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3.0 Environment

The following sections describe the existing biophysical and socio-economic environment before implementation of the proposed Project. Section 3.1 provides an overview of the Project setting and the various Valued Components (VC) that may interact with the Project. These VCs include the atmospheric, aquatic, terrestrial, and socio-economic environments, land and resource use, and heritage and cultural resources.

Section 3.2 describes the baseline studies conducted for this Project, including summaries of methodologies employed for desktop and field surveys, synopses of results, and data gaps. The full reports for the baseline studies can be found in Appendices A to L.

Section 3.3 describes the predicted future condition of the environment over the expected lifespan of the Project if it were not to proceed.

3.1 Description of Existing Environment and Valued Components

The environment within the Project Area has experienced a long history of anthropogenic use, including the development of the Argentia Peninsula as a U.S. naval base, an industrial seaport, a port for the Marine Atlantic ferry terminal, a hydrometallurgy nickel processing test facility, a glider training facility for the Royal Canadian Air Cadets, and a marshalling port for monopiles for wind projects. In progress (as of 2024) are plans for a marine terminal expansion in Cooper Cove in Argentia Harbour (NL EA registration no. 2279). The Argentia Backlands also has a long history of anthropogenic use dating back to the naval base, and infrastructure remains today in the form of a road network and bunkers scattered throughout the landscape. The Argentia Backlands also includes a hiking trail with plans for expansion to provide 16 km of recreational hiking trails throughout the area (NL EA registration no. 2257).

The Argentia Peninsula is essentially a brownfield site with few remaining natural terrain features; however, the adjacent Argentia Backlands provide a mosaic of different habitat types including young and mature coniferous forest, wetlands, meadows, ponds, and scrub forest, with a history of habitat modification from the naval base and domestic use. The transmission line route to Long Harbour will parallel existing linear features for the greater portion of the distance with only one section likely to intersect intact natural land, along the last 5 km to Long Harbour.

Given that this Project has three distinct sections comprising the Project Area (i.e., the peninsula, the Argentia Backlands, and the transmission line to Long Harbour), VCs were chosen to ensure that the entire Project Area was reflected in this assessment. VCs are elements of natural and human

environments that have scientific/socio-economic/cultural/historical importance to stakeholders, the public, the proponent, regulators, scientists, or Indigenous Peoples.

VCs for this Project were selected to comply with guidance provided by NL DECC and to characterize the biophysical/ecological environment, the anthropogenic environment, and the social/economic/cultural environment. For this Registration, a set of Key Indicators (KI) were identified within each VC to address the full suite of potential and anticipated interactions with the Project. The focus of this chapter is to provide a baseline description of each of the KIs using measurable parameters that will enable a detailed examination and prediction of environmental effects (Section 4).

3.1.1 Atmospheric Environment

The scope of the atmospheric environment VC encompasses regional climate, greenhouse gas (GHG) emissions, air quality, light, vibration, and noise. Information from regulatory agencies and baseline studies have been distilled into the following subsections to illustrate the existing condition of the atmospheric environment in the Project Area.

3.1.1.1 Regional Climate

The Project Area is in the Southeastern Barrens Subregion of the Maritime Barrens Ecoregion. The Ecoregion is characterized by foggy, cool summers and short, relatively moderate winters along the coasts and colder inland (Protected Areas Association of Newfoundland and Labrador [PAANL], 2008). Due to the proximity to the Atlantic Ocean, the region is susceptible to prolonged periods of dense fog.

Canadian Climate Normals calculated for data collected from a nearby meteorological station in Long Harbour (approximately 15 km from the Project Area) are presented in Table 3.1.1-1 (Government of Canada, 2023a). While a meteorological station exists in Argentia, data collection has been historically sporadic, thus hindering the calculation of Canadian Climate Normals. For this Registration, it has been assumed that meteorological data collected at the Long Harbour Station are representative of regional climatic conditions.

Daily average temperatures in Long Harbour ranged from -4.0 to 15.9 degrees Celsius (°C), with the lowest average temperatures occurring in February and the highest in August (Government of Canada, 2023a). The average daily temperature drops below freezing in December and remains below zero until March. Annual average precipitation in Long Harbour is approximately 1,366.3 millimetres (mm), which includes approximately 1,205.9 mm of rain and 160.4 centimetres (cm) of snow. Monthly average precipitation ranged from 91.5 mm to 150.2 mm; the least was measured in May and the most in October.

Table 3.1.1-1 Long Harbour Canadian Climate Normals (1971-2000).

Month	Daily Temperature			Precipitation			Wind
	Average (°C)	Maximum (°C)	Minimum (°C)	Total (mm)	Rain (mm)	Snow (cm)	Maximum Hourly Speed ($km \cdot h^{-1}$)[1]
January	-3.5	0.4	-7.4	130.5	86.9	43.6	72 (1977)
February	-4	0	-7.8	108.1	67.6	40.5	79 (1982)
March	-1.1	2.7	-4.9	110.9	83.6	27.3	72 (1976)
April	3	6.4	-0.5	102.3	92.7	9.6	53 (1975)
May	6.8	10.7	2.9	91.5	89.9	1.7	64 (1970)
June	10.8	14.9	6.7	112	112	0	55 (1978)
July	14.9	18.7	11.1	93.5	93.5	0	53 (1983)
August	15.9	19.5	12.2	102.4	102.4	0	56 (1972)
September	12.9	16.4	9.3	123.8	123.8	0	63 (1979)
October	8.2	11.5	4.9	150.2	149.8	0.4	71 (1976)
November	4	7.1	0.8	125.2	117.4	7.8	72 (1976)
December	-0.7	2.7	-4	116.2	86.5	29.7	74 (1971)
Year	5.6	9.2	1.9	1366.3	1205.9	160.4	79 (1982)

NOTES
[1] Bracketed values indicate the year in which maximum hourly wind speed was recorded.

Maximum hourly wind speeds were recorded at 53 to 79 kilometres per hour ($km \cdot hr^{-1}$); the highest wind speeds have been historically detected between October and March.

Wind speed and direction were not recorded at the Long Harbour station; however, wind data collected at the Argentia station in 2023, marking the first year of continuous data collection in several years, were reviewed (Government of Canada, 2023b). The wind rose presented in Figure 3.1.1-1 shows that wind speeds most frequently occurred from the southeast direction. Predominant wind directions were from the southeast and northwest, with a larger proportion of strong wind speeds occurring from the southeast.

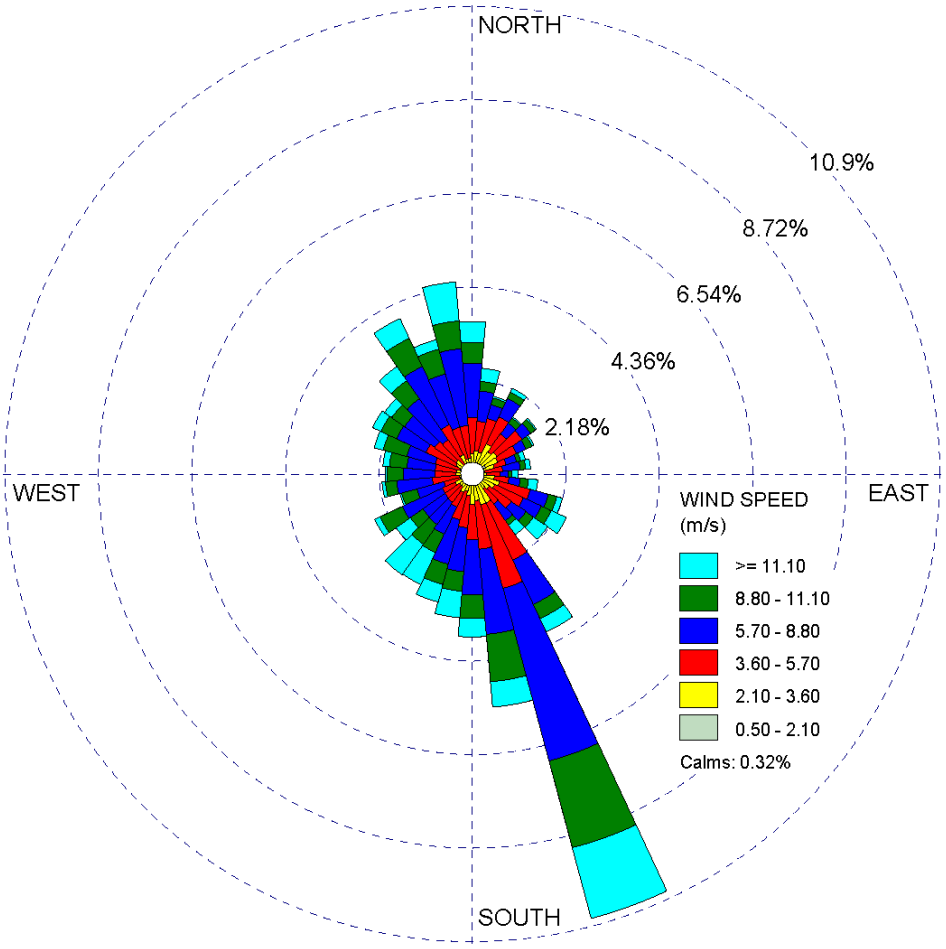


Figure 3.1.1-1 Winds at Argentia, NL (2023).

In addition to temperature, precipitation, and wind data, incidences of historical extreme weather events were also included in Long Harbour Canadian Climate Normals (Table 3.1.1-2). The extreme maximum and minimum daily temperatures were 30.6°C and -25°C, recorded in August 1972, and February 1975, respectively (Government of Canada, 2023a). The highest single day total of precipitation was recorded in October 1981, where 119 mm of rain fell. Extreme snow depths were recorded between November and May, with the most extreme snow depth of 84 cm measured in March 1987.

Table 3.1.1-2 Long Harbour Extremes (1971-2000).

Month	Temperature		Precipitation			
	Extreme Maximum (°C) [1]	Extreme Minimum (°C)[1]	Extreme Daily Rainfall (mm) [1]	Extreme Daily Snowfall (cm) [1]	Extreme Daily Precipitation (mm) [1]	Extreme Snow Depth (cm)[1]
January	15 (1976)	-24 (1984)	53.8 (1999)	30.5 (1971)	53.8 (1999)	60 (1992)
February	16 (1996)	-25 (1975)	59.2 (1970)	30 (1987)	59.2 (1970)	40 (1982)
March	17.2 (1976)	-22.5 (1986)	80.2 (1994)	35.6 (1974)	80.2 (1994)	84 (1987)
April	21 (1986)	-14 (1994)	82 (1986)	24 (1999)	82 (1986)	24 (1999)
May	20.5 (1989)	-6.7 (1974)	55 (1999)	31 (1972)	55 (1999)	4 (1988)
June	25 (1977)	-5 (1981)	92.4 (1986)	0 (1970)	92.4 (1986)	0 (1988)
July	26.1 (1973)	-1 (1982)	63 (1998)	0 (1970)	63 (1998)	0 (1988)
August	30.6 (1972)	1.7 (1975)	78.5 (1974)	0 (1970)	78.5 (1974)	0 (1988)
September	27 (1989)	-2.5 (1982)	68 (1995)	0 (1970)	68 (1995)	0 (1988)
October	22.5 (1987)	-6 (1982)	119 (1981)	10.2 (1975)	119 (1981)	0 (1987)
November	19.5 (1989)	-12 (1978)	66.4 (1983)	23 (1997)	66.4 (1983)	28 (1997)
December	16.1 (1969)	-20 (1993)	41 (1992)	30 (1991)	41 (1992)	60 (1991)

NOTES
[1] Bracketed values indicate the year in which extreme was recorded.

3.1.1.2 Climate Change Projections

Impacts of climate change for Newfoundland and Labrador were projected using available observations and regional climate models (Finnis, 2013; Finnis & Daraio, 2018). A summary of projected climate change impacts for Argentia is presented in Table 3.1.1-3. Projected climate change impacts are based on temperature and precipitation indices.

Table 3.1.1-3 Climate change projections for Argentia, NL.

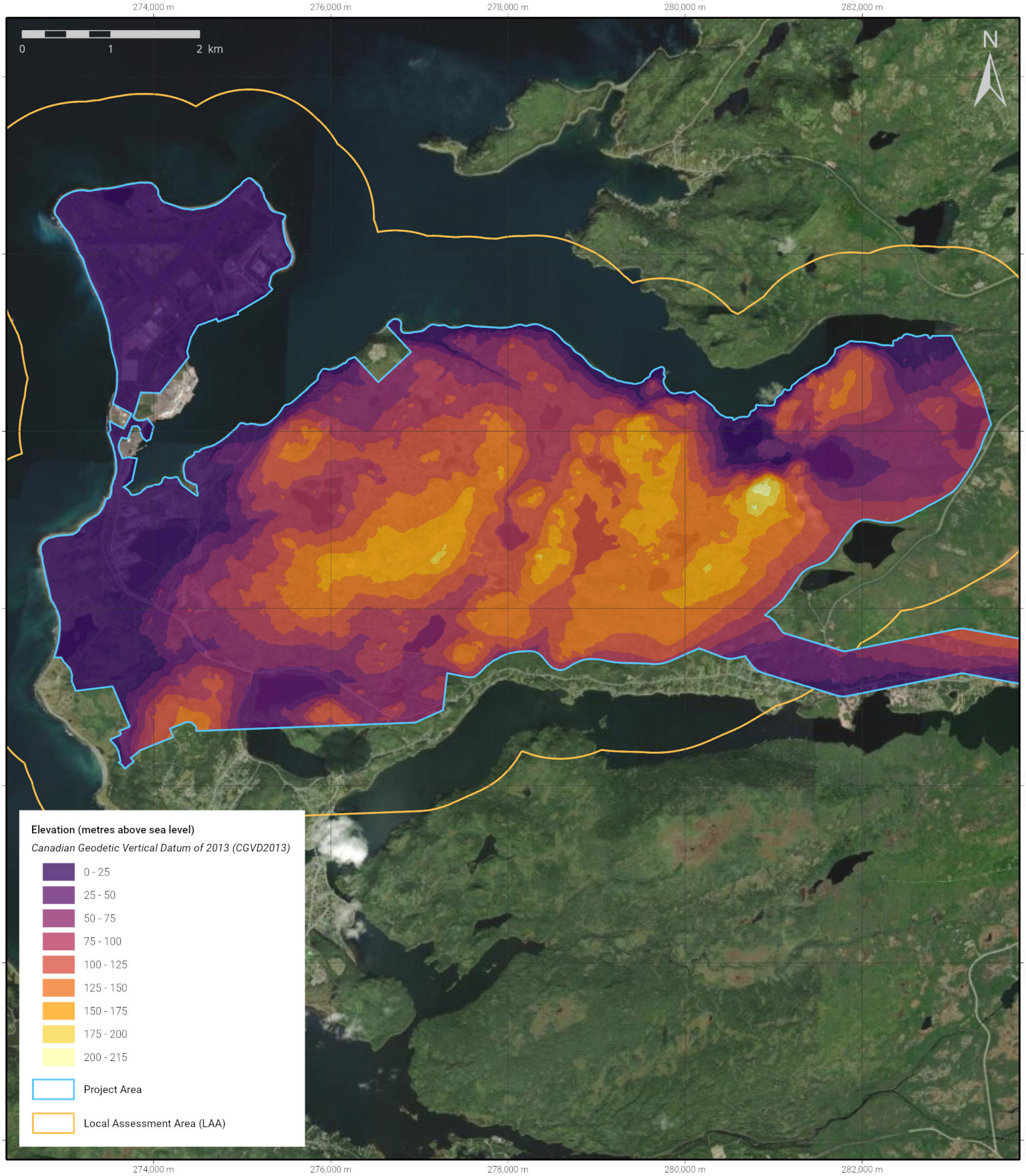
Climate Index	Season	20th Century Climate	Projection: 2041-2070		Projection: 2071-2100	
			Average	Uncertainty	Average	Uncertainty
Daily Mean Temperature (°C)	Winter	-1.0	2.3	1.3	4.3	1.7
	Spring	2.8	5.7	0.8	7.6	1.1
	Summer	13.6	16.6	1.3	18.4	1.8
	Fall	9.3	11.5	1.2	13.5	1.6
Daily Minimum Temperature (°C)	Winter	-3.82	0.00	1.48	2.24	1.86
	Spring	-0.15	3.10	0.67	5.06	1.01
	Summer	10.94	13.84	1.33	15.68	1.89
	Fall	6.68	8.84	1.18	10.91	1.62

Climate Index	Season	20th Century Climate	Projection: 2041-2070		Projection: 2071-2100	
			Average	Uncertainty	Average	Uncertainty
Daily Maximum Temperature (°C)	Winter	1.73	4.55	1.12	6.41	1.53
	Spring	5.73	8.39	1.08	10.10	1.34
	Summer	16.35	19.44	1.29	21.13	1.80
	Fall	11.92	14.17	1.23	16.15	1.62
Number of Frost Days	Winter	72.5	44.3	14.9	22.9	18.7
	Spring	40.5	16.5	4.6	6.0	5.4
	Summer	0.0	0.0	0.0	0.0	0.0
	Fall	6.9	2.2	1.5	0.6	0.7
Maximum Heat Wave Duration (days)	Winter	0.0	0.2	0.2	0.1	0.2
	Spring	0.0	0.3	0.4	0.1	0.2
	Summer	0.0	0.0	0.1	0.1	0.1
	Fall	0.0	0.0	0.0	0.2	0.2
Mean Daily Precipitation (mm)	Winter	3.0	3.9	0.3	4.2	0.4
	Spring	2.1	2.9	0.2	3.1	0.2
	Summer	3.0	2.9	0.4	2.9	0.4
	Fall	3.4	3.7	0.2	3.6	0.3
Mean Precipitation Event Intensity (mm)	Winter	8.5	10.0	0.9	10.7	0.9
	Spring	8.0	8.8	0.3	9.3	0.3
	Summer	10.8	9.9	0.7	10.1	0.7
	Fall	10.8	11.7	0.5	11.9	0.7
Maximum 3-day Precipitation (mm)	Winter	44.0	58.6	7.7	63.6	9.2
	Spring	42.1	51.0	4.1	56.4	4.7
	Summer	63.5	58.6	7.1	63.2	9.3
	Fall	54.2	72.8	7.3	74.2	6.4
Maximum 5-day Precipitation (mm)	Winter	56.5	69.8	7.8	76.4	9.4
	Spring	48.9	60.1	4.1	67.1	4.9
	Summer	71.8	67.1	7.8	73.0	10.8
	Fall	66.3	83.0	7.7	85.3	8.0
Maximum 10-day Precipitation (mm)	Winter	84.8	101.9	10.1	111.6	12.5
	Spring	66.1	84.9	6.2	93.9	5.9
	Summer	91.2	93.9	12.0	98.0	14.0
	Fall	99.0	113.3	7.8	113.2	9.6
Number of Days with 10 mm or more Precipitation	Winter	8.5	11.9	1.0	13.0	1.2
	Spring	5.8	8.6	0.7	9.4	0.6
	Summer	8.9	8.3	0.9	8.3	0.7
	Fall	11.1	10.7	0.6	10.3	1.0

Climate Index	Season	20th Century Climate	Projection: 2041-2070		Projection: 2071-2100	
			Average	Uncertainty	Average	Uncertainty
90th percentile of precipitation events (mm)	Winter	9.0	12.1	1.0	13.6	1.4
	Spring	6.4	8.5	0.5	9.2	0.6
	Summer	8.0	8.0	0.8	7.9	1.1
	Fall	11.5	10.6	0.7	10.3	1.4
Maximum Number of Consecutive Dry Days	Winter	10.8	8.3	0.6	8.1	0.7
	Spring	23.6	11.0	0.6	10.6	0.7
	Summer	11.7	12.0	1.4	12.3	1.3
	Fall	11.6	10.9	1.0	11.0	1.2
Mean Dry Spell Length (days)	Winter	3.0	3.9	0.3	4.2	0.4
	Spring	2.1	2.9	0.2	3.1	0.2
	Summer	3.0	2.9	0.4	2.9	0.4
	Fall	3.4	3.7	0.2	3.6	0.3

It is expected that temperature increases between 4.4 to 5.3°C will occur in Argentia over the next century. This region currently experiences temperatures near 0°C from September to May, thus, rising temperature trends indicate less precipitation in the form of snow and more in the form of rain. Precipitation analyses predict that there will be fewer but heavier snowstorms and more frequent and heavier occurrences of rain throughout the cold season. It is anticipated that the Avalon Peninsula will have a lower number of days with temperatures below freezing, particularly in the fall and spring. There are considerable increases in precipitation event intensity along the south coast; Argentia will see increases in precipitation intensity in the winter, spring, and fall. Projected changes in maximum 3-day, 5-day, and 10-day precipitation as well as the 90th percentile of precipitation events follow regional patterns like those described for mean precipitation intensity. Hazardous events typically occur over several days, during which time reservoirs, soil moisture capacity, and waterbodies may gradually become overloaded and overflow as a result. The greatest changes for consecutive precipitation days for the Avalon Peninsula occur in the winter and are concentrated along the south coast.

Based on Intergovernmental Panel on Climate Change (IPCC) predictions, coastal sea level in Argentia is projected to rise by 40 cm by 2049 and 100+ cm by 2099 (Batterson & Liverman, 2010). Local impacts of crustal rebound (i.e., rising of land mass as ice sheets melt) in Argentia are projected to increase by 2 mm annually. As per Figure 3.1.1-2, areas along the coast and the Argentia Peninsula have the lowest elevations above sea level and will thus be the most vulnerable to sea level rise.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.1 - 2	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Project Area Elevations	NOTES: Elevation data source: Government of Canada - High Resolution Digital Elevation Model (HRDEM) - CanElevation Series	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-009-Rev1

3.1.1.3 GHG Emissions

GHG emissions in Newfoundland and Labrador predominately originate from large industry including mining, oil refining, electricity generation, and offshore petroleum. There are six key GHGs: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). Provincial GHG emissions are dominated by CO_2, CH_4 and N_2O; emissions of fluorinated gases (HFCs, PFCs, SF_6) are less abundant.

The **Management of Greenhouse Gas Act, 2016** stipulates that GHG emissions are reported in terms of carbon dioxide equivalents (CO_2e), allowing emissions from all GHGs to be accurately compared. Emissions are converted to units of CO_2e using global warming potentials (GWPs); GWP is an index to measure the amount of energy a GHG will absorb relative to CO_2 over a given period. In accordance with the Act, industrial facilities are required to report emissions to the Newfoundland and Labrador Department of Environment and Climate Change (NL DECC) if annual emissions reach or exceed 15,000 tonnes (t) of CO_2e. Provincial GHG emission data for the 2022 reporting year is provided in Table 3.1.1-4.

There are no large industrial facilities in the Project Area. The nearest large industrial facility, and hence emission source, to the Project is the Long Harbour Hydromet Nickel Processing Facility operated by Vale Newfoundland and Labrador (Vale) approximately 20 km from the Project Area. In 2022, the Long Harbour Hydromet Nickel Processing Facility emitted 50,240 tonnes of CO_2e; accounting for approximately 2% of provincial GHG emissions (Newfoundland and Labrador Department of Environment and Climate Change, n.d.). Other sources of GHGs near the Project are considered negligible or transient in nature (e.g., Marine Atlantic Ferry and POA operations).

Table 3.1.1-4 Provincial GHG Emissions 2022.

Facility	Location	Operator	Approximate Distance from Project (km)	Greenhouse Gas Emissions (tonnes CO_2e) excluding biomass				
				CO_2	CH_4	N_2O	Other[1]	Total
Long Harbour Operations	Long Harbour	Vale Newfoundland and Labrador	20	48,818	39	1,383	0	50,240
Braya Renewable Fuels	Come by Chance	Braya Renewable Fuels (Newfoundland) LP	50	43,542	882	660	0	48,083
Holyrood Thermal Generating Station	Holyrood	Newfoundland and Labrador Hydro	70	651,767	172	3,866	0	655,805
Holyrood Gas Turbine	Holyrood	Newfoundland and Labrador Hydro	70	1,904	2	85	0	1,992
Canada Fluorspar Inc	St. Lawrence	Canada Fluorspar Inc	120	3,274	7	127	0	3,408
Corner Brook Pulp and Paper	Corner Brook	Kruger Inc.	350	32,418	34	287	321	33,061
Iron Ore Company of Canada	Labrador City	Rio Tinto - Energy and Minerals	>1,000	815,297	490	7,718	0	823,505
Tacora Resources	Wabush	Tacora Resources, Inc	>1,000	109,187	112	1,819	0	111,118
Voisey's Bay Mine Site	Voisey’s Bay	Vale Newfoundland and Labrador	>1,000	142,503	178	6,387	0	149,070
Tata Steel Mineral Canada	Schefferville (Québec)	Tata Steel Mineral Canada	>1,000	36,936	46	1,651	0	38,633
Hibernia GBS	Offshore	HMDC Ltd.	-[2]	441,204	11,772	2,798	0	455,774
Hebron GBS	Offshore	ExxonMobil Canada Ltd.	-[2]	418,124	10,446	3,015	0	431,586
SeaRose FPSO	Offshore	Cenovus Energy Inc.	-[2]	299,399	17,238	1,860	0	318,497
West Hercules	Offshore	Equinor Canada Ltd.	-[2]	16,633	23	662	0	17,318

[1]Other includes hydrofluorocarbons, perfluorinated compounds, sulfur hexafluoride.
[2]Approximate distances for offshore industrial facilities not calculated.

3.1.1.4 Air Quality

Ambient air quality in the province is generally good – episodes of diminished air quality are rare and typically a result of long-range transport of pollutants (e.g., smoke from forest fires in other regions) or industrial emissions (Newfoundland and Labrador Department of Environment and Climate Change, 2023). While long-range transport of pollutants and industrial emissions are considered major sources, ambient air quality can also be impacted on a regional scale by minor sources including vehicular traffic and woodstove use. Regardless of source, quality of ambient air is assessed via comparison to provincial and federal standards; NL Air Quality Standards (NL AQS) and Canadian Ambient Air Quality Standards (CAAQS; established by the Canadian Council of Ministers of the Environment (CCME)), respectively.

Air quality in Newfoundland and Labrador is monitored using the National Air Pollution Surveillance (NAPS) network, a cooperative initiative by Environment and Climate Change Canada (ECCC) and the Newfoundland and Labrador Department of Environment and Climate Change (NL DECC). As part of the NAPS network, the NL DECC manages and runs six monitoring stations. In addition to the NAPS network, NL DECC manages the industrial monitoring network (IMN) for which major industrial operations in NL monitor air quality near their operations for select pollutants. The NAPS network and IMN focus on the following air contaminants (Environment and Climate Change Canada, 2022; Newfoundland and Labrador Department of Environment and Climate Change, 2023):

- Particulate matter less than 2.5 microns ($PM_{2.5}$);
- Particulate matter less than 10 microns (PM_{10});
- Ozone (O_3);
- Nitric oxide (NO);
- Nitrogen dioxide (NO_2);
- Oxides of nitrogen (NO_x);
- Carbon monoxide (CO); and
- Sulfur dioxide (SO_2).

Data collected from NAPS and IMN stations are summarized by the NL DECC in annual ambient air monitoring reports, which present statistics that are key indicators of air quality. Such statistics are compared to air quality standards prescribed by the provincial **Air Pollution Control Regulations, 2022**. There are no ambient air quality monitoring stations in the Project Area, nor are there any large industry emission sources. The closest ambient air quality monitoring (AAQM) stations are in Long Harbour. The two stations in Long Harbour, operated under the IMN by Vale, monitor $PM_{2.5}$, PM_{10} and NO_x/NO_2. Since regional air quality does not vary significantly in the province, the NAPS monitoring station in Mount Pearl, located approximately 90 km northeast of the Project, was used to supplement the desktop assessment of air quality in the Project Area. Ambient levels of SO_2, NO_x/NO_2, CO, O_3, $PM_{2.5}$ and PM_{10} are monitored at the AAQM station in Mount Pearl.

There were no exceedances of the NL AQS for SO_2, $PM_{2.5}$, PM_{10}, NO_2, and CO at the AAQM stations in Mount Pearl and Long Harbour between 2020 and 2022 (Newfoundland and Labrador Department of Environment and Climate Change, 2021, 2023). The 8-hour ambient levels of O_3 in Mount Pearl exceeded the NL AQS in 2020 (one exceedance) and 2021 (13 exceedances). A summary of the maximum concentrations detected between 2020 and 2022 at the AAQM stations in Mount Pearl and Long Harbour are provided in Table 3.1.1-5.

Table 3.1.1-5 Ambient Air Quality Monitoring Results – Maximum Concentrations (2020-2022).

Air Contaminant	Units of Concentration	Averaging Time	Maximum Concentration (2020-2022)			NL AQS
			Mount Pearl (NAPS)	Long Harbour (IMN)		
				Community Centre (AM1)	Access Road (AM3)	
CO	ppb	1 hour	1,700	--[1]	--[1]	30,582
		8 hour	500	--[1]	--[1]	13,107
$PM_{2.5}$	$\mu g \cdot m^{-3}$	24-hour	16	25.0	23.7	25
		1-year	5.1	5.3	5.0	8.8
PM_{10}	$\mu g \cdot m^{-3}$	24 hour	28.2	29.9	29.2	50
O_3	ppb	1-hour	54.3	--[1]	--[1]	82
		8-hour	49.0	--[1]	--[1]	44
NO_2	ppb	1-hour	40.3	14.3	9.3[2]	213
		24 hour	11.7	4.3	2.8[2]	106
		1-year	1.1	1.1	--[3]	53
SO_2	ppb	1-hour	8.7	--[1]	--[1]	344
		3 hour	6.6	--[1]	--[1]	229
		24 hour	2.2	--[1]	--[1]	115
		1-year	0.3	--[1]	--[1]	23

NOTES
ppb=parts per billion; $\mu g \cdot m^{-3}$ = micrograms per cubic metre
[1] Parameter not measured.
[2] Based on limited data.
[3] Insufficient data to calculate annual average.

Table 3.1.1-5 illustrates that maximum concentrations detected across a three-year period are generally significantly lower than NL AQS, apart from $PM_{2.5}$ in Long Harbour and O_3 in Mount Pearl. Elevated concentrations of $PM_{2.5}$ at Long Harbour AAQM stations are likely a result of ongoing industrial operations in the area.

In the absence of an AAQM station in the Study Area, a baseline ambient air quality survey was conducted in the summer of 2023 to characterize background concentrations of air contaminants of potential concern of the Project. Such air contaminants included $PM_{2.5}$, total suspended particulate (TSP), metals, ammonia (NH_3), NO_2 and SO_2. Ambient concentrations of $PM_{2.5}$, TSP and metals were determined by collecting size-selective samples via particle samplers on pre-weighed filter media over a discrete time frame (i.e., 72-hours). Ambient concentrations of NH_3, NO_2 and SO_2 were determined via a

month-long deployment of passive samplers that contain species-specific sorbent to collect gases and vapours through a permeative or diffusive process. To facilitate comparison with NL AQS, 72-hour and monthly concentrations were converted to 24-hour concentrations using methodology set out in the Air Dispersion Modelling Guideline for Ontario (Ontario Ministry of the Environment and Climate Change, 2017).

Results of the baseline ambient air quality survey are summarized in Tables 3.1.1-6 and 3.1.1-7. Sampling was conducted at two locations and were surveyed in duplicate: one in a residential area on Power Street in Dunville and another in a mixed-use area near the POA and a seasonal camping area (Sunset RV Park) in Argentia. Rationale for baseline sample location selection is detailed in Appendix A (Atmospheric Environment Baseline Study). A single set of passive samplers (i.e., one for each gaseous species) were deployed at each location in Dunville (also referred to as Power Street) and Argentia (also referred to as Port Authority).

Table 3.1.1-6 Baseline Ambient Air Quality Survey Results – $PM_{2.5}$, TSP and Metals.

Sampling Details			Monitoring Results (µg·m^{-3})						
			Particulate Matter		Total Metals				
Averaging Period	Site	Date	$PM_{2.5}$	TSP	Copper (Cu)	Lead (Pb)	Nickel (Ni)	Vanadium (V)	Zinc (Zn)
24-hour*	Power Street	July 14-17	3.71	38.4	0.0014	ND	0.0034	0.00086	0.011
		July 17-20	5.07	15.6	0.0013	ND	0.0011	0.00078	0.016
	Port Authority	July 20-23	2.52	9.47	0.0016	ND	0.0016	0.00058	ND
		July 23-26	4.35	16.2	0.0045	0.00067	0.0099	0.00078	0.012
NL AQS			25	120	50	2	2	2	120

NOTES:
µg·m^{-3}=micrograms per cubic metre; ND=not detected
*Results converted to 24-hour exposure for comparison NL AQS.

Table 3.1.1-7 Baseline Ambient Air Quality Survey Results – NH_3, NO_2 and SO_2.

Sampling Details		Monitoring Results (ppb)		
Exposure Period	Site	Ammonia (NH_3)	Nitrogen dioxide (NO_2)	Sulfur dioxide (SO_2)
24-hour	Power Street	0.8	0.5	0.3
	Port Authority	0.3	0.3	0.3
NL AQS		144	106	115

NOTES
ppb=parts per billion
*Results converted to 24-hour exposure for comparison with NL AQS.

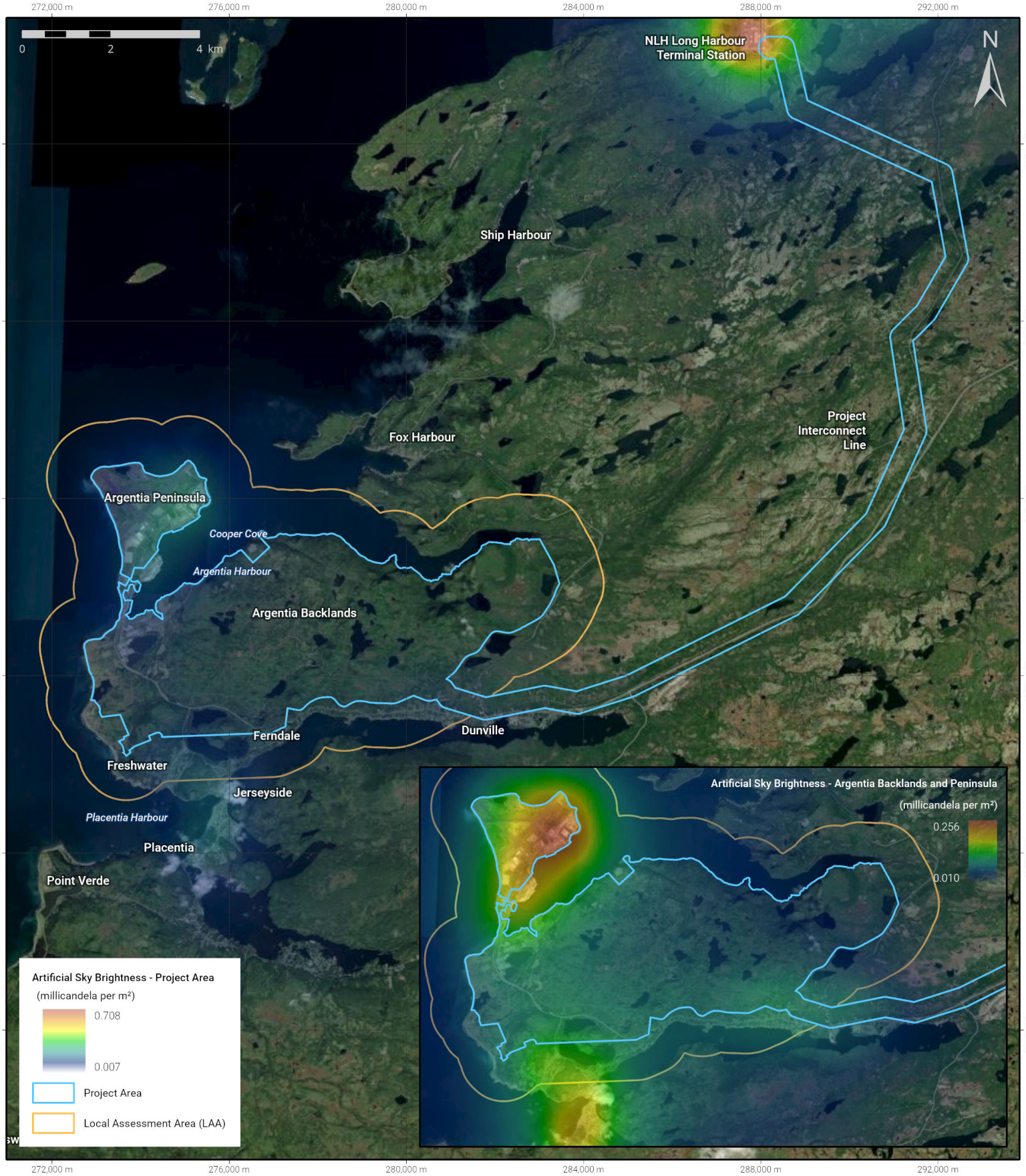
Consistent with AAQM station data in the region, concentrations of air contaminants measured in the baseline ambient air quality survey were significantly lower than NL AQS.

3.1.1.5 Light

The existing ambient light environment of the Project, located in a rural area, is categorized as E2 (low district brightness areas) by the Institution of Lighting Engineers (ILE) (The Institution of Lighting Engineers, 2005). Guidance from the ILE was applied as there are currently no regulations in NL related to light from industrial operations.

Regional levels of ambient light were further assessed using modelling data and satellite observations of artificial light (Falchi *et al*., 2016a, 2016b). The presence of artificial light can cause artificial skyglow, the most visible negative effect of light pollution. Artificial skyglow occurs when clouds are illuminated by nighttime light sources on the Earth's surface. It is the cumulative effect of all lights either emitting or reflecting from the Earth's surface upward plus emissions of atmospheric photochemical activity. Artificial brightness of the Project Area, as classified by the New World Atlas of Artificial Sky Brightness, ranges from 55.7 to 445 microcandela per square metre (µcd·m^{-2}) (Falchi *et al*., 2016a, 2016b). Total brightness of the Project Area ranges from 0.017 to 0.651 millicandela per square metre (mcd·m^{-2}), or 17 to 651 µcd·m^{-2}. Ambient light levels in the Project Area can be further classified using the Bortle scale, which uses nine levels to measure night sky brightness in a particular location (Bortle, 2001). According to the Bortle scale, night sky brightness in the Project Area is classified as rural sky to suburban sky (i.e., Class 3 to 5). The highest incidence of artificial light within the Project Area occurs on the Argentia Peninsula, the industrial hub of the area, followed by the industrial and residential areas of Argentia, Placentia and Dunville (Figure 3.1.1-3).

Baseline studies of ambient light were not conducted due to the siting of Project infrastructure. The Argentia Green Fuels Facility will be constructed in the area of highest incidence of artificial light. The onshore Argentia Wind Facility will be constructed on POA Property at sufficient setback from sensitive receptors, and Project infrastructure will be equipped with the minimum amount of lighting required to meet Transport Canada standards.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.1 - 3	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Artificial Sky Brightness	NOTES: Artificial Sky Brightness sourced from New World Atlas Dataset: Falchi et al., 2016a, 2016b	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-010-Rev0

3.1.1.6 Noise

Ambient noise levels in the Project Area are a culmination of both biogenic (e.g., birds, mammals, wave breaking, wind) and anthropogenic (e.g., vehicular traffic, heavy equipment, earthworks, blasting) sources. Biogenic sources of noise are intermittent while noise generated by ongoing construction and industrial activities are more continuous, and thereby substantive. Such sources are concentrated on or near the Argentia Peninsula, which due to regional topography, does not significantly impact regional noise levels.

Ambient noise levels in the Project Area are considered to be classified as quiet rural to urban residential (Health Canada, 2017). A baseline noise assessment was conducted to support this classification. Ambient noise levels were measured at four monitoring locations: one at the closest sensitive receptor to Project infrastructure noise in Dunville, NL, and three near other potential receptors in the surrounding communities of Freshwater, Ferndale and Fox Harbour, NL. Rationale for monitoring location selection is detailed in Appendix A (Atmospheric Environment Baseline Study). Baseline measurements were used to calculate daytime sound pressure levels (L_d), nighttime sound pressure levels (L_n) and day-night average sound pressure levels (L_{dn}) in terms of A-weighted decibels (dBA); units that reflect frequencies most audible to the human ear. Daytime values were calculated between 07:00 and 23:00, and nighttime between 23:00 and 07:00. Baseline noise levels are summarized in Table 3.1.1-8.

Table 3.1.1-8 Baseline Noise Levels.

Monitoring Location		Monitoring Period*	Measured Noise Levels (dBA)		
			Day; L_d	Night; L_n	Day-Night; L_{dn}
M1	Freshwater, NL	December 1-17, 2023	37	36	43
M2	Ferndale, NL	December 1-17, 2023	42	35	43
M3	Dunville, NL	July 20-26, 2023	52	34	50
M4	Fox Harbour, NL	December 1-17, 2023	61	51	61
*Indicates total period; measurements at individual locations spanned two to six days.					

Baseline values of L_{dn} ranged from 43-61 dBA, which corresponds to a quiet rural (<45 dBA) to urban residential (58-62) community type (qualitative description) according to Health Canada's *Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise* (Health Canada, 2017).

In addition to ambient noise levels, the presence of low frequency noise (LFN) was assessed. Originating from both biogenic and anthropogenic sources, LFN is noise with frequency content in the range of 16 to 200 hertz (Hz). LFN is quantified by subtracting concurrent measurements of A- and C-weighted sound pressure levels (i.e., in units of C-weighted decibels (dBC)); a difference greater than 20 decibels (dB) indicates the presence of LFN (Health Canada, 2017; Nova Scotia Environment and Climate Change, 2023). The presence of LFN, though intermittently detected, was confirmed at all monitoring locations during the baseline noise assessment. Since the region is subject to high winds and wave breaking, it is

likely that biogenic LFN is hindering the detection of anthropogenic LFN, if present (Alberta Energy Regulator, 2023).

3.1.1.7 Vibration

Ambient levels of vibration in the Project Area are low; vibrations occur intermittently based on ongoing construction and industrial activities in the region. Such activities include earthworks, blasting, and movement of heavy equipment. Natural sources of vibration such as volcanic occurrences and seismic activities (i.e., those caused by movement of tectonic plates), both onshore and offshore, are negligible.

Baseline levels of vibration were not measured due to the siting of Project infrastructure. Vibration effects arising from the Construction and Operations and Maintenance phases are not anticipated to impact sensitive receptors since minimum setback distances will be the greater of 3.0 times the turbine blade tip height or 600 m. A setback distance of this magnitude will ensure alignment with the Federal-Provincial-Territorial (FPT) Committee on Health and the Environment on Health and the Environment, which recommends a minimum setback distance of 550 m (FPT Committee on Health and the Environment Working Group on Wind Turbine Noise, 2012).

3.1.2 Aquatic Environment

3.1.2.1 Aquatic Environment Introduction

The Aquatic Environment chapter has been developed in consideration of recommendations provided in Section 3.1.2 of the 'Environmental Assessment Guidance for Registration of Onshore Wind Energy Generation and Green Hydrogen Production Projects' (NL DECC, 2023). The chapter is focused on the following components:

- Groundwater Resources
- Surface Water Resources
- Freshwater Environment
- Freshwater Fisheries
- Marine Environment
- Marine Fisheries and Aquaculture

The content of the Aquatic Environment chapter has been developed based on both field data, as collected in the Aquatic Environment Baseline Study in 2023 (Appendix B1), and publicly available desktop information, reports, and on-line data resources. Additionally, a Source Water Hydrology Report (Appendix C1) was prepared based on publicly available desktop information.

This section of the report specifically describes components of the Aquatic Environment within the RAA, LAA and Project Area associated with the Argentia Green Fuels Facility, wind turbine locations, access roads and Project interconnect lines.

3.1.2.2 Water Resources

Groundwater Resources

There are no public groundwater supply wells located in the Town of Placentia. There are 13 drilled wells, all of which are volcanic bedrock groundwater supply wells. The surficial geology of the Project Area is primarily shaped by the latest glaciation period, the late Wisconsin, resulting in a till veneer covering most of the Project Area (AMEC, 2013).

Bedrock exposed or beneath the thin layer of glacial till in the Argentia Backlands area is composed of extrusive igneous rocks associated with the Bull Arm Formation with little or no primary permeability, resulting in a low to moderate groundwater yield (Newfoundland and Labrador Geoscience Atlas, 2024). The Argentia terrace, an industrially impacted area, consist of younger clastic sedimentary rocks associated with the Big Head Formation (King, 1988). Due to the age and composition of this rock unit, it is characterized by having a low to moderate hydrological yield (Geoscience Atlas; NLDIET, n.d.).

Overall, the thin surficial unit and the aged volcanic and sedimentary bedrock make for a shallow groundwater system very sensitive to surface water supply in the lakes and rivers. Groundwater has little influence on the overall water balance in the region because of its limited capacity. No groundwater is anticipated to be used.

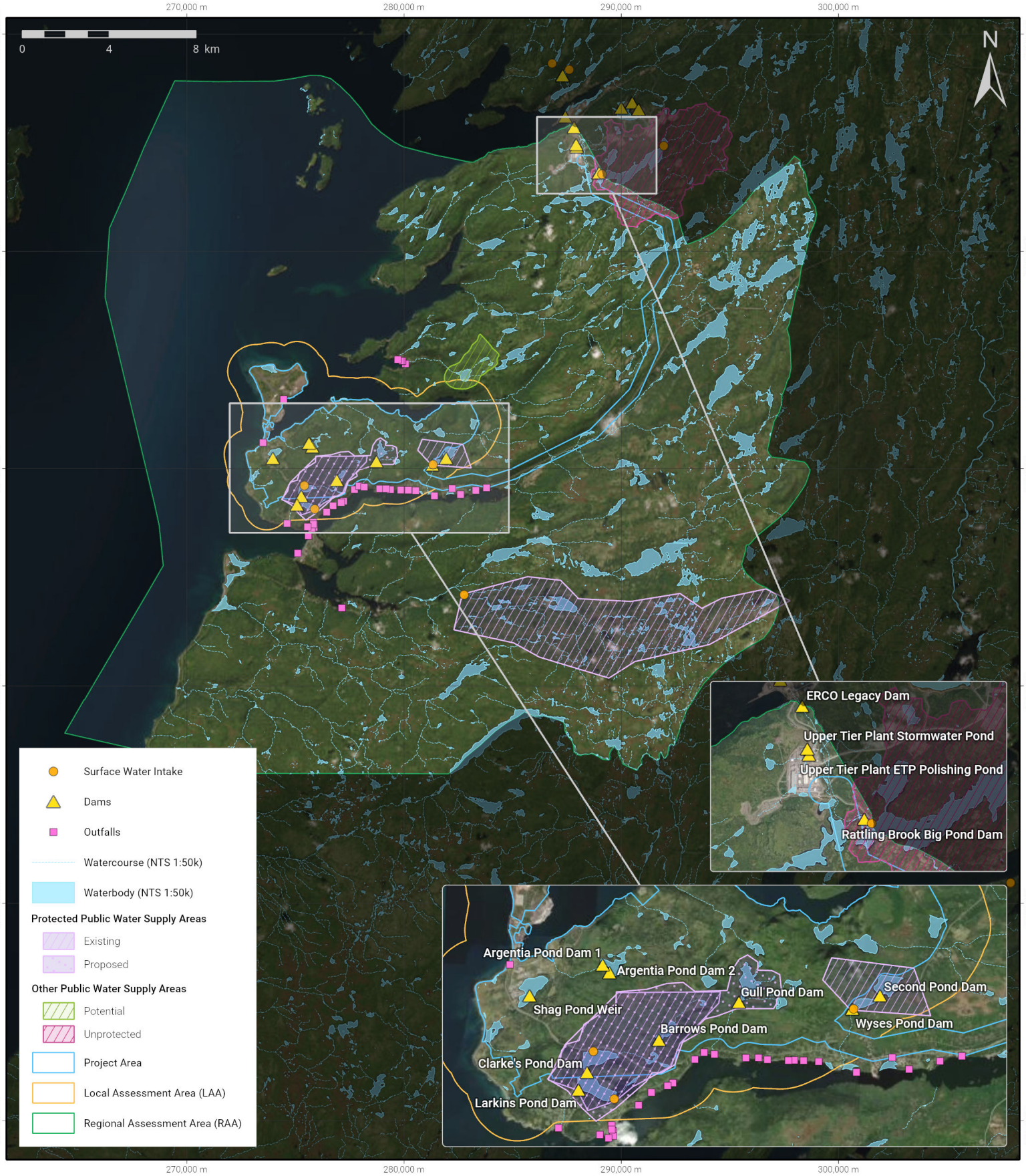
Surface Water Resources

Surface water is represented in the region by several ponds and tributaries (Figure 3.1.2-1). There are nine dam regulated ponds in the Project Area, three of which are protected public water supply areas (PPWSA) with their associated intakes. Clarke’s Pond and Larkins Pond form Placentia’s operational water sources, with a watershed expansion area for Clarke’s Pond consisting of Barrows Pond (also referred to as Barrons Pond), Gull Pond, and an inactive water source of Argentia Pond (PEC, 2024). Argentia Pond might also be known locally as Arch Pond (Argentia/Arch Pond). The Project Area also includes a portion of the Unprotected Rattling Brook Big Pond Public Water Supply Area. The LAA includes a portion of the Potential Fox Harbour Pond Public Water Supply Area. There are two industrial outfalls in Argentia and 25 municipal outfalls in Placentia, which discharge to the ocean.

The Town of Placentia's PPWSA is presently comprised of four active water supplies namely Clarke’s Pond, Larkin’s Pond, Barrons Pond, and Gull Pond and three inactive supplies, Wyses Little Pond/Wyses Big Pond, Argentia/Arch Pond and Southeast Brook. The Clarke’s Pond water supply currently services the communities of Freshwater, Argentia (including the POA), and Dunville. Clarke’s Pond has piped

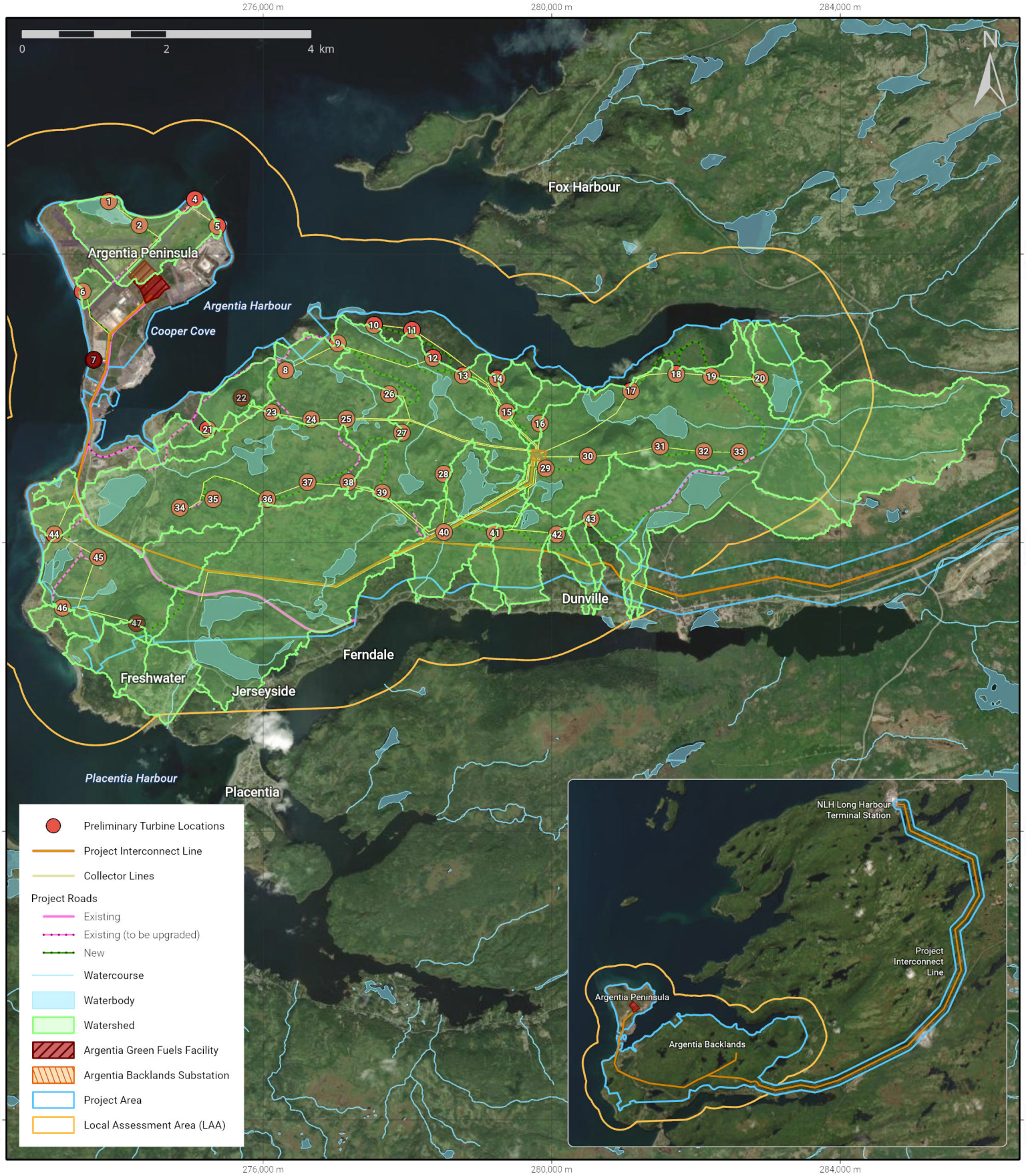
connections to allow for inflow from Barrows Pond and Gull Pond (PEC, 2024). The Larkins Pond water supply currently services Jerseyside, Ferndale, Placentia Proper, and Southeast Placentia (PEC, 2024). It is expected that the total water requirements for the Project (13.7 L/s) can be met by the Town of Placentia's municipal system.

Watersheds within the Argentia Backlands have been delineated in conjunction with watercourses mapped on NTS 1:50,000 scale maps (Figure 3.1.2-2). In Placentia, historical flooding has been triggered by high tides and winds, large rainfall events, storm surge, and wave runup; flood mapping has been delineated by 1:20-year and 1:100-year annual exceedance probability (AEP) floods for current climate and climate change conditions on Figure 3.1.2-3 to 3.1.2-6 (KGS Group, 2022).



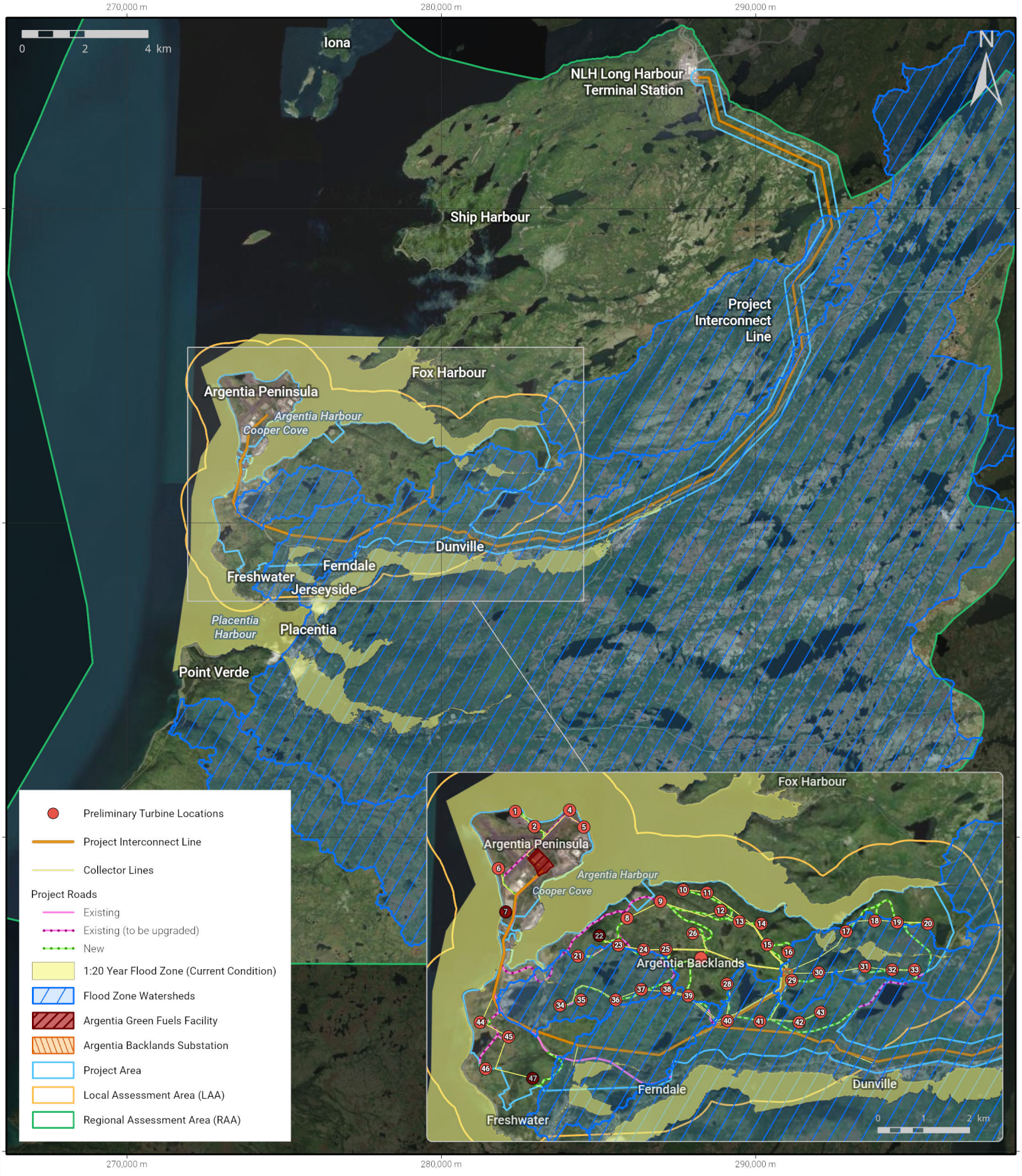
Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Surface Water Resources in the Project and Assessment Areas	NOTES: Watercourse and Waterbody data sourced from Canadian National Topographic System (NTS) 1:50k series. Surface Water Resource data sourced from NL Government's Water Resources Portal.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-011-Rev1



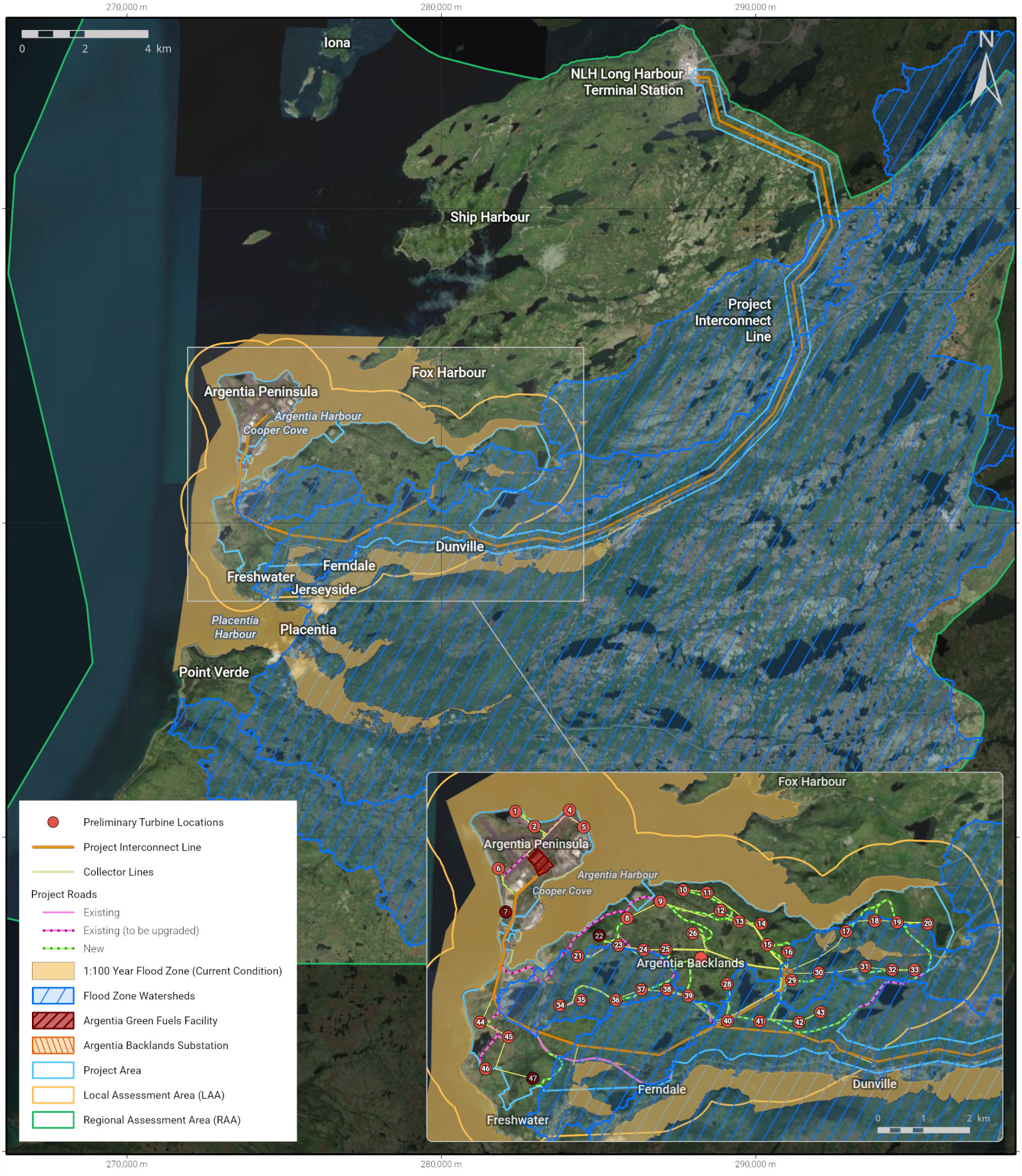
Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 2	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Bursey	DATE: 24/07/28
	FIGURE TITLE: Watersheds in the Argentia Backlands	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change. Watershed delineation derived from NRCan HRDEM Digital Terrain Model	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-160-Rev1



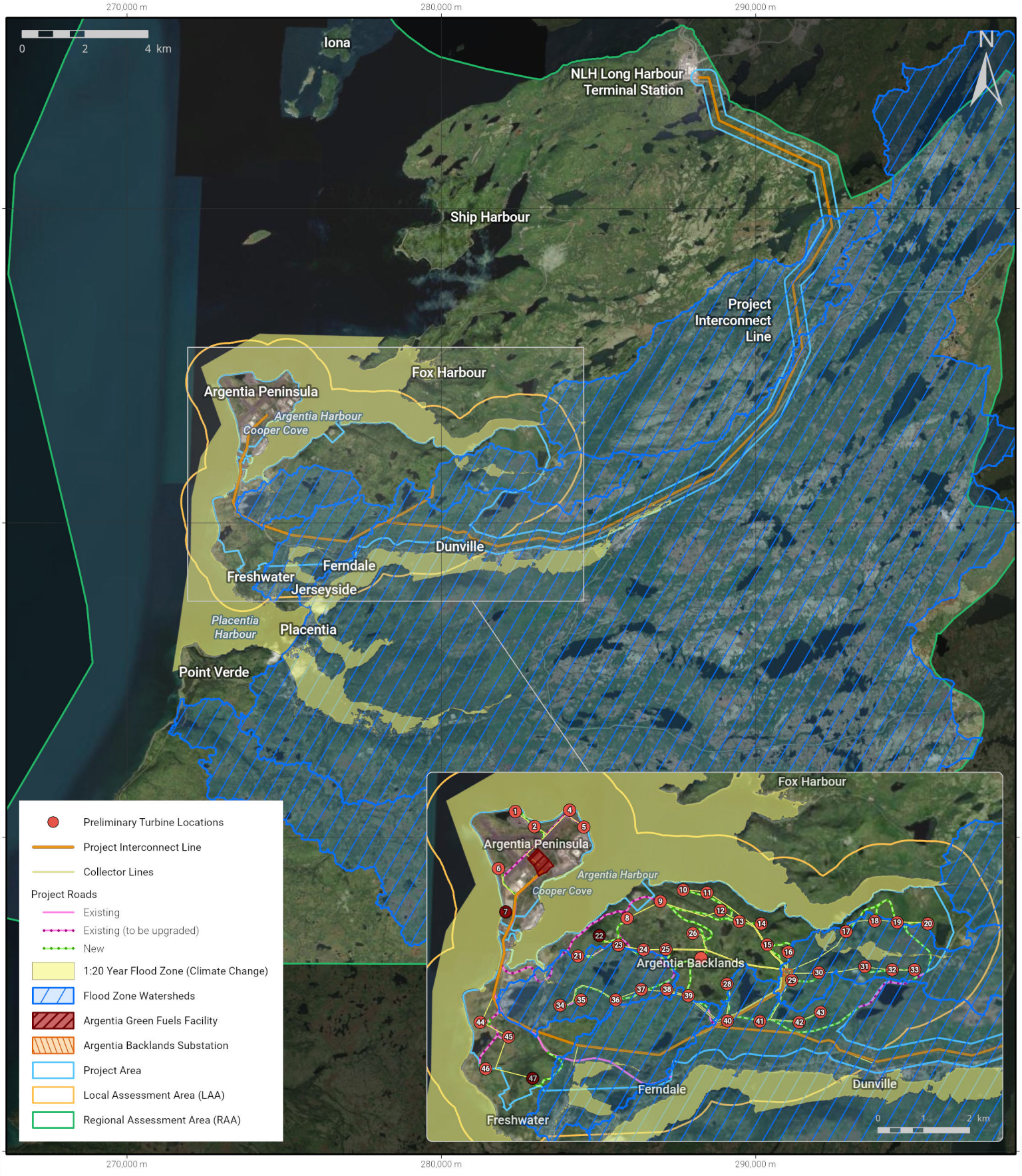
Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 3	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Bursey	DATE: 24/07/28
	FIGURE TITLE: 1:20 AEP (Current Conditions) Floodplains in the Project and Assessment Areas	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change. Flood Mapping data sourced from NL Water Resources Division	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-161-Rev0



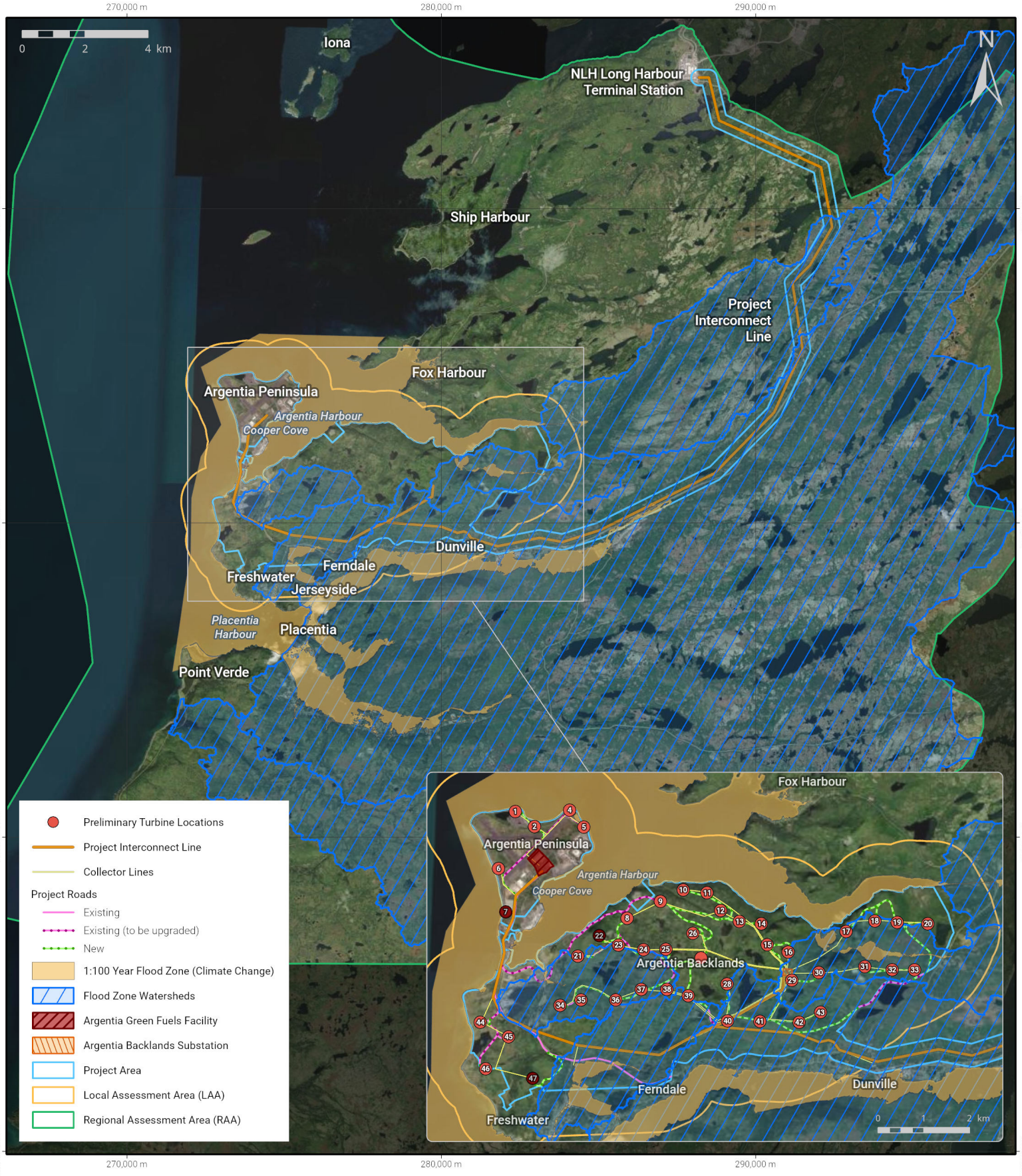
Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 4	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Bursey	DATE: 24/07/28
	FIGURE TITLE: 1:100 AEP (Current Conditions) Floodplains in the Project and Assessment Areas	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change. Flood Mapping data sourced from NL Water Resources Division	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-162-Rev0



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 5	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Bursey	DATE: 24/07/28
	FIGURE TITLE: 1:20 AEP (Climate Change) Floodplains in the Project and Assessment Areas	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change. Flood Mapping data sourced from NL Water Resources Division	REVIEWED BY: CBourke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBourke	sem

SEM MAP ID: 238-005-GIS-163-Rev0



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 6	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Bursey	DATE: 24/07/28
	FIGURE TITLE: 1:100 AEP (Climate Change) Floodplains in the Project and Assessment Areas	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change. Flood Mapping data sourced from NL Water Resources Division	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-164-Rev0

Hydrology

An alternative water supply has been identified as Shalloway Ponds located approximately six km east of the POA, with a watershed area of 8.3 km². A flow duration analysis determined that the Shalloway Ponds are more than adequate to supply 100% of the process water required for the Project without considering storage (CPL, 2023); however, there is no existing water distribution infrastructure at this location.

Hydrologic conditions were evaluated for the RAA by using data from the Water Survey of Canada (WSC, n.d.). Regional streamflow monitoring stations with historic information were selected to characterize regional hydrologic conditions (Table 3.1.2-1).

Table 3.1.2-1 Water Survey of Canada Stations used in Regional Hydrologic Analysis.

Station ID	Station Name	Drainage Area (km²)	Years of Record	Period of Record
02ZK002	Northeast River Near Placentia	89.6	45	1979 to 2023
02ZK003	Little Barachois River near Placentia	37.2	41	1983 to 2023
02ZK004	Little Salmonier River near North Harbour	104	41	1983 to 2023
02ZK006	Rattling Brook below Bridge	32.7	17	2007 to 2023

The regional hydrology was analyzed using historic flow data from nearby WSC stations to represent the streamflow characteristics at the Project site. Based on a literature review, a runoff coefficient (i.e., the fraction of precipitation that appears as runoff) is suggested to be 80% (NLDEL, 1992) and 81% (AMEC, 2013).

Monthly flow patterns were analyzed based on data from nearby WSC stations with drainage areas less than 250 km². Flow patterns were analyzed on a percentile basis to establish minimum, mean, and maximum monthly flow rates and have been expressed as unit flow rates (L/s/km², Table 3.1.2-2). The average monthly unit flow rates are higher than average in November, December, January, February, and April. The flow rates recede during the summer period of June, July, and August (Figure 3.1.2-7 to 3.1.2-9). The lowest unit flow rate occurs in August and the 50th percentile August unit flow rate is 51% lower than the annual average unit flow rate for the regional watersheds.

Table 3.1.2-2 Monthly Unit Flow Rates.

WSC Station	Drainage Area (km²)	Unit Flow Rate (L/s/km²)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean Annual Unit Flow	Annual Runoff (mm/year)
02ZK002 (2000 to 2019)	89.6	5th Percentile	16.8	25.8	27.0	34.8	17.5	10.6	7.9	5.6	11.0	18.4	28.8	30.2	36.3	614
		50th Percentile	53.9	53.2	58.6	68.4	39.0	28.3	26.2	20.9	30.4	44.7	53.2	53.4	44.1	1,392
		95th Percentile	84.7	123.6	103.9	116.2	76.4	59.7	51.8	37.4	59.3	85.0	80.3	78.1	55.3	2,505
02ZK003 (1983 to 2019)	37.2	5th Percentile	17.3	19.0	27.0	28.7	13.7	12.3	9.4	7.3	8.9	17.4	24.0	25.8	35.5	554
		50th Percentile	50.0	51.2	56.8	62.8	33.2	27.5	23.6	21.0	29.7	41.2	50.4	50.0	41.4	1,305
		95th Percentile	88.7	97.7	125.7	119.8	74.7	58.8	47.8	43.2	62.2	68.1	86.0	74.7	49.7	2,486
02ZK004	104.0	5th Percentile	18.0	25.5	32.4	37.3	13.2	9.0	7.0	6.0	9.2	20.6	35.1	31.5	40.6	642
		50th Percentile	59.5	58.5	66.5	79.7	41.5	29.6	24.5	20.0	35.9	51.0	64.9	64.4	49.6	1,564
		95th Percentile	102.8	117.6	124.7	138.2	100.3	76.4	50.3	43.3	83.7	90.7	101.1	98.9	61.4	2,959
02ZK006 (2007 to 2022)	32.7	5th Percentile	18.1	22.9	26.2	32.2	13.1	11.4	9.1	7.6	9.6	15.8	25.2	30.9	31.4	583
		50th Percentile	46.3	51.1	44.7	55.1	31.2	28.6	25.4	23.9	30.7	36.7	49.0	54.3	39.7	1,251
		95th Percentile	84.5	97.0	64.4	91.0	55.8	58.5	47.0	49.4	73.8	67.9	83.2	83.3	48.0	2,243
WSC Station Average		5th Percentile	17.6	23.3	28.1	33.3	14.4	10.8	8.3	6.6	9.7	18.0	28.3	29.6	19.0	598
		50th Percentile	52.4	53.5	56.7	66.5	36.2	28.5	24.9	21.5	31.7	43.4	54.4	55.5	43.8	1,378
		95th Percentile	90.2	109.0	104.7	116.3	76.8	63.4	49.2	43.3	69.7	77.9	87.7	83.7	81.0	2,548

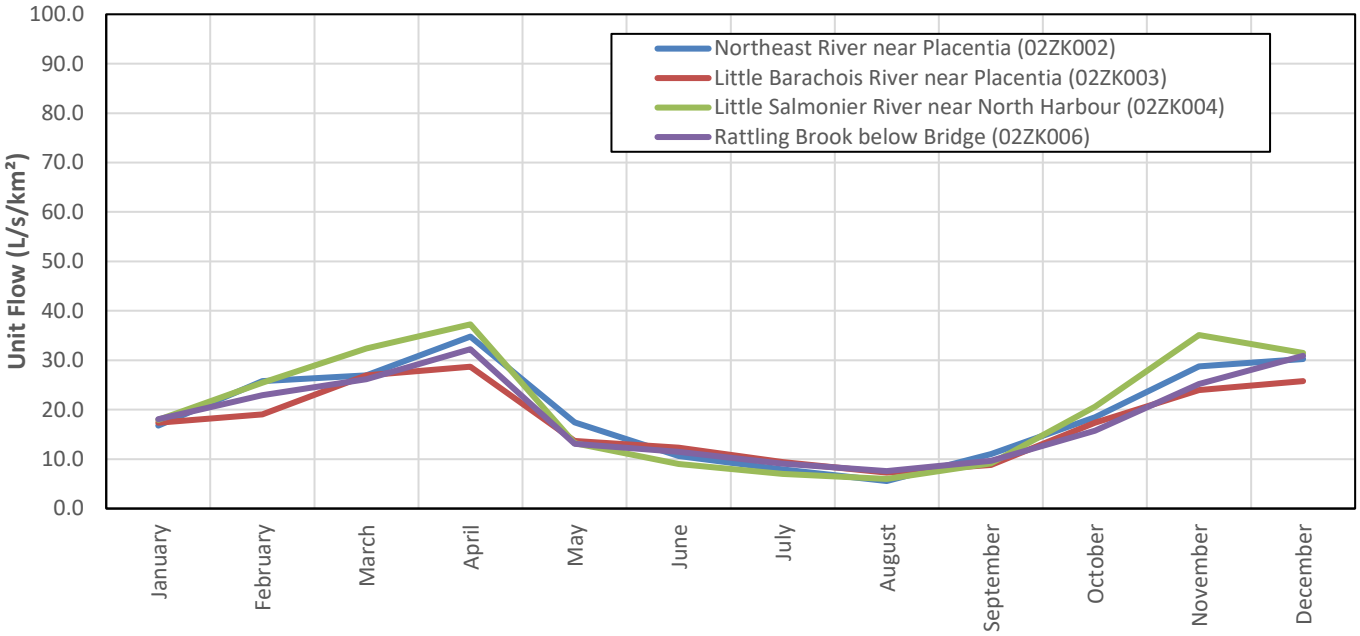


Figure 3.1.2-7 5th Percentile Monthly Unit Flow for Regional Watersheds.

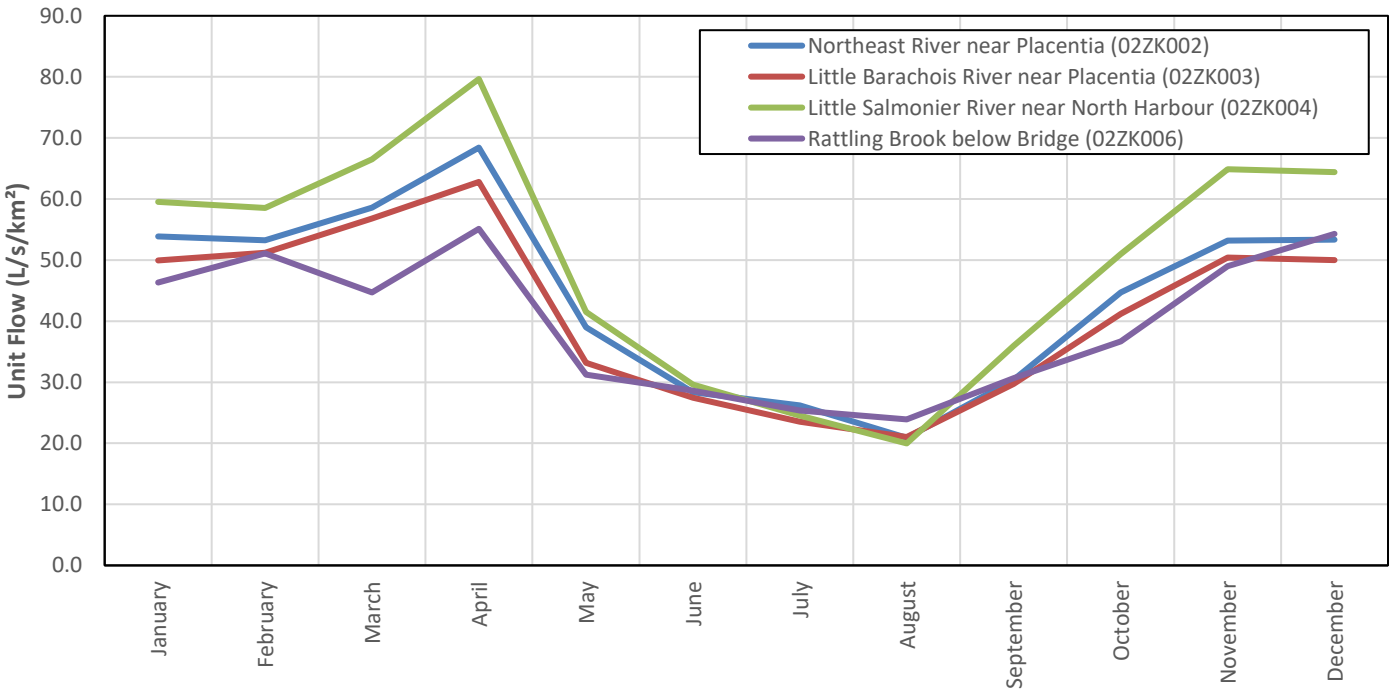


Figure 3.1.2-8 50th Percentile Monthly Unit Flow for Regional Watersheds.

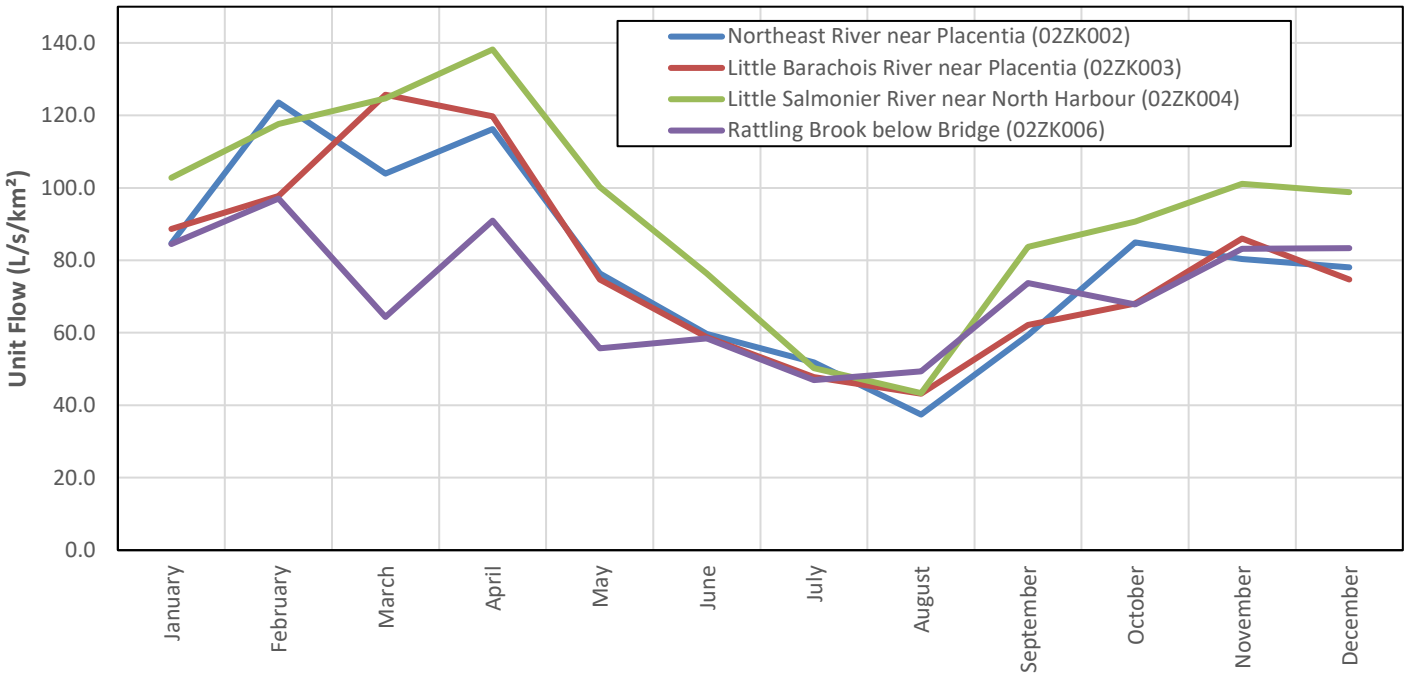


Figure 3.1.2-9 95th Percentile Monthly Unit Flow for Regional Watersheds.

Protected Public Water Supply Area Water Quality

A comprehensive baseline evaluation was conducted on the ponds within the PPWSA. The purpose of this evaluation was to characterize the quality of the proposed source water intended for the Argentia Green Fuels Facility. This evaluation aimed to provide a detailed understanding of the existing surface water conditions using publicly available data from the Water Resources Management Division (WRMD) and laboratory chemical analysis results. Public water supply and representative watershed ponds were assessed. To ascertain adherence to quality standards as outlined by the Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines (CEQG) (CCME CEQG, n.d.), surface water samples were analyzed for total metals, inorganic parameters, calculated chemical parameters, petroleum hydrocarbons, and volatile organic compounds.

Surface water samples were collected from the PPWSA and watershed boundary ponds in May 2023 and October 2023. Metals concentrations were predominantly below the Reportable Detection Limit (RDL). In May and October, antimony, arsenic, beryllium, bismuth, boron, molybdenum, selenium, silver, thallium, tin, and uranium concentrations were undetected in all samples. In May, cobalt, lead, nickel, phosphorus, vanadium, and zinc concentrations were undetected in all samples. Laboratory analysis results for the PWS areas were compared to water quality guidelines for the protection of aquatic life. No Canadian Council of Ministers of the Environment Canadian Environmental Quality Guidelines (CCME CEQG) exist for freshwater aquatic life for the following metals: antimony, beryllium, bismuth, chromium,

cobalt, tin, vanadium, and zinc, although concentrations of these metals were largely undetected in all samples. While barium, calcium, magnesium, manganese, potassium, sodium, strontium, and titanium were detected in nearly all samples, there are no guidance values set by the CCME CEQG for these metals. Boron, molybdenum, nickel, selenium, silver, thallium, and uranium concentrations were substantially less than the CCME CEQG in all samples analyzed in both May and October. Cadmium concentrations were significantly lower than the CCME CEQG in all samples analyzed. Aluminium concentrations exceeded the recommended limit set by the CCME CEQG (0.005/0.1 mg/L) in seven samples in May and three samples in October. Copper concentrations exceeded the CCME CEQG (0.002 mg/L) in one sample in May and two samples in October. Iron concentrations exceeded the CCME CEQG (0.3 mg/L) threshold in two samples in May and three samples in October. There was one sample in October where the lead concentration surpassed the CCME CEQG (0.001 mg/L).

Water samples were analyzed for inorganic and calculated chemical parameters in samples collected from the PPWSA and watershed boundary ponds in May 2023 and October 2023. Chloride concentrations in surface water samples were found to range from 7.6 to 21.0 mg/L in May and 5.7 to 18.0 mg/L in October. All measured chloride levels were within the acceptable limits established by the CCME CEQG for the protection of aquatic life. Laboratory pH measurements indicated values ranging from 5.00 to 7.05 in May and 5.10 to 7.58 in October. It is important to note that the CCME CEQG for the protection of aquatic life recommend a range between 6.5 and 9.0. Some pH values recorded in both May and October were less than the pH guideline minimum. Nitrate concentrations were calculated to range from <0.050 to 0.072 mg/L. Nitrate was detected at Clarke's Pond and Gull Pond in May, and at Clarke's Pond, Gull Pond, and Pond 4G in October. Water samples exhibited low nitrate levels with concentrations significantly lower than the CCME CEQG limit. The analytical results for several key water quality parameters – including alkalinity, colour, ammonia nitrogen, total suspended solids, turbidity, conductivity, calculated total dissolved solids, and hardness – are thoroughly discussed in the Aquatic Baseline Study Report (Appendix B1). Despite the detailed analysis, it is important to note that water quality guidelines do not provide specific guidance values for these particular inorganic and chemical parameters. As such, while these laboratory results offer valuable insight into the overall water quality and characteristics of the sampled waterbodies, they cannot be compared to CCME CEQG standards for the protection of aquatic life.

Water samples collected from the PPWSA, and watershed boundary ponds were analyzed for total petroleum hydrocarbons (TPH) and volatile organic compounds (VOC) in May 2023. Results are reported for benzene, toluene, ethylbenzene, total xylenes, C6-C10, >C10-C16, >C16-C21, >C21-C32 hydrocarbons, and modified TPH. Hydrocarbon concentrations in all water samples were predominantly below the RDLs. The duplicate sample collected at Hickey's Pond was the only exception, with >C21-C32 hydrocarbons and modified TPH detected at very low concentrations.

3.1.2.3 Freshwater Environment Introduction

Freshwater fish and fish habitat information required to support the Registration was acquired using publicly available desktop information and reports, augmented by a detailed *in situ* aquatic baseline study completed in 2023 (Appendix B1). The field baseline study focused on fish and fish habitats within the Project Area and with potential interactions with the Project components.

The entire watershed of the Argentia Peninsula and Argentia Backlands is located within the Southeastern Barrens Subregion of the Maritime Barrens Ecoregion. Hundreds of lakes, streams and ponds were created by the glacial gouging of the Earth's surface (PSPC, 2019), offering a suitable environment for aquatic life in Argentia Backlands. Aquatic organisms found in the Argentia Backlands are a subset of the potential species composition of the Southeastern Barrens Subregion of the Maritime Barrens Ecoregion. Multiple aquatic organisms (e.g., plankton, benthic invertebrates, and fish) are found in the Ecoregion, while there are no freshwater aquatic reptiles and only four species of amphibians that occur in Newfoundland.

3.1.2.4 Freshwater Fish and Fish Habitat

The following section discusses potential fish-bearing streams and waterbodies comprised in the aquatic environment surrounding areas of interest that may interact with planned access roads, collector systems, turbine bases, and Project interconnect line.

Argentia Peninsula Aquatic Habitat

The Argentia Peninsula has one waterbody, named *The Pond*. *The Pond* will be infilled as part of the ongoing Cenovus West White Rose Extension project prior to the planned installation of the wind turbines for the Project. *The Pond* is 23.2 ha in size, with a mean and maximum water depth of 7 m and 14 m, respectively (Husky Energy, 2012). It contains brackish water, with probable seawater intrusion from the bay, as well as from waves and spray during storm or spring tide events. Groundwater is thought to enter through the southeast end of *The Pond*. The substrate varied from mostly gravel in the northwest area to predominately sand and silt with a high clay fraction. Total Organic Carbon (TOC) in the sediment ranged from 72 to 179 g/kg and redox values indicated that some areas of *The Pond* were anoxic. An investigation of water and sediment contamination in *The Pond* found exceedances of fluoranthene, pyrene, Total PCBs, copper, and various total petroleum hydrocarbon fractions in sediment samples (Husky Energy, 2012). Mercury exceedances were reported in water samples. Aquatic plants and freshwater invertebrates typical of freshwater ponds in the area were not present in *The Pond*, and only threespine stickleback were captured. DFO subsequently determined that *The Pond* did not constitute productive fish habitat (DFO Letter to Husky, dated October 2, 2012). No other freshwater waterbodies or watercourses were identified on the Argentia Peninsula.

As mentioned in section 2.3.2.1, the wind turbine's foundation clearing area will be approximately 100 m X 75m. There are six potential wind turbine sites on the Argentia Peninsula for the proposed Project (proposed wind turbines 1, 2, 4, 5, 6 and 7). Five of the six wind turbine 100 m foundation clearing buffer zones encounter the marine coastline delimitation of the Argentia Port Lands area (proposed wind turbines 1, 4, 5, 6 and 7). One of those five wind turbine foundation clearing areas overlaps *The Pond* while also encountering the marine coastline (proposed wind turbine number 1). None of the proposed Argentia Peninsula wind turbine center points are within 60 m of a waterbody in accordance with the NTS 1:50,000 scale maps; with the exception of the proximity of wind turbine 1 to *The Pond*. None of the waterbodies (marine or freshwater) adjacent to the wind turbines on the Argentia Peninsula cover more than one-third of the 100 m buffer zone according to imagery, allowing at least two-thirds of practical space in the 100 m buffer zone.

The proposed connector and interconnect line systems have sections in proximity to the marine coastline, especially at the narrow of the Argentia Peninsula (Figure 2.3-1). Although some sections of the proposed connector and interconnect line systems are in the vicinity of the marine coastline of the Argentia Peninsula, none of them are near surface freshwater sources except a single-end collector line approximately 75 m from *The Pond*.

Argentia Backlands and Project Area Aquatic Habitat

The aquatic habitat assessments were conducted on 63 watercourses/waterbodies in the LAA. A total of 55 watercourse and six waterbody crossings have the potential to interact with access roads, electrical infrastructure, wind turbine clearing areas, and other Project components. In addition, two watercourses were assessed from pond outlets in the PPWSA. Of those 63, 17 freshwater habitats (27%) were assessed in a field study, which comprise of 15 watercourses and two waterbodies. A total of 46 (73%) were assessed through desktop analysis, which comprise of 42 watercourses and 4 waterbodies. Further pre-construction surveys will be conducted on definitive watercourse and waterbody crossings to assess the aquatic environment (e.g. Fish and Fish Habitat) in relation to those Project components as further commitments.

The majority of the 57 watercourse channels characterized (42 desktop study and 15 field study) were within a channel width of 5m, primarily dominated by coarse substrates and surrounded by mixed riparian vegetation composed of the dominate Ecotype mature coniferous forest, followed by coniferous scrub and regenerating coniferous forest. The slopes associated with the crossings were estimated between 0 to 21% (mean of 3.8%). From the 57 watercourse, 35 streams (61%) were determined as fish-bearing habitat or potential critical fish habitat. Two waterbodies were assessed in the field while 4 were assessed uniquely through desktop analysis for a total of six crossings involving waterbodies. Of the six waterbodies, three waterbodies were characterized as bog, and three others varied in size considerably. Waterbody shoreline substrate type was primarily dominated by fine substrates with surrounding vegetation composed of the dominate Ecotype wetland and mature coniferous forest, followed by areas

of coniferous scrub. Neither of the two waterbodies assessed in the field were fish-bearing habitat. Only two ponds located near Collector Lines and the Interconnect Line were found to be potential fish habitat based on the desktop analysis (Appendix B1).

The baseline field study demonstrated that the freshwater environment of Argentia Backlands is conducive to critical life events for salmonids, depending on their life stages. Nine watercourses were considered fish-bearing habitat for salmonid, of which eight were successfully fished and one assessed visually in the field. A salmonid critical habitat analysis was conducted on those eight, with flow velocity, depth and substrate type for main indicators for critical life events (e.g. overwintering). The analysis of potential critical habitats at the proposed crossing sites revealed that spawning and rearing/nursing are the two life events with the highest likelihood of occurring near these crossings, in alignment with species-specific site preferences and temporal requirements. The findings of potential critical salmonid habitat are consistent with most small undisturbed streams in NL.

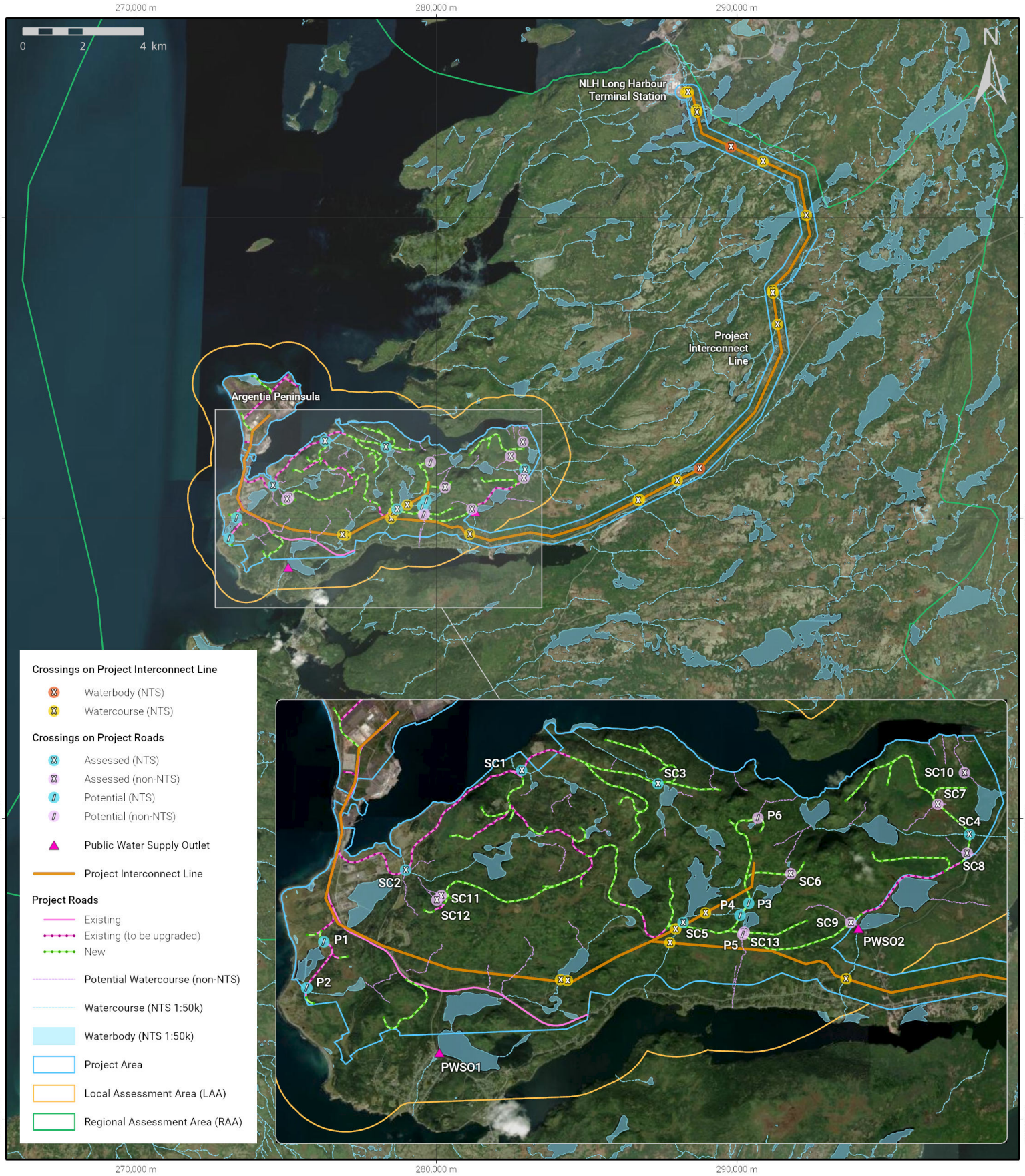
There were 21 potential crossings (19 streams and 2 waterbodies) identified with the proposed access roads (Figure 3.1.2-10). Of the 19 streams, 13 streams were assessed in the field (SC1-SC13). Further watercourses were identified as potential crossings (P1- P6) supplementary to stream crossings studied in the field. Of the 19 watercourses, nine were identified as fish-bearing habitats. The two waterbodies were identified as not fish-bearing habitat based on field assessment. Pre-construction surveys will be conducted on watercourse and waterbody crossings to assess the aquatic environment (e.g. Fish and Fish Habitat) in relation to Project components like access roads (Appendix B1).

The two outlets of PPWS ponds were studied for fish and fish habitat, including Wyse's Little Pond (PWSO2) and Larkin's Pond Outlets (PWSO1), which were categorized respectively as an inactive and active supply, respectively. Both outlets were characterized as fish-bearing habitat based on the field study (Appendix B1).

The Collector Line and Interconnect Line water crossings were assessed through desktop analysis. There were 19 potential crossings (17 streams and 2 waterbodies) associated with the collector system assessed in the desktop analysis. Of the 17 watercourses, 12 were determined as potentially fish-bearing. One of the waterbodies was determined as fish-bearing habitat. There were also 20 potential crossings (18 streams and 2 waterbodies) associated with the Project Interconnect Line to the Long Harbour Terminal Station (Appendix B1). Crossings associated with the collector system and Project Interconnect Line were assessed via a desktop analysis in the Aquatic Baseline Study.

Minimal interaction between the aquatic environment and wind turbines is expected. As mentioned in Section 2.3.2.1, the wind turbine foundation clearing area will be approximately 100 m X 75m. Using a 100 m radius buffer zone adjacent to the wind turbine foundation, there are no watercourse or waterbody identified when referencing the NTS 1:50,000 scale maps for the Argentia Backlands, except at a single

location (proposed wind turbine 14). The high-water mark of a single stream was identified at approximately 80 m from the center of the proposed location of wind turbine 14. The desktop analysis demonstrates that the channel can be characterized with discontinuous overland flow and is not likely fish-bearing. In addition to the clearing areas for the wind turbine foundations, designed construction laydown areas, including building and excavating material piles, are to be determined and will be located to avoid adverse effects on the aquatic environment.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 10	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Potential Water Crossings in the Project Area	NOTES: Watercourse and Waterbody data sourced from Canadian National Topographic System (NTS) 1:50k series and high-resolution aerial imagery.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-012-Rev1

Argentia Backlands Habitat Description

Part of the Argentia Backlands is associated with the shoreline of Argentia Harbour. No major rivers drain into the Argentia Harbour area, although a small stream flows from Argentia/Arch Pond to Argentia Harbour (Husky Energy, 2012). The stream is 2.4 to 3 m wide, fast-flowing and well-vegetated, with extensive riparian habitat on both sides. Argentia/Arch Pond is a popular fishing area, and brook trout are reported regularly; however, the outflow stream is not known to be used for fishing. The stream terminates in Salmon Cove at the southeast corner of Argentia Harbour.

From the different types of infrastructure mentioned (i.e. access roads, collector system, wind turbine foundations and Project Interconnect and Gen-Tie Lines), the access road crossings were of interest for the characterization of fish and fish habitat due to their sizable footprint on the aquatic environment.

Table 3.1.2-3 provides the habitat type and stream characterization of 11 steams associated with the access roads (n=9) (i.e. SC1, SC2, SC3, SC4, SC5-2, SC6, SC7, SC10, and SC13), and PPWS outlets (n=2) (i.e. Larkins Pond Outlet-PWSO1 and Wyses little Pond Outlet-PWSO2) identified during the 2023 Aquatic Baseline Study. Pools were the most frequent mesohabitat type present in eight of 11 streams assessed, followed by steady and run habitats in seven and six streams, respectively, while riffles were present in five streams, and rapids were identified in two streams. The most abundant mesohabitat type was steady followed by pool, representing on average 35% and 25% of the total stream habitat assessed, respectively. The streams varied in width from 0.74 m to 4.7 m, while average stream depth ranged from 0.17 m to 0.66 m and total discharge ranged from 0.001 m^3/s to 0.173 m^3/s.

Table 3.1.2-3 Summary of Habitat Types and Stream Characteristics, 2023.

Stream ID	Habitat Type (%)					Characteristics and flow		
	Run	Steady	Riffle	Pool	Rapids	Width (m)	Max Depth (m)	Discharge (m^3/s)
SC1	0	10	0	5	85	4.15	0.37	0.082
SC2	25	0	25	0	50	4.70	0.17	0.027
SC3	0	0	50	50	0	4.20	0.38	0.011
SC4	50	0	20	30	0	3.55	0.32	0.048
SC5	6.7	60	0	33	0	3.26	-	-
SC6	0	40	30	30	0	1.10	0.26	0.003
SC7	0	50	0	50	0	1.23	0.68	0.002
SC10	35	0	0	65	0	0.91	0.21	0.004
SC13	0	100	0	0	0	0.74	0.19	0.0008
PWS01	10	90	0	0	0	2.6	0.30	0.007
PWS02	10	50	30	10	0	2.90	0.30	0.161
Min	**0**	**0**	**0**	**0**	**0**	**0.74**	**0.17**	**0.0008**
Max	**50**	**100**	**50**	**65**	**85**	**4.70**	**0.66**	**0.161**
Mean	**14**	**36**	**14**	**25**	**12**	**2.67**	**0.33**	**0.035**

Habitat surveys for streams SC8, SC9, SC11 and SC12 were not performed as these sites were deemed as not permanent fish habitat. Stream flow measurements were not completed in SC5 due to standing water at the site.

Boulders were the most frequent substrate type, being present in seven of 11 streams assessed, followed by cobbles and rubble habitats in seven and six streams, respectively. On average, clay was the most encountered type of substrate with 34 % of the overall streams assessed, followed by boulders and rubbles with 16 % and 11 %, respectively.

The vegetation types (habitat ecotype) in the vicinity of the watercourses and waterbodies studied were principally characterized with regenerating coniferous forest, with many sparse areas comprised of coniferous scrubs, mature coniferous forest and wetlands (Section 3.1.3). Riparian vegetation in the Argentia Backlands exhibits considerable variability in species composition and abundance across different study sites (SC1-13, and PWS01-02). Spatially dominate species include mountain alder (green alder), black spruce, balsam fir, graminoids including grass-like plants such sedges (*Carex spp*.), and various other shrubs and moss species, each showed site specific prevalence. Certain species such as sphagnum moss, dryopteris fern, and sweet gale were consistently observed over the vast majority of the sites studied. Based on the observations across the sites assessed in the baseline studies, the most recorded riparian vegetation appears to be graminoids (plant-like grass like sedge), which were noted in at least 50% of the study sites, indicating their widespread presence across riparian zones of the Backlands. On the other hand, leatherleaf (*Chamaedaphne calyculata*) and *Kalmia spp.* (including *Kalmia angustifolia*, commonly known as sheep laurel) were among the least commonly observed riparian vegetation types. They were noted in fewer instances and usually in trace amounts (Appendix B1).

Argentia Backlands Water Quality

In-situ water quality was assessed in all 11 streams studied in summer 2023, which revealed the range of temperature (°C), dissolved oxygen (%), pH, and Conductivity (µS/cm) of streams studied in the Backlands. The temperature of the streams ranged from 9.3 to 21.1°C (mean of 15.8°C), dissolved oxygen ranged from 50% to 98.4% (mean of 87.8%), pH ranged from 4.8 to 8.3 (mean of 6.5), while the conductivity of the streams ranged from 33.7 to 119.5 µS/cm (mean of 67.1 µS/cm). *In-situ* water quality assessed in two waterbodies revealed surface water temperature between 20.5°C and 21.1°C, dissolved oxygen saturation varied from 73.9% to 96.9%, pH ranged from 6.8 and 8.3, while conductivity ranged from 57.9 to 65 µS/cm.

Analytic water quality was assessed in the 11 streams studied. Key parameters were examined in a laboratory setting and the result were as follows: the sum of nitrate + nitrite was detected at five sites and ranged from 0.06 to 0.25 mg/L (mean of 0.13 mg/L), while nitrate was not detected at any site; turbidity ranged from 0.4 to 14 NTU and total alkalinity ranged from 2.9 to 21.0 mg/L (mean of 10.7 mg/L) among streams.

Metals were assessed in 11 streams studied. Antimony, beryllium, bismuth, molybdenum, nickel, phosphorus, selenium, silver, thallium, tin, uranium, and vanadium concentrations were undetected. Voron, cadmium, chromium, cobalt, copper, lead, and titanium concentrations were detected in nine of the streams studied. Aluminum, barium, calcium, iron, magnesium, manganese, potassium, sodium, and strontium concentrations were detected in all streams. There were seven instances (i.e., SC4, SC5-2, SC6, SC7, SC13, PWSO1 and PWSO2) where aluminum concentrations exceeded CCME CEQG. The concentration of copper in streams was equal to or higher than the CCME CEQG in three instances (i.e., SC1, SC13 and PWSO1) and in one instance in the waterbody crossing WBC1. There were seven instances (i.e., SC4, SC5-2, SC6, SC7, SC13, PWSO1 and PWSO2) where iron concentrations exceeded CCME CEQG. There was one instance (i.e., SC13) where lead concentrations exceeded CCME CEQG. There was one instance (i.e. SC6) where manganese concentration exceeded the CCME CEQG.

Freshwater Fish

Fish species in the Project Area and with the potential to occur in the RAA and LAA are discussed below. Fish species reported across the Northeastern inland region of Placentia Bay (e.g. surroundings of Argentia, Long Harbour and Chapel Arm) include Arctic char, brook trout, brown trout (sea trout), rainbow smelt, American eel, Atlantic salmon/ouananiche, and stickleback sp. (i.e. blackspotted, threespine and ninespine sticklebacks) (NLDEC, n.d.; AMEC, 2007; PSPC, 2019). Fish community compositions in the Northeastern inland region comprise diadromous (i.e. catadromous and anadromous) and landlocked (freshwater resident) populations.

Four scheduled salmon rivers are located in the RAA, and one of them, Northeast River, shares boundaries with the LAA. The headwaters of Northeast River are formed by Camp Fire Pond, Big Gull Pond, Branch Pond, Station Pond, Mickeys Pond, Junction Pond and Rhodies Pond. All these ponds drain into Fitzgerald's Pond, which flows into the Northeast River (PSPC, 2019). Reported fish species in the Northeast River include Atlantic salmon, Arctic char, American eel, brown trout, brook trout, rainbow smelt, and threespine/ninespine stickleback (NLDEC, n.d.; PSPC, 2019). These species could be expected to be occasional or common in the LAA and RAA.

Table 3.1.2-4 provides a list of fish species reported in the Northeastern inland region of Placentia Bay and the Avalon Peninsula with their potential to occur in the RAA. Commonly found fish species are based on their presence during the 2023 baseline study, while occasionally found fish species are based on presence in adjacent rivers (i.e. Northeast River). Other species of fish are categorized as rare and unlikely to be found in the LAA or RAA.

Table 3.1.2-4 Freshwater Fish Species with the Potential to Occur in the LAA.

Finfish	*Species Name*	Potential Occurrence in LAA
Catadromous Fish		
American eel	*Anguilla rostrata*	Occasional
Anadromous Fish		
Atlantic salmon (South NL Pop.)	*Salmo salar*	Occasional
Atlantic sturgeon (Maritimes Pop.)	*Acipenser oxyrinchus*	Rare
Brown trout (Sea trout)	*Salmo trutta*	Occasional
Rainbow smelt	*Osmerus mordax*	Occasional
Freshwater		
Arctic char (landlocked)	*Salvelinus alpinus*	Rare to Occasional
Brook trout	*Salvalinus fontinalis*	Common
Banded killifish (NL Pop.)	*Fundulus diaphanus*	Rare
Mummichog	*Fundulus heteroclitus*	Rare
Ouananiche (landlocked salmon)	*Salmo salar*	Common
Rainbow trout	*Oncorhynchus mykiss*	Rare
Blackspotted stickleback,	*Gasterosteus wheatlandi*	Rare
Ninespine stickleback,	*Pungitius pungitius*	Rare to Occasional
Threespine stickleback,	*Gasterosteus aculaeatus*	Common

Fish were captured during the baseline study at seven stream crossings (including Gull Pond outlet), none of the waterbodies, and one PPWSA outlet. Brook trout were present at every stream site (n=7), while only a few streams contained ouananiche (n=2) and threespine stickleback (n=2). A total of 68 fish were captured from the Argentia Backlands, including 38 brook trout (56%), 21 ouananiche (31%) and nine threespine stickleback (13%) (Appendix B1). Of the 38 brook trout, 31 were aged with a scale sample. The age varied from YOY to 3+ averaging 1+, which was also the most common age class. The

Atlantic salmon captured were assumed to be ouananiche as large bodied, anadromous populations do not normally become established in small streams. Additionally, several of the streams had very high gradients as they neared the marine environment, and it is likely there were barriers to upstream migration. American eel was not captured during surveys but were observed during the 2023 baseline field studies. More information on the species captured or observed during the baseline studies are provided below.

The American eel in NL was designated "threatened" in 2012 (COSEWIC, 2012) and has been listed under the provincial **Endangered Species Act** as vulnerable. This catadromous species spends most of its life in freshwater and estuaries (brackish) but migrates to sea to spawn once sexual maturation is complete (Scott and Crossman, 1998). Bradbury *et al*. (1999) indicated that eels typically begin their spawning down-stream migration in late summer and fall throughout much of eastern Canada. Scruton *et al*. (1997) reported that downstream migration of eels in Newfoundland generally occurs between mid-August and mid-October. American eels spawn in the Sargasso Sea with peak spawning occurring in mid-winter between January and March. Young eels (elvers) begin their upstream migration in most areas of insular Newfoundland in early June to mid-August (Bradbury *et al*., 1999; Scruton *et al*., 1997). Grant and Lee (2004) indicated that up-stream migrating elvers tend to be bottom dwellers, hiding in burrows, snags, plant masses, under rocks or any other type of shelter, including burrowing directly into the substrate, and that soft, undisturbed bottom sediments provide critical shelter for migration. The habitat preferences of American eel indicate that freshwaters within the Project Area potentially provide overwintering, feeding and migratory habitats.

Atlantic salmon in Newfoundland exist in both anadromous (sea-run) and landlocked forms (ouananiche) (Smith, 1988). There is substantial variance in the timing of the upstream spawning migration in insular Newfoundland, ranging from May to September (Porter, 1975; Scruton *et al*., 1997). Newfoundland's anadromous populations of Atlantic salmon typically spawn in a stream characterizing a clean, well-aerated, gravel bottom riffle upstream of a pool (Scott and Scott, 1988; Smith, 1988; Gibson, 1993; Stanley and Trial, 1995; Scott and Crossman, 1998) between mid-October to mid-November (Scruton *et al*., 1997). Adults may return immediately to sea after spawning or overwinter in freshwater habitats, before migrating to sea in the spring (Gruenefeld, 1988; Smith, 1988). Eggs incubate over winter (Smith, 1988) for four or five months (Porter, 1975; Scruton *et al*., 1997). Hatching usually occurs between mid-April and early May in Newfoundland (Porter, 1975; Scruton *et al*., 1997). Downstream migration of over-wintering adults occurs in May and June (Porter, 1975). Young Atlantic salmon after hatching, might remain within the substrate for several weeks (Randall, 1982), before moving to other habitats. Juveniles going to sea began to migrate downstream as smolt in the spring (May and June) (Porter, 1975; Scott and Scott, 1988; Scott and Crossman, 1998). Anadromous Atlantic salmon would be expected to be common in scheduled salmon rivers within the RAA.

There are well-established populations of landlocked Atlantic salmon, or ouananiche, in many of the inland Newfoundland waters (Grant and Lee, 2004). The ouananiche life history is comparable to sea-run Atlantic salmon, except adults remain in freshwater. Freshwater populations spawn along rocky lake shorelines in insular Newfoundland (Scott and Crossman, 1964; Cowan and Baggs 1988; Scruton *et al*., 1997) or migrate into tributary streams (Scott and Crossman 1964; 1998; Hutchings 1986; Einarsson *et al*., 1990) in moving water, usually above outlet streams and near the mouths of inlet streams (Scruton *et al*., 1996). Ouananiche most often spawns in Newfoundland between late September to early November (Leggett, 1965; Lee, 1971; Beak Consultants Ltd., 1981; Scruton et al., 1996, 1997), and the eggs hatch between early April and mid-June (Scruton *et al*., 1997). Ouananiche often return to the lake shortly after stream-spawning (Warner and Havey, 1985; Scruton *et al*., 1996, 1997) while some take up residence in tributary pools before returning to the lake the following spring (Scott and Crossman, 1964; Havey and Warner, 1970). Ouananiche will overwinter in both the deep warmer waters of ice-covered lakes as well as in the fast-flowing ice-free waters of inlets and outlets (Scruton *et al*., 1997). Grant and Lee (2004) and Bradbury *et al*. (1999) reported that ouananiche young-of-the-year (YoY) and juveniles usually reside in stream riffle 'nursery' areas before moving into lakes after two to three years. Ouananiche would be expected to be common in streams and waterbodies within the LAA and RAA.

Threespine sticklebacks are relatively broadly distributed throughout most of Newfoundland and are most likely to be found in ponds or streams flowing through wetlands with fine substrates, among other habitats (Grant and Lee, 2004; Scott and Crossman, 1998). This euryhaline species is tolerant of marine, brackish and freshwater environments, occupying mainly shallow waters in still or relatively slow-flowing zones (Scott and Crossman, 1998). Anadromous populations undergo a spring (May-June) spawning upstream migration into fresh or brackish water, with spawning generally occurring in June or July (Scott and Crossman, 1998). Some anadromous threespine sticklebacks leave the streams and/or estuaries and move into saltwater in the fall to overwinter (Coady and Power, 1973). Freshwater threespine stickleback resident populations also undergo migration in the spring (May-June) from deep to shallow waters of lakes or larger rivers into smaller, slower streams or backwaters (Scott and Scott, 1988; Scott and Crossman, 1998). Landlocked threespine sticklebacks spawn mainly in June and July (Scott and Scott, 1988). Grant and Lee (2004) indicated incubation varies by location from seven to 40 days, depending on the temperature. Males provide parental care during incubation up to when young are still in the vicinity of the nest (about two weeks after hatching) (Scott and Scott, 1988; Scott and Crossman, 1998), at the end of summer (early September). Threespine stickleback would be expected to be common in streams and waterbodies within the LAA and RAA.

Brook trout, also known as speckled trout, exists in both anadromous and landlocked form in Newfoundland. This fish is widely distributed in insular Newfoundland and usually utilizes lakes, ponds and tributaries for spawning, overwintering, and feeding. They may spend one or two months feeding at sea in relatively shallow water, close to their natal stream, while others spend their entire life in freshwater (Scott and Scott, 1988). Anadromous and freshwater residents generally have similar life histories.

Migratory activities between both environments (freshwater and marine) can occur throughout the year (O'Connell, 1982), however, peak downstream migration of brook trout typically occurs in May or June, while upstream spawning migrations for both forms occur in July in Newfoundland. Brook trout normally spawns in shallow, gravel-bottomed streams and occasionally within the shorelines of lakes between late September and early November (Bradbury *et al*., 1999). Eggs incubate in the substrate over winter and hatch between April and mid-June (Baggs, 1989; Scruton *et al*., 1997). Brook trout would be expected to be the most common and widely distributed species in streams and waterbodies within the LAA and RAA.

Freshwater Plankton

Planktonic species occurring in the Project Area freshwater habitats are discussed below.

A baseline assessment of the phytoplankton and zooplankton community was conducted in one waterbody as a potential road crossing site. Phytoplankton were categorized in four size fractions (1-10, 10.1-20, 20.1-64, >64 µm) and had a mean biomass of 36, 308, 2,860, and 285 mg/m^3, respectively, which represented 1.0%, 8.8%, 82.0%, and 8.2% of the community, respectively. *Euastrum* (Class: Chlorophyceae) was the largest single genus (1802 mg/m^3), and represented 51.6% of the phytoplankton community, followed by two diatoms, *Frustulia* (681 mg/m^3) and *Stauroneis* (218 mg/m^3), which represented 19.5% and 6.2% of the community, respectively.

The mean zooplankton biomass (µg/m^3) for each major taxonomic group of Copepods, Cladocerans, and Rotifers was 0.66, 1.84, and 0.03 mg/m^3, respectively, which represented 26.2%, 72.5%, and 1.3% of the zooplankton community. *Bosmina* was the largest single genus with a biomass of 0.77 mg/m^3 followed by *Polyphemus* as a group (0.67 mg/m^3) and the genus *Streblocerus* (0.38 mg/m^3), both Cladocerans, followed closely by Cyclopoid (nauplii) as a group (0.32 mg/m^3) within the Copepods.

Planktonic organisms with the potential to occur in the LAA, RAA and along the Project Interconnect and Gen-Tie Lines toward Long Harbour, are expected to have a similar species composition as freshwaters in the Project Area due to having adjacent watersheds.

Freshwater Benthic Invertebrates

The benthic invertebrate species occurring in the Project Area freshwater habitats are discussed below.

Streams and waterbodies in the Argentia Backlands had an average richness of 48 benthic taxa across all samples, with Ephemeroptera (31.1%), Diptera (24.5%) and Coleoptera (12.7%) representing the major taxonomic groups, with an average density of 2,531 individuals/m^2. Simpson’s Diversity and Evenness Indexes were calculated at 0.723 and 1.457, respectively.

Benthic organisms with the potential to occur in the LAA, RAA and along the Project Interconnect and Gen-Tie Lines toward Long Harbour are expected to have a similar species composition as freshwaters in the Project Area due to adjacency of watersheds.

Freshwater Amphibians

Amphibian species occurring in Newfoundland are discussed below.

Four species, including American Toad (*Anaxyrus americanus*), Mink Frog (*Lithobates septentrionalis*), Green Frog (*Lithobates clamitans*) and Wood Frog (*Rana sylvatica*) are found in insular Newfoundland, and they all are considered exotic (NLDFFA, 2005.; NatureWatch, 2024). American Toads are mostly terrestrial and inhabit freshwaters only during the breeding season and as larvae. Toad breeding occurs in warm, shallow ponds, streams, river margins, and even large puddles and roadside ditches. The Mink Frog prefers large, cold, permanent ponds, lakes and slow-moving rivers with abundant vegetation. The Green Frog is mostly found in or near shallow, permanent waterbodies such as springs, swamps, brooks, and edges of ponds, or lakes. The Wood Frog prefers moist woodlands and vernal woodland pools (NatureWatch, 2024). The Green Frog is the most abundant amphibian in Newfoundland (NLDFFA, 2011). General status assessments have categorized the four species as exotic and secure in Newfoundland (NLDFFA, 2005.).

No amphibians were captured or observed during the 2023 baseline study when conducting fish surveys or habitat assessments. Amphibians are not expected to be common in the LAA, RAA, and along the Project Interconnect Line toward Long Harbour due to the lack of presence in the Project Area and considering adjacency to watersheds in the Project Area.

3.1.2.5 Freshwater Fisheries

Commercial, recreational, and Indigenous fisheries activities may occur near or within the RAA. There is potential for commercial freshwater fisheries for American eel and rainbow smelt. Species potentially fished recreationally or under communal Food, Social or Ceremonial (FSC) licences, as issued by DFO, within the RAA include American eel, Arctic char, Atlantic salmon, ouananiche, brook trout and rainbow smelt.

Freshwater Commercial Fisheries

The province of NL is not reported in the Freshwater Commercial Fisheries Landings data maintained by DFO (DFO, 2023), however, commercial fisheries data for Atlantic salmon, rainbow smelt, and American eel, are reported in the Seafisheries Commercial Landings data (DFO, 2022). No commercial Atlantic salmon and rainbow smelt fisheries landings (quantity or value) were reported for Newfoundland from 2014 to 2021 (DFO, 2022a). Rainbow smelt are not under moratorium in Newfoundland, however, there are no new commercial licences available and previously issued commercial smelt licences are site

specific (DFO, 2024). Commercial smelt fishing has the potential to occur near the RAA if a licence condition allows it. There has been no commercial salmon fishing in Newfoundland since the 1992 moratorium with all commercial fisheries closed due to declines in stock abundance (DFO, 2020).

The American eel fishery is primarily targeted at both the yellow and silver eel life stages (DFO, 2023a). Commercial American eel fisheries in NL reported relatively small and variable landings between 2014 and 2021, ranging from 22 MT (2019) to 53 MT (2018), over the period from 2014 to 2019, averaging 36.5 MT. The commercial eel fishery did not meet the confidentiality requirements in 2020 and 2021, and no landings were reported (DFO, 2022a). American eel landings have decreased considerably since peak harvests in the early 1990s (e.g., 147 MT in 1990, NLDEC, 2010). Commercial American eel fisheries are generally concentrated at the mouths of rivers. The opening dates for the commercial eel fishery in 2022 were July 1 (eel pot) and August 15 (fyke nets), with a closing date of October 31 (DFO, 2022b). No new commercial eel licences are being issued (DFO, 2024); consequently, the number of licences has decreased.

It is not expected that commercial freshwater fisheries will occur at a significant level within the RAA. There is a moratorium on commercial fishing for Atlantic salmon and it is unlikely that moratorium would ever be lifted. Rainbow smelt are not represented in the commercial freshwater or marine fisheries landings for NL. American eel has been included in the province's commercial marine fishery landings over the last few decades. A total of 154 commercial eel licences were issued in 2009 of which only 40 licensed fishermen reported sales, with most reported landings from NAFO Division 4R (NLDEC, 2012). No new commercial licenses are being issued for eels.

Freshwater Indigenous Fisheries

Licenses for Indigenous fisheries for FSC purposes are issued by DFO under the Aboriginal Communal Fishing Licences Regulations. This type of licence allows the licence holder to catch what is needed for themselves and/or their community for FSC purposes (DFO, 2022c). A communal FSC licence allows Indigenous harvesters the right to fish for FSC purposes over all other fishery uses, and it takes priority after conservation purposes (DFO, 2022d). The restrictions for fish species and size, along with the locations fished, are specified in the licence conditions.

No established First Nation is located within the RAA. The Miawpukek First Nation and the Qalipu Mi’kmaq First Nation are located in insular Newfoundland. The Miawpukek (Miawpukek Mi’kamawey Mawi’omi) community is the closest First Nation group to the RAA. The Samiajij Miawpukek reserve is located in Conne River, adjacent to Bay d’Espoir on the south coast of the island of Newfoundland, and they hold a FSC for various species. Miawpukek First Nation holds a FSC communal salmon fishing licence but has opted not to harvest salmon under this licence since 1997 due to conservation concerns (DFO, 2022d). Indigenous fishers also have access to salmon for FSC purposes through the recreational fishery (DFO, 2020).

The Miawpukek First Nation has a FSC license for Atlantic salmon and American eel and these species are known to occur in the RAA. It is, however, unlikely that a substantial Indigenous fishery would occur within the RAA given the distance from the Samiajij Miawpukek reserve in Conne River, which is situated approximately 140km northwest of the RAA.

Freshwater Recreational Fisheries

The freshwater recreational fishery in NL is governed through the federal **Fisheries Act** and its regulations (**Fishery (General) Regulations** and the **Newfoundland and Labrador Fishery Regulations**) and the **NL Wild Life Act** and its' associated regulations. DFO is responsible for the management of Atlantic salmon fisheries in NL, while the provincial Department of Fisheries, Forestry and Agriculture (formerly Fisheries and Land Resources, Wildlife Division), is responsible for the issuance of licences for inland fisheries (DFO, 2020). Atlantic salmon licenses are required for residents and non-residents in NL, while trout and other recreational fish licenses are only required for non-residents. The regulations govern daily and yearly quotas, possession limits, and length limit for species fished in inland and tidal waters.

No outfitters are located within the RAA (Gov. NL, n.d.). Recreational license holders would have access to scheduled salmon rivers within and near the RAA. Four scheduled salmon rivers, listed on Schedule 1 of the Newfoundland and Labrador Fishery Regulations, are found within the RAA (Table 3.1.2-5). American eels are also fished recreationally (NLDEC, 2010; DFO, 2023a); however, in 2011, all licenses were within the Bay St. George/Port aux Port Bay area (NLDEC, 2012). No new recreational eel licences are being issued (DFO, 2024), consequently the number of licences has decreased over time.

Recreational fisheries take place in the RAA for Atlantic salmon, brook (speckled) trout, Arctic char, rainbow smelt, ouananiche (landlocked Atlantic salmon) and other species. The entire island of Newfoundland is in Trout Angling Zone 1, which includes the RAA, which regulates fishing for brook trout, brown trout, rainbow trout, rainbow smelt, and ouananiche. The recreational fishery for Atlantic salmon is managed through a system of scheduled salmon rivers and Salmon Fishing Areas (SFAs) with angling requirements (e.g. fly fishing only, barbless hooks, catch and release) specified for each scheduled river.

Scheduled salmon rivers found in the RAA within SFA 10 include Northeast River (Placentia) up to the southern half of Big Gull Pond (unscheduled pond) and the entire length of Southeast River (Placentia) and Great Barasway. Portions of the upper watershed of the Little Salmonier River, St. Mary's Bay (SFA 9) are also included in the RAA. Part of the Northeast River watershed is within the LAA, specifically the Project Interconnect Line corridor to Long Harbour. A considerable section of the Project Interconnect Line is adjacent to the Northeast River (Placentia), with the Route100 as a physical barrier. Although proposed infrastructure may be located in the vicinity of this scheduled river and cross paths with the Northeast River's tributary system, none of the proposed project components are planned to cross the main channel.

Each scheduled salmon river in the RAA is Class 2 and has a salmon retention limit of one fish and a catch-and-release limit of three fish per season (Table 3.1.2-5) (DFO, 2023b).

Table 3.1.2-5 Scheduled Salmon Rivers within the RAA

Salmon Scheduled Rivers	SFA	Class
Northeast River, Placentia	10	2
Southeast (South East) River (Placentia) and tributary streams	10	2
Great Barasway	10	2
Little Salmonier River, St. Mary's Bay	9	2
Source: Anglers' Guide 2023-2024 (DFO, 2023b)		

Table 3.1.2-6 provides a summary of the catches of Atlantic salmon in the recreational fishery from 2010 to 2016. The total salmon counts for Northeast River for 2022 and 2023 were considerably lower than the yearly average from pre-moratorium of 1984 to 2021.

Table 3.1.2-6 Number of Small (<63 cm) and Large (≥63 cm) Atlantic Salmon Retained (Ret.) and Released (Rel.) on Scheduled Salmon Rivers in SFA 10 in 2010 to 2016.

Scheduled Salmon River	Small Salmon		Large Salmon		Total Salmon		
	Ret.	Rel.	Ret.	Rel.	Ret.	Rel.	Total
Great Barasway	5	4	0	1	5	5	10
Southeast River	91	119	0	32	91	151	242
Northeast River	131	130	0	19	131	148	280

The only DFO fishway in the RAA is on the Northeast River and Table 3.1.2-7 summarizes the salmon count passing through this fishway, including the average count before and after the salmon moratorium of 1992. The count in 2021, 2022 and 2023 averaged 457 fish, which is lower than the average since the moratorium as well as pre-moratorium, however, DFO considers the salmon stock as healthy (DFO, 2022e).

Table 3.1.2-7 Salmon Fishway Counts for Northeast River.

Total/Average Salmon					
2023 (Total)	2022 (Total)	2021 (Total)	2016-2021 (Average)	Moratorium 1992-2021 (Average)	Pre-Moratorium 1984-1991 (Average)
383	425	563	558	689	520
Source: Atlantic Salmon Fishway Counts (DFO, 2023c).					

The prevailing recreational species captured in freshwater in NL was brook trout according to the 2015 Survey of Recreational Fishing in Canada (DFO, 2019). The recreational fishery for brook trout in NL has continually produced some of the highest resident participation rates, on a per capita basis, of any similar fisheries in Canada (Clarke and Perry, 2014). Residents do not require a license to participate in the recreational fishery, consequently data are not collected on recreational catches.

It is expected that recreational freshwater fisheries will continue to occur at a significant level within the RAA. Recreational fishing is mainly focussed on brook trout, and to a lesser extent, on ouananiche and rainbow smelt, while anadromous Atlantic salmon are fished in the four scheduled salmon rivers. Recreational fishing for American eel has the potential to occur in the RAA although no more new licences are being issued.

3.1.2.6 Freshwater Sensitive Time Periods and Working Windows

This section summarizes the sensitive times of the year that fish populations are likely to be present and potentially vulnerable in the Project Area. Periods associated with important life history events (e.g. migrations, spawning and nursery) of brook trout, threespine stickleback, Atlantic salmon, both anadromous populations and ouananiche, and American eel are provided in Table 3.1.2-8. These species are considered important owing to their likely presence in the RAA based on baseline study results and professional opinion.

Catadromous (e.g., American eel) and anadromous (e.g., Atlantic salmon, brook trout, threespine stickleback) forms of fish have more extensive migration patterns than freshwater resident populations. Sexually mature catadromous American eels undergo downstream migration from mid-August to mid-October. Young American eels migrate upstream from early June to mid-August, with August being the peak for migratory events. Anadromous Atlantic salmon and brook trout migration patterns extend from May to September, with a concentration of downstream migration in the spring (May and June) and upstream migration in summer and early fall (July to September). Threespine stickleback has an upstream spawning migration in the spring (May and June) and downstream migration throughout the fall (September and October). Migratory activities between both environments (freshwater and marine) can occur throughout the year, however, peak downstream migration of brook trout typically occurs in May or June, while upstream spawning migrations for both forms occur in July (O'Connell, 1982). Ouananiche and resident brook trout have a relatively limited migration compared to anadromous forms; they usually intensify their movement upstream before spawning. Ouananiche migration occurs throughout the summer and fall, with a high occurrence the two months before the peak of spawning (October).

Table 3.1.2-8 Summary of Sensitive Time Associated with Freshwater Fish Species of Interest in the Regional Assessment Area.

Species	Life History Sensitive Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Peak Activity
Freshwater Environment														10
Brook trout (anadromous and landlocked)	Migrating	1	1	1	2	7	7	8	10	8	1	1	1	9
	Spawning	0	0	0	0	0	0	0	1	5	10	5	0	8
	Incubation, Hatching	2	3	4	10	10	7	0	0	0	0	0	2	7
Threespine stickleback (anadromous and landlocked)	Migrating	0	0	0	1	10	10	1	2	8	7	1	0	6
	Spawning	0	0	0	0	1	10	10	1	0	0	0	0	5
	Egg incubation, Hatching	0	0	0	0	0	3	8	7	3	0	0	0	4
Atlantic salmon (anadromous)	Migrating	0	0	0	1	10	10	9	9	8	0	4	4	3
	Spawning	0	0	0	0	0	0	0	0	1	10	10	1	2
	Incubation, Hatching	3	3	3	10	8	1	0	0	0	0	2	3	1
Atlantic salmon (Ouananiche)	Migrating	0	0	0	0	0	0	1	5	5	4	3	3	0
	Spawning	0	0	0	0	0	0	0	0	5	10	7	0	
	Incubation, Hatching	1	1	1	10	10	7	1	0	0	0	1	1	
American eel (Catadromous)	Migrating	0	0	0	0	1	7	8	10	8	5	1	0	

American eel spawn in the open ocean (Sargasso Sea), while for both forms (anadromous and landlocked) of brook trout and Atlantic salmon spawning events occur in the fall and peak in October. Anadromous and landlocked threespine stickleback spawn between June and July.

Brook trout and Atlantic salmon eggs incubate over winter in streams or lakes and hatch in the spring (April and May), while threespine stickleback egg incubation lasts less than 40 days and hatching occurs in summertime.

The Argentia Backlands streams and waterbodies potentially provide migratory, spawning, nursery, rearing, and feeding habitats for these four species of fish. Brook trout and ouananiche in these streams and waterbodies are likely resident and are not from anadromous stock. The Project's freshwater components will interact with 13 stream crossings, two waterbodies (bogs), and one potential water supply pond (Gull Pond). Stream crossings are expected to be affected the most during the Construction Phase (e.g., temporary watercourse perturbations including erosion, deposition of fines, addition of culverts, fording during Project Interconnect Line installation), while the Operation and Maintenance Phase and Decommissioning and Rehabilitation Phase are expected to have lesser effect (e.g. transportation, maintenance).

Brook trout and ouananiche migration and spawning are particularly important considering their confirmed presence during baseline studies. Habitat alteration of salmon and trout streams, including near pond's outlets and shorelines, should be avoided during the spawning period (September 1- November 30). Perturbation of trout, salmon, and eel migrations at stream crossings during spring and summer should also be avoided from May to September. Threespine stickleback most often migrate and spawn in the spring and summer so a similar avoidance period (May - September) should be considered. DFO recommends not carrying out in-water work in tributaries and headwaters of rivers on the island of Newfoundland from October 1 to May 31 (spawning, incubating and hatching period). It is therefore likely that most instream work will be conducted between May 31 and September 1 and mitigation measures (e.g., such as a fish relocation plan), may need to be implemented during this period to minimize interference with fish migration and rearing.

3.1.2.7 Freshwater Conservation Concern

Freshwater Species at Risk and/or Species of Conservation Concern

Species listed under the **Species at Risk Act** (SARA) Schedule 1 are legally protected under Section 32(1), which states; "no person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, and endangered species, or a threatened species." SARA species are ranked as extirpated, endangered, threatened and of special concern. Prohibitions of NL ESA, 2002, Section 16, states; "a person shall not disturb, harass, injure, or kill an individual of a species designated

as threatened, endangered or extirpated." The NL ESA designates species as extirpated, threatened, endangered, vulnerable, data deficient, or not at risk.

Information used to characterize the species of interest in the RAA and LAA. included publicly available literature and information provided by the Atlantic Canada Conservation Data Centre (AC CDC). A request for information from the AC CDC was made in 2023 for the Project Area and up to 5 km surrounding the Argentia Backlands. Supporting documentation also included Committee on the Status of Endangered Wildlife in Canada (COSEWIC) reports.

Two aquatic species have been designated by COSEWIC, or under SARA and/or NL ESA, that may occur in the RAA, include American eel and Atlantic salmon (South NL population) (Table 3.1.2-9). Banded killifish, Atlantic sturgeon and mummichog also have designation under these conservation legislations (Table 3.1.2-9), however, their occurrence within the RAA is extremely unlikely. The South Newfoundland population of Atlantic salmon are anadromous species, and their freshwater habitats provide spawning, nursery, rearing and migratory routes, while marine waters provide feeding, additional rearing and migratory corridor for maturation (COSEWIC, 2010). A key limiting factor for the Atlantic salmon population is the accessibility to migratory corridors while other threats include poor freshwater and marine survival, climate change, interception in other fisheries, poaching, migration barriers, land use practices, and many others (COSEWIC, 2010). The presence of Atlantic salmon in the RAA is expected in marine/coastal areas and freshwater scheduled salmon rivers. The baseline study for this Project showed the presence of landlocked salmon in two stream crossings in the Argentia Backlands of the Project Area (Appendix B1).

The American eel is part of a panmictic stock, meaning that individuals from the entire range for the species come together to reproduce as a single breeding population (Atlantic States Marine Fisheries Commission (ASMFC, n.d.). This catadromous species migrates downstream in late summer or autumn to marine waters and undertakes an extensive migration to the Sargasso Sea to spawn (COSEWIC, 2012). Glass eels (young eels) drift toward the continental shelf to eventually proceed into inshore waters and some young eels migrate upstream to freshwater habitats, while others remain in brackish or salt waters (COSEWIC, 2012). A key limiting factor for the American eel is the accessibility to migratory corridors while other threats include changing oceanic and regional coastal currents, climate change, migration barriers, hydroelectric dams and turbines, poor water quality, contamination, and interception in other fisheries (COSEWIC, 2010). American eel has the potential to occur within the LAA, particularly in the lower reaches of streams that are interconnected to the shore.

Table 3.1.2-9 Aquatic Species at Risk and/or Species of Conservation Concern.

Common Name	*Species Name*	IUCN Red List[1]	COSEWIC Status	SARA Status	NL ESA Status	Occurrence in LAA
Atlantic Salmon (South Newfoundland Pop.)	*Salmo salar*	Near Threatened	Threatened	Not Listed*	Not Listed	Occasional
American Eel	*Anguilla rostrata*	Endangered	Threatened	Not Listed*	Vulnerable	Occasional
Banded Killifish (Newfoundland Pop.)	*Fundulus diaphanus*	Least Concern	Special Concern	Special Concern	Vulnerable	Rare/None
Atlantic Sturgeon (Maritimes Pop.)	*Acipenser oxyrinchus*	Vulnerable	Threatened	Not Listed*	Not Listed	Rare/None
Mummichog	*Fundulus heteroclitus*	Least Concern	Not Listed	Not Listed	Vulnerable	Rare/None

Sources: IUCN websites (2024), COSEWIC website (2023); DFO (2019); NL ESA (2002); SARA websites (2024); LGL (2019).

Notes: 'NL' = Newfoundland and Labrador. 'Pop.' = population(s), 'Not Listed*' = Represent species not on the Species at Risk Acts (SARA) list, although under consideration for addition in Schedule 1 of SARA;

1' = IUCN Red List referred to the global specie, if not specified

Freshwater Habitats of Conservation Concern

No critical habitats (as defined by SARA or NL ESA) for these species were identified in the RAA.

Spawning habitats are important for reproduction and recruitment for salmonid populations and spawning locations and suitable spawning substrates are considered potentially limiting to fish production. No discrete spawning habitats were documented during the baseline survey in 2023. Riffles and runs accounted for 14% and 13% of the habitats surveyed, respectively, while gravels accounted for 8% of the substrate types. It is likely that in small streams like those that occur in the Argentia Backlands spawning habitats/substrates would be distributed in patches rather than as discrete reaches.

Spawning areas would also be important for maintaining salmon populations in the four scheduled salmon rivers in the RAA. Porter (1975) documented considerable evidence of spawning in these rivers, such as redds (i.e. sites selected by females for laying eggs). However, the geographical location of the spawning activity was not provided. Vale Newfoundland and Labrador Ltd. created large reaches of spawning habitat on the Northeast River, in the Placentia Junction, Fitzgerald's Pond and Northeast Arm reaches, as compensation for habitat losses related to the Long Harbour Commercial Nickel Processing Plant.

3.1.2.8 Marine Environment Introduction

The marine fish and fish habitat characteristics of the LAA and RAA are discussed in this section to consider potential interactions with the marine footprint of the Project. The marine component of the LAA is in Placentia Bay, which is part of the Placentia Bay/Grand Banks (PBGB) Large Oceans Management Area (LOMA) Integrated Management Plan (DFO, 2012; DFO, 2012a). The PBGB LOMA, now known as the PBGB Integrated Management Area (PBGB IMA) is a large management area of approximately 550,000 km^2. Placentia Bay is one of the two coastal management areas present in the PBGB LOMA, the other being the Coast of Bays (DFO, 2012a). Placentia Bay is home to various living organisms and communities forming complex trophic levels and food webs from primary producers to apex predators.

3.1.2.9 Marine Geology and Geomorphology

The following section will discuss the Placentia Bay marine geology, geomorphology, and to an extent, the geology associated with the marine components of the RAA and LAA.

Placentia Bay is located on the south coast of the island of Newfoundland and is bounded on the west by the Burin Peninsula, on the east by the Avalon Peninsula and to the north by the isthmus of Avalon. Placentia Bay stretches over 125 kilometres in a southwest-northeast direction, with the mouth of the bay approximately 145 km wide, covering an approximate area of 5,000 square kilometres. The Bay is characterized by well-defined channels that can reach water depths of 430 m, and by islands, shoals, reefs and banks, with an overall average depth of 125 m. At Argentia, depths to the northeast are in the 10 to 18 m range and within approximately 2 km of the shore to the east, depths are approximately 20 m, while

within approximately 5 km depths exceed 100 m. The seabed surrounding the Argentia area and the LAA is considered relatively shallow (<20 m) (Navionics, n.d.).

The lack of a sill at the mouth of Placentia Bay allows for the unrestricted exchange of water from the Atlantic Ocean into the outer bay, while three main islands restrict the water exchange between the inner and outer bays (MacIsaac *et al*., 2023). Placentia Bay is a glacially modified basin that has a complex glacial history, having been affected by ice draining from both the Burin and Avalon Peninsulas, and the seabed of the Placentia Bay shows some remarkable topography. The underlying bedrock is a combination of Late Proterozoic submarine and non-marine volcanic and sedimentary rocks (Shaw *et al*., 2015). Seabed features on the eastern side of Placentia Bay include landforms indicative of glacially modified terrain including drumlins and mega-flutes are common. Seafloor surficial sediments vary from coarse-grained glacial deposits in the nearshore to fine-grained sediments near the centre of the bay. Most sediments on the eastern part of the bay and the upper channels contain thick sediments from the Quaternary, with glaciomarine sediments that have been then overlayed by postglacial mud.

Placentia Bay has an irregular coastline, containing many smaller bays, inlets, a combination of small and large islands, rocky headlands and platforms, and many sand gravel flat beaches. The Bay falls within DFO's Coastal Management Area due to its heavy use by recreational, commercial, and even industrial traffic (DFO, 2012). Placentia Bay is separated into an inner bay and an outer bay, with the inner bay which containing three large islands: Red Island, Long Island and Merasheen Island. These islands divide the inner bay into three north-trending channels, the Western, Central and Eastern channels, which combine in the middle of the Bay. The Eastern Channel is the most extensively used in the area as the main shipping lane (DFO, 2012).

Argentia Harbour comprises two basins, the inner Argentia Harbour basin and the outer Argentia Harbour basin. These basins reach maximum water depths of 30 and 58 m, respectively, and are separated by a shoal, with a minimum water depth of approximately 15 m, that extends eastward into the harbour (Husky Energy, 2012). Glacial sediments of the shoal are overlain by a mid-Holocene wave-formed spit composed of pebble-cobble gravel, and the spit has been dredged to a water depth of approximately 8.5 m. The seabed surrounding the Argentia Peninsula was further modified in the late 1990s by dredging, spoil dumping, cable-laying and anchor dragging. A variety of anthropogenic material and debris has also been placed or deposited on the seabed since World War II, associated with the military base on the Argentia Peninsula, including wharves, piers, seaplane slipways and ammunition handling berths.

The shores of Placentia Bay have been primarily shaped by extensive wind and waves from weather systems, and by the seasonal ice cover (MacIsacc *et al*., 2023). Landforms along the coastline fall into five different categories:

1. Flats with mostly sand to gravel flatlands which tend to be wide and have low relief;
2. Steep shallow beaches of gravel to boulder size;
3. Sandy bars connecting smaller islands (called tombolos);
4. Lagoons; and
5. Estuaries.

3.1.2.10 Physical Oceanography

The following sections provide an overview of relevant aspects of the physical oceanography in Placentia Bay and the RAA. Much of the material in this section is taken from MacIsaac *et al.* (2023), LGL (2018) and references within, and Husky Energy (2012) and references within.

Tides

Table 3.1.2-10 shows the tides reported by the Canadian Hydrography Service (CHS, 2022) for Station 0835 (Argentia Harbour), in the LAA and RAA. Station 0815 (at the head of the bay at Come by Chance), and Station 0760 (Burin on the southwest coast of Placentia Bay) (MacIsaac *et al*., 2023). Tides within Placentia Bay are semi-diurnal, meaning there are two high tides and two low tides each lunar day. The mean tidal range reported by the Canadian Hydrographic Services was 1.5 to 1.6 m. The tidal signal generally propagates from northeast to southwest, taking approximately a quarter-hour to traverse the bay.

Table 3.1.2-10 Summary of Tidal Range (Canadian Hydrographic Services, 2022)

Station	Mean Water Level (m)	Range	
		Mean Tide	Large Tide
0835 Argentia	1.4	1.6	2.7
0815 Come By Chance	1.4	1.6	2.4
0760 Burin	1.2	1.5	2.3

Currents

Circulation in Placentia Bay is a general cyclonic circulation during spring and summer, with waters entering by the eastern shore and leaving by the western shore, forming a counterclockwise open gyre in the bay, mostly during the period from April to June (Husky Energy, 2012). These surface circulation patterns and speeds are primarily affected by local wind patterns. The prominent southwest winds during much of the year account for the counterclockwise near-surface currents (MacIsaac *et al*., 2023). There is

seasonality in the general circulation pattern, with stronger inshore currents present during fall and weaker currents present during spring and summer.

Currents are observed to be the fastest at the Placentia Bay mouth, averaging 19 cm/s in June and July to 29 cm/s in November with upper limit speeds ranging from 135 cm/s in February to 178 cm/s in November. Mean surface currents at the Pilot Boarding Station (PBS), located near Argentia Peninsula and nearest to the RAA, were approximately 22 cm/s with an upper limit of 33 cm/s in December and 48 cm/s in September (MacIsaac *et al*., 2023). Current speeds were significantly reduced in the inner parts of the bay. Surface current speeds at Come by Chance were significantly lower with 8 cm/sec for majority of the year with an upper limit ranging from 11 cm/s in July to 23 cm/s in September (MacIsaac *et al*., 2023).

Placentia Bay experiences a predominantly southwest to west flow of air mass throughout the year. West to northwest winds, prevalent during the winter, shift to counterclockwise during March and April, resulting in a predominant southwest wind by summer. Winds shift slightly as autumn approaches, becoming predominantly westerly again by late fall and into winter. Mean wind speeds tend to be at their lowest during summer months and highest during the tropical cyclone season. Seasonal average and maximum average wind speeds for Placentia Bay are provided in Table 3.1.2-11.

Table 3.1.2-11 Seasonal and Maximum Average Wind Speeds in Placentia Bay (LGL, 2018).

Season	Average Wind Speed		Maximum Average Wind Speed	
	m/s	km/hr	m/s	km/hr
Spring	8 – 9	29 – 32	27.5 – 30	99 – 108
Summer	6 – 7	22 – 25	25 – 27.5	90 – 99
Fall	8 – 9	29 – 32	30 – 32.5	108 – 117
Winter	10 – 11	36 – 40	25 – 27.5	90 – 99

The upper portion of Placentia Bay, particularly from Rushoon on the Burin Peninsula to near Placentia on the Avalon Peninsula is susceptible to frequent storm surges and seiches due to the bay's wedge-shaped geometry and large islands at the head of the bay (Husky Energy, 2012). Storm surges associated with very low-pressure storm systems passing through the region and strong winds blowing over the water surface results in high water levels that can cause severe flooding for low-lying coastal regions. The Town of Placentia is considered to have a high hazard (medium frequency, high severity) for storm surge risk, in part due to its low elevation (Husky Energy, 2012).

Southeastern Newfoundland is located along the major storm track route and can experience storms including hurricanes and tropical storms between August and October. Cyclones move over colder waters and transform into fast-moving extra-tropical cyclones, producing large waves and hurricane force winds. The most intense storms generally approach from the south, feeding off the contrasting temperatures of

the Labrador Current and Gulf Stream. Fifty-three tropical storms have passed through the Placentia Bay region between 1961 and 2015, five of which were Category 1, two were Category 2 and one was Category 3.

Wave heights in Placentia Bay are lowest in the spring and summer, and largest in winter. Waves are most frequently from the southwest and this is true for all months of the year near Red Island and for the mouth of Placentia Bay. Minimum monthly mean wave heights range from 0.2 m in June and July to 1.3 m from May through August at the mouth of Placentia Bay. Monthly means from April through September are 1.0 m or less near Red Island. Maximum monthly mean wave heights range from 1.6 m in December near Red Island to 2.4 m, also in December, at the mouth of Placentia Bay. Maximum wave heights range from 4.2 m in June to 8.2 m in March near Red Island. Wave conditions in Argentia Harbour, due to its sheltered location, would be considerably less than the open water Red Island values.

Placentia Bay shows a marked seasonal cycle with a strong stratification during the summer, with relatively warm and fresh water standing above colder and saltier waters, a more mixed system in fall and an almost completely mixed water column during the winter and spring (Husky Energy, 2012). The summer period also shows a marked intrusion of deep and salty water entering in the bay and present from June through October. The mean salinity average per month is consistent and measured at approximately 32 psu. Salinity measures during the 2023 Baseline, ranged from 30.06 and 32.10 psu, with a slight variation due to surface water runoff from Argentia Peninsula (Appendix B1). Saltier water is denser and is near the bottom in the water column. This layer is more consistent all year but can extend higher up the water column in the fall, which correlates to a period of mixing within the entire water column. The mixing continues into the winter months (January to May) when the water column will have a near uniform salinity of 31 psu (MacIsaac *et al*., 2023).

The water column in outer Placentia Bay is relatively mixed and uniform in the winter and spring before a strong thermocline forms during summer. The thermocline can persist from June to October with a mean monthly temperature range of 10 – 14°C that generally penetrates to 20 m. The water column is highly mixed from the end of December until May, with a mean monthly temperature of 2°C from the surface to 140 m and near zero below that (Stantec, 2012). Baseline data from 2023 in Argentia Harbour also demonstrated a thermocline in the water column from August through the end of November, with a similar temperature range (Appendix B1). The temperature of the water column at two marine stations ranged from well mixed (17.9°C to 4.4°C) in the last week of August to relatively uniform (5.5°C to 4.5°C) in the second week of December.

Marine Geophysical Considerations

Sea ice is present in southeastern Newfoundland from late winter and early spring, right before or during iceberg season. Pack ice presence in Placentia Bay is variable from year to year and most sea ice within

the bay is formed off southern Labrador and drifts south to enter the bay mid-February. Ice can be present in Placentia Bay between mid-February until mid-April, however, the bay is generally not completely covered by ice. Most of the ice is considered new ice, where the thickness is less than 10 cm, but there are some areas that can be 15 cm or more, while pack ice can range in thickness from 30 to 120 cm (LGL, 2007). Argentia Harbour is considered an ice-free, your-round access, however, sea ice might be present to an extent in the marine and coastal areas of the LAA and RAA between February and April.

Placentia Bay records show low iceberg numbers due to the southern location, warmer temperatures, orientation, and circulation of the bay (Colbourne *et al*., 2016). Icebergs were recorded in Placentia Bay in seven of the 30 years between 1974 and 2003 and a total of 30 icebergs were recorded in this period (Husky Energy, 2012).

Catto et al. (1999) have defined five regions in Placentia Bay based on shoreline biological communities and two of these regions, the Cape Shore (Cape St. Mary's to northern tip of the Argentia peninsula) and Northeast Placentia Bay (Argentia Harbour to North Harbour), are within the RAA.

The Cape Shore is dominated by northward-flowing ocean currents, which occasionally carry pack ice into the bay. Summer sea temperatures remain relatively low throughout July and August, and winds are usually oriented onshore, especially during spring and summer. The shorelines are subjected to heavy surf, especially in smaller coves with shallow water depths. Fog is pervasive and has a major influence on shore biology. The coastline is mostly erosional in nature in most areas, with erosion occurring slowly along bedrock shores and rapidly along raised glacio-marine terraces. Some of these shorelines contain substantial proportions of sand and silt, and clay is present in offshore areas. Seawater clarity is reduced by surf-suspended sediment. Erosion of this type of material is a controlling factor for many biological communities. This region has the lowest biological diversity within Placentia Bay, but productivity is high, due to the high concentrations of nutrients carried by upwelling waters off Cape St. Mary's.

Northeast Placentia Bay has similar north-flowing currents, but the shores are much more protected from surf and ice erosion by the highly convoluted and indented nature of the coast, with many shoals, headlands and small islands. Pack ice which can be carried northwards into the outer part of Placentia Bay but seldom is transported north of Argentia. The diversity of species is higher than in the Cape Shore region but is still relatively low. Zonation of perennial species occurs within protected habitats, such as embayments and sheltered coves. Productivity is relatively high due to nutrients and phytoplankton carried into the region but is less than in the Cape Shore region.

Catto et al. (1999) have identified the major controlling factors for biological productivity and communities in Placentia Bay as: pack ice scour, landfast ice, substrate size, fog, temperature, seawater chemistry, and anthropogenic effects. These would be in addition to the major influence of tides, winds, waves, and water currents. Anthropogenic effects can include sewage and fish wastes, and construction of wharves,

breakwaters, causeways, roads, and garbage disposal areas all which alienate numerous shores. Fishing activities can have a major effect on shorelines, as well as on the species directly fished. Placentia Bay has several major industrial sites including the Come-by-Chance oil refinery, the Marystown shipyard, the former phosphorus plant in Long Harbour, and the former Argentia Naval Base. Aquaculture is becoming a major industry in the bay with potential for adverse anthropogenic effects.

Dispersion Study

A dispersion study using near-field modeling was conducted to evaluate the marine effluent discharge in Argentia Harbour (Appendix B2). The study assessed whether the concentration of parameters of potential concern adhere to the ambient seawater quality standards as outlined by the Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines (CEQG) at the periphery of the mixing zone (CCME CEQG, 2003.).

The near-field modeling used a 3D dilution mixing model to determine the mixing zone of parameters of potential concern (i.e. temperature and salinity) from the sub-surface marine effluent. According to the ambient seawater quality standards as outlined by the CCME CEQG at the periphery of the mixing zone (CCME CEQG, 2003.), an effluent mixing zone reaching a temperature difference of 1°C and Salinity change of 10% from the ambient seawater would comply with the guidelines.

Ambient condition data obtained during the marine baseline study (i.e., CTD and temperature profiling; Appendix B1 and B2), along with predicted effluent discharge parameters and historical oceanographic data, were incorporated into the near-field modeling. The dilution mixing model was comprised of a conservative current speed (5 cm/s) based on historical data from the four moorings currents on the East coast of Placentia Bay. Four scenarios were considered for the near-field modeling (i.e. summer conditions with and without currents and winter conditions with and without currents). Thus, four simulations were created.

The marine water quality guidelines established by CCME for temperature and salinity were consistently met at close proximity to the discharge source across all examined scenarios. The key findings from the simulations are summarized as follows:

1) Summer Scenario without Current:
    - Temperature change reduced to below 1°C within 7 seconds, at a distance of 1.20 m from the source.
    - Salinity change reduced to below 10% of the ambient value (31.2 PSU) within 9 seconds, at a distance of 1.53 m from the source.
    - Upon surfacing, ambient temperature and salinity changes were 0.15°C and 0.59 PSU, respectively, equivalent to 1.88% of the ambient salinity.
2) Summer Scenario with Current:

- Temperature change reduced to below 1°C within 5 seconds, at a distance of 0.77 m from the source.
- Salinity change reduced to below 10% of the ambient value (31.2 PSU) within 6 seconds, at a distance of 0.90 m from the source.
- Upon surfacing, ambient temperature and salinity changes were 0.05°C and 0.21 PSU, respectively, equivalent to 0.68% of the ambient salinity.

3) Winter Scenario without Current:

- Temperature change reduced to below 1°C within 12 seconds, at a distance of 2.04 m from the source.
- Salinity change reduced to below 10% of the ambient value (32.0 PSU) within 8 seconds, at a distance of 1.39 m from the source.
- Upon surfacing, ambient temperature and salinity changes were 0.28°C and 0.58 PSU, respectively, equivalent to 1.83% of the ambient salinity.

4) Winter Scenario with Current:

- Temperature change reduced to below 1°C within 8 seconds, at a distance of 1.19 m from the source.
- Salinity change reduced to below 10% of the ambient value (32.0 PSU) within 6 seconds, at a distance of 0.91 m from the source.
- Upon surfacing, ambient temperature and salinity changes were 0.10°C and 0.22 PSU, respectively, equivalent to 0.68% of the ambient salinity.

The scenario presented the greatest challenge for mixing and dispersion occurred under winter ambient conditions without current, where the temperature guideline was met at a distance of 2.04 m from the source, and the salinity guideline was met at 1.39 m from the source.

3.1.2.11 Marine Water Quality

The following section presents an overview of the water quality that was assessed during the 2023 marine baseline at two stations (i.e. marine station 1-MS1 and marine station 2-MS2). The averages of subsurface and mid-water column samples were similar between the two marine stations MS1 and MS2 in the summer of 2023 (Appendix B1).

Within Argentia Harbour, mean TOC ranged from 0.90 mg/L (MS1) to 1.3 mg/L (MS2), and mean TSS from 5.0 mg/L (MS1) to 4.4 mg/L (MS2). Average pH was near neutral at both sites with values at MS1 and MS2 calculated as 7.82 and 7.85, respectively. Mean turbidity had a narrow range of 0.19 NTU (MS1) to 0.14 NTU (MS2). Ammonia was not detected at MS1, however, it was measured at MS2-WS3 (0.085 mg/L), while the sum of nitrate + nitrite was not detected at MS2, however, it was detected at MS1-WS5 (0.06 mg/L).

Mean chlorophyll ‘a’ was comparable between sites and ranged from 0.93 µg/L (MS1) to 1.16 µg/L (MS2) (acidification), and from 0.68 µg/L (MS1) to 0.76 µg/L (non-acidification) (MS2). Chlorophyll ‘a’

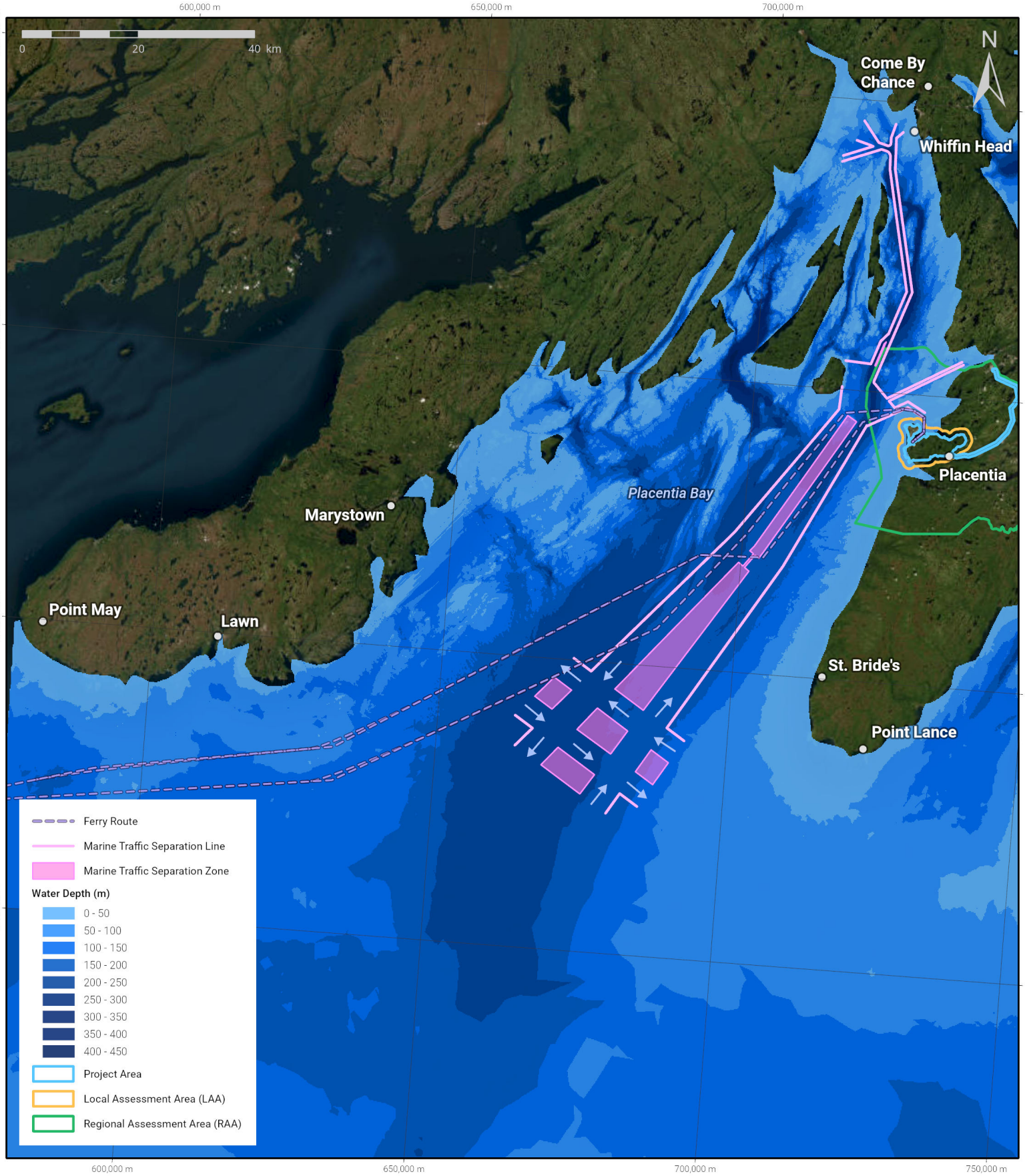
concentration at the subsurface in both stations was higher than the mid water and near bottom samples. Secchi depth was measured at 3.5 m for MS1 and 4 m for MS2.

3.1.2.12 Marine Navigation

The following section presents an overview of marine navigation in Placentia Bay, and within the RAA and LAA. Marine routes and marine traffic density in Placentia Bay and RAA are discussed below, followed by a projection for the Argentia Harbour marine traffic.

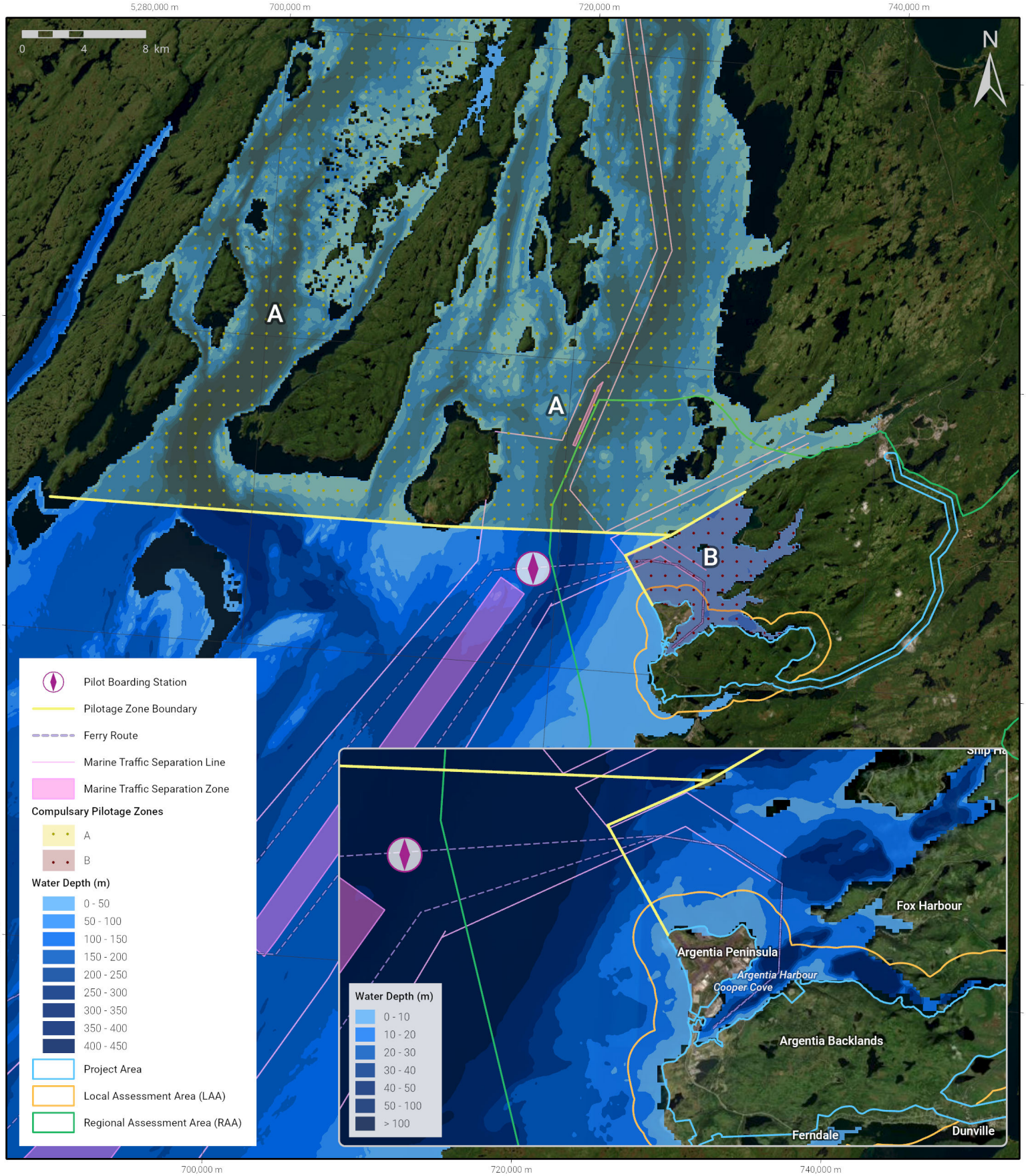
The main shipping lanes in Placentia Bay are represented by two-way routes that pass through the deep water of the Eastern Channel between Long Island and the Avalon Peninsula (Figure 3.1.2-11). Vessels more than 20 m in length entering the bay must report to the Canadian Coast Guard's Marine Communications and Traffic Services (MCTS). Marine traffic using those routes in Placentia Bay consists of tankers, ferries, containers and bulk carriers, cargo ships and fishing vessels (DFO, 2008). The major ports in Placentia Bay include Come by Chance, Whiffen Head, Argentia, Marystown and Long Harbour, according to the National Centre of Expertise on Maritime Pilotage.

Figure 3.1.2-12 provides the navigation corridors in Placentia Bay, and near Argentia Peninsula and harbour. Placentia Bay is designated as a compulsory pilotage area under the Atlantic Pilotage Authority (APA, n.d.). There are two registered pilot areas (zones) past the Pilot Boarding Station (PBA); one being Placentia Bay – Zone A (North of the PBA) and the other Argentia – Zone B (East of PBA).



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 11	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Shipping Lanes in Placentia Bay	NOTES: Depths sourced from Canadian Hydrographic Service (CHS) Non-Navigational (NONNA) bathymetric data. Traffic routes sourced from CHS/Department of Fisheries and Oceans (DFO) on Government of Canada's Open Data Portal.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-020-Rev1



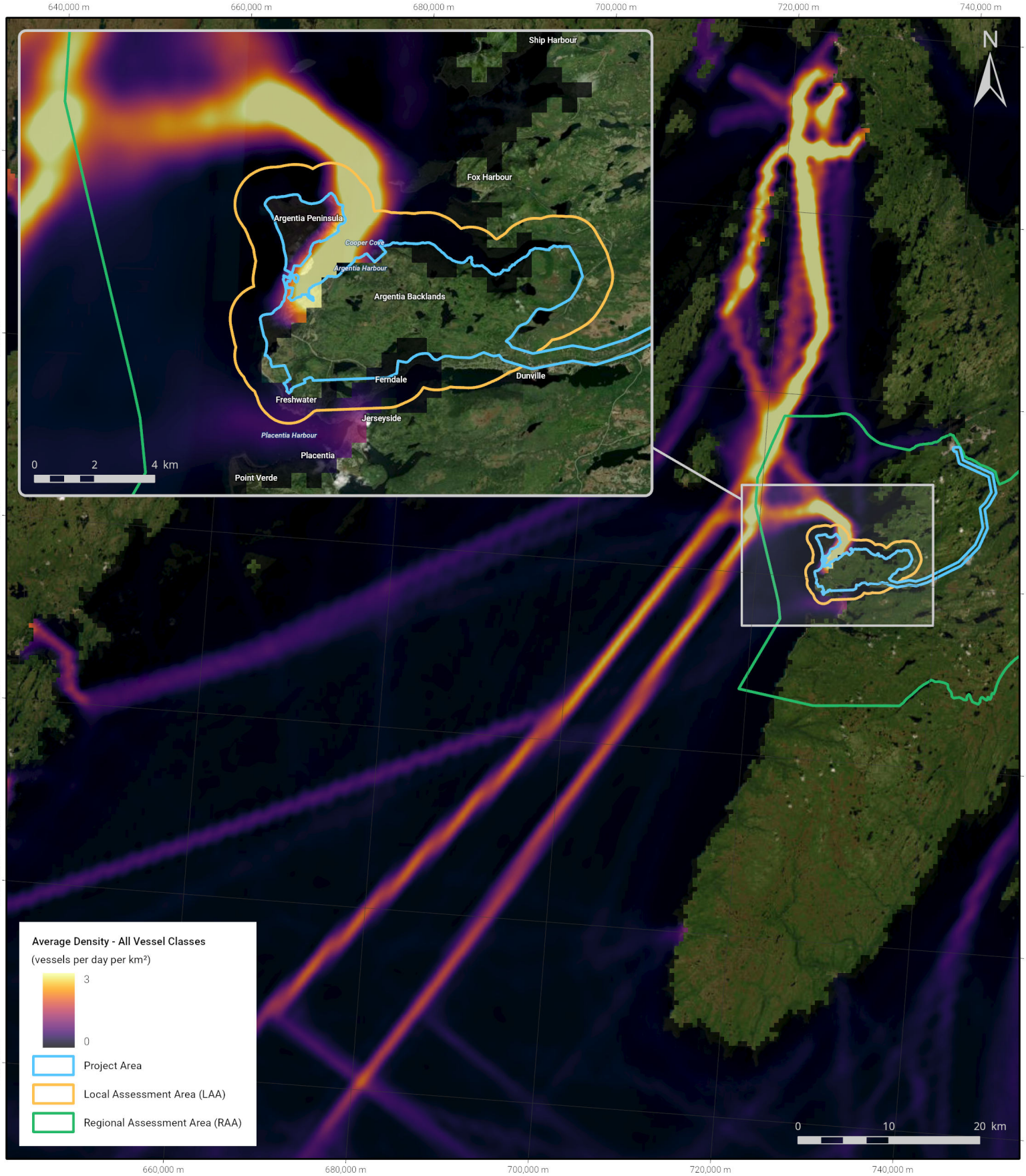
Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 12	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Navigation Corridors Near Argentia	NOTES: Depths sourced from CHS Non-Navigational (NONNA) bathymetric data. Traffic routes sourced from CHS/DFO on Government of Canada's Open Data Portal. Compulsory Pilotage Area data sourced from Atlantic Pilotage Authority webpage.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-018-Rev1

Figure 3.1.2-13 shows the marine traffic density in Placentia Bay in 2022 (DFO, 2023i). The information provided in the marine traffic density map originates from the Automatic Identification System. This global system uses shipborne equipment to remotely track vessel identification and positional information. The tracking system is typically required on all vessel classes of 300 gross tonnage or more on an international voyage, of 500 gross tonnage or more not on an international voyage, and passenger ships of all sizes.

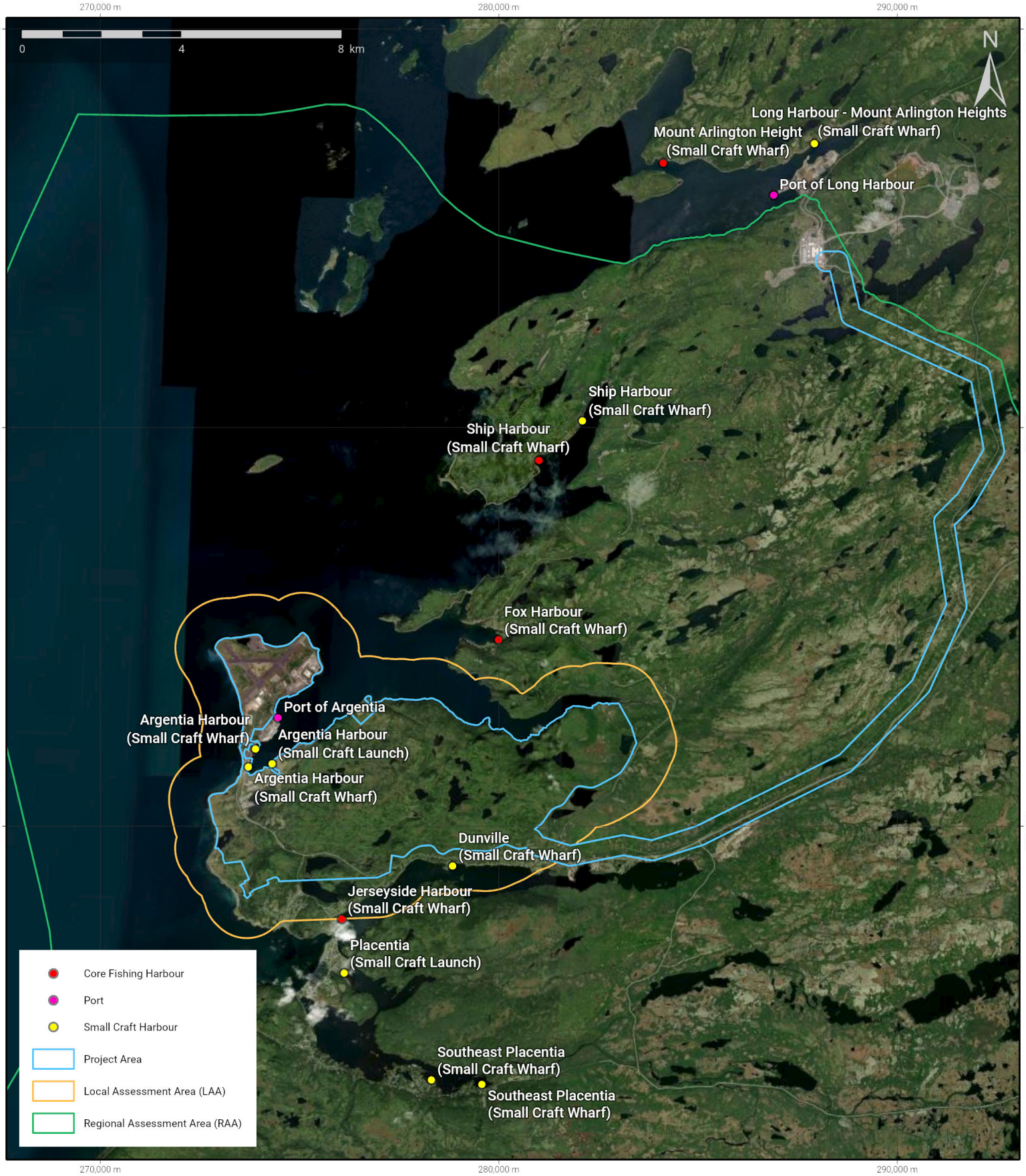
The colour coding illustrates the traffic density of average vessels per day per square kilometre in 2022. It is apparent that there was a high density of marine traffic for the Argentia Harbour area and within the LAA, with approximately three vessels per day/km^2 navigating in the harbour.

Figure 3.1.2-14 provides the small craft harbours (i.e. core fishing harbours) situated within and near the RAA. Additional potential adjacent embarkation sites for small crafts are specified in the figure (i.e. wharves and launch sites), where small recreational boats, small fishing vessels or leisure embarkation devices can assess waters and eventually navigate in the waters surrounding the RAA or LAA. The core fishing harbours in the RAA include Ship Harbour, Fox Harbour and Jeseyside/Placentia Harbour. Two main ports are situated within the RAA including the POA and Long Harbour.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 13	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Marine Traffic Density in Placentia Bay	NOTES: Density map produced from Automatic Identification System (AIS) data published by Fisheries and Oceans (DFO) on Government of Canada's Open Data Portal.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-019-Rev1



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 14	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: J. Crocker	DATE: 24/07/28
	FIGURE TITLE: Small Craft Harbours and Adjacent Embarkation Sites	NOTES:	REVIEWED BY: CBourke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBourke	sem

SEM MAP ID: 238-005-GIS-041-Rev1

Table 3.1.2-12 provides the variation in marine traffic recorded by the POA Authority, which corresponds to the vessel numbers entering the harbour and docking at the POA between 2013 and 2022. The lowest number was recorded in February 2013 (n=6), while the lowest monthly average number of vessels recorded for the year was in 2015 (mean of 11.42). The highest number of vessels recorded was in April 2017 (n=34), while the lowest monthly average of vessels recorded for the year was in 2020 (mean of 18.08). A seasonal variation in vessel traffic is apparent, and the yearly number of vessels at the POA overall has been increasing during this period, although the number of vessels decreased in 2021 and 2022 after peaking in 2020 (Port of Argentia- Marine Traffic Vessel Report; Dillon, 2023).

A total of 1,736 vessels were recorded by the POA between 2013 and 2022 (Table 3.1.2-12). The yearly total of vessels recorded was the lowest in 2015 (n=137), while the highest number of total vessels recorded was in 2020 (n=217). The average number of yearly vessels for that time period was 173.6 vessels per year.

Table 3.1.2-12 Variations of Marine Traffic Vessel (N), Port of Argentia, 2013-2022.

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Sum	Mean
2013	15	6	13	15	17	11	9	10	15	17	10	12	150	13
2014	9	7	12	12	12	15	11	15	21	13	10	9	146	12
2015	7	8	9	12	13	11	12	13	14	12	14	12	137	11
2016	12	14	15	22	14	14	12	14	15	15	15	11	173	14
2017	14	19	14	34	20	14	15	12	9	13	13	11	188	16
2018	7	8	12	18	18	14	14	10	17	16	15	9	158	13
2019	14	10	15	16	19	15	19	22	13	17	19	18	197	16
2020	14	18	22	16	29	22	16	19	17	16	15	13	217	18
2021	16	12	14	12	18	17	17	20	16	18	9	12	181	15
2022	15	14	14	18	24	12	17	16	16	16	11	16	189	16

Notes: Monthly minimums are highlighted in lighter gray, while monthly maximums are highlighted in darker gray.

The POA and Placentia Bay provide navigable waterways with for a variety of purposes, from leisure to commercial activities. The POA features deep-water docking wharves, this allows the POA to accommodate considerably larger vessels and heavy-lift shipments from an array of current industries, including the Marystown Shipyard, Cow Head Fabrication Facility, Argentia Ferry Terminal, North Atlantic Refining Limited, Vale Inco, and Newfoundland Transhipment Ltd (Dillon, 2023). The POA is accessed year-round, supporting present and future commercial activities that are expected to grow in the coming years, including welcoming investment from renewable energy.

Cargo ships supporting Project construction will require appropriate certification and approval to work in Canadian and Newfoundland waters. National and international ships navigating in Canadian waters are subject to the legislations and regulations under the **Canadian Navigable Waters Act, Canada Shipping Act,** 2001, and **Transportation of Dangerous Goods Act**, among other Regulations and Legislations.

Communication systems will be required to allow contact between marine vessels and shore bases. A Canadian Coast Guard Marine Communications and Traffic Services (CCG-MCTS) broadcasts from the Placentia centre. The MCTS centres offer free services relevant to navigation in Placentia Bay, including:

- Messages pertaining to weather or ice conditions and forecasts;
- Messages concerning aids to navigation;
- Eastern Canada Vessel Traffic Services Zone (WCAREG) messages;
- Messages reporting pollution; and,
- Radio-medical messages.

3.1.2.13 Marine Biosecurity

Marine biosecurity is the management of socio-economic and environmental risks associated with introducing and spreading marine pests and diseases from exogenous sources. Newfoundland faces imminent threats to its marine biodiversity and ecosystems from unwanted pests and diseases. Aquatic invasive species (AIS) are one of the largest marine biosecurity risks Newfoundland ports face and are relevant to marine traffic associated with Project construction and operation.

The AIS Regulations (2015) operate under the **Fisheries Act** with the purpose of protecting Canadian waterbodies by preventing the spread and introduction of AIS into Canadian waters and managing them once introduced. These regulations, paired with relevant federal, provincial, and territorial legislations, create management tools to deal with the threat of AIS. They prohibit actions such as importation, possession, transportation, release, and introduction of AIS (DFO, 2019a). The key pathways of AIS introduction or spread are shipping, recreational and commercial boating, use of live bait, aquarium and water garden trade, live food for human consumption, unauthorized importation, and diversions of canals and waterbodies (DFO, 2018).

Shipping vessels are a major pathway of introduction and spread of AIS relevant to the Project. They can carry AIS in their cargo, hulls (i.e., biofouling), and ballast water. Ballast water and biofouling actions can also accidentally introduce and spread pathogens into Canadian waters (DFO, 2022f).

The **Ballast Water Regulations** (SOR/2021-120) came into force in Canada on June 23, 2021. These regulations operate under the **Canada Shipping Act** (2001) and **Fisheries Act** and strengthen Canada's ability to protect its environment and economy from AIS (TC, 2019). Transport Canada is the regulatory body that regulates ballast water management, which is critical in preventing the arrival of aquatic invasive species. These regulations apply to vessels if they are designed or constructed to carry ballast water and include Canadian vessels everywhere; vessels that are not Canadian and are in waters under Canadian jurisdiction, such as international ships navigating in Canadian waters (TC, 2021). Vessels carrying ballast

water that enter or navigate within the Placentia Bay or waterbodies within the Project RAA, they will be subject to complying with the ballast water regulations.

Argentia Renewables will follow recommended best practices and guidelines to help mitigate the potential spread of AIS. Any shipping vessels will be inspected for biofouling of Vase tunicate, European green crab and other AIS. Best practices that will be implemented to prevent the introduction and spread of AIS include:

- AIS awareness in waters frequented;
- Taking precautions with respect to vessel traffic and gear movement between affected and unaffected areas to prevent introductions and spread;
- Clean, drain and dry gear and ropes to prevent movement between areas by avoiding transportation of water from one location to another;
- Routine vessel maintenance (i.e. cleaning the hull and using antifouling paint to prevent biofouling); and
- Identifying and reporting any AIS to DFO.

3.1.2.14 Marine Fish and Fish Habitat

The nearshore environment pertaining to fish and fish habitat in the Argentia area, adjacent to the LAA and RAA, was described in the Husky White Rose Extension Project EA (Husky Energy, 2012), and relevant information is provided below. The habitat components considered included phytoplankton, zooplankton, the water column, invertebrates and benthic habitat. The nearshore adjacent to the harbour was considered to be biologically rich and ecologically important for many fish species that use the area for feeding, migration and spawning and includes productive coastal habitats such as eelgrass beds and salt marsh habitat (Catto *et al.*, 1999).

In the sheltered shallow subtidal habitats, filamentous brown, green and red algae, fucoids and kelp occur, and in deeper nearshore water, patches of kelp and filamentous brown macroalgae occur. Important fish habitat in the nearshore includes eelgrass beds, macroalgal (e.g., rockweed, kelp) beds and capelin spawning beaches (pebble beaches). These habitats provide refugia, spawning grounds, nurseries and food resources for Atlantic cod in particular, as well as a diversity of ichthyoplankton, including cod, cunner, American plaice and capelin.

The benthic communities in Argentia Harbour were dominated by sea stars, sand dollars, and winter flounder, although sea urchins, toad crab, rock crab, hermit crab, mussels, sea scallops, ocean pout,

sculpin, cunner, and whelks were also present (Christian and Lee, 1998). A sand-silt substrate with little algal cover was the dominant habitat in Argentia Harbour at depths greater than 15 m while a steep, rocky slope with bedrock, boulder, and cobble substrate was continuous along the northwestern shore of the harbour in the shallow subtidal areas (JWEL, 1997).

Stantec (2012) observed the following habitat conditions in the inner harbour from the high tide mark to a water depth of 30 m:

- Backshore was comprised of sand dunes with grass and sedge vegetative cover with an elevation of 2 m above sea level;
- Backshore changed abruptly to the foreshore, marked by a sandy beach ridge;
- Intertidal zone composed mostly of sand, with some cobble/gravel mix and trace rubble; and
- Shallow subtidal zone (mean low tide to 30 m depth) was influenced by wave action and substrate consisted mostly of sand and fines, with some rubble/cobble/gravel mix.

Remote-operated vehicle (ROV) surveys found the most common substrate to be sand (86%), followed by cobble (5%), gravel (5%) and mud (4%). The average water depth was 17.5 m, and kelp and sour weed were the dominant species of vegetation at 10% and 3%, respectively. Rockweed was also present on large cobble and boulders, and eelgrass averaged 8% of the macroflora species present and covered 1% of the seafloor area. Other vegetation observed in very low densities included sea colander, smooth cord weed, ribbon weed, and dulse. Macrofaunal species observed included rock crab, snow crab and sea stars. Sea gooseberries were common throughout the water column. Common periwinkle was present but uncommon. The few fish observed included flounder (n=5), longhorn sculpin (n=2), cunner (n=1), and little skate (n=1). Flounder were observed most often on fine substrate.

Marine sediments collected within and outside Argentia Harbour in 1998 by VBNC (2002) found elevated levels of arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, and zinc that exceeded Environment Canada's maximum allowable levels (MALs). Concentration of metals was higher within the harbour than beyond the harbour. Sediment samples within the harbour also had finer sediments and higher total organic levels, both of which would facilitate metal loading of the sediment.

Surface seawater samples collected from Argentia Harbour in 1998 by were found to generally have higher concentrations of metals including cadmium, cobalt, copper, lead, manganese, nickel and zinc than those collected from sites outside the harbour (VBNC, 2002). Cadmium was found to exceed Environment Canada MAL at one station. Higher than average levels of metals were expected in Argentia Harbour, as this area was considered a brownfield site.

The productive Labrador Current and the Gulfstream both influence oceanographic conditions within Placentia Bay and provide rich feeding grounds for marine mammals such as whales, dolphins, porpoises,

and seals, as well as numerous finfish and shellfish species. The area is home to at least 14 groundfish species including Atlantic cod, lumpfish and winter flounder; nine species of pelagic fish including mackerel, herring and capelin; seven species of shellfish including snow crab, lobster and scallop. There are approximately 14 marine mammals and two significant reptiles that seasonally or permanently inhabit Placentia Bay.

Over the past few decades, the biotic marine environment in Argenita harbour has been assessed at multiple occasions. Species composition for flora and fauna biotas were characterised via various methods. The last thorough field surveys were conducted over a decade ago. Thus, additional assessments were necessary to complete a holistic understanding of the marine environment going forward.

The following sections provide an overview of relevant aspects of the marine biological environment in the RAA. Specifically, plankton, invertebrates, finfish, sharks, marine mammals, marine reptiles, invasive species, and other marine organisms. Species at risk or of conservation concern are discussed in the following sections. Table 3.1.2-13 provides an extensive list of aquatic organisms found in Placentia Bay with the potential to occur in the LAA and RAA.

Although the presented desktop information of the marine environment and field study of the plankton and benthic communities were completed to describe the marine fish and fish habitat, there will be potential opportunities for improvement to describe the marine flora and fauna near proposed Project components (i.e. marine effluent). A drop-down camera survey will be completed in future to assess marine habitats associated with the proposed marine effluent upon installation.

Table 3.1.2-13 Marine Organisms with the Potential to Occur in the LAA and RAA.

Marine	*Species Name*	Occurrence in LAA
Finfish		
Pelagic		
Bluefin Tuna (Atlantic Pop.)	*Thunnus thynnus*	Rare
Capelin	*Mallotus villosus*	Occasional
Herring, Atlantic	*Clupea harengus*	Occasional
Lumpfish	*Cyclopterus lumpus*	Rare to Occasional
Mackerel, Atlantic	*Scomber scombrus*	Occasional
Demersal		
Acadian Redfish (Atlantic Pop.)	*Sebastes fasciatus*	Rare
American Plaice (NL Pop.)	*Hippoglossoides platessoides*	Occasional
Arctic Shanny	*Stichaeus punctatus*	Occasional
Atlantic (Striped) Wolffish	*Anarhichas lupus*	Rare
Atlantic Cod (Laurentian North Pop.)	*Gadus morhua*	Common
Atlantic Cod (NL Pop.)	*Gadus morhua*	Occasional
Atlantic Halibut	*Hippoglossus hippoglossus*	Rare
Atlantic Tomcod	*Microgadus tomcod*	Rare to Occasional
Alewife (Gaspereau) *	*Alosa pseudoharengus*	Rare
American Shad *	*Alosa sapidissima*	Rare to Occasional
Cunner	*Tautogolabrus adspersus*	Occasional
Cusk	*Brosme brosme*	Rare
Deepwater Redfish (Gulf of St. Lawrence = Laurentian Channel Pop.)	*Sebastes mentella*	Rare
Eelpout (sp.)	*Lycodes sp. and Zoarces sp.*	Rare
Eelpout (Arctic)	*Lycodes reticulatus*	Rare
Eelpout (Newfoundland)	*Lycodes lavalaei*	Rare
Eelpout (Ocean Pout)	*Zoarces americanus*	Occasional
Grenadier (Roundnose)	*Coryphaenoides rupestris*	Rare
Grenadier (sp)	*Macrouridae (Family)*	Rare
Greenland halibut (Turbot)	*Reinhardtius hippoglossoides*	Rare
Greysole/Witch Flounder	*Glyptocephalus cynoglossus*	Rare
Haddock	*Melanogrammus aeglefinus*	Rare
Monkfish (American angler)	*Lophius americanus*	Rare
Northern Wolffish	*Anarhichas denticulatus*	Rare

Marine	*Species Name*	Occurrence in LAA
Finfish		
Pollock (Atlantic) (Saithe)	*Pollachius virens*	Rare
Radiated Shanny	*Ulvaria subbifurcata*	Rare
Sculpin (sp.) (Atlantic Pop.) *	*Cottidae (Familly)*	Rare
Skate, Little	*Leucoraja erinacea*	Rare
Skate, Winter (Eastern Scotian Shelf – Newfoundland Pop.)	*Leucoraja ocellata*	Rare
Stake, Smooth (Laurentian-Scotian Pop.)	*Malacoraja senta*	Rare
Skate, Thorny	*Amblyraja radiata*	Rare
Spotted Wolffish	*Anarhichas minor*	Rare
White Hake (Atlantic and Northern Gulf of St. Lawrence Pop.)	*Urophycis tenuis*	Rare
Winter Flounder	*Pseudopleuronectes americanus*	Occasional to Common
Wrymouth	*Cryptacanthodes maculatus*	Rare to Occasional
Yellowtail Flounder	*Limanda ferruginea*	Rare to Occasional
Shark		
Atlantic spiny Dogfish	*Squalus acanthias*	Rare
Basking shark (Atlantic Pop.)	*Cetorhinus maximus*	Rare
Blue shark	*Prionace glauca*	Rare
Porbeagle shark	*Lamna nasus*	Rare
Shortfin mako shark (Atlantic Pop.)	*Isurus oxyrinchus*	Rare
White shark (Atlantic Pop.)	*Carcharodon carcharias*	Rare
Invertebrates		
Arthropoda		
American Lobster	*Homarus americanus*	Occasional to Common
Amphipods (sp.)	*Amphipoda (Order)*	Occasional
Barnacles (sp.)	*Cirripedia (Subclass)*	Occasional
Crab (Atlantic Rock)	*Cancer irroratus*	Occasional
Crab (European Green)	*Carcinus maenas*	Occasional
Crab (Hermit)	*Pagurus spp.*	Occasional
Crab (snow/queen)	*Chionoecetes opilio*	Occasional to Common
Crab (Toad)	*Hyas araneus, and Hyas coarctatus*	Occasional
Isopods (sp.)	*Isopoda (Order)*	Occasional
Shrimp (Northern)	*Pandalus borealis*	Occasional
Shrimp (striped)	*Pandalus montagui*	Occasional
Shrimp (Japanese Skeleton)	*Caprella mutica*	Occasional

Marine	*Species Name*	Occurrence in LAA
Invertebrates		
Annelida		
Polychaetes (sp.)	Annelida (Phylum)	Common
Bryozoa		
Bryozoans	Bryozoa (Phylum)	Common
Cnidaria		
Anthozoans (sp) (Soft/Stony Corals and Sea Anemones)	*Cnidaria (Phylum)*	Occasional
Hydrozoans	*Cnidaria (Phylum)*	Occasional
Jellyfish (sp.)	*Cnidaria (Phylum)*	Occasional
Ctenophora		
Comb Jellies (sp.)	*Ctenophora (Plylum)*	Occasional
Sea Gooseberry (Comb Jellies)	*Pleurobrachia pileus*	Occasional
Echinodermata		
Echinoderm (sp.)	*Echinodermata (Phylum)*	Occasional to Common
Brittle Star (sp.)	*Echinodermata (Phylum)*	Occasional
Mud Star	*Ctenodiscus sp.*	Occasional
Sand dollar (sp.)	*Echinodermata (Phylum)*	Occasional
Sea cucumber (sp.)	*Echinodermata (Phylum)*	Occasional
Sea Star (sp.)	*Echinodermata (Phylum)*	Occasional
Ursin (sp.)	*Echinodermata (Phylum)*	Occasional
Mollusca		
Bivalve (sp.)	*Bivalvia (Class)*	Common
American Oyster	*Crassostrea virginica*	Occasional
Clams, Stimpsons surf	*Mactromeris polynyma*	Occasional
Mussel (Blue)	*Mytilus edulis and Mytilus trossulus*	Occasional
Mussel (Northern Horse)	*Modiolus modiolus*	Occasional
Scallop (Islandic)	*Chlamys islandica*	Occasional
Scallop (Sea)	*Placopecten magellanicus*	Occasional
Gastropod (sp.)	*Gastropoda (Class)*	Occasional to Common
Periwinkles (sp.)	*Littorina sp.*	Occasional
Whelk	*Buccinum undatum*	Occasional
Squid (sp.)	*Cephalopoda (Class)*	Rare
Squid (Illex/shortfin)	*Illex illecebrosus*	Rare
Octopod (sp.)	*Octopoda (Order)*	Rare

Marine	*Species Name*	Occurrence in LAA
Invertebrates		
Porifera		
Sponges (sp.)	*Porifera Pphylum)*	Occasional
Marine Mammals		
Baleen Whales (Mysticetes)		
Blue whale (Atlantic Pop.)	*Balaenoptera musculus*	Rare
Fin whale (Atlantic Pop.)	*Balaenoptera physalus*	Rare
Humpback whale (Western North Atlantic Pop.)	*Megaptera novaeangliae*	Rare
Minke whale (North Atlantic subspecies)	*Balaenoptera acutorostrata*	Rare
North Atlantic Right whale	*Eubalaena glacialis*	Rare
Sei whale (Atlantic Pop.)	*Balaenoptera borealis*	Rare
Toothed Whales		
Atlantic White-sided dolphin	*Lagenorhynchus acutus*	Rare
Harbour porpoise (Northwest Atlantic Pop.)	*Phocoena phocoena*	Rare
Killer whale (Northwest Atlantic Pop.)	*Orcinus orca*	Rare
Long-finned pilot whale	*Globicephala melas*	Rare
Northern bottlenose whale (Davis Strait-Baffin Bay-Labrador Sea Pop.)	*Hyperoodon ampullatus*	Rare
Northern bottlenose whale (Scotian Shelf Pop.)	*Hyperoodon ampullatus*	Rare
Short-beaked Common dolphin	*Delphinus delphis*	Rare
Sperm whale	*Physeter macrocephalus*	Rare
Sowerby's Beaked Whale	*Mesoplodon bidens*	Rare
White-beaked Dolphin	*Lagenorhynchus albirostris*	Rare
Pinnipeds and Otters		
Grey seal	*Halichoerus grypus*	Rare
Harbour seal	*Phoca vitulina*	Rare to Occasional
Harp Seal	*Phoca groenlandica*	Rare
Hooded seal	*Crystophora cristata*	Rare
River Otter (Marine)	*Lutra canadensis*	Rare
Marine Reptiles		
Kemp's ridley Sea turtle	*Lepidochelys kempii*	Rare
Leatherback Sea turtle (Atlantic Pop.)	*Dermochelys coriacea*	Rare
Loggerhead Sea turtle	*Caretta caretta*	Rare

Marine	*Species Name*	Occurrence in LAA
Marine Flora		
Filamentous Algae (red, brown and green Algae sp.)	-	Occasional to Common
Coralline Algae (sp.)	*Orallinales (Order)*	Occasional to Common
Dulse	*Palmeria palmata*	Occasional
Eelgrass	*Zostera marina L.*	Occasional to Common
Irish moss	*Chondrus crispus*	Occasional to Common
Kelps (Finger)	*Laminaria digitata*	Occasional to Common
Kelps (Winged)	*Alaria esculenta*	Occasional to Common
Kelps (Cabbage)	*Laminaria longicruris*	Occasional to Common
Ribbon Weed	*Petalonia sp,*	Occassional
Rockweed	*Ascophyllum nodosum*	Occasional to Common
Sea Colander	*Agarum sp.*	Occasional to Common
Smooth Cord Weed	*Chordaria filum*	Occasional
Sour Weed	*Demarestia sp,*	Occasional to Common

Source: Occurrence level was based on habitats, distributions and detections of species from various articles, reports, and online platforms available by Provincial (Gov. NL) and Federal (Gov. Canada) Agencies, Organisations (COSEWIC website, SARA Website, Fishbase website) and Environmental Impact Assessments (LGL, 2019, LGL 2007).
Notes: See the Baseline Study and AIS Section for additional organisms potentially located in LRA.
'*' = Consider as Marine fish as well as diadromous fish.

Marine Plankton

Plankton is an umbrella term for small passive organisms in the aquatic environment, some which drift with ocean currents and tides their entire life cycle, while others are only classified as plankton in early life stages until they are large enough to swim against the currents (NOAA, 2023). Two subcategories of plankton (i.e. zooplankton and phytoplankton) in the RAA/LAA are discussed below.

Zooplankton community structure is strongly influenced by depth, temperature, and season. Community complexity differs substantially along the Northwest Atlantic Region (i.e. Gulf of St. Lawrence, Scotian shelf, Newfoundland and Labrador Shelves) (DFO, 2022d). Copepods are by far the most abundant group in the Northwest Atlantic Region (Davis, 1986; DFO, 2022d), but non-copepod organisms also contribute substantially to total zooplankton abundance (DFO, 2022d). Two copepod taxa, *Calanus finmarchicus* and *Pseudocalanus spp.*, represent different broad groups with similar life histories and are considered key bioindicators of the condition of the zooplankton communities and community shifts on the Newfoundland and Labrador Shelves (DFO, 2022d). Zooplankton communities associated with the Newfoundland shelves are likely to be found in RAA and LAA due to proximity and similar physical oceanography.

Copepod, krill, amphipod and euphausiid species, as well as planktonic egg and larval stages of fish and invertebrates, dominate the zooplankton community in Placentia Bay, which is most abundant between mid-April and mid-June (Husky Energy, 2012). The distribution of pelagic eggs and early larval stages were consistent with passive drift, but later stages of larvae frequently concentrated on the western side of Placentia Bay. The highest concentrations of American plaice and Atlantic cod eggs were on the western side of Placentia Bay, with densities of Atlantic cod eggs highest during early spring.

Table 3.1.2-14 shows the major zooplankton taxa found in LAA during the 2023 aquatic baseline study (Appendix B1). Arthropoda was the dominant taxa (49.26% of total zooplankton biomass) followed by Cnidaria (46.29%). Zooplankton community composition from Argentia Harbour (LAA) concurred with DFO (2022d) and showed that copepods were by far the most abundant group of zooplankton. Two-thirds of the Arthropoda biomass was associated with Copepod taxa and contributed to 32.69% of the total biomass, while the non-copepods taxa contributed 16.57% to total zooplankton biomass. Cnidaria were also an important part of the LAA zooplankton community (46.29%). Davis (1986) conducted extensive characterization the zooplankton in Placentia Bay and all major taxa from the baseline study were represented in categories described by Davis (1986). Species of zooplankton found in Placentia Bay (Davis, 1986) coincided with species of high abundance collected in August during the baseline study including *Temora longicornis, Centropages hamatus, Oithona sp., Acartia sp., Calanoida indet., Pseudocalanus sp. complex, Centropages sp., Eurytemora sp. Evadne sp., and Obelia sp.*

Table 3.1.2-14 Major Marine Zooplankton Taxa Found in the LAA, Aquatic Baseline, 2023.

Phylum (Class)	Biomass %
Bryozoa (Cyphonautes)	0.22%
Chaetognatha	0.00%
Cnidaria	46.29%
Arthropoda	49.26%
Arthropoda (Non-Copepoda)	16.57%
Arthropoda (Copepoda)	32.69%
Ctenophora	0.05%
Echinodermata	0.05%
Mollusca	4.06%
Nemertea	0.05%
Chordata	0.00%
Annelida (Polychaeta)	0.02%
Total Biomass (mg/L)	100.00%

Phytoplankton blooms in the Northwest Atlantic Ocean are characterized by spring and fall events (LGL, 2018). Time-series coastal stations primary production analysis demonstrated a pattern of a few larger phytoplankton species (often diatoms) dominating the spring bloom with succession to a higher cell density of smaller phytoplankton species as temperature increases throughout the summer months. Typically, phytoplankton shifts have been defined by reoccurring yearly cycles of picophytoplankton (0.2 to 2 µm) (prior to spring bloom), diatoms (during the spring bloom), followed by other phytoplankton (e.g., coccolithophores like golden brown algae (e.g. haptophytes), post-spring-bloom), with further succession towards small phytoplankton during the fall bloom. Water samples from Placentia Bay in 1998 were analyzed for chlorophyll ‘a’ to estimate phytoplankton standing crop, and chlorophyll ‘a’ concentrations were higher in the inner bay than the outer bay and were highest in April.

Biomass estimates of phytoplankton collected in August 2023, were dominated by Diatoms of >30 µm in size, while Haptophytes were underrepresented compared to the Diatoms. The phytoplankton community composition in the LAA during the summer of 2023 was similar to what would have been expected during the spring bloom in the Northwest Atlantic Ocean, suggesting a possible delay in the typical phytoplankton community shift.

Marine Benthos

The marine benthos species occurring in the LAA and RAA are discussed below.

Benthos communities are composed of benthic surface-dwelling epifauna and burrowing bottom-dwelling infauna. The benthic communities of the Placentia Bay marine ecosystem include intertidal, shallow subtidal and subtidal bottom-dwelling organisms and dominant fauna in intertidal and shallow subtidal

habitat include blue mussel, green sea urchin, common periwinkle, barnacle, frilled anemone, horse mussel, and various amphipods and isopods. In deeper areas of the bay, polychaetes, amphipods, sand dollar, sea urchins, sea stars, scallops, mussels and brittle stars dominate. In recent years, the invasive European green crab has also become important in the benthic community. Infauna such as seaworm-like (polychaete, annelids), and epifauna such as echinoderms (e.g. sea stars, brittle stars, mud stars, sea urchins, sand dollars, sea cucumber) tunicates, shellfish (e.g. shrimps, snow crabs, lobster), gastropods (e.g. whelks), bivalves (e.g. horse mussels, scallop, mussels), sea anemones, sponges, soft corals, bryozoans, and hydrozoans could be expected to be found within the RAA (LGL, 2018).

Benthic organisms in LAA were associated with the dominant substrate type in Argentia Harbour (i.e. mud, silty mud and sandy mud) and the Argentia Peninsula (i.e., sand and muddy sand; poorly sorted sand gravel; boulder, gravel, patches of coarse sand and poorly sorted gravel) and consisted mostly of seaworm-like (e.g., polychaete), shellfish, echinoderms, bivalves, bryozoans, and hydrozoans. ROV surveys in the nearshore near Argentia harbour indicated that sand dollars were very common in sandy habitats, while sea urchins characterized rocky habitats. Rock crabs, hermit crabs, sea stars, barnacles, broken shells, planktonic sea gooseberries, and frilled anemones were also observed.

Samples of the benthic community in Argentia Harbour were collected in the 2023 baseline study (Appendix B1) and were limited to sampling infauna. Average abundance, richness, and biomass were 694 organisms, 38 taxa, and 117 g/m^3, respectively. The benthic community was dominated by Annelida (Polychaeta) (94.7%), followed by Nemertea (2.4%), Mollusca (2.0%), Arthropoda (0.4%), and Echinodermata (0.4%) in abundance. Simpson's Diversity and Evenness Indexes were 0.873 and 0.030, respectively, indicating relatively low diversity.

Marine Fish

Fish are commonly associated with particular habitat types in nearshore areas of Placentia Bay, and species such as cod, cunner, winter flounder, lumpfish and herring are frequently associated with habitats such as eelgrass, kelp beds or cobble. Soft sediment habitat (e.g., sand or mud) provide refuge for benthic species such as American plaice and winter flounder. Capelin, herring and sand lance from nearshore pelagic schools near the surface, particularly at night and are important forage fish species for higher trophic levels. Several fish species migrate seasonally to Placentia Bay, and this includes Atlantic herring, capelin and Atlantic cod in spring and Atlantic mackerel and possibly herring in autumn. Atlantic salmon, brook trout, brown trout and American eel migrate to and from rivers and feed in Placentia Bay during summer. Many of the species that use the shallow areas of Placentia Bay migrate to deeper waters during winter, such as lobster, snow crab and winter flounder. American plaice, Atlantic cod, cunner, winter flounder, lumpfish, wolffish, capelin, herring, mackerel and sand lance reproduce in Placentia Bay, and many rely on coastal habitats for spawning and refugia. DFO research vessel surveys of fish and fish

habitat in Argentia found few fish and shellfish and winter flounder, longhorn sculpin, little skate, snow crab, and rock crab occurred in very low numbers (Husky Energy, 2012).

Many of the numerous marine finfish species that occur in Placentia Bay have ecological and economic importance, primarily from a fisheries perspective. This section provides summary information regarding the life histories and ecological associations for finfish species of special interest found in the RAA. Fish species of interest found occasionally or commonly in RAA include Atlantic cod (NL and Laurentian North (LN) populations), American plaice (NL Population), Atlantic herring and lumpfish, important commercial species, and capelin, an important species in the food chain of many fish, marine mammals, and birds.

Atlantic cod has historically been one of the leading food fisheries in the world, and until recent years was NL's single most important commercial species. The various Atlantic cod populations have decreased precipitously during the past couple of decades, to the point where inshore Atlantic cod appear to be more abundant than those in the offshore areas (DFO, 2017). The NL and LN Atlantic cod populations were designated "Endangered" by COSEWIC in 2003 (COSEWIC, 2003).

St. Pierre Bank (Northwest Atlantic Fisheries Organization (NAFO) Division. 3Ps) Atlantic cod stock is comprised of the LN Population (COSEWIC, 2003). This stock migrates seasonally between neighbouring areas and also migrates seasonally between inshore and offshore sub-components. Some Newfoundland Shelf Atlantic cod populations migrate from the relatively warm offshore waters to inshore coastal waters in spring to feed primarily on capelin before returning offshore in the fall (COSEWIC, 2003). The Atlantic cod fishery occurs in 3Ps, typically between mid-May and the end of March. Seasonal closures of the entire stock area generally occur annually (usually from March to mid-May) at the peak of spawning time with an aim to minimize impacts on spawning aggregations (DFO, 2021). Spawning is broadly distributed in 3Ps and may occur close to the shore of southern Newfoundland (e.g. inshore of the Placentia Bay), as well as offshore in Burgeo Bank, St. Pierre Bank and in the Halibut Channel (DFO, 2022c). Inshore cod spawning occurs in several bays in Placentia Bay (Lawson and Rose 2000a). The timing of spawning is variable and prolonged among stocks, with spawning in Placentia Bay occurring from March until August (DFO, 2021; 2022c). Spawning is often synchronized with higher availability of larvae food like plankton bloom (spring and fall), especially in spring. Juveniles settle in the demersal area after the larval stage where they stay for a period of one to four years. Young Atlantic cod begin to undertake the seasonal migration after the settlement period as undirected swimming in coastal waters, while adults directly migrate to and from specific, highly preferred locations which are temperature or feeding-related (COSEWIC, 2003).

Capelins are important for the optimal growth, condition and reproductive potential of northern cod (Rose and O'Driscoll, 2002). Capelin was found in 9.5% of the cod taken in Placentia Bay in January and June and constituted 22% of the diet in terms of weight and condition of Placentia Bay cod was higher than in neighbouring bays.

The American plaice (NL Pop.) St. Pierre Bank Stock (NAFO 3Ps) and two other stocks (NAFO 2J3K, 3LNO) that were designated "threatened" in 2009 by COSEWIC (COSEWIC, 2009; DFO, 2011). These stocks have been under fishing moratoria since 1993 but are allowed as bycatch in other fisheries (COSEWIC, 2009; DFO, 2011; DFO, 2020a), which accounts for the catch in Placentia Bay (3Psc). American Plaice typically occupy all areas of the continental shelves. These fish may occupy non-preferential habitats (temperature, sediment type, etc.) to access rich feeding sites (COSEWIC, 2009). They are most abundant in water deeper than 100 m but have also been observed in coastal shallower waters of Placentia Bay (<15 m) (LGL, 2018). The NL population of American plaice migrate mainly before spawning which starts at the end of winter and continues until the end of spring depending on geographic location. Spawning in St. Pierre Bank, Grand Bank and Northeast Newfoundland Shelf occurs in March through May (COSEWIC, 2009) and suggests that spawning of American plaice in Placentia Bay may occur during this time period.

There are five coastal Atlantic herring stocks in east and southeast Newfoundland, one of which is the St. Mary's Bay-Placentia Bay (SMB-PB) stock (Wheeler *et al*., 2004; DFO, 2009). Spring spawners to dominate most stocks and Atlantic herring spawn during May and June. These demersal spawners deposit adhesive eggs on stable bottom substrates, typically in shallow (<20 m depth) coastal waters, primarily on gravel or rocky bottom where there is an abundance of seaweed. Eelgrass has been associated with herring spawning in some locations (Scott and Scott, 1988). The larvae from herring eggs are pelagic and pelagic larvae and juveniles are known to make diel (night-to-day) vertical migrations. The juveniles and adults tend to avoid the surface waters during daylight hours. Herring are pelagic schooling fish do not appear to have any substrate preference during juvenile and adult phases. Atlantic herring are visual feeders, consuming primarily plankton during daylight hours (Scott and Scott, 1988).

Lumpfish are semi-pelagic, spending much of their time away from the coast. Adult lumpfish exhibit seasonal migrations, moving into shallow coastal waters to spawn in spring and early summer, and then returning to offshore waters in late summer and early fall. Female lumpfish are commercially fished for their roe during the inshore spring-summer spawning season (Kearley, 2012). Lumpfish eggs adhere to the substrate and larval hatch typically occurs during May–June and the larvae attach to macroalgae and hard substrates. Juvenile lumpfish remain in coastal areas up to age one, when they adopt semi-pelagic characteristics of adult lumpfish and distribute themselves offshore (Scott and Scott, 1988; Kearley, 2012).

Capelin is one of the most ecologically important fish species as it is important food for many fish, marine birds, and mammals. These pelagic fish exhibit inshore-offshore migrations associated with spawning. Capelin typically overwinter in offshore waters, move shoreward in early spring to spawn on appropriate beaches in spring/summer, and return to offshore waters in autumn. Juvenile capelin are found in Newfoundland bays but capelin larvae are rapidly carried out of the bays and inshore areas by surface currents (DFO, 2015). The arrival of capelin to the head of Placentia Bay generally occurs in June and July.

Five stock complexes of capelin have been recognized in the Newfoundland region based on spawning and overwintering locations, including the Saint-Pierre Bank stock that spawns on the south coast of Newfoundland and Placentia Bay (Carscadden *et al*., 1989). Beach suitability for spawning is dependent on substrate type, with a preference for gravel, and eggs are typically deposited in the intertidal zone, although capelin also deposit eggs in the subtidal zone (Carscadden *et al*., 1989). The size of the substrate on a beach will determine its suitability for capelin spawning and capelin appear to prefer gravel 5 to 15 mm in diameter but will spawn on substrate as small as 2 mm diameter and as large as 25 mm diameter.

There are a total of 31 capelin beaches that have been identified in the bay, eight of which are major sites with at least some spawning every year (Sjare *et al*., 2003). Typical capelin beaches are located at Fox Harbour (north of Argentia) and Point Verde, southern Ship Cove and Gooseberry Cove (along the Cape Shore south of Argentia) and capelin spawning on beaches near Argentia has been reported historically (Catto *et al*., 1999).

Capelin larvae were most abundant near the islands in the center of Placentia Bay, and capelin biomass was highest June in outer Placentia Bay, while the highest capelin densities in January occurred on the eastern side of outer Placentia Bay, and south of Merasheen and Red Islands (O'Driscoll and Rose, 1999). Highest densities in March were towards the western side of outer Placentia Bay and throughout the inner bay while June densities were distributed evenly throughout outer Placentia Bay.

Marine Shark

Sharks can be found in Placentia Bay marine area, but most are rarely observed. Six species of shark that occur in Newfoundland waters are: Atlantic spiny dogfish, basking shark, porbeagle shark, shortfin mako shark; blue shark; and white shark (Table 3.1.2-15). The porbeagle shark was designated as endangered by COSEWIC in May 2004 and is known to occur in southern Newfoundland waters but are most common on continental shelves (COSEWIC, 2004; Scott and Scott, 1988). The shortfin mako shark was designated as threatened by COSEWIC in April 2006, and are pelagic and found in continental shelf habitats. The blue shark occurs primarily in oceanic pelagic and continental shelf habitats. The Atlantic population of white shark is designated as endangered on Schedule 1 of SARA and by COSEWIC. White sharks are relatively rare in Canadian waters, which represents the northern-most portion of their distribution (COSEWIC, 2006).

No species of sharks are expected to be found occasionally or commonly near the Argentia Harbour and the LAA considering the shallow coastal water, proximity of shoreline, marine traffic and the predominantly pelagic and offshore nature of shark distribution.

Marine Mammals

Marine mammals that could occur in Placentia Bay are identified in Table 3.1.2-15. Eleven species of marine mammals are expected to regularly occur in Placentia Bay, including eight species of cetaceans and three species of seals, while several additional species have been observed in the bay but are considered rare. Three species of baleen whales regularly occur in Placentia Bay including humpback whale, fin whale, and minke whale. Two mysticete species, the blue whale and North Atlantic right whale, whose occurrence in Placentia Bay are considered rare, are listed as Endangered under Schedule 1 of SARA. Five species of toothed whales are known or expected to regularly occur in Placentia Bay including long-finned pilot whales, short-beaked common dolphin, Atlantic white-sided dolphin, white-beaked dolphin, and harbour porpoise. The harbour porpoise is considered of Special Concern by COSEWIC. Harbour, grey, and harp seals occur in Placentia Bay. Harbour seals may occur in small numbers year-round whereas harp and grey seals are considered visitors. Harbour seals prefer the quiet waters of bays and inlets and generally use inshore rocks and sand bars for resting and are observed throughout coastal areas of Placentia Bay (Sjare *et al.*, 2005). These seal species are not considered at risk by COSEWIC nor are they listed on SARA. Some river otters in the Placentia Bay have adopted a predominant marine lifestyle and one of the highest otter densities in Newfoundland occurs from the southern extent of Merasheen Island to the head of Placentia Bay (Goudie and Jones, 2007).

The shallow water composing the majority of LAA, proximity of shoreline, marine traffic and feeding behaviour of whales, seals, and river otter make it unlikely that marine mammals will occur occasionally or commonly near the Argentia Peninsula and Harbour and interact with the Project's marine component.

Marine Reptiles

There are two marine reptile species that may occur in Placentia Bay, Leatherback Sea turtles (Atlantic Pop.) and Loggerhead Sea turtles (Table 3.1.2-15). Leatherback sea turtles regularly occur in Placentia Bay and they are listed as Endangered on Schedule 1 of SARA. Two primary areas of important habitat were recognized for the Leatherback Sea turtles (Atlantic Pop.): the southeastern Gulf of St. Lawrence; and the waters south and east of the Burin Peninsula, which include parts of Placentia Bay (DFO, 2020b). Loggerhead sea turtles, also listed as Endangered on Schedule 1 of SARA, may also occur in Placentia Bay but their occurrence is considered uncommon. Husky Energy (2012) also considered that Kemp's ridley sea turtle could potentially be found in Placentia Bay. The migratory and feeding behaviour of sea turtles make it very unlikely that there will be a substantial presence of marine reptiles near the LAA.

Marine Shellfish

Shellfish in Placentia Bay comprise a substantial number of species (Table 3.1.2-15). Snow crab and American lobster are two shellfish with the highest economic importance for commercial fisheries in

Placentia Bay (DFO, 2023d). These species are substantially fished throughout the bay, in the RAA and to an extent in the LAA. As for Snow crab and American lobster, sea scallops are harvested commercially. In Placentia Bay, scallops are also harvest recreationally. Shellfish species of economic value found occasionally and commonly in the LAA will be discussed below.

Snow crab in Newfoundland waters typically occurs at water depths ranging between 60 and 400 m on substrates consisting of mud and gravel. The commercial fishery for snow crab has been very lucrative since the groundfish moratorium in 1992, but recent years have seen a downward turn in the stock (DFO, 2016). The mating of first-time spawning females occurs during winter, while multiple-time spawners occur during spring and summer (DFO, 2019b). The eggs are carried by the females until larval hatch during the summer months. The larvae are pelagic and may remain in the water column for months. The pelagic larval stage eventually settles to the seabed and continues development to maturity in the benthic habitat. The snow crab fishing season in 2023 in 3Ps occurred from the start of April to the end of June and Placentia Bay North 3Psc is an inshore fishery where snow crabs are fished within the RAA.

American lobster has a continuous distribution around the island of Newfoundland, occupying a relatively narrow band of rocky habitat over an approximate depth range of 2-40 m (Ennis, 1984). The inshore lobster fishery is primarily conducted in areas with water depths of 15–20 m during spring and early summer and remains important for many fishers (DFO 2016a). Lobster mating typically occurs during the summer months, immediately after the female moults. The female carries the developing eggs on the underside of her abdomen. Hatching occurs the following summer and the resultant larvae assume a pelagic existence. The planktonic larvae settle to the benthic habitat for development to the adult stage (DFO, 2021a). The American lobster is an opportunistic feeder and is known to consume a variety of food including crustaceans, echinoderms, molluscs, fishes, and polychaetes (DFO, 2021a). The American lobster fishery (usually May to July) was the second most lucrative fishery in 3Psc for 2023.

Sea scallops are generally distributed throughout the shallow (<20 m) coastal regions around Newfoundland, occurring primarily on sand/gravel or gravel/pebble substrates. They are abundant in shallow sheltered sandy locations, such as western Placentia Bay. Commercial and recreational harvesting of sea scallops occurs in areas around Newfoundland, including Fortune Bay, Placentia Bay, and St. Mary's Bay. Sea scallops are harvested nearshore in northern Placentia Bay, in water depths <200 m. Spawning typically occurs in September and October. Both the eggs and larvae are planktonic, and the larva develops a "foot" that allows it to attach to the substrate and then develop to the juvenile stage. The juveniles then lose their attachments and lie freely on the ocean bottom for development to the adult stage (DFO, 2007).

Overall, the marine environment within the LAA and RAA is residence to a vast range of benthic organisms while providing adult feeding grounds, migratory paths, and possible spawning, nursery, and larval or juvenile rearing areas to many fish and shellfish species. Species of special concern, like American plaice

(Newfoundland Pop.) and Atlantic cod (Laurentian North Pop.), or species of high economic value like snow crab and lobster (American), might carry out some of their life history processes within the RAA through a substantial period of the year, notably during spring and summer months.

3.1.2.15 Marine Fisheries and Aquaculture

The following section gives an overview of the fishing industry activities within Placentia Bay, which might overlap with the RAA or LAA. Commercial fishing is considered an important economic contributor for communities of Placentia Bay, including those in proximity to the Project. Licenses and quotas are set by DFO for individual species management areas and NAFO divisions and subdivisions. The Placentia Bay region is located within the NAFO Division 3Ps. The area North of 3Ps is referred to as the “inshore area” and consists of Sub-Division 3Psa, 3Psb, and 3Psc units and Placentia Bay is situated in sub-Division 3Psc. Weather and ice conditions, availability of resources, fisheries licencing and management, and harvesting plans and preferences influence the extent and timing of fishing activity in the Placentia Bay.

Commercial, recreational, and Indigenous fisheries take place in many areas in southern Newfoundland. The fishing industry is not the only core seafood industry in the Placentia Bay and aquaculture and seafood processors are also an important part of the industry. Activities related to the marine fishery, aquaculture industry and fish/seafood processing in Placentia Bay, RAA and LAA will be discussed below.

Marine Commercial Fisheries

Commercial fishery data sets for species that interact with the RAA (NAFO sub-divisions 3Psc) were acquired from DFO (DFO, 2023), and are presented in Tables 3.1.2-15 and 3.1.2-16. Harvest data are provided by landed weight (kgs) and value ($) by species between 2018 and 2022. The 3Psc area covers an area much more expansive than the RAA, however, general information on trends associated for the fishery in this sub-division provide insight and knowledge for the general area in which the Project will occur.

Commercial fisheries have undergone considerable changes over the last three decades, shifting in many locations from a groundfish-based to a shellfish-based industry, and more recently back to a groundfish-based fishery. A harvesting moratorium on Atlantic cod in 3Ps was declared from 1993 to 1996 and prior to that, Atlantic cod had comprised ~50–70% of the annual catch weight (1986–1993) while snow crab accounted for only ≤1%. Immediately after the moratorium, Atlantic cod comprised only 5% of the annual catch, while the proportion of snow crab increased to ~10–23%. A limited cod fishery was reinstated in 1987, and since then cod and snow crab are the principal species harvested in 3Ps accounting for 50-75% of the annual catch.

The fisheries in Placentia Bay are conducted year-round although the overall catch has been much less evenly distributed throughout the year, compared to a decade ago. The 3Psc ground fishery reopened in the mid-1990s, and the peak harvesting months in terms of quantity have been June and July. This pattern was influenced by the cod fishing activities, which generally occur throughout all months except April. May and June were the two highest months by value, owing to the large harvest of high-value snow crab in May.

Tables 3.1.2-15 and 3.1.2-16. provide the quantities (in Kgs) and values ($) of landings in 3Psc per species from 2018 to 2022, respectively. Snow crab (8,448,726 Kgs), Atlantic cod (7,087,930 Kgs) and Atlantic herring (1,455,683 Kgs) were the top three species of importance in 3Psc, in terms of volume landed weight, between 2018 to 2022. In terms of value, snow crab ($104,240,363), American lobster ($10,493,676) and Atlantic cod ($10,469,315) were the top three species. It is apparent that economically, the fishing industry in Placentia Bay was mainly dominated by the snow crab fishery in those years.

Table 3.1.2-15 Landed Weight (Kgs) in the 3Psc Commercial Fishery, 2018-2022.

Preliminary Landings in 3Psc						
Species	**2018**	**2019**	**2020**	**2021**	**2022**	**Total**
American plaice	22,475	16,803	14,498	O/L	O/L	**53,776**
Capelin	-	O/L	-	-	-	-
Clams, Stimpsons surf	-	-	-	-	O/L	-
Cod, Atlantic	2,727,138	2,077,822	1,327,311	458,109	497,550	**7,087,930**
Crab, Queen/Snow	749,838	1,103,765	1,259,145	2,170,861	3,165,117	**8,448,726**
Greysole/witch flounder	O/L	O/L	O/L	-	-	-
Haddock	12,505	O/L	47.9	O/L	O/L	**12,553**
Hake, white	3,263	O/L	O/L	O/L	O/L	**3,263**
Halibut, Atlantic	9,138	5,632	6,920	2,647	O/L	**24,337**
Herring, Atlantic	O/L	O/L	670,494	O/L	785,189	**1,455,683**
Lobster (American)	14,263	27,566	10,315	7,567	8,622	**68,333**
Monkfish (Am angler)	O/L	O/L	O/L	O/L	-	-
Pollock	31,071	9,193	O/L	O/L	-	**40,264**
Redfish	7,244	280	153	O/L	O/L	**7,677**
Scallop, Iceland	O/L	-	-	O/L	O/L	-
Scallop, Sea	O/L	O/L	O/L	236,221	O/L	**236,221**
Sea cucumber	-	-	O/L	-	-	-
Sea Urchins	O/L	O/L	-	-	-	-
Seal fat	-	O/L	-	-	-	-
Seal skins, harp, beater (no.)	-	O/L	-	-	-	-
Shark, blue	O/L	-	-	-	-	-
Shark, mako (Shortfin)	-	-	-	O/L	-	-
Skate	O/L	O/L	O/L	O/L	-	-
Squid, Illex	-	O/L	O/L	-	-	-

Preliminary Landings in 3Psc						
Species	**2018**	**2019**	**2020**	**2021**	**2022**	**Total**
Tuna, bluefin	-	-	-	O/L	O/L	-
Turbot/Greenland halibut	O/L	O/L	O/L	O/L	O/L	-
Whelks	O/L	O/L	O/L	O/L	O/L	-
Winter flounder	O/L	O/L	O/L	O/L	O/L	-
Wolffish, Striped/ Atlantic	O/L	O/L	-	-	-	-
Yellowtail flounder	O/L	O/L	O/L	O/L	-	-
Other Landings (O/L)	1,441,203	2,076,983	243,823	1,455,178	412,014	**5,629,201**

Source: Economic Analysis and Statistics DFO, 2023.

Notes:

"-" = No data available

O/L = Categorized as Other Landings, did not meet confidentiality requirements specified within the Statistics Act and DFO policies.

Table 3.1.2-16 Landed Value ($) Recorded in the 3Psc Commercial Fishery, 2018-2022.

Preliminary Landings in 3Psc						
Species	**2018**	**2019**	**2020**	**2021**	**2022**	**Total**
American plaice	16,801.15	11,932.58	10,747.36	O/L	O/L	**39,481**
Capelin	-	O/L	-	-	-	-
Clams, Stimpsons surf	-	-	-	-	O/L	-
Cod, Atlantic	3,751,807.74	3,271,372.12	1,907,720.22	644,110.82	894,304.06	**10,469,315**
Crab, Queen/Snow	7,966,089.86	12,969,738.03	101,976.57	35,271,928.61	47,930,629.90	**104,240,363**
Greysole/witch flounder	O/L	O/L	O/L	-	-	-
Haddock	12,189.74	O/L	40.57	O/L	O/L	**12,230**
Hake, white	2,917.17	O/L	O/L	O/L	O/L	**2,917**
Halibut, Atlantic	86,335.22	56,345.98	54,756.27	21,593.78	O/L	**219,031**
Herring, Atlantic	O/L	O/L	233,551.02	O/L	346,032.50	**579,584**
Lobster (American)	199,306.96	386,368.89	9,631,302.85	128,646.42	148,050.64	**10,493,676**
Monkfish (Am angler)	O/L	O/L	O/L	O/L	-	-
Pollock	22,368.67	5,734.45	O/L	O/L	-	**28,103**
Redfish	6,001.54	235.28	109.70	O/L	O/L	**6,347**
Scallop, Iceland	O/L	-	-	O/L	O/L	-
Scallop, Sea	O/L	O/L	O/L	707,442.30	O/L	**707,442**
Sea cucumber	-	-	O/L	-	-	-
Sea Urchins	O/L	O/L	-	-	-	-
Seal fat	-	O/L	-	-	-	-
Seal skins, harp, beater (no.)	-	O/L	-	-	-	-
Shark, blue	O/L	-	-	-	-	-
Shark, mako (Shortfin)	-	-	-	O/L	-	-
Skate	O/L	O/L	O/L	O/L	-	-
Squid, Illex	-	O/L	O/L	-	-	-

Preliminary Landings in 3Psc						
Species	**2018**	**2019**	**2020**	**2021**	**2022**	**Total**
Tuna, bluefin	-	-	-	O/L	O/L	-
Turbot/Greenland halibut	O/L	O/L	O/L	O/L	O/L	-
Whelks	O/L	O/L	O/L	O/L	O/L	-
Winter flounder	O/L	O/L	O/L	O/L	O/L	-
Wolffish, Striped/ Atlantic	O/L	O/L	-	-	-	-
Yellowtail flounder	O/L	O/L	O/L	O/L	-	-
Other Landings (O/L)	616,079.99	1,136,313.19	421,619.44	630,894.67	1,275,625.72	**4,080,533**

Source: Economic Analysis and Statistics DFO, 2023.

Notes:

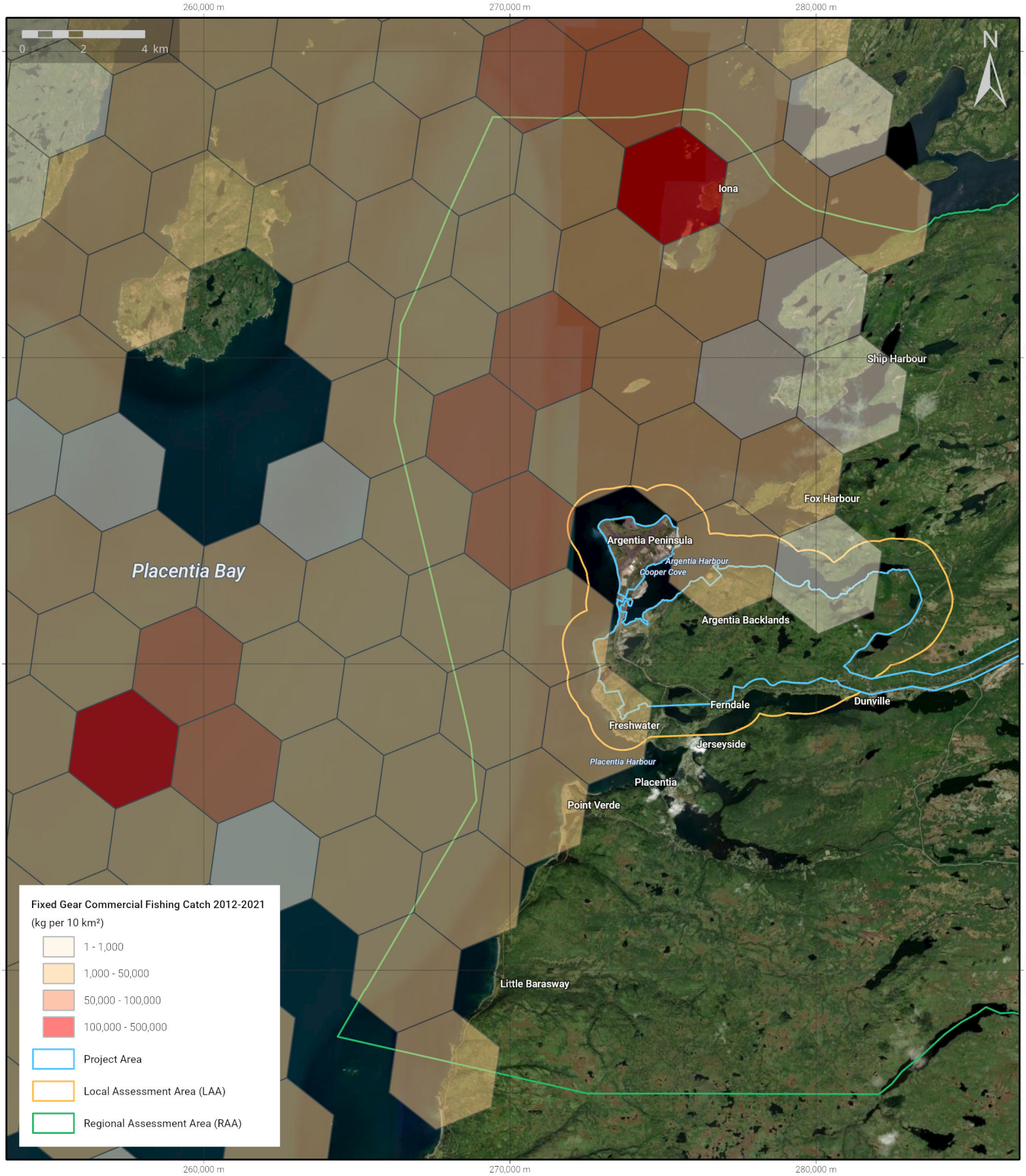
"-" = No data available

O/L = Categorized as Other Landings, did not meet confidentiality requirements specified within the Statistics Act and DFO policies.

Commercial fisheries data was also obtained through the online Canada Marine Planning Atlas (DFO, 2023e) to give a visual representation of fishing activity adjacent to the RAA. Placentia Bay fisheries employ both mobile gear (typically towed by a vessel) and fixed gear (most often set out and left by the fisher, typically anchored or weighted in place).

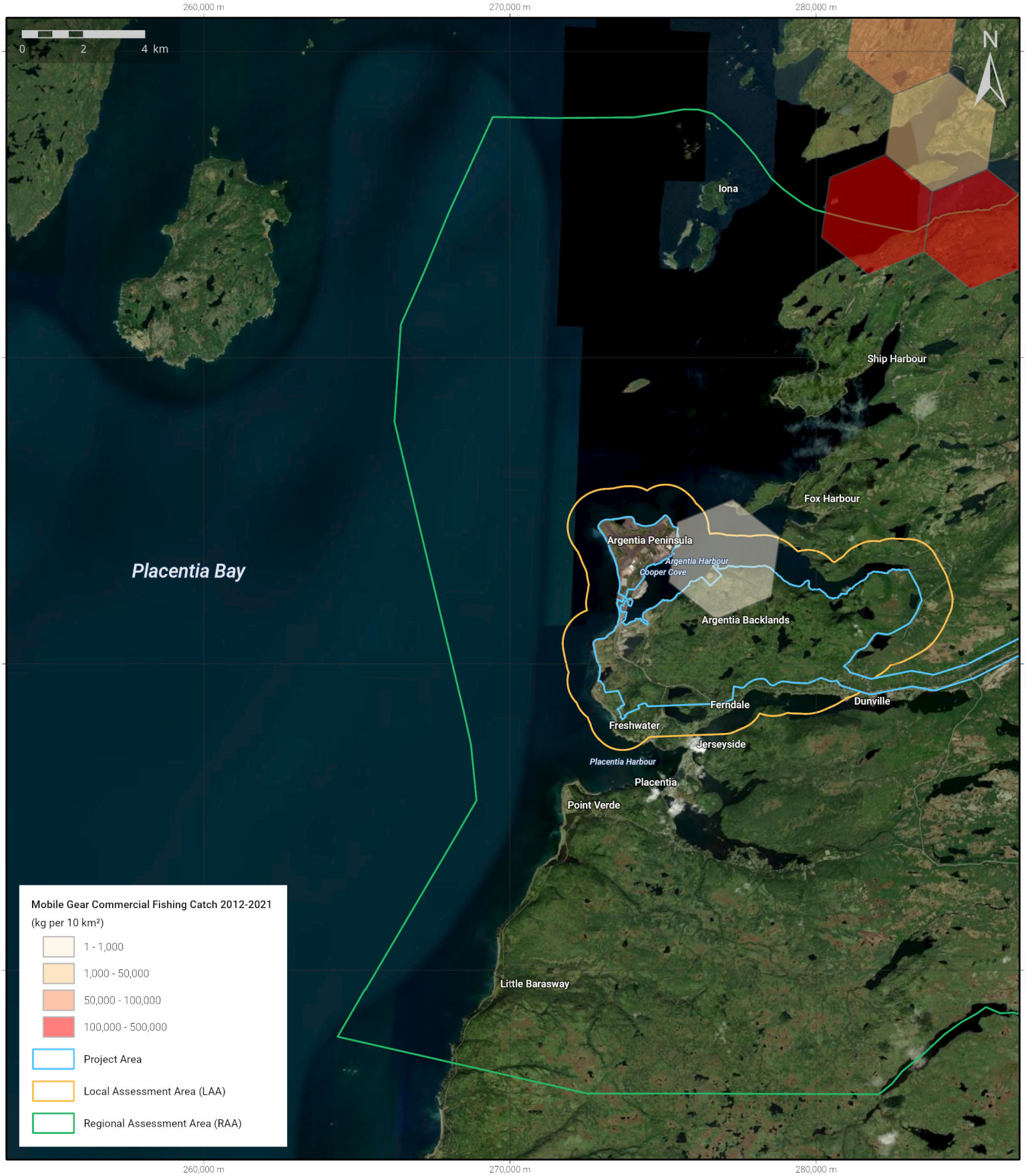
Figures 3.1.2-15 and 3.1.2-16 showed the catch density associated with using fixed and mobile gears during 2012 to 2021 adjacent to the RAA and LAA, respectively. Fixed gear (e.g. crab and lobster pots, gillnets, hand line, longline) were the most common type of fishing gear and tend to be more 'site specific' than mobile fisheries. Fixed gear may be left in place for several days while the fishing boat returns to port. Fixed gears were used widely throughout the entire bay and RAA, with the crab and lobster pots being the most common gear type deployed (DFO, 2023e). Mobile gears were scarcely used in Placentia Bay and adjacent to the RAA compared to fixed gears. A small density of mobile gear (i.e., dredge) was used near the mouth of Argentia Harbour (LAA) for the scallop fishery. The north of the RAA coincided with high activity for purse and/or tuck seine, which were used near Long Harbour and Fair Haven for the Atlantic herring fishery (DFO, 2023e). Fishing gear used in Placentia Bay is often specific to the species harvested with pots and traps used for snow crab and lobster, scallop drags for scallops, purse seines for herring, and diving for sea urchins. Cod is harvested using several gear types but in Placentia Bay, the majority of the cod catch is harvested with gillnets.

Husky Energy (2012) reported that very little fishing activity takes place in Argentia Harbour, however, lobster pots were set at various locations along the shoreline adjacent to the harbour, continuing along the shoreline towards Placentia Sound and extending into the south shore of the sound. Lobster is also harvested on the north shore of the sound, continuing to the west to Fox Harbour. Herring spawn near the shore along the east side of the Argentia Peninsula. Fishers also reported that capelin sometimes spawn on the beach in the cove between the tip of the Peninsula and The Pond, and that capelin traps have sometimes been set close to the shore in this area. DFO also stated that cod were caught at various locations relatively close to land along the north side of Placentia Sound, and on grounds to the west along this shoreline up to Fox Harbour and continuing along the north shore. These grounds were considered very good cod hand lining areas and were used by both commercial harvesters and recreational fishers.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 15	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Commercial Fishing Catch by Fixed Gears	NOTES: Sourced from the 'Eastern Canada Commercial Fishing' dataset published by the Government of Canada/Fisheries and Oceans Canada (DFO).	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-013-Rev1



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 16	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Commercial Fishing Catch by Mobile Gears	NOTES: Sourced from the 'Eastern Canada Commercial Fishing' dataset published by the Government of Canada/Fisheries and Oceans Canada (DFO).	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

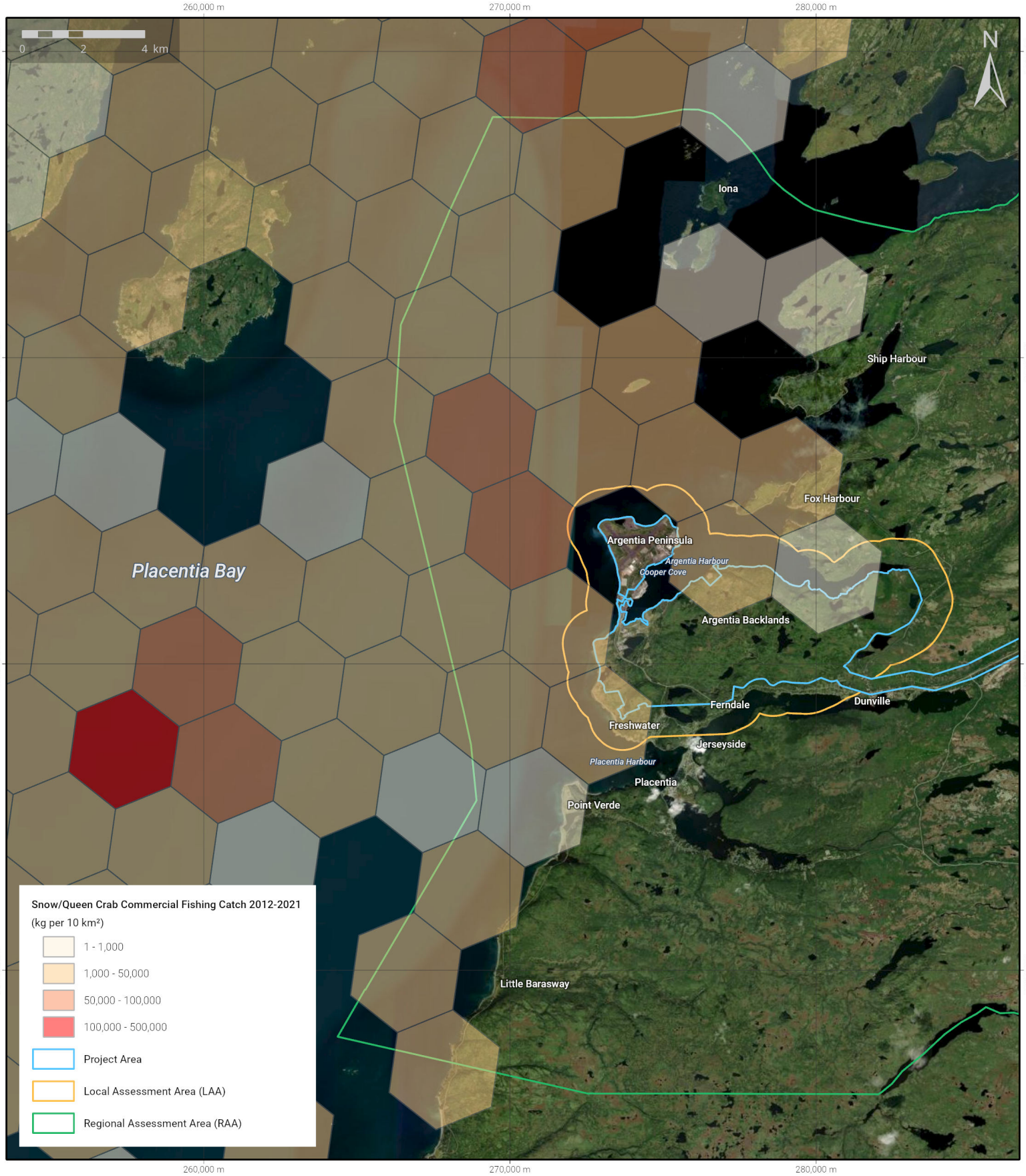
SEM MAP ID: 238-005-GIS-014-Rev1

Husky Energy (2012) examined geo-referenced catch data for 2005 to 2010 for a marine area 2.5 km in radius from Argentia Harbour and a range of species had been harvested within this area in every year since 2005 from 2010. The predominant species was mackerel, other species harvested include sea scallops, snow crab, Atlantic cod, mackerel, lumpfish and whelk. A variety of gears were used including purse seine, pots, longline, baited handline and gillnets. Local fishers noted that the catch data did not include other species, such as lobster, herring, flounder, lumpfish, which were not captured in the geo-referenced dataset. Harvesting activities took place throughout most months, with activities in July and September accounting for most of the catch. Enterprises from communities such as Placentia, Jerseyside, Argentia, Main Brook, Fox Harbour and Southern Harbour harvested various species in the general vicinity of Argentia.

Figures 3.1.2-17 and 3.1.2-18 illustrate the density of snow crab and Atlantic cod commercial fishing near the RAA and LAA, from 2012 to 2021. These figures show locations with catch density associated with the two most common fish species in terms of quantity in Placentia Bay (DFO, 2023e). Both species are expected to be found and fished within the RAA and LAA surrounding the Argentia Peninsula and outside of the mouth of the harbour (DFO, 2023e).

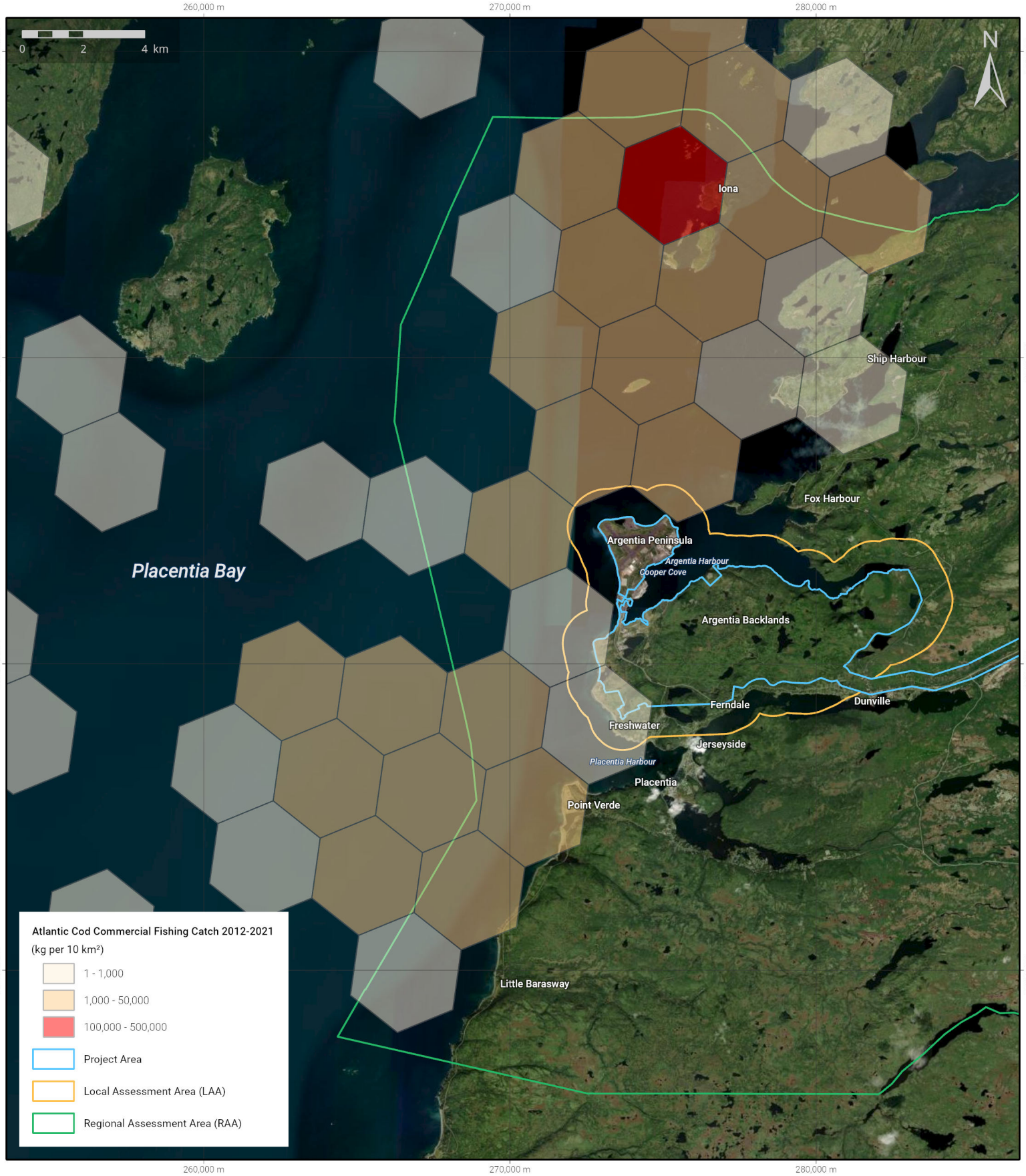
DFO has been working since 1996 to document coastal fisheries resources through direct contact with individuals and stakeholders in coastal communities, including Placentia Bay. DFO used this information to create Community-based Coastal Resource Inventories (CCRIs) and Figure 3.1.2-19 shows the location of the major fisheries in Placentia Bay from that knowledge source (O'Brien *et al.,* 2008). This information indicates that the major fisheries occurring in proximity to the RAA are for American lobster and Atlantic cod and the snow crab fishery occurs in deeper offshore areas.

Table 3.1.2-17 describes the commercial fishing seasons set by DFO for 2023 (DFO, 2022g). Fishing seasons start and end dates may vary from year to year and is subject to change. The 2023 fishing season dates for 3Ps demonstrate the temporal dynamic in commercial fishing in Placentia Bay and adjacent to the RAA. Some fisheries are regulated by quotas and once the quota is reached the fishery is closed. The fishing season for Atlantic cod and most groundfish starts mid-May through March with a relatively long harvesting season. The shellfish fishery has a relatively short harvesting season, with American lobster between May and July and snow crab between April and June.



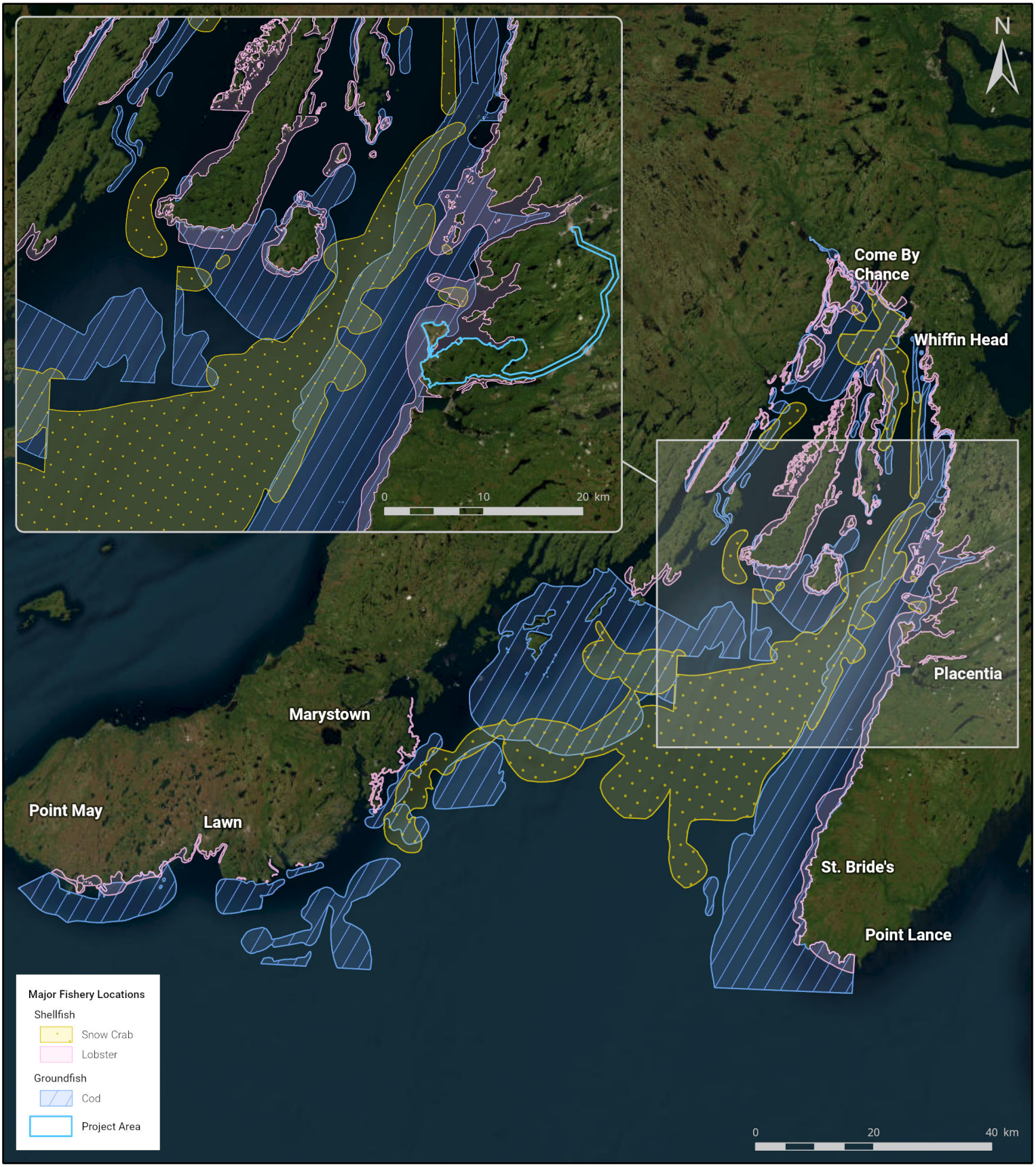
Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 17	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Density of Commercial Fishing Catch of Snow/Queen Crab	NOTES: Sourced from the 'Eastern Canada Commercial Fishing' dataset published by the Government of Canada/Fisheries and Oceans Canada (DFO).	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-015-Rev1



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 18	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Density of Commercial Fishing Catch of Atlantic Cod	NOTES: Sourced from the 'Eastern Canada Commercial Fishing' dataset published by the Government of Canada/Fisheries and Oceans Canada (DFO).	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-016-Rev1



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 19	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Location of Major Fisheries in Placentia Bay	NOTES: Fishery information sourced from the 1996-2007 Community-Based Coastal Resource Inventory (CCRI) published by Fisheries and Oceans (DFO) on the Government of Canada's Open Data Portal.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-038-Rev1

Table 3.1.2-17 Marine Commercial Fisheries Seasons in 3Ps in 2023.

Fixed Gears	
Species Common Names (Area)	**Commercial Fishing Season Date**
Atlantic halibut (3Ps - all units)	Mid-May to March 31
American place (3Ps - all units)	Fishing is not authorized in NAFO Sub-Division 3Ps (Bycatch only)
Atlantic cod (3Ps units (b) and (c))	Mid-May to February 28.
Greenland halibut (Turbot) (3Ps - all units)	Mid-May to March 31
Lobster (Lobster Fishing Area 10 - 3Ps unit (c))	May 1 to July 10
Redfish (3Ps - all units)	Fishing is authorized in NAFO Sub-Division 3Ps units (a) and (b) for fixed gears, not in unit (c) (Bycatch only)
Skate/Monkfish (3Ps units (a), (b) and (c))	April 1 to March 31, but only open during periods when Atlantic halibut retention is prohibited.
Snow/Queen crab (3Ps - all units)	Early April to June 30
White hake (3Ps unit (c))	Fishing is not authorized in NAFO Sub-Division 3Ps unit (c) (Bycatch only)
Winter flounder (Blackback) (3Ps- all units)	Mid-May to March 31
Mobile Gears	
Species Common Names	**Commercial Fishing Season Date**
Herring (Herring Fishing Area 10 - 3Ps unit (c))	Summer April 1 to June 30, Fall August 15 to March 31
Redfish (3Ps units (a), (b), (c), (e), (f), (g), and (h) portion of Redfish Unit 2)	July 1 to March 31
Scallop (Scallop Fishing Areas 10 - 3Ps unit (c))	Jan 1 to Dec 31.
Skate (3Ps - all units)	April 1 to March 31
Grey sole/witch flounder (3Ps - all units)	April 1 to March 31
Source: Fisheries Management Decisions DFO, 2022g. **Notes**: Dates of fishing season are subject to change. For some fisheries, specific dates for openings and closings will be determined in consultation with industry through the normal Conservation Harvesting Plan (CHP) process (DFO, 2022). Some specific opening dates are determined annually in consultation with the FFAW/industry, while other fisheries openings may be delayed or staggered due to the DFO research vessel science survey. The 2022-2023 season NAFO Sub-Division 3Ps for groundfish mobile and fixed gear vessels, less than 27.4 m have been used to represent various groundfish (e.g. Atlantic halibut, Atlantic cod, Greenland halibut, monkfish, redfish, skate, white hake, and winter flounder).	

Table 3.1.2-18 summarizes commercial fishery seasons in 3Psc by month for the six most important commercial species in terms of landed weight and value. Snow crab, followed by American lobster and Atlantic cod were the three most economically valued species by far, according to the landed values from 2018 to 2022 in 3Psc. Sea scallops, Atlantic herring, and Atlantic halibut represented the other three fisheries by value in Placentia Bay between 2018 and 2022 (Table 3.1.2-16). Fishing in Placentia Bay is conducted year-round, however, the peak fishing season in 3Psc starts in the spring (April or May) and ends in summer (July), with June being the month with the most ongoing commercial fishing activity.

Table 3.1.2-18 Top Commercial Fisheries by Season in 3Psc, 2023.

Species Common Names	Jan.	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Atlantic Halibut												
Atlantic Cod												
Atlantic Herring												
American Lobster												
Scallop												
Snow/Queen Crab												

Source: Fisheries Management Decisions DFO, 2022g.
Notes: Gray cells represent OPEN fishing season. Light gray cells represented the less valuable species economically while dark gray represents the three species of highest economic importance for the period 2018-2022, (Economic Analysis and Statistics DFO, 2023). Colour-crossed cells indicate that the fishing season started or ended mid-month. Crossed cells represented CLOSED fishing season.

Marine Recreational Fisheries

The following section addresses the marine and coastal recreational fisheries that could occur in the RAA or LAA. Table 3.1.2-19 provides information on the recreational fisheries in in the province in relation to required licencing and seasonal dates for specific fisheries. DFO regulates coastal water recreational fisheries (saltwater/marine/brackish) in NL. Recreational fishing licenses may be required for some species and not for others for residents. Recreational fishery regulations and management measures apply to a variety of species including mussel, clam, squid, mackerel, capelin, trout, smelt, various groundfish species, seal (personal use), scallop and shark.

Table 3.1.2-19 Marine and Coastal Recreational Fisheries in Newfoundland and Labrador.

Species Common Name	Licence Required (Y/N)	Season Date
Mussel	N	Open year-round
Clams	N	Open year-round
Squid	N	Open year-round
Mackerel	N	April 1 to December 31
Capelin	N	Open year-round
Trout (Coastal Waters)	N	Open year-round
Smelt (Coastal Waters)	N	Open year-round
Groundfish	N	The season is announced annually in spring, with an opening first date in July continuing to the beginning of October
Seal (Personal Use)	Y	TBD
Scallop	Y	January 1 to December 31
Shark	Y	April 1 to December 31

Source: DFO 2023f

Groundfish like Atlantic cod are the main recreational fishery in insular Newfoundland for cultural and historical reasons and recreational fishing occurs within the RAA. DFO permits a recreational groundfish

fishery in designated NAFO Divisions, including in the RAA (NAFO Subdivision 3Psc) (DFO, 2023h). Groundfish species that can be retained (n=5) include Atlantic cod, flounder (e.g., winter, witch, and yellow flounders), American plaice, pollock, haddock, redfish, turbot (i.e. Greenland halibut), skate, and white hake, while sculpins and cunners may be released. Retaining Atlantic halibut, wolffish sp., or shark sp. is not permitted.

Recreational fishing activity along the coast of the Project Area (i.e., Argentia Harbour and Peninsula and Argentia Backlands coast) may be lower due to private land status and remote access, and higher marine traffic from Argentia Harbour. Other areas, like the coastal southern limit of the LAA, may experience more recreational fishing, particularly during the groundfish fishery from July to October.

Marine Indigenous Fisheries

The following section discusses of the potential presence of Indigenous fishery activities near the RAA. The closest Indigenous community to the Project is the Miawpukek First Nation located at the mouth of Conne River on the south coast of insular Newfoundland. Miawpukek operates and/or functions under the umbrella of, or in collaboration with, several enterprises from the seafood sector, both fisheries and aquaculture (e.g., Netukulimk Fisheries Ltd.; Miawpukek First Nations with RS Marine Ltd. (NLDFFA, 2023).

The Miawpukek First Nation has commercial licences in 3Ps and they hold enterprises and other licenses that permit access to other Divisions (e.g., 3KL, 3LN, Areas 4-33) (Equinor, 2017). Miawpukek mainly harvest snow crab, but also has the prospect of harvesting sea cucumber, groundfish, whelk, bluefin tuna, cunners, and other species (NLDFFA, 2023). The Miawpukek First Nation has a FSC licence in a portion of 3P, from along the south coast to Bay d'Espoir, for scallop, lobster, mackerel, herring, rainbow trout, brook trout, Atlantic cod, American eel, rainbow smelt, capelin, seal (harp, grey, and harbour), snow crab, whelk, and redfish (Equinor, 2017). The south coast of Bay d'Espoir is situated within the NAFO Sub-Division 3Psa, further West of the Burin Peninsula. Miawpukek is also involved in the commercial fishery with one of the largest wild seafood companies, Clearwater Seafoods, and is a member of the Mi'kmaq Coalition, which acquired 50% of this company in 2021.

Miawpukek are important in the aquaculture business, recently aiming to assess cunner bioavailability as cleaner fish for aquaculture sea lice issues (NLDFFA, 2023). Miawpukek are also involved in monitoring traditional harvests, commercial fisheries, food fishery, Atlantic salmon, American eel, and northern wolfish, among other resources across the province (Indigenous Guardians Toolkit, n.d.). The Miawpukek are therefore an important stakeholder in Newfoundland's commercial, recreational and Indigenous fisheries, which could extend to a potential involvement in fisheries in 3Psc or freshwater resources near the RAA.

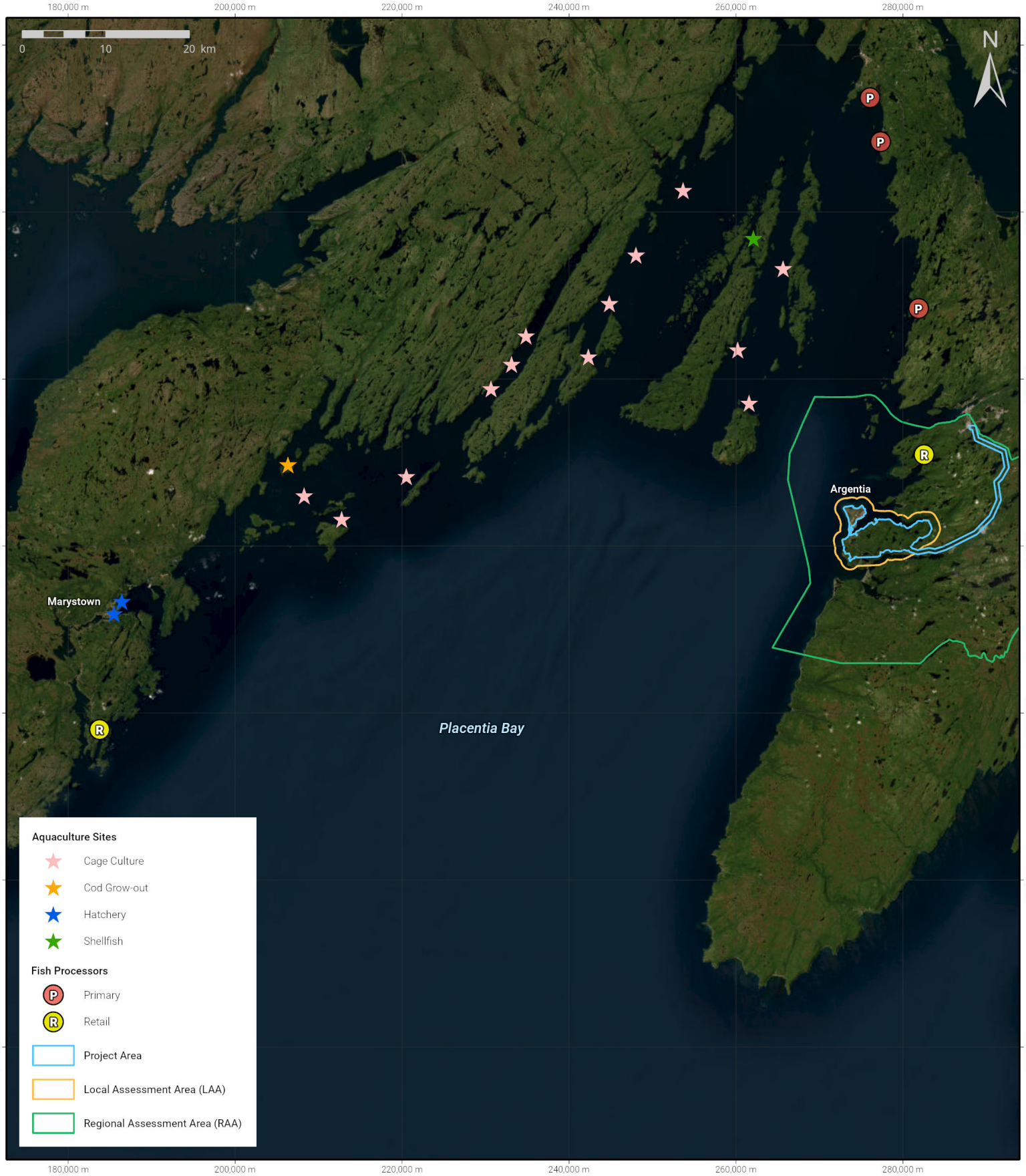
Aquaculture and Fish Processing

Possible interactions with the aquaculture industry or seafood processors within Placentia Bay and the RAA are discussed below. Aquatic farmed species that are produced in NL include finfish (e.g., Atlantic salmon, steelhead trout, Atlantic cod) and shellfish (e.g., blue mussels and American oysters) (Gov. NL. n.d.a). Atlantic salmon is the principal salmonid aquaculture species in the province. The finfish aquaculture sector operates marine-based cage sites along the province's south coast and comprises three large multinational companies, Mowi Canada East, Cooke Aquaculture and Grieg Seafood. The south coast region is the only part of the province that is suitable for salmonid culture, as the bays (e.g. Placentia Bay) and fiords are generally ice-free the entire year (Gov. NL, n.d.a)

Figure 3.1.2-20 provides the location and type of aquaculture sites as well as licensed seafood processors in Placentia Bay and adjacent to the RAA. Placentia Bay has two land-based and 16 marine-based licenced aquaculture sites. Both land-based facilities near Marystown are characterized as hatcheries (DFO, 2023e) and are owned by Marbase Cleanerfish Ltd. and Grieg NL Nurseries Ltd. Most of the marine-based sites are situated near the West coast of Placentia Bay, and the Western and Central Channels near Merasheen Island. Grieg Marine NL Ltd. Grieg Newfoundland Salmon Ltd. operates 14 of the 16 licenced marine-based cage culture sites for Atlantic salmon production. Aquaculture sites are located inshore, typically in sheltered coves or along protected shorelines. Site locations are often influenced by environmental factors, proximity to other human activities, community sewage outfalls and access to services (roads and electricity). None of the marine cage sites in Placentia Bay are located in the RAA.

There are several seafood-licensed processors found on the Placentia Bay coast including Dandy Dan's Fish Market Limited (Ship Harbour) (Figure 3.1.2-20), Avalon Ocean Products Incorporated (Fair Haven), Quin-Sea Fisheries Limited (Southern Harbour), and Icewater Seafoods Inc. (Arnold’s Cove). Dandy Dan's Fish Market Limited (retail) is the only operator within the RAA (DFO, 2023e).

Argentia Harbour is important for infrastructure to support the aquaculture industry. Grieg Seafood NL has selected Argentia for a feed distribution center to supply its marine-based cage sites in Placentia Bay. Harvested salmon from Grieg Seafood NL Ltd. are landed at Argentia and trucked to a processing facility in Bay de Verde. Argentia is expanding its support for this industry with a new aquaculture-dedicated wharf development (Aquaculture Wharf) and proposed supply warehouses, in the harbour's southern area (NL DECC, 2022). Future aquaculture support services near Argentia could include cleaning, maintaining and repairing the net and sea cages as well as a research and development site.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.2 - 20	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: J. Crocker	DATE: 24/07/28
	FIGURE TITLE: Aquaculture Sites and Fish Processors in Placentia Bay	NOTES: Fishing data sourced from Statistical Services, Fisheries and Oceans Canada (DFO)	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-017-Rev1

3.1.2.16 Marine Sensitive Time Periods and Working Windows

This section summarizes the sensitive times of the year (e.g. migration, feeding and spawning) for marine species that are likely to be occasionally or commonly present in the marine environment adjacent to the LAA and RAA.

Table 3.1.2-20 provides the sensitive time periods for four species of special concern or high economic value with the potential to occur within the LAA. The four species include Atlantic cod and American plaice (NL populations), which are species of special concern, and American lobster and snow crab, which are species of high economic value in Placentia Bay.

Sensitive time for Atlantic cod is associated with an increased inshore movement or migration in spring before spawning, for inshore spawners. A subsequent migration occurs to deeper waters in response to the coming winter. Atlantic cod spawning activities typically occur in Placentia Bay between March and August and are likely to peak from late March to mid-May. Sensitive times for American plaice are associated with an increased migration in winter before spawning which occurs typically between March and May.

Snow crab and lobster are typically fished from April to June and from May to July, respectively, and spawning typically occurs from February to May and July to September, respectively. Up-slope spawning migration for snow crab and spawning events for both snow crab and lobster are associated with their moulting phases, making them vulnerable to perturbation.

Limited environmental alteration will be expected in the LAA and RAA marine environment in relation to the Project footprint, therefor there are no obvious limited working windows for the Project in relation to the four species of concern or high economic value.

Table 3.1.2-20 Sensitive Time Periods Associated with Potential Marine Organisms in the LAA.

Species	Life History Sensitive Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Peak Activity
Marine Environment														10
Snow Crab	Molting, Spawning	6	10	10	10	7	4	4	1	0	0	0	1	9
	Hatching	0	0	2	5	10	2	1	0	0	0	0	0	8
American Lobster	Molting, Spawning	0	0	0	0	1	1	8	10	8	2	0	0	7
	Hatching	0	0	0	2	3	9	10	10	8	1	0	0	6
American plaice (NL Pop.)	Migrating	3	3	2	0	0	0	0	0	0	0	1	3	5
	Spawning	0	1	8	10	10	1	0	0	0	0	0	0	4
	Hatching	0	0	4	8	8	8	1	0	0	0	0	0	3
Atlantic cod (NL Pop.)	Migrating	1	2	4	5	5	5	4	1	0	0	1	3	2
	Spawning	0	1	4	10	10	7	4	2	0	0	0	0	1
	Incubation, Hatching	0	1	1	4	10	10	7	6	2	2	0	0	0

3.1.2.17 Marine Conservation Concern

Marine Species at Risk and/or of Conservation Concern

The following section presents an overview of the aquatic species of special interest which could potentially occur in the RAA and LAA. Aquatic invasive species (AIS), species with conservation status (e. g. species listed by SARA or the NL ESA), and with potential conservation concern in relation to the Project's marine component are discussed below.

Aquatic Invasive Species

Aquatic invasive species include fish, invertebrates or plant species which were introduced into a new aquatic environment outside their natural range (DFO, 2019a). This also includes species native to other parts of Canada that have been introduced into areas beyond their historical range.

AIS populations can rapidly proliferate once introduced into a favourable habitat and can negatively affect native species. They can also alter habitats to make them less hospitable for native species. Unintended introductions of AIS have been linked to marine transport through ballast water and attachment to ship hulls. The spread of AIS has been rising globally due to increased trade volumes and reduced shipping times (DFO, 2019a; Sardain *et al.,* 2019). Reporting the presence and monitoring the spread of AIS, as well as compliance with precautionary tools, are necessary for prevention and mitigation (McKenzie, *et al.,* 2016).

Table 3.1.2-21 provides a list of the seven AIS that have been reported in Placentia Bay from DFO (C. McKenzie personal communication, September 18, 2023), of which, five were found within the RAA. Occurrence in the RAA is based on reported presence/absence from AIS maps obtained from DFO. Figure 3.1.2-21 demonstrates the extensive distribution of the European green crab in Placentia Bay and throughout other parts of insular Newfoundland. Of any of the AIS, European green crab is the species with the most likelihood to be noticeable within the RAA due to the nature of the species and proximity of areas of detection recorded.

Table 3.1.2-21 Aquatic Invasive Species Identified in Placentia Bay.

Common Name	*Species Name*	Distribution in the RAA	Species Characteristics and Threats to Native Species
European Green Crab	*Carcinus maenas*	Argentia, Fox Harbour, Long Harbour, Placentia NE and SE, Spencer's Cove	The European green crab is an aggressive and territorial crab species that feeds primarily on shellfish and other crustaceans and has also been observed feeding on small and juvenile finfish in eelgrass beds. The green crab may damage eelgrass by burrowing in sediment, cutting the roots of eelgrass. This species has the potential to substantially alter biodiversity and deteriorate habitats in various ecosystems in Newfoundland (DFO, 2010).
Japanese Skeleton Shrimp	*Caprella mutica*	Fox Harbour	The Japanese skeleton shrimp is a small amphipod crustacean that infests artificial structures such as buoys and mussel aquaculture socks. This species' abundance may reach 100,000 individuals per m^2, competing with mussels for food and space (DFO, 2023g).
Coffin Box	*Membranipora membranacea*	Argentia, Placentia	Coffin box is a small Bryozoan invertebrate that can cover substance surfaces as it lives with others in colonies. It can that can harm kelp beds, which are highly productive marine habitats, contributing as a food source and hiding place for many species of fish and invertebrates. Coffin box can starve kelp by blocking the access to nutrients and light availability and permanently alter kelp beds and affect biodiversity (DFO, 2011a).
Oyster Thief	*Codium fragile ssp. fragile*	Not in the RAA	Oyster thief is a green alga and can replace native seaweeds (kelp and eelgrass). This can disturb natural ecological cycles between underwater kelp forests and barrens, typically controlled by sea urchin populations (DFO, 2013).
Golden Star Tunicate	*Botryllus schlosseri*	Argentia, Fox Harbour, Long Harbour, Placentia NE and SE, Spencer's Cove	Golden star tunicate a filter feeder, and overgrowth may cover surrounding plants and animals, depriving them of sunlight or food. They also compete for food with nearby filter feeders, such as mussels and scallops. The spread of golden tunicate can disrupt shellfish harvesters, aquaculture farmers, and aquatic organisms living on the ocean floor (DFO, 2022h).
Vase Tunicate	*Ciona intestinalis*	Argentia	Vase tunicate is a filter-feeding organism that competes with bivalves for nutrients, bacteria and other small organic matter. Their overgrowth may cover surrounding plants and animals, depriving them of sunlight, food or space. The vase tunicate is prevalent in submerged aquaculture structures (i.e. mussel socks). This organism may cause water quality issues and decrease the size and condition of commercially raised mussels (DFO, 2013a).
Violet Tunicate	*Botrylloides violaceus*	Not in the RAA	The violet tunicate is a filter feeder, absorbing nutrients from phytoplankton (algae), bacteria and other small organic matter. Overgrowth may cover surrounding plants and animals, depriving them of sunlight or food, and compete for food with nearby mussels and scallops. The violet tunicate can release a chemical, making it hard for aquatic organisms to attach properly to substrates, and become vulnerable to water currents. Tunicates can disrupt shellfish harvesters, aquaculture farmers, and aquatic organisms living on the ocean floor (DFO, 2011b).

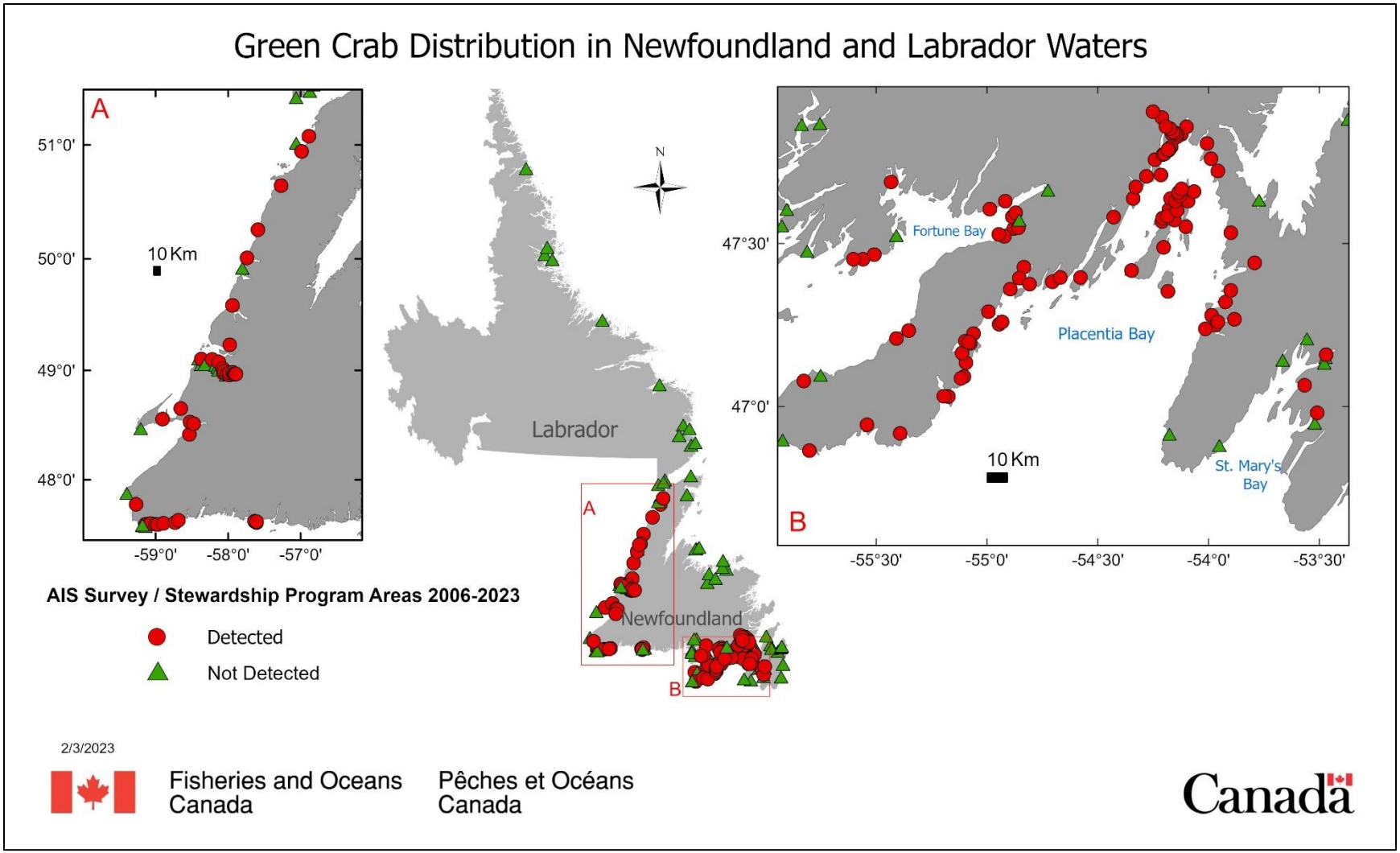


Figure 3.1.2-21 European Green Crab (*Carcinus maenas*) Distribution in Placentia Bay.

Listed Species and/or of Conservation Concern

Species listed under the *Species at Risk Act* (SARA) Schedule 1 are legally protected and are ranked as extirpated, endangered, threatened and of special concern. The *Newfoundland and Labrador Endangered Species Act* (NL ESA) designates species as extirpated, threatened, endangered, vulnerable, data deficient, or not at risk. Information used to identify and characterize the species of interest in the RAA and LAA included listing under SARA and the NL ESA and information provided by the Atlantic Canada Conservation Data Centre (AC CDC) based on a request made in 2023. Supporting documentation included COSEWIC reports and publicly available literature. Aquatic invasive species are also of special concern and have been discussed previously.

Tables 3.1.2-22 provides the aquatic species of special interest with their potential to occur in the LAA. Overall, 38 aquatic species of concern other than AIS have been reported in Placentia Bay or the Avalon Peninsula. There are 21 marine fish, ten marine mammals (five baleen whales and five toothed whales and two marine reptiles that have been identified). Only four of 33 species are expected to be found occasionally or commonly in the RAA and LAA, based on habitat utilization and reported presence of which two are marine finfish and two are diadromous fish.

Table 3.1.2-22 Summary of Marine Species of Special Concern.

Common Name	Species Name	IUCN Red List[1]	COSEWIC Status	SARA Status	Occurrence in LAA
Finfish					
Marine Fish					
Acadian Redfish (Atlantic Pop.)	*Sebastes fasciatus*	Endangered	Threatened	Not Listed	Rare
American Plaice (NL Pop.)	*Hippoglossoides platessoides*	Endangered	Threatened	Not Listed	Occasional
Atlantic (Striped) Wolffish	*Anarhichas lupus*	N/A	Special Concern	Special Concern	Rare
Atlantic Cod (Laurentian North Pop.)	*Gadus morhua*	Vulnerable	Endangered	Not Listed	Common
Atlantic Cod (NL Pop.)			Endangered	Not Listed	Occasional
Atlantic Spiny Dogfish	*Squalus acanthias*	Vulnerable	Special Concern	Not Listed *	Rare
Basking Shark (Atlantic Pop.)	*Cetorhinus maximus*	Endangered	Special Concern	Not Listed *	Rare
Bluefin Tuna (Atlantic Pop.)	*Thunnus thynnus*	Least Concern	Endangered	Not Listed	Rare
Cusk	*Brosme brosme*	Least Concern	Endangered	Not Listed*	Rare
Deepwater Redfish (Gulf of St. Lawrence - Laurentian Channel Pop.)	*Sebastes mentella*	Least Concern	Endangered	Not Listed	Rare
Grenadier (Roundnose)	*Coryphaenoides rupestris*	Critically Endangered	Endangered	Not Listed*	Rare
Lumpfish	*Cyclopterus lumpus*	N/A	Threatened	Not Listed	Rare
Northern Wolffish	*Anarhichas denticulatus*	Endangered	Threatened	Threatened	Rare
Porbeagle Shark	*Lamna nasus*	Vulnerable	Endangered	Not Listed *	Rare
Shortfin Mako shark (Atlantic Pop.)	*Isurus oxyrinchus*	Endangered	Endangered	Not Listed *	Rare
Smooth Skate, (Laurentian-Scotian Pop.)	*Malacoraja senta*	Vulnerable	Special Concern	Not Listed*	Rare
Spotted Wolffish	*Anarhichas minor*	Near Threatened	Threatened	Threatened	Rare

Common Name	Species Name	IUCN Red List[1]	COSEWIC Status	SARA Status	Occurrence in LAA
Marine Mammals					
Baleen Whales					
Blue Whale (Atlantic Pop.)	*Balaenoptera musculus*	Endangered	Endangered	Endangered	Rare
Fin Whale (Atlantic Pop.)	*Balaenoptera physalus*	Vulnerable	Special Concern	Special Concern	Rare
Humpback whale (Western North Atlantic Pop.)	*Megaptera novaeangliae*	Least Concern	Not Listed	Not Listed (Sch1), Special Concern (Sch 3)	Rare
North Atlantic Right Whale	*Eubalaena glacialis*	Endangered	Endangered	Endangered	Rare
Sei Whale (Atlantic Pop.)	*Balaenoptera borealis*	Endangered	Endangered	Not Listed *	Rare
Toothed Whales					
Harbour Porpoise (Northwest Atlantic Pop.)	*Phocoena phocoena*	Least Concern	Special Concern	Not Listed (Sch1), Threatened (Sch 2), Under revision Dec, 2023	Rare
Killer Whale (Northwest Atlantic Pop.)	*Orcinus orca*	N/A	Special Concern	Not Listed *	Rare
Northern Bottlenose Whale (Davis Strait-Baffin Bay-Labrador Sea Pop.)	*Hyperoodon ampullatus*	Near Threatened	Special Concern	Not Listed *	Rare
Northern Bottlenose Whale (Scotian Shelf Pop.)			Endangered	Endangered	Rare
Sowerby's Beaked Whale	*Mesoplodon bidens*	Least Concern	Special Concern	Special Concern	Rare
Marine Reptiles					
Leatherback Sea Turtle (Atlantic Pop.)	*Dermochelys coriacea*	Vulnerable	Endangered	Endangered	Rare
Loggerhead Sea Turtle	*Caretta caretta*	Vulnerable	Endangered	Endangered	Rare

Sources: IUCN websites (2024), COSEWIC website (2023); DFO (2019); NL ESA (2002); SARA websites (2024); LGL (2019).

Notes: 'NL' = Newfoundland and Labrador. 'Pop.' = population(s), 'Not Listed*' = Represent species not on the Species at Risk Acts (SARA) list, although under consideration for addition in Schedule 1 of SARA;

1' = IUCN Red List referred to the global specie if not specified

Marine Species of Concern

Atlantic cod (Laurentian North Pop.) and American plaice (NL population) have a high probability of occurrence in the marine areas of the RAA and LAA (Table 3.1.2-22).

Coastal habitats of Placentia Bay, including the RAA and LAA, provide potential spawning, feeding, nursery, rearing areas and migratory routes for Atlantic cod (Laurentian North Pop.) at different stages of their life circle. Juvenile Atlantic cod, for example, were observed within the near the coastline with less than 15 m depth near east side of Placentia Bay (LGL, 2007).

Coastal habitats of Placentia Bay, including the LAA, provide potential spawning, feeding, nursery, rearing areas and migratory routes for American plaice (NL population) at different stage of their life cycle. Additional information on these two species has been previously provided in the Marine Fish and Fish Habitat and the Marine Fishery portions of this report. Sensitive time periods for these species are discussed in the Sensitive Time Periods and Working Windows previous portion of this report.

LGL (2018) have identified other SARA listed species that have potential to occur in Placentia Bay including white shark, northern wolffish, spotted wolffish, Atlantic wolffish and banded killifish. White sharks are relatively rare in Canadian waters and individuals in Atlantic Canada are likely seasonal migrants, however, one acoustically tagged shark was recorded in Placentia Bay south of Merasheen and Red Islands. No wolffish have been caught as by-catch in commercial fisheries or in DFO research vessel surveys in recent years, however, Atlantic wolffish were captured in DFO research vessel surveys in the period from 2010 to 2015. Newfoundland populations of banded killifish are designated as special concern in SARA and as vulnerable under the NL ESA. The species is euryhaline and populations exist on the western part of Placentia Bay near Marystown. The potential for any of these species to occur in the RAA or LAA would be extremely low.

Marine Habitats of Conservation Concern

The whole of Placentia Bay is designated as an Ecologically and Biologically Significant Area (EBSA), which is one of 14 EBSAs within the Placentia Bay-Grand Banks Large Ocean Management Area PBGB LOMA (DFO, 2019c), and this would include the marine component of the RAA and LAA. DFO has identified EBSAs that may contain depleted or rare species, ecologically significant species and community properties, and degraded areas, which require special management measures (DFO, 2007a). Some EBSAs may be put forward as areas of interest for designation as a Marine Protected Area (MPA) while other areas or species may be considered for protection under other management schemes such as SARA.

The Placentia Bay EBSA boundary extends across the mouth of the bay from St. Lawrence on the west side to the St. Mary's Bay on the east side. It primarily was identified as an EBSA based on coastal data, but the seaward boundary was extended south to capture important areas and habitats for corals and

sponges as well as leatherback turtle. This EBSA has important salmon rivers, capelin spawning beaches, eelgrass habitats and seabird colonies in the nearshore, and many other key features just outside the bay.

Piper's Hole River and Cape Rodger River, which drain into Placentia Bay, have a genetically distinct population of salmon (Bradbury *et al*., 2015). Capelin spawning beaches are heavily concentrated on the east side of the bay, with a few also found on the west side and southern tip of the Burin Peninsula.

Eelgrass habitat is found in many coves and harbours throughout the bay. However, the invasive green crab is having an impact on eelgrass habitat (*Matheson et al.,* 2016). Leatherback turtles are known to frequent the entire bay, with 18% of all sightings from the 2016 Northwest Atlantic International Sightings Survey (NAISS) found within the boundaries of the Placentia Bay EBSA (DFO, unpublished data). This EBSA also captures part of a larger area denoted as important for blue whales (DFO, 2019d). Important areas for large gorgonian coral, soft coral and sponge are found near the seaward boundary of the Placentia Bay EBSA.

The presence of two Significant Benthic Areas (SiBAs) in the south of the bay have been identified (DFO, 2017a), however, these are not close to the RAA. A SiBA is defined as an ecologically and biologically significant habitat type, feature, community, or species considered intrinsically sensitive to fishing impacts and slow to recover (e.g. coral and sponge dominated habitats). There are also no MPAs or critical habitats, as defined under SARA and the NL ESA, identified near the RAA or LAA (DFO, 2023e).

Sensitive areas near the RAA and LAA included: Placentia Bay Extension EBSA; capelin spawning beaches; eelgrass beds; salt marshes; wetlands, and scallop beds. The Canadian Parks and Wilderness Society (CPAWS) have also identified 'Special Marine Areas' in Newfoundland and Labrador (CPAWS, 2018), including Placentia Bay Extension and Bar Haven.

Capelin occurring in southwestern Newfoundland overwinter in offshore waters and migrate inshore to Placentia Bay in early spring to spawn on preferred beaches in spring and summer and then return to the offshore once again in autumn. Capelin typically arrive at the head of Placentia Bay in June and July. Capelin spawning beaches were identified, based on local ecological knowledge, near St. Lawrence, Lamaline, Cape St. Mary's and Placentia. more than 80 capelin beaches have been identified in Placentia Bay of which 31 spawning beaches were identified, eight of which were thought to be annual spawning sites (Sjare *et al.,* 2003). Beach suitability appears to be determined by substrate and capelin spawning beaches occur in sheltered, semi- exposed and exposed areas. Eggs are usually deposited in the intertidal zone, although offshore spawning has also been documented, and larvae are generally carried out of the inshore region by surface currents.

Eelgrass has been found to be among the most productive ecosystems globally and provides a number of important functions and services, including: supporting high diversity; providing refuge and nursery

areas for invertebrates and fishes; providing food sources for migrating and over-wintering waterfowl; stabilizing sediments, filtering the water column; shoreline protection; and recycling and storing nutrients and exchanging gases. Eelgrass is considered an Ecologically Significant Species (DFO, 2009) and is protected under the **Fisheries Act**. Extensive eelgrass beds have been identified in Placentia Bay (Catto *et al.,* 1999), particularly in shallow and sheltered coastal areas. Matheson *et al.* (2016) studied the effects of European green crab invasion on eelgrass including eelgrass beds in Ship Harbour, Fox Harbour, Placentia Sound, and Placentia (NE and SE), Placentia Sound, all within the RAA. Eelgrass habitat was also observed near the Argentia peninsula in low densities while other algae (kelp, sea colander and sour weed) were more abundant (Husky Energy, 2012).

Salt marshes are recognized as sensitive habitats that support birds, insects and terrestrial mammals in tidal areas. Salt marsh plants stabilize sediments and provide coastal protection from erosion and wave action. The main concentrations of salt marshes in Placentia Bay are near Swift Current outside of the RAA and LAA.

3.1.3 Terrestrial Environment

The Project Area is in the Avalon Geological Zone, and is primarily comprised of subaerial volcanic rocks, including unseparated fluviatile and shallow marine siliciclastic sedimentary (Colman-Sadd *et al*., 2000). A review of the “Surficial Geology of the St. John’s and Trepassey Map Areas (NTS 1N and 1K)”, Map 94-230 (Liverman & Taylor, 1994), indicates that surficial soils of the Argentia Peninsula and adjacent mainland consist of marine clay, sand, gravel and diamicton, and the inland portions of the Project Area surficial soils range from till blanket, hummocky terrain to a till veneer, mainly consisting of a blanket of diamicton or sand and gravel, overlying bedrock, with some patches of exposed bedrock further inland.

3.1.3.1 Vegetation

The Project Area is located within the Southeastern Barrens Subregion of the Maritime Barrens Ecoregion (Protected Areas Association of Newfoundland and Labrador, 2008). It is characterized by stands of black spruce (*Picea mariana*), balsam fir (*Abies balsamea*), tamarack (*Larix laricina*), and sporadic patches of yellow birch (*Betula alleghaniensis*). Non-forested habitats present in the Project Area consist mainly of barrens, heaths, rock outcrops, bogs, fens and anthropogenically altered areas.

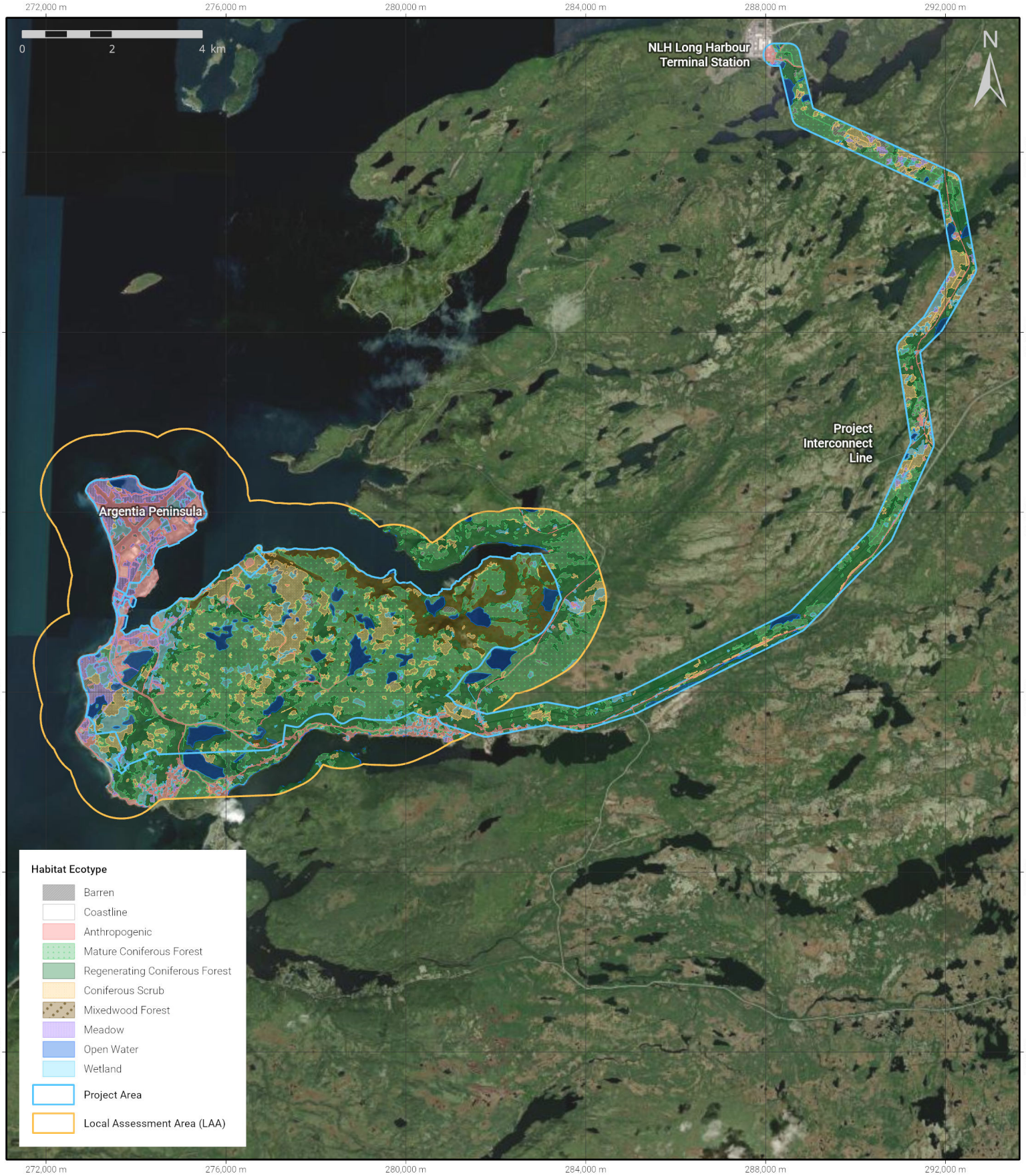
3.1.3.2 Ecological Land Classification (ELC)

A two-method approach was employed for the identification of the ecotypes that exist throughout the Project Area; first, a comprehensive data/information compilation exercise was conducted to compile existing information on the Project Area. Secondly, detailed ELC mapping was completed for the Project Area using high-resolution digital images imported into ArcGIS for interpretation, supported by a comprehensive field verification program. Habitat polygons were interpreted and digitized at a scale of 1:5,000 using 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 from information collected from the field. Information gathered in the field was also used to refine ecotype boundaries and aggregate ecotypes based on similar characteristics.

The ELC was used to plan the surveys of the other VCs included in this Registration. Specialized ecotypes like wetlands and rock outcrops tend to have elevated potential for the occurrence of rare wildlife and plant species. Such ecotypes were targeted during the rare plant surveys. For example, coniferous forests adjacent to wetlands were targeted for boreal felt lichen, open areas were surveyed for Short-eared Owl, and mature coniferous stands were surveyed for Red Crossbill *percna*.

The ecotype mapping for the Project Area resulted in 2,555 individual polygons representing several ecotypes including Barren, Coastline, Anthropogenic, Mature Coniferous Forest, Meadow, Mixedwood Forest, Regenerating Coniferous Forest, Coniferous Scrub, Open Water, and Wetland (Figure 3.1.3-1). Each is described below.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.3 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Ecological Land Classification for the Project Area	NOTES:	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	
			sem	

SEM MAP ID: 238-005-GIS-021-Rev0

Barren

Barrens are characterized by unvegetated, exposed bedrock (Figure 3.1.3-2). Soils are typically well-drained, and ground cover often primarily consists of crustose and fruticose lichens, feathermosses, and low-lying woody plants like lowbush blueberry (*Vaccinium angustifolium*) and black crowberry (*Empetrum nigrum*).

Figure 3.1.3-2 Upland Barren Ecotype in the Project Area.

Coastline

The Coastline ecotype within the Project Area is located primarily on the western side of the Argentia Peninsula and south of the Peninsula along the coast (Figure 3.1.3-3). It is comprised of anthropogenically altered beaches with varying sizes of stony substrates. The coastline is devoid of any significant vegetation but could provide nesting habitat for shorebirds and/or seabirds.

Figure 3.1.3-3 Coastline Ecotype in the Project Area.

Anthropogenic

The Anthropogenic ecotype encompassed all habitats that were significantly altered by human activity, including impervious surfaces, building infrastructure, and the like (Figure 3.1.3-4). This would include the old airstrip on the Peninsula, all the roads and secondary roads throughout the Project Area, concrete bunkers and military structures, and the old railway bed.

Figure 3.1.3-4 Anthropogenic Ecotype in Project Area

Mature Coniferous Forest

Mature Coniferous Forest habitat comprises a substantial proportion of the available habitat in the Project Area, particularly in the Argentia Backlands (Figure 3.1.3-5). This ecotype is an amalgamation of several forest types, including Mature Balsam Fir, Mature Black Spruce, and Mature Fir-Spruce, which were not distinguished from each other as this ELC did not dictate that level of resolution (and field verification). Black spruce (*Picea mariana*) and balsam fir (*Abies balsamea*) typically dominate the tree stratum. The shrub layer often consists of understory balsam fir and low shrub species such as Labrador tea (*Ledum groenlandicum*) and lowbush blueberry (*Vaccinium angustifolium*). Herbaceous vegetation often consists of bunchberry (*Cornus canadensis*), twinflower (*Linnea borealis*), Clinton lily (*Clintonia borealis*), and creeping snowberry (*Gaultheria hispidula*). Ground cover visually consists of a continuous layer of feathermoss species, namely Schreber's moss (*Pleurozium schreberi*), stairstep moss (*Hylocomium splendens*) and plume moss (*Ptilium crista-castrensis*). In wetter areas, *Sphagnum* spp. dominate the moss layer.

Figure 3.1.3-5 Mature Balsam Fir-Sphagnum Forest Adjacent to a Wetland in Project Area.

Regenerating Coniferous Forest

A significant proportion of the Project Area has been affected historically by domestic cutting, windthrow, ice damage, clearcutting, and moose browsing. Therefore, a large percentage (24%) of the Project Area is comprised of Regenerating Coniferous Forest (Figure 3.1.3-6). On the Avalon Peninsula generally, and within the Project Area, this ecotype is mostly represented by young (e.g., 5–15-year-old) balsam fir thickets.

Figure 3.1.3-6 Regenerating Coniferous Forest in the Project Area.

Coniferous Scrub

Within the transition zones from upland forest to wetlands exist swaths of stunted black spruce (and sometimes balsam fir) (Figure 3.1.3-7). These thick scrub areas are often characterized by wetter soils (histosols) and *Sphagnum* spp.

Figure 3.1.3-7 Coniferous Scrub in the Project Area.

Mixedwood Forest

Mixedwood Forest stands were relatively sparse within the Project Area. These were characterized by >25% deciduous trees in a forest stand (3.1.3-8). Yellow birch (*Betula alleghaniensis*) was the most prevalent deciduous species component in these stands, but White birch (*Betula papyrifera*) was also present in some stands. Balsam fir and/or black or white spruce comprised the coniferous component.

Figure 3.1.3-8 Mixedwood in the Project Area.

Meadow

The Meadow ecotype is an anthropogenically formed habitat, located primarily on the Argentia Peninsula and near the coast (Figure 3.1.3-9). It is characterized by graminoid species, often non-native bluejoint grass (*Calamagrostis canadensis*) and myriads of other non-native herbaceous species like hawkweed (*Hieracium* spp.), swamp thistle (*Cirsium muticum*), and red clover (*Trifolium pratense*).

Figure 3.1.3-9 Meadow ecotype in the Project Area.

Open Water

The Open Water ecotype was scattered throughout the Project Area in the forms of ponds, rivers, streams, and open-water wetlands.

Wetland

Wetlands within the Project Area primarily consist of fens and bogs, both were mapped as a Wetland within the ELC (Figure 3.1.3-10). 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.

Figure 3.1.3-10 Wetland Ecotype in the Project Area.

Wetlands provide functions within an ecosystem that can further provide benefits to local communities and support water management and climate change related policies. In addition to supporting biodiversity and providing wildlife habitat, wetlands are essential landscape features that perform critical ecosystem functions like water storage and runoff delay, flood prevention, water purification, groundwater recharge, and carbon storage. Development in wetlands requires a permit under Section 48 of the **Water Resources Act** for all development activities within or affecting wetlands. The following section outlines the regulations pertaining to provincial and federal wetland management.

Regulations

Province of Newfoundland and Labrador

The Water Resources Management Division of the Department of Environment and Climate Change maintains a **Policy for Development in Wetlands** (hereafter the "**Policy**") that establishes criteria for issuing a permit for development activities in and affecting wetlands in accordance with Section 48 of the **Water Resources Act** (hereafter "**the Act**"). The statutory definition of Wetland under the Act refers to "*land that has the water table at, near or above the land surface and includes bogs, fens, marshes, swamps and other shallow open water areas*" (Water Resources Act, 2002).

The stated objective of this **Policy** is to limit developments in wetlands to those which do not adversely affect water quantity, water quality, hydrological characteristics, functions, or habitats. Outlined within the Policy are the types of developments having indirect or direct effects to wetlands that are not permitted, and development activities that may be approved only with written permission by the Minister of Environment and Climate Change. When developments affecting wetlands are permitted under **the Act**, any required mitigative or restoration measures are specified in the terms and conditions of the environmental approval. As more than 90% of the province is managed as Crown Land, the Policy has wide applicability across the land base.

Activities affecting wetlands in Newfoundland and Labrador may also be regulated by the **Environmental Protection Act,** when a proposed project affecting wetlands triggers an Environmental Assessment based on criteria outlined in the **Environmental Assessment Regulations** (2003).

Government of Canada

At the federal level, wetland conservation in Canada is promoted by the **Federal Policy on Wetland Conservation** (hereafter "**the Federal Policy**"), which centers on the objective to "promote the conservation of Canada's wetlands to sustain their ecological and socio-economic functions, now and in the future" (Government of Canada, 1991). **The Federal Policy** outlines the Goals, Guiding Principles and Strategies for achieving this objective.

Under **the Federal Policy**, a wetland is defined as "*land that is saturated with water long enough to promote wetland or aquatic processes as indicated by poorly drained soils, hydrophytic vegetation and various kinds of biological activity which are adapted to a wet environment. Wetlands include bogs, fens, marshes, swamps and shallow waters (usually 2 m deep or less) as defined in The Canadian Wetland Classification System published by the National Wetlands Working Group of the Canada Committee on Ecological Land Classification (1987)*" (Government of Canada, 1991).

Goals of **the Federal Policy** include: maintaining wetland functions and values throughout Canada; enhancement and rehabilitation of wetlands in areas where degradation has reached "critical levels";

recognition of the value of wetland functions within federal resource planning and management processes; securement of significant wetlands; endorsement of sustainable management practices in relevant sectors (e.g., forestry and agriculture); sustainable use of wetlands that allows continued use by future generations; and no net loss of wetlands on federal lands and waters (Government of Canada, 1991). The no net loss of wetlands goal of **the Federal Policy** is associated with a three-step mitigation hierarchy whereby wetland loss is primarily avoided, unavoidable wetland loss is minimized, and any remaining loss is offset through compensation to maintain baseline wetland functioning (Government of Canada, 1991).

The Federal Policy is applicable to all federal lands and waters and provides a directive to all federal departments to protect wetland functions in their operations and programs. **The Federal Policy** may have broader applicability extending to private or provincially managed land in cases where wetland effects are caused by an activity that is federally permitted or funded (Government of Canada, 1991). In this case, the Project is expected to only interact with **the Federal Policy** where the T-line may cross Crown Lands.

3.1.3.3 Fauna (Mammals)

The Project Area, LAA, and RAA each include tracts of wilderness which provides habitat for many mammalian species in the province. Mammals from orders Artiodactyl (e.g., moose), Carnivora (e.g., foxes, coyotes), Rodentia (e.g., beavers, voles) Insectivora (e.g., shrews) and Lagomorpha (e.g., hares) were all considered during mammal surveys. Chiroptera (Bats) required a specialized survey which is described in the Species at Risk section (Section 3.1.3.5). The list of non-volant mammals considered possible for the LAA included in Table 3.1.3-1.

Table 3.1.3-1 Non-volant Mammals with the Potential to Occur in LAA.

Common Name	Species Name	IUCN Red List	Occurrence in LAA
Moose	Alces alces	Least Concern	Common
Lynx	Lynx canadensis	Least Concern	Occasional
Red Fox	Vulpes vulpes	Least Concern	Common
Coyote	Canis latrans	Least Concern	Occasional
Short-tailed Weasel	Mustela erminea	Least Concern	Common
Mink	Neovison vison	Least Concern	Occasional
Otter	Lontra canadensis	Least Concern	Occasional
Beaver	Castor canadensis	Least Concern	Occasional
Muskrat	Ondatra zibethicus	Least Concern	Occasional
Meadow Vole	Microtus pennsylvanicus	Least Concern	Common
Red-backed Vole	Myodes gapperi	Least Concern	Rare
Red Squirrel	Tamiasciurus hudsonicus	Least Concern	Common
Deer Mouse	Peromyscus maniculatus	Least Concern	Rare
Norway Rat	Rattus norvegicus	Least Concern	Occasional

Common Name	Species Name	IUCN Red List	Occurrence in LAA
House Mouse	Mus musculus	Least Concern	Occasional
Snowshoe Hare	Lepus americanus	Least Concern	Common
Masked Shrew	Sorex cinereus	Least Concern	Common
American Marten	Martes americana atrata	Least Concern	Rare

A literature survey and data searches were conducted for the Project Area, including the AC CDC data query. The AC CDC provides provincial lists of flora and fauna and assigns a conservation status rank (S-rank) for each species in the province. No mammal records were provided in the AC CDC data. Mammal field surveys were conducted throughout the field activities from fall 2022 to spring 2024 (concurrently with the ELC, avian, and lichen field surveys). These surveys were designed to determine the presence/absence of mammals within or adjacent to the Project Area and to establish relative usage of the range of habitats within the Project Area. Biologists opportunistically recorded evidence of mammals including tracks, scat, browsing, and auditory detections. Tracks or browsing in close proximity (<50 m) of each other were counted as one, where applicable (e.g., according to age). Table 3.1.3-2 summarizes the observations made during surveys but is not considered inclusive of all the mammals using the Project Area. Interactions between mammals and the Project will be discussed in Environmental Effects (Chapter 4).

Table 3.1.3-2 Mammal observations in the Project Area

Species	Latin Name	Visual	Tracks	Other
Moose	*Alces alces*	Yes	Yes	Pellets, shed antlers
Red Fox	*Vulpes vulpes*	Yes	Yes	Scat
Short-tailed Weasel	*Mustela erminea*	Yes	Yes	-
Coyote	*Canis latrans*	-	Yes	-
Beaver	*Castor canadensis*	-	-	Browsing, dams
Snowshoe Hare	*Lepus americanus*	Yes	Yes	Pellets
Meadow Vole	*Microtus pennsylvanicus*	-	Yes	-
Masked Shrew	*Sorex cinereus*	Yes	Yes	-
Red Squirrel	*Tamiasciurus hudsonicus*	Yes	Yes	Nests, caches, calls

Dedicated surveys would be required to confirm several of the other species, such as hair snags for lynx, or snap-trapping for small mammals. However, those were deemed unnecessary for the scope of this Project. A muskrat (*Ondatra zibethicus*) survey will be conducted in fall 2024 as per discussions with Newfoundland and Labrador Wildlife Division (NL WD) regarding a probable decline in this species.

3.1.3.4 Avifauna

The **Migratory Birds Convention Act**, 1994 (MBCA) and **Migratory Birds Regulations** (MBR) were implemented to protect birds (both populations and individuals) and nests that contain live birds and/or

viable egg(s). The MBCA and MBR prohibit the capture, kill, take, injury, or harassment of a migratory bird, and protect migratory bird nests. In NL, almost all bird families are federally protected by the MBCA. Raptors and owls are an exception and are protected under provincial **Wild Life Act** legislation. Bird SAR are discussed in subsequent sections.

Resident and migratory species of birds in the Argentia area include representatives from the bird Orders Anseriformes (Waterfowl), Galliformes (Gamebirds), Gaviiformes (Loons), Accipitriformes (Raptors), Charadriiformes (Shorebirds), Columbiformes (Doves), Gruiformes (Rails), Strigiformes (Owls), Coraciiformes (Kingfishers), Piciformes (Woodpeckers), and Passeriformes (Perching birds). These varieties of birds may interact with the Project in differing ways, depending on their ecological niches, migration strategy, and morphology/physiology (including the positioning of the eyes and flying ability). Such interactions are discussed in Environmental Effects (Chapter 4).

The Project Area, LAA, and RAA are located within the Atlantic Flyway (a route regularly used by large numbers of migrating birds), which is one of four major flyways in North America (Figure 3.1.3-11). This region (and eastern Newfoundland in general) does not experience immense numbers of migrating birds (relative to other parts of Canada), as most eastern avian migrants funnel north and south through eastern mainland Canada. Only a subset of individuals using the Atlantic flyway would reach the latitude of the Project Area.

The bird Orders are grouped and discussed in the following sections, which summarize existing conditions, including historical records for bird species in the Project Area, and a summary of results from original surveys that have been conducted in each season since the fall of 2022. Avifauna survey effort is presented in Figure 3.1.3-12a. Detailed survey results can be found in the Avifauna Component Study in Appendix D1.

Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.3 - 11	COORDINATE SYSTEM: WGS 1984 World Mercator	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Four Major Flyways in North America	NOTES: Adapted from Washington State University-Everett with Everett Community College 2021-2022. Project Development Report 21 pp.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

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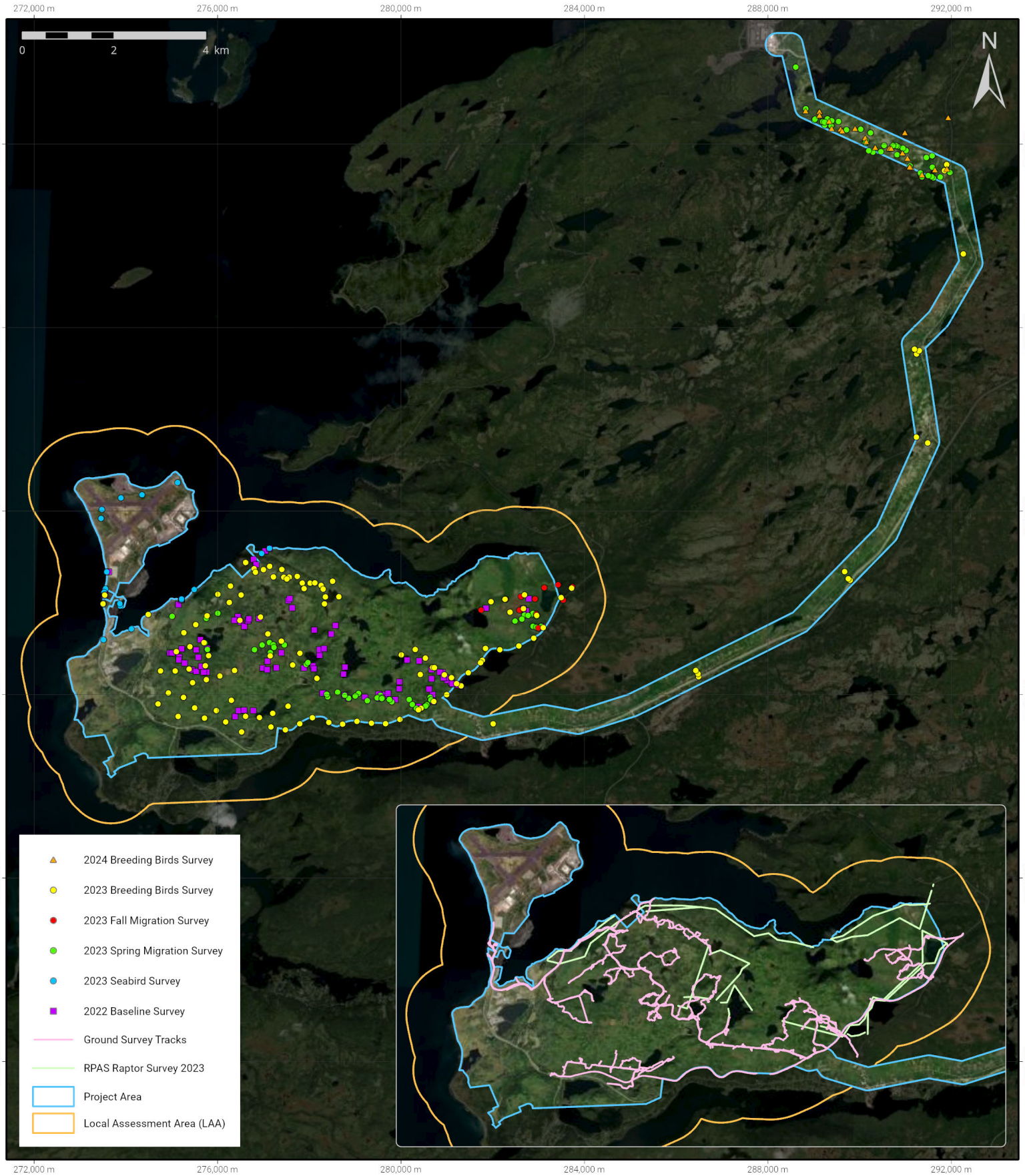

Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.3 - 12a	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Bursey	DATE: 24/07/28
	FIGURE TITLE: Survey Effort for Avifauna 2022-2024	NOTES: RPAS - Remotely Piloted Aircraft System	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

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Passeriformes and Piciformes (Perching Birds and Woodpeckers) and Others

Passerines (songbirds) vocalize with songs and calls during the breeding season to attract mates, defend territories, and communicate. Piciformes (woodpeckers) "sing" by drumming on trees and other substrates and have various vocalizations. Breeding bird surveys in Newfoundland are typically conducted in June to maximize the potential for the greatest number of breeding species. Breeding bird surveys are often conducted with the "point count" method (i.e., visiting pre-determined locations and listening and observing for a period of time) or transect surveys, which involve recording observations along routes throughout the Project Area, and often stratifying effort proportionally to habitat types or to focus on specialized habitats (e.g., wetlands, old growth forest). A combination of survey methods was incorporated into the Project, to maximize the number of detections spatially across ecotypes present in the Project Area and temporally. Efforts were conducted year-round, with point counts primarily employed during the breeding season and transect and point count surveys during the rest of the year. In addition, the data were supplemented by two Automatic Recording Units (ARUs) that operated year-round from April 22 to October 18, 2023, as well as from the desktop historical data.

There are many passerine and woodpecker species known from the Project Area, including, but not limited to the following (Table 3.1.3-3), which all have the potential for using the Project Area at some time of year (compiled from original data collected from 2022-2024, supplemented with AC CDC, Cornell University, and eBird information):

Table 3.1.3-3 Potential Life Cycle Uses of the Project Area by Passerine and Woodpecker Species

Species	Scientific Name	NL ESA/ COSEWIC	IUCN Red List	Potential Life Cycle Uses of the Local Assessment Area	
				Breeding	Non-Breeding
American Goldfinch	*Spinus tristis*	-	Least Concern	✓	
American Robin	*Turdus migratorius*	-	Least Concern	✓	✓
Black-and-white Warbler	*Mniotilta varia*	-	Least Concern	✓	
Black-backed Woodpecker	*Picoides arcticus*	-	Least Concern	✓	✓
Black-capped Chickadee	*Poecile atricapillus*	-	Least Concern	✓	✓
Black-throated Green Warbler	*Setophaga virens*	-	Least Concern	✓	
Blackpoll Warbler	*Setophaga striata*	-	Near Threatened	✓	
Blue-headed Vireo	*Vireo solitarius*	-	Least Concern	✓	
Blue Jay	*Cyanocitta cristata*	-	Least Concern	✓	✓
Bohemian Waxwing	*Bombycilla garrulus*	-	Least Concern	✓	✓
Boreal Chickadee	*Poecile hudsonicus*	-	Least Concern	✓	✓
Canada Jay	*Perisoreus canadensis*	-	Least Concern	✓	✓

Species	Scientific Name	NL ESA/ COSEWIC	IUCN Red List	Potential Life Cycle Uses of the Local Assessment Area	
				Breeding	Non-Breeding
Cedar Waxwing	*Bombycilla cedrorum*	-	Least Concern	✓	
Common Raven	*Corvus corax*	-	Least Concern	✓	✓
Common Yellowthroat	*Geothlypis trichas*	-	Least Concern	✓	
Dark-eyed Junco	*Junco hyemalis*	-	Least Concern	✓	✓
Downy Woodpecker	*Dryobates pubescens*	-	Least Concern	✓	✓
Fox Sparrow	*Passerella iliaca*	-	Least Concern	✓	✓
Golden-crowned Kinglet	*Regulus satrapa*	-	Least Concern	✓	✓
Gray-cheeked Thrush	*Catharus minimus*	Threatened	Least Concern	✓	
Hairy Woodpecker	*Dryobates villosus*	-	N/A	✓	✓
Hermit Thrush	*Catharus guttatus*	-	Least Concern	✓	
Horned Lark	*Eremophila alpestris*	-	Least Concern	✓	✓
Magnolia Warbler	*Setophaga magnolia*	-	Least Concern	✓	
Northern Waterthrush	*Parkesia noveboracensis*	-	Least Concern	✓	
Northern Flicker	*Colaptes auratus*	-	Least Concern	✓	✓
Palm Warbler	*Setophaga palmarum*	-	Least Concern	✓	
Pine Grosbeak	*Pinicola enucleator*	-	Least Concern	✓	✓
Pine Siskin	*Spinus pinus*	-	Least Concern	✓	✓
Purple Finch	*Haemorhous purpureus*	-	Least Concern	✓	✓
Red Crossbill	*Loxia curvirostra*	Threatened	Least Concern	✓	✓
Ruby-crowned Kinglet	*Corthylio calendula*	-	Least Concern	✓	
Ruffed Grouse	*Bonasa umbellus*	-	Least Concern	✓	✓
Savannah Sparrow	*Passerculus sandwichensis*	-	Least Concern	✓	
Swainson's Thrush	*Catharus ustulatus*	-	Least Concern	✓	
Swamp Sparrow	*Melospiza georgiana*	-	Least Concern	✓	
Tree Swallow	*Tachycineta bicolor*	-	Least Concern	✓	✓
White-throated Sparrow	*Zonotrichia albicollis*	-	Least Concern	✓	
White-winged Crossbill	*Loxia leucoptera*	-	Least Concern	✓	✓
Wilson's Snipe	*Gallinago delicata*	-	Least Concern	✓	
Wilson's Warbler	*Cardellina pusilla*	-	Least Concern	✓	
Yellow Warbler	*Setophaga petechia*	-	Least Concern	✓	

Sixty-two species of birds were observed during surveys in the Project Area during the breeding season. These comprised a typical suite of boreal forest species, with the most common comprised of passerines like Northern Waterthrush (*Parkesia noveboracensis*), Blackpoll Warbler (*Setophaga striata*), White-throated Sparrow (*Zonotrichia albicollis*), Yellow-bellied Flycatcher (*Empidonax flaviventris*), and Fox Sparrow (*Passerella iliaca*). During spring migration surveys the most commonly observed included White-throated Sparrow, American Robin (*Turdus migratorius*), Yellow-rumped Warbler (*Setophaga*

coronata), and Hermit Thrush (*Catharus guttatus*). For fall migration the most common were White-winged Crossbill (*Loxia leucoptera*), Boreal Chickadee (*Poecile hudsonicus*), Pine Siskin (*Spinus pinus*), Golden-crowned Kinglet (*Regulus satrapa*), and Black-capped Chickadee (*Poecile atricapillus*).

A full list of bird species observed can be found in the Avifauna Component Study in Appendix D1.

Accipitriformes and Strigiformes (Raptors and Owls)

Raptors and owls are protected by the regulations of the NL **Wild Life Act**, including all species of eagles, falcons, hawks, osprey, and owls. Raptor surveys were conducted throughout the Project Area during all seasons of the year from fall 2022 onwards, but efforts focused on migration and breeding season. These surveys necessitated an amalgamation of several techniques, including targeting different habitat types (e.g., open habitats for species like Northern Harrier (*Circus hudsonius*) and Short-eared Owl, mature forest for Great-horned Owl and Northern Goshawk, etc.), and scanning the sky for soaring raptors, as well as searching any cliffs and tall trees for nests.

There are several raptor and owl species known from insular Newfoundland, including, but not limited to, those listed in Table 3.1.3-4. All have potential for using the Project Area at some time of year:

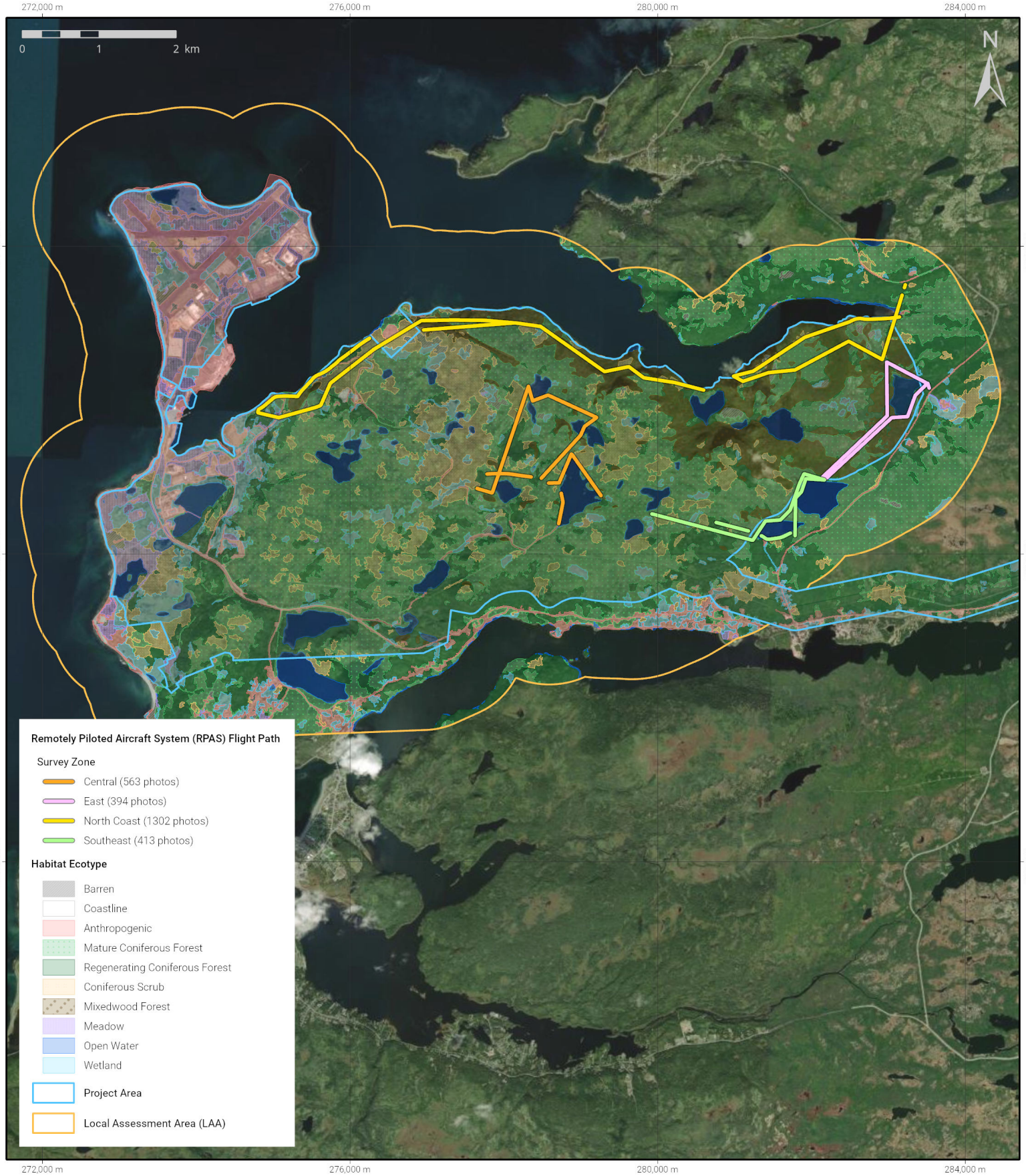
Table 3.1.3-4 Potential Life Cycle Uses of the Project Area by Raptors and Owls

Species	Scientific Name	NL ESA and COSEWIC/ SARA	IUCN Red List	Potential Life Cycle Uses of the Local Assessment Area	
				Breeding	Non-Breeding
American Kestrel	*Falco sparverius*	-	Least Concern	✓	
Bald Eagle	*Haliaeetus leucocephalus*	-	Least Concern	✓	✓
Boreal Owl	*Aegolius funereus*	-	Least Concern	✓	✓
Great Horned Owl	*Bubo virginianus*	-	Least Concern	✓	✓
Merlin	*Falco columbarius*	-	Least Concern	✓	
American Goshawk	*Accipiter atricapillus*	-	N/A	✓	✓
Northern Harrier	*Circus hudsonius*	-	Least Concern	✓	
Northern Hawk Owl	*Surnia ulula*	-	Least Concern	✓	✓
Osprey	*Pandion haliaetus*	-	Least Concern	✓	
Red-tailed Hawk	*Buteo jamaicensis*	-	Least Concern	✓	
Sharp-shinned Hawk	*Accipiter striatus*	-	Least Concern	✓	
Short-eared Owl	*Asio flammeus*	Threatened/ Special Concern	Least Concern	✓	

Surveys since fall 2022 have produced observations of Bald Eagle, Sharp-shinned Hawk, American Goshawk, Great-horned Owl, Merlin, and Northern Harrier. However, no nests were found for any raptors or owls during surveys.

In addition to the on-the-ground surveys, a RPAS flight was conducted in July 2023 to collect high-resolution imagery of the areas with the highest potential for large raptors (flight path is depicted in Figure 3.1.3-12b). A pre-planned aerial transect survey was performed to obtain high quality imagery which was thoroughly investigated for areas of interest (i.e., large stick nests atop trees, etc.). Nest site fidelity across years is common for many raptor species and nests of large raptors can be identified from RPAS high-resolution photographs. No raptor nests were recorded during the flight. A full list of bird species observed during these surveys can be found in the Avifauna Baseline Study in Appendix D1.

The purpose of deploying a RPAS to survey raptor nests as an alternative to the traditional helicopter survey was to minimize disturbance to birds. RPASs represent an effective and adaptable tool for safely surveying raptor nests and provide a permanent record of the survey. Argentia Renewables will continue to pursue ways to embrace technology in this regard. Details on the mitigations for raptors and owls can be found in Section 4.2.3, the Post-Construction Monitoring Plan (Appendix S), and for Short-eared Owl in the Species at Risk Impacts Mitigation and Monitoring Plan (Appendix R). A dedicated Short-eared Owl survey will be conducted in fall 2024 as per discussions with NL WD.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.3 - 12b	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Flight Path of the 2023 RPAS Raptor Nest Survey	NOTES:	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	
			sem	

SEM MAP ID: 238-005-GIS-033-Rev1

Anseriformes (Waterfowl), Charadriiformes (Gulls/Auks/Plovers/Sandpipers), and other Waterbirds

Given the location of the Project Area, immediately adjacent to the POA, the area boasts a wide variety of waterfowl and waterbirds (e.g., gulls, alcids, sandpipers, etc.). Since these species may interact with the Project outside of the Project Area (i.e., several species use the marine environment in proximity to the proposed array of turbines), the LAA was used to assess this group instead of the (terrestrial) Project Area.

Table 3.1.3-5 lists the water-associated birds that may be found in the LAA during some stage of their annual cycle (i.e., for breeding, staging during migration, and/or wintering). This list was compiled from original data collected since fall 2022, observations from eBird, AC CDC data, and information from Cornell University on uses of the area from range maps.

Table 3.1.3-5 Water-associated Birds that may use the Local Assessment Area.

Species	Scientific Name	NL ESA/ COSEWIC and SARA	IUCN Red List	Potential Habitat Use of the Local Assessment Area		Potential Life Cycle Uses of the Local Assessment Area		
				Marine	Freshwater	Breeding	Non-Breeding	Migration Only
American Black Duck	*Anas rubripes*	-	Least Concern	✓	✓	✓	✓	
Belted Kingfisher	*Megaceryle alcyon*	-	Least Concern		✓	✓		
Canada Goose	*Branta canadensis*	-	Least Concern		✓	✓	✓	
Common Goldeneye	*Bucephala clangula*	-	Least Concern		✓	✓	✓	
Common Loon	*Gavia immer*	-	Least Concern	✓	✓	✓	✓	
Common Merganser	*Mergus merganser*	-	Least Concern		✓	✓	✓	
Green-winged Teal	*Anas crecca*	-	Least Concern		✓	✓	✓	
Northern Pintail	*Anas acuta*	-	Least Concern		✓	✓		
Red-breasted Merganser	*Mergus serrator*	-	Least Concern	✓	✓	✓	✓	
Ring-necked Duck	*Aythya collaris*	-	Least Concern		✓	✓		
Greater Scaup	*Aythya marila*	-	Least Concern	✓	✓	✓	✓	
Razorbill	*Alca torda*	-	Least Concern	✓		✓	✓	

Species	Scientific Name	NL ESA/ COSEWIC and SARA	IUCN Red List	Potential Habitat Use of the Local Assessment Area		Potential Life Cycle Uses of the Local Assessment Area		
				Marine	Freshwater	Breeding	Non-Breeding	Migration Only
Semipalmated Sandpiper	*Calidris pusilla*	-	Near Threatened		✓			✓
Semipalmated Plover	*Charadrius semipalmatus*	-	Least Concern		✓	✓		
Whimbrel	*Numenius phaeopus*	-	Least Concern		✓			✓
Greater Yellowlegs	*Tringa melanoleuca*	-	Least Concern		✓	✓		
Ruddy Turnstone	*Arenaria interpres*	-	Least Concern	✓	✓			✓
Sanderling	*Calidris alba*	-	Least Concern	✓	✓			✓
Herring Gull	*Larus argentatus*	-	Least Concern	✓	✓	✓	✓	
Double-crested Cormorant	*Nannopterum auritum*	-	Least Concern	✓	✓	✓	✓	
Great Black-backed Gull	*Larus marinus*	-	Least Concern	✓	✓	✓	✓	
Black Guillemot	*Cepphus grille*	-	N/A	✓			✓	
Black-legged Kittiwake	*Rissa tridactyla*	-	Vulnerable	✓		✓		
Northern Gannet	*Morus bassanus*	-	Least Concern	✓		✓		
Mallard	*Anas platyrhynchos*	-	Least Concern		✓	✓	✓	✓
Long-tailed Duck	*Clangula hyemalis*	-	Least Concern	✓			✓	
Harlequin Duck	*Histrionicus histrionicus*	Vulnerable/ Special Concern	Least Concern	✓			✓	
Dovekie	*Alle alle*	-	Least Concern	✓			✓	
Northern Fulmar	*Fulmarus glacialis*	-	Least Concern	✓		✓	✓	
Parasitic Jaeger	*Stercorarius parasiticus*	-	Least Concern	✓				✓
Thick-billed Murre	*Uria lomvia*	-	Least Concern	✓	✓		✓	
Canada Goose	*Branta canadensis*	-	Least Concern		✓	✓		

Species	Scientific Name	NL ESA/ COSEWIC and SARA	IUCN Red List	Potential Habitat Use of the Local Assessment Area		Potential Life Cycle Uses of the Local Assessment Area		
				Marine	Freshwater	Breeding	Non-Breeding	Migration Only
Great Shearwater	*Ardenna gravis*	-	Least Concern	✓			✓	
Black Scoter	*Melanitta americana*	-	Near Threatened	✓	✓			
Common Eider	*Somateria mollissima*	-	Near Threatened	✓		✓	✓	
White-winged Scoter	*Melanitta deglandi*	-	Least Concern	✓			✓	
Black-bellied Plover	*Pluvialis squatarola*	-	Least Concern		✓			✓
Sooty Shearwater	*Ardenna grisea*	-	Near Threatened	✓			✓	
Lesser Yellowlegs	*Tringa flavipes*	Threatened (COSEWIC Only)	Least Concern		✓			✓
Dunlin	*Calidris alpina*	-	Least Concern		✓			✓
White-rumped Sandpiper	*Calidris fuscicollis*	-	Least Concern		✓			✓
American Golden-Plover	*Pluvialis dominica*	-	Least Concern	✓				✓
Least Sandpiper	*Calidris minutilla*	-	Least Concern		✓	✓		
Common Tern	*Sterna hirundo*	-	Least Concern	✓	✓	✓		
Common Murre	*Uria aalge*	-	Least Concern	✓		✓	✓	
Black-headed Gull	*Chroicocephalus ridibundus*	-	Least Concern	✓	✓		✓	
Iceland Gull	*Larus glaucoides*	-	Least Concern	✓			✓	
Glaucous Gull	*Larus hyperboreus*	-	Least Concern	✓			✓	

Harlequin Duck was the only waterfowl SAR known from the region, from the AC CDC search, and from online birding groups that noted many recent observations around the town of Branch, approximately 40 kilometres south of the Project Area. No observations were made in the Project Area or LAA during field surveys conducted from 2022-2024. This species is discussed in the Species at Risk section, but generally is not expected to interact with the Project, as the species solely uses the marine environment in winter and turbulent high-elevation rivers (mostly in Labrador) for the breeding season. There is no suitable habitat for Harlequin Duck within the boundaries of the Project Area, and only wintering habitat

within the RAA. However, if the species is observed during any phase of the Project, a re-evaluation of monitoring and mitigation will be undertaken (through consultations with NL WD and/or ECCC).

3.1.3.5 Species at Risk (SAR) and Species of Conservation Concern (SCC)

Several federal and provincial legislative acts and regulations are pertinent to the potential interactions of the Project with SAR and/or SCC, and with SAR habitats throughout the Project Area. In NL, a SAR can be listed either provincially under the Newfoundland and Labrador **Endangered Species Act** (2001) (NL ESA) or federally under the **Species at Risk Act** (SARA). The Committee for the Status of Endangered Wildlife in Canada (COSEWIC), a committee of government and non-government experts, directs the assessments and classifies species using scientific, community and Indigenous traditional knowledge. In Section 4.1.3 and Appendix R, avoidance and minimization measures for all SAR known from the Project Area are assessed in detail. In cases where interactions with SAR cannot be avoided, minimization measures will be incorporated, and a *Permit to Engage in an Economic Activity Under Section 19 of the NL ESA, SNL 2001 C.E.-10-1* will be sought from the NL WD.

In addition, the Atlantic Canada Conservation Data Centre (AC CDC), provides data on SAR and rarity rankings for each species. These non-SAR but rare flora and/or fauna will be considered Species of Conservation Concern (SCC) and will also be considered in this document, pertaining primarily to plants and some bird species. SCC do not have legislation associated with their status but are considered rare in the province. Conservation status for each species is represented by a status rank (S-rank). AC CDC maintains S-ranks for terrestrial vertebrates, vascular plants, bryophytes, lichens, and invertebrates. SCC are comprised of S-ranked species from ‘S1’ to ‘S3S4’, with lower numbers representing greater rarity and conservation concern.

Each piece of SAR legislation and regulatory body is discussed below.

Regulations

3.1.3.6 Newfoundland and Labrador Endangered Species Act

The NL WD coordinates the assessment and listing of SAR and develops recovery and management plans, monitoring programs, and research projects to promote the conservation of SAR and to ensure no native species become extinct in the province due to human activity or interference. 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 NL but does not include marine fish, bacteria, and viruses. Designation under the Act follows recommendations from COSEWIC and/or the Species Status Advisory Committee (SSAC) on the appropriate assessment of a species. Classifications of the **NL ESA** are outlined in Table 3.1.3-6.

Table 3.1.3-6 NL Endangered Species Act Status Criteria.

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.

Government of Canada's Species at Risk Act (SARA)

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 in Table 3.1.3-7.

Table 3.1.3-7 SARA Status Criteria.

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

Committee on the Status of Endangered Wildlife in Canada

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 meets twice a year to assess 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; the government makes the final decision on whether species will be listed under the SARA. Descriptions of COSEWIC classifications can be found in Table 3.1.3-8.

Table 3.1.3-8 COSEWIC Status Criteria.

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.

Atlantic Canada Conservation Data Centre (AC CDC)

The 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 (Table 3.1.3-9).

Table 3.1.3-9 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.

Possible, Probable, and Confirmed SAR for the Project

To assess the likelihood of SAR using the Project Area or LAA, a comprehensive desktop review was conducted, followed by field surveys for each candidate species identified. From an AC CDC data query it was determined that three SAR had potential for using the Project Area based on historical records within 5 km of the center point of the Project Area: Gray-cheeked Thrush (*Catharus minimus*), Harlequin Duck (*Histrionicus histrionicus*), and Short-eared Owl (*Asio flammeus*) (Table 3.1.3-10). This information provided a starting point for the SAR assessment.

Secondly, a desktop ArcGIS assessment of the ecotypes present (from the ELC) was conducted, and several more SAR were deemed possible or probable to interact with the Project. Rusty Blackbird (*Euphagus carolinus*), Northern myotis (*Myotis septentrionalis*), Olive-sided Flycatcher (*Contopus cooperi*), and blue felt lichen (*Degelia plumbea*) were all assessed as Possible, and boreal felt lichen (*Erioderma pedicellatum*), Red Crossbill *percna* (*Loxia curvirostra percna*), and little brown myotis (*Myotis lucifugus*) were all deemed Probable.

Thirdly, surveys were conducted for each of the aforementioned species to attempt to confirm the presence/absence of each in the Project Area (and extrapolate findings to the LAA, where necessary). The following species were confirmed as present within the boundaries of the Project Area: Gray-cheeked Thrush, Red Crossbill *percna*, little brown myotis, Northern myotis, Silver-haired Bat, Yellow-banded Bumblebee, boreal felt lichen, blue felt lichen, and water pygmy-weed. One SAR that was detected but was somewhat unexpected, and not part of the desktop assessment, was the hoary bat (*Lasiurus cinereus*). Each SAR is discussed in the sections below, including a summary of results from the field surveys.

Species of Conservation Concern

The AC CDC data request for the 5 km area surrounding the center of the Project Area included the following results for S3-S1 species (Table 3.1.3-10).

Table 3.1.3-10 AC CDC Data Results for the Project Area.

Common Name	Scientific Name	Taxonomic Family	Use	Year	S-Rank (2015) *	COSEWIC Rank	NL ESA Rank	SARA Rank	IUCN Red List
American Golden-Plover	Pluvialis dominica	Charadriidae	Fall Migration	2020	S3M				Least Concern
American Golden-Plover	Pluvialis dominica	Charadriidae	Fall Migration	2020	S3M				Least Concern
Black-bellied Plover	Pluvialis squatarola	Charadriidae	Fall Migration	2020	S3M				Least Concern
Black-Bellied Plover	Pluvialis squatarola	Charadriidae	Fall Migration	2021	S3M				Least Concern
Gray-cheeked Thrush	Catharus minimus	Turdidae	Breeding Season	1991	S2B, SUM		Threatened		Least Concern
Greater Yellowlegs	Tringa melanoleuca	Scolopacidae	Breeding Season	2021	S3B, S4M				Least Concern
Harlequin Duck	Histrionicus histrionicus	Anatidae	Winter	1947	S3B, S2N, SUM	Special Concern	Vulnerable	Special Concern	Least Concern
Horned Lark	Eremophila alpestris	Alaudidae	Breeding Season	2021	S3B, SUM				Least Concern
Lesser Yellowlegs	Tringa flavipes	Scolopacidae	Fall Migration	2021	S3M	Threatened			Least Concern
Northern Goshawk	Accipiter gentilis	Accipitridae	Resident	2002	S3				Least Concern
Northern Harrier	Circus cyaneus	Accipitridae	Spring Migration	2002	S3B, SUM				Least Concern
Northern Harrier	Circus cyaneus	Accipitridae	Breeding Season	2021	S3B, SUM				Least Concern
Northern Harrier	Circus cyaneus	Accipitridae	Fall Migration	2020	S3B, SUM				Least Concern
Sanderling	Calidris alba	Scolopacidae	Fall Migration	2020	S3M				Least Concern
Short-eared Owl	Asio flammeus	Strigidae	Breeding Season	1991, 2019, 2021	S3B, SUM	Threatened	Vulnerable	Special Concern	Least Concern
* under the S-Rank column, the following qualifiers are used: B = Breeding (i.e., the conservation status refers to a breeding population in the Province; M = Migrant (i.e., the conservation status refers to an aggregating transient population in the Province.									

Plant Species at Risk

The landscape of the Project Area is largely a mosaic of forests of various ages and species compositions, and the vegetation communities present are the result of various harvesting activities and disturbances over the past several decades, with many alterations dating back to the era of the military

base in Argentia. Some of these habitat types had heightened potential for the presence of rare plants including the wetlands, anthropogenic areas (namely the Argentia Peninsula), and rock outcrops. A rare flora study was conducted to compile historical records of rare plants known in the Project Area, and conduct original surveys in appropriate habitats to catalogue any rare species in the Project Area, their relative abundances, and their locations. These efforts addressed species listed under SARA, COSEWIC, the NL ESA, and species ranked regionally rare to uncommon (i.e., ranked S1 to S3) by the Atlantic Canada Conservation Data Centre (AC CDC).

There are currently thirty provincially listed plant Species at Risk (SAR) known to occur in NL. A data request to the AC CDC for a 5 km radius covering the Project Area (Figure 3.1.3-13) produced the following list of four species, all ranked in 2015:

- Water pygmy-weed (*Tillaea aquatica*) observed in 2020, listed as S1
- Sago pondweed (*Stuckenia pectinata*), observed in 1924, listed as S2S3
- Maritime sea-blite (*Suaeda maritima*), observed in 1924, listed as S3
- Southern running-pine (*Diphasiastrum digitatum*), observed in 1988, listed as S2

These species records are all from the brownfield Argentia Peninsula. Water pygmy-weed was discovered most recently (2020) in the cracks and depressions of the former runway. Southern running-pine was found in 1988 in the gravel of the former airbase. The other records date back a century to a location behind “The Pond” on the northwestern end of the Peninsula. Water pygmy-weed, sago pondweed, and maritime sea-blite were all found in that area in 1924. There were no historical records of rare plants from the remainder of the Project Area.

A survey for water pygmy-weed was 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 WD.

Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.3 - 13	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: J. Crocker	DATE: 24/07/28
	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-039-Rev0

In addition to the AC CDC data query and literature search, a rare plant survey was conducted in the Project Area in areas of high potential, as determined from the ELC. These included areas of disturbance, wetlands, and rocky outcrop. The rare plant survey was conducted in early September 2023 and coverage of all the high-potential areas was 100%.

Throughout baseline surveys and fieldwork efforts conducted in 2022 and 2023, all visits to the Project Area were used to record observations of rare plant species. In addition, a dedicated rare plant survey was completed in September 2023 that focused on areas and species with high probability of occurrence in the Project Area (Appendix D6). There were thirteen rare plants observed in the Project Area, none of which are SAR or listed by the NL ESA. A dedicated 2024 water pygmy-weed survey on the Argentia Peninsula was completed and the observation of four plants were recorded.

Lichen Species at Risk

The ecological conditions of the Project Area provided potential habitats for three rare lichen species that are listed under the NL ESA and the SARA: boreal felt lichen (*Erioderma pedicellatum*), vole ears lichen (*Erioderma mollissimum*), and blue felt lichen (*Pectenia plumbea*). Boreal felt lichen and blue felt lichen are listed as Vulnerable by the Province and as Special Concern federally. Vole ears lichen is listed as Endangered under both the NL ESA and SARA. Vole ears lichen is historically known to be present in Southeast Placentia. Wrinkled Shingle Lichen (*Pannaria lurida*) is a fourth species of rare lichen known in NL but is highly unlikely to inhabit the Project Area. Nevertheless, it was sought out and was considered during blue felt lichen surveys of deciduous forests. The organism will not be discussed further as it was not found during surveys, confirming its low potential for existing in the area. The three rare lichens deemed to have potential for the Project Area are discussed below.

Blue Felt Lichen

Blue felt lichen typically grows on branches and trunks of trees but may also occur on forest floor substrates such as non-vascular vegetation (i.e., mosses) and rock (COSEWIC, 2010). Blue felt lichen is listed as vulnerable under the NL ESA. This species prefers deciduous phorophyte hosts like yellow birch, which is relatively more common in the central and northern parts of the Avalon Peninsula. Red maple (Acer rubrum) is the preferred phorophyte in Sir Robert Bond Park in Whitbourne but BLFL has been known to also occur on white spruce (Picea glauca) in other portions of the Avalon (COSEWIC, 2010).

Eighty thalli of blue felt lichen were identified on yellow birch in several small stands within the Project Area, primarily around Big Shalloway Pond (Figure 3.1.3-14).

Figure 3.1.3-14 Blue Felt Lichen on Yellow Birch Stands near Big Shalloway Pond.

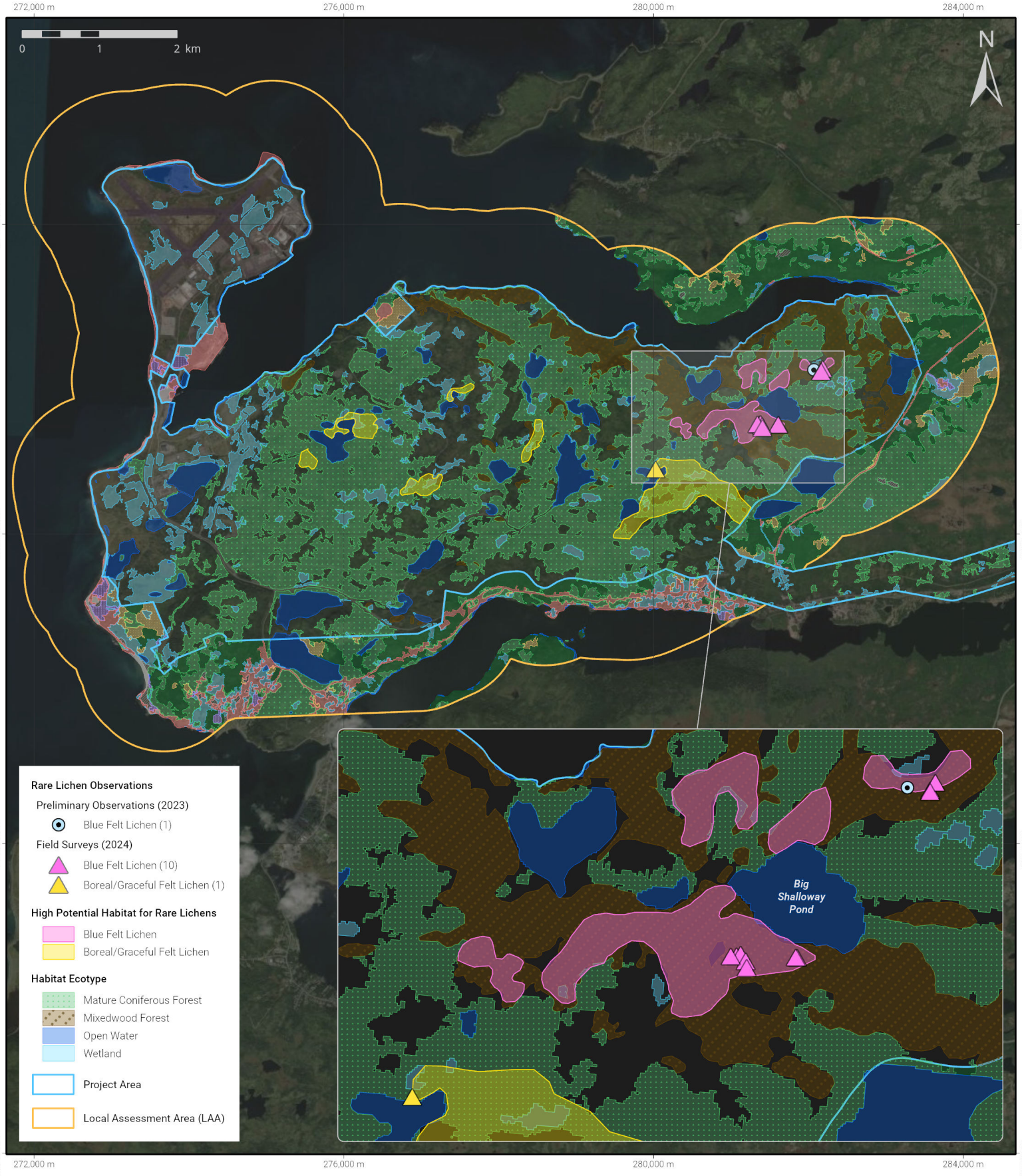
Boreal Felt Lichen and Vole Ears Lichen

The preferred phorophyte for boreal felt lichen is mature balsam fir, with the principal substrate for growth being liverwort species, *Frullania asagrayana* (Cornejo & Scheidegger, 2016). The water sacs of *Frullania* host *Rhizonema*, the cyanobacterial partner which associates with the fungal hyphae of the boreal felt lichen to create a viable lichen. Boreal felt lichen reproduces through spore dispersal using apothecia (fruiting bodies). These apothecia appear as small mushroom-like structures on the upper surface of the lichen ranging from black to bright red when fully developed. Boreal felt lichen does not reproduce by soredia (i.e., asexual reproduction structures) like many other species (e.g., *Erioderma mollissimum*, *Coccocarpia palmicola*). However, boreal felt lichen may reproduce vegetatively by fragmentation when portions of existing thalli break off and colonize a new substrate with a suitable microsite (e.g., healthy *Frullania* presence).

Anthropogenic activities that alter boreal felt lichen habitat and forest quality have historically played a role as stressors on populations in NL. These include forestry operations, land development/conversion, wildfires, gap dynamics, tree diseases, overbrowsing of balsam fir by moose, and insect infestation.

Preferred habitats for boreal felt lichen include closed canopy, mature balsam fir forests on transitions to wetlands or near waterbodies. High-potential habitats were mapped based on species composition and proximity to wetland/water (Figure 3.1.3-15) before an extensive field program that targeted 100% coverage of all high-potential areas. Preliminary surveys were conducted for boreal felt lichen and vole ears lichen during other surveys, such as the ELC ground-truthing, bird surveys, and mammal surveys. Vole ears lichen has similar habitat requirements as boreal felt lichen (but can colonize deciduous species) but is much rarer; for the survey any potential boreal felt lichen habitat was considered as potential vole ears lichen habitat.

Boreal felt lichen was (somewhat surprisingly) only found at one site north of Hickey's Pond on the eastern side of the Project Area, despite the absence from several high-potential areas. Only two thalli were observed on one balsam fir tree.



Pattern | Argentia Renewables

FIGURE NUMBER: 3.1.3 - 15		COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
FIGURE TITLE: Rare Lichen Observations and Suitable Habitat		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: C Burke	
PROJECT TITLE: Argentia Renewables			APPROVED BY: C Burke	sem

SEM MAP ID: 238-005-GIS-022-Rev0

Bird Species at Risk

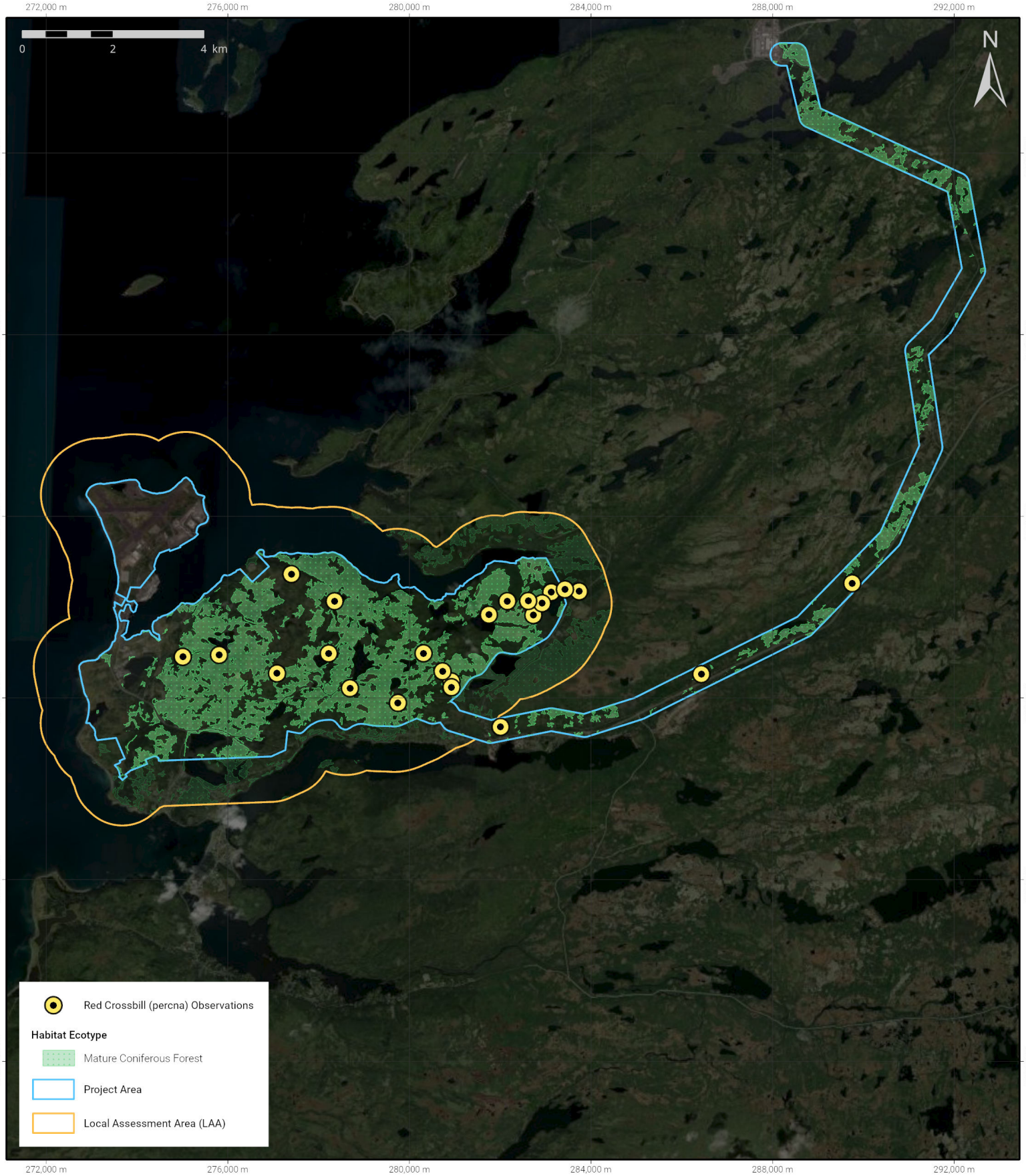
A comprehensive assessment was conducted to determine the historical presence of bird SAR in the Project Area, the potential for SAR to use the Project Area or LAA (and to interact with the Project), and the current use of the areas by SAR. The assessment was comprised of a review of AC CDC data, eBird and the NLbirds lists, species range maps, and by conducting on-the-ground surveys to establish current use. The sections below summarize the results of the desktop and field surveys for each SAR deemed possibly present in the Project Area or LAA.

Red Crossbill *percna*

The Newfoundland subspecies of Red Crossbill (*Loxia curvirostra percna*) is a medium-sized finch ranging from dull red to greyish-olive, most notably recognized by their specialized curved and crossed mandibles for seed eating (COSEWIC, 2016). It is a distinct Newfoundland subspecies listed as Threatened under the NL ESA and SARA.

A desktop ArcGIS habitat suitability exercise displayed an abundance of the Mature Coniferous ecotype in the Project Area (Figure 3.1.3-16). This ecotype comprised suitable foraging and nesting habitat for Red Crossbill *percna* in the form of mature coniferous trees with dense foliage cover (Environment Canada, 2006). Red Crossbill *percna* are dependent on conifer forests for their food resources in the form of conifer seeds and cones (COSEWIC, 2016). This species historically relied on red pine (*Pinus resinosa*) and eastern white pine (*Pinus strobus*) but due to declines in those tree species in insular NL, it now depends primarily on black and white spruce (COSEWIC, 2016). Cone availability is critical for survival and reproduction, so Red Crossbill is irruptive throughout its range, in pursuit of food resources (COSEWIC, 2016). Red Crossbill exhibits site fidelity to breeding areas, nests anytime between spring and fall in loose colonies, and foraging together in flocks (COSEWIC, 2016).

Threats to Red Crossbill *percna* in insular Newfoundland include (1) habitat alteration, due to the removal of mature coniferous habitat for forestry and development activities (COSEWIC, 2016) (2) competition for conifer cones from the introduced red squirrel (*Tamiasciurus hudsonicus)* (Benkman, 1989) (3) nest predation by squirrels, and (4) the decline of native and non-native pine trees (Benkman, 1989).



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.3 - 16	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Red Crossbill *percna* Observations and Suitable Habitat	NOTES:	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-023-Rev1

Comprehensive field studies were conducted on avifauna year-round, beginning in fall 2022 and extending to spring 2024, including targeted studies for Red Crossbill *percna* within the Mature Coniferous habitat ecotype. The species was observed several times in the Project Area, during point count surveys, transect surveys, and with autonomous recording units (ARUs). Observations were recorded during spring and fall migration, breeding season, and during winter surveys. The detailed results from Red Crossbill *percna* surveys are discussed in the Avifauna Baseline Study in Appendix D1, and mitigations for interactions with the Project are discussed in the draft Species at Risk Impacts and Mitigation Monitoring Plan (Appendix R) and Post-construction Monitoring Plan (Appendix S).

Rusty Blackbird

Rusty Blackbird (Euphagus carolinus) is a medium-sized songbird with yellow eyes and a black, slightly curved bill (COSEWIC, 2017). It is a wetland specialist that feeds primarily on invertebrates, but also on small fish and crustaceans (COSEWIC, 2017). It is listed as Vulnerable under the NL ESA and as Special Concern under Schedule 1 of the SARA and by COSEWIC. The Canadian breeding population has suffered one of the greatest population declines of birds in Canada, which ostensibly began in the 1920s (COSEWIC, 2017). There are an estimated 40,000 individuals in Atlantic Canada and are known to breed in wetlands around Newfoundland and Labrador (N.L. Department of Environment and Conservation, n.d.-a).

Rusty Blackbird breeding habitat is characterized by coniferous-dominated forests near wetlands, such as treed swamps, bogs, and beaver ponds, and nests are constructed in shrubs or small trees near water (COSEWIC, 2017). Suitable habitat for Rusty Blackbird appears to be decreasing on both the breeding and wintering grounds, due to the degradation and loss of wetlands by human activities, the contamination and/or acidification of wetlands, and habitat degradation due to climate change (COSEWIC, 2017). According to the Management Plan for Rusty Blackbird (N.L. Department of Fisheries, Forestry, and Agriculture, 2020), potential threats in Newfoundland have not been adequately studied, but habitat loss/degradation, disease transmission, and the effects of climate change have been identified as potential threats.

Within the D3-4 nesting zone of insular Newfoundland (within which the Project Area lies), Rusty Blackbird usually nests between early May and mid-July (Figure 3.1.3-17). The Wetland ecotype from the ELC (Figure 3.1.3-18) would comprise potential habitat for Rusty Blackbird and these habitats were targeted during surveys for this species. It was noted during surveys that the wetland types present were atypical of those often associated with this species; Rusty Blackbird prefers wet woodlands, often in the form of treed swamps or bogs. Most wetlands in the Project Area lacked the vertical structure necessary for this species. All areas with high potential (of which there were few) for Rusty Blackbird were visited during the breeding season. No Rusty Blackbird observations were made during the two years of surveys, and none were detected from the ARU data. While there were many wetlands in the Project Area, there

were almost none with the vertical structure typical of Rusty Blackbird breeding habitat (i.e., treed swamps or marshes, beaver ponds).

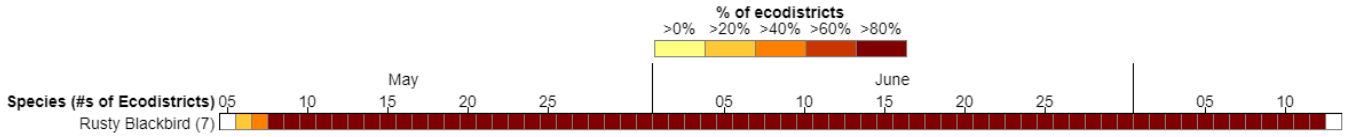
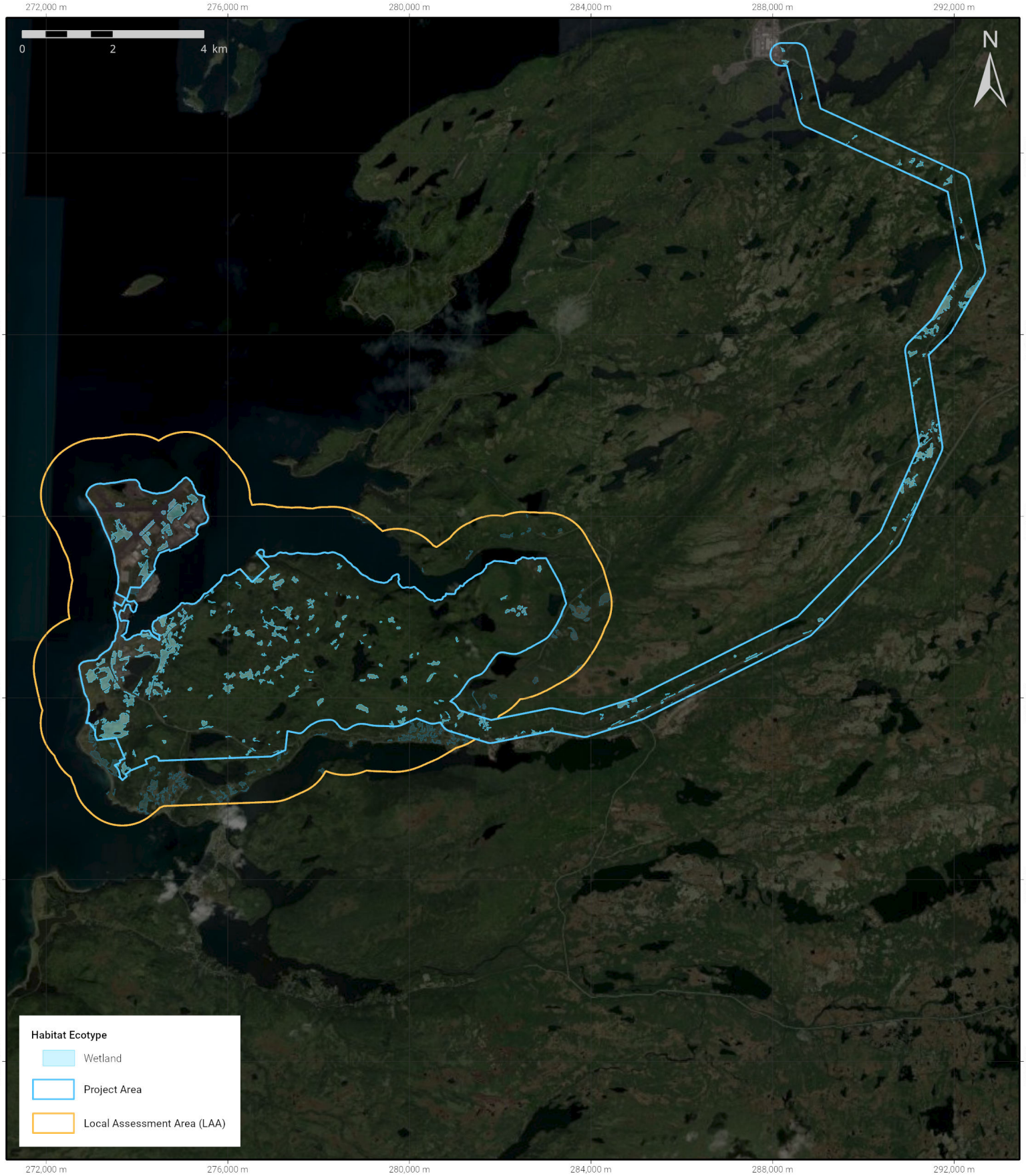


Figure 3.1.3-17 Nesting Calendar for Rusty Black Bird in D3-4.

If this SAR is detected within the Project Area in the future, mitigations will include those discussed for other passerine species in the Species at Risk Impacts and Mitigation Monitoring Plan (Appendix R) and Post Construction Monitoring Plan (Appendix S). In addition, if this SAR is observed, consultations with the NL WD will be sought to discuss appropriate mitigation measures.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.3 - 18	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Rusty Blackbird Suitable Habitat	NOTES:	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	
			sem	

SEM MAP ID: 238-005-GIS-034-Rev0

Gray-cheeked Thrush

The Gray-cheeked Thrush (*Catharus minimus minimus*) is a medium-sized thrush with a grayish-brown face and upperparts with stippling on the throat and breast. The Newfoundland subspecies of Gray-cheeked Thrush is listed as Threatened under the NL ESA (and by COSEWIC) but is not currently listed under the SARA. In Newfoundland, threats to Gray-cheeked Thrush may include habitat loss and/or fragmentation due to forestry practices and nest predation by red squirrels (Thompson *et al*., 1999; Lewis & Montevecchi, 1999). Declines may also be attributable to threats on wintering grounds rather than those on breeding grounds in Newfoundland. More research is needed to definitively establish the causal factors in the decline. Recent research has indicated that the species may be now essentially a higher elevation subspecies in NL (≥350 m) (Robineau-Charette et al., 2023).

Gray-cheeked Thrush in Newfoundland prefers windswept coastal coniferous tuckamore, coniferous scrub, and regenerating clearcuts of balsam fir saplings. In the Project Area coastal windswept conifer scrub exists in patches along the Argentia Peninsula and regenerating balsam fir thickets exist in windfallen clearings throughout the Argentia Backlands. Bogs and fens throughout the Argentia Backlands may also provide habitat in the coniferous scrub on their peripheries. Upland rocky outcrops and barrens may also contain suitable scrub habitat. The ELC ecotypes suitable for Gray-cheeked Thrush habitat therefore included Coniferous Scrub and Regenerating Coniferous Forest (Figure 3.1.3-19). Surveys for Gray-cheeked Thrush targeted those ecotypes as areas of heightened potential. Three observations of Gray-cheeked Thrush were made during the breeding bird survey, and one observation was made during the fall migration survey. This species was previously known from the Placentia area as per data from eBird, the Newfoundland Breeding Bird Atlas and the Province of Newfoundland and Labrador (Species Status Advisory Committee [SSAC], 2010). From the AC CDC data query, there was one occurrence of Gray-cheeked Thrush recorded in the Project Area in 1991. Data suggests that the once ubiquitous population on the Island of Newfoundland declined drastically in recent years (SSAC, 2010). During point count surveys in June 2023, three observations were recorded in the Project Area. Two of the observations were in a forested area near a treed bog, and the other observation was near the Argentia Sunset RV Park in mature forests.

Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.3 - 19	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Gray-cheeked Thrush Observations and Suitable Habitat	NOTES:	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-035-Rev0

Within the D3-D4 nesting zone of insular Newfoundland, Gray-cheeked Thrush usually nests between late May and mid-July (Figure 3.1.3-20).

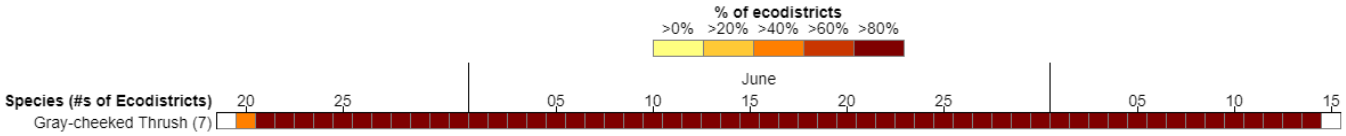
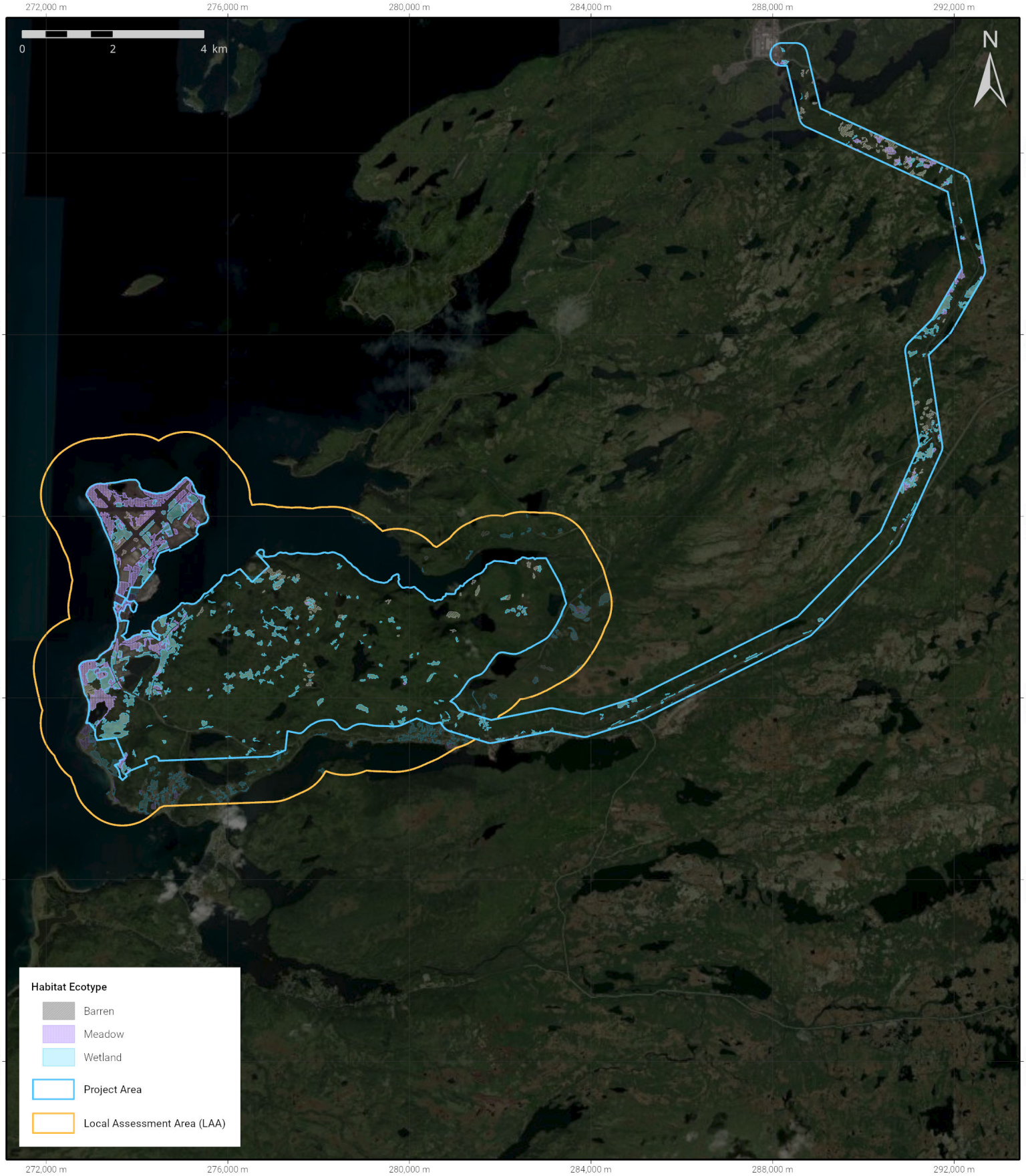


Figure 3.1.3-20 Nesting Calendar for Gray-cheeked Thrush in D3-4.

3.1.3.7 Short-eared Owl

Short-eared Owl (*Asio flammeus*) is a medium-sized owl, approximately 34-42 cm in length (COSEWIC, 2021). The plumage is mottled brown above and is buff with heavy streaking below. Unlike most owls, the Short-eared Owl is diurnal and hunts for small mammals mostly around dusk and dawn. Short-eared Owl is listed as Vulnerable under the NL ESA and was recently assessed as Threatened by COSEWIC. Short-eared Owl is listed as Special Concern under the SARA Schedule 1. Short-eared Owl is also protected by the **NL Wild Life Act** and **Wildlife Regulations**.

Short-eared Owl generally favours open habitats throughout the year, including grasslands, tundra, and wetlands (COSEWIC, 2021). In NL, Short-eared Owls have been observed in several habitat types, including tundra, coastal barrens, sand dunes, fields, and bog habitats (N.L. Department of Environment and Conservation, n.d.-b). Open habitats are particularly abundant on coastal barrens and above the treeline in Labrador, although virtually all coastal areas and nearshore islands are suitable habitat (N.L. Department of Environment and Conservation, n.d.-b). Nests are located on the ground in shallow scrapes near taller vegetation for concealment (COSEWIC, 2021). In winter, Short-eared Owl roost in conifers adjacent to open areas used for hunting or on the ground in the shelter of tall grasses or forbs (COSEWIC, 2021). Declines in the extent and quality of open grassland and wetland habitats have likely reduced the distribution and abundance of Short-eared Owl in southern Canada (COSEWIC, 2021). Short-eared Owl is also known to perch along roads and fly relatively close to the ground, sometimes colliding with vehicles (COSEWIC, 2021). Fragmentation of breeding habitat by roads and other anthropogenic developments may increase predation risk (COSEWIC, 2021). Collisions with wind turbines and power lines have also been identified as a possible threat (Environment and Climate Change Canada [ECCC], 2018a).



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.3 - 21	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Short-eared Owl Suitable Habitat	NOTES:	REVIEWED BY: CBurke	
			APPROVED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		sem	

SEM MAP ID: 238-005-GIS-036-Rev0

Within the D3-4 nesting zone of insular Newfoundland, Short-eared Owl usually nest between mid-April to mid-July (Figure 3.1.3-22).

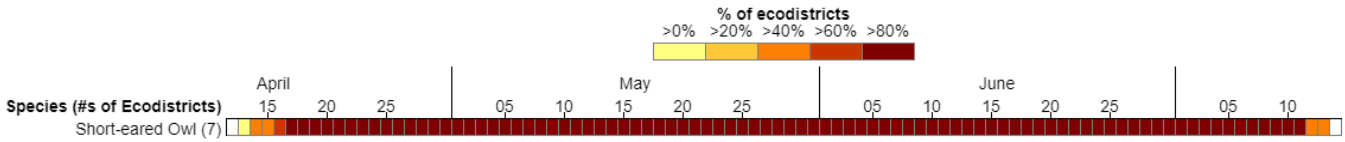


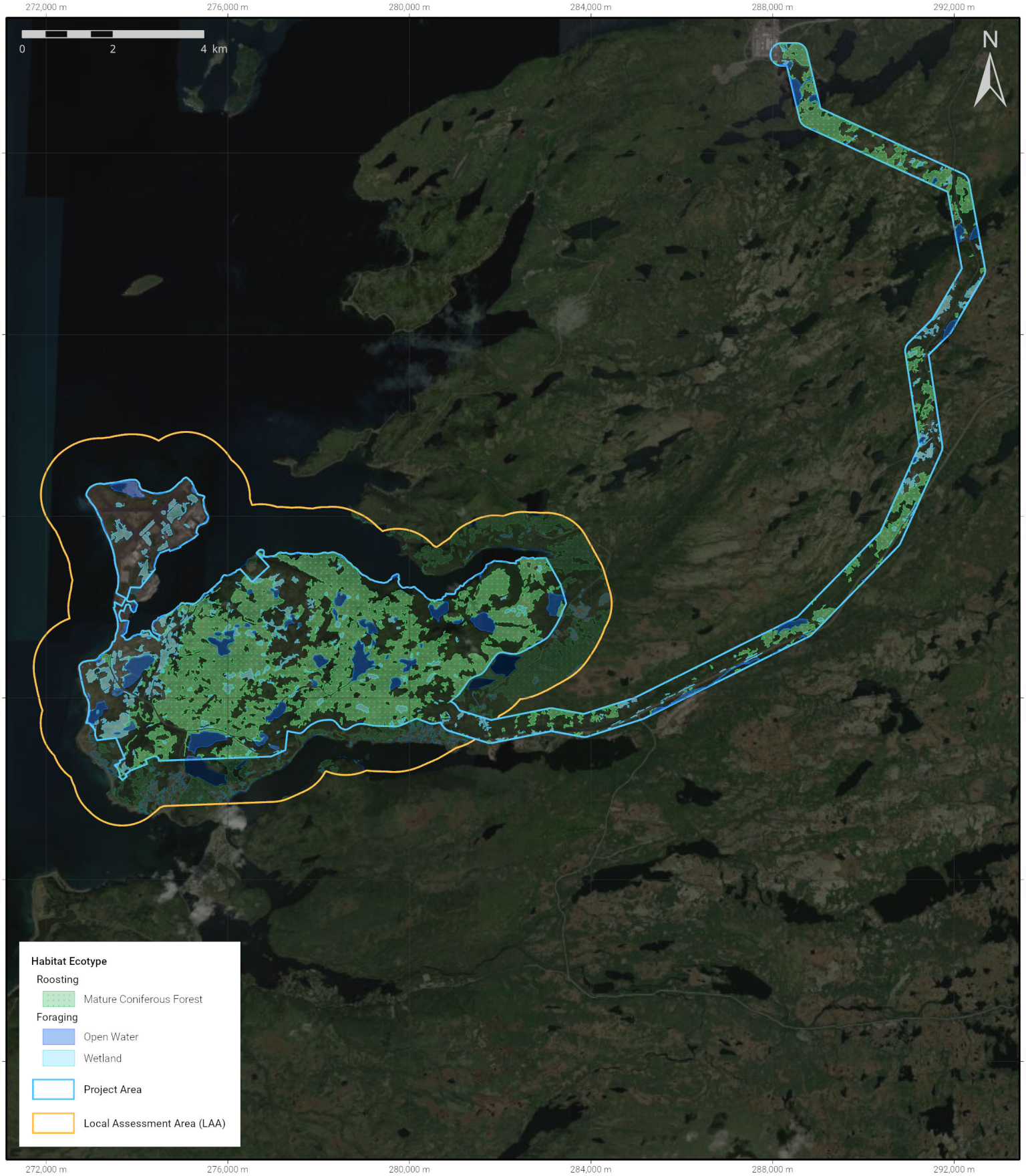
Figure 3.1.3-22 Nesting Calendar for Short-eared Owl in D3-4.

An AC CDC data request produced four historical records of Short-eared Owl within 5 km radius of the center of the Project Area, all of which occurred on the Argentia Peninsula and dated back to 1991. Two other observations occurred in July 2019 and the last one was in July of 2021. Given the industrial nature of the peninsula it is unlikely this would be considered high quality habitat.

Comprehensive field studies were conducted on avifauna year-round beginning in fall 2022 and extending to spring 2024, including targeted surveys for Short-eared Owl within the Wetland and Meadow habitat types. No Short-eared Owl observations were recorded during these surveys, but a follow-up survey will be conducted in 2024. This species will be specifically addressed as part of an avian powerline collision risk assessment to identify portions of the Project that will have bird flight diverters installed. Methods for avifauna surveys were discussed in the Avifauna Component Study in Appendix D1, and mitigations for interactions of Short-eared Owl with the Project are discussed in the Species at Risk Impacts and Mitigation Monitoring Plan (Appendix R) and Post-construction Monitoring Plan (Appendix S).

Bat Species at Risk

Four species of bats were considered possible for the Project Area. The little brown myotis (*Myotis lucifugus*) is common throughout Newfoundland and was expected to be using the Project Area. This species, along with Northern myotis (*Myotis septentrionalis*), a less commonly known species in Newfoundland, are both experiencing drastic declines due to White-nose Syndrome (WNS), a fungal disease that causes bats to arouse from hibernation and die from starvation and freezing (COSEWIC, 2013). Due to this threat, both species were listed as endangered in Canada by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2013 (COSEWIC, 2013), and were emergency listed as endangered on the federal SARA in 2014 (ECCC, 2018b). WNS was discovered in Newfoundland in 2018 (N.L. Fisheries and Land Resources, 2018), and both species were listed as Endangered under the NL ESA in 2021 (N.L. Fisheries, Forestry, and Agriculture, 2021. A map of suitable bat habitat is presented in Figure 3.1.3-23.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.3 - 23	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Bat Suitable Habitat	NOTES:	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	
			sem	

SEM MAP ID: 238-005-GIS-037-Rev0

The other two bat species found in the Project Area were the hoary bat (*Lasiurus cinereus*) and silver-haired bat (*Lasionycteris noctivagans*). These species are migratory and spend the summer months in Canada before returning south to overwinter (COSEWIC, 2023). These bats are not susceptible to WNS; however, they are at an increased risk of windmill collisions during migration (Voigt *et al*., 2024; COSEWIC, 2023).

Tables 3.1.3-11 through 3.1.3-13 demonstrate the average calls detected per night and per night hour in 2022 and 2023. Data is by detector (e.g., BL BAT 1) and by month.

Table 3.1.3-11 Average Calls per Night and Night Hour, 2022.

Species	Calls per Night		Calls per Night Hour	
	Month			
	Sept.	Oct.	Sept.	Oct.
Little brown myotis (*Myotis lucifugus*)				
BL BAT 1	1	0.0967	0.0877	0.00730
BL BAT 2	1.5	0.0322	0.131	0.00243
BL BAT 3	1.7	0.129	0.149	0.00974
NOTES • In 2022, detectors were deployed in September and October only. • Two bat species were detected in 2022: the little brown myotis and the silver-haired bat. The silver-haired bat was recorded four only times and is thus not included in this table. Further information is provided in Appendix D2 (Bat Component Study).				

Table 3.1.3-12 Average Calls per Night, 2023.

Species	Month					
	May	Jun.	Jul.	Aug.	Sept.	Oct.
Little brown myotis (*Myotis lucifugus*)						
ARG BAT 1	1.6	107.7	28.1	28.9	0.93	-
ARG BAT 2	-	-	-	50.5	4.06	-
ARG BAT 3	0.516	4.482	35.967	40.064	1.6	-
ARG BAT 4	-	0.103	11.7	8.096	1.633	-
ARG BAT 5	-	2.655	23	48.7	2.566	0.0645
Northern myotis (*Myotis septentrionalis*)						
ARG BAT 1	1.6	107.7	28.1	28.9	0.93	-
ARG BAT 2	-	-	-	1.096	0.4	0.032
ARG BAT 3	0.096	0.793	1.419	1.193	0.233	-
ARG BAT 4	-	0.103	1.483	0.806	0.2	-
ARG BAT 5	-	-	1.032	1.838	0.2	0.032
Silver-haired bat (*Lasionycteris noctivagans*)						
ARG BAT 1	-	-	-	-	-	-
ARG BAT 2	-	-	-	0.064	13.9	0.032
ARG BAT 3	-	-	-	-	-	0.032
ARG BAT 4	-	-	-	-	-	-
ARG BAT 5	-	-	-	-	0.1	0.064
Hoary bat (*Lasiurus cinereus*)						

Species	Month					
	May	Jun.	Jul.	Aug.	Sept.	Oct.
ARG BAT 1	-	-	-	-	-	-
ARG BAT 2	-	-	-	-	-	-
ARG BAT 3	-	-	-	-	-	-
ARG BAT 4	-	-	-	-	-	-
ARG BAT 5	-	-	-	-	0.5	-

Table 3.1.3-13 Average Calls per Night Hour, 2023.

Species	Month					
	May	Jun.	Jul.	Aug.	Sept.	Oct.
Little brown myotis (*Myotis lucifugus*)						
ARG BAT 1	0.182	13.156	3.313	3.039	0.081	-
ARG BAT 2	-	-	-	5.31	0.356	-
ARG BAT 3	0.058	0.547	4.236	4.217	0.14	-
ARG BAT 4	-	0.012	1.379	0.852	0.143	-
ARG BAT 5	-	0.324	2.709	5.13	0.225	0.00487
Northern myotis (*Myotis septentrionalis*)						
ARG BAT 1	0.113	0.122	0.117	0.105	0.087	-
ARG BAT 2	-	-	-	0.115	0.035	0.00243
ARG BAT 3	0.0109	0.0968	0.167	0.125	0.020	-
ARG BAT 4	-	0.012	0.174	0.084	0.017	-
ARG BAT 5	-	-	0.121	0.193	0.017	0.00243
Silver-haired bat (*Lasionycteris noctivagans*)						
ARG BAT 1	-	-	-	-	-	-
ARG BAT 2	-	-	-	0.006	1.222	0.00243
ARG BAT 3	-	-	-	-	-	0.00243
ARG BAT 4	-	-	-	-	-	-
ARG BAT 5	-	-	-	-	0.008	0.00487
Hoary bat (*Lasiurus cinereus*)						
ARG BAT 1	-	-	-	-	-	-
ARG BAT 2	-	-	-	-	-	-
ARG BAT 3	-	-	-	-	-	-
ARG BAT 4	-	-	-	-	-	-
ARG BAT 5	-	-	-	-	0.0438	-

Each bat species is discussed below, along with further results from the bat detector surveys which were conducted from fall 2022 to the present and will continue through 2024.

3.1.3.8 Little Brown Myotis

In 2013, little brown myotis (*Myotis lucifugus)* was listed as Endangered under the SARA Schedule 1 and was listed as Endangered on the NL ESA in 2021.

Little brown myotis is the most common bat in insular Newfoundland, known from all parts of the island. It is a small, insectivorous species with a diet consisting of a wide range of terrestrial and aquatic insects, which they primarily hunt in the airspace above waterbodies/wetlands (COSEWIC, 2013). In NL, little brown myotis is a resident species typically found in forested habitats near foraging habitat. In the Project Area, the Mature Coniferous Forest ecotype would be considered roosting habitat, and the Wetlands and Open Water ecotypes would be considered suitable foraging habitats. However, they may also use the airspace above and within all the other ecotypes.

During the breeding season, females form large maternity roosts where they give birth to and raise their pups (COSEWIC, 2013). Maternity roosts may be at a natural site, such as a cavity in a tree, a snag, a rock crevice, a cave, or the underside of loose bark, or, more often at an anthropogenic site such as an attic in a building or within other structures like sheds or abandoned cabins (COSEWIC, 2013). Females are thought to select a quality maternity roost at the expense of travelling long distances to forage (Broders *et al*., 2013). Little brown myotis spend winters in hibernation in underground sites, such as caves and abandoned mines.

An AC CDC data query turned up zero results for little brown bat for the Project Area, which is likely due to a lack of survey effort in the area. Baseline surveys have been conducted for all bat species since the fall of 2022 with Anabat Swift detectors deployed around the Project Area (three locations in fall 2022 and five locations in 2023), adjacent to waterbodies/wetlands deemed to be suitable foraging habitat. A brief deployment in the fall 2022 (September 9 to October 3) resulted in the detection of 134 echolocation calls of little brown myotis from all three detectors. Efforts in 2023 (from five detectors) produced 12,257 calls of Little Brown Myotis. The detector with the fewest detections had 666, and the highest had 4,973 (mean of 2,451 per detector). Monitoring is ongoing in 2024 with the deployment of eight detectors, beginning in mid-April and with a temporal window extending to November. The baseline study report on bats can be found in Appendix D2.

Northern Myotis

Northern myotis, Endangered on the NL ESA and SARA, is found throughout southern Canada and is most common in central and eastern provinces (COSEWIC, 2012). Northern myotis are insectivores and tend to forage in forested areas, on moths, and a variety of other invertebrates (Broders *et al*., 2010; BCI, 2024a). They can be difficult to visually distinguish from little brown bats, as the two species are very similar, and may share hibernacula in the winter (COSEWIC, 2012).

Suitable habitat for Northern myotis exists throughout the Project Area in the form of the Mature Coniferous Forest ecotype. This species can also be found within and using the airspace above all the other ecotypes as well.

An AC CDC data query produced zero results for Northern myotis. Bat detector surveys conducted in the fall of 2022 did not record any Northern myotis, but 643 calls were detected during 2023 (from five detectors, with a low of 47 detections and a high of 306; mean of 128.6 per detector). Monitoring is ongoing in 2024 with the deployment of eight (8) detectors, beginning in mid-April and with a temporal window extending to November. The baseline study report on bats can be found in Appendix D2.

Hoary Bat

The Hoary Bat (*Lasiurus cinereus*) is the largest bat in Canada. They have distinct brown fur heavily frosted with white on their body, yellow fur around the face, they weigh between 20-35 g, and have an average wingspan of 43 cm (Reid, 2006). Hoary Bats feed primarily on large moths, but also flies, beetles, and grasshoppers. Hoary bat is widespread in eastern Canada but is relatively rare in the Atlantic Provinces. It is a long-distance migrant, moving from northern breeding sites to overwintering sites as far south as Mexico. Hoary bats are typically solitary and roost in the foliage of mature deciduous or coniferous trees. Hoary bats are particularly vulnerable to collisions with turbines during migration and account for the majority of bat fatalities at many wind projects in North America.

An AC CDC data query produced zero results for hoary bat for the Project Area. Bat detector surveys conducted in the fall of 2022 did not record any hoary bats, but 15 calls were detected on September 20, 2023 (from just one of the five detectors on one night). From this low number of detections, it may be probable that the Argentia area is not a significant migratory route for hoary bat. However, monitoring is ongoing in 2024 with the deployment of eight detectors, beginning in mid-April and with a temporal window extending to November, and with two on meteorological towers to survey the airspace of the swept area of the turbines. The baseline study report on bats can be found in Appendix D2.

Silver-haired Bat

Silver-haired bats are a migratory species that can be found across Canada during the summer and fall (COSEWIC, 2023). In the spring, females form maternity colonies in cavities of trees or snags, where they typically give birth to two pups (COSEWIC, 2023). During this time, males are typically solitary (COSEWIC, 2023). Most silver-haired bats overwinter south of Canada (COSEWIC, 2023). They are insectivorous and eat a wide variety of insects, although 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).

An AC CDC data query produced zero results for silver-haired bat for the Project Area. Bat detector surveys conducted in the fall of 2022 recorded four echolocation calls, and 426 were detected during 2023 (421 of which were from one detector). From this relatively low number of detections, it may be likely that the Argentia area is not a regular migratory route for silver-haired bat, nevertheless monitoring is ongoing in 2024 starting with the deployment of eight detectors, beginning in mid-April and with a

temporal window extending to November. The baseline study report on bats can be found in Appendix D2.

Mammals

No mammal SAR were observed in the Project Area in 2022 or 2023. An American marten(*Martes americana atrata*) hair snag survey will be undertaken in 2024 as per discussions with NL WD and in following with NL WD's guidance document (Herdman, 2014).

Insects

Yellow-banded Bumble Bee

The yellow-banded bumble bee (*Bombus terricola*) is a medium-sized bumble bee characterized by a distinctive broad band of golden yellow hair across two segments of the abdomen. The species only occurs in North America and is known to be present in every province in Canada. It is a habitat generalist, occupying a wide variety of open habitats, including meadows within coniferous, deciduous, and mixed-wood forests and woodlands; riparian zones; urban parks, gardens, and agricultural areas; and along roadsides (COSEWIC, 2015).

Primary threats facing this SAR include pathogen transmission and spillover from managed bumble bee populations in greenhouses; pollution (the use of insecticides, herbicides and fungicides in agriculture and silviculture); intensification of agriculture; and climate change (habitat shifting and alteration, and temperature extremes). Canada aims to manage this population through the restoration activities (i.e., plant bee-friendly flowering plants, conserving foraging and overwintering habitat, etc.) and the reduced use of pesticides and herbicides.

The yellow-banded bumble bee was observed on two occasions within the Project Area (Figure 3.1.3-24), during avian surveys. A dedicated survey will be conducted in August 2024.

Figure 3.1.3-24 A Young *Bombus terricola* Queen in the Project Area.

3.1.3.9 Geology

Geological desktop analysis and interpretation has been conducted on the Project Area, which includes the Argentia Peninsula, and the Argentia Backlands. The purpose of the study was to review, interpret, and predict within reason possible geological hazards of the Project Area and suggest possible and reasonable mitigation measures to reduce the effects of any unpredicted hazardous events. Review of topographic, surficial and bedrock mapping, geological research, and all publicly available material was used to complete this assessment.

The surficial geology of the Project Area is primarily shaped by the latest glaciation period, the late Wisconsin, resulting in a thin sediment layer or till veneer covering most of the Project Area (AMEC, 2013). Surficial geology mapping from the Newfoundland and Labrador Geological Survey (Catto, 1998) indicates that the majority of the Project Area in the western sections of the Argentia Backlands is covered by thin veneers of glacial till, primarily composed of diamicton and was transported and deposited by the receding glaciers. The eastern side of the Badlands is mostly bog, with poorly drained accumulations of peat, peat moss, and other organic matter, as the area contains a topographic low and has poor drainage (Taylor *et al*., 1994). Areas on both sides also contain smaller wedges of glacial till and bog. There are areas of exposed bedrock as well.

The POA area is characterized as a long, level terrace with gently inclined step-like surface, bounded by the waters of Placentia Bay. Marine sediments of clay, silt, sand, gravel and diamicton are generally

moderately to well sorted and are commonly stratified, and make up the surface of the terrace. A combination of glaciation, coastal erosion and delta-like deposition were involved in the moulding of the landscape of the Argentia Peninsula (Taylor, 1994). The terrain of the Backlands is similar to a hummocky-type with a level landscape along the coast and the Argentia Peninsula. The hummocky characteristic of the Project Area is greatly bedrock controlled, with areas of dense to sparse vegetation within the topographic lows. The north side of the Project Area steeply descends into the waters of Placentia Sound.

The underlying bedrock of the Argentia Backlands Project Area, which is either exposed at surface in locations of higher topography or covered beneath the thin layer of glacial till in lower areas, consists of major rock units of the Bull Arm Formation within the Musgravetown Group These rock units are each comprised of three major rock-types: 1) Mafic flows, which includes minor felsic flows and clastic sedimentary rocks; 2) Predominantly crystal and lithic tuffs; and 3) Mafic to felsic variegated flows, and pyroclastic and clastic sedimentary rocks (King, 1988). These rock-types are examples of a subaerial volcanic formation. These bimodal volcanic rock sequences are some of the oldest rocks on the Avalon and were formed during the Ediacaran of the Neoproterozoic era, dated approximately 605 million years ago (Mills 2023).

Deformation processes during the bedrock formation, caused the rock units to create a dome like structure of an anticline (King, 1988) during what is known as the “Avalon Orogeny”, the first of three major deformation periods of the Avalon associated with the eastern margins of the Appalachians (Hughes, 1970, 1972).

The Project Area of the Argentia terrace, the future plant location, is underline by a clastic sedimentary rock unit which is one of the two members of the Big Head Formation. This formation is described as wavy bedded, gray to green tuffaceous siltstone and arkose with local inclusion of the Whiteway Member, which consists of red sandstone and siltstone (King, 1988). This unit is younger than the Bull Arm Formation and is believed to have formed during the Gaskiers glaciation period, approximately 580 Ma (million years) ago. The glacial origin is derived as the unit contains diamictites, a generalized term for any poorly sorted sedimentary rock unit of any depositional origin. Also, the unit shows the presence of sedimentary tillites Mills *et al*., 2021. Brückner (1977) concluded that the diamictites within the Big Head Formation more then likely originated from the Bull Arm Formation. Even though no glacial striae were found, the author noted that as the poor sorting of both clasts and matrix material, the range of clast lithology, shape and size, and the general appearance of the Long Harbour diamictite, which “so closely resemble those of the Gaskiers tillite”, are sufficient criteria upon which to interpret the former as “genuine tillite” (Mills *et al*., 2021).

3.1.4 Land and Resource Use

Land and resource use (LRU) is selected as a valued component (VC) for the assessment and mitigation of Project associated effects on ecological and societal values. This section considers the five key indicators (KI) through which the LRU VC and the Project interact: private and municipal designated land use, commercial and industrial resource use, recreation and subsistence land and resource use, protected sensitive areas, and Indigenous land use. A secondary source study was conducted to compile the existing LRU in the RAA. The scope of this assessment follows the Project Area, LAA, and RAA as outlined in Chapter 2, Section 2.1.1.1.

3.1.4.1 Zoning

The Project Area is located in Argentia, NL, a seaport and industrial park located on the brownfield Argentia Peninsula of a former American military base, and it extends eastward to encompass 3,578 hectares of private land (owned by the POA) into the Argentia Backlands of Placentia. Argentia Green Fuels production and export facility will be constructed on the Argentia Peninsula along with six wind turbines (out of the preliminary 46 turbines). Four turbines will be located just south of Highway 102 near Cooper Drive, and the remaining thirty-six turbines will be distributed throughout the Argentia Backlands (Figure 2.1-1). New Linear infrastructure associated with the Project will include a network of secondary roads to each turbine, collector lines, Project Gen-Tie, and a series of water supply pipelines connecting the PPWSA to the Argentia Green Fuels Facility. In addition, a new Project Interconnect Line, approximately 25 km long, may be required, pending further studies, to be constructed largely parallel to an existing line and will connect to the Long Harbour terminal station. This section would be constructed on Crown Land. The existing transmission line is on leased crown land (title number 23010). The remainder of Project components (Argentia Wind Facility, Argentia Green Fuels Facility, laydown areas, collector lines) are on POA Property.

There are no federal government owned lands, including national parks or Canadian forces bases, proximate to the Project Area and the Project is located wholly within the province of NL.

The RAA overlaps with three municipal planning areas, Town of Placentia, Fox Harbour, and Town of Long Harbour – Mount Arlington Heights (Figure 3.1.4-1). Each of these towns are incorporated, by order, under the **Municipalities Act, 1999** and is the subject of a municipal plan registered under the **Urban and Rural Planning Act, 2000**. Placentia as it is seen today is the result of an amalgamation of the following communities, Placentia (“Townside”), Southeast Placentia, Freshwater, Dunville, and Jerseyside. Placentia also includes the Argentia Industrial Park in its Municipal planning. Within the RAA, there are three unincorporated communities of Iona, Little Barasway, and Ship Harbour.

The Project is slated to occur predominantly within the Town of Placentia. The registered municipal land use map for the Project Area is a combination of industrial and rural zoning. At the time of Registration, the Argentia Backlands portion of the Project is zoned as rural under the Town of Placentia Municipal

Plan 2014-2024 (D.W. Knight Associates., 2015). However, in discussion with the Town of Placentia on March 20, 2020, the following modifications were considered based on the existing Municipal Land Use Plan:

- Substation location must be classified as industrial, or rules for rural must be amended to allow substations.
- Turbine locations must be classified as industrial, or rules for rural must be amended.
- If the Argentia Green Fuels Facility is considered regular industrial, no amendment required as it fits existing zoning of the Argentia Peninsula. However, if hazardous industrial, Argentia Green Fuels location must be classified as hazardous industrial, or rules for general industry must be amended.

In this discussion, the two options for getting the correct municipal zoning to accommodate the Project are an amendment to the Municipal Land Use Plan and a filing of a new Land Use Plan; based on the associated timelines of 3-4 months and up to 18 months, respectively, it was agreed, between the Project and the Town, that an amendment is the preferred option to ensure rezoning is completed promptly following Environmental Assessment approval.

In addition, the Project Interconnect Line will be substantially located on Crown Lands until joining the substation in Long Harbour. The Long Harbour substation is zoned as special industrial.

Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.4 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Municipal Planning Zones in the Project and Assessment Areas	NOTES: Municipal land use and protected road zone data sourced from the NL Government Land Use Atlas.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-024-Rev0

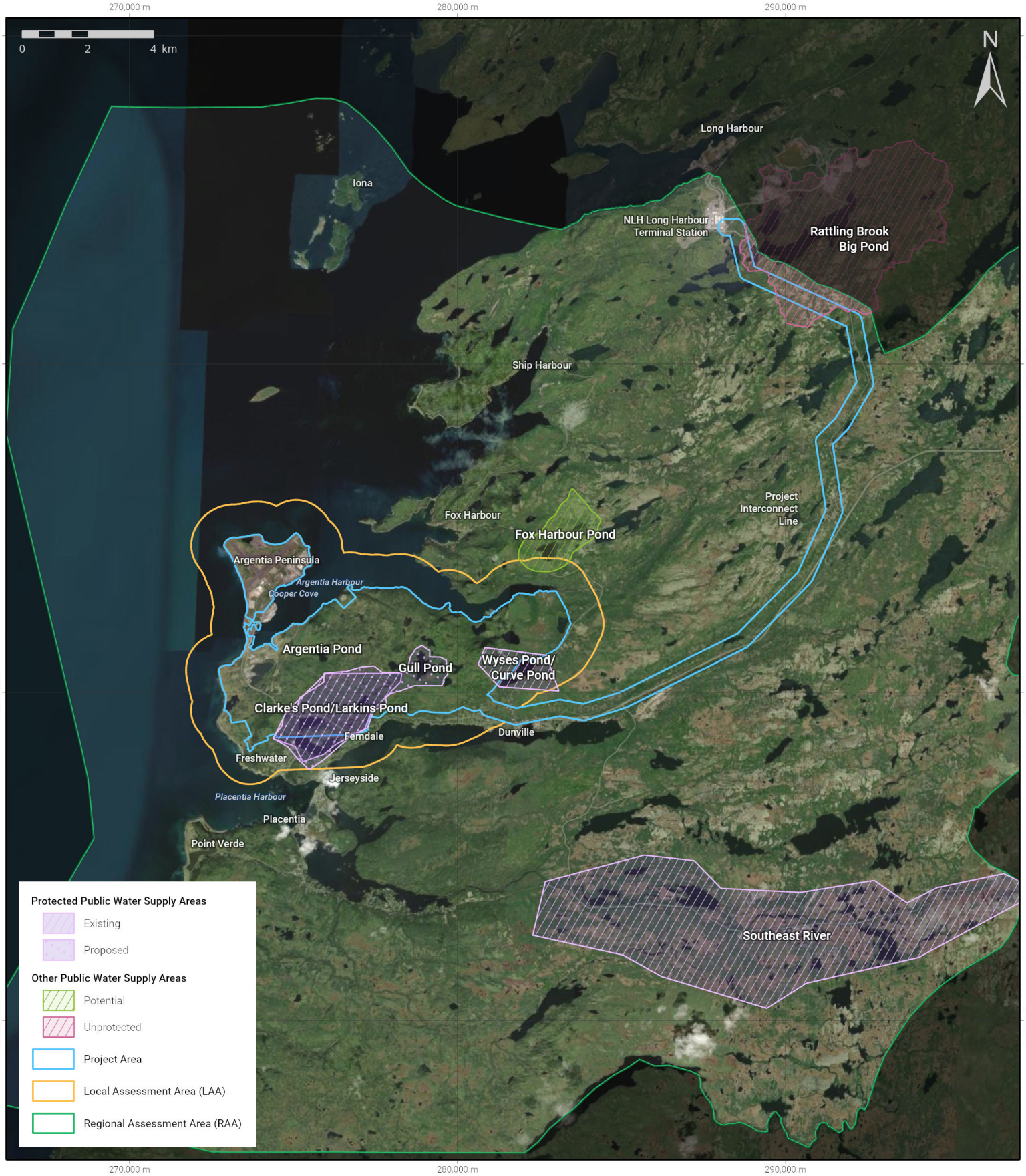
Protected Public Water Supply Areas

Within the Project RAA, there are three PPWSAs and two unprotected watersheds included in the Town of Placentia's Municipal Plan (D. W. Knight Associates, 2015). Two of the protected watersheds are located within the LAA include Clarke's Pond/Larkins Pond and Wyses Pond/Curve Pond, the third is Southeast River located south of Placentia in the Projects RAA (Figure 3.1.4-2). The three unprotected watersheds include Argentia Pond and Gull Pond, both of which are located within the LAA, and Rattling Brook Big Pond.

- Clarke's Pond/Larkins Pond watershed is partially located within the Argentia Backlands and is located within a significantly developed section of Freshwater and Jerseyside (D. W. Knight Associates, 2015). This watershed provides water to the amalgamated communities of Placentia including Southeast Placentia, Freshwater, Jerseyside, and Ferndale (PEC, 2024). Existing development is allowed to continue, provided water quality is not affected. At the discretion of Council, new single dwellings may be permitted on an infill (between two developed lots) basis along existing public roads (D. W. Knight Associates, 2015).
- Wyses Pond/Curve Pond watershed remains protected as a water reserve, and no longer provides water services to Dunville. The municipality intends to keep this water supply substantially undeveloped, limiting developments to land use activities and structures associated with the future provision of domestic water supply and passive recreation (D. W. Knight Associates, 2015).
- Southeast River was developed as a water supply for the former community of Placentia (D. W. Knight Associates, 2015). Mineral workings or forestry activity may be permitted subject to the controls on mineral workings set out in this Municipal Plan and subject to the approval of the Departments of Environment and Conservation and Natural Resources (D. W. Knight Associates, 2015).
- Argentia Pond no longer supplies water to the Industrial Complex and is not a protected watershed.
- Gull Pond and Barrows Pond are watershed reserves that are being added to the Clarke's/Larkins Pond system and will be protected under the PPWSA (PEC, 2024). See figure 3.1.4-2 for the proposed Gull Pond PPWSA.
- Rattling Brook Big Pond Watershed marginally overlaps with the projects RAA at its northern extent next to Long Harbour South. This watershed is managed by the Municipality of Long Harbour and its intended use is to support any large industry on the south side of the harbour.

As per the municipal plans, no development is permitted in these watersheds without approval by the Department of Environment and Climate Change – Water Resources Management Division. However, the construction of roads as well as transmission lines are permitted and will be developed within the

PPWSA as part of this Project. These watersheds are managed for the purpose of preserving water quality for the residents and the surrounding environment. A description of municipal water supply infrastructure and availability appears in the Source Water Hydrology Report (Appendix C1).



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.4 - 2	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Public Water Supplies in the Project and Assessment Areas	NOTES: Public Water Supply data sourced from the NL Government Land Use Atlas.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-025-Rev1

Protected Roads

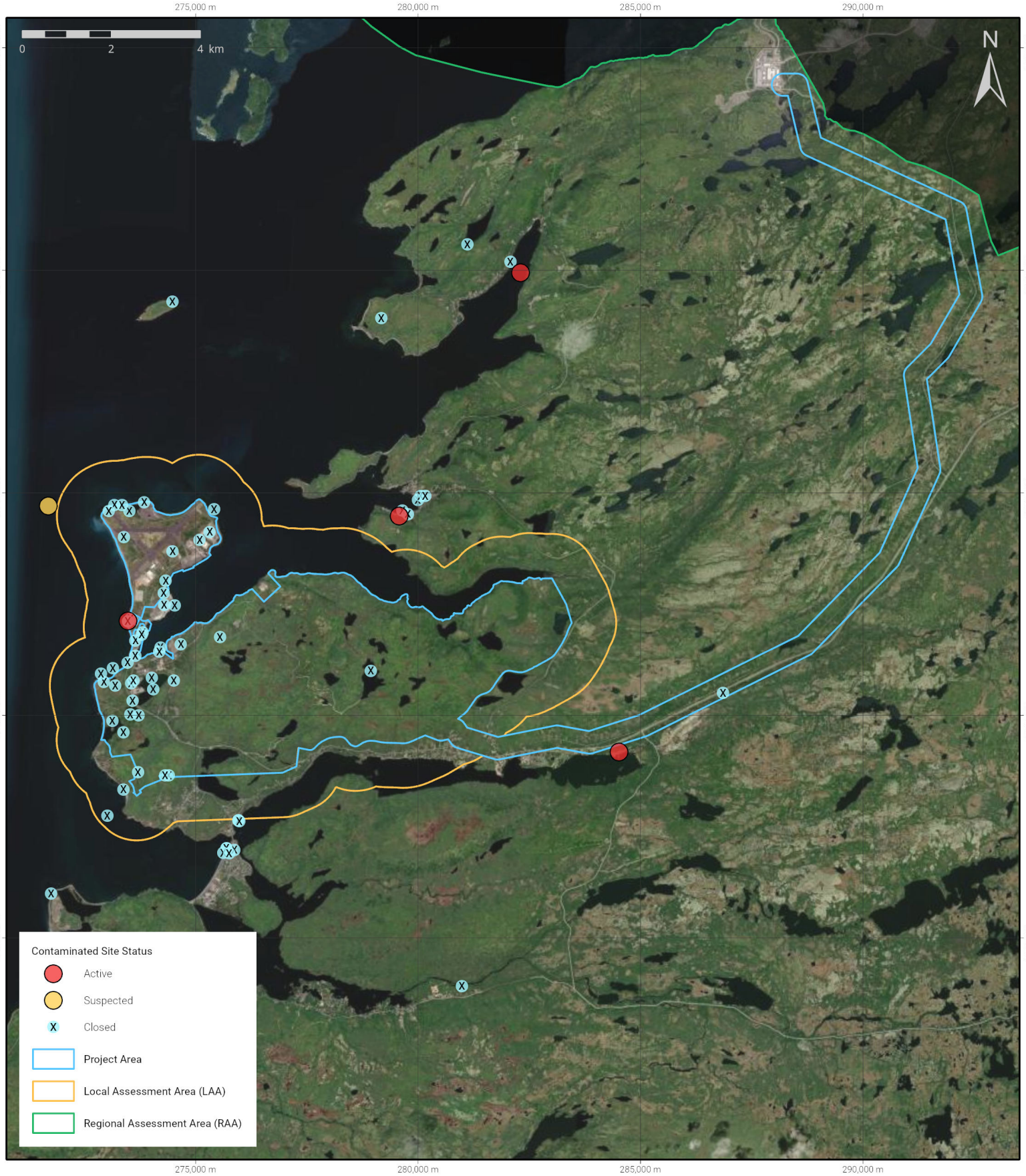
Protected road designations exist under Section 61 of the **Urban and Rural Planning Act** (2000) to control the development within a buffered area along roadways in both Crown Lands and private lands. Within the RAA, where the Project Interconnect Line twins the existing transmission line along Route NL-100 there are two areas of protected roads. The first begins at the Southeast Placentia Road and extends east approximately 4.2 km and buffers 100 m on either side of the highway (Figure 3.1.4-2). This section of protected road runs through an approved Municipal Plan for the Town of Placentia under the provisions of the **Urban and Rural Planning Act**. The second section abuts the first on the eastern Project boundary and continues along NL-100 extending to the Trans Canada Highway (TCH). With the only exception near the Town of Whitbourne, the protected road area buffers the road 400 m on either side. This section of protected road regulates the permit allocation for building development within the protected area with an exception for signs which are permitted to be erected and displayed in accordance with the **Highway Sign Regulations**.

3.1.4.2 Commercial and Industrial Resource Use

Port of Argentia

The Argentia Peninsula was established as a US Naval Base during WW II (1941) as part of a 99 year Lend-Lease agreement between Great Britain and the United States. After its final closure (starting in 1974 and finally completed in 1994) the Government of Canada (Public Works and Government Services – PWGSC) took over the property and completed a massive decommissioning starting with an extensive Environmental Site Assessment in 1993/94 (Janes & Worthman, 2005). In 1995 the Argentia Management Authority (AMA) was formed, and a decade-long Remediation Project commenced, with project completion in 2006/07 (Janes & Worthman, 2005). In 2001 the Government of Canada property and “Port” were transferred to the AMA (Port of Argentia, 2023). In 2015 the property was rebranded and renamed the Port of Argentia (POA) (Port of Argentia, 2015).

Most of the POA property can be considered a “brownfield site”. The peninsula is heavily developed and lacks native vegetative cover. Within the POA Property boundaries, there are a number of secured contaminated sites that are well defined and for which some restrictions may remain in place (Figure 3.1.4-3) (Treasury Board of Canada Secretariat, 2023). A Project Environmental Site Assessment will be completed and, as appropriate, Project infrastructure may be adjusted based on report findings.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.4 - 3	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Federal Contaminated Sites in the Project and Assessment Areas	NOTES: Contaminated Site data sourced from the Treasury Board of Canada Secretariat Federal Contaminated Sites Inventory (April 24, 2024).	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-026-Rev0

The 3,578 ha comprising the POA landmass (Project Area in Figure 3.1.4-1) includes the Argentia Peninsula (1,191 ha) as well as adjacent land, referred to as the Argentia Backlands (2,387 ha) . The POA currently exercises full care, custody, and control over its diverse range of assets and facilities (Dillon Consulting, 2023). The Argentia Peninsula portion of the property has a natural barrier of rolling hills that provide separation from residences, with the nearest structure 4 km away from the marine terminal at Cooper Cove (Dillon Consulting, 2023). Adjacent property owners include Marine Atlantic (ferry terminal), Government of Canada (Canadian Coast Guard - CCG Vessel Traffic Centre), Province of Newfoundland and Labrador (Argentia Ferry Access Road, Tourist Information Centre), and US Government (United States Navy/TE Building).

The POA operates as an industrial hub serving a variety of users and tenants (Port of Argentia, 2023). A network of roads provides access throughout the property, and electricity is available throughout the port facility (Dillon Consulting, 2023). Water is supplied from the Placentia municipal water supply (Dillon Consulting, 2023). The POA can accept vessels up to 300 metres in length and up to 11 metres draft. As a heavy industrial seaport, the POA facilities include:

- 319 ha of harbour lands which are composed of:
    - 70 ha of paved runways (for use as a marshalling yard for Wind Turbine Monopiles).
    - 40 ha secured marine terminal with quayside storage yard.
    - 3 km ice-free, deep-water harbour, with a wide turning basin.
    - 630 m length of docking facilities with up to 11 m / 36 ft of draft.
    - Experienced stevedore crews trained in off-loading numerous types of cargo and certified to handle hazardous material, including explosives.
    - Extensive land zoned for industrial use.
    - Pilotage services.

In addition to Argentia Renewables Wind LP, there are 40 existing users/tenants at the POA. Currently, Argentia Capital Inc. (a joint venture between POA and Torrent Capital) is planning to expand the services available at the port by expansion of the docking facilities and related upgrades to attract more business. Other infrastructure enhancements are proposed for features such as in-ground utilities and port electrification, as well as a mobile harbour crane and ancillary warehouses. The POA serves a series of domestic and international container shipping lines. Eimskip provides Trans-Atlantic container service between European ports and North America, calling weekly at Argentia on its Green Line. TMSI offers short-sea container service with weekly calls at Argentia, Halifax, and St. Pierre.

The POA is establishing North America’s first and only monopile marshalling port in support of US offshore wind projects. Argentia’s strategic location and proximity to US offshore wind developments are key factors in securing contracts to receive monopiles for laydown and storage. Grieg Seafood NL has selected Argentia as its preferred site for a feed distribution hub to supply its sea cages in Placentia Bay.

POA is expanding its support to this sustainable industry with a new aquaculture dedicated wharf development, complete with supply warehouses laydown acreage quayside.

Vessel traffic associated with the POA has been reported by Dillon Consulting (2023); see Table 3.1.4-1. The ten-year average (2013 – 2022) was 173 vessels (range 137 – 217). The monthly average ranges from 12 (Dec, Jan, Feb) to 18 (May). The overall range by month is from six (Feb 2013) to 34 (Apr 2017). This reflects an average of less than one vessel movement per day. The values in Table 3.1.4-1 represent vessel transit arrivals only, departures are counted separately. Marine Atlantic vessel movements are also tracked separately and can be seen in Table 3.1.4-2, where each arrival and departure count as a combined single sailing.

Table 3.1.4-1 Port of Argentia Vessel Traffic 2013 – 2023.

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	TOTAL
2013	15	6	13	15	17	11	9	10	15	17	10	12	150
2014	9	7	12	12	12	15	11	15	21	13	10	9	146
2015	7	8	9	12	13	11	12	13	14	12	14	12	137
2016	12	14	15	22	14	14	12	14	15	15	15	11	173
2017	14	19	14	34	20	14	15	12	9	13	13	11	188
2018	7	8	12	18	18	14	14	10	17	16	15	9	158
2019	14	10	15	16	19	15	19	22	13	17	19	18	197
2020	14	18	22	16	29	22	16	19	17	16	15	13	217
2021	16	12	14	12	18	17	17	20	16	18	9	12	181
2022	15	14	14	18	24	12	17	16	16	16	11	16	189
2023	15	16	14	16	15	-	-	-	-	-	-	-	76

Table 3.1.4-2 Marine Atlantic Ferry Traffic 2014-2023

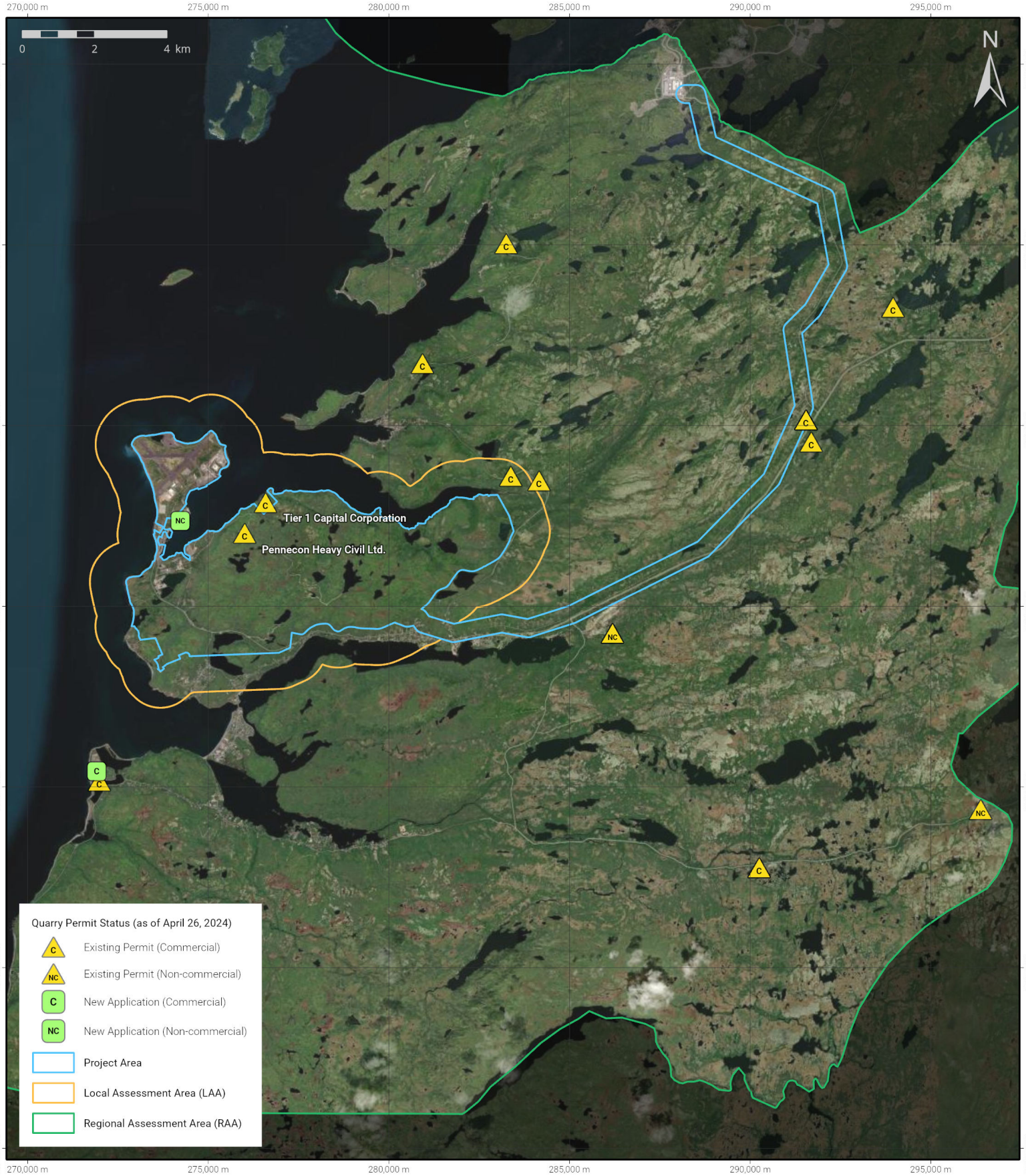
Year	June	July	Aug	Sept	Oct	Nov	Dec	TOTAL
2014	10	24	27	15	-	-	-	76
2015	10	27	25	18	-	-	-	80
2016	12	27	26	17	-	-	-	82
2017	13	27	26	16	-	-	-	82
2018	14	26	27	17	-	-	-	84
2019	9	26	27	14	-	-	-	76
2020	0	0	0	0	-	-	-	0
2021	0	16	18	10	-	9	2	55
2022	12	27	24	13	-	-	-	76
2023	13	27	26	16	-	-	-	82

Mining, Quarrying, and Petroleum

Within the extents of the RAA, there are currently 16 issued quarry permits and two new permit applications (retrieved from the NL GeoScience Atlas, April 26th, 2024). Of the 16 issued permits, 14 are considered 'Commercial' and two are considered 'Non-commercial' while the two new permit applications include one 'Commercial' and one 'Non-commercial'. Permitted quarry activity (including new applications) within the outer RAA extent covers an area of 55.51 hectares being held by 13 different companies (Newfoundland and Labrador Mineral Lands Division, 2024b). Figure 3.1.4-4 below shows the locations of all quarry activity within the RAA extent with details provided in Table 3.1.4-3.

Table 3.1.4-3 List of Current Quarry Permits within the RAA (as of April 26, 2024).

Permit ID	Permit Class	Company Name	Purpose	Size (Ha)
149057	Quarry Permit	M.J. Hickey Construction Ltd.	Commercial	0.98
148767	Quarry Permit	Tier 1 Capital Corporation	Commercial	3.17
148025	Quarry Permit	Oldridge Holdings Ltd.	Commercial	2
148704	Quarry Permit	Maher's Heavy Equipment Ltd.	Commercial	0.5
148002	Quarry Permit	Edward Meade	Commercial	1
148582	Quarry Permit	J & E Enterprises Ltd.	Commercial	1
149056	Quarry Permit	M.J. Hickey Construction Ltd.	Commercial	5.78
147924	Quarry Permit	Dept. of Transportation and Infrastructure	Non-commercial	2.5
148876	Quarry Permit	Meade's Services & Storage Ltd.	Commercial	1
147798	Quarry Permit	M.J. Hickey Construction Ltd.	Commercial	0.98
147800	Quarry Permit	M.J. Hickey Construction Ltd.	Commercial	5.78
149055	Quarry Permit	M.J. Hickey Construction Ltd.	Non-commercial	5
148793	Quarry Permit	RJG Construction	Commercial	1
148602	Quarry Permit	Pennecon Heavy Civil Ltd.	Commercial	3.87
147894	Quarry Permit	Meade's Services & Storage Ltd.	Commercial	1
148365	Quarry Permit	KJH Dirtwork's	Commercial	1
148296	New Application	Port of Argentia Inc	Non-commercial	9.95
146651	New Application	Farrells Excavating Ltd.	Commercial	9



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.4 - 4	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Quarry Permits in the Project and Assessment Areas	NOTES: Quarry Permit data sourced from NL Mineral Lands Division GeoScience Atlas on April 26, 2024.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-027-Rev0

Two quarries currently located on the POA Property are being considered for use for the Project. One is permitted to Tier 1 Capital Corporation located on Broad Cove Head, Argentia and encompasses 3.17 ha. The second is permitted to Pennecon Heavy Civil Ltd. located on Silver Mine Rd, Argentia and encompasses 3.87 ha. If additional quarry materials are required beyond what these two quarries can supply, the Project will assess potential quarry sites and give preference to a single site provider, rather than multiple smaller quarry sites.

No active mines are located within the RAA. One historical mine, Silver Cliff Mine, was located on the Argentia Backlands. Since its discovery in 1882, intermittent operations continued until 1925 (Prospector Resource Room, 2014). The original nine veins are polymetallic Ag-Pb-Zn^{+}/-Au^{-} rich, only two of which have been developed, the Fowler Vein and MacKay Vein, have since increased to 20 recorded veins on the property (Prospector Resource Room, 2014). The property became restricted from 1941-1994 because of the US Military base, and then the land became privately owned the mineral claims have not been further developed (Prospector Resource Room, 2014).

As of April 26, 2024, there are 15 mineral licences listed within or overlapping with the outer extents of the RAA totalling an area of approximately 2,024 Ha. While some licences do occur outside the Project area, eight licences are contained within the Project Area, with a total of approximately 775 ha. Figure 3.1.4-5 and Table 3.1.4-4 below illustrate and list the current active mineral licences within the outer extents of the RAA (Newfoundland and Labrador Mineral Lands Division,2024a). The Project recognizes that residents of NL have the right to apply for mineral licences within the province, and the company will consult and work with the Mineral Lands Division of the Newfoundland and Labrador Department of Industry, Energy and Technology (NLDIET) to ensure that Project site safety is maintained while mitigating any issues from the mineral licences and their holders.

While the RAA has not seen any exploration activities for petroleum, the POA has actively supported the growth and development of the province’s offshore Oil and Gas industry infrastructure through projects including Cenovus Energy, Cooper Cove Development, and Bay du Nord.

Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.4 - 5	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Mineral Licenses in the Project and Assessment Areas	NOTES: Mineral License data sourced from NL Mineral Lands Division GeoScience Atlas on April 26, 2024.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-028-Rev0

Table 3.1.4-4 List of Mineral Licences within the RAA (March 2024).

Mineral Licence Number	Licence Holder	Number of Claims	Licence Status	Issued Date	Expiry Date	Permit Area (Ha)
037594M	Bond Rideout	4	Issued	2024-03-28	2029-03-28	100
017107M	Jason White	1	Issued	2004-06-03	2024-06-03	25
023018M	Jason White	3	Issued	2010-04-08	2025-04-08	75
023019M	Jason White	5	Issued	2012-12-03	2027-12-03	125
030867M	Jason White	3	Issued	2020-05-31	2025-05-31	75
033181M	John Cochrane	6	Issued	2021-07-26	2026-07-26	150
035574M	John Cochrane	1	Issued	2023-06-23	2028-06-23	25
036436M	Maxine Cochrane	10	Issued	2023-08-31	2028-08-31	250
036917M	Maxine Cochrane	2	Issued	2024-01-02	2029-01-02	50
031930M	Nathan Fleming	10	Issued	2021-01-29	2026-01-29	250
033034M	Nathan Fleming	3	Issued	2021-07-05	2026-07-05	75
035021M	Stephen Sheppard	11	Issued	2022-09-22	2027-09-22	275
035023M	Stephen Sheppard	4	Issued	2022-09-22	2027-09-22	100
036883M	Stephen Sheppard	4	Issued	2023-12-15	2028-12-15	100
025659M	Vulcan Minerals Inc.	14	Issued	2018-01-02	2028-01-03	350

Forestry

The province is divided into 24 Forest Management Districts (FMD), 18 in Newfoundland and six in Labrador, which are managed by the Forestry Service of NL under the Provincial **Forestry Act** (1990). District 1 encompasses the Avalon Peninsula east of Come by Chance and contains numerous forestry managed crown lands for the use of silviculture. There is no active industrial forestry within or near the RAA, however there are eight silviculture areas.

Agriculture

Within the RAA there is one area of regional pastureland along the Argentia Access Rd, and one area of agricultural crown reserve on the eastern extent of NL Route 100. These areas are managed by the Agriculture and Lands Branch of the Department of Fisheries, Forestry, and Agriculture. Lands, including agricultural areas of interest, are offered by the branch to famers through a request for proposals process for an Agricultural Crown Land Lease. The Project will not be interacting with agricultural land.

Hydro and Electrical Infrastructure

Within the RAA, NLH owns the 230 kV transmission line from Long Harbour to the Western Avalon substation (TL208), and Newfoundland Power owns the 69 kV transmission line and equipment on the Avalon Peninsula, including the transmission line 55L, which extends from Blaketown to Clarke's Pond. All medium and/or low voltage collector lines within the RAA are owned and operated by NL Power, in addition to terminal stations used for switching operations, or stepping up/down the voltage. While the

Project will own the Project Interconnect Line, following its construction NLH will operate the Interconnect Line.

Industrial Effluent

The NL DECC Water Resources Portal identifies 17 outfalls in the Placentia and Dunville areas, most of these are well to the south of the POA Property (Water Resources Management Division, 2023). Two outfall sites exist at the POA Property. Outfall 3800-37 (located at the northern end of Cooper Cove) is listed as a treated effluent outfall associated with the Argentia Inco Demonstration Plant. A Blivet (all-in-one packaged sewage treatment plant) treatment system handles domestic sewage as well as "lagoons for industrial effluent". Outfall 3800-38 is located on the Argentia isthmus and may discharge to the west side of the isthmus. It is described as "not a municipal outfall". What appears to be the same site (or one very close by) is shown on the Federal Contaminated Sites Inventory (Site # 00018124) and is described as "Argentia Harbour Rear Range" (Treasury Board of Canada Secretariat, 2023).

Canadian Coast Guard Radar Station

The Canadian Coast Guard (CCG) infrastructure occupies two locations within the Project Area. One is the Freshwater Hill VHF tower located just outside the southern extent of the POA Property. The second is the Pearce Peake Radar tower, which is located on the western side of the Argentia Backlands. The operation by CCG of the Vessel Traffic Centre includes use of a radar system whose effectiveness could be hampered by the presence of physical structures within its viewing arc. The preliminary layout consists of 12 turbines located within the line-of-sight where they are anticipated to interfere with the radar's marine traffic monitoring functions. The initial affected Project infrastructure includes turbine sites 1, 2, 4, 5, 6, 7, 21, 34, 44, 45, 46, and 47, and meteorological tower 2. Through consultation with the CCG, wind turbine sites 7, 22 and 47 have been removed from the Project. Wind turbine site 21 has been microsited east to avoid the line-of-site of the Pearce Peake Radar Tower. Meteorological tower 2 is a temporary installation that will be removed during construction and will not cause long term interference. Given these changes, the affected Project infrastructure now includes turbines 1, 2, 4, 5, 6, 34, 44, 45, and 46. Argentia Renewables continues to engage the CCG to develop a plan to reduce interference on the remaining infrastructure. A variety of measures are being developed between Argentia Renewables and the CCG that can be applied to reduce potential interference including masking, blanking, antenna quaint, and tracking. Mitigation measures that are being explored include:

- Existing capabilities in the radar and the CCG's tracking and display system to mitigate false returns due to wind turbine clutter and any loss of detection downrange due to shadowing; and
- In the extreme, further relocation of wind turbine sites.

3.1.4.3 Recreational and Subsistence Resource Use

Tourism

The Argentia Provincial Visitor Information Centre is located on route NL-100, 3 km from the Marine Atlantic Ferry Terminal. The Information Centre is open from May to October to help guide tourists on the local events, tourist attractions and operators, and regional history. Seasonally, the POA operates the Sunset RV Park on the Argentia Backlands, 2 km southeast of the Marine Atlantic Ferry Terminal. The park provides 40 serviced sites with amenities including water, sewer, 30- and 20-amp electrical hookups, washrooms, showers, and a picnic area. Additionally, the Argentia Backlands includes 15 km of prepared walking trails available to campers. Additional camping is available at the privately owned Fitzgerald's Pond Park located adjacent to the Provincial Park Reserve, 25 km from the POA.

In addition to the natural attractions of the area, the RAA is home to the Castle Hill National Historic Site. Located on the bluff overlooking the Town of Placentia, walking trails throughout the site, the visitor centre exhibit, gift shop, picnic facilities, and bilingual guide services are available.

Hunting and Trapping Wildlife Management Areas

Subsistence hunting is a large part of NL culture and attraction, and more than tens of thousands of licenses (including big game, small game, birds), are awarded/sold each year. All license holders must comply with regulations set forth by NLDFFA, Wildlife Division, and the federal **Migratory Birds Hunting Regulations** (Environment and Climate Change Canada, 2023). It is important to note that hunting and trapping is prohibited to occur on the POA and Argentia Backlands at the discretion of the private landowners (i.e., POA).

Big game animals of insular Newfoundland include caribou, moose, and black bear are managed by the NLDFFA, Wildlife Division. Management areas overlapping with the RAA include Moose Management Area (MMA) 31-Placentia and 32-Capeshore, Black Bear Management Area (BBMA) 31-Placentia and 32-Capeshore, and Caribou Management Area (CMA) 77-Cape Shore Newfoundland. In total, the quotas for moose in both MMA 31 and 32 totals 575 in the 2023-24 season (Province of NL, 2023). Black bear hunting in BBMA's 31 and 32 are closed, meaning no hunting season occurs. The same is true for the remainder of the Avalon due to low black bear populations in the region. Elsewhere in the province, black bears are hunted and trapped in both spring and fall (Province of NL, 2023). Only the southern extent of the RAA overlaps with CMA 77. However, the likelihood of the caribou interacting with the RAA is low, given that in the 2023-24 season only 10 caribou licences were issued in CMA 77, thus indicating a small population (Province of NL, 2023).

As a result of there being no non-resident big game hunting licenses available in the RAA, there are no registered outfitting companies located within the RAA boundaries. The nearest outfitting company is

Deep Country Lodge, Deep Bight, NL, 90 km north of the Argentia Peninsula (*Deep Country Lodge - Deep Bight*, n.d.).

Non-migratory birds and small game animals of insular Newfoundland include several species of ptarmigan, grouse, and snowshoe hare, which are managed by NL Wildlife Division. The seasons and bag limits vary for each species, hunting method, and is area dependent. The RAA overlaps with the Avalon/Swift Current area for ptarmigan, the “Remainder of Island” area for snowshoe hare, and the island-wide area for grouse (Province of NL, 2023). Generally, non-migratory birds and small game animals are hunted in the fall and winter.

Migratory birds including waterfowl and snipe are regulated federally via migratory game bird hunting permits**.** In the RAA, migratory bird hunting zones include Avalon-Burin Inland and Avalon-Burin Coastal, overlapped by Murre/Turr hunting zone 3. The seasons and bag limits vary for each species and are zone dependent. For the RAA, most seasons occur September to December except for some duck species and Murres which extend until March.

Furbearer trapping in NL is held to the performance standards of the Agreement on International Humane Trapping Standards (AIHTS) and is managed by the Department of Fisheries, Forestry and Agriculture (Department of Fisheries, Forestry and Agriculture, 2018). Furbearing species that are present in the RAA include beaver, fox, lynx, coyote, mink, muskrat, and otter. While generally the optimum furbearer harvesting season is the fall and winter, seasons may vary for each different species. The RAA is in management zone 2. For beavers, zone 2 is further subdivided into 49 traplines, five of which overlap with the RAA. Only two traplines, beaver fur zone 2 trapline 14 (Argentia) and zone 2 trapline 24 (Long Harbour), overlap directly with the Project Area.

Fishing/Angling

Salmon fishing in NL is a license regulated sport managed by DFO. The RAA is located within the greater Salmon Fishing Area 10, which extends from Cape St. Mary’s to Point Crew, encompassing Placentia Bay. The RAA includes two of the 20 salmon rivers in this area includes Southeast River (Placentia), tributary streams, and Northeast River (Department of Fisheries and Oceans Canada, 2023a).

Trout fishing is also managed by DFO, and insular Newfoundland is regulated as a single unit (Zone 1). Trout fishing season varies based on the species and whether the water in which you are fishing is scheduled or non-scheduled, however anglers may angle for trout year round in coastal waters (Fisheries and Oceans Canada, 2023b). Commonly fished species include brook trout, brown trout, rainbow trout, and ouananiche. Trout angling season for non-scheduled waters runs from February 1 to April 15 and May 15 to September 7 in the 2023-24 season. There are no scheduled trout waters or special trout areas located within the RAA.

Domestic Wood Harvesting

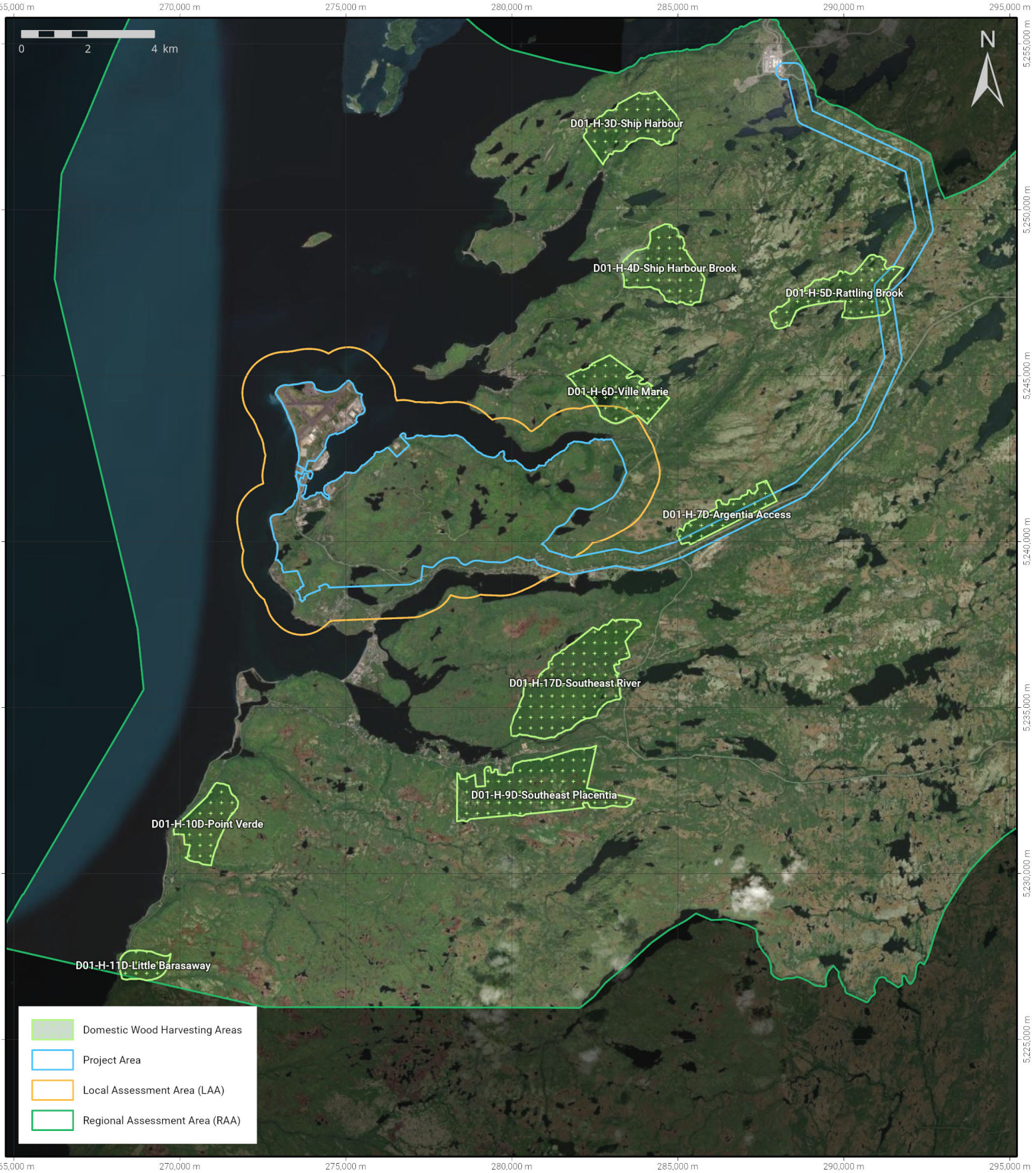
The Project is in Domestic Harvesting District 01-Avalon, and is managed by the NL DFFA. This area encompasses Avalon Peninsula east of Come by Chance. Permits are required for wood harvesting on Crown Lands. The surface area of the Avalon Peninsula is approximately 969,000 hectares (ha), where 628,800 hectares of Crown Land are included in the intensive forest inventory of the Avalon (NL DFFA, 2016). With the exception of private land, the entire land area located in Domestic Harvesting District 01-Avalon is currently managed by the Crown (NL DFFA, 2016). There is no ownership of land by Corner Brook Pulp and Paper (NL DFFA, 2016). Most Project activities will occur on POA Property; in which case, permitting of domestic wood harvesting is not applicable.

There are nine domestic cutting zones in the RAA, two of which are located within the LAA (Figure 3.1.4-6). The domestic wood harvesting zone D01-H-5D and D01-H-7D runs along Route NL-101 and Route NL-100 respectively, and both are within the vicinity of the preliminary Project Interconnect Line right-of-way.

In addition to the designated cutting zones in the area, within domestic harvesting District 01-Avalon there are special considerations for roadside wood harvesting. Excluding designated cutting zones, private lands, protected areas, parks, and outlined exclusion areas (not in RAA), domestic wood harvesting is permitted within 100 m from the center of a provincial highway or an NLH transmission Line Right-of-Way (ROW) (NL DFFA, 2022). Within this area, people must only harvest dead and/or blowdown timber and only existing accesses may be used to reach the site (NL DFFA, 2022).

Swimming

Given the province’s abundance of natural water resources, it is a common summer recreation activity to swim in local ponds and rivers. Recreational outdoor swimming can occur in designated and undesignated locations that are only know through popularity amongst the community. Within the RAA there are 9 known swimming locations, only one is located with the Project Area (Young, n.d.). The site is located at Barrow’s Pond which is located within the PPWSA in the Argentia Backlands.



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.4 - 6	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Domestic Wood Harvesting in the Project and Assessment Areas	NOTES: Domestic Harvest Area data sourced from NL Government Land Use Atlas on April 26, 2024.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-029-Rev0

Berry Picking and Plant Harvesting

Foraging in NL has become an increasingly popular recreational activity. Preferred activities include the culturally important berry picking in late summer and early fall, and emerging public interest in fungi harvesting. Residents of the greater-Placentia area usually pick berries along both sides of the Long Harbour Road turn-off, near Fitzgerald's Pond Park, and on the Argentia Backlands (Jacques Whitford Limited, 2007). Berries in Newfoundland include but not limited to low-bush blueberries, partridge berries, blackberries, cloud berries or bakeapple, raspberry, currants, cranberries and strawberries (Gov NL, 2022)

Trails and Unique Sites

The Town of Placentia strongly supports heritage in sports and recreation, with 15 parks and recreation facilities across the community, listed below. The Municipal Plan also outlines the potential for the construction of the East Coast Trail, in addition to pursuing the construction of a community swimming pool in partnership with the Placentia Lions Club.

- Unity PARC Arena
- Community Allied Youth
- Skate Park/Green Gym
- Regatta Grounds
- Wayne John Searle Memorial Recreation Complex
- Willard Hatfield Memorial Ball Field
- William Hogan Ball Field
- Jeff Jones Memorial Soccer Pitch
- Coalyard Playground
- Ferndale Veterans' Park Playground
- Mount Pleasant Playground
- Freshwater Playground
- William Hynes Memorial Playground
- Mount Pleasant Playground
- Heritage Walking Trails and Boardwalk

An additional trail system has been recently registered by Hike Placentia Inc (Registration Number: 2257). The development will extend from Point Verde to the previous American Naval Base located within the Argentia Backlands. Argentia Renewables commits to working with Hike Placentia on their trail development in the Argentia Backlands.

3.1.4.4 Protected, Special, and Sensitive Areas

Parks and Reserves

Municipal parks are located throughout Placentia and the surrounding areas including playground and natural areas. In Placentia, there are 12 outdoor playgrounds, heritage walking trails, and boardwalks. The existing and proposed designated trails will be protected by a suitable buffer, within which any development application shall be referred by the Town to the Heritage Trail Committee and other relevant agencies, prior to the granting of a permit (D. W. Knight Associates, 2015). If a link with the East Coast Trail is developed in future, any development within a certain distance of the Trail shall be subject to review and approval by the Town after consultation with the East Coast Trail Association and relevant Provincial Government agencies (D. W. Knight Associates, 2015). The intent will be to protect the Trail as a hiking/walking facility in a largely natural environment (D. W. Knight Associates, 2015).

Provincial Park Reserves are former provincial camping parks (pre 1997) where the campground area was de-proclaimed and privatized while the remainder of the provincial park was retained to protect natural features (ParksNL, 2020). Within the RAA, located 25 km from the Argentia Ferry, Fitzgerald's Pond Provincial Park on the Avalon Peninsula protects a population of rare boreal felt lichen.

Proposed Protected Areas

There are no proposed protected areas within the RAA. The nearest proposed area is Halls Gullies, approximately 17 km from the Project RAA (Wilderness and Ecological Reserves Advisory Council, 2020).

Historic Sites

Castle Hill historic site is located on the bluff overlooking the Town of Placentia. This historic site protects the remains of the 17th century French fortification along with the surrounding trails connecting Fort Royal to the two redoubts located on site. This tourist stop offers views of both Placentia and Argentia, and provides guests with tours, information, and activities during its summer operating months of June – October. All plant life is protected within National Parks and Historic Sites. In reference to the Historic Resources Overview Assessment (Appendix F), there are minimal interactions with the Project.

Sensitive Wildlife Areas

Sensitive wildlife areas identify habitat suitable for the presence of SAR and are managed by the NL Wildlife Division. Two sensitive wildlife areas occur within the Project Area which are established due to the historic occurrence of endangered plants located on the Argentia Peninsula. These sites were also identified in the AC CDC report conducted as part of the terrestrial baseline survey. The two sites are located on the former military airstrip and include observations of water pigmy-weed (*Tillaea aquatica*) and are incorporated into the Species at Risk Impact Monitoring and Mitigation Plan (Appendix R).

In addition, two sensitive wildlife areas are identified in the RAA. One is an area identified for endangered plants and is located 2.7 km south of the community of Dunville. This area is known to have blue felt lichen which is listed as a vulnerable under **NL Endangered Species Act** (NL ESA), special concern under SARA. The second is the Cape Shore woodland caribou area located along the southern extent of the RAA extending south 27 km.

3.1.4.5 Indigenous Land Use

The Island of Newfoundland is the ancestral unceded homelands of the Beothuk and Mi'kmaq. On the island there are two federally recognized First Nation Bands including the Miawpukek First Nation (Conne River) and Qalipu First Nation (a landless band representing 67 communities throughout the Island) (Pike, n.d.). Neither Band identifies as being represented nor do they avail of the land resources within the RAA, the closest being Miawpukek First Nation located in Conne River.

3.1.5 Heritage and Cultural Resources

A desktop Historic Resources Overview Assessment (HROA) was conducted in 2024 and researched the cultural / historical sequence of Newfoundland with a focus on Placentia Bay and the Project Area. A description of the selected study areas appears in Section 3.2 (Baseline Studies) and in Appendix F.

The background and contextual data compiled indicates a human presence in the Placentia Bay region extending back at least 3,500 years ago and includes occupations by several different First Nations and Pre-Inuit Indigenous cultures during the Precontact, Early and later Historic Periods, and by Europeans and peoples of European decent starting sometime after 1,500 CE and continuing at various degrees of intensity to this day. Given the longstanding human usage of the region, as confirmed from the review of archaeological data, historic and current documentation and aerial imagery, there is theoretical potential that sites and historic properties deriving from one or more of the cultural groups mentioned above could be present within the Project Area.

One archaeological site (ChAl-14) registered within the Project Area and is comprised of 13 structures reportedly associated with the mid-twentieth century US Military presence in the region. There is also one registered architectural resource of built-heritage significance known as the 282 Coastal Defense Battery, and it too is related to the US military presence in the area. A map showing the registered archaeological sites in the region (including ChAl-14) and the one architectural resource situated within the Project Area is presented in Figure 3.1.5-1. The Castle Hill National Historic Site is described above in Section 3.1.4 (Land and Resource Use) and is not included in the below map.

Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.5 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Bursey	DATE: 24/07/28
	FIGURE TITLE: Registered Archaeological Sites and Architectural Resources	NOTES: Registered Archaeological Site data provided by the NL Government's Provincial Archaeology Office (PAO). Registered Heritage Structure provided by Heritage NL. The 'LAA' predates the current Regional Assessment Area (RAA) and covers a 50 km-diameter circle that centers on a point near the community of Placentia.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

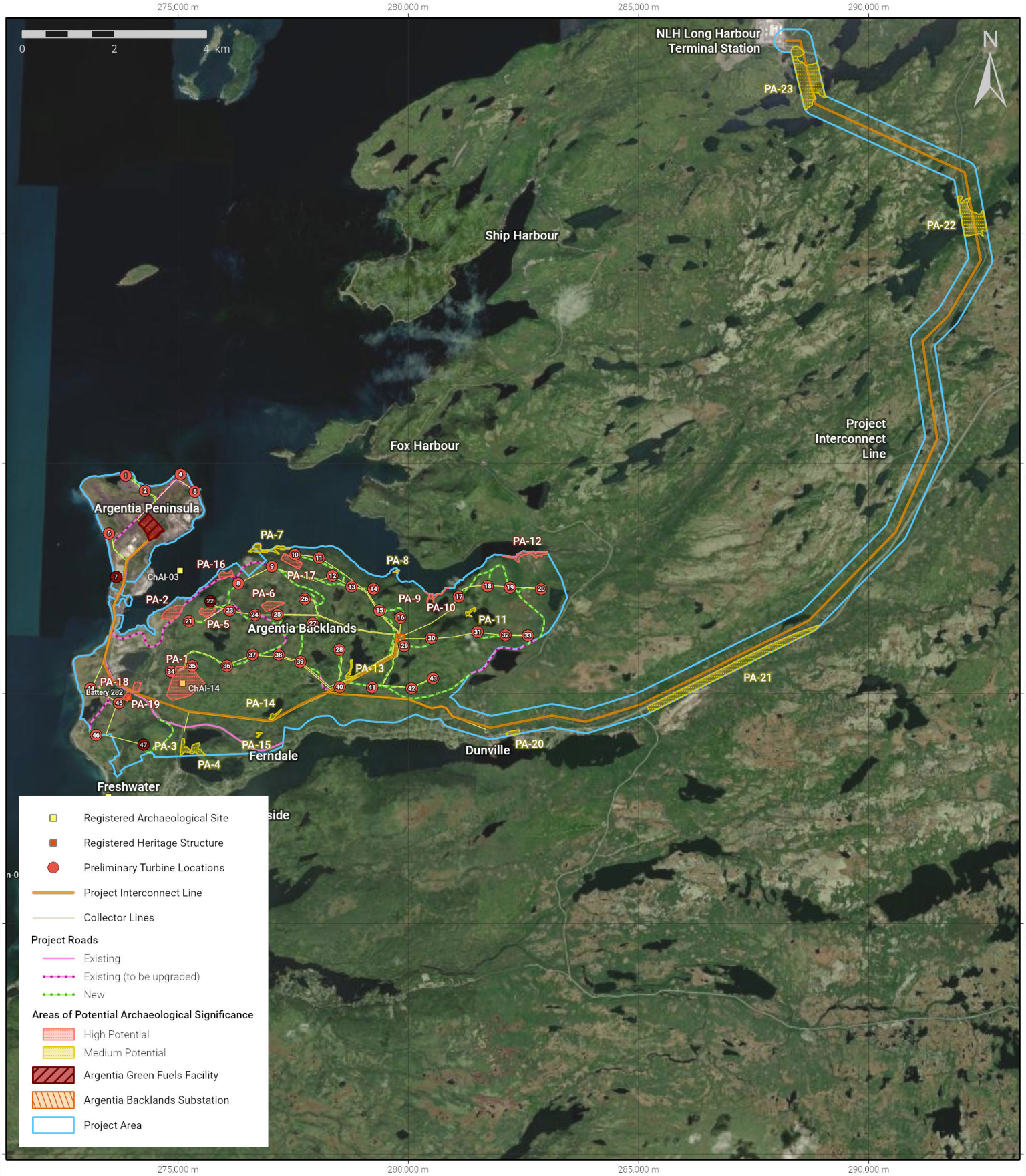
SEM MAP ID: 238-005-GIS-030-Rev0

During the HROA, twenty-one other locations of potential archaeological significance were identified in the Argentia Backlands and along the Project Interconnect Line. Six of these in the Argentia Backlands are rated as having High potential, as they do or could contain structural and/or artifactual objects associated with late-nineteenth to early-twentieth century mining activities, or military remains dating to the same period as those located at ChAl-14. An additional four locations in the Argentia Backlands are also rated as having High potential, as they are situated in environmental settings that may have been used during the Precontact and/or Historic Periods for temporary settlement or other forms of land-use. Seven locations in the Argentia Backlands and along the Project Interconnect Line, with similar yet less pronounced and attractive landscape attributes, are rated as having Medium potential. All other terrain within the Project Area is rated as Low potential. A maps indicating areas of High and Medium historic resources / archaeological potential are presented in Figure 3.1.5-2. A summary of information regarding each area of High potential is presented below in Table 3.1.5-1. No locations with historic resources / archaeological potential have been delineated for the Argentia Peninsula.

Although fossils are protected under the **Historic Resources Act (1985)** and are inventoried by the PAO, the potential for any such resources to be present within the Project Area is Low.

Table 3.1.5-1 Areas of High Historic Resources Potential within the Project Area.

Reference Code	Area Description	Metres above sea level (mASL)	Potential Rating
PA-1	Registered archaeological site – ChAl-14 – 13 WWII military bunkers (PAO SRF)	120	High
PA-2	WWII military ordnance – 281 Coastal Defense Battery.	40	High
PA-5	Possible WWII military structures	110	High
PA-6	WWII Military bunkers (6)	110	High
PA-9	Pond frontage along waterway (Outside Shalloway Pond) and coastal shoreline	0-10	High
PA-10	Pond frontage along waterway (Outside Shalloway Pond) and coastal shoreline	0-10	High
PA-12	Coastal shoreline	0-10	High
PA-16	Possible WWII military structure	40	High
PA-17	Late-19 – early-20th century, above-ground mining infrastructure associated with Silver Cliff Mine	20	High
PA-18	WWII command bunker	45	High
PA-19	WWII military ordnance – 282 Coastal Defense Battery (architectural resource)	25	High



Pattern | Argentia Renewables	FIGURE NUMBER: 3.1.5 - 2	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/28
	FIGURE TITLE: Areas of Potential Archaeological or Historic Significance	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change.	REVIEWED BY: CBurke	
	PROJECT TITLE: Argentia Renewables		APPROVED BY: CBurke	sem

SEM MAP ID: 238-005-GIS-031-Rev1

3.1.6 Socio-Economic Environment

A socio-economic baseline report was prepared for the purposes of effects assessment. It is included as Appendix G. The Project Area considered in the assessment is described in Section 2.1, and is defined as “the area in which Project infrastructure components and activity (e.g., construction, operation, decommissioning) will occur, and within which direct environmental interactions with the Project will likely occur”. Specifically, the Project Area will encompass the collective spatial footprint of the wind turbines, the Argentia Green Fuels Facility, ammonia storage infrastructure, electrical substation(s), turbine-interconnected transmission lines, a transmission line to the main electrical grid in Long Harbour, and associated roads for elements of the Project. A 100-metre buffer was added to either side of the transmission line to Long Harbour.

The Local Study Area selected for the socio-economic environment coincides with data and information that are available from Statistics Canada (Census of Canadian Population) and NL Statistics Agency (Community Accounts) for the Town of Placentia, which includes the POA and the communities of Freshwater, Dunville, Southeast Placentia and Jerseyside – amalgamated with Placentia in 1991 (Town of Placentia 2024). NL Statistics Agency also provides data (not available for the Town of Placentia) for Local Area 2: Placentia-St. Bride's Area, which includes Placentia along with Fox Harbour and Ship Harbour to the north and the communities of Point Verde, Big Barasway, Ship Cove, Patrick's Cove-Angels Cove, Cuslett, St. Bride's, Point Lance and Branch to the south.

The Regional Study Area selected for the socio-economic environment coincides with census data for the Avalon Peninsula Economic Region or Census Division (CD) No. 1, Avalon, both of which include the Avalon Peninsula and the Isthmus. Data was also obtained from NL Statistics Agency for Economic Zones: 17, 18, 19, 20, which encompass the Avalon Peninsula but not the Isthmus. Where data were not available, the census also supplies data for Eastern Health, which encompasses a larger area including the Avalon Peninsula, Bonavista Peninsula and Burin Peninsula. Avalon is the area anticipated to supply labour for a large construction project at Placentia. For some aspects of the human environment such as economic benefits, provincial royalties / taxes, and effects on gross domestic product, the Regional Study Area is the province of NL.

3.1.6.1 Communities and Community Life

The following provides a summary of key issues related to the Communities and Community Life VC as identified through the baseline study, issues identified by regulators, or concerns expressed by the public or stakeholders during engagement activities for the Project.

Population Demographics

The 2021 population of Placentia was 3,289 residents showing a decline of 5.9% from the previous census (Statistics Canada 2023a). The median age had risen from 50.5 years in 2011 to 56.4 years in

2021 (Statistics Canada 2012, Statistics Canada 2023a). The largest age cohort (25.8%) was 50 to 64 years in Placentia (Statistics Canada 2023a), reflecting an ageing workforce and / or a high proportion of younger retirees. Placentia showed a small increase in the proportion of in-migrants (75 people in 2021).

Community Health and Wellbeing

Key social determinants of health were selected to help describe vulnerable areas with regards to community health and wellbeing, including education, income, housing, food security, health and social services, diversity, equity, and inclusion. The following provides a summary of these key social determinants.

Education

Primary to secondary and post-secondary education is available in Placentia. Capacity is likely available in the school system. Placentia has two schools, which had a total enrolment 433 in the 2021-2022 school year, showing a net loss of five students in 2023 (NL Education 2023a). The College of the North Atlantic Placentia campus offers programs in Early Childhood Education, Heavy Duty Equipment Technician / Truck and Transport Mechanic, Heavy Equipment Operator, Machinist, Industrial Mechanic (Millwright), Personal Care Attendant and Welder (CNA, 2023a). In 2021, the population of Placentia had a higher rate of individuals without a high school diploma or equivalent compared to Avalon or NL and a lower rate of individuals with a university degree (Statistics Canada, 2023a). A higher proportion of residents had an apprenticeship diploma, which is often suitable for employment in rural areas. Major fields of study tended to align with gendered roles. Women+ were more likely to have university education at 13.3%. Men+ showed higher tendency (17.8%) towards education in apprenticeship or a trades certificate or diploma.

Income

The 2020 median after-tax income of individuals and households in Placentia was lower than in the other jurisdictions and in Canada (Statistics Canada, 2023a). Notably, the median income of women+ was lower than men+ in Placentia, Avalon and NL but the income of women+ grew by higher rates than that of men+ between 2015 and 2020 (Statistics Canada, 2023a). In 2020, the Canadian wage gap was $7,200 (Statistics Canada 2023a). The wage gap in Avalon ($6,400) was lower than NL ($7,400) and Placentia ($7,800). The low-income rate was higher for women+ in Placentia (19%), Avalon (13.7%) and NL (16.3%) compared to men+. The same was true for Canada with 11.6% women+ having low income (Statistics Canada 2023a). In each of the three jurisdictions, single parents were about four times as likely to be women+ than men+. In Placentia, women+ aged 65 and older were most likely to experience low income in 2020.

Housing

The rate of homeownership in Placentia (81.5%), Avalon (73.3%), and NL (75.7%) was higher than Canada (66.5%) in 2021 (Statistics Canada, 2023a). Consequently, the rate of household renters was lower in Placentia compared to Avalon and NL. For each of the three jurisdictions, a high proportion of housing was considered suitable (98.2%-99.4%) and low percentages were considered unsuitable (0.06%-1.9%) or in need of major repairs (4.6%-7.4%). Between 2016 and 2021, the number of private dwellings in Placentia decreased by 25 and the number of private dwellings occupied by usual residents decreased by 16 (Statistics Canada 2023a). The reason is unknown though it may be attributable to changes in the classification of dwellings – meaning a private dwelling in one census might be classified as a collective dwelling (e.g., rooming or boarding house) in another census. Regions with a higher number of temporary residents may experience more fluctuations. The median value of dwellings in Placentia was lower than the Avalon and NL in 2021 (Statistics Canada, 2023a). Median value increase was limited between the last two censuses for Placentia (+0.08%) and Avalon (+0.31%) (Statistics Canada, 2018). For NL, housing prices increased by 26% between 2011 and 2016 and 9.48% between 2016 and 2021 (Statistics Canada 2018, 2012). In 2021, renters in Canada were approximately four times as likely (20%) as homeowners to be in core housing need (Statistics Canada, 2022a). In 2021, 8% of NL households were in core housing need compared to 10.1% in Canada. In 2021, the median monthly shelter costs for rented dwellings ($665) in Placentia had increased but remained lower than Avalon and NL (Statistics Canada, 2023a). The proportion of individuals spending 30% or more of their income on housing decreased between 2016 and 2021 in Placentia, Avalon and NL. The proportion of tenant households spending 30% or more of income on shelter was lowest in Placentia compared to the other jurisdictions though a higher percentage of tenant households in Placentia lived in subsidized housing.

Food Security

Data were not available to describe food insecurity in Placentia, but it generally increased in NL. The cost of the NL nutritious food basket (NLNFB) increased by 12% between 2021 to 2022 (NL Statistics Agency, 2021).

Health and Social Services

Access to health and social services: In NL, access to a regular health care provider and hip fracture surgery are on par with Canadian averages (Canadian Institute for Health Information, 2024). The Placentia Health Centre offers in-patient and out-patient services including three emergency care beds and diagnostic services (Eastern Health 2023a). Patients are referred to regional or provincial facilities in Carbonear or St. John’s for further care (Government of NL, 2023b). Placentia has a private ambulance service. Placentia has one Family Child Care Provider with six spaces (NL Education, 2023b). It is likely that childcare is provided on an informal basis.

Diversity, Equity, and Inclusion

Population diversity is low but increasing in NL. In 2021, about 30 people (0.9%) in Placentia self-identified as being part of a visible minority and originated from countries in Asia, Europe, the Americas, Africa and the Philippines (Statistics Canada, 2023a). Between 2020 and 2021, the number of race or ethnically motivated police-reported hate crimes in Canada increased by 6% (1,723 incidents), following an 83% increase in 2020 (Statistics Canada, 2023d). Black, indigenous and people of colour (BIPOC) were subjected to hate crimes by at least 50% more than other groups. Fewer than ten (10) hate crimes were reported in NL in 2020 (Justice Canada, 2023). The Anti-Racism Coalition of NL believes racist incidents have also increased in NL (CBC, 2022).

Water and Sewer

Infrastructure and services are provided by the Municipality of Placentia, provincial government agencies and industrial / commercial service providers. The municipality of Placentia manages water and sewer infrastructure and services. Three surface water supplies provide treated drinking water (NL Environment and Climate Change, Water Resources Management Division 2023). Waste water and storm water are collected in a sewerage system with multiple coastal outfalls, but Placentia does not have sewage treatment facilities (Town of Placentia 2023a).

Waste Management

The municipality of Placentia provides curbside collection of household solid waste, recycling and bulk garbage (Town of Placentia, 2023b). Eastern Waste operates a local waste recovery facility for residential drop-off of non-recyclable waste materials (ERSB 2023). Businesses are expected to deliver their own waste or use contracted services. Solid waste and recycling materials are delivered to the Robin Hood Bay Regional Waste Management Facility in St. John’s (Robin Hood Bay 2024).

Transportation

Ground, air and marine transportation are governed by provincial and federal authorities. Placentia is accessed via Route 100 from Trans-Canada Highway 1. The nearest airport is St. John’s International. The seasonal Marine Atlantic ferry service operates from mid-June to late September (Marine Atlantic, 2024). The ferry arrives at Argentia at approximately 9:30 AM Monday, Thursday and Saturday and departs 5:00 PM the same day. Placentia Bay is one of seven Canadian Coast Guard vessel traffic services zones in Atlantic Canada (CCG, 2022). The Coast Guard’s Marine Communications and Traffic Services (MCTS) monitors marine traffic in Placentia Bay from Argentia.

Utilities and Communications

Placentia receives electricity from the Clarke’s Pond Terminal Station, which is connected by a 69-kV transmission line to the Holyrood Thermal Generating Station (NLH 2022). Nearby Long Harbour is

served by the Voisey's Bay Nickel Terminal Station, which is connected to TL208, a 230-kV transmission line connected to the Muskrat Falls Generating Station via the Western Avalon Terminal Station (NLH 2022; NLH 2023). Major providers offer mobile and landline telephone services, Internet, wireless networking, cable or satellite television and home security in NL (Bell Aliant 2023; Rogers 2023a). Other providers supply mobile phone services. Cellular service is insufficient in parts of rural NL, which may create an issue for mobile customers as well as during emergencies. The Government of NL's 2023 Cellular Service Improvement Initiative aims to improve coverage especially for communities with no or limited cellular access (NLIET 2023). Meanwhile, alternative communication services (e.g., satellite phone, InReach) are available.

Prevention and Emergency Services

The Royal Canadian Mounted Police (RCMP) Placentia detachment with support from the Whitbourne detachment serves communities from Ship Harbour to Cape St. Mary's (RCMP 2024). An increase in reported incidents including violent crimes in Placentia has been attributed to drug activity and individuals with criminal backgrounds moving into the community (CBC, 2023b). NL experienced a nearly 20% increase in the crime severity index between 2021 and 2022 (Statistics Canada, 2022b). Approximately 88% of police-reported crimes in NL were attributed to the St. John's CMA (Statistics Canada 2023c), indicating the crime rate is generally much lower outside of the St. John's area. The municipality of Placentia provides fire prevention and response services (Town of Placentia 2024). A 2015 report rated Placentia Volunteer Fire Department as Acceptable for offensive interior fire suppression / rescue (i.e., firefighters have the training, equipment and resources to enter a structure and provide search and rescue operations and interior fire suppression (NL Fire and Emergency Services 2015). The Fire Department also rated Acceptable for defensive exterior (i.e., firefighters do not enter structures to supress fires or rescue individuals). Emergency health services are available at the Placentia Health Centre, Carbonear and St. John's (Province of NL 2023b).

Recreation

The municipality of Placentia provides playgrounds for small children with facilities and programs for various sports and activities including hockey, curling, skating, skateboarding, basketball, rowing, softball, soccer, tennis and walking (Town of Placentia 2024). The facilities are in the built-up areas of the Town. The Argentia Sunset RV park (seasonally operated by the POA) features 40 serviced and two un-serviced sites along with washrooms / showers and a picnic area in the Argentia Backlands area of the POA lands (Port of Argentia 2024, NL Tourism 2023). The Argentia Backlands Trail is 16 km of hiking trails (Port of Argentia 2024). Hike Placentia Inc. has proposed to link the Backlands Trail to a larger 22 km network for the Placentia area (Hike Placentia Inc. 2023). No national or provincial parks or proposed parks are in Placentia. Fitzgerald's Pond Provincial Park Reserve (on Route 100) has 24 privately operated camp sites (Campendium 2023).

3.1.6.2 Economy, Employment, and Business

The following sections provide a summary of key issues related to the Economy, Employment and Business VC as identified through the baseline study, issues identified by regulators, or concerns expressed by the public or stakeholders during engagement activities for the Project. More detailed information can be found in the socio-economic baseline report (Appendix G).

Economy

Newfoundland and Labrador's gross domestic product (GDP) was 40.72 billion in 2022 (NL Statistics Agency, 2023b). The largest four contributors to NL GDP were "Mining and Oil Extraction" (25%) followed by "Real Estate and Rental and Leasing" and "Health Care and Social Assistance" (both 10%) and "Public Administration" (9%). Together, these make up 54% of GDP. Placentia is a regional hub for government and commercial services including secondary and post-secondary educational institutions, health care facilities, seniors' care facilities and municipal / provincial / federal government offices. The POA, Vale NL's Long Harbour Processing Plant and the Cenovus West White Rose Expansion Project are important in terms of employment and procurement though the latter is a temporary construction project to be completed in 2025. In 2021, the largest economic sectors in Placentia were "Health Care and Social Assistance" (21.2%), "Retail Trade" (10.9%), "Construction" (10.9%), "Transportation and Warehousing" (7.3%) and "Education Services" (7.3%) (Statistics Canada, 2023a).

Employment

In 2020, the employment rate in Placentia was similar for men+ and women+ though the unemployment rate for men+ was 7% higher than for women+ (Statistics Canada 2023a). Men+ were more likely to be engaged in part-time, casual, short-term or seasonal work and women+ were more likely to be employed in full-time, year-round and permanent positions. This could be attributed to the higher tendency for men+ to participate in industries such as construction (short-term) and fishing (seasonal). The rate of self-employment is relatively low but remains three times higher for men+ than women+.

Labour Supply

In 2021, most employed residents of Placentia worked within the census subdivision (CSD) of residence (i.e., Placentia) compared to those in the Avalon or NL. Small proportions of workers in each jurisdiction commuted to a different census subdivision (CS) and census division (CD) within NL, to a different province or territory or worked outside of Canada. While most workers (around 80%) in Placentia, Avalon and NL had commute times of 30 minutes or less in 2021, a larger proportion of workers living in Placentia (12.3%) experienced commute times of 60 minutes or greater, which may indicate a tendency for some to accept longer commutes for employment. The proportion of men+ commuting more than an hour for work was twice as high in Placentia compared to NL, which may be linked to certain traditional work sectors for men+ (e.g., construction or industrial sites). Employment in the NL non-residential construction sector increased in 2022 over 2021 due to a post-pandemic commercial recovery, ongoing

institutional projects and the restart of construction at the West White Rose project (BuildForce Canada, 2023). Some capital investment eased in 2023, resulting in a more balanced situation for many trades and occupations. Weaker markets are anticipated in 2024 and 2025 for some trades, though those engaged in heavy-industrial activities could experience tight labour markets in 2025. Labour markets for all trades are expected to weaken by 2031. However, several proposed large-scale resource projects (e.g., hydrogen, mining) could be under development at that time. Due to the anticipated number of retirements, it is expected that competition for younger workers will be intense in NL (BuildForce Canada, 2023). Competition for labour in all sectors will continue to be strong in NL until at least 2027. From present to 2032, demand will be highest for construction trades in 2025 though only for certain trades (i.e., boilermakers, construction managers, construction millwrights and industrial mechanics, contractors and supervisors, crane operators, electricians, heavy equipment operators, heavy-duty equipment mechanics, insulators, plumbers, steamfitters, pipefitters and sprinkler system installers and truck drivers). The construction industry and other sectors will need to expand recruitment programs to attract workers. Recruitment of individuals from groups (e.g., women, Indigenous Peoples and immigrants) who have been traditionally under-represented in the construction sector will have a positive impact on labour supply.

Employment Equity and Diversity

The construction industry and other sectors will need to expand recruitment programs to attract workers. Recruitment of individuals from groups (e.g., women, Indigenous Peoples and immigrants) who have been traditionally under-represented in the construction sector will have a positive impact on labour supply. In 2022, approximately 1,780 women (about 10% of total workers) were employed in the NL construction industry, of which 60% worked directly on construction projects (BuildForce Canada, 2023). Women made up only 7% (1,070) of the 15,200 tradespeople employed in the construction industry. Women had higher participation in non-residential construction and were most often employed as electricians (22% of total women), trade helpers and labourers (19%), construction managers (7%), painters and decorators (6%) and heavy-duty equipment mechanics (5%). In 2021, Indigenous workers accounted for approximately 9% of the NL construction labour force (BuildForce Canada, 2023), which was the same as 2016 Indigenous employment in construction. Meanwhile, the general labour force increased its share of Indigenous workers between 2016 to 2021. In 2021, new Canadians accounted for approximately 8% of NL's workforce, which is below that of Canada (BuildForce Canada, 2023). In 2021, the proportion of immigrants (1.9%) in the NL construction labour force was less than one-quarter of the immigrant share in the general NL labour force. NL is anticipated to receive 37,700 new immigrants between 2023 and 2032, who will make up an increasing share of the NL working-age population.

Business

Businesses are in the Port of Argentia industrial park and in the commercial areas of the municipality. The Port of Argentia industrial park has about 40 businesses offering a variety of services (Port of Argentia 2023). Along with serving its tenants, the Port is focused on expansion and new developments in marshalling, renewable energy, aquaculture, offshore energy and critical minerals.

Culture and Tourism

Placentia has a variety of cultural interpretation sites and activities in the built-up areas of the municipality. Three key elements of Placentia's tourism infrastructure and services are on industrial park lands. These are the seasonal Marine Atlantic ferry terminal, the Argentia Sunset RV Park and the Argentia Backlands Trail. Fitzgerald's Pond Provincial Park Reserve is on Route 100). Twelve nationally, provincially and / or municipally recognized heritage sites, structures and events in Local Area 2: Placentia-St. Bride's Area. One, the Argentia 282 Coastal Defence Battery, is in the POA industrial park. Placentia has approximately 100 rooms available to tourists. About 50 rooms were identified in hotels, efficiency apartments and bed and breakfast guest homes (NL Tourism 2023; Town of Placentia 2021; Placentia Area Chamber of Commerce 2023; Castle Landing 2018; Rosedale Manor 2023). Approximately 20 short-term rentals with a total of more than 50 rooms were also identified (Airbnb 2023; Baycation 2023; Bay Chalets 2023).

Capacity and Growth

Though not all businesses are members of the Placentia Area Chamber of Commerce, the Chamber has 106 members (Placentia Area Chamber of Commerce 2023). Services offered include accommodations, cargo and storage, construction, electrical, food services, printing / signage, recruitment, safety, security, telecommunications, waste management) but the capacity of the businesses is unknown. Some businesses are present due to the facilities and major construction project at the POA. The seafood sector is supported by various core fishing harbours, aquaculture sites and processing facilities in Placentia Bay.

3.1.6.3 Project Occupations

Construction

The Project will employ approximately 1,097 full-time equivalent (FTE) positions (50 hr/week) for construction and on-site assembly work during peak construction activities. It is projected that 4,063,800 person-hours will be required over the course of the construction phase. In fostering the development of infrastructure associated with the Argentia Wind Facility and the Argentia Green Fuels Facility, a diverse range of employment opportunities become available. This workforce is expected to comprise

predominantly construction-related trades, reflecting the hands-on nature of the Project. Construction employment positions also encompass a proficient management team, an array of professionals and administrators, and technical occupations in applied sciences and engineering. The duration of employment for construction of the Argentia Green Fuels Facility and the Argentia Wind Facility is expected to be 29 months and 22 months, respectively.

Construction workers and tradespeople would fall under code 7, trades, transport and equipment operators and related occupations, according to the National Occupation Classification (NOC; Statistics Canada, n.d.). Office and administrative roles are designated under code 1 in the NOC, specifically falling within the broad category of business, finance and administration occupations. Project management positions are categorized under code 0 as per the NOC, specifically falling within the domain of legislative and senior management occupations. Project and Field Engineers, Quality Control Managers and Coordinators, Safety Coordinators, and Environmental Coordinators are classified under code 2 in the NOC, explicitly natural and applied sciences and related occupations.

Tables 3.1.6.-1 and 3.1.6-2 provide an overview of the construction phase employment. The breakdown of occupations and duration of employment are derived from an existing Project schedule. While subject to modification, this estimate displays the magnitude and timing of the workforce needed for Project Construction. As the Project advances and becomes more refined in its design and planning, updates to these estimates will be developed and available. The workforce requirements, the estimated number of workers required by NOC code, and the employment targets by occupational group are outlined in the Workforce and Employment Plan (Appendix Q).

Table 3.1.6-1 Construction Phase Labour Forecast for the Argentia Green Fuels Facility.

NOC Code	Category	Description	Peak Construction FTEs
0	Legislative and senior management occupations	Project Manager	1
1	Business, finance and administration occupations	Human Resources Manager	1
		Recruiters	4
		Contract Administrator	2
		Financial Manager	1
		Purchasers	4
2	Natural and applied sciences and related occupations	Project Engineers	4
		Field Engineers	14
		Quality Control Manager	2
		Quality Control Coordinators	5
		Safety Manager	1
		Safety Coordinators	8
		Environmental Coordinators	4
7		Construction Manager	1

	Trades, transport and equipment operators and related occupations	Superintendent	14
		Foreman	69
		Tradespeople	682

Table 3.1.6-2 Construction Phase Labour Forecast for the Argentia Wind Facility.

NOC Code	Category	Description	Peak Construction FTEs
0	Legislative and senior management occupations	Project Manager	1
1	Business, finance and administration occupations	Human Resources Manager	1
		Recruiters	2
		Financial Manager	1
		Purchaser	1
2	Natural and applied sciences and related occupations	Project Engineers	2
		Field Engineers	5
		Quality Control Manager	1
		Quality Control Coordinator	1
		Safety Coordinators	3
		Environmental Coordinator	1
7	Trades, transport and equipment operators and related occupations	Construction Manager	1
		Superintendent	5
		Foreman	21
		Tradespeople	234

Operation

The Project will employ an estimated 51 full-time positions for Operation and Maintenance of the Argentia Green Fuels Facility and 14 full-time positions for Operation and Maintenance of the Argentia Wind Facility. Table 3.1.6-3 provides a summary of the Project operations phase employment.

Green Fuels Facility Maintenance Technicians, Green Fuels Facility Managers, and Wind Turbine Technicians are categorized as NOC code 7, trades, transport and equipment operators and related occupations Green Fuels Facility Operators, and Wind Site Managers are designated as NOC code 9, occupations in manufacturing and utilities. Green Fuels Facility Engineers are classified as NOC code 2, natural and applied sciences and related occupations.

Table 3.1.6-3 Operations Phase Labour Forecast.

NOC Code	Category	Description	Operation
1	Business, finance and administration occupations	Administration	5
2	Natural and applied sciences and related occupations	Green Fuels Facility Engineer	2
7	Trades, transport and equipment operators and related occupations	Green Fuels Facility Maintenance Technicians	15
		Green Fuels Facility Manager	2
		Wind Turbine Technicians	10
9	Occupations in manufacturing and utilities	Green Fuels Facility Operators	30
		Wind Site Manager	1

3.2 Baseline Studies

Table 3.2-1 provides a summary of baseline studies conducted for the Project to generate information and data required to support the evaluation of environmental effects, to develop mitigation measures, or to provide baseline for follow up monitoring programs. In many cases, a study addressed more than one of these purposes. Summaries of each original baseline study are provided in the following subsections, as well as a brief description of plans for further and ongoing studies.

Table 3.2-1 Index of Baseline Studies Completed for the Argentia Renewables Project.

Valued Component	Key Indicator	Desktop Research Completed (Y/N)	Desktop Modelling Completed (Y/N)	Original Baseline Study Conducted (Y/N)	Corresponding Appendix (Letter – Title)
Atmospheric Environment	Regional Climate	Y	N	N	N/A
	Greenhouse Gas (GHG) Emissions	Y	Y	N	H - Energy and Emissions Study
	Air Quality	Y	Y	Y	A - Atmospheric Environment Baseline Study, H - Energy and Emissions Study
	Light	Y	Y	N	I – Light Impact Assessment
	Sound Quality (Noise)	Y	Y	Y	J – Noise Impact Study
	Vibration	Y	N	N	NA
Aquatic Environment	Surface Water Resources	Y	Y	Y	C1 -Source Water Hydrology

alued Component	Key Indicator	Desktop Research Completed (Y/N)	Desktop Modelling Completed (Y/N)	Original Baseline Study Conducted (Y/N)	Corresponding Appendix (Letter – Title)
Aquatic Environment	Freshwater Environment	Y	Y	Y	B1 - Aquatic Environment Component Study
	Marine Environment	Y	Y	Y	B2 - Ocean Dispersion Model Report
	Fisheries and Aquaculture	Y	N	N	B1 - Aquatic Environment Component Study
	Species at Risk	Y	N	N	N/A
	Habitats of Conservation Concern	Y	N	N	N/A
	Marine Biosecurity	Y	N	N	N/A
Terrestrial Environment	Wetlands	Y	Y	Y	D3 - Ecological Land Classification Component Study
	Vegetation and Rare Flora	Y	Y	Y	D6 - Rare Plants Component Study, D5 - Rare Lichens Component Study
	Avifauna	Y	Y	Y	D1 - Avifauna Component Study
	Bats	Y	Y	Y	D2 - Bat Component Study
	Mammals	Y	N	Y	D4 - Mammals Component Study
	Species at Risk	Y	Y	Y	Terrestrial Environment Baseline Studies D 1-2, 5-6
	Areas of Conservation Concern	Y	N	N	N/A
	Soils and Terrain	Y	N	N	N/A
Land and Resource Use	Zoning	Y	N	N	N/A
	Commercial and Industrial Resource Use	Y	N	N	N/A
	Recreational and Subsistence Resource Use	Y	N	N	N/A
	Protected, Special and Sensitive Areas	Y	N	N	N/A
	Indigenous Land Use	Y	N	N	N/A
Heritage and Cultural Resources	Historic and Archaeological Resources	Y	Y	N	F - Historic Resources Overview
	Paleontological Resources	Y	N	N	

Valued Component	Key Indicator	Desktop Research Completed (Y/N)	Desktop Modelling Completed (Y/N)	Original Baseline Study Conducted (Y/N)	Corresponding Appendix (Letter – Title)
Heritage and Cultural Resources	Architectural Resources	Y	N	N	F - Historic Resources Overview
Socio-Economic Environment	Population Demographics	Y	N	N	G - Socioeconomic Baseline
	Community Health and Wellbeing	Y	N	N	
	Infrastructure and Services	Y	N	N	
	Economy	Y	N	N	
	Employment	Y	N	N	
	Business	Y	N	N	
Human Health and Quality of Life	Shadow Flicker	Y	Y	N	K – Shadow Flicker Impact Assessment
	Ice Throw	Y	Y	N	L – Ice Throw Analysis

3.2.1 Atmospheric Environment Baseline Studies

The potential effects of climate change for NL were projected using available observations and regional climate models (Finnis, 2013; Finnis & Daraio, 2018), these are included in Section 3.1.1.

A GHG inventory was developed for the Construction and Operation and Maintenance phases of the Project. The GHG inventory calculated the emissions produced from direct and indirect sources including, but not limited to, stationary combustion, mobile equipment, blasting, electricity consumption, and marine transport. Annual Operation and Maintenance phase emission estimates were compared to the threshold of 15,000 tonnes of CO_2e set out in the **Newfoundland and Labrador Management of Greenhouse Gas Act** (MGGA) to determine whether the Act and associated regulations are applicable to the Project. An air release inventory for the Construction and Operation and Maintenance phases of the Project was also developed. The air release inventory includes all releases generated by combustion and non-combustion processes including, but not limited to, stationary combustion, mobile equipment, blasting, wind erosion of exposed surfaces, material handling, flare stacks, and marine transport. Air releases were computed in terms of annual emissions for the Construction and Operation and Maintenance phases, and as emission rates for the Operation and Maintenance phase of the Project. Emission rates were used in an air dispersion modeling exercise via the latest CALPUFF dispersion modeling system (version 7.2.1) as per the Guideline for Plume Dispersion Modelling issued by NL DECC. Modeling was performed to predict maximum ground level concentrations of air contaminants of potential concern during operation of the Argentia Green Fuels Facility; steady air releases are not anticipated during operation of the Argentia Wind Facility. Concentrations, modeled as maximum hourly, maximum daily and annual average emissions, were predicted in relation to ambient air quality in the LAA and RAA during normal operation of the Project. Modelled concentrations of air contaminants of potential concern

were compared to the Newfoundland and Labrador Air Quality Standards (NL AQS) per the **Air Pollution Control Regulations, 2022**, and the Canadian Ambient Air Quality Standards (CAAQS), as developed by the Canadian Council of Ministers of the Environment (CCME). Further details regarding methods and results of the modelling are provided in Appendix H (Energy and Emissions Study).

In the absence of an Ambient Air Quality Monitoring (AAQM) station in the Study Area, a baseline ambient air quality survey was conducted in the summer of 2023 to characterize background concentrations of air contaminants of potential concern of the Project. Such air contaminants included $PM_{2.5}$, total suspended particulate (TSP), metals, ammonia (NH_3), NO_2 and SO_2. Sampling was conducted at two locations: one in a residential area on Power Street in Dunville and another within the Project Area and between the POA and a seasonal camping area (Sunset RV Park). The baseline ambient air quality survey methods and results are summarized in Section 3.1.1, and details regarding the study appear in Appendix A (Atmospheric Environment Baseline Study).

Regional levels of ambient light were assessed using modelling data and satellite observations of artificial light (Falchi *et al*., 2016a, 2016b). GHD completed an effects assessment of light based on the arrays associated with similar projects. After determining luminous flux estimates for each light source, the effects of the incident light at the identified sensitive receptors were determined. Baseline studies of ambient light were not necessary due to the siting of Project infrastructure and the industrial (Argentia Peninsula) and rural (Argentia Backlands) nature of the area. Further information is provided in Section 3.1.1 and Appendix I (Light Impact Assessment – GHD).

Ambient noise levels in the Project Area are considered to range between quiet rural to urban residential (Health Canada, 2017). A baseline noise assessment was conducted in July 2023 and December 2023 to support this classification, whereby ambient noise levels and presence of Low Frequency Noise (LFN) were measured at four monitoring locations: one at the closest sensitive receptor for Project infrastructure noise in Dunville, NL, and three proximate to other potential receptors in the surrounding communities of Freshwater, Ferndale and Fox Harbour, NL. A 3-D acoustical model was used to evaluate the potential noise levels on receptors during Construction and Operation and Maintenance. The model utilized a conservative “worst-case scenario” approach in which the noise model input was based on specifications of the largest model of wind turbine and the maximum number of wind turbines being considered for the Project, along with maximum anticipated noise outputs from the Argentia Green Fuels Facility. The baseline noise assessment methods and results are summarized in Section 3.1.1, and details regarding the study appear in Appendix J (Noise Component Study).

Baseline levels of vibration were not measured due to the siting of Project infrastructure and anticipated low levels of ambient vibration in the Project Area; vibrations occur intermittently based on ongoing construction and industrial activities in the region.

3.2.2 Aquatic Environment Baseline Studies

A desktop surface water resources study was conducted and supplemented with baseline field studies in 2023. Baseline water quality sampling of the potential source water in the PPWSA for the Argentia Green Fuels Facility was conducted May 23-24 and October 19, 2023. Details of field methods and water quality results are provided in Appendix B1 (Aquatic Environment Baseline Study).

Hydrologic conditions for the RAA were evaluated based on analyses of publicly available streamflow monitoring data (Water Survey of Canada) to determine monthly unit runoff rates and regional streamflow patterns. A Source Water Hydrology Report (Appendix C1) was conducted to evaluate the potential to supply the Project from watersheds and ponds that comprise the Town of Placentia PPWSA. A two-system water balance model was devised to assess the monthly water balance of system reservoirs (Clarke's Pond, Larkins Pond, Barrows Pond, and Gull Pond) and watersheds. The water balance incorporated both the existing water withdrawal and the projected Project water withdrawal rates. These analyses examined the water balance in the studied watersheds on both annual as well as an ongoing (continuous) temporal interval. The analyses used long term historical data (1950 to 2013) and incorporated projected climate change influence (from 2014 to 2095). The full report is provided in Appendix C1 (Source Water Hydrology Report).

The review of groundwater resources in the RAA comprised a desktop exercise only. Groundwater has little influence on the overall water balance in the region, and the direct Project interactions with groundwater will be minimal.

Potential freshwater stream crossings associated with proposed access roads, wind turbines, and transmission line within the Project Area were first identified via desktop analysis followed by assessment in the field. Aquatic habitat characterization and fish population assessments of stream crossings were conducted between August 24 and September 20, 2023. Aquatic habitat characterization and fish population assessment of Larkin's Pond outlet was performed on October 24, 2023. No amphibians were captured or observed during the 2023 baseline study when conducting fish surveys or habitat assessments. Further details regarding the aquatic baseline studies are provided in Appendix B1 (Aquatic Environment Baseline Study).

Desktop review of marine environment encompassed marine geology, geomorphology, physical oceanography, marine navigation, marine fish and fish habitat, marine mammals, marine reptiles, and shellfish of the LAA and RAA. This data was supplemented with baseline studies between August 26 to December 10, 2023, in Argentia Harbour. The marine baseline field studies included measurement of water column conductivity/temperature/depth (CTD) and temperature profiling, water quality sampling, sediment sampling, and zooplankton, phytoplankton, and benthic communities sampling. Further details regarding the aquatic baseline studies are provided in Appendix B1 (Aquatic Environment Baseline Study).

Dispersion modelling of the proposed Argentia Green Fuels Facility outfall was conducted in 2024 and further described in Appendix B2 (Effluent Dispersion Model Report).

Information on freshwater and marine fisheries (commercial, recreational, aquaculture, and Indigenous) was collected through a desktop review that included commercial harvest data by species supplied by DFO for 2018-2022. Additionally, at the suggestion of Fish Food and Allied Workers Union (FFAW), and with their cooperation, an online survey was conducted to gather feedback from local fish harvesters on harvest activities in and near the Project Area. The survey was distributed in February 2024 to FFAW members in the Placentia Bay area but received limited response. The survey responses are included in Appendix U4.

Desktop review of freshwater and marine Species at Risk (SAR) comprised a review of AC CDC data, examination of species range maps, and review of available DFO data. Field crews recorded all incidental observations and other evidence of SAR while conducting baseline studies in 2023. SAR observed during the 2023 field studies were limited to a single visual observation of American eel (*Anguilla rostrata*).

Habitats of conservation concern were examined via desktop review and during baseline habitat surveys. No critical habitats (as defined by SARA or NL ESA) for aquatic species were identified in the RAA. No discrete spawning habitats were documented during the baseline survey in 2023. Detailed results are provided in Appendix B1 (Aquatic Environment Baseline Study).

Marine biosecurity and known occurrence of aquatic invasive species were examined via desktop review of information for Placentia Bay.

3.2.3 Terrestrial Environment Baseline Studies

Detailed Ecological Land Classification (ELC) mapping was completed for the Project Area, utilizing results from a comprehensive field verification program conducted from September 26 to December 8, 2022, followed by several minor adjustments for lichen habitat based on surveys conducted in 2023. The ELC was used in planning and as a resource for several surveys of the other VCs included in this Registration. For example, it provided a model for delineating the extent of wetlands at a higher resolution than standard 1:50 k topographic maps. As well, specialized ecotypes shown on the ELC were targeted during the SAR and rare plant surveys. Details and ELC maps are provided in Appendix D3 (Ecological Land Classification Component Study).

A desktop rare flora study was conducted to compile historical records of rare plants. The collected information, supplemented by ELC mapping was used in the design of baseline field studies to catalogue rare species in the Project Area. The rare plant survey was conducted in early September 2023 and covered all the high-potential areas as described in Appendix D6 (Rare Plants Component Study). In addition to rare plants, rare lichens are known to be present in the Avalon region. Preliminary surveys for

lichens were conducted concurrently with other field studies such as the ELC ground-truthing, bird surveys, and mammal surveys. Targeted surveys were conducted intermittently for lichen SAR beginning on September 26, 2022, and finished on March 21, 2023. Details regarding lichen survey methods and results are provided in Appendix D5 (Rare Lichens Baseline Study).

Desktop avifauna studies included a review of AC CDC data, eBird and the NL birds lists as well as species range maps. These data informed the program of baseline field studies that were carried out in appropriate habitats as indicated by the ELC. These surveys served to establish current use patterns. Comprehensive field studies were conducted on avifauna year-round beginning in 2022 (September 26, October 11, December 1, and December 8, 2022) and extending to spring 2024 using a combination of study methods designed to maximize the number of detections spatially and temporally. Point counts were primarily employed during the breeding season and transect surveys during the rest of the year, supplemented with two autonomous recording units (ARUs) (i.e., 'Songmeters') that operated year-round from April 22 to October 18, 2023. Observations were recorded weekly during spring migration from May 7 to May 25, 2023, biweekly during fall migration from Sept 26 to January 3, weekly during the breeding season from June 7 to June 27, 2023, and biweekly during the overwintering period for resident birds from January 15 to April 11, 2024. To detect raptor species, a series of ground-based sky-scans were conducted. Additionally, a RPAS flight in July 2023 collected high-resolution imagery that could detect raptor species as well as nests of large raptors. Detailed avifauna survey methods and results can be found in Appendix D1 (Avifauna Component Study). Mitigation measures applicable to interactions with the Project are discussed in Appendix R (Species at Risk Impacts and Mitigation) and Appendix S (Post-construction Monitoring Plan). Additional avifauna surveys will be conducted through the winter season of 2025 and additional SAR observations will be recorded.

Targeted studies for avifauna SAR were conducted in addition to, or concurrent with, the above-described year-round avifauna studies. Species targeted included:

- Short-eared Owl (*Asio flammeus*) within the wetland and meadow habitat types. None have been observed to date; a follow-up survey was conducted in July 2024 based on consultation with Wildlife Division (WD).
- Red Crossbill *percna* (*Loxia curvirostra percna*) within the mature coniferous habitat ecotype. Multiple observations have been recorded to date.
- Gray-cheeked Thrush (*Catharus minimus)* within coniferous scrub and regenerating coniferous forest habitat ecotypes. Three observations isolated to the breeding season have been recorded to date.
- Harlequin Duck (*Histrionicus histrionicus*) within the marine coastline habitat ecotype. None have been observed to date.

- Rusty Blackbird (*Euphagus carolinus*) within the wetland habitat ecotype. None have been observed to date.
- Olive-sided Flycatcher (*Contopus cooperi*) within the mature coniferous forest, regenerating coniferous forest, and mixedwood forest habitat ecotypes. None have been observed to date.

Baseline surveys were conducted for all bat species since the fall of 2022, with Anabat Swift detectors sited within the Project Area, adjacent to waterbodies/wetlands deemed to be suitable foraging habitat. Detectors were deployed initially in three locations from September to October 3, 2022. In 2023, detectors were deployed in three locations starting on April 18, with another two locations added on June 27. All five detectors were retrieved on November 16, 2023. Monitoring is ongoing in 2024 with the deployment of eight detectors, beginning in mid-April and with a temporal window extending to November. Detailed bat survey methods and results can be found in Appendix D2 (Bat Component Study). Bat SAR detected to date include Northern myotis (*Myotis septentrionalis*), little brown myotis (*Myotis lucifugus*), and hoary bat (*Lasiurus cinereus*).

Survey teams opportunistically recorded evidence of mammals including tracks, scat, browsing, and auditory detections while in the field throughout 2022-2024. Although there were no dedicated field surveys, provision was made for incidental observations and results were included in the appended report in Appendix D4 (Mammals Component Study). Opportunistic observations of arthropods were also recorded. Two observations of the SAR yellow-banded bumble bee (*Bombus terricola*) occurred concurrently with summer avian surveys.

3.2.4 Land and Resource Use Baseline Studies

A secondary source study was conducted to compile the existing land and resource uses within the Project Area, LAA, and RAA as presented in Section 2.1. This information was supplemented by comments received via engagement with stakeholders, Indigenous Peoples, and the public in various forms as detailed in Chapter 8.

3.2.5 Heritage and Cultural Resources Baseline Studies

A desktop review of archaeological sites registered for Placentia Bay was conducted, and a desktop terrain model was constructed to infer as to whether any structures or features of potential archaeological value may be found. Methods and results of the desktop review and modelling are summarized in Section 3.1.5, and details appear in Appendix F (Historic Resources Overview Assessment).

Slight modifications were made to the Study Areas as presented in Section 2.1 for this VC. A desktop review of Precontact and Historic Period archaeological sites registered for Placentia Bay was conducted, comprising the Regional Assessment Area (RAA) for Heritage and Cultural Resources assessment. The LAA selected for Heritage and Cultural Resources comprised a circular area measuring 50 km in diameter

centered on a point near the Town of Placentia. The Project Area as presented in Section 2.1.1 was divided into three principal sectors based on the potential for direct interaction with Project activities and infrastructure. The three sectors of the Heritage and Cultural Resources Project Area are the Argentia Peninsula, the Argentia Backlands, and a 500 m wide linear corridor (i.e., 250 m on either side of a centreline) along the Project Interconnect Line. No part of the marine environment of Placentia Bay, either within Argentia Harbour or Placentia Sound, was included as part of the Heritage and Cultural Resources Project Area.

3.2.6 Socio-Economic Baseline Studies

A desktop study was conducted by GHD to examine the baseline socio-economic environment within the Project Area, LAA, and RAA. Methods and results of the desktop study are summarized in Section 3.1.6, and details appear in Appendix G (Socio-Economic Baseline Study - GHD).

Study areas for this VC were selected based on available data and known concerns regarding the Project and the potential for effects on the communities, the region, and the province. The Project Area considered in the socio-economic effects assessment is presented in Section 2.1.1.1. However, the LAA identified in Section 2.1.1.2 is not significantly different from the Project Area from a socio-economic assessment perspective. Therefore, the Socio-Economic LAA uses data and information which are available from Statistics Canada (Census of Canadian Population) and NL Statistics Agency (Community Accounts) for the Town of Placentia, which includes the Port of Argentia and the communities of Freshwater, Dunville, Southeast Placentia and Jerseyside – amalgamated with Placentia in 1991 (Town of Placentia 2024). Where data are not available for Placentia, NL Statistics Agency data may be substituted using Local Area 2: Placentia-St. Bride's Area, which includes Placentia along with Fox Harbour and Ship Harbour to the north and the communities of Point Verde, Big Barasway, Ship Cove, Patrick's Cove-Angels Cove, Cuslett, St. Bride's, Point Lance and Branch to the south. The Socio-Economic LAA corresponds with the RAA presented in Section 2.1.1.3.

Therefore, the Socio-Economic RAA includes census data for the Avalon Peninsula Economic Region or Census Division (CD) No. 1, Avalon, both of which include the Avalon Peninsula and the Isthmus. Data may also be obtained from NL Statistics Agency for Economic Zones: 17, 18, 19, 20, which encompass the Avalon Peninsula, but not the Isthmus. Where data are not available, the census also supplies data for Eastern Health, which encompasses a larger area including the Avalon Peninsula, Bonavista Peninsula and Burin Peninsula. Avalon is the area anticipated to supply labour for this Project during construction. For selected aspects of the socio-economic environment, such as economic benefits, provincial royalties / taxes, and effects on gross domestic product, the Socio-Economic RAA is the province of NL.

3.2.7 Human Health and Quality of Life Baseline Studies

Studies of various aspects of the Project that may interact with the Human Health and Quality of Life VC are discussed above in Atmospheric Environment (air quality, light, sound quality (noise), vibration), Land and Resource Use (domestic wood harvesting, viewscapes, and traditional, cultural, recreational, and Indigenous activities), Aquatic Environment (groundwater and surface water, fish and fish habitat), and Terrestrial Environment (animals, birds or plants and their habitats). For brevity these are not repeated here.

An analysis to determine the extent and duration of shadow flicker caused by moving shadows cast by wind turbines was conducted by APG. The model utilized a conservative “worst-case scenario” approach in which the model inputs were based on specifications of the largest model of wind turbine and the maximum number of wind turbines being considered for the Project. A digital elevation model (DEM) derived from the Aerial Lidar database was used as the terrain model for the analysis. Further details regarding the modelling study are provided in Appendix K (Shadow Flicker Impact Assessment – APG).

An analysis to determine the risk of ice fall or throw for wind turbine operations in cold weather was conducted by GHD. The model utilized a conservative “worst-case scenario” approach in which the specifications of the largest model of wind turbine and the maximum number of wind turbines being considered for the Project were input to the model. Climate data for the model was sourced from the Argentia meteorological station, and blade heating technology was not considered in the model. Further details regarding the modelling study are provided in Appendix L (Ice Throw Analysis – GHD).

3.2.8 Data Gaps

There are no information gaps that could impair the ability to make effects predictions for the Argentia Renewables proposed Project. Where Project description details are not yet available (or alternatives are still under consideration), mitigation measures (e.g., bat curtailment protocol, avoidance and minimization of impacts to boreal felt lichen) have been applied coupled with conservative assumptions have been made that would overstate any potential negative environmental effects. As Project planning proceeds, there will be a continuing process of identification and refinement of both mitigation and monitoring measures for all Project phases.

Land disturbance during Project construction will result in land use changes, thereby resulting in changes to and losses of carbon sinks in the Project Area. Carbon sink effects were not quantified for the Project as the study is not stipulated in the Guidance Document, nor is it provincially/federally required from a GHG accounting perspective. It is listed as a requirement per the Strategic Assessment of Climate Change (SACC) in the Draft Technical Guide Related to the Strategic Assessment of Climate Change (August 2021; https://www.strategicassessmentclimatechange.ca/), however the SACC is only applicable to federal assessments.

No field studies have been completed regarding local groundwater, and there is a notable absence of publicly available data sources on groundwater characteristics in this region, which limits detailed analysis. Groundwater in the region likely plays a minor role in the overall water balance, primarily due to the low to moderate yield of the volcanic bedrock and the shallow nature of the groundwater system. This limited role of groundwater suggests that its exclusion from detailed field studies does not affect the ability to make effects predictions.

The road layout in the Argentia Backlands will be adjusted as design specifics are developed (e.g., Wind generation sites). The field work component of the freshwater aquatic assessment, including the consideration of required new stream crossings was based on the routing as defined at that time. Thus, some locations will require site specific assessment (P1-P6). However, the collected information on streams and waterbodies provides a good representation of general regional characterization of the aquatic habitat in the Project Area. Argentia Renewables will carry out site – specific aquatic surveys for crossings P1-P6 as well as others as required prior to construction.

The quantity of data collected on avifauna and bats has been adequate for the purposes of describing the existing environment and to support effects assessments. However, a full two-year cycle of observation data collection has not been completed. Hence, surveys are ongoing and will continue through 2024. Bat monitoring is ongoing in 2024 with the deployment of eight detectors, beginning in mid-April and with a temporal window extending to November, and with two on meteorological towers to survey the airspace of the swept area of the turbines. Avifauna surveys will include point counts, acoustic monitoring, short-eared owl, and raptor surveys. All results will be shared with regulators and resource managers, and the information incorporated into ongoing plans for mitigation and monitoring.

Rare plants and lichens will continue to be surveyed in 2024. The rare plant survey was conducted late in the growing season (September 2023) and prior to the definition of a corridor for the Project Interconnect Line. Additional surveys will be conducted in 2024, including for rare plants along the Project Interconnect Line, further delineation of the yellow birch stands and the distribution of blue felt lichen prior to any construction activities if they will possibly interact with Project infrastructure. Further explanation of the how the Project will interact with rare plants and lichens including proposed mitigations are discussed in the SAR IMMP (Appendix R).

A muskrat survey will be conducted in fall 2024 as per discussions with NL WD regarding a suspected decline of this species in the region. A dedicated, yellow-banded bumblebee survey will be conducted in August 2024, as a supplement to the limited information collected in 2023.

3.3 Predicted Future Condition of the Environment Without the Undertaking

This section describes the predicted future condition of the environment over the expected lifespan of the Project if it were not to proceed. This analysis aids in distinguishing between environmental changes attributable to the Project and those arising from natural processes. It should be noted that it is reasonably likely that in the foreseeable future a wind generation and green hydrogen and ammonia facility would be developed in the area of the Project if the Project itself does not proceed, but for the purposes of this analysis, this possibility is disregarded. This analysis also assumes that the Project Area is not utilized for a different purpose not already being undertaken that could have a future impact on the environment.

As noted in Section 6.0 (Cumulative Effects), there are several ongoing activities and undertakings that can reasonably be assumed to continue in the area and interact with the natural and human environment. These include:

- Commercial traffic to and from Argentia Port, including marine shipping and road traffic associated with Port activity.
- Marine Atlantic ferry seasonal passenger traffic.
- Cenovus White Rose Extension Project.
- Dandy Dan's Fish Market Ltd. Seafood Processing Plant.
- Argentia Gold Corporation Cannabis Production Facility.
- Government services and infrastructure, including federal, provincial and municipal (Town of Placentia) activities. These include water and sewer supply/maintenance, roadway upkeep, building construction and facilities maintenance.
- Local tourism industry, including sites operated and maintained by Government (e.g., Castle Hill National Historic Site, Argentia Visitor Information Centre), and private tourism accommodations (such as AirBnB).
- Inshore and nearshore fisheries in the Argentia Harbour.
- Vale Nickel Processing Plant in Long Harbour.

The following discussion considers the continued effects of ongoing interactions along with natural environmental processes.

Atmospheric Environment

If Project development does not proceed, air contaminant concentrations in the LAA would be similar to the established baseline concentrations discussed in Section 3.1.1. The current air quality in the LAA is

characterized by low background levels, and any increases would likely be attributed to the introduction of other developments that generate substantial emissions.

Government initiatives, guided by specified targets, aim to mitigate the effects of climate change. If the Project does not move forward, it is expected that the current trajectory of decreasing GHG emissions at both federal and provincial levels of government would persist. This downward trend is primarily attributed to ongoing initiatives and strategies implemented by governments to meet their specified reduction targets. The proposed Project is expected to contribute to the global reduction of carbon emissions by replacing fossil fuel consumption with renewable energy sources. Specifically, the Project utilizes wind energy to produce green hydrogen and ammonia. The continuation of fossil fuel usage could persist in the absence of the Project, resulting in a missed opportunity to reduce global GHG emissions.

If the Project area remains in its current state, it is anticipated that the future condition of the acoustic environment will closely resemble the conditions documented in Section 3.1.1.

Climate change phenomena (e.g., storm surge, sea level rise, and altered precipitation patterns) are expected to continue in the absence of the Project. While the Project is intended to be a contributor to global efforts of carbon reduction, the effect of the loss of the Project on local climate change parameters will be negligible, albeit negative, given the scale of anticipated change.

Aquatic Environment

In the absence of the Project, the local environment is likely to remain in its current state. The future condition of the freshwater aquatic environment – groundwater and surface water resources, and fish and fish habitat – is expected to closely resemble the existing environment discussed in Section 3.1.2.

The primary sources of demand for the Municipal Water System are from residents, local businesses, and commercial users in the Town of Placentia, including the POA. This source is also proposed to supply potable water to the Argentia Green Fuels Facility. If the Project does not proceed, the result would be slightly reduced growth in demand on the Municipal Water System.

In the absence of the development of Project infrastructure (linear facilities, wind turbine foundations) in the Argentia Backlands, the natural flow of surface runoff, hydrology, and water quality would remain relatively unchanged. There would be no disturbance to aquatic habitat and species.

If the Project does not proceed, the anticipated future state of the marine environment would remain largely consistent with the description of the existing environment outlined in Section 3.1.2. In the absence of the Project, the negligible to low potential effect on the marine environment from discharge of treated water generated during hydrogen and ammonia production would not materialize.

The existing ongoing undertakings and activities interact with marine habitat and biota, namely via discharges to the marine environment. There is a pattern of outfalls associated with the existing municipal and POA water and sewer systems. Some outfalls are relatively short term (e.g., the Cenovus White Rose Extension Project) and will cease once the Construction Phase is complete; however, it is the nature of the POA operation that other users/tenants will be identified as business opportunities wishing to utilize the Port facilities. In the absence of the Project, water quality conditions in the marine environment near the Project area will continue to experience low potential negative effects.

The area currently has a modest level of vessel activity associated with commercial and recreational fisheries, Marine Atlantic ferry traffic, and POA marine traffic. The predicted increase in marine vessel movements will be slightly moderated in the absence of the Project. Effects associated with vessel traffic, including local, Canadian, and international vessel movements will experience little change in the absence of Project related traffic. The Project is not anticipated to have any effect on marine resource harvesting, so there will be no change in the potential effects on local fish populations in the absence of the Project. The continuation of the Cenovus White Rose Extension Project will involve channel dredging and other interactions with the nearshore marine environment; however, the associated potential effects from this Project have been subjected to thorough environmental assessment and appropriate mitigation and monitoring programs developed to address potential negative effects on the marine environment.

Effects resulting from the planned Marine Terminal Expansion Project at the POA are considered in Section 6.0 (Cumulative Effects).

Terrestrial Environment

If Project development does not proceed, the predicted future state of the terrestrial environment (avifauna and bats, wildlife and wildlife habitat, wetlands and vegetation) would remain mostly unchanged from what was described in the existing environment portion of this assessment in Section 3.1.3.

Project activities associated with wind energy development have the potential to adversely affect avifauna and bat species through habitat alteration or loss, injury and mortality, and disruption to movement. Habitat alteration or loss resulting from site preparation and the Construction Phase will reduce habitat quality and quantity in the Argentia Backlands. Habitat use will be reduced because of vegetation clearing and edge effects. In the absence of the Project, these losses in quantity and reductions in quality of habitat will not occur. The risk of injury and mortality to birds and bats increases due to collisions with wind turbine blades and other Project infrastructure (transmission infrastructure, meteorological towers, and overhead collector lines). In the absence of the Project this threat to bird and bat populations is eliminated. It is unlikely that other, ongoing activities and Projects (such as hiking trail development) would pose a similar level of risk to bats, birds or their habitat. Disruption to movement is another concern as the presence of wind turbines can impede the regular migratory pathways or daily movements of birds. If the Project does not proceed and the Argentia Backlands are maintained in an undeveloped state, the

potential negative effects previously mentioned would be avoided and the existing ecological balance, habitat structure, and biodiversity of birds and bats would remain intact.

The execution of Project activities related to the Argentia Wind Facility may have negative effects on wildlife through changes in behaviour and sensory disturbances. Disturbances arising from Project activities encompass heightened levels of noise, increased artificial light, elevated dust levels, and the intensified human presence in the Project Area. Heightened levels of noise can disrupt the auditory environment for wildlife, affecting communication, navigation, and breeding behaviours. Increased artificial light may interfere with nocturnal species, potentially disrupting feeding and mating patterns. The intensified human presence can lead to changes in wildlife behaviour, including stress and avoidance responses. If the Project does not proceed and the Argentia Backlands are maintained in an undeveloped state, the aforementioned negative effects would be avoided. If the Project does not move forward, it is expected that safeguards for species listed under SARA Schedule 1 or NL ESA would persist, thereby ensuring continual protection of the designated species. In the absence of Project related effects, it is predicted that habitat quality within areas of conservation concern will remain unaffected.

Land and Resource Use

If Project development does not proceed, the envisioned future state of the environment concerning land and resource use is foreseen to exhibit minimal deviation from its current condition. The abundance and utilization of commercial resources play a central role in shaping the environmental landscape. Furthermore, the availability of harvested species and the use of sustainable management practices serve to protect the prospective state of the environment.

The proposed Project location on the POA (a seaport and industrial park on a brownfield site) is designated for commercial and industrial use. It is probable that development would occur in this area even if this Project were not to proceed. Industrial land and resource use may include wind farm development, mineral exploration, aquaculture, inshore and nearshore fishery, petroleum exploration and development, and wood harvesting.

Planning and development of a network of hiking trails in Placentia and surrounding communities is currently underway by the Placentia Trails Committee. The hiking trail will extend from the former US military base through the community of Placentia. Should the Argentia Backlands area remain undeveloped by the Project, the trail extension will result in improved accessibility to recreational land and resources for the community and visitors. In the absence of the proposed Project the synergies associated with optimal use of the Project’s linear features and the possibility of cost savings for trail construction would be lost.

Heritage and Cultural Resources

The existing heritage and cultural resources are fixed and limited, therefore, without implementation of the Project, the distribution and abundance of heritage and cultural resources will remain unchanged. A historic resources overview assessment (a desktop survey of archaeological records) has been completed as a requirement of the Registration document. It is unlikely that such an assessment would have been produced if the Project had not been proposed. As such, in the absence of the proposed Project there is a diminished probability of identifying, locating, and characterizing heritage and cultural resources within the Project area and subjecting these resources to provincial management, regulation, and protection measures.

Socio-Economic Environment

In the absence of the Project a continued decline in community populations in the region can be expected due to aging and residents relocating. This population decline would, in turn, reduce the demand on infrastructure and services, creating surplus capacity, but also the decreased population and smaller tax base would result in diminished investment in local community services and essential infrastructure, such as health services and social programs, education and training facilities and programs, and fire and emergency services. If the Project does not proceed, the current economic decline in local communities will exacerbate the downward trend in population, leading to a diminished demand on facilities and services, such as housing, accommodations, health services and social programs, education and training facilities and programs, and prevention and emergency services. This intricate interplay highlights the balance between populations demographics, community needs, and financial resources available for sustaining and enhancing local communities and industries, as well as family life, recreation, and culture.

In the absence of the Project, the anticipated economic boost for the area and the prospective employment opportunities directly tied to the Project would be forfeited, resulting on a loss of employment opportunities and absence of economic growth. The Project seeks to create local employment opportunities that would not otherwise be possible without a comparable venture. With an increase in employment opportunities and an influx of people relocating to the area for Project-related work, there is an increased demand for accommodations, food services, education and training, healthcare and social assistance, and retail trade industries.

The Cenovus White Rose Extension Project in Argentia is a temporary construction project expected to be completed in 2025, while the Argentia Renewables Project is scheduled to commence the Construction Phase the same year. This sequencing would make a good fit for Construction Phase related employment and economic activity and offset the “boom-bust” cycle associated with major project construction. The completion of construction activities associated with the Cenovus Project is likely to result in a decline in demand and employment opportunities for construction labourers and trade workers in the labour market. In the absence of the Argentia Renewables Project, there would be a notable

downturn associated with the completion of the Cenovus project and layoffs of trades, transportation, equipment operation, and related occupations.

The absence of the Project would also diminish the potential to diversify the economy of the area. The Project aims to promote a more resilient and varied economy, thereby lessening the vulnerabilities associated with an economic dependence on a relatively narrow array of industry sectors.