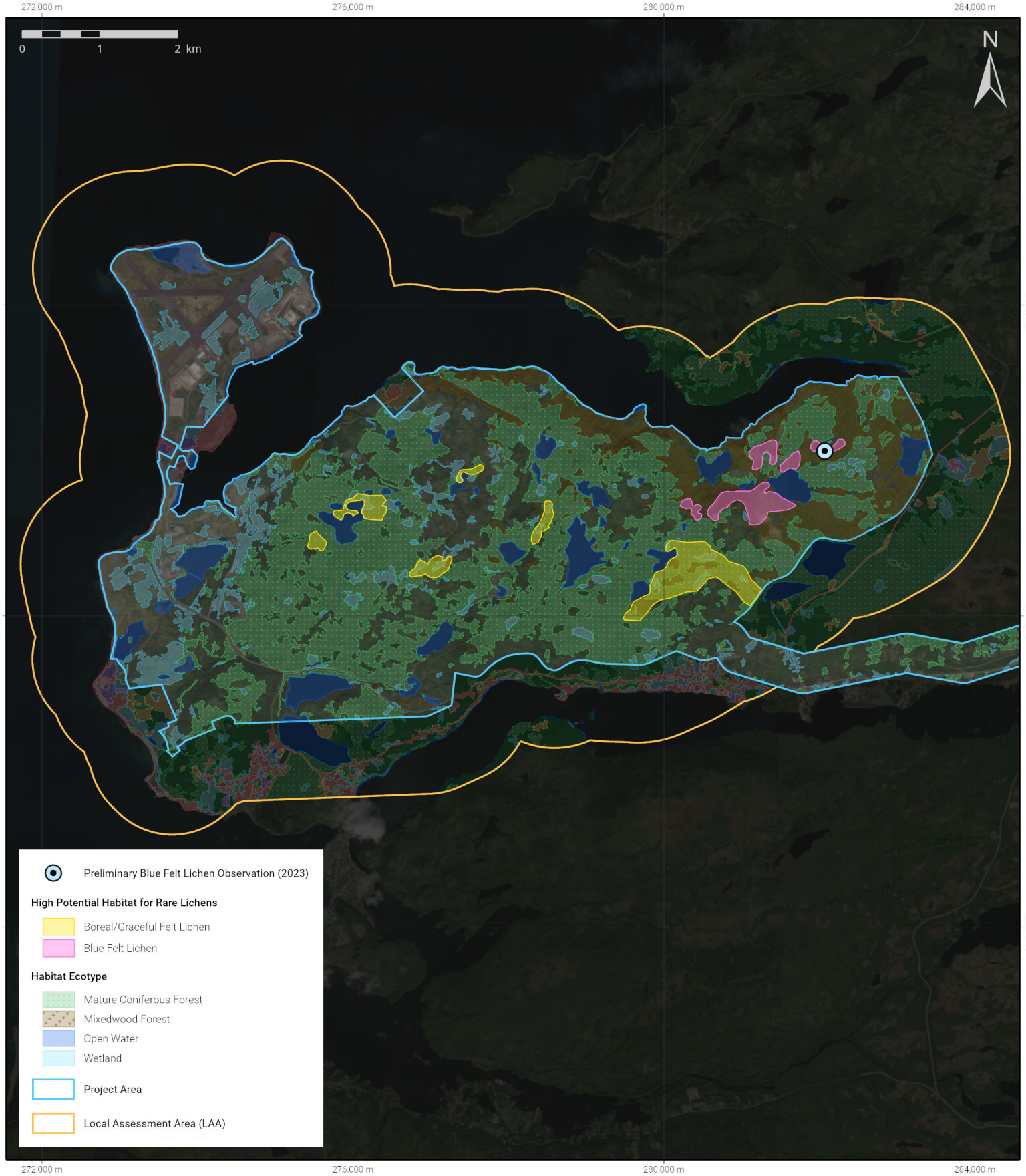
3.1.1 Boreal Felt Lichen and Vole Ears Lichen Habitat

Boreal felt lichen and vole ears lichen share the same phorophyte and habitat preferences and were thus identified by the same suitable habitat. Mature balsam fir stands identified during preliminary field programs in 2022 and 2023 were determined to be suitable habitat for boreal felt lichen and vole ears lichen. Mature balsam fir forest habitat can be seen growing in a moist environment where sphagnum moss and upland forest mosses are in transition, indicating high moisture levels. *Frullania* growth is appropriate to support lichen colonization and growth, and indicator species such as healthy *Coccocarpia* exist throughout the forest stand. Areas identified as suitable habitat for boreal felt lichen and vole ears lichen are presented in Figure D5-3.1-2 at the end of this section.

3.1.2 Blue Felt Lichen Habitat

Mixedwood Forests were identified in the Project Area along the northern coast and northeast section of the Argentia Backlands. During preliminary field exercises, Mixedwood forest stands identified in the northeast section, near Shalloway ponds, were comprised of more than 70% mature birch. These areas were observed to contain mature yellow birch with minimal understory growth (and limited to feathermosses or sphagnum mosses on wetland transitions). **Furthermore,** a small patch of this suitable site was observed to contain two thalli of blue felt lichen growing on a large yellow birch (Figure D5-3.1-1). Areas identified as suitable habitats for blue felt lichen are presented in Figure D5-3.1-2.

Figure D5-3.1-1 Blue Felt Lichen Thalli on a Mature Yellow Birch in the Project Area.



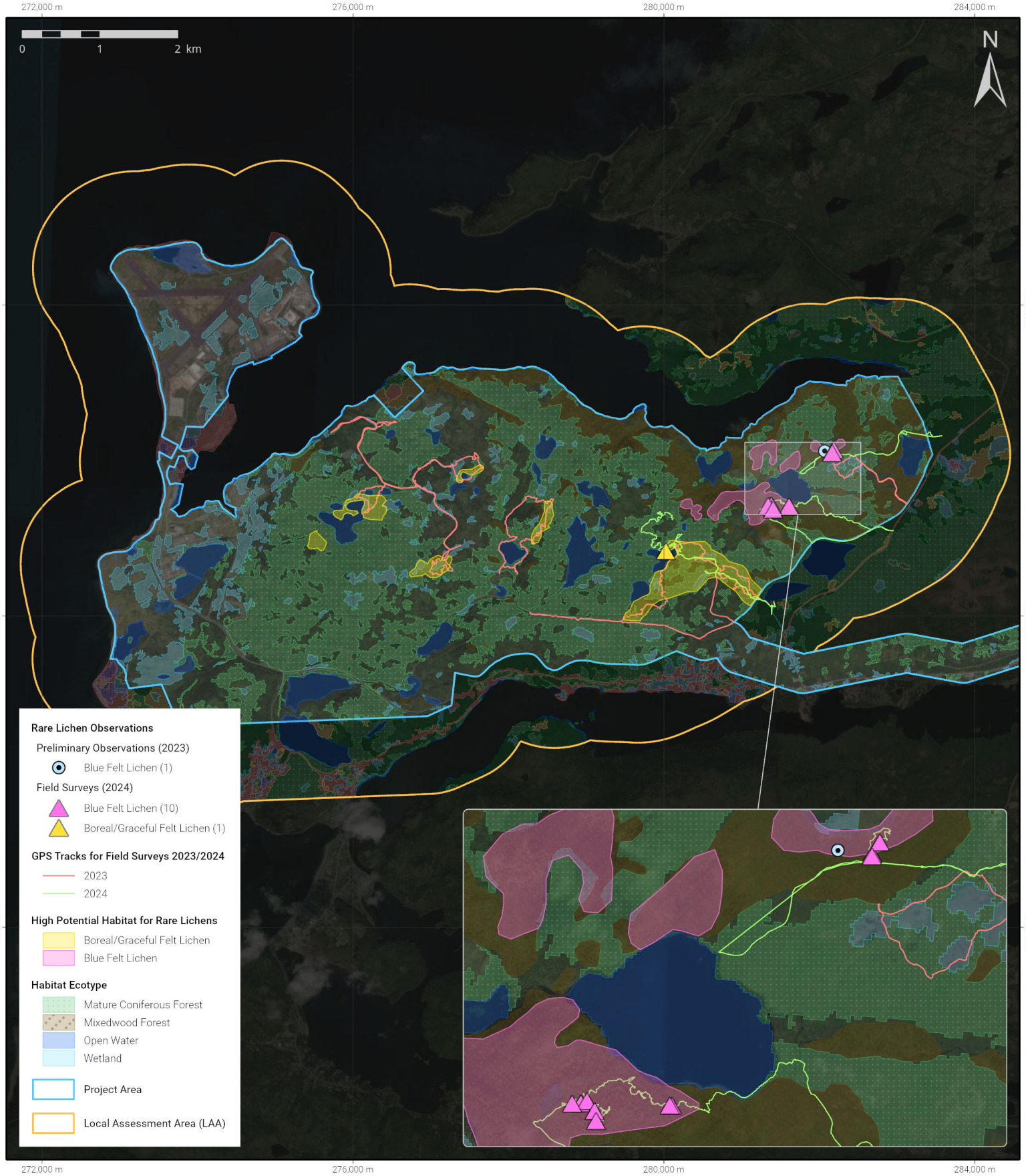
Pattern | Argentia Renewables

FIGURE NUMBER: D5 - 3.1 - 2	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/26
FIGURE TITLE: Habitat Suitability for Rare Lichens	NOTES: High potential habitat determined through ELC ecotype, terrain, canopy analysis combined with field observations (point collections) of lichen habitat potential during various terrestrial component studies.	REVIEWED BY:	
PROJECT TITLE: Argentia Renewables		APPROVED BY:	sem

SEM MAP ID: 238-005-GIS-114-Rev1

3.2 Field Surveys

Field surveys were conducted in all high-potential habitats for the rare lichens deemed possible for the Project Area. Observations were made of boreal felt lichen and blue felt lichen but not vole ears lichen (Figure D5-3.2-1). Results of the field surveys are discussed in the sections below.



Pattern | Argentia Renewables	FIGURE NUMBER: D5 - 3.2 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/26
	FIGURE TITLE: Rare Lichens Field Survey Overview	NOTES: High potential habitat determined through ELC ecotype, terrain, canopy analysis combined with field observations (point collections) of lichen habitat potential during various terrestrial component studies.	REVIEWED BY:	
	PROJECT TITLE: Argentia Renewables		APPROVED BY:	sem

SEM MAP ID: 238-005-GIS-115-Rev1

3.2.1 Boreal Felt Lichen and Vole Ears Lichen

Areas of high potential for boreal felt lichen and vole ears lichen were surveyed according to the habitat suitability map. Based on topographic characteristics from aerial imagery, transects were created to allow for thorough surveys. Despite extensive efforts with 100% coverage of all high potential areas (Figure D5-3.2-1), only two boreal felt lichen thalli were observed on a single tree at one site north of Hickey's Pond in the eastern portion of the Project Area (Table D5-3.2.1-1). No vole ears lichen was observed during field surveys.

Table D5-3.2.1-1 Recorded Observations of Boreal Felt Lichen.

Survey Year	Coordinates (UTM, Zone 22T)		Number of Thalli per Tree
2024	280023.89 m E	5240847.59 m N	2

3.2.2 Blue Felt Lichen

The relatively low proportion of Mixedwood Forest in the Project Area facilitated a focus on those areas of heightened potential for blue felt lichen. Full coverage of each suitable yellow birch (to the height that was practical and safe) was necessary to determine the presence of thalli. During ELC surveys in 2023, two thalli were observed out of approximately 100 surveyed trees. An additional 80 potential thalli were identified during dedicated surveys in 2024. The 2023 and 2024 survey results are shown in Table D5-3.2.2-1. Consultations with Wildlife Division began in 2023 to confirm the identification of these thalli as blue felt lichen (from photographs). To date, more than half of the thalli have been confirmed as being blue felt lichen. Twenty hectares of suitable Mixedwood Forest remains to be surveyed and will be completed in the summer of 2024.

Table D5-3.2.2-1 Recorded Potential Observations of Blue Felt Lichen.

Survey Year	Coordinates (UTM, Zone 22T)		Number of Thalli per Tree
2023	282069.00 m E	5242121.00 m N	2
2024	281613.24 m E	5241422.66 m N	1
2024	281607.35 m E	5241423.10 m N	1
2024	281363.00 m E	5241429.00 m N	1
2024	281380.00 m E	5241435.37 m N	2
2024	281400.91 m E	5241407.76 m N	3
2024	281339.00 m E	5241428.00 m N	14
2024	281404.77 m E	5241380.66 m N	2
2024	282163.01 m E	5242113.90 m N	10
2024	282183.94 m E	5242145.50 m N	15
2024	282162.46 m E	5242107.12 m N	31

4.0 Discussion

Surveys have confirmed that boreal felt lichen and blue felt lichen are present within the Project Area. While habitat suitability maps indicated that there would be a high likelihood of boreal felt lichen presence throughout the Project Area, only two thalli were found. No development will occur near the known population of boreal felt lichen and vole ears lichen in Southeast Placentia. Rare lichens found in the Project Area will be protected through mitigation measures (e.g., mandatory set-back distances) as committed to in Chapter 4.2 of the Registration document. Additional surveys of potential habitat will be completed once Project infrastructure design is more advanced.

Conversely, despite the low expectation for blue felt lichen to be found in the Project Area, more than 80 thalli are likely to be confirmed. Stands/polygons identified as mixedwood will be surveyed for blue felt lichen prior to any construction activities, if it is possible for interaction with Project infrastructure.

5.0 References

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Appendix D6

Rare Plants Baseline Study

Appendix D6

Rare Plants Baseline Study

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List of Acronyms and Abbreviations

Abbreviations	Definitions
AC CDC	Atlantic Canada Conservation Data Centre
CO_2	Carbon Dioxide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
ELC	Ecological Land Classification
NL ESA	Newfoundland and Labrador Endangered Species Act
GPS	Global Positioning System
IUCN	International Union for Conservation of Nature
LP	Limites Partnership
NL	Newfoundland and Labrador
POA	Port of Argentia
SAR	Species at Risk
SARA	Species at Risk Act
SCC	Species of Conservation Concern
SSAC	Species Status Advisory Committee

1.0 Introduction

The Rare Plants Baseline Study has been developed by Argentia Renewables Wind LP (Argentia Renewables), an affiliate of Pattern Energy Group LP (Pattern Energy) for the Argentia Renewables Project (the Project), which entails the development, construction, operation and maintenance, and eventual decommissioning and rehabilitation of an onshore wind energy generation facility (Argentia Wind Facility) and a green hydrogen and ammonia production, storage, and export facility (Argentia Green Fuels Facility). The wind energy facility (i.e., wind turbine farm) will be mostly located on what is known as the Argentia Backlands, a largely uninhabited, forested area with scattered relic military sites and variable habitat types. The Argentia Green Fuels Facility will be located on the Argentia Peninsula, a brownfield industrial complex. The Port of Argentia (POA) owns both the Argentia Backlands property and the Argentia Peninsula. The two, along with a Project Interconnect Line, comprise the Argentia Renewables Project Area. This baseline study focuses on the presence/absence of rare plants in the Project Area and potential interactions resulting from Project development.

Rare plant observations were documented with a two-week dedicated survey throughout the Project Area, and incidental reports from all baseline field studies (e.g., avifauna, rare lichens, ELC). Hereafter, all species that are listed by the federal **Species at Risk Act** (SARA), the Newfoundland and Labrador **Endangered Species Act** (NL ESA), or that are ranked as S1 to S3 by the Atlantic Canada Conservation Data Centre (AC CDC) are collectively referred to as 'rare plants'. Descriptions of relevant legislative and organizational classifications for rare species and species of conservation concern are provided as Appendix D6.2.

2.0 Methods

2.1 Desktop Review

The goal of the desktop exercise was to identify historical occurrences of plant species in or near the Project Area as listed under SARA and/or the NL ESA and to assess potential for rare plants based on literature and range maps. The study also targeted species currently ranked regionally as rare to uncommon (i.e., S1 to S3) by the AC CDC (see Appendix D6.2).

An information request was submitted to AC CDC to identify rare species listings for a 5 km radius around the Project Area. Additionally, the Ecological Land Classification (ELC) map was examined for habitat types with heightened potential to host rare plants, such as wetlands or elevated rocky outcrops. This screening was used to determine candidate search areas with an elevated likelihood of occurrence for

rare plants. Based on the ELC mapping and the data from AC CDC, a list of rare flora that had an elevated probability of occurrence in the Project Area was compiled.

2.2 Rare Plant Survey Methods

The dedicated rare plant survey was conducted in early September 2023, during the temporal window of maturity for many flowering vascular plants in the region. A targeted approach was taken to ensure coverage of the ecotypes with the most potential (from the desktop review including rocky outcrops and wetlands), and habitats with low potential were only minimally surveyed. Locations of rare plants were recorded using a handheld GPS and first sightings of each species were documented. The number of individuals of each rare species (S1 to S3 ranking) was estimated at each discrete site, including the extent of occurrence.

In cases where species identification remained in question, the plant was collected for identification in the laboratory using a hand lens, botanical keys, and online resources. The field biologists were experienced botanists familiar with local species. Transects were established through a large portion of the Project Area including the Argentia Backlands, the Argentia Peninsula, and the proposed Project Interconnect Line corridor.

In addition, incidental observations of rare plant species were sought during the other field surveys conducted in 2023 (e.g., rare lichens, avifauna). These opportunistic surveys covered most of the Project Area. All S-ranked species encountered were documented, including location, number of individuals, and photographs. Photographs taken throughout all the myriad surveys supplemented the overall flora list.

Additional studies will be conducted in 2024. Yellow birch stands will be delineated via ground-truthing efforts based on existing imagery of the Project Area. A survey for water pygmy-weed was conducted in July 2024.The 2023 rare plant survey will be extended into 2024 to cover the full extent of the Project Interconnect Line corridor, following the same methodology as in previous years, and in consultation with regulatory authorities. Further information will be provided after these studies are complete.

3.0 Results

3.1 Desktop Study

3.1.1 AC CDC Results

The AC CDC report produced four historically documented rare species within the 5 km search radius of the Project Area (Figure D6-3.1.1-1). These included water pygmy-weed (*Tillaea aquatica*), sago pondweed (*Stuckenia pectinata*), maritime sea-blite (*Suaeda maritima*), and southern running pine (*Diphasiastrum digitatum*). Since these four species were known to have occurred in the Project Area, focus was placed on surveying their previously known locations (Figure D6-3.1.1-1).

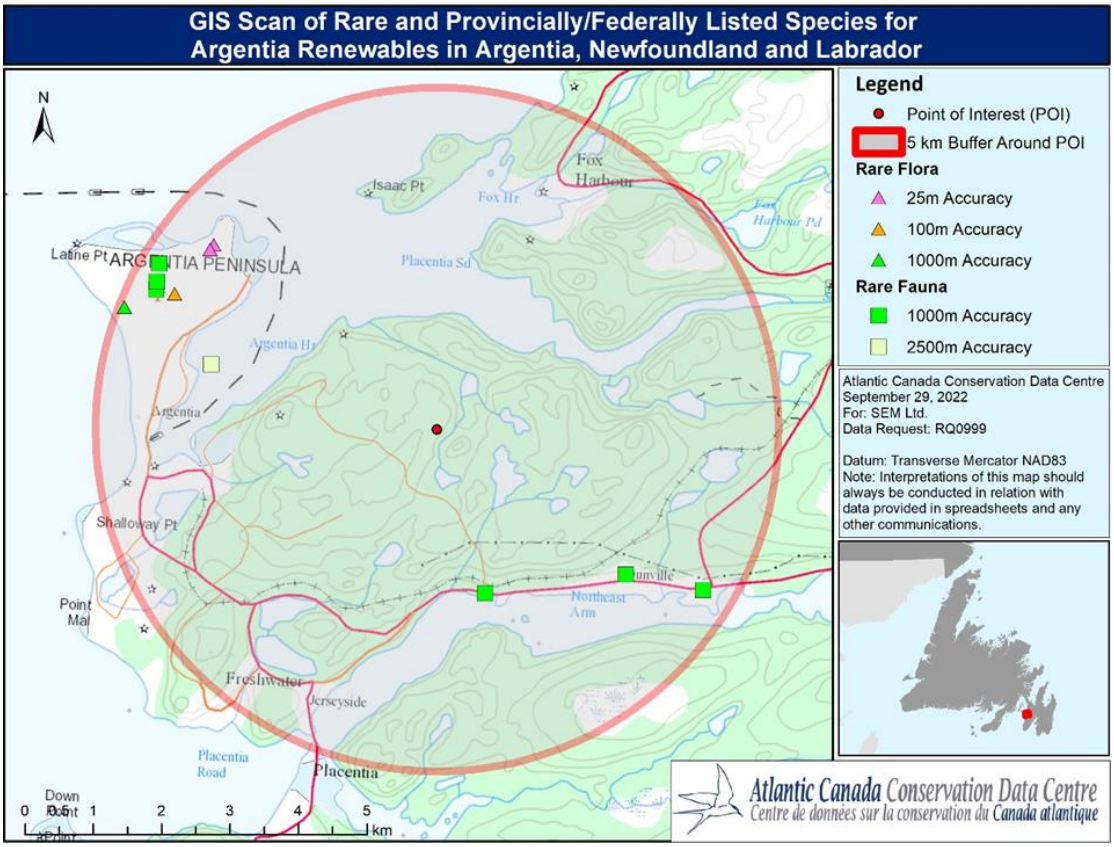


Figure D6-3.1.1-1 AC CDC Data Query Results for the 5 km Radius Around the Center of the Project Area.

3.1.1.1 Water Pygmy-weed

Water pygmy-weed is a coastal-loving succulent found on sandy, gravelly, or muddy shores alongside oceans and brackish waterways (NL Department of Fisheries, Forestry, and Agriculture, 2021). The

species is listed as Vulnerable by COSEWIC and was listed under the NL ESA in 2008 (SSAC, 2008). In Newfoundland, it is only known from the Avalon and Burin Peninsulas (NL Department of Fisheries, Forestry, and Agriculture, 2021).

In Newfoundland, this species occupies wet, anthropogenically disturbed habitats such as quarry pits, roadside shoulders and ditches, and trail ruts (NL Department of Fisheries, Forestry, and Agriculture, 2021). Water pygmy-weed was observed on the old runway on the Argentia Peninsula in 2020 (Figure D6-3.1.1-1).

3.1.1.2 Sago Pondweed

Sago pondweed, or fennel pondweed, is a submerged aquatic plant found in brackish ponds and tide pools (Kantrud, 1990). This rare plant was last recorded in the Project Area in 1924 on a sandy pond shore located on the barrier beach of the Argentia Peninsula. The species is not listed under COSEWIC, SARA, or the NL ESA.

3.1.1.3 Maritime Sea-blite

Maritime Sea-blite typically grows on salt marshes and seashores (Tessier *et al*., 2000). This species was last documented in the Project Area in 1924 in a damp depression in the sand and gravel at the back of the barrier beach on the Argentia Peninsula. The species is not listed under COSEWIC, SARA, or the NL ESA.

3.1.1.4 Southern Running-pine

Southern running-pine is known to occur in coniferous and hardwood forests, second-growth forests, and shrubby or open fields (McKay & Marsh, 2001). This rare plant was last documented in the Project Area in 1988 in turfy gravel at the old U.S. naval airbase. The species is not listed under COSEWIC, SARA, or the NL ESA.

3.1.2 NL ESA Rare Plants

The literature review of the Project Area identified 30 plant species listed provincially under the NL ESA (excluding rare lichens), of which six plants are listed federally under SARA. Of the federally listed plant SAR, zero were known to occur in the Project Area based on AC CDC records. One provincially listed plant, the water pygmy-weed, was historically documented in the Project Area. Table D6-3.1.2-1 presents all NL ESA-listed species in addition to the four AC CDC-recorded species. For global context, the IUCN Red List ranking has also been included for each species.

Table D6-3.1.2-1 Desktop Survey Results for Rare Plants in Project Area

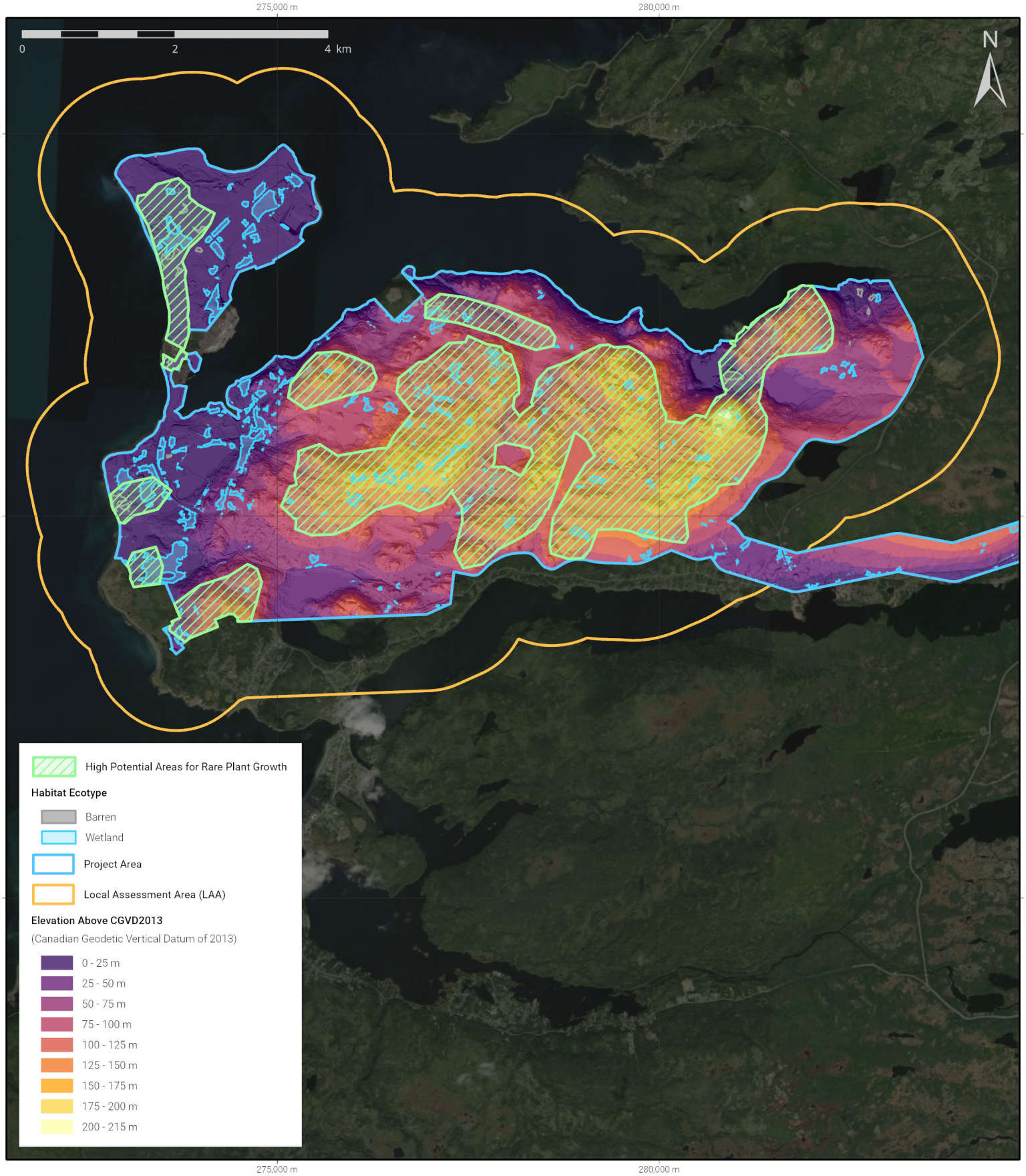
Common Name	Scientific Name	Provincial Status (NL ESA)	Provincial Status (S-Rank)	Federal Status (SARA)	IUCN Red List	Historically Observed in Project Area (AC CDC)	Suitable Habitat in Project Area, and Within Known Range?
Alaska Rein Orchid	*Platanthera unalascensis*	Endangered	S1	N/A	N/A	No	No
Barrens Willow	*Salix jejuna*	Endangered	S1	Endangered	N/A	No	No
Black Ash	*Fraxinus nigra*	Threatened	S2	N/A	Critically Endangered	No	No
Bodin's Milkvetch	*Astragalus bodinii*	Threatened	S1	N/A	N/A	No	No
Crowded wormseed mustard	*Erysimum inconspicuum var. coarctatum*	Endangered	S1	N/A	N/A	No	No
Cutleaf fleabane	*Erigeron compositus*	Endangered	S1	N/A	N/A	No	No
Dense draba	*Draba pycnosperma*	Vulnerable	SH	N/A	N/A	No	No
Feathery false Solomon's seal	*Maianthemum racemosum subspecies racemosum*	Endangered	S1	N/A	N/A	No	No
Fernald's braya	*Braya fernaldii*	Endangered	S1	Endangered	N/A	No	No
Fernald's milk-vetch	*Astragalus robbinsii var. fernaldii*	Vulnerable	S1	Special Concern	N/A	No	No
Gmelin's watercrowfoot	*Ranunculus gmelinii*	Endangered	S1	N/A	Least Concern	No	No
Griscom's arnica	*Arnica griscomii subsp. griscomii*	Endangered	S1	Threatened	N/A	No	No
Lindley's aster	*Symphyotrichum ciliolatum*	Endangered	S1	N/A	N/A	No	No
Long's braya	*Braya longii*	Endangered	S1	Endangered	N/A	No	No
Low Northern rockcress	*Neotorularia humilis*	Endangered	S1	N/A	N/A	No	No
Mackenzie's sweetvetch	*Hedysarum boreale subsp. Mackenzii*	Threatened	S1	N/A	N/A	No	No
Maritime sea-blite	*Suaeda maritima*	N/A	S3	N/A	N/A	Yes	Yes
Mountain bladder fern	*Cystopteris montana*	Endangered	S1	N/A	N/A	No	No

Common Name	Scientific Name	Provincial Status (NL ESA)	Provincial Status (S-Rank)	Federal Status (SARA)	IUCN Red List	Historically Observed in Project Area (AC CDC)	Suitable Habitat in Project Area, and Within Known Range?
Mountain fern	*Thelypteris quelpaertensis*	Vulnerable	S1	N/A	N/A	No	No
Northern bog aster	*Symphyotrichum boreale*	Endangered	S1	N/A	Least Concern	No	No
Northern twayblade	*Listera borealis*	Endangered	S1	N/A	N/A	No	No
Oval-leaved creeping spearwort	*Ranunculus flammula var. ovalis*	Endangered	S1	N/A	Least Concern	No	No
Porsild's bryum	*Haplodontium macrocarpum*	Threatened	S2	Threatened	N/A	No	No
Rattlesnake root	*Prenanthes racemosa*	Endangered	S1	N/A	N/A	No	No
Red pine	*Pinus resinosa*	Threatened	S2	N/A	Least Concern	No	No
Rock dwelling sedge	*Carex petricosa var. misandroides*	Endangered	S1	N/A	N/A	No	No
Sago pondweed	*Stuckenia pectinata*	N/A	S2S3	N/A	Least Concern	Yes	Yes
Sharpleaf aster	*Oclemena acuminata*	Threatened	S2	N/A	N/A	No	No
Southern running-pine	*Diphasiastrum digitatum*	N/A	S2	N/A	N/A	Yes	No
Tradescant's aster	*Symphyotrichum tradescantii*	Threatened	S2	N/A	N/A	No	No
Vreelands's striped coralroot	*Corallorhiza striata var. vreelandii*	Endangered	S1	N/A	N/A	No	No
Water pygmy-weed	*Tillaea aquatica*	Vulnerable	S1	N/A	N/A	Yes	Yes
Wooly arnica	*Arnica angustifolia subsp. tomentosa*	Endangered	S1	N/A	N/A	No	No

3.1.3 ELC for Rare Plants

Based on the AC CDC and NL ESA desktop results, the ELC was used to determine areas of elevated rare plant potential for field surveys. The review of ELC mapping resulted in the identification of high-potential areas, including wetlands, rock outcrops, talus slopes, and riparian zones. Elevated exposed

rock barrens are often the site of rare plant growth in NL, including alpine and semi-alpine, open conditions with low moisture, and minimal growing mediums. Areas of overlap between previously identified rare plant species in the Project Area and the ELC produced the following map (Figure D6-3.1-2).



Pattern | Argentia Renewables	FIGURE NUMBER: D6 - 3.1.3 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/26
	FIGURE TITLE: High Potential Sites for Rare Plant Growth in the Project Area	NOTES: Elevation data source: Government of Canada - High Resolution Digital Elevation Model (HRDEM) - CanElevation Series	REVIEWED BY:	
	PROJECT TITLE: Argentia Renewables		APPROVED BY:	sem

SEM MAP ID: 238-005-GIS-129-Rev1

3.2 Field Surveys

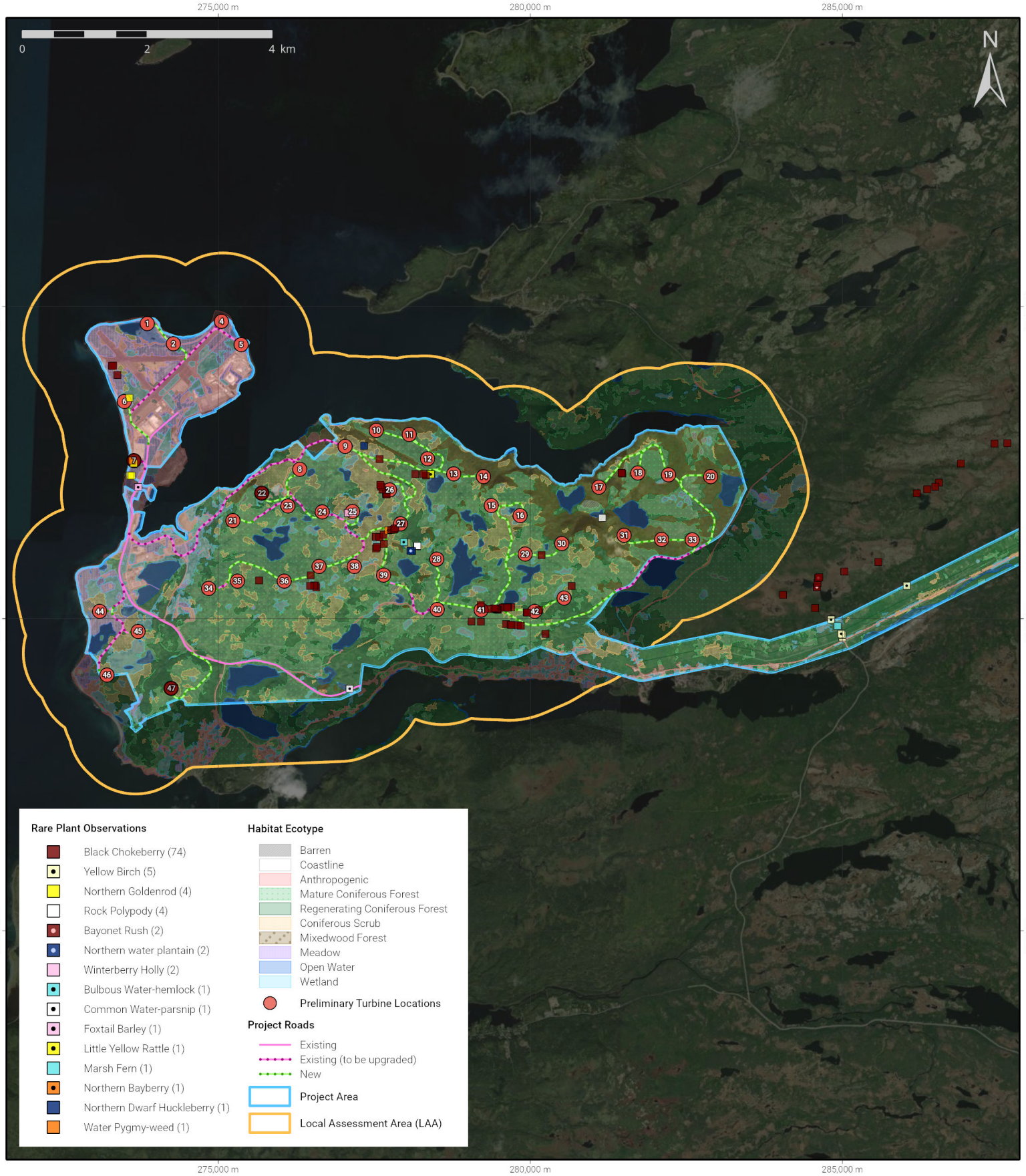
The dedicated rare plant survey was conducted throughout the Project Area from September 1 to 13, 2023. Data from the dedicated survey was supplemented by the opportunistic observations compiled during other surveys.

The survey effort was stratified according to high-potential ecotypes and to the preliminary proposed Project infrastructure (Figure D6-3.2-1). In total, there were 132 species documented, with 13 rare (S2-S3) species (Appendix D6.1). There were no S1 or critically imperilled species observed in the Project Area. The resulting list of identified rare plant species is provided in Table D6-3.2-1, inclusive of all S2-S3 (Imperiled-Vulnerable) observed species in the Project Area.

Table D6-3.2-1 List of Rare Plants Observed in the Project Area.

Common Name	Scientific Name	Provincial Status (NL ESA)	Provincial Status (S-Rank)	IUCN Red List
Northern water plantain	*Alisma triviale*	No	S2	Least Concern
Foxtail barley	*Hordeum jubatum*	No	S2	Least Concern
Northern bayberry	*Myrica pensylvanica*	No	S2	N/A
Rock polypody	*Polypodium virginianum*	No	S2	N/A
Bayonet rush	*Juncus militaris*	No	S3	Least Concern
Black chokeberry	*Aronia melanocarpa*	No	S3	N/A
Bulbous water-hemlock	*Cicuta bulbifera*	No	S3	Least Concern
Canada yew	*Taxus canadensis*	No	S3	Least Concern
Common water-parsnip	*Sium suave*	No	S3	Least Concern
Little yellow rattle	*Rhinanthus minor*	No	S3	N/A
Marsh fern	*Thelypteris palustris*	No	S3	Least Concern
Northern dwarf huckleberry	*Gaylussacia bigeloviana*	No	S3	Least Concern
Northern goldenrod	*Solidago multiradiata*	No	S3	N/A
Yellow birch	*Betula alleghaniensis*	No	S3	Least Concern
Water Pygmy-weed	*Tillaea aquatic syn. Crassula aquatica*	Yes	S1	Not Listed

Below is a description of the 13 rare plants and one SARA listed plant, their preferred habitat, locations, and numbers of individuals. A map of their locations in comparison to proposed Project infrastructure is presented as Figure D6-3.2-1.



Pattern | Argentia Renewables	FIGURE NUMBER: D6 - 3.2 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/26
	FIGURE TITLE: Rare Plant Observations in the Project Area	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change.	REVIEWED BY:	
	PROJECT TITLE: Argentia Renewables		APPROVED BY:	sem

SEM MAP ID: 238-005-GIS-116-Rev1

Northern water plantain (*Alisma triviale*) is an emergent-aquatic plant that grows to be 1 m tall, with small white flowers that have a yellow dot at the base of each petal (Boland, 2017). The plant grows naturally in bogs and shallow water along shorelines (Boland, 2017). Two individual observations were made in the central Mature Coniferous Forest ecotype.

Foxtail barley (*Hordeum jubatum*) is a perennial grass with a 0.3 to 0.6 m tall hollow purple stem and rough, greenish grey leaves with dense flowers 5 to 12 cm long (Best *et al*., 1978). This plant reproduces via wind dispersion of seeds, prefers dry warm environments, and is resilient to high salinity (Best *et al*., 1978). This plant was observed once at the POA.

Northern bayberry (*Myrica pensylvanica*) is a broadleaf deciduous shrub that grows to about 1.5 m tall with alternating oblanceolate-shaped green leaves (Boland, 2013). This shrub is naturally found in costal barrens, fens, and sand dunes (Boland, 2013). This plant was identified once in the coniferous Scrub ecotype.

Rock polypody (*Polypodium virginianum*) is a small evergreen fern that grows less than 30 cm in height, characterized by erect leathery green leaves (Boland, 2017). This plant grows in shaded conditions and is naturally found in rocky forests and along cliff edges (Boland, 2017). This plant was identified four times in the Project Area, in the Mixedwood Forest and Regenerating Coniferous Forest of the Argentia Backlands.

Bayonet rush (*Juncus militaris*) is distinct from other *Juncus spp.* as its lowest stem leaf overtops the flower array stem (Hogeland & Killingbeck, 1985). This species inhabits the edges of freshwater environments including lakes and slow-moving rivers (Hogeland & Killingbeck, 1985). This plant was identified two times, but just outside of the Project Area.

Black chokeberry (*Aronia melanocarpa*) is a 2-3 m tall deciduous shrub with edible fruit, naturally found in wet wooded areas such as along shorelines and within forest understory (Kulling & Rawel, 2008). During spring the shrub displays clusters of white flowers that turn into dark purple berries by the fall (Kulling & Rawel, 2008). This plant was identified 74 times throughout the Project Area, predominantly in the Coniferous Scrub of the Argentia Backlands.

Bulbous water-hemlock (*Cicuta bulbifera*) is a 45-100 cm tall plant with its upper stems ending in umbels of approximately 16 small white flowers (Boland, 2017). This species naturally occurs in wetland marshes, streams, and ponds (Boland, 2017). This plant was identified once in Regenerating Coniferous Forest in the center of the Project Area.

Common water-parsnip (*Sium suave*) is a perennial plant that has small dull-white flowers and strongly ridged stems (Legasy, 1995). It is found in wet meadows, open thickets, and along shorelines (Legasy, 1995). This plant was identified once in the Project Area within the Barrows Ponds system adjacent to Route 100.

Little yellow rattle (*Rhinanthus minor*) is an erect widely spaced plant with symmetrical flowers in spikes at the top (Westbury, 2004). This plant is naturally found in grasslands and wetlands (Westbury, 2004). This plant was identified once in the Mature Coniferous Forest in the Project Area.

Marsh fern (*Thelypteris palustris*) is an erect perennial fern that grows to be 30-100 cm tall and is characterized by compound leaves that are pinnate-pinnatifid in structure with paired leaflets (Fawcett & Smith, 2021). Natural habitats include marshes, fens, and thickets (Boland, 2017). This plant was identified in one location in the Project Area, within the Project Green Fuels Gen Tie buffer that runs along Route 100.

Northern dwarf huckleberry (*Gaylussacia bigeloviana*) is a deciduous shrub that has thin bark, simple leaf blades, and delicate bell like flowers tinged in pink, which mature into black fruits (Boland, 2013). This shrub occurs in wetlands, specifically in peatlands in Newfoundland (Boland, 2013). This plant was identified in one location in the Project Area, heading into Broad Cove Canyon.

Northern goldenrod (*Solidago multiradiata*) is a leafy, flowering perennial that grows no taller than 30 cm with dense yellow flowers (Boland, 2017). This plant naturally occurs in dry open areas, cliffs, or heaths (Boland, 2017). This plant was identified four times on the Argentia Peninsula.

Yellow birch (*Betula alleghaniensis*) is a native deciduous tree that can reach 25 m in height and is naturally found in moist woodlands (Boland, 2013). Its leaves are 6-12 cm long, dark green with pale undersides, oval-shaped, and with serrated edges (Boland, 2013). The bark can range in color from yellow/brown to reddish, and is thin and flaky (Boland, 2013). This tree species was identified five times in the Project Area during initial field studies, predominantly along the Project Interconnect Line corridor. However, during rare lichens surveys (Appendix D5), several stands were discovered outside of the original high-potential areas identified for this survey.

Water pygmy-weed (Tillaea aquatic syn. Crassula aquatica) is a coastal loving succulent found on sandy, gravelly, or muddy shores alongside oceans and brackish waterways (Wildlife Division, 2021). This species can range from green to red in colour depending on conditions and season (Wildlife Division, 2021). Water pygmy-weed is adapted to transition between aquatic and immersed forms, suiting its coastal lifestyle (Wildlife Division, 2021). As an annual, this plant is reliant on yearly seed production for survival (Wildlife Division, 2021). Water pygmy-weed has been observed on the airstrip of the Argentia

Peninsula in 2020. Water pygmy-weed is listed as “vulnerable” under the NL ESA and is listed as “endangered” under COSEWIC and SARA Schedule 1. An additional survey for water pygmy-weed was also conducted on July 16, 2024, throughout the accessible portions of the Argentia Peninsula, with four individuals recorded. The locations of water pygmy-weed were recorded, and mitigations will be considered in consultation with NL Wildlife Division.

4.0 Discussion

The interactions between rare plant species and wind energy projects must be assumed to be as varied as the rare plant species themselves. Some species benefit from anthropogenic disturbance while others are impacted by fragmentation and alteration of habitats. Most, if not all, potential direct interactions would occur during the Construction Phase.

Research has shown a reduced biodiversity of plant species close to wind farms and the displacement of rare plants by invasive species (Urziceanu *et al*., 2021). This may be associated with the increased opportunity for invasive species to occupy recently disturbed habitats. There is also potential for wind turbines to create air turbulence and vertical mixing, which in turn can affect the local climate (i.e., temperature, moisture, and CO_2 levels) and vegetation growth patterns (Kaffine, 2019; Urziceanu *et al*., 2021).

No SARA-listed or NL ESA species were identified during the September 2023 survey. However, 13 rare plants were identified across the Project Area, based on surveys of high potential areas for rare plant species presence. During the additional terrestrial field studies, including ELC (Appendix D3) and rare lichens (Appendix D5), common plant species and rare lichen species were recorded. In addition, larger yellow birch stands were documented. Additional studies in 2024 will delineate the full extent of yellow birch stands. Surveys for water pygmy-weed were conducted on the Argentia Peninsula in July 2024 with four individuals observed. The rare plant study will continue in 2024 to cover the full extent of the Project Interconnect Line corridor. Survey area coverage will reflect any adjustments to Project design. Photos and coordinates of the identified rare plants will be provided upon completion of the 2024 field season.

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Appendix D6.1
List of All Plants Observed During the Rare Flora Survey

List of All Plants Observed During the Rare Flora Survey in 2023.

Common Name	Scientific Name	Provincial Status (S-Rank)
Northern water plantain	*Alisma triviale*	S2
American green alder	*Alnus alnobetula ssp. crispa*	S5
American mountain ash	*Sorbus americana*	S4
Arrow-leaved smartweed	*Persicaria sagittata*	SNA
Balsam fir	*Abies balsamea*	S5
Bayonet rush	*Juncus militaris*	S3
Bifid hemp-nettle	*Galeopsis bifida*	SNA
Black chokeberry	*Aronia melanocarpa*	S3
Black crowberry	*Empetrum nigrum*	S5
Black knapweed	*Centaurea nigra*	SNA
Black spruce	*Picea mariana*	S5
Black-girdled bulrush	*Scirpus atrocinctus*	S5
Blue ground-cedar	*Diphasiastrum tristachyum*	S5
Bluebead lily	*Clintonia borealis*	S5
Bluejoint reedgrass	*Calamagrostis canadensis*	S5
Bog aster	*Oclemena nemoralis*	S5
Bog bilberry	*Vaccinium uliginosum*	S5
Bog birch	*Betula pumila*	SNR
Bog cranberry	*Vaccinium oxycoccos*	S5
Bog goldenrod	*Solidago uliginosa*	S5
Bog rosemary	*Andromeda polifolia*	S5
Boreal bog sedge	*Carex magellanica*	S5
Bulbous water-hemlock	*Cicuta bulbifera*	S3
Bunchberry	*Cornus canadensis*	S5
Butter-and-eggs	*Linaria vulgaris*	SNA
Canada blackberry	*Rubus canadensis*	SNR
Canada burnett	*Sanguisorba canadensis*	SNR
Canada mayflower	*Maianthemum canadense*	S5
Canada yew	*Taxus canadensis*	S3
Choke cherry	*Prunus virginiana*	S4
Cinnamon fern	*Osmundastrum cinnamomeum*	S5
Cloudberry	*Rubus chamaemorus*	S5
Club-spur orchid	*Platanthera clavellata*	S5
Colonial bentgrass	*Agrostis capillaris*	SNA
Coltsfoot	*Tussilago farfara*	SNA
Common blue violet	*Viola sororia*	SNR
Common dandelion	*Taraxacum officinale*	SNA
Common eyebright	*Euphrasia nemorosa*	S4

Common juniper	*Juniperus communis*	S5
Labrador tea	*Rhododendron groenlandicum*	S5
Common plantain	*Plantago major*	SNA
Common St. John's-wort	*Hypericum perforatum*	SNA
Common water-parsnip	*Sium suave*	S3
Common yarrow	*Achillea millefolium*	SNA
Compact rush	*Juncus compressus*	SNA
Creeping buttercup	*Ranunculus repens*	SNA
Creeping snowberry	*Gaultheria hispidula*	S5
Curled dock	*Rumex crispus*	SNA
Deeproot clubmoss	*Diphasiastrum tristachyum*	S5
Dragon's mouth orchid	*Arethusa bulbosa*	S4
Dwarf raspberry	*Rubus pubescens*	S5
Eastern larch	*Larix laricina*	S5
Evergreen wood-fern	*Dryopteris intermedia*	S5
Fireweed	*Chamaenerion angustifolium*	S5
Flat-topped white aster	*Doellingeria umbellata*	S5
Floating pondweed	*Potamageton natans*	S4
Foxtail barley	*Hordeum jubatum*	S2
Fraser's marsh St. John's wort	*Triadenum fraseri*	S5
Giesecke's harebell	*Campanula giesekiana*	SNR
Goldthread	*Coptis trifolia*	S5
Haircap moss	*Polytrichum commune*	S4
Harlequin blue flag	*Iris versicolor*	S5
Heal all	*Prunella vulgaris*	S4
Hooded ladies'-tresses	*Spiranthes romanzoffiana*	S4
Horned bladderwort	*Utricularia cornuta*	S5
Indian-pipe	*Monotropa uniflora*	S5
Japanese knotweed	*Reynoutria japonica*	SNR
Knight's plume moss	*Ptilium crista-castrensis*	S5
Large cranberry	*Vaccinium macrocarpon*	S4
Large-leaved avens	*Geum macrophyllum*	S4
Late Lowbush blueberry	*Vaccinium angustifolium*	S5
Leatherleaf	*Chamaedaphne calyculata*	S5
Lingonberry	*Vaccinium vitis-idaea*	S5
Little yellow rattle	*Rhinanthus minor*	S3
Low hop clover	*Trifolium campestre*	SNA
Marsh blue violet	*Viola cucullata*	S4
Marsh fern	*Thelypteris palustris*	S3
Tall meadow rue	*Thalictrum pubescens*	S5
Michaux's sedge	*Carex michauxiana*	S4

Mountain holly	*Ilex mucronata*	S5
Mountain wood fern	*Dryopteris Campyloptera*	S5
New York aster	*Symphyotrichum novi-belgii*	S5
Northern bayberry	*Myrica pensylvanica*	S2
Northern dwarf huckleberry	*Gaylussacia bigeloviana*	S3
Northern goldenrod	*Solidago multiradiata*	S3
Northern pitcher plant	*Sarracenia purpurea*	S5
Northern starflower	*Lysimachia borealis*	S5
Northern wild raisin	*Viburnum cassinoides*	SNR
Pale bog laurel	*Kalmia polifolia*	S5
Pearly everlasting	*Anaphalis margaritacea*	S5
Pincherry	*Prunus pensylvanica*	S4
Pink lady's-slipper	*Cypripedium acaule*	S4
Purple-stemmed aster	*Symphyotrichum puniceum*	S5
Purple avens	*Geum rivale*	S4
Pussy willow	*Salix discolor*	S5
Rabbit's-foot clover	*Trifolium arvense*	SNA
Red clover	*Trifolium pratense*	SNA
Rhodora	*Rhododendron canadense*	S5
Rock polypody	*Polypodium virginianum*	S2
Rough-stemmed goldenrod	*Solidago rugosa*	S5
Round-leaved sundew	*Drosera rotundifolia*	S5
Schreber's moss	*Pleurozium schreberi*	S5
Scotch lovage	*Ligusticum scoticum*	S5
Seaside plantain	*Plantago maritima*	S5
Shaggy moss	*Rhytidiadelphus triquetrus*	S4
Sheep laurel	*Kalmia angustifolia*	S5
Sidebells wintergreen	*Orthilia Secunda*	S5
Skunk currant	*Ribes glandulosum*	S5
Small white violet	*Viola macloskeyi*	S5
Smooth black sedge	*Carex nigra*	S5
Soft rush	*Juncus effusus*	S5
Spinulose wood fern	*Dryopteris carthusiana*	S4
Spoon-leaved sundew	*Drosera intermedia*	S4
Stair-step moss	*Hylocomium splendens*	S5
Stiff clubmoss	*Lycopodium annotinum*	S5
Sub-Arctic lady-fern	*Athyrium filix-femina*	S5
Sweet gale	*Myrica gale*	S5
Tansy ragwort	*Jacobaea vulgaris*	SNA
Tawny cottongrass	*Eriophorum virginicum*	S4
Three-leaved rattlesnake root	*Nabalus trifoliolatus*	S5

Three-leved liverwort	*Bazzania trilobata*	S4S5
Tufted bulrush	*Trichisporum cespitosum*	S5
Twinflower	*Linnaea borealis*	S5
Upright sedge	*Carex Stricta*	SNR
Water lobelia	*Lobelia dortmanna*	S5
White birch	*Betula papyrifera*	S5
White clover	*Trifolium repens*	SNA
White fringed orchid	*Platanthera blephariglottis*	S4
Wild carrot	*Daucus carota*	SNA
Wild strawberry	*Fragaria virginiana*	S5
Woodland strawberry	*Fragaria vesca*	SNR
Yellow birch	*Betula alleghaniensis*	S3

Appendix D6.2
Legislative and Organizational Species at Risk Classifications

The NL ESA provides special protection for plant and animal species considered to be Endangered, Threatened, or Vulnerable. This legislation applies to species, sub-species and populations that are native to Newfoundland and Labrador but does not include marine fish, bacteria, and viruses. Designation under the Act follows recommendations from the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and/or the Species Status Advisory Committee (SSAC) on the appropriate assessment of a species. Classifications of the NL ESA are outlined below.

NL ESA Classifications

Classification	Description
Extinct	No longer exists.
Extirpated	No longer exists in the wild, but exists elsewhere (e.g., exists in another province, a zoo, or a botanical garden).
Endangered	Faces imminent extirpation or extinction. For example, taxon in this category can have a declining total population size, a very small population (<250 mature individuals), an area of occupancy of less than 500 km2, and/or occur at five or less locations. Without intervention, this taxon is likely to become Extirpated from the province.
Threatened	Is likely to become endangered if nothing is done to reverse the factors limiting its survival. For example, taxon in this category can have a declining total population size, a very small population (<1000 mature individuals), an area of occupancy of less than 2000 km2, and/or occur at 10 or less locations.
Vulnerable	Has characteristics which make it particularly sensitive to human activities or natural events such as susceptibility to catastrophic events (e.g., oil spill) or restricted habitat or food requirements that are themselves under threat. This category may also be used to identify a wildlife species that has recovered from Threatened or Endangered status but which is not yet secure. Species in this category are likely to become threatened or endangered if not managed effectively.
Data Deficient	All sources of available information have been investigated but the information in the status report is insufficient to determine risk of extinction based on distribution and/or population status. Listing in this category indicates that more information is required and future research may show another classification is appropriate.
Not At Risk	Generally applied to widespread and abundant taxa unlikely to fit the criteria for Vulnerable, Threatened or Endangered in the near future.

The **Species at Risk Act** (SARA) was proclaimed in June 2003, to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of wildlife species that are Extirpated, Endangered or Threatened because of human activity, and to manage species of Special Concern to prevent them from becoming endangered or threatened. In addition, it complements existing laws and agreements to provide for the legal protection of wildlife species and the conservation of biological diversity. The Act aims to prevent wildlife species from becoming extinct and to secure the necessary actions for their recovery. It applies to all federal lands in Canada, all wildlife species listed as being at risk, and their critical habitat. Descriptions of SARA classifications can be found below.

SARA Classifications

Classification	Description
Extinct	A wildlife species that no longer exists
Extirpated	A wildlife species that no longer exists in the wild in Canada, but exists elsewhere in the wild
Endangered	A wildlife species that is facing imminent Extirpation or Extinction
Threatened	A wildlife species that is likely to become Endangered if nothing is done to reverse the factors leading to its Extirpation or Extinction
Special Concern	A wildlife species that may become a Threatened or an Endangered species because of a combination of biological characteristics and identified threats

COSEWIC is an independent advisory panel to the Minister of Environment and Climate Change Canada that assesses the status of wildlife Species at Risk. Members are wildlife biology experts from academia, government, non-governmental organizations, and the private sector. COSEWIC designations are regarded as recommendations to the Federal Government, where the government makes the final decision on whether species will be listed under the SARA. Descriptions of COSEWIC classifications can be found below (COSEWIC, 2021).

COSEWIC Classifications

Classification	Description
Extinct (X)	A wildlife species that no longer exists
Extirpated (XT)	A wildlife species that no longer exists in the wild in Canada, but exists elsewhere in the wild
Endangered (E)	A wildlife species that is facing imminent extirpation or extinction
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed
Special Concern	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats
Data Deficient (DD)	A category that applies when the available information is insufficient (a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction.
Not At Risk (NAR)	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.

The Atlantic Canada Conservation Data Centre (AC CDC) provides provincial lists of flora and fauna and assigns a conservation status rank (S-rank) for each species in the province. The AC CDC maintains S-ranks for all terrestrial vertebrates, vascular plants, bryophytes, macrolichens and many invertebrate groups. It should be noted that S-ranks do not have any legislative protections, and for this reason are often referred to as Species of Conservation Concern (SCC), for species with S-ranks of S1 to S3. However, the AC CDC also provides the corresponding SAR information for those species that are both a SCC and SAR. AC CDC S-rank definitions are provided below.

AC CDC S-Rank Definitions

S-rank	Definition
SX	Presumed Extirpated - Species or community is believed to be extirpated from the province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
S1	Critically Imperiled - Critically imperiled in the province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the province.
S2	Imperiled - Imperiled in the province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the province.
S3	Vulnerable - Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer), 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 province.
SNR	Unranked - Provincial conservation status not yet assessed.
SU	Unrankable - Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
SNA	Not Applicable - A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
S#S#	Range Rank - A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).
SH	Possibly Extirpated (Historical)—Species or community occurred historically in the province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become SH without such a 20-40 year delay if the only known occurrences in a province were destroyed or if it had been extensively and unsuccessfully looked for. The SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.
Not Provided	Species is not known to occur in the province.

The International Union for Conservation of Nature (IUCN) Red List of Threatened Species maintains a categorized list of global species of conservation concern. This database provides species' conservation status alongside robust and reliable information. The IUCN Red List is used by a wide variety of organizations, including government bodies. IUCN Red List categories are defined below (IUCN Species Survival Commission, 2012).

IUCN Red List Categories

Category	Description
Extinct (X)	A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual.
Extinct in the Wild (EW)	A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual.
Critically Endangered (CR)	A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see Section V), and it is therefore considered to be facing an extremely high risk of extinction in the wild.
Endangered (EN)	A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see Section V), and it is therefore considered to be facing a very high risk of extinction in the wild.
Vulnerable (VU)	A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Section V), and it is therefore considered to be facing a high risk of extinction in the wild.
Near Threatened (NT)	A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
Least Concern (LC)	A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.
Data Deficient (DD)	A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat.
Not Evaluated (NE)	A taxon is Not Evaluated when it has not yet been evaluated against the criteria.

Appendix D7

Insects Baseline Study

Appendix D7
Insects Baseline Study

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List of Acronyms and Abbreviations

Abbreviations	Definitions
AC CDC	Atlantic Canada Conservation Data Center
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
ELC	Ecological Land Classifications
NL ESA	Newfoundland and Labrador Endangered Species Act
SARA	Species at Risk Act

1.0 Introduction

The Insect Baseline Study has been developed by Argentia Renewables Wind LP (Argentia Renewables), an affiliate of Pattern Energy Group LP (Pattern Energy) for the Argentia Renewables Project (the Project), which entails the development, construction, operation and maintenance, and eventual decommissioning and rehabilitation of an onshore wind energy generation facility (Argentia Wind Facility) and a green hydrogen and ammonia production, storage, and export facility (Argentia Green Fuels Facility). The wind energy facility (i.e., wind turbine farm) will be mostly located on what is known as the Argentia Backlands, a largely uninhabited, forested area with scattered relic military sites and variable habitat types. The Argentia Green Fuels Facility will be located on the Argentia Peninsula, a brownfield industrial complex. The Port of Argentia (POA) owns both the Argentia Backlands property and the Argentia Peninsula. The two, along with a Project Interconnect Line, comprise the Argentia Renewables Project Area. This baseline study focuses on the presence/absence of any insect Species at Risk (SAR) in the Project Area and potential interactions resulting from Project development.

There are three insect SAR whose range includes Newfoundland: the yellow-banded bumble bee (*Bombus terricola*), gypsy cuckoo bumble bee (*Bombus bohemicus*), and the transverse lady beetle (*Coccinella transversoguttata*). The yellow-banded bumble bee and transverse lady beetle were listed as vulnerable under the Newfoundland and Labrador **Endangered Species Act** (NL ESA) in 2022. The yellow-banded bumble bee and transverse lady beetle are listed as Special Concern under the federal **Species at Risk Act** (SARA), while the gypsy cuckoo bumble bee is listed as Endangered. Insect SAR observations were recorded during all baseline field studies (e.g., rare lichens, avifauna). The yellow-banded bumble bee was the only insect SAR recorded, with two observations in 2023.

2.0 Methods

2.1 Desktop Review

A comprehensive literature review was conducted to determine the potential presence of insect SAR in the Project Area. Historical information about the presence of these species in Newfoundland and the Project Area was reviewed, along with contemporary information about species range and observations. Background information was also collected on the habitat preference and lifestyle of each species as well as a general assessment of potential interactions with wind turbine operations.

An Atlantic Canada Conservation Data Centre (AC CDC) request was submitted for reports of insect SAR within a 5 km radius of the Project Area. Habitat suitability within the Project Area was also examined, based on the Ecological Land Classification (ELC) (Appendix D3).

2.2 Field Studies

Insect surveys were conducted concurrently with avifauna, rare lichens, and ELC surveys throughout the Project Area, and within myriad habitat types, some of which had potential for the presence of insect SAR. In particular, the Meadow and Wetland ecotypes had heightened potential for the insect SAR that were possible for this region.

For each insect SAR observation, the following data was recorded:

- Date and time;
- Weather data;
- GPS location;
- General habitat description and host plant/flower;
- Number of individuals;
- Worker, Queen, or Male (Bombus spp. only); and
- Additional notes.

A species-specific survey for the yellow-banded bumble bee will take place in August 2024. Six locations will be surveyed: three anthropogenic sites that mimic the sites to be created by the Project (e.g., roadsides and other disturbed areas), and three naturalized sites that represent native habitat (e.g., wetlands, upland barrens, meadows). The surveyor will be trained in insect identification and will observe each site for 45 minutes. Sites will be surveyed a minimum of one time each. All bee species will be recorded as per the observation data list above. The yellow-banded bumble bee survey will provide valuable insight into how Project development will affect this species.

3.0 Results

3.1 Desktop Review

A comprehensive desktop review of insect SAR determined that the likelihood of the presence of any of these SAR in the Project Area was low. In addition, the AC CDC report did not contain any observations of insects of conservation concern (S-ranks of S3 to S1) within the Project Area.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) reports for the yellow-banded bumble bee, gypsy cuckoo bumble bee, and transverse lady beetle showed no recent observations of these species in the region (COSEWIC, 2014; COSEWIC, 2015; COSEWIC, 2016). The transverse lady beetle has not been observed in Newfoundland since before 1996 (COSEWIC, 2016).

The gypsy cuckoo bumble bee is rated as less likely to be present on the Avalon Peninsula, and there are no museum-collected samples from this region (COSEWIC, 2014). It was noted that the yellow-banded bumble bee is found along coastal areas, and frequently seen along the Gulf of St. Lawrence (COSEWIC, 2015). The yellow-banded bumble bee does not have many habitat-specific preferences and can be found in various habitat types, collecting pollen and nectar from a wide variety of plants (COSEWIC, 2015).

Operating wind turbines generate insect mortalities, but there has been little scientific research conducted into the interactions between insects and wind turbines (Voigt, 2021). No studies have been completed that are specific to the insect SAR targeted with this baseline study. One recent study indicated that wind turbines do not appear to affect honeybee colonies (Fourrier *et al*., 2023). However, the bee SAR studied in the Project Area are bumble bees rather than honeybees, so extrapolating these conclusions provides limited inference.

3.2 Field Surveys

There were no observations of the transverse lady beetle or the gypsy cuckoo bumble bee in the Project Area. Two observations of the yellow-banded bumble bee were made in the Project Area. The first was on June 29, 2023, in the quarry of the northwest corner of the property. This was a small worker bee flying in circles, searching for suitable flowers to forage. The second observation was on August 9, 2023, when a large, young unmated queen was seen resting and foraging on meadowsweet (*Spiraea latifolia*) in the riparian area along the southern inlet to Gull Pond (Figure D7-3.2-1).

Figure D7-3.2-1 A Young *Bombus terricola* Queen in the Project Area.

4.0 Discussion

Baseline surveys and fieldwork did not yield any observations of the gypsy cuckoo bumble bee or the transverse lady beetle in the Project Area. The desktop review also indicated that these species were not known to be present in the general region. It is reasonable to conclude that these species are likely not present in the Project Area and will not interact with the Project. However, ongoing monitoring will be conducted opportunistically, and a dedicated insect SAR survey will occur in the summer of 2024.

The yellow-banded bumble bee was the only insect SAR that was observed in the Project Area. These bumble bees are found across Canada and are ecologically important in their role as a pollinator of native plant species (COSEWIC, 2015). Yellow-banded bumble bees create their nests underground (Laverty & Harder, 1988) and can be found in a range of different habitat types (COSEWIC, 2015). Identified stressors to the yellow-banded bumble bee, such as large-scale farming and honeybee farming, are not present in the Project Area (COSEWIC, 2015).

While wind turbine operations have the potential to cause insect mortalities, there is limited knowledge on this topic (Voigt, 2021). Argentia Renewables is committed to pollinator conservation and recognizes that this Project may have some (albeit likely minimal) interaction with this SAR. As a precaution, species-specific surveys will be conducted for the yellow-banded bumble bee to improve estimates of their abundance and habitat use in the Project Area.

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