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2.0 Proposed Undertaking

This section describes the proposed undertaking and the context within which it will be carried out. An overview of the proposed Project Area is provided to facilitate the environmental assessment process. This is followed by a presentation of the rationale for the undertaking in the context of broader public sector policies plans and programs. The goal of this document is to provide a comprehensive description of project planning, construction, operation and maintenance, and decommissioning and rehabilitation. Alternatives to the Project, and within components of the Project, are described, along with the implications of the selections to potential environmental effects. Finally, a description is included of the regulatory framework that applies to the geographic area and categories of activities associated with all stages of the Project.

The Project will produce green hydrogen using locally produced wind-generated electricity. Hydrogen will be produced at the Argentia Green Fuels Facility where it will also be converted to ammonia for shipment by third-party marine vessels. The associated Argentia Wind Facility will comprise approximately 300 MW of installed capacity from up to 46 wind turbines located throughout the Port of Argentia (POA) Property. The current wind turbine design for the Project is expected to have a nominal power of 6.8 MW, a hub height of approximately 100-119 m and a rotor diameter of 162 m. For the purposes of this Registration, a hub height of 119 m is conservatively assumed.

Argentia Renewables is well-suited and equipped to carry out the proposed Project in a manner that ensures minimal environmental disruption and optimal socio-economic benefits. Argentia Renewables utilizes a “designed in” approach to mitigation measures; i.e., rather than developing a project and then adding in mitigation and monitoring measures as required to satisfy regulatory requirements, the approach is one of integrating measures as early as possible in the planning cycle.

As an affiliate of Pattern, Argentia Renewables will draw on Pattern’s experience to navigate development challenges and apply existing policies and programs to the undertaking. Pattern is an experienced developer and operator of large renewable energy infrastructure projects throughout North America and has developed and implemented a suite of proven corporate policies and programs.

2.1 Study Areas

The Project Area is in Argentia, Newfoundland and Labrador (NL), a seaport and industrial park located on the brownfield Argentia Peninsula of a former American military base. The Project Area extends eastward into the Argentia Backlands, as well as a narrow corridor to accommodate the electrical infrastructure outside of this area.

2.1.1 Site Description

The elements of the Project will interact with the environment at various spatial scales, therefore three levels of "study area" were assessed: a Project Area, a Local Assessment Area, and a Regional Assessment Area. Each is defined below, along with a rationale for the delineation of boundaries. These study areas encompass the scope of study of the biophysical environment. Adaptations to each study area that were made for the socio-economic and heritage and cultural resources studies are described in Section 3.2 (Baseline Studies).

2.1.1.1 Project Area

The Project Area for the Argentia Renewables Project was defined as "*the area in which Project infrastructure components and activities (e.g., construction, operation and maintenance, decommissioning and rehabilitation) will occur, and within the boundaries of which direct environmental interactions with the Project will likely occur*". Specifically, the Project Area encompassed the collective spatial footprint of the Argentia Wind Facility, the Argentia Green Fuels Facility, ammonia storage infrastructure, electrical substation(s) and power lines, and all the associated roads for those various elements of the Project (further discussed in Section 2.3). Within the Argentia Backlands and the Argentia Peninsula, the Project Area boundaries correspond to the POA Property boundaries. A 250 metre (m) buffer was added to either side of the Project Interconnect Line, which is the transmission line that will connect to the Newfoundland and Labrador Hydro (NLH) electrical grid at the Long Harbour Terminal Station, to account for edge effects of the linear corridor and to provide for alignment adjustments of the transmission line Right of Way (ROW). Figure 2.1.1-1 depicts the Project Area.

2.1.1.2 Local Assessment Area

The Local Assessment Area (LAA) for the Project was defined as "the area in which environmental interactions are detectable (and measurable) beyond the boundaries of the Project Area". Interactions with the Project within the LAA are primarily indirect; often the LAA is sufficiently separated (spatially and/or temporally) from Project features to preclude direct interactions.

A one kilometre (km) buffer was added to the Argentia Backlands and the Argentia Peninsula Project Area, while the 250 m buffer along the Project Interconnect Line remains unchanged, to define the boundary of the LAA. This distance was selected to encompass the local municipalities' infrastructure and housing, as well as the nearshore marine environment. It also encompasses a corridor along the Project Interconnect Line. The LAA is adequate to comprise all the viewscapes of the Project, any noise transmission beyond the Project Area, and the coastal environment which provides habitat for seabirds and shorebirds. The LAA is where indirect but measurable changes to Valued Components (VCs) may occur. Figure 2.1.1-1 depicts the core LAA for the Project.

Pattern | Argentia Renewables

FIGURE NUMBER: 2.1.1 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/25
FIGURE TITLE: Study Area Boundaries Associated with the Project	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change.	REVIEWED BY:	
PROJECT TITLE: Argentia Renewables		APPROVED BY:	

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SEM MAP ID: 238-005-GIS-003-Rev1

2.1.1.3 Regional Assessment Area

The Regional Assessment Area (RAA) was defined as "the spatial extent of potential indirect and cumulative environmental effects which may reach beyond the limits of the LAA". The RAA, therefore, extends an additional 15 km beyond the radius of the localities of Argentia, Dunville, Fox Harbour, Freshwater, Iona, Little Barasway, Placentia, Point Verde, Jerseyside, Ferndale, and Ship Harbour (Figure 2.1.1-1). While the RAA is based on the Census subdivision, the Census boundary is not arbitrary, rather it aligns with regional drainage basins.

The RAA includes the area within which most cumulative effects would occur, such as additive interactions from other local industrial installments, projects, or infrastructure. In particular, the extent of the RAA boundary considers changes to the environment that may indirectly interact with the landscape or resources for local communities or migratory wildlife species. The RAA boundary encompasses other projects such as the Voisey's Bay Nickel Processing Facility, the POA Cooper Cove Project, the Monopile Marshalling Port, and others as further discussed in Chapter 6 (Cumulative Effects).

The RAA will be adjusted appropriately for each VC, especially with respect to the socio-economic interactions of the Project as discussed in Section 3.2 (Baseline Studies).

2.1.2 Project Land and Property Ownership

The Project will be located primarily on the POA Property. The Argentia Green Fuels Facility will be situated on the Argentia Peninsula, and the Argentia Wind Facility will be primarily on the Argentia Backlands, north of the communities of Dunville and Ferndale. The Project Interconnect Line intersects both private and Provincial Crown Land.

The POA Property borders on several other privately and publicly held lands. Opposite to the intersection of the Argentia Access Road and the Main Road to Freshwater is the Provincially owned tourist bureau. Project interactions with tourism activity and business are addressed in Sections 3.1.4 and 3.1.6 (Land and Resource Use and Socio-economic Environment, respectively).

Within the POA Property on the Argentia Peninsula, the industrial park has approximately 40 existing tenants that offer a variety of goods and services, many of which are compatible with supporting construction projects and industrial operations. More details pertaining to POA business activities are provided in the Socio-economic Baseline Report (Appendix G). The Marine Atlantic ferry service, a Crown Corporation, connects North Sydney, NS, and Argentia, NL, and operates from June to September. According to the 2024 passenger ferry timetable, arrivals from North Sydney are set for 09:30 on Mondays, Thursdays, and Saturdays, with departures the same day at 17:00 (Marine Atlantic, 2024). Historic ferry crossings are discussed in Section 3.1.4 and Project interactions are discussed in the Transportation Impact Study and Traffic Management Plan (Appendix E).

On the southwest corner of the Project Area along the coast is the T.E. Site, a remnant of the former United States (US) military base. The property is currently owned by the US Department of the Navy.

The Canadian Coast Guard 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 VHF Radar tower, which is located on the western side of the Argentia Backlands. More details pertaining to the Canadian Coast Guard Radar Station are provided in Section 3.1.4 and Chapter 8 (Land and Resource Use and Public and Indigenous Consultation, respectively). Adjacent to the Freshwater Hill VHF tower there are four additional communication towers operated by the Royal Canadian Mounted Police (RCMP), Boeing Corporation Satellite Signal Receiving Site, Newfoundland Broadcasting Company Limited, and Newtel Communications. All four are located outside of the southern boundary of the POA Property.

Two quarries currently located within the POA Property on the Argentia Backlands and are being considered as aggregate borrow sources for the Project. One is permitted to Tier 1 Capital Corporation located on Broad Cove Head, Argentia and encompasses 3.17 hectares (ha). The second is permitted to Pennecon Heavy Civil Limited located on Silver Mine Road, Argentia and encompasses 3.87 ha. More details pertaining to mining and quarrying are in Section 3.1.4 (Land and Resource Use).

Argentia Renewables will develop and finance the construction of the Project Interconnect Line; however, the operation and maintenance of the line, once completed, will rest with NLH. The Project Interconnect Line will primarily parallel existing rights-of-way for a large portion of the route, but a section will require greenfield construction. The Project Interconnect Line is the only portion of the Project that involves Provincial Crown Land.

2.2 Rationale for the Undertaking

The Project aims to foster the growth of the green hydrogen and ammonia industry in NL, creating opportunities for workers and businesses to establish long-term careers and partnerships within an industry capable of decarbonizing challenging sectors. The Project objective is to produce economically viable green hydrogen and ammonia for export, meeting increasing market demands, while contributing to the reduction of greenhouse gas emissions and promoting the global shift to decarbonization. Ammonia will be produced from hydrogen (electrolysis process) and nitrogen (air separation) for transport to export markets. The green hydrogen and ammonia industry will play an important role in addressing Europe’s green energy transition and climate objectives.

2.2.1 Global Market for Hydrogen and Ammonia

Global demand for hydrogen, especially green hydrogen (i.e., hydrogen produced without carbon, e.g., using renewables to power the electrolysis of water) has been growing rapidly in recent years as countries attempt to decarbonize various industries, energy sources, and modes of transportation. Hydrogen is beginning to be used as a clean energy carrier to help reduce dependence on fossil fuels and lower greenhouse gas emissions across myriad sectors of the economy. A particularly important use for hydrogen is its catalytic reaction with nitrogen to create ammonia, the foundation for fertilizers around the world and a vital aspect of world food security. Ammonia is a key feedstock for other chemical processes as well, including the production of methanol.

The extensive coastline, high wind speeds, and abundance of high elevation terrain of NL make it one of the premium jurisdictions in North America for wind energy projects. The Island of Newfoundland also has a geographic advantage over competitors to the west and south – it contains the closest ports to Europe, a primary market for green hydrogen. The European Commission is implementing strict regulations as to what constitutes green hydrogen and will require producers to prove the origins of their hydrogen. Green energy for electrolyzers must be sourced from dedicated new capacity (such as a wind farm) or from green electricity purchased from a grid. The NL hydroelectric-powered grid provides an interconnection opportunity that is greener than most other jurisdictions, offering a competitive advantage in achieving European standards (Department of Industry, Energy and Technology, 2021).

2.2.2 Provincial and Federal Commitments to Address Climate Change

Canada is one of many countries that have made a policy commitment seeking to achieve “Net Zero” carbon emissions by 2050. Consistent with this national policy, the Province of NL has developed a Renewable Energy Strategy and a Hydrogen Development Action Plan.

The Renewable Energy Strategy encourages the development of a green hydrogen industry in the province by committing to such action items as:

- Continue to advance the development of a clean power roadmap for Atlantic Canada;
- Pursue export opportunities; and
- Build the Province’s understanding of opportunities to generate new green products such as green hydrogen, green ammonia, or biofuel, and to export the energy via ship.

In a recently signed Memorandum of Understanding (MOU), the Province of NL reiterated its commitment to identify and pursue hydrogen opportunities that provide the best long-term benefit for the province (e.g., increased jobs, gross domestic product, and tax revenue to support government programs and services -Government of Newfoundland and Labrador, 2022). In 2022, the Province of NL acted on these commitments by repealing the onshore wind moratorium policy established in 2006, a major barrier to industrial-scale wind development.

The Province of NL released its Hydrogen Development Action Plan on May 14, 2024 (NL Department of Industry, Energy and Technology, 2024). This plan identifies green hydrogen as a key resource in global efforts to decarbonize fossil fuel dependent sectors. Through the plan, the Province of NL commits to supporting the development of a globally competitive green hydrogen and ammonia industry (Government of Newfoundland and Labrador, 2024). The Argentia Renewables Project is noted in the document as a trailblazing green hydrogen and ammonia project that will lead the establishment of this new industry.

2.2.3 The Argentia Renewables Commitment to Environmental and Community Stewardship

Argentia Renewables is committed to the sustainable development, construction, and operation of renewable energy facilities, while providing a workplace that is diverse, equitable, and inclusive. The company is also committed to developing lasting partnerships with the local communities in proximity to the Project Area. Argentia Renewables believes that being a good neighbor benefits both the areas where they operate and their long-term success. Argentia Renewables is committed to listening to and respecting the landowners and communities that will host and have interest in this Project, and to being involved in meaningful stakeholder engagement throughout the lifetime of the Project. To this end, Argentia Renewables will:

- Respect the heritage and history of Indigenous Peoples in all communities;
- Treat landowners and community members with respect and seek to gain their trust;
- Share information and solicit input to build local relationships while respecting and considering all points of view;
- Explore ways to support the growth of healthy and vibrant communities while providing sponsorships and donations;
- Identify and assess potential positive and negative community and cultural effects to inform planning and decision-making;
- Design and construct projects and operate facilities in a manner that complies with all applicable regulations; and
- Work to monitor, report, and continually improve overall performance, incorporating feedback into outreach programs.

2.3 Project Description

The Project involves the installation of 300 MW of wind power on the POA Property, shown in Figure 2.3-1. The wind turbine sites will be dispersed throughout the POA Property to maximize the potential of the wind component of the Project. The Argentia Green Fuels Facility will be located at the northern end of the Argentia Peninsula, near the Argentia graving dock, which is brownfield private land zoned for industrial use. The facility will produce hydrogen through the electrolysis of water and nitrogen by air separation. Ammonia will be created when the hydrogen and nitrogen gases react, and its energy content is a product of the energy used to produce these gases. The Argentia Green Fuels Facility will run on locally generated renewable energy from the Argentia Wind Facility, supplemented by energy from the NLH grid, which is expected to be almost entirely hydroelectric in origin. The ancillary services at the Argentia Green Fuels Facility will also run on this renewable energy. As a result, the produced ammonia will have near-zero carbon intensity. The Project is expected to produce up to 400 metric tonnes per day (tpd) of green ammonia, equivalent to up to 146,000 metric tonnes (t) of ammonia per year. The Project will require between 170 to 200 MW of renewable energy and 1,185 cubic metres (m^3) of freshwater daily.

Electrical infrastructure will be required to connect wind power generated in the Argentia Backlands to the Argentia Green Fuels Facility, as well as to connect the Argentia Green Fuels Facility to the NLH grid as shown in Figure 2.3-2. Energy generated at each wind turbine site will be conveyed by a series of low voltage (34.5 kV) Collector Lines that run to a substation in the Argentia Backlands (the Argentia Backlands Substation). The Project Green Fuels Generation Interconnect Line (Project Gen-Tie), a high voltage (230 kV) overhead powerline, will connect the Argentia Peninsula Substation to the Argentia Backlands Substation. Another high voltage overhead powerline, the Project Interconnect Line, will connect the NLH Long Harbour Terminal Station to the Argentia Backlands Substation to transmit electricity from the NLH grid to the Project. The Preliminary Layout of the Project Interconnect Line generally follows a corridor along an existing Newfoundland Power 69 kV powerline ROW to the Long Harbour Terminal Station as shown in Figure 2.3-2.

The Argentia Green Fuels Facility will include a hydrogen electrolyzer, air separators, ammonia synthesizers, hydrogen, and ammonia storage, as well as ancillary equipment and maintenance buildings required to operate and maintain the facility (Figure 2.3-3). An electrical substation will be constructed near the Argentia Green Fuels Facility, referred to as the Argentia Peninsula Substation.

The Argentia Wind Facility component of the Project is anticipated to include up to 46 wind turbines based on the Preliminary Layout provided in Figure 2.3-1. This is the layout that was used for studies and surveys contained in this Registration. Throughout the early engagement process for this Project, as described in Chapter 8, Argentia Renewables has sought to gather feedback from the public, key stakeholders, Indigenous Peoples, and government departments and agencies regarding siting of wind turbines. In response to feedback obtained through the public consultation process, turbines 7, 22 and 47 have been removed from the preliminary layout. Additional layout changes based on stakeholder feedback have been presented later in Figure 2.4.2-1.

Where practicable, existing roads in the Argentia Backlands have been incorporated into the Project design to limit additional habitat fragmentation. Figure 2.3-1 categorizes the roads in the Argentia Backlands into new roads, existing roads that will be upgraded and existing roads that will not be upgraded. The Project will require a water collection and purification system, which will include infrastructure for the delivery of water from the selected source to a water treatment plant located at the Argentia Green Fuels Facility. The treated water will feed into the hydrogen facility. A wastewater treatment system will also be required for effluent.

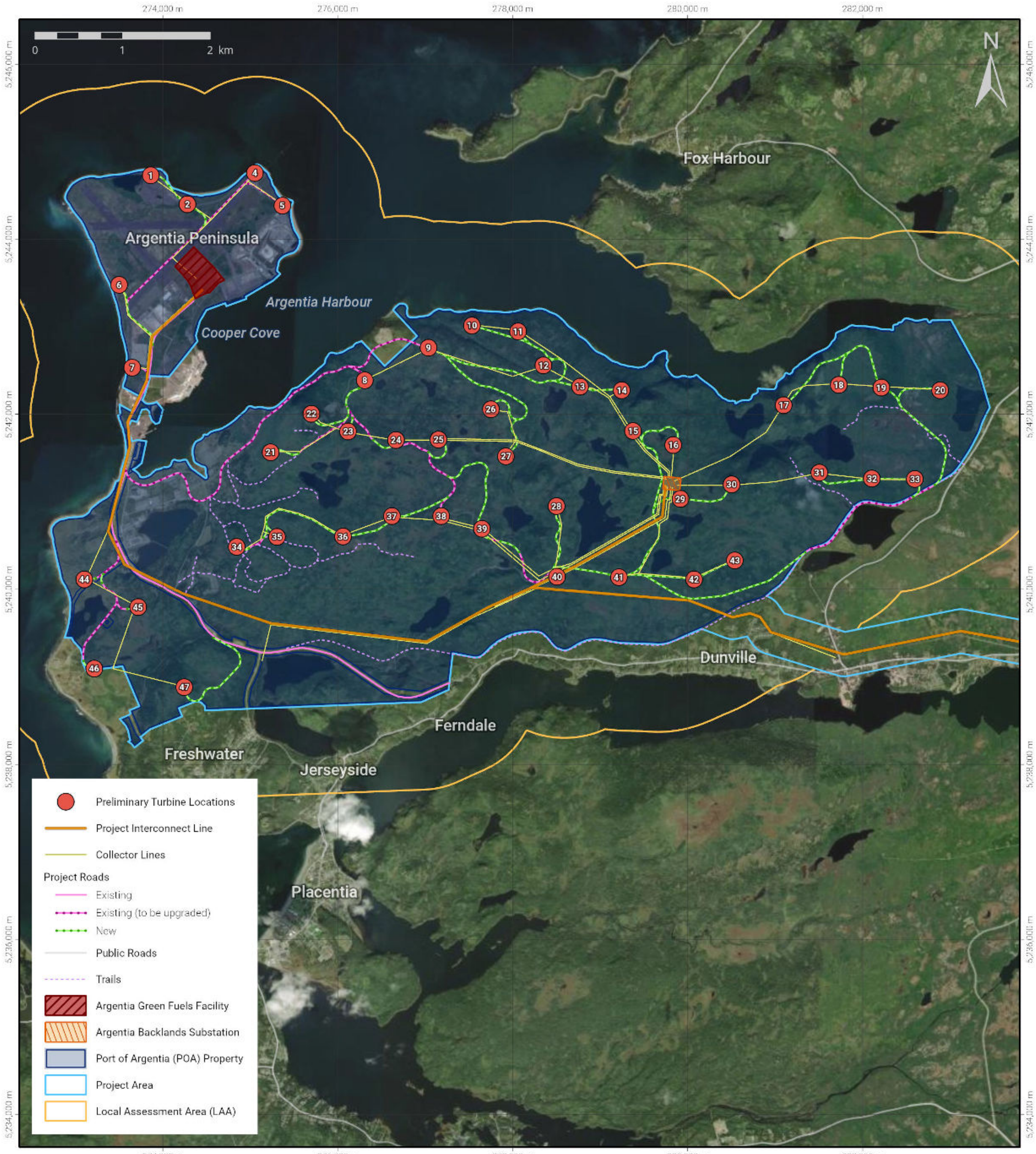

FIGURE NUMBER:
2.3 - 1

FIGURE TITLE:
Preliminary Layout of the Argentia Wind Facility

PROJECT TITLE:
Argentia Renewables

COORDINATE SYSTEM:
NAD 1983 CSRS UTM Zone 22N

NOTES:
The location of proposed project infrastructure is considered preliminary and is subject to change.

PREPARED BY: C. Burke

DATE: 24/07/25

REVIEWED BY:

APPROVED BY:

Pattern | Argentia Renewables

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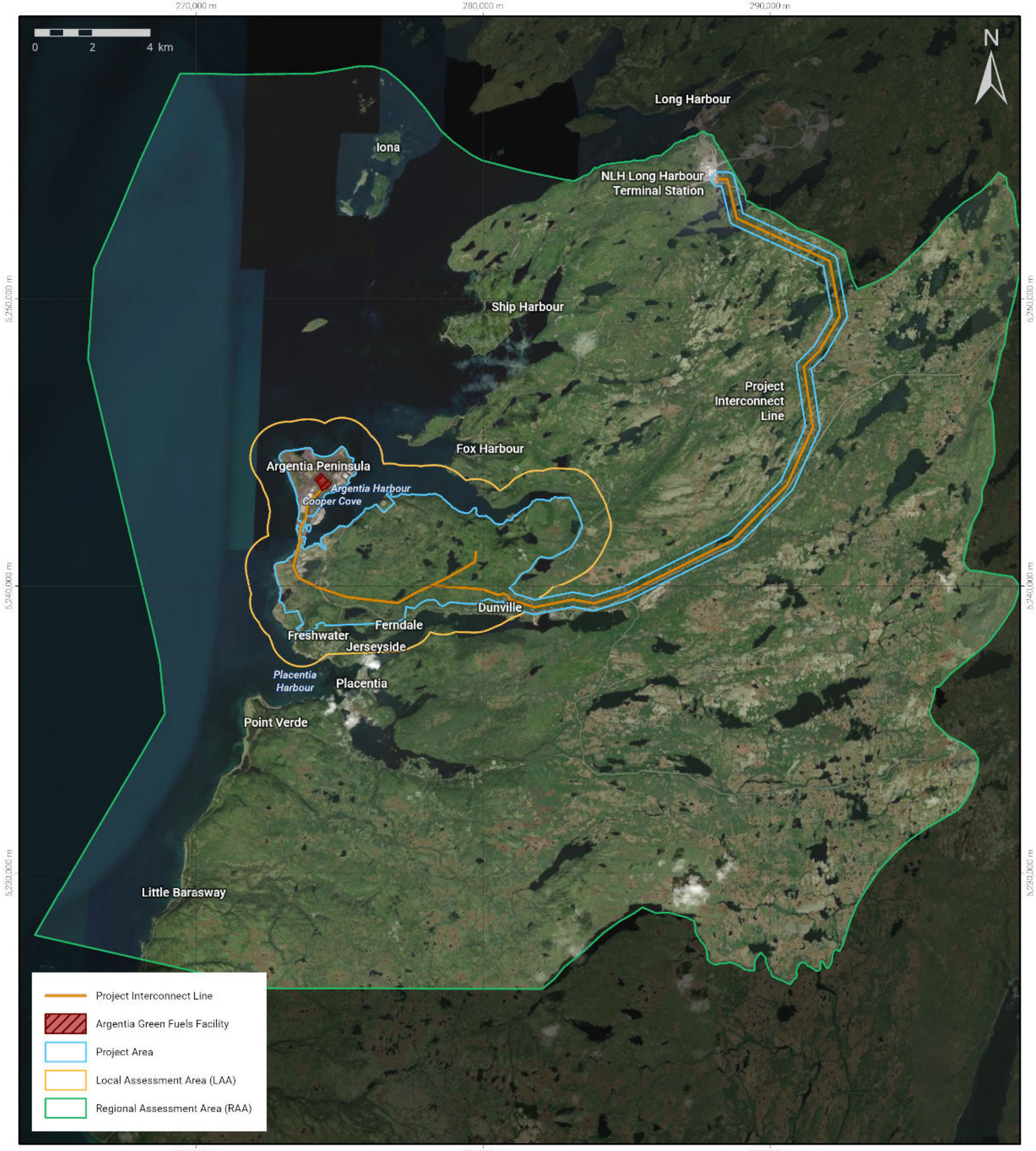
SEM MAP ID: 238-005-GIS-C04-Rev1



Pattern | Argentia Renewables	FIGURE NUMBER: 2.3 - 2	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/26
	FIGURE TITLE: Preliminary Layout of the Project Interconnect Line	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change.	REVIEWED BY:	
			APPROVED BY:	
	PROJECT TITLE: Argentia Renewables		sem	

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Figure 2.3-3 Preliminary Development Concept of the Argentia Green Fuels Facility.

REV	DATE	REVISION DESCRIPTION	DRN	CHK	APP
00	13.10.23	ISSUED FOR REVIEW	TS	BH	CN

CONSULTANT: AtkinsRéalis

CLIENT: Pattern

PATTERN ENERGY.
119 Spadina Avenue,
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Canada, ON M5V 2L1.

PREPARED	JS	13.10.2023
DRAWN	TS	13.10.2023
CHECKED	BH	13.10.2023
APPROVED	CN	13.10.2023
SCALE 1:1000	FORMAT	B1

PROJECT: Argentia Renewables - Feasibility Study

DRAWING TITLE: CONCEPT PLOT PLAN

DRAWING NUMBER: SNC-XX-XX-DDRW-Z-0002

REV: 00

Pending the necessary approvals, Project construction is expected to begin in Q2 of 2025, with commissioning occurring in Q4 of 2027. Once the Project is operational, the product will be exported by third-party marine vessels to international markets. Although the Project is expected to operate for 30 years, Project components could be repaired or replaced to extend the design life. Decommissioning and rehabilitation of the Project will require an estimated 12 months and entail the removal of Project infrastructure and restoration of the land to its prior state at the discretion of the landowner.

2.3.1 Argentia Green Fuels Facility

The Argentia Green Fuels Facility infrastructure will be sited based on property availability, ease of construction and infrastructure access, proximity to suitable dock space, adequate buffer space allowance from other industrial activities, and foundation conditions. The facility will include the following:

- Hydrogen production (electrolyzer, hydrogen storage tanks, cooling water system, firewater / buffer tank, feedwater treatment, and wastewater treatment);
- Ammonia production (ammonia synthesis and refrigerant compression, air separation units, nitrogen compressor, ammonia storage tank and boil off units, tank flare, and an ammonia flare); and
- Ancillary service buildings and laydown areas for the maintenance and operation of the facility.

The facility is expected to have an installed capacity of 400 tpd of ammonia. The electrolyzer facility is anticipated to have an installed capacity of 80 tpd of hydrogen. Figure 2.3.1-1 depicts the process of producing green ammonia from renewable power.

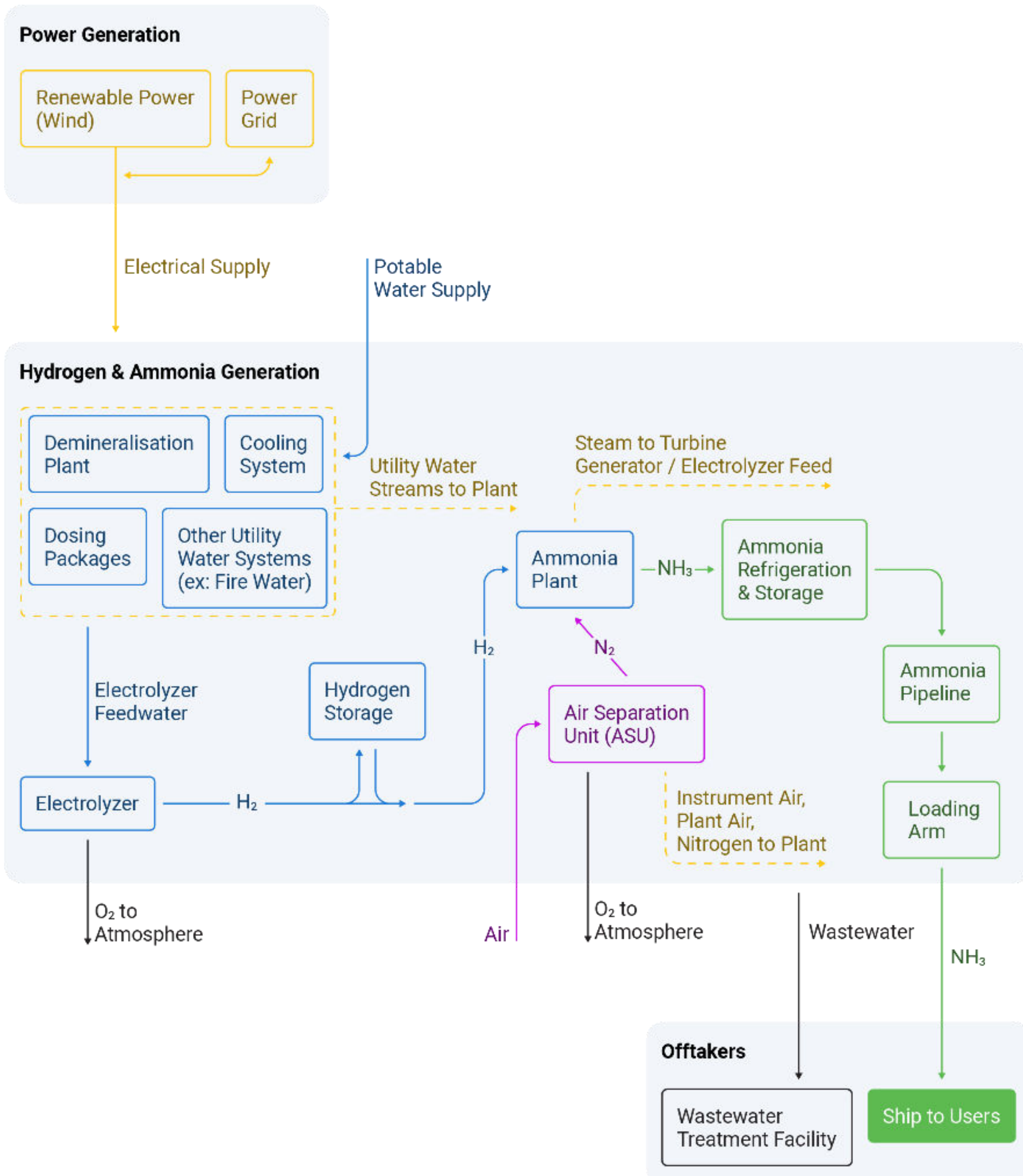


Figure 2.3.1-1 Argentia Green Fuels Facility Process Flow Diagram (adapted from AtkinsRéalis, 2023).

The feasibility study conducted by AtkinsRéalis (formerly SNC-Lavalin Group) in 2023 concluded that a 160 MW alkaline electrolyzer connected to a 140 kilo-tonnes per annum (ktpa) (384 tpd) ammonia plant is the optimal facility size accounting for both economic and Project risk considerations. The ammonia plant has been marginally upgraded to 146 ktpa (400 tpd). The average potable water consumption is expected at 0.0142 cubic metres per second (m^3/s) (equivalent to 14.2 litres per second (L/s)), ranging from 0.0116 to 0.0144 m^3/s (11.6 – 14.4 L/s).

2.3.1.1 Hydrogen Production

Generated wind energy will be used to power the electrolysis process which splits water molecules (H_2O) into hydrogen (H_2) and oxygen (O_2) constituent parts. Oxygen produced will be vented to the atmosphere at a safe location. Hydrogen from the electrolyzer will be fed to the ammonia plant. Hydrogen will be mixed in a 3:1 stoichiometric ratio with nitrogen produced by air separation. A limited quantity of hydrogen may be stored as a buffer during periods of low electricity generation.

An alkaline electrolyzer is currently anticipated to be the optimal type of technology for this Project given the logistics, manufacturing capability, financials, water consumption, and maintenance ease. Water consumption by an alkaline electrolyzer is in the range of 9-11 kilograms (kg) of water per kg of hydrogen produced. The amount of potable water rejected was assumed to be in the range of 25-40%, based on the quality of the source water in the municipal supply. The electrolyzer rated capacity is 160 MW with a hydrogen production capacity of 2,960 kilograms per hour (kg/h), equivalent to 71,040 kg/day.

A schematic diagram of the alkaline electrolysis process is displayed in Figure 2.3.1-2. The electrolyzer cell inputs are direct current electricity and deionized water from the water treatment process. The electrolyzer electrodes (anode and cathode) are separated by a diaphragm. Water molecules are broken down in the cathode to produce hydrogen gas and hydroxide ions (OH^-) when electrical current is applied. Hydroxide ions pass through a permeable membrane where they recombine to form oxygen and water. Potassium hydroxide (KOH) or sodium hydroxide (NaOH) at 20-40 weight percent (wt.%) are commonly used as the cell electrolyte in alkaline electrolysis. A summary of the half cell reactions and overall reaction are detailed below:

$$\text{Anode: } 2OH^- \rightarrow \frac{1}{2}O_2 + H_2O + 2e^-$$

$$\text{Cathode: } 2H_2O + 2e^- \rightarrow 2OH^- + H_2$$

$$\text{Overall: } H_2O \rightarrow \frac{1}{2}O_2 + H_2$$

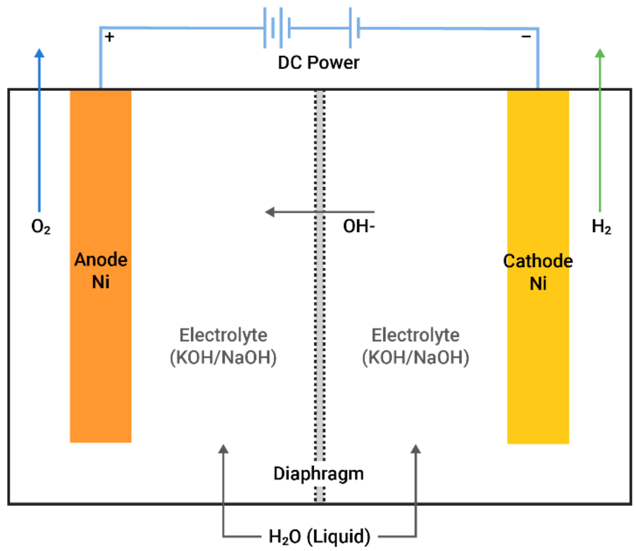


Figure 2.3.1-2 Alkaline Electrolyzer Cell.

Alkaline electrolysis is a low temperature technology, typically operating at temperatures of 70-90°C, and pressures of 1-30 bar-gauge (barg). Ammonia production process efficiency is achieved by the provision of a continuous supply of hydrogen; therefore, the design allows for 14 t of hydrogen storage in an above ground steel container. This represents 0.2 days of production, considered optimal given the availability of electric power to the plant.

2.3.1.2 Ammonia Production

Nitrogen (N_2) will be produced by an air separation unit (ASU), which extracts nitrogen that naturally occurs in the atmosphere. The main air compressor filters and compresses the air, a knockout drum removes moisture, and molecular sieve beds purify the air. The air is then cooled in a heat exchanger before entering the column. A stream of high purity nitrogen is produced by the top product of the column, which is pressurised to 30 barg by the nitrogen compressor, and then sent to the syngas mixing drum in the Argentia Green Fuels Facility. A stream of waste oxygen and some argon is produced by the bottom product of the column, which is used by the molecular sieve beds or vented to a safe location.

The Haber-Bosch process will be used to produce ammonia (NH_3), which involves mixing hydrogen produced from the electrolyzer in a 3:1 stoichiometric ratio with high purity nitrogen from the ASU using a catalyst under high temperature and pressure. A multistage centrifugal compressor train compresses the ammonia syngas to 140 barg and 70°C. Unreacted components are recycled back into the compressor's stages to improve plant conversion overall.

$$N_2 + 3H_2 \rightarrow NH_3 \rightarrow \Delta H_{298K} = -91.4 \frac{kJ}{mol}$$

The ammonia reaction is exothermic, and depending on operation circumstances typically exhibits a per-pass conversion of 20-30%. Overall conversion efficiency of the system is enhanced/increased by employing a recycle reactor, which cycles the syngas stream through a loop to generate more product.

Chilling machines and refrigeration units will cool the hot ammonia product to its saturation temperature of -32°C at atmospheric pressure. The high temperature reactor effluent is used for heat integration of the reactor feed. A system of chillers is employed in conjunction with a vapour compression refrigeration cycle to reach saturation temperature.

The ammonia plant efficiency does not reduce linearly. All rotating equipment still needs similar power draw during turndown compared to operating at full capacity to circulate unreacted synthesis gas, maintain temperatures in the storage tanks, and maintain the refrigeration loop cycle.

Table 2.3.1-1 Ammonia and Nitrogen Input Parameters for the Model.

Input	Value	Unit
Turndown	40	% of maximum capacity
Syngas Conversion	99.7	% of correct stoichiometric ratio
ASU Power Consumption	107	kilowatt hour per tonne (kWh/t) of N_2

2.3.1.3 Water Supply

The Town of Placentia's municipal water supply system currently provides water to the Argentia Peninsula. The Town of Placentia Protected Public Water Supply Area (PPWSA) encompasses Clarke's Pond and Larkins Pond, with Barrows Pond and Gull Pond as backups when necessary. Wyses Pond is also listed as a part of the PPWSA, however, the supply line has been closed off for some time and the Town of Placentia does not intend to reopen it due to water quality concerns.

Water supply for the Project will be obtained from the PPWSA, which would require connection to the town's water infrastructure. According to preliminary discussions with Town Officials, it is anticipated that the surface water resources in the Town of Placentia PPWSA can supply all the process water requirements for the Project. A Source Water Hydrology Analysis (Appendix C1) was completed to confirm availability of water for both municipal and Project requirements. An alternative water supply option was also reviewed and described in Section 2.4.1.3.

2.3.1.4 Water Requirements

The electrolyzer in the Argentia Green Fuels Facility will receive water that has been demineralized and treated, likely via de-chlorination and reverse osmosis, before it enters the electrolyzer. In the production of demineralised feedwater, reject water with a higher conductivity than the intake water will be generated. The percentage of water rejected is estimated to be 25%, based on the source water quality data. A considerable increase in water demand of up to 80-90 L/s would be required for evaporative cooling of the plant, and so non-evaporative cooling will be the design basis for the Project. The Town of Placentia water flow requirement was evaluated against electrolyzer plant sizes in the preliminary assessment of proposed water requirements by AtkinsRéalis. The calculation results showed that a minimum flow rate of 11.6 L/s (25% reject water) and a maximum of 14.4 L/s (40% reject water) are needed for an electrolyzer system with 150 MW installed capacity and 67,920 kg/day of hydrogen production. Optimization modelling determined that the optimal facility size is a 160 MW electrolyzer connected to a 400 TPD ammonia plant.

The water demand for the Project is based on an electrolyzer rated capacity of 71,040 kg/day of hydrogen production, and an electrolyzer consumption of between 9-11 kg of water per 1 kg of hydrogen produced. The water requirement for the Project is calculated from the above-mentioned parameters:

$$71{,}040\ \frac{\text{kg of } H_2}{\text{day}} \times 9\ \frac{\text{kg of } H_2O}{\text{kg of } H_2} \times 0.001\ \frac{\text{m}^3 \text{ of } H_2O}{\text{kg of } H_2O} = 639.36\ \frac{\text{m}^3}{\text{day}}$$

$$71{,}040\ \frac{\text{kg of } H_2}{\text{day}} \times 11\ \frac{\text{kg of } H_2O}{\text{kg of } H_2} \times 0.001\ \frac{\text{m}^3 \text{ of } H_2O}{\text{kg of } H_2O} = 781.44\ \frac{\text{m}^3}{\text{day}}$$

The Project is expected to require between 639.36 m^3/day and 781.44 m^3/day of water, which assuming 40% reject water from water treatment is equivalent to 1,065.6 m^3/day and 1,320.4 m^3/day, respectively. The water consumption demand was therefore conservatively estimated at 1,185 m^3/day (13.7 L/s) (AtkinsRéalis, 2023).

The Argentia Green Fuels Facility will require a non-evaporative cooling water system which is estimated to require an instantaneous maximum flow rate of 44 L/s at times. The cooling water system flow rate will not be a constant demand and is accounted for in the Project water consumption of 1,185 m^3/day (13.7 L/s). The cooling water system will be designed to remove heat from the electrolyzer and ammonia plant by rejecting the absorbed heat through an air-cooling mechanism. This design minimizes evaporative water losses and makes use of the colder climatic conditions of the region. The cooling water system consists of a holding tank, circulation pumps, chemical treatment packages, and fin-fan air coolers. The fin-fan air coolers will be elevated banks of tubes, with fans assisting the air flow across the banks of tubes to extract heat from the atmosphere.

The Source Water Hydrology Report (Appendix C1) confirmed sufficient baseline water availability for the needs (13.7 L/s) of the Project, with provisions in place for operational adjustments during infrequent and extreme dry periods. Prior to commencement of Project operations, the Project will develop a Real-Time Water Monitoring Plan (Water Monitoring Plan), a draft Table of Contents (TOC) for this plan has been provided in Appendix C2. This plan will consist of not only a Surface Water Monitoring Plan but also an Ambient Surface Water Quality Grab Sampling Site Plan. The Water Monitoring Plan will outline water level and water quality thresholds (i.e., normal range, alert levels, critical levels), methods for monitoring that will include utilization of a real-time hydrometric station, as well as actions that would be taken based on water level and water quality thresholds, including potential curtailment of Project water use. This will allow the Project to monitor water levels, water quality, and climate. The Water Monitoring Plan will be developed in consultation with both the Town of Placentia and the Water Resource Management Department.

During operation of the Project, the Project will implement the Water Monitoring Plan and operate a water monitoring system utilizing a real-time hydrometric station and be monitored as per the Project Water Monitoring Plan to monitor source surface water used by the Project. These systems will monitor water levels, water quality, and climate. These systems will be integrated with water level monitoring thresholds and adaptive water management strategies to support the Project long-term and ensure the protection of the Public Water Supply and mitigate against drawdown below prescribed thresholds during potential dry conditions.

If real-time or grab sample water monitoring results pursuant to the Project Water Monitoring Plan indicate that curtailment thresholds for water levels or water quality conditions during dry conditions at the Public Water Supply are triggered as defined in the Water Monitoring Plan, Pattern will curtail water use from the Public Water Supply. Specifically, water use will be reduced or halted to prevent any adverse impact on the water availability and quality of the Public Water Supplies.

2.3.1.5 Storage and Transfer of Hydrogen and Ammonia

As described above, hydrogen and nitrogen will be generated on-site. The variable gaseous production resulting from the changing renewable energy flows to the ammonia synthesis facility will be buffered using gaseous storage tanks.

Hydrogen storage will be used to ensure a continuous supply for ammonia production, given the variability of electricity supply from intermittent wind production. Hydrogen will be stored in pressurized gaseous format in above ground pressure vessels. There will be a nominal amount of above-ground hydrogen storage in mild steel buffering tanks, however this is more for operational control rather than storage. The Optimization Modelling carried out by AtkinsRéalis revealed that the optimal vessel size is for 0.2 days of hydrogen storage. Therefore, the amount of hydrogen storage required for the Project is approximately 14 t.

Liquified ammonia will be stored on-site in a 15 kilo-tonne (kt) tank as a link between continuous ammonia production and routine ship pickups. Ammonia will be stored in the tank at its saturation temperature at atmospheric pressure. The storage capacity of the ammonia tank is designed to contain approximately 40 days of 400 tpd ammonia production. The shipping routine will require transit ships that follow a 30-day schedule, therefore requiring 29 days of ammonia storage on-site and one day for loading onto the transport vessel. The extra storage capacity will serve as a reserve to handle contingencies and delays in maritime operations.

Ammonia will be transferred through a constantly circulating transfer line from the storage tanks to the loading arms for offtake in the ammonia carrying vessel at the Loading Facility, further described in Section 2.3.4. Up to two loading arms will be fixed to the Cooper Cove wharf extension. The wharf extension is included as part of the Cooper Cove Marine Terminal Expansion Project (Registration No. 2279). It is the only in-water infrastructure required for the loading of ammonia.

2.3.1.6 Wastewater

The Argentia Green Fuels Facility will use water according to the water balance diagram, shown in Figure 2.3.1-3. The hydrogen and ammonia production processes will generate wastewater streams with varying compositions, depending on the specific processes and raw materials used, necessitating different treatment regimes. Water usage within the Argentia Green Fuels Facility is outlines as follows:

- Hydrogen production:
    - Reagent utilized in the production of hydrogen.
    - Cooling employed in the hydrogen electrolysis process.

- Ammonia Synthesis:
    - Boiler feed water used for the ammonia synthesis process boiler.
    - Cooling applied to manage the heat generated during exothermic ammonia synthesis reactions.

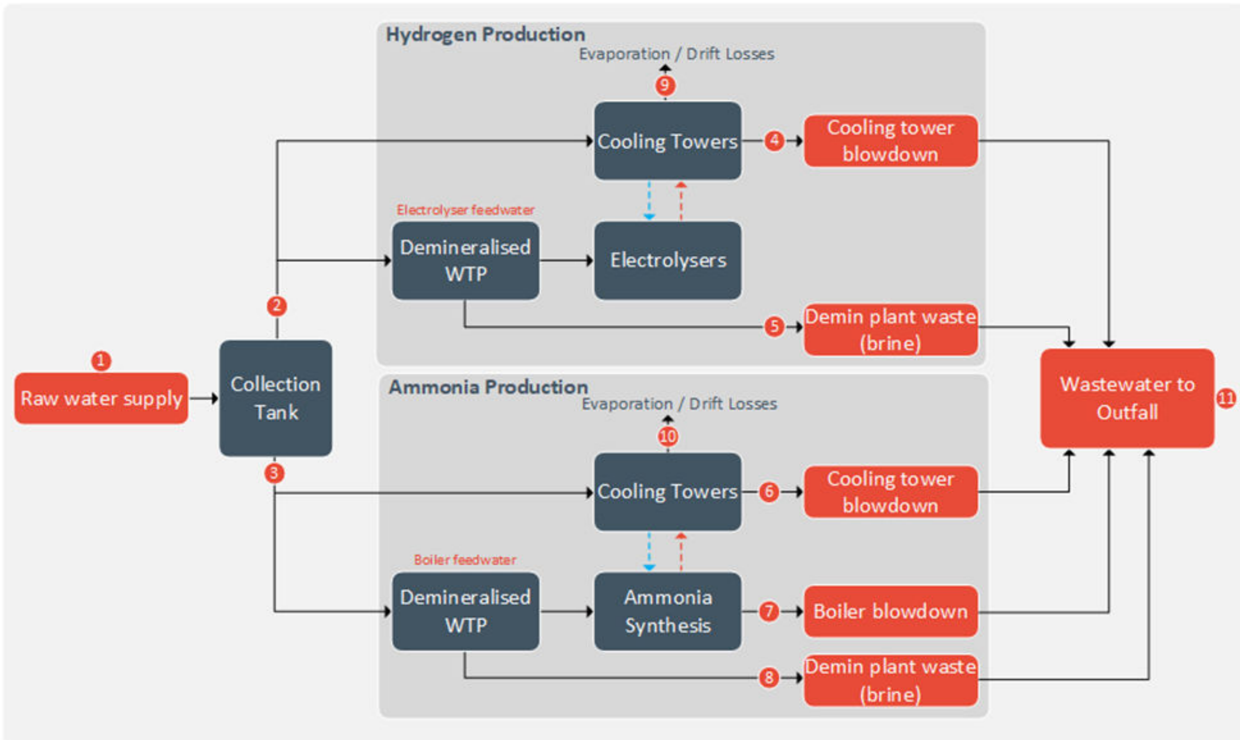


Figure 2.3.1-3 Site-Wide Water Balance Diagram for Hydrogen Generation and Ammonia Synthesis Processes.

The following wastewater streams are expected:

Demineralized Water Treatment Plant (WTP) Concentrate/Brine

The concentrate or brine from the demineralized WTP, assumed to be a membrane process, is a fraction of the feedwater containing a high concentration of dissolved solids derived from the feedwater to the system. Essentially, the basic chemistry of the brine stream is mirrors that of the raw water supply, but with the salts concentrated up by a concentration factor determined by the system's recovery rate (i.e., [1/(1-y)] where Y is the recovery expressed as a decimal). Assuming an overall recovery of 75% for the demineralized WTP, the concentration factor is calculated to be 4.

In addition to the original components of the raw water, chemicals may be dosed to help prevent scaling on the membranes. The type of scaling inhibitor will be selected based on local regulations relating to their concentrations in the effluent discharge. Understanding the requirements of the receiving water body is critical in selecting the chemical dosing regimen. It is expected that the TDS of this blowdown stream will be significantly lower than the overall concentration of the seawater, and therefore the effluent discharge is not expected to be an environmental concern.

The demineralized WTP will produce a low volume of chemical waster during periodic chemical cleaning (high and low pH), which will be neutralized and discharged to the marine environment.

Boiler Blowdown

Boiler blowdown is a small proportion of the boiler feedwater and steam condensate systems. The blowdown is typically less than 1% of the total mass of water circulating within the steam systems and is required to purge contaminants from the system. Boiler feedwater is a very pure water, so the blowdown is generally very clean by most standards.

Domestic Sewage

Domestic sewage from site administration and operational buildings is expected to be sent to the local municipal wastewater treatment works/outfall. No provision is made for on-site sewage treatment.

Cooling Tower Blowdown

Cooling tower blowdown will be derived from the evaporative cooling systems at the hydrogen and ammonia production facility. The cooling towers are expected to operate with cycles of concentration between 1.5 and 3 to control the concentration of dissolved solids (TDS) within the circulating cooling water.

The basic chemistry of the blowdown stream will be essentially the same as the raw water supply but with salts concentrated by a factor of 1.5 to 3 times. In addition to the original components of the make-up water, chemicals may be dosed to help prevent scaling and the buildup of biofilms within the system. The types of biocides and scaling inhibitors will be selected based on local regulations relating to their concentrations in the effluent discharge.

Understanding the requirements of the receiving water body is critical in selecting the chemical dosing regimen. It is expected that the TDS concentration of this blowdown stream will be significantly lower than the overall TDS concentration of the seawater. Consequently, the effluent discharge is not expected to be an environmental concern.

Process Contact Wastewater

Process contact wastewater will be treated in a comprehensive system that includes a wastewater drum, stripper, various coolers, and transfer pumps designed to handle electrolysis reject water, blowdown, and water that comes into contact with process gas. Wastewater generated from the Argentia Green Fuels Facility will accumulate in the wastewater drum. When the volume in the drum reaches a certain level, an automatic level controller will start the pit pump to transfer the water to the stripper. The stripper will be a vertical packed bed tower designed to remove traces of ammonia from the wastewater, with the assistance of low-pressure steam. The stripped gaseous ammonia will be sent to the flare, while the remaining wastewater will be cooled and held in a transfer sump before being discharged or sent for additional effluent treatment. Additionally, temperature control in the transfer sump will ensure the wastewater is adequately cooled for safe discharge to the marine environment.

Wastewater from the Argentia Green Fuels Facility will be processed and discharged to the marine environment. Argentia Renewables will ensure that the wastewater contaminant concentrations are within the allowable limits for discharge as specified in Schedule A of NLR65/03: **Environmental Control Water and Sewage Regulations** under the **Water Resources Act**.

Electrolyzers used for hydrogen production typically require in-line water treatment technologies to manage and treat water used in the electrolysis process. Water treatment is crucial to ensure the quality of incoming and outgoing water, prevent equipment corrosion, and comply with environmental regulations. The pretreatment process will utilize reverse osmosis due to the Town's water supply system having low total dissolved solids (TDS) levels. Surface water sampling results from May 2023 showed significant chloride content. The chloride content necessitates dechlorination prior to electrolysis, as halogens can react with the hydrogen product. Sampling results also revealed elevated concentrations of magnesium, sodium, and calcium. The need to treat these parameters will depend on the specific requirements of the electrolyzer.

Wastewater treatment requirements will be established during the detailed design of the Project to align with the composition of wastewaters produced from the selected electrolyzer technology and will be provided to the NL Department of Environment and Climate Change (NL DECC) once available. The characterization of influent quality and quantity is subject to modification; however, estimates are provided in Section 2.3.4.2. Wastewater will be generated when the inflow water is purified before entering the electrolyzer, as well as when water and process gases interact.

Based on the detailed characterization of the effluent in Section 2.3.4.2, no parameters of concern have been identified. As a result, the wastewater is anticipated to meet the regulatory standards for discharge without necessitating additional treatment system(s) other than possible neutralization of membrane cleaning solutions. This assessment indicates that the effluent quality is within acceptable limits, thereby negating the need for extensive wastewater treatment infrastructure. However, ongoing monitoring will be implemented to ensure continued compliance and to address any potential issues that may arise in the future.

Outfall

The preferred effluent outfall location has not yet been selected. The location will be selected with a consideration of several factors, including; existing nearby outfall infrastructure, other existing marine operations, suitability of shoreline conditions, suitability of sea bottom conditions, property ownership, existing underground utilities, geotechnical conditions, pumping requirements, and cost effectiveness.

The final design of the outfall will show features and dimensions including:

- Routing and profile;
- Location of pipe discharge, including depth from surface and distance from shore;
- Pipe sizes and type;
- Joint details, including fittings/fastenings;
- Headworks structure;
- Rockfill protection in tidal zone;
- Cribbing; and
- Weight blocks and/or anchor blocks.

Existing public outfalls will not be used; however, existing industrial outfalls at the POA Property are being considered including the outfall associated with the West White Rose Project, and the outfall located at the northern end of Cooper Cove. More information regarding these outfalls can be found in Appendix B2.

2.3.1.7 Water Quality/Quantity Monitoring

Real-time water quality of incoming and outgoing water streams to and from the Argentia Green Fuels Facility will be monitored by an online analyzer. Design of the water quality and quantity monitoring systems is ongoing, and Argentia Renewables will comply with the NL Water Resources Management Division (NL WRMD), as well as Environment and Climate Change Canada (ECCC) to ensure enforceable operational requirements for industry stations are met.

Argentia Renewables will establish a Real Time Water Quality (RTWQ)/hydrometric monitoring station to provide near real time water quantity and quality information for a selected waterbody outflow within the PPWSA from which the Project will draw water. There are no existing hydrometric or RTWQ monitoring stations at any of the streams within the Town of Placentia PPWSA. The ponds have surface water intakes in Larkins Pond, Clarke's Pond, and Gull Pond. According to the National Hydro Network linear flow data, surface water ultimately flows out of the PPWSA system at the outlet of Larkins Pond (Water Resources Portal, 2024). Prior to Project construction, RTWQ/hydrometric monitoring station(s) be installed and commissioned to continuously monitor water quantity and quality at waterbodies from which the Project draws water. Station locations will be selected in consultation with NL DECC. Collected water quality and quantity data will also support the ongoing efforts by WRMD to collect grab samples from PPWSA ponds to monitor source water quality. Station design (such as equipment with digital data loggers and satellite transmission) and data quality assurance/quality control will adhere to the guidance established in the WRMD Protocols Manual for Real-Time Water Quality Monitoring in NL (2023).

The continuous collection of water quality data will be used to monitor the health of the aquatic ecosystem in the selected source waterbody and to determine timelines for specific events that occur. Moreover, this information will prove valuable to the Town of Placentia in ensuring availability of water for municipal use. As noted in Appendix W (Mitigation Measures) if it is determined based on water monitoring during Operations that Project drawdown of available water could cause a temporary water shortage or any material water quality changes to the Town of Placentia municipal water supply, Project consumption of water affecting the Placentia municipal water supply would be curtailed until this condition is no longer met.

Further specifications regarding water management and monitoring during Construction, Operation and Maintenance, and Decommissioning and Rehabilitation shall be developed as the Project progresses. A Water Management and Monitoring Plan annotated table of contents appears in Appendix C2.

2.3.1.8 Operations and Maintenance Building

Up to two operations and maintenance buildings (O&M buildings) will be constructed in the Project Area to monitor daily operations of the Argentia Green Fuels Facility and provide an area for storage of spare parts and maintenance equipment. The O&M buildings will have offices, staff parking, a workshop, parts and vehicle storage, a sewage treatment system, a storage yard, and other ancillary amenities. Water will be supplied by the Town of Placentia. Workers will produce a limited amount of solid waste (garbage and recycling) when performing maintenance and this waste will be collected and disposed of at an authorized facility. Power to the O&M buildings will be provided by the local distribution network.

2.3.2 Argentia Wind Facility

The Argentia Wind Facility will include up to 46 wind turbine sites connected by a network of access roads and electrical infrastructure. Based on the Preliminary Layout, six wind turbines will be sited on the Argentia Peninsula, four turbines will be located just south of Highway 102 near Cooper Drive, and the remaining 36 turbines will be distributed throughout the Argentia Backlands (Figure 2.3-1). A series of water supply pipelines connecting the municipal water supply to the Argentia Green Fuels Facility.

The proposed Argentia Wind Facility will be the primary source of electricity for the Argentia Green Fuels Facility. The NLH electricity grid will serve as a backup power source to ensure continued operation of the Argentia Green Fuels Facility. The electricity provided from the NLH grid is produced mainly from hydropower, therefore, the output is expected to qualify as renewable, or "green" hydrogen and ammonia. This link will be designed to enable the delivery of 10 MW of firm power and 145 MW of non-firm power. Alternatives to the Preliminary Layout are described in Section 2.4 (Alternative Methods of Carrying Out the Undertaking).

2.3.2.1 Wind Turbines

The Project electricity generation will total 300 MW of installed capacity from wind turbines located throughout the POA Property (Figure 2.3-1). The current wind turbine model for the Project is a 6.8 MW wind turbine, with a hub height of 100 - 119 m (119 assumed), and a rotor diameter of 162 m. The final wind turbine model selection is anticipated to be substantially similar to the model provided in Figure 2.3.2-1. The wind turbine towers will be constructed from tubular steel and concrete or a combination of tubular steel and concrete. Concrete hybrid towers consist of a concrete base with a transition piece towards a tubular steel top. The concrete bottom is comprised of precast high strength concrete rings, and the tubular steel top is comprised of flange joined steel sections. The rotor blades are made of fiberglass and epoxy resin. Each wind turbine will have a nacelle at the top of the tower to contain a generator, gearbox, bearings, couplings, and auxiliary equipment.

Each turbine will require a foundation and an adjacent crane pad for installation of the wind turbine components. The foundation cleared area will be approximately 100 m X 75 m. Crane pads typically measure 20 m x 30 m, with their detailed design reflecting the specific requirements of the cranes used. Following Construction, each crane pad will remain in place during Operation and Maintenance, and Decommissioning and Rehabilitation to support such activities as the removal or replacement of wind turbine components.

The 6.8 MW wind turbine is a pitch-regulated upwind turbine with a three-blade rotor. The blades consist of two airfoil shells with incorporated structure. The blade angles are optimized by a pitch control microprocessor system that constantly adjusts blade position according to ambient wind conditions. The wind turbine is powered by a magnet generator and full-scale converter. The pitch control microprocessor concept and the power system features allow each unit to operate continuously at or close to their rated power.

The 6.8 MW wind turbine is designed for medium to high sustained wind velocity sites. Operational specifications (Table 2.3.2-1) include a cut-in wind speed of 3 m/s, a cut-out wind speed of 25 m/s, and an operating temperature range between -20 °C and +45°C.

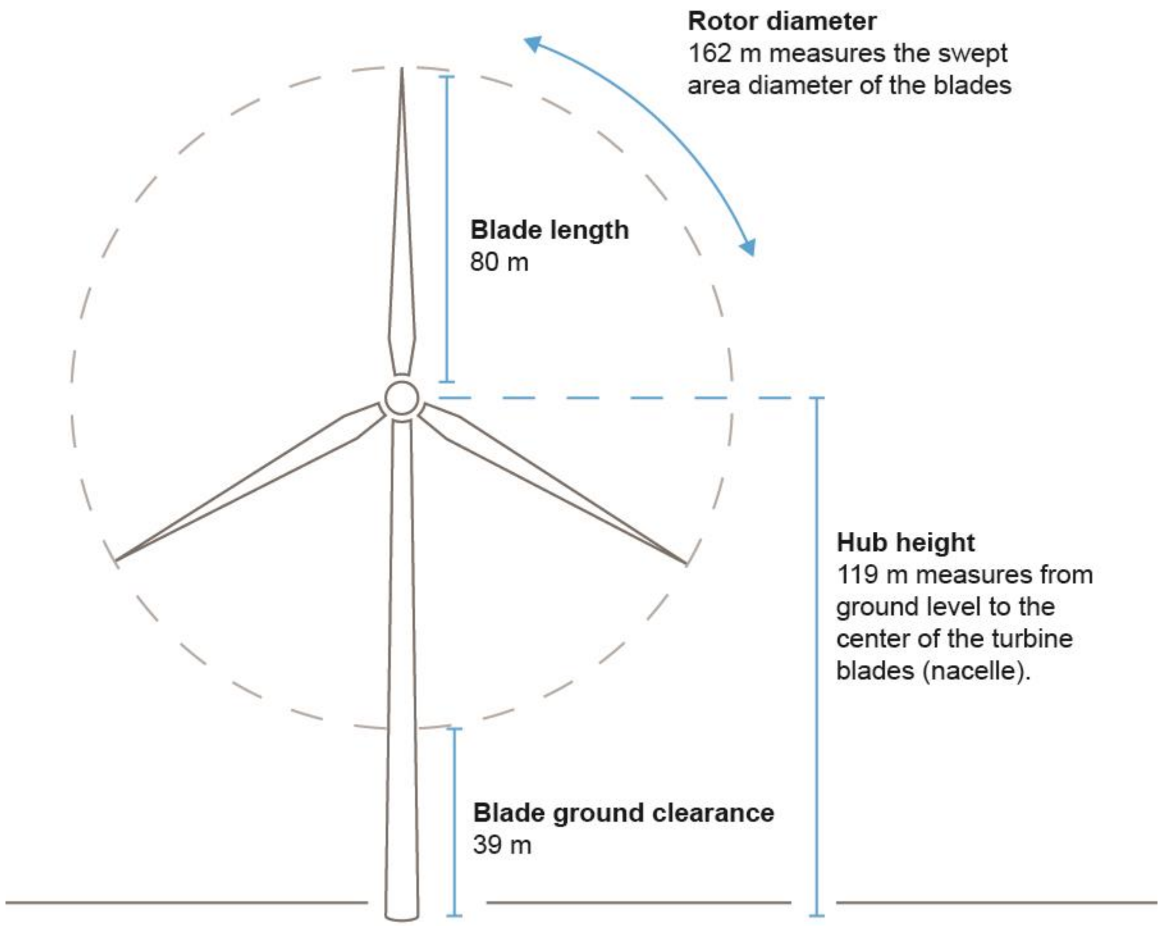


Figure 2.3.2-1 Standard Wind Turbine Profile.

Table 2.3.2-1 Wind Turbine Mechanical Design Specifications.

Wind Turbine Component	Specification
Rotor	
Rotor Diameter	162 m
Swept Area	20,612 m^2
Speed, Dynamic Operation Range	4.3 – 12.1 rpm
Rotational Direction	Clockwise (front view)
Orientation	Upwind
Tilt	6°
Hub Coning	6°
Number of Blades	3
Aerodynamic Brakes	Full feathering
Blade	
Blade Length	80 m
Maximum Chord	4.3 m
Chord at 90% blade radius	1.68 m
Type Description	Structural airfoil shell
Material	Fibreglass reinforced epoxy, carbon fibres and Solid Metal Tip
Blade Connection	Steel roots inserted
Airfoils	High-lift profile
Pitch System	
Type	Hydraulic
Number	1 cylinder per blade
Range	-20°C to +45°C
Hydraulic System	
Main Pump	Redundant internal-gear oil pumps
Pressure	Max. 260 bar
Filtration	3 µm (absolute) 40 µm in line
Hub	
Type	Ball shell hub
Material	Cast iron
Main Shaft	
Type Description	Hollow shaft
Material	Cast iron
Main Bearing Housing	
Material	Cast iron
Main Bearing	
Type	Rolling bearings
Lubrication	Oil circulation
Gearbox	
Type	2 Planetary stages
Gear House Material	Cast
Lubrication System	Pressure oil lubrication

Wind Turbine Component	Specification
Total Gear Oil Volume	900-1,100 L
Oil Cleanliness Codes	ISO 4406-/15/12
Generator Bearing	
Type	Rolling bearings
Lubrication	Oil circulation
Yaw System	
Type	Plain bearing system
Material	Forged yaw ring heat-treated. Plain bearings PETP
Yaw gear type	Multiple stages planetary gear
Yawing Speed (50 Hz)	Approx. 0.4°/sec.
Yawing Speed (60 Hz)	Approx. 0.5°/sec.
Crane	
Lifting Capacity	Max 800 kg
Towers	
Type	Tubular steel towers Concrete Hybrid Towers
Modularized Nacelle	
Main nacelle house and side compartment structure	Sheet metal structure. GRP components in roof dome and front cover.
Base frame	Cast iron

2.3.2.2 Wind Turbine Foundations

Foundation conditions will vary throughout the Project Area; hence several types of foundation designs will apply. Geotechnical evaluations will be required to determine the most suitable design for each wind turbine location. The most common foundation is expected to be rock-anchored concrete cap type (Table 2.3.2-2), with gravity cast-in-place concrete making up the remainder (Table 2.3.2-3). The latter design includes provision to accommodate buoyant conditions where groundwater presence is shallow.

Table 2.3.2-2 Rock-Anchored Foundation Design Quantities.

<table>
<tr><td rowspan="5">Concrete</td><td rowspan="3">Base</td><td>Diameter (m)</td><td>14.5</td></tr>
<tr><td>Thickness (m)</td><td>3</td></tr>
<tr><td>Total Structural Volume (m³)</td><td>462</td></tr>
<tr><td rowspan="2">Min. Lean Concrete</td><td>Thickness (m)</td><td>0.3</td></tr>
<tr><td>Volume (m³)</td><td>54</td></tr>
<tr><td rowspan="5">Rock Anchors</td><td colspan="2">Number</td><td>24</td></tr>
<tr><td colspan="2">Diameter (mm)</td><td>64</td></tr>
<tr><td colspan="2">Length (m)</td><td>15.24</td></tr>
<tr><td colspan="2">Bonded Length (m)</td><td>7.5</td></tr>
<tr><td colspan="2">Pre-Stress Load (kN)</td><td>2,100</td></tr>
<tr><td rowspan="2">Reinforcement</td><td colspan="2">Density (kg/m³)</td><td>150</td></tr>
<tr><td colspan="2">Quantity (kg)</td><td>69,300</td></tr>
<tr><td rowspan="2">Earthworks</td><td>Excavation</td><td>Volume (m³)</td><td>864</td></tr>
<tr><td>Backfill</td><td>Volume (m³)</td><td>381</td></tr>
</table>

Table 2.3.2-3 Gravity Foundation Design Quantities.

<table>
<tr><th colspan="3">Foundation Type</th><th>Non-Buoyant</th><th>Buoyant</th></tr>
<tr><td colspan="3">Groundwater Level Below Existing Grade (m)</td><td>>3.1</td><td>0.3</td></tr>
<tr><td colspan="3">Top of Concrete (TOC) Elevation Above Existing Grade (m)</td><td>0.5</td><td>0.9</td></tr>
<tr><td rowspan="10">Concrete</td><td rowspan="4">Base</td><td>Diameter (m)</td><td>23.5</td><td>27.0</td></tr>
<tr><td>Thickness (m)</td><td>2.5</td><td>2.7</td></tr>
<tr><td>Toe Thickness (m)</td><td>0.5</td><td>0.5</td></tr>
<tr><td>Volume (m³)</td><td>618</td><td>843</td></tr>
<tr><td rowspan="3">Pedestal</td><td>Diameter (m)</td><td>7</td><td>7</td></tr>
<tr><td>Thickness (m)</td><td>1.1</td><td>1.5</td></tr>
<tr><td>Volume (m³)</td><td>42</td><td>58</td></tr>
<tr><td colspan="2">Total Structural Volume (m³)</td><td>660</td><td>901</td></tr>
<tr><td rowspan="2">Min. Lean Concrete</td><td>Thickness (m)</td><td>0.1</td><td>0.1</td></tr>
<tr><td>Volume (m³)</td><td>51</td><td>66</td></tr>
<tr><td rowspan="2">Reinforcement</td><td colspan="2">Density (kg/m³)</td><td>100</td><td>100</td></tr>
<tr><td colspan="2">Quantity (kg)</td><td>66,000</td><td>90,100</td></tr>
<tr><td rowspan="2">Earthworks</td><td>Excavation</td><td>Volume (m³)</td><td>2,079</td><td>2,814</td></tr>
<tr><td>Backfill</td><td>Volume (m³)</td><td>1,430</td><td>2,645</td></tr>
</table>

2.3.2.3 Electrical Infrastructure

Electrical infrastructure will be required to collect power generated by the Argentia Wind Facility, transmit the power to the Argentia Green Fuels Facility, as well as to transmit power from the NLH grid to the Argentia Green Fuels Facility, when required.

Energy generated at each wind turbine site will be conveyed by a series of low voltage (34.5 kV) Collector Lines that run to a substation in the Argentia Backlands (the Argentia Backlands Substation). Approximately 39 km of overhead lines with approximately 8 km of underground in/out cabling will be used to connect the Collector Lines System to the turbine sites. The overhead portions of the system will have a single wood pole design. Substantial bedrock exists in Argentia, and soil conditions may not be suitable for a trenched system, therefore final differences between overhead and underground configurations will be refined based on additional geotechnical work. For that reason, the Collector Lines System is mostly planned as an above-ground system to limit the extent of drilling and blasting of cable trenches.

There will be two electrical substations located in the Project Area, one in the Argentia Backlands and the other on the Argentia Peninsula. The Collector Lines will connect to the Argentia Backlands Substation, where the generated power will be increased to transmission voltage (230 kV) to reduce energy loss due to resistance that occurs over long distances. The Project Green Fuels Generation Interconnect Line (Project Gen-Tie), a high voltage (230 kV) overhead powerline, will transmit the power from the Argentia Backlands Substation to the Argentia Peninsula Substation. The Argentia Peninsula Substation will decrease power to distribution voltage (34.5 kV) to provide energy for use in the Argentia Green Fuels Facility and ancillary buildings. In this way, the Argentia Wind Facility will connect to the Argentia Green Fuels Facility “behind the meter”. Both substations have an overhead bus design which includes main power transformers (with containment), high and medium voltage breakers, disconnects, surge arrestors, fencing, lighting, instrumentation, a station service transformer, and a control building. The Argentia Backlands Substation is anticipated to have two 230-34.5 kV power transformers, a capacitor bank, and a radial high voltage breaker present. The Argentia Peninsula Substation is expected to have two 230-34.5 kV power transformers and one 34.5-15 kV power transformer present.

The Project Interconnect Line will be approximately 35 km long and will connect the NLH Long Harbour Terminal Station to the Argentia Backlands Substation to transmit electricity from the Island Interconnected System to the Project, when required. The Project Interconnect Line will match the voltage of the NLH TL208 transmission line (230 kV). Utility poles will be H-frame wood poles with 3-pole dead-ends and heavy angles, with a ruling span of 80 m.

The Preliminary Layout provided in Figures 2.3-1 and 2.3-2 include the current design configurations of the collector lines, substations, and transmission lines. The Project Interconnect Line generally follows a corridor along an existing Newfoundland Power 69 kV powerline right-of-way to the Long Harbour

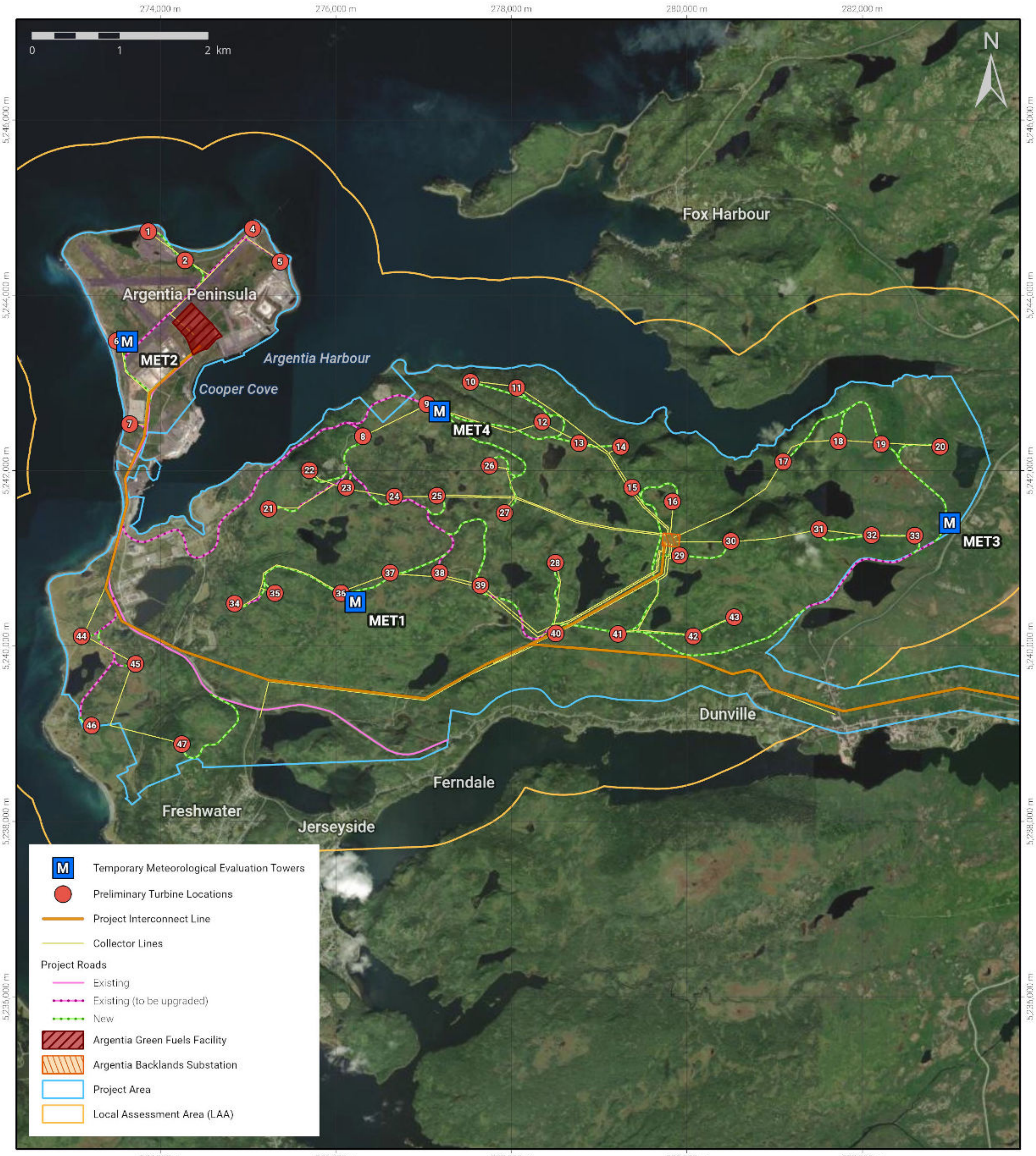
Terminal Station. The Collector Lines System preliminary layout was produced by Capacitated Minimum Spanning Tree analysis with ten circuits connecting to the Argentia Backlands substation and two circuits connecting to the Argentia Peninsula Substation, with a maximum of four turbines per circuit and a capacity of 27.2 MW per circuit.

2.3.2.4 Project Access Roads

Access roads will be required for construction, operation and maintenance, and decommissioning and rehabilitation phases of the Project. Figure 2.3-1 provides an overview of the Project road infrastructure and categorizes the road network into new roads, existing roads that will not be upgraded, and existing roads that will be upgraded. Road stream crossings will be designed for 1:100-year climate change flows to avoid waterlogging and drainage issues in the project area. One of the key design considerations for road placement is the transportation of cranes, wind turbine components, and foundation components to each site. The current estimate is for 42 km of new gravel roads to be constructed, and the upgrade of 6.5 km of existing gravel roads and 1.5 km of existing paved road. Access roads will range in width from 5 to 20 m and be designed to avoid or reduce negative environmental effects (i.e., maintaining local drainage patterns and reducing width of disturbance). Project access roads are further discussed in Appendix E (Transportation Impact Study).

2.3.2.5 Meteorological Evaluation Towers

Meteorological measurements are necessary for the accurate quantification of the available energy from the Argentia Wind Facility. The collected data includes wind speed and direction, air temperature, barometric pressure, and relative humidity. Four temporary meteorological evaluation towers (METs), which are 60 - 80 m in height above ground surface, have been installed in the Project Area as shown in Figure 2.3.2-2. Ground-based remote sensors, commonly referred to as LiDAR (Light Detection and Ranging), have also been installed. Two permanent METs will be installed with the turbines, and these shall remain with the Project through its lifetime for performance monitoring, resource forecasting, and to satisfy grid offtaker requirements. The permanent MET masts are typically self-supported, painted and lit steel lattice structures with a height equal to the hub height of the turbines (currently 119 m). These permanent structures have an approximate base footprint of 15 m x 15 m and no guy wires. The locations of the permanent METs will be determined during a later phase of the Project design.

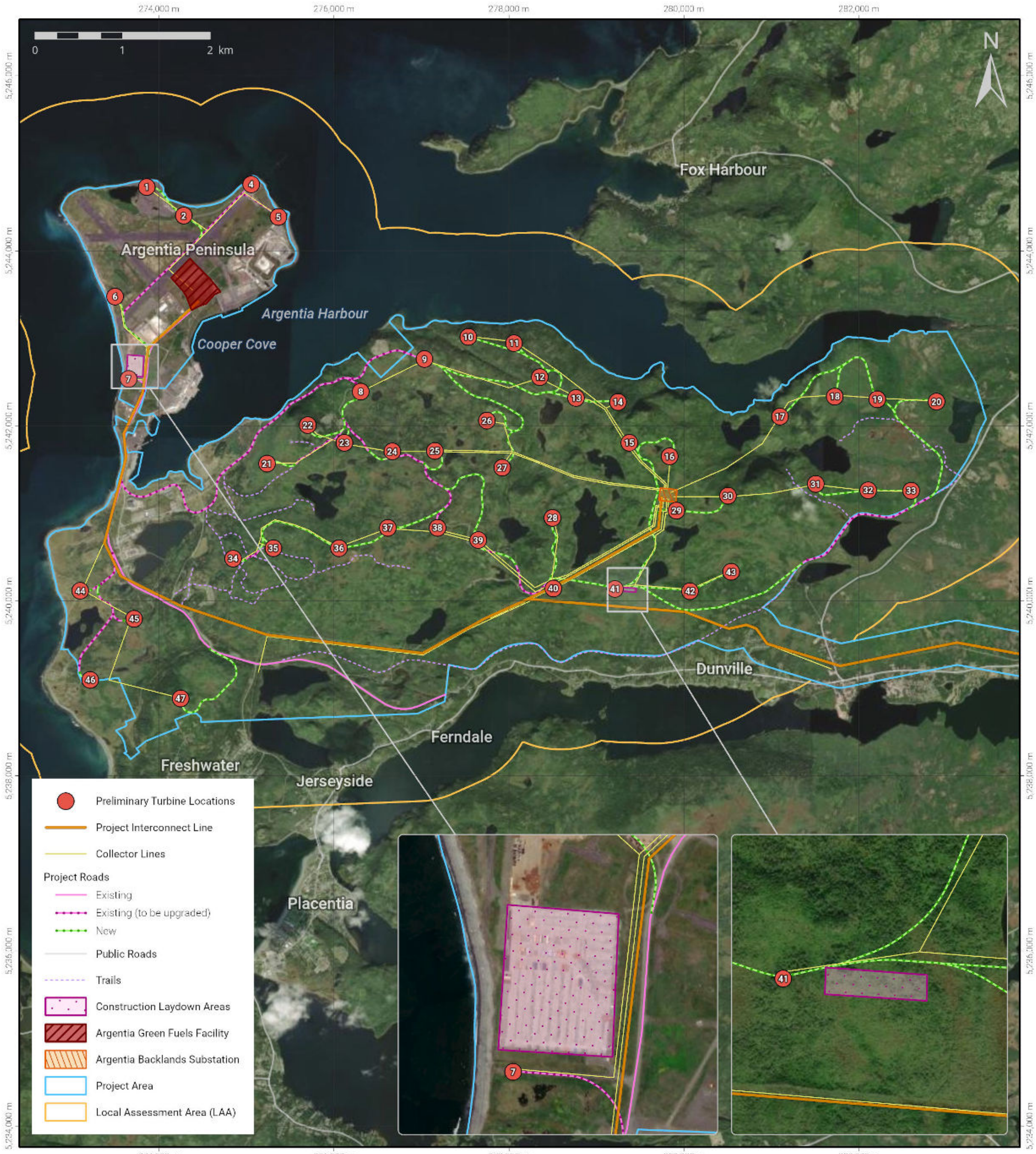


Pattern | Argentia Renewables	FIGURE NUMBER: 2.3.2 - 2	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/25
	FIGURE TITLE: Locations of Temporary Meteorological Evaluation Towers	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change.	REVIEWED BY:	
			APPROVED BY:	
	PROJECT TITLE: Argentia Renewables		sem	

SEM MAP ID: 238-005-GIS-C06-Rev1

2.3.2.6 Laydown Areas

Temporary construction compounds and laydown areas will be needed for general construction activities and the temporary storage of wind turbine components, electrical equipment such as cable reels and pad-mounted transformers, construction materials and equipment, vehicles, office trailers, a concrete batch plant, crusher(s), and portable toilets. The existing available POA Property on the Argentia Peninsula will be used extensively to reduce the need for additional terrain disturbance. At the Argentia Backlands, however, an area comprising six ha will be required. The anticipated configurations of laydown areas are provided below in Figure 2.3.2-3.



Pattern | Argentia Renewables	FIGURE NUMBER: 2.3.2 - 3	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/25
	FIGURE TITLE: Location of Construction Laydown Areas	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change.	REVIEWED BY:	
			APPROVED BY:	
	PROJECT TITLE: Argentia Renewables		sem	

SEM MAP ID: 238-005-GIS-C07-Rev1

2.3.3 Construction

The Project construction phase will include the installation of wind turbines, electrical infrastructure, water collection systems, access roads, hydrogen electrolyzers and storage, ammonia synthesizer units and storage, maintenance buildings, and other supporting infrastructure for the Argentia Green Fuels Facility and the Argentia Wind Facility. The key features of Project Construction are summarized in Table 2.3.3-1.

Comprehensive planning and design activities were conducted, including the collection of required site-specific information. These surveys characterize a variety of site conditions. Major studies include geotechnical surveys to analyze soil and foundation conditions, installation and operation of meteorological towers to gather critical weather data and environmental surveys to establish baseline conditions. Wind turbine site selection, infrastructure routing, and wind turbine foundation design are dependent on the results of these surveys.

A wind resource assessment began in late 2022 and is ongoing through 2024 to determine the average wind speeds, wind direction, and frequency of high wind events. Specifications for wind turbines, such as rotor diameter, hub height, and power capacity, will be made based on the site's conditions, while also considering reliability, efficiency, and cost.

Table 2.3.3-1 Key Metrics Associated with the Construction of the Project.

Key Metrics	Estimated Quantity
Total Road Length	1.5 km of paved road upgrades, 6.5 km of gravel road upgrades, and 42 km of new gravel roads
Number of Wind Turbine Sites	46
Wind Turbine Major Component Deliveries	352 deliveries via marine vessel for nacelles, hubs, blades and towers
Wind Turbine Site Laydowns	6 ha
Concrete	23,520 m^3 (foundations), 425 m^3 (substations), 113 m^3 (building)
Common Excavation	238,000 m^3 (gravel roads), 115,500 m^3 (turbine areas), 12,000 m^3 (Port laydown and staging area), 25,000 m^3 (Backlands laydown), 56,600 m^3 (foundations), 4,150 m^3 (substations), 1,500 m^3 (yard)
Rock Excavation (Quarried)	133,500 m^3 (gravel roads), 69,300 m^3 (turbine areas)
Crushed Aggregate	5,830 m^3 Argentia Green Fuels Facility and 144,740 m^3 Argentia Wind Facility
Bulk Explosives	250,000 kg
Person Hours	3,848,000
Construction Duration	29 months for the Argentia Green Fuels Facility and 22 months for the Argentia Wind Facility

Once the initial planning and design are completed, and approvals issued by regulatory agencies, Project Construction will commence. Initial efforts will focus on the preparation of infrastructure such as the construction of access roads, installation of above and below-ground collector lines and substations for the electrical transmission system, installation of temporary infrastructure, such as wind turbine staging areas, construction compounds, and laydown areas, and construction of necessary support facilities.

Temporary laydown and storage areas will be established to accommodate the placement of various construction materials and equipment. The establishment of infrastructure for the Argentia Wind Facility component of the Project requires transportation and storage of Project materials and equipment, wind turbine foundation construction, wind turbine tower assembly, and wind turbine installation. Foundation installation for wind turbines involves excavation, concrete pouring, and installation of anchors. Soil conditions, wind loads, and seismic activity need to be factored into the foundation design. Foundations will be built for stability and longevity. The towers will be assembled on-site and firmly anchored to the foundation. For the rotors to reach optimal wind speed, each tower must be of a prescribed height and able to accommodate anticipated wind loads. The wind turbine components (rotor, gearbox, generator, control systems) must be transported to each site and installed following the manufacturer's instructions.

The development and design phase will guide the construction of the hydrogen and ammonia facility components, ensuring alignment with the availability of necessary resources. The establishment of infrastructure for the Argentia Green Fuels Facility involves an array of construction activities. These encompass the construction of essential electrical infrastructure, installation of critical components such as the Haber-Bosch reactor and electrolyzer, piping systems, and deployment of the air separation unit, nitrogen compressors, and an emergency power generation unit. The particulars of the Project also include the installation of the ammonia synthesis unit, the refrigeration unit, and the ammonia storage tank, accompanied by a boil-off unit. The installation of process flare and storage flare units is integral to the facility's safety and operational protocols.

The Project will employ approximately 960 full-time equivalent positions (50 hr/week) for construction and on-site assembly work during peak construction activities, requiring a variety of skills. Section 3.1.6.1 Project Occupations provides a detailed list and categorization of occupations anticipated during the construction phase according to the National Occupational Classification (NOC) 2021.

2.3.3.1 Emissions and Energy Use

The Project construction phase will generate noise, vibration, and light emissions (Table 2.3.3-2). Construction Phase noise, vibration and light emission assessments are detailed further in Appendix J (Noise and Vibration Impact Assessment) and I (Light Impact Assessment). The Noise and Vibration Impact Assessment evaluates potential noise and vibration impacts from the Project based upon the largest potential wind turbine model that is being considered for the Project. This turbine model corresponds to an anticipated greatest potential level of sound and vibration relative to receptors in the

Project area. The purpose of evaluating the Project's noise and vibration impacts relative to the largest potential turbine model is to take a conservative approach to impact assessment.

Table 2.3.3-2 Noise, Vibration and Light Emission Sources: Project Construction.

Emission	Source
Light	Mobile equipment headlights, portable construction lighting
Noise	Operation of mobile equipment and small stationary construction equipment (e.g., generators, compressors, compactors, etc.), blasting activities
Vibration	Operation of mobile equipment and small stationary construction equipment (e.g., generators, compressors, compactors, etc.), blasting activities, site works (e.g., pile driving, site preparation, road construction, etc.)

The ranges of intensity of noise and light emissions are provided in Table 2.3.3-3; vibration emissions are assumed to be negligible during Project construction.

Table 2.3.3-3 Intensity of Noise and Vibration Emissions: Project Construction.

Emission	Metric	Range	Unit
Light	Luminous flux	5,200 - 85,000	Lumen (lum)
Noise	Sound power level	87 - 145	A-weighted decibel (dBA)

Project construction activities are not anticipated to generate sustained periods of low-frequency noise (LFN). LFN has frequency content ranging between 16 and 200 hertz (Hz), and is not well perceived by the human ear and is experienced instead as vibrations (Health Canada, 2017).

Additionally, Project construction activities will release carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen oxides (NO_x), and particulate matter (PM) to air. Emissions to air are generated via non-combustion and combustion processes, as detailed in Table 2.3.3-4.

Table 2.3.3-4 Air Emission Sources: Project Construction.

Emission	Source
Carbon Dioxide (CO_2)	Operation of mobile and stationary construction equipment, blasting
Methane (CH_4)	
Nitrous Oxide (N_2O)	
Carbon Monoxide (CO)	
Sulfur Dioxide (SO_2)	
Nitrogen Oxides (NO_x)	
Particulate Matter (PM)	Operation of mobile and stationary construction equipment, blasting, wind erosion of exposed surfaces (e.g., stockpiles, laydown areas), material handling, unpaved roads

CO_2, CH_4 and N_2O are greenhouse gases (GHGs) that directly contribute to climate warming. CO, SO_2, NO_x and PM are considered air pollutants; some air pollutants are indirect GHGs that contribute to climate warming by influencing atmospheric chemistry. Nitrogenous air contaminants were divided into two categories since N_2O is a direct GHG and NO_x are indirect GHGs. Key components of NO_x include nitric oxide (NO) and nitrogen dioxide (N_2O). Particulate matter referenced in Table 2.3.3-5 considers three size fractions: (1) fine particulate matter; (2) coarse particulate matter; and (3) total suspended particulate (TSP). Fine particulate matter is defined as particles with diameters less than or equal to 2.5 microns ($PM_{2.5}$) while coarse particulate matter is less than or equal to 10 microns (PM_{10}).

The primary source of air emissions released during Project construction is related to fossil fuel combustion in stationary and mobile equipment in the Project Area. Outside of the Project Area, fossil fuel (i.e., diesel) combustion will be required in marine vessels for the transport of major components from manufacturers. Annual fuel consumption requirements and associated GHG emissions for Project construction are provided in Table 2.3.3-5. GHG emissions are provided in terms of carbon dioxide equivalents (CO_2e), the sum of emissions of CO_2, CH_4, and N_2O following standardization by global warming potentials (GWPs) for each GHG. Emission calculation methodology, associated assumptions, and rationale is provided in Appendix H (Energy and Emissions Study). Appendix H also details indirect emissions and emissions generated from less dominant sources (i.e., non-fossil fuel related emissions).

Table 2.3.3-5 Annual Fuel Consumption and Emissions: Project Construction.

Construction Activity	Annual Fuel Consumption (L)	Annual GHG Emissions (tonnes CO2e)
Within Project Area[1]		
Stationary Combustion	182,862	1,531
Mobile Equipment	2,342,912	6,426
Outside of Project Area[2]		
Marine Transport	80,000,000[3]	172,223

[1] Projected to occur across two calendar years.
[2] Projected to occur across one calendar year.
[3] Provided as an estimate based on assumed routes and fleet, further details on estimation methods provided in Appendix H.

Within the Project Area, annual fuel consumption demand is dominated by mobile equipment during the construction phase. A list of key construction equipment is provided in Table 2.3.3-6. Emissions by mobile equipment category are provided in Appendix H.

Table 2.3.3-6 Equipment List: Project Construction.

Equipment Category		
Argentia Wind Facility	**Argentia Green Fuels Facility**	
Articulated Truck	Backhoe	Explosive Fasteners
Boom Truck	Compactor	Fork Truck
Bulldozer	Bulldozer	Generator
Compactor	Pickup Truck	Grinders and Cutters
Concrete Load Truck	Impact Pile Driver	Jack Hammers
Concrete Truck	Hydraulic Rock Breakers	Manlift
Crane	Vibratory Hammer	Welder
Drill	Flat Bed Truck	
Excavator	Concrete Truck	
Fuel Truck	Concrete Pump Truck	
Grader	Crane	
High Deck Trailer	Air Tracks (blasting)	
Loader	Backhoe	
Pickup Truck	Blasting Equipment	
Skid Steer	Compressor	
Telehandler	Concrete Saws	
Water Truck	Concrete Vibrators	

2.3.4 Operation and Maintenance

The operation and maintenance phase of the Project is anticipated to require a labour force of an estimated 51 full-time equivalent positions for the Argentia Green Fuels Facility. The Project will employ approximately 14 workers for the Argentia Wind Facility. Argentia Wind Facility staff will include a variety of service technicians including wind turbine monitors, geotechnical technicians for access road maintenance, electrical, electronics, and computer technicians for electrical transmission system, as well as engineers who will oversee operation of wind turbines and meteorological data acquisition. Section 3.1.6.1 Project Occupations provides a breakdown and listing of job categories, NOC designation, and number of occupations expected during the operation and maintenance phase according to the NOC 2021.

Regular maintenance is crucial for sustaining the efficiency and longevity of the Argentia Green Fuels Facility. Routine inspections will be conducted to detect faults in the equipment, especially piping, storage facilities, and related infrastructure. This can trigger changing out catalysts, replacing aged process equipment, and repairing or replacing damaged process components.

Argentia Wind Facility maintenance activities will include regularly scheduled monitoring of performance leading to updates to equipment and preventative maintenance and repairs. To ensure that all parts of the Argentia Wind Facility are inspected and maintained on a regular basis, a maintenance schedule will be developed and followed. Data collected during operation of the Argentia Wind Facility will be analyzed to find trends and improve performance. This includes monitoring energy output, availability, and reliability of the wind turbines. A key objective is the avoidance of unplanned outages. These will be reduced through timely identification of changes in wind turbine performance. Continuous monitoring of wind speed and direction, air temperature, atmospheric pressure, electricity generation, and turbine performance will ensure optimal performance of the Argentia Wind Facility.

All components of the Argentia Wind Facility will be routinely inspected and serviced. The wind turbines will undergo regular inspections of the rotor, gearbox, and other crucial parts. Regular maintenance will be performed, including, cleaning and lubricating moving parts, checking electrical connections, and inspecting structural components. The manufacturer's recommendations and the Argentia Wind Facility operating conditions will serve as the foundation for the preventative maintenance schedule. The Argentia Wind Facility will be upgraded regularly to increase effectiveness and performance. This activity will include replacement of worn or damaged components, repair of electrical faults, troubleshooting control systems, and installing new technologies. Comprehensive documentation will be kept for all maintenance, repairs, and upgrades. The performance and maintenance of the Argentia Wind Facility such as road maintenance will be tracked using these records, and they will be reviewed regularly to pinpoint potential improvement areas.

Safety is of the highest priority for the Project, including the operation and maintenance of the Argentia Wind Facility. All personnel will receive regular safety training and follow the safety procedures in place. This includes checking that the wind turbines are free of hazardous debris and that all electrical components are grounded correctly. Emergency procedures will be in place to address equipment failure or other unplanned events. The Argentia Green Fuels Facility will adhere to industry safety standard operations and maintenance processes. The Argentia Wind Facility will be operated and maintained in a way that protects both people and the natural environment.

Preventative measures are necessary to inspect, maintain, and repair electrical systems safely and efficiently. Vegetation control methods may be implemented around transmission lines and substations to prevent damage to infrastructure and minimize any potential for contact with electric conductors. Along the 230kV interconnection with the NLH grid, clearing trees and excessive vegetation will be the responsibility of NLH. The objective of vegetation management is to remove potentially hazardous vegetation (spruce, fir, juniper, birch, and alder) and promote the growth of low-lying plant species (shrubs, grasses, and berries) to ensure reliability and safety objectives are met while minimizing potential environmental effects. Vegetation management techniques include application of selective (approved) herbicides in conjunction with manual brush clearing and tree trimming. Selective herbicides use drastically reduces the likelihood of power outages, fire hazards, and safety risks (Newfoundland Labrador Hydro, n.d.).

Produced ammonia will be stored between the arrival and loading of ammonia carrying vessels. The capacity of the storage tank will be paired with the shipping schedule for the ammonia product, currently estimated at 30 days of production. Liquified ammonia will be stored on-site in a 15 kt tank at its saturation temperature at atmospheric pressure. The storage capacity of the ammonia tank is designed to contain approximately 40 days of 400 tpd ammonia production. The buffering tank will provide operational control of the feed of hydrogen to the ammonia plant.

The extra storage capacity will serve as a reserve to handle contingencies and delays in maritime operations. The storage tank will be double walled, double integrity type, which consists of an inner and outer tank with insulation in annular space between the two tanks or on the outer tank. Storage tanks will be equipped with a deluge system. Since ammonia has a saturation temperature of -32°C, heat from the atmosphere will be absorbed by the contents of the tank. The evolved vapours will be sent to a boil-off unit, where they will be chilled and then returned to the tank to maintain the saturation temperature.

A continuously circulating transfer line will move ammonia from the storage tanks to the Loading Facility at the Argentia Peninsula dock. The loading mechanism will consist of a vendor supplied package of up to two loading arms. Liquid ammonia will be transferred to a refrigerated marine transport vessel which is headed for international markets. The Loading Facility dockside arrangement may be adjusted pending further design discussions with the POA, as described in Section 2.4.1.6.

Water supply for the Project will be obtained from the Town of Placentia PPWSA, which would require connection to the town's water infrastructure. Water treatment will involve dechlorination and reverse osmosis. The selected alkaline electrolyzer technology will determine the precise requirements of the feedstock water. Dechlorination is necessary prior to electrolysis since halogens will contaminate the hydrogen product.

The Argentia Green Fuels Facility will implement a closed loop system for equipment drainage. The following four water collection systems are assumed to be included in the wastewater treatment design such that direct discharge is permitted (contaminated water is subject to a wastewater stripper before being released):

- Clean Storm Water System drains to a clean storm water pond from both process and non-process areas. The collected water is to be pumped to the sea at the east side of the peninsula.

- Potentially Contaminated Sewer System – Surface runoff from potential contaminated process areas is drained into a potentially contaminated storm water pond. The pond is intended to hold ammonia-containing water from emergency spillage, spent fire water, storm events, and water from the diked impoundment of the ammonia storage tanks. If there is an ammonia release from the storage tanks, the pond design must have mechanisms for the environmentally safe evaporation of the ammonia and foam that is added to the pond, as well as for the potential foam and water application emergencies. All effluent in this stream will be regularly sampled and analysed before being released into the environment. The electrolyzer water purification system will likely combine with the contaminated sewer system.

- Oily Water Sewer System – Potentially contaminated water from machinery houses is drained to nearby oily sumps. The collected water will be pumped to an effluent treatment plant oily water tank.

- Sanitary Water System – Sanitary water is emptied into a sanitary water tank from outlying buildings with kitchens, sinks, showers, and restrooms. The collected water is pumped to a sanitary sewage treatment plant.

2.3.4.1 Emissions and Energy Use

The ‘Noise and Vibration Impact Study’ (Appendix J) evaluated cumulative noise and vibration emissions from the concurrent operation of the Argentia Wind Facility and Argentia Green Fuels Facility for the lifetime of the Project. The study modelled sound and vibration levels at sensitive receptors with the greatest potential exposure to Project noise. The largest potential wind turbine model that is being considered for the Project was used in the modelling exercise as it corresponds to an anticipated greatest potential level of sound and vibration relative to sensitive receptors. Noise sources for Project operation are outlined in Table 2.3.4-1. Both A-weighted sound power level (dBA) by octave band in hertz (Hz) and total sound power level (dBA) are provided for each noise source. As a conservative measure, it was assumed that all noise sources will operate outside (i.e., not enclosed in buildings or structures).

For the most part, noise emissions will be constrained to the Project Area. The geographic reach of noise beyond the Project Area is detailed in Appendix J. The acoustic environment in the Local Assessment Area is not anticipated to change significantly because of Project operation and maintenance activities. Total (i.e., baseline plus Project) day-night average sound levels will deviate slightly from baseline levels, but will continue to comply with limits set forth by Health Canada (Health Canada, 2017). Modeling data was used to assess whether low frequency noise (LFN) will be generated by wind turbines. Per calculations performed as part of the Noise and Vibration Impact Study (Appendix J), LFN is not anticipated to be an issue at identified sensitive receptors.

Project operation and maintenance activities are not anticipated to generate substantial vibration emissions. A minimum setback to sensitive areas of 550 m will be maintained around all potential vibration sources to ensure that vibration effects are not experienced by receptors (FPT Committee on Health and the Environment Working Group on Wind Turbine Noise, 2012).

Table 2.3.4-1 Noise Sources: Project Operation and Maintenance.

Source	A-weighted sound power level (dBA) by Octave Band (Hz)									Total Sound Power Level (dBA)
	31.5	63	125	250	500	1,000	2,000	4,000	8,000	
Argentia Wind Facility										
Wind Turbine [1]	81.0	91	99	104	105	104	100	93	83	110
Argentia Green Fuels Facility										
Cooling Water Tower	39	52	60	77	72	77	79	79	75	85
Cooling Water Tower Vent	35	45	56	72	64	69	70	68	61	77
Nitrogen Compressor	65	79	92	101	110	123	129	122	114	131
Electrolyser Compressors 1	38	52	65	74	83	96	102	95	89	104
Electrolyser Compressors 2	49	63	76	85	94	107	113	106	98	115
Ammonia Air Coolers	81	97	107	111	114	113	111	108	98	119
Transformers [2]	70	89	101	103	109	106	102	97	88	112
Boil Off Gas Compressors	46	60	73	82	92	104	110	103	95	112
Tank Flare	81	91	108	111	114	117	116	115	109	122
Ammonia Flare	81	91	108	111	114	117	116	115	109	122
Piping Valves 1	41	53	60	69	78	93	96	99	97	103
Piping Valves 2	41	53	60	69	78	93	96	99	97	103
Piping Valves 3	41	53	60	69	78	93	96	99	97	103
Turbine Glycol Chiller	74	86	91	92	95	92	90	90	85	100
Turbine Combustion Intake	51	67	79	86	91	93	92	89	82	98
Diesel Generator 1	0	81	86	86	89	83	80	74	67	93
Diesel Generator 2	0	81	86	86	89	83	80	74	67	93

[1] Sound pressure level at hub height.
[2] Tonality was detected in the transformer sound spectrum, and thus, in accordance with the Health Canada Guidance, a +5 dBA tonal penalty has been applied.

Permanent lighting will be required for infrastructure in the Argentia Wind Facility and Argentia Green Fuels Facility. Turbines in the Argentia Wind Facility will be equipped with navigation light fixtures, as necessary, to satisfy requirements of the Transport Canada Standard 621 – Obstruction Marking and Lighting (Canadian Aviation Regulations). Other sources of light include mobile equipment required for the operation and maintenance of both facilities and permanent lighting on Argentia Green Fuels Facility Infrastructure. Geographic reach of light emissions will be limited; it is assumed that 50% of incident light will not extend beyond the Project Area due to directionality and line of sight obstructions, namely thick tree cover in the area. Based on surrounding woodland and topographic changes, the true quantity of light blocked will be much higher (i.e., greater than 90%), especially when foliage is in full bloom.

In addition to artificial light, the Project will generate shadow flicker (SF). SF occurs when sunlight shines through rotating wind turbine blades, generating pulsating light and shadow (Haac *et al.*, 2022). SF most commonly occurs in the morning and evening hours when the sun is at the horizon (i.e., sunrise and sunset). SF intensity diminishes with increasing distance from wind turbines; thus, SF is most noticeable to receptors closest to the turbines.

Operation and maintenance activities will generate combustion and non-combustion process emissions to air over the lifetime of the Project. Combustion process emissions will arise as a result of fossil fuel combustion in mobile equipment, emergency generator, and flare stacks. Non-combustion process emissions will be discharged to the atmosphere via venting to maintain equilibrium of the Argentia Green Fuels Facility. The facility will be designed such that outputs are vented to a safe location. Oxygen produced in the electrolyzer is not required for the ammonia production process and will be vented to the atmosphere. The air separation unit (ASU), used to extract nitrogen from ambient air for use in the ammonia production process, will vent oxygen and trace amounts of argon to the atmosphere. The stream of ambient air used in the ASU will be purified through molecular sieve beds, which will remove contaminants from the stream. As such, local air quality will not change due to ASU outputs (i.e., oxygen and trace argon) to the atmosphere.

Table 2.3.4-2 details air emission sources generated during Project operation and maintenance. In addition to species emitted during Project construction, nominal emissions of volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs) will be generated during operation and maintenance activities.

Table 2.3.4-2 Air Emission Sources: Project Operation and Maintenance.

Emission	**Source**
Combustion Processes	
Carbon Dioxide (CO_2)	Operation of mobile equipment and emergency generator, flare stacks
Methane (CH_4)	
Nitrous Oxide (N_2O)	
Carbon Monoxide (CO)	
Sulfur Dioxide (SO_2)	
Oxides of Nitrogen (NO_x)	
Particulate Matter (PM)	Operation of mobile equipment and emergency generator, flare stacks, unpaved roads
Volatile Organic Compounds (VOCs)	Operation of emergency generator
Polycyclic Aromatic Hydrocarbons (PAHs)	
Non-combustion Processes	
Oxygen (O_2)	Operation of electrolyzer and air separation unit
Argon (Ar)	Operation of air separation unit
Water vapour (H_2O)	Operation of steam boiler

Air emission sources listed in Table 2.3.4-2 account for those generated within the Project Area. Emissions will also be generated by marine transport of the end product and electricity consumption, which are both generated outside of the Project Area.

The primary source of air emissions released during Project operation and maintenance is related to fossil fuel combustion in mobile equipment, emergency generator, and flare stacks, as well as marine transport. Annual fuel consumption requirements, along with GHG emissions associated with fuel combustion, are provided in Table 2.3.4-3. Emission calculation methodology and rationale is provided in Appendix H (Energy and Emissions Study). Appendix H also details indirect emissions and emissions generated from less dominant sources (i.e., non-fossil fuel related emissions).

Table 2.3.4-3 Annual Fuel Consumption and Emissions: Project Operation and Maintenance.

Operation and Maintenance Activity	Fuel Type	Annual Fuel Consumption (L)	Annual GHG Emissions (tonnes CO_2e)
Within Project Area			
Mobile Equipment	Diesel	17,400	48
Emergency Generator	Diesel	307,200	826
Flare Stacks	Propane	16,915,862	101
Outside of Project Area			
Marine Transport	Diesel	62,000,000[1]	19,393
[1] Provided as an estimate based on assumed routes and fleet.			

Emissions from emergency generator use within the Project Area are overestimated. As a conservative measure, it was assumed that annual usage would not exceed 100 hours of use per year for the lifetime of the Project. However, it is possible that the emergency generator may not be required at all in a given year, thereby significantly reducing annual emissions. Since the NLH grid has not yet transitioned to 100% renewable power, GHG emissions associated with electricity consumption must be considered. It was estimated that 1,489 tonnes of CO_2e will be emitted as a result of NLH grid consumption. As a conservative measure, it was assumed that 10 MW of firm power will be required each year (i.e., 8,760 hours), resulting in 87,600 megawatt hours (MWh) per year.

The Argentia Green Fuels Facility will be equipped with flare systems to mitigate, prevent, and disperse releases of off-gases from the ammonia production and storage areas. Flare tips will be continuously lit with a flammable gas source (e.g., commercial propane (C_3H_8)) should flaring be needed. Flares will be equipped with a variety of monitoring equipment such as instantaneous imaging devices (cameras), continuous emissions measurement (CEM) devices, and predictive emission monitoring systems (PEMS). The PEMS software will be connected to the ammonia plant data and control system, which will provide feed gas data input to estimate pollutant emission concentration in real-time. Monitoring equipment shall ensure adherence to regulatory requirements. The current design is for two flares: one for the ammonia plant (the "process flare") and one for the ammonia storage tank (the "tank flare").

The process flare is required for process upsets, maintenance, start-up, and shutdown. In particular, emergency and relief cases from the main process areas (electrolysis, ammonia loop, refrigeration) and some of the balance of plant systems (steam, cooling water) will be managed by the process flare. Vented gas streams destined for the process flare may contain liquid and thus will be directed to the flare separator to remove condensable material (mainly contaminated water) prior to relief to the atmosphere via the flare stack top outlet. Condensable material from the flare separator will be pumped to the wastewater circuit. Molar composition of vented gas streams ("streams") directed to the process flare, as identified in the FEL1 study are presented in Table 2.3.4-4. Key constituents of streams include hydrogen (H_2), water (H_2O), nitrogen (N_2), ammonia (NH_3) and argon (Ar). Streams are not anticipated to include oxygen; when generated, it will be vented to the atmosphere at a safe location and/or used to regenerate molecular sieves in the air separation unit.

Table 2.3.4-4 Molar Composition of Vented Gas Streams.

Stream	Source	Temperature (°C)	Enthalpy (kJ/kmol)	Molar Composition (%)[1]				
				H_2	H_2O	N_2	NH_3	Ar
Hydrogen	Electrolyzer	80	1,659	100	0	0	0	0
Syngas	Mixing Drum	75.9	1,504	75	0	25	0	0
Syngas	Syngas Compressor	10	-431	75	0	25	0	0
Syngas	Syngas Compressor	56	-809	62	0	21	4	14
Syngas	Cold Exchanger	34.1	-2,071	58	0	19	5	18
Purge Gas	Wash Water Column	50.7	-28,078	30	9	13	13	34
Purge Gas	Purge Gas Separator	10	-16,373	25	0	11	34	29

The process flare will relieve intermittently vented gas streams from the electrolyzer, mixing drum, syngas compressor, cold exchanger, wash water column and purge gas separator. Frequency of flaring is anticipated to be intermittent in nature to maintain equilibrium of the plant, however, the pilot light will be continuously lit should process flaring be needed.

The tank flare is required to support 15 kT of liquid ammonia storage capacity at the site. The primary function of the tank flare is to relieve tank vapours when the boil-off unit is not in operation. Since liquified ammonia is stored at its saturation temperature (-32°C) at atmospheric pressure, ammonia vapour evolution will occur as heat is absorbed from the atmosphere. Evolved vapours will be sent to the boil-off unit for refrigeration. Resulting liquified ammonia will be sent back to the storage tank. In the absence of the boil-off unit, evolved vapours will be directed to the tank flare to maintain system equilibrium. Beyond continuous ignition of the pilot flare, continuous use of the tank flare is not anticipated. Intermittent inputs to the tank flare are anticipated to occur only as a result of process upsets, maintenance, start-up, and shutdown.

In addition to annual emissions detailed above, atmospheric discharges were estimated for the Argentia Green Fuels Facility. Daily and annual atmospheric discharge rates were computed for flare stacks and emergency generator use. Atmospheric discharges associated with flare stacks include those generated from operation of continuous pilots and intermittent releases. For estimation purposes, intermittent releases were defined as scenarios where a maximum of 16.7 tonnes of ammonia (i.e., one hour of production) is released over a one-hour period per year. Flare stack atmospheric discharges also account for residual propane and ammonia releases. The assumed destruction efficiency of both flares is 98%, thus 2% of residual flare fuel (i.e., C_3H_8, NH_3) will be released. Emission rates, in units of grams per second ($g \cdot s^{-1}$), of flare stacks for Argentia Green Fuels Facility operation are outlined in Table 2.3.4-5. Calculation methodology, including associated assumptions, is detailed in Appendix H (Energy and Emissions Study).

Table 2.3.4-5 Flare Stack Atmospheric Discharges: Project Operation and Maintenance.

<table>
<tr><th colspan="3">Function</th><th colspan="2">Continuous Pilots</th><th colspan="2">Intermittent Releases</th></tr>
<tr><th colspan="3">Flare</th><th>Process Flare</th><th>Tank Flare</th><th>Process Flare</th><th>Tank Flare</th></tr>
<tr><th colspan="3">Fuel Combusted</th><th>C_3H_8</th><th>C_3H_8</th><th>NH_3</th><th>NH_3</th></tr>
<tr><th colspan="3">Annual Operating Hours</th><th>8,760</th><th>8,760</th><th>1</th><th>1</th></tr>
<tr><td rowspan="15">Emission Rate (g/s)</td><td rowspan="5">Hourly</td><td>NO_x</td><td>1.51E-03</td><td>1.51E-03</td><td>26.2</td><td>26.2</td></tr>
<tr><td>CO</td><td>1.22E-02</td><td>1.22E-02</td><td>-</td><td>-</td></tr>
<tr><td>TSP</td><td>4.99E-01</td><td>4.99E-01</td><td>-</td><td>-</td></tr>
<tr><td>C_3H_8</td><td>2.06E-02</td><td>2.06E-02</td><td>-</td><td>-</td></tr>
<tr><td>NH_3</td><td>-</td><td>-</td><td>92.6</td><td>92.6</td></tr>
<tr><td rowspan="5">Daily</td><td>NO_x</td><td>1.51E-03</td><td>1.51E-03</td><td>1.09</td><td>1.09</td></tr>
<tr><td>CO</td><td>1.22E-02</td><td>1.22E-02</td><td>-</td><td>-</td></tr>
<tr><td>TSP</td><td>4.99E-01</td><td>4.99E-01</td><td>-</td><td>-</td></tr>
<tr><td>C_3H_8</td><td>2.06E-02</td><td>2.06E-02</td><td>-</td><td>-</td></tr>
<tr><td>NH_3</td><td>-</td><td>-</td><td>3.86</td><td>3.86</td></tr>
<tr><td rowspan="5">Annual</td><td>NO_x</td><td>1.51E-03</td><td>1.51E-03</td><td>2.99E-03</td><td>2.99E-03</td></tr>
<tr><td>CO</td><td>1.22E-02</td><td>1.22E-02</td><td>-</td><td>-</td></tr>
<tr><td>TSP</td><td>4.99E-01</td><td>4.99E-01</td><td>-</td><td>-</td></tr>
<tr><td>C_3H_8</td><td>2.06E-02</td><td>2.06E-02</td><td>-</td><td>-</td></tr>
<tr><td>NH_3</td><td>-</td><td>-</td><td>1.06E-02</td><td>1.06E-02</td></tr>
</table>

Atmospheric discharges were also estimated for the emergency generator, should it be required, during operation of the Argentia Green Fuels Facility. In the event of power loss, the emergency generator will be required to supply 8 MW of standby (i.e., emergency) power to support the Argentia Green Fuels Facility. It was assumed that the emergency generator will be used for a maximum of 96 hours per year (i.e., one day per quarter). Estimated atmospheric discharges associated with operation of the emergency generator are provided in Table 2.3.4-6. Atmospheric discharge estimates provided in Table 2.3.4-6 include key air contaminants but is not an exhaustive list. Appendix H (Energy and Emissions Study) details atmospheric discharges of all air contaminants, as well as calculation methodology and associated assumptions.

Table 2.3.4-6 Emergency Generator Atmospheric Discharges: Project Operation and Maintenance.

Function			Emergency Generator
Fuel Combusted			**Diesel**
Annual Operating Hours			**96**
Emission Rate (g/s)	Hourly	CO	12.4
		SO_2	1.47
		NO_x	46.7
		TSP	9.05E-01
		PM_{10}	7.24E-01
		$PM_{2.5}$	6.99E-01
	Daily	CO	12.40
		SO_2	1.47
		NO_x	46.7
		TSP	9.05E-01
		PM_{10}	7.24E-01
		$PM_{2.5}$	6.99E-01
	Annual	CO	1.36E-01
		SO_2	1.62E-02
		NO_x	5.12E-01
		TSP	9.91E-03
		PM_{10}	7.93E-03
		$PM_{2.5}$	7.66E-03

2.3.4.2 Effluent Discharge / Wastewater Treatment

The Argentia Geen Fuels Facility will receive water that has been demineralized to ensure high purity before it enters the electrolyzer. During the production of this high purity feedwater, a significant volume of reject water is generated. A conservative estimate of 60% system recovery with 40% reject has been used, though it is likely lower than achievable efficiency. In subsequent engineering design phases, Argentia Renewables aims to target a recovery rate of 70-80% (i.e., 20-30% reject).

The Argentia Renewables Feasibility Study Report conducted by AtkinsRéalis concluded that the proposed ammonia production at 146,000 tonnes per year would require a fresh water supply of 1,185 m^3/day. It is estimated that 25% to 40% of the total water supply will be diverted to wastewater streams from the purification treatment system, while the remainder will be used for electrolysis. Reject water from the production of demineralized feedwater will have a higher salinity compared to the intake water due to the removal of minerals and impurities. Wastewater influent will contain nutrients, metals, physical parameters, and major ions originally present in the water supply, concentrated to 2.5 times the initial concentrations based on the worst-case scenario of 40% reject water or concentrated to 4 times the initial concentrations based on the more probable scenario of 25% reject water.

It is estimated that wastewater discharged from the site would exhibit slightly elevated total dissolved solids (TDS) levels compared to the intake water. The increase in TDS can be attributed to the cooling tower cycle (non-evaporative cooling) and demineralized water treatment plant (WTP) brine. The cooling towers are anticipated to operate within a concentration cycle between 1.5 and 3. The wastewater influent calculations did not explicitly include cooling tower blowdown, as the concentration factors of 2.5 and 4 already account for elevated TDS levels. Therefore, the effluent quality derived from these calculations can be directly applied to the cooling tower blowdown.

The Aquatic Baseline Study (Appendix B1) presented an evaluation of the Public Water Supply (PWS) for the Town of Placentia and ponds within the watershed boundary area to effectively characterize potential source water quality for the Argentia Green Fuels Facility and to supplement historic data available from the Water Resources Management Division (WRMD). Water supply for the Argentia Green Fuels Facility is planned to be sourced from the PWS – Clarke's Pond, Larkins Pond, Barrows Pond, and Gull Pond. Surface water samples were collected from the PWS waterbodies in May 2023 and October 2023. Bureau Veritas (BV) Laboratories conducted comprehensive chemical analysis of surface water samples, which included the assessment of metals and general chemistry parameters (e.g., nutrients, inorganics).

Wastewater influent was estimated based on surface water data analyzed from Clarke's Pond, Larkins Pond, Barrows Pond, and Gull Pond. The surface water quality data was multiplied by 4 and 2.5 times the initial concentrations to characterize wastewater from the purification process. For analytical results below the reportable detection limit used for each laboratory test, concentrations were considered to be equal to one half of the detection limit multiplied by either 4 or 2.5 depending on the percent reject water. The concentrations of chemical parameters were then compared with the constituents listed under Schedule A in the NLR65/03, ensuring thorough evaluation and regulatory compliance (Table 2.3.4-7). Chemical parameters in in the wastewater influent, estimated from the 25% and 40% reject water cases, are significantly lower than the maximum authorized limits specified under Schedule A in the **Environmental Control Water and Sewage Regulations**.

Table 2.3.4-7 Predicted Wastewater Influent: Project Operation and Maintenance.

Parameter	Concentration (mg/L)		Maximum Authorized Limit
	25% reject	40% reject	
Metals			
Arsenic	0.0020	0.00125	0.50
Barium	0.0080 - 0.0400	0.0050 - 0.0250	5.0
Boron	0.100	0.0625	5.0
Cadmium	0.00002 - 0.00004	0.0000125 - 0.0000250	0.050
Chromium	0.0020 - 0.0084	0.001250 - 0.00525	0.05 / 1.0 *
Copper	0.0023 - 0.0044	0.00145 - 0.00275	0.30
Iron	0.10 - 2.64	0.0625 - 1.65	10
Lead	0.0010	0.000625	0.20
Nickel	0.0040	0.0025	0.50
Selenium	0.0010	0.000625	0.010
Silver	0.0002	0.000125	0.050
Zinc	0.0100	0.00625	0.500
General Chemistry			
Nitrogen (Ammonia nitrogen)	0.10 - 0.21	0.0625 - 0.130	2.0
Nitrate	0.100 - 0.288	0.0625 - 0.180	10
Total suspended solids (TSS)	2.0 - 10.4	1.25 - 6.5	30
Total dissolved solids (TDS)	88 - 224	55 - 140	1000
*hexavalent / trivalent chromium			

It is important to note that in addition to the parameters previously mentioned, there are other specific requirements outlined in the NLR65/03. These include biological oxygen demand (B.O.D.), bacterial levels (coliform), cyanide, mercury, phenol, phosphorus, phosphates, chlorine, sulfides, oils, and floating debris. Although the values of these additional water quality parameters are not available, it is unlikely that the electrolyzer will significantly contribute to these constituents. However, it is critical that these constituents do not exceed the maximum content specified in Schedule A of the NLR65/03 before any effluent can be discharged into the Argentia Harbour.

Metals and general chemistry parameters (e.g., nutrients and inorganics) are not anticipated to exceed the thresholds specified in the **Environmental Control Water and Sewage Regulations**, as detailed above for the characterization of wastewater influent from hydrogen and ammonia production. Trace amounts of ammonia are expected to be present in the wastewater system; therefore, ammonia stripping will be used to remove ammonia from the wastewater. Ammonia stripping involves a phase transition from liquid ammonia to gaseous ammonia by increasing the temperature of the water and then passing it through a vertical packed bed tower. In the tower, the wastewater flows downward while the steam is blown upward. This countercurrent flow facilitates the transfer of ammonia gas out of the water, where it can be treated or directed to a flare.

2.3.5 Decommissioning and Rehabilitation

The Project will have a Decommissioning and Rehabilitation Plan associated with all aspects of work at the Project site. The Project's decommissioning and rehabilitation activities will aim to restore the site to its original state at the discretion of the landowner. The preliminary Decommissioning and Rehabilitation Plan will be dynamic, and wherever practical, rehabilitation measures will be implemented progressively as opportunities arise throughout the lifetime of the Project. All permits, licences, and other authorizations required for the decommissioning and rehabilitation will be obtained as required.

Argentia Renewables will continue to seek solutions and improve the decommissioning strategy as the Project progresses considering available technologies. Argentia Renewables is committed to complying with all environmental regulations and requirements in place at the time of decommissioning. A Project decommissioning plan will be developed and finalized once all Project infrastructure has been finalized to allow for a properly scoped plan prior to commencement of commercial operations.

The Project's decommissioning and rehabilitation activities aim to restore the site and typically include:

- Removal and appropriate disposal of equipment, materials, and supplies;
- Demolition and removal of Project related infrastructure;
- Removal and appropriate disposal of non-hazardous demolition debris; and
- Overburden and topsoil replacement and re-contouring of land if required.

During all phases of the Project, equipment and infrastructure will be demobilized when it is no longer required. Equipment will be carefully removed, and infrastructure no longer required will be taken down in reverse order of setup. Materials and equipment will be removed and transported off site per the Waste Management Plan (Appendix N).

At the end of Project operational life, Argentia Renewables will ensure that the site is fully demobilized. Final grading will be completed at the site once infrastructure has been removed. These areas will have organic materials re-spread and seeded.

The following sections pertain to specific decommissioning and rehabilitation practices that will be considered for select Project infrastructure and equipment. These are followed by a discussion of emissions and energy use during the decommissioning and rehabilitation phase.

2.3.5.1 Argentia Wind Facility

The decommissioning and rehabilitation of the wind turbines will involve removing the base of the structure and the turbine blades. Components such as nacelle and tower sections have an established practice of recycling, and appropriate plans will be implemented. Some wind turbine manufacturers have recently introduced recyclable wind blades which will be factored into the decommissioning and rehabilitation approach. Typically, the turbine base will be removed to 1 m below ground, rebar cut off and the site covered with soil. The area immediately surrounding the turbine foundation will be re-graded, and soil that was removed will be replaced.

Access roads will be reclaimed, while public roads will remain, and gates will be removed.

The decommissioning of the electrical infrastructure will include removal of the conductors, reducing poles to ground level, and disassembling and removing infrastructure from right-of-ways. Removal of transmission lines and inactive conductors will be carried out in a safe manner in accordance with approvals. Decommissioned electrical infrastructure will be considered for reuse or recycling wherever possible (such as wood or metals) or transported to an appropriate facility for disposal. Portions of this decommissioning activity will involve cranes and a specialist contractor. Underground electrical cables will be cut off and removed to 1 m depth.

2.3.5.2 Argentia Green Fuels Facility

The decommissioning and rehabilitation of the Argentia Green Fuels Facility will involve the dismantlement of the electrolyzers, water treatment systems, and hydrogen handling systems. These components will be recycled or refurbished for continued use wherever possible. Buildings housing the electrolyzers can be demolished or left in place to facilitate redevelopment of the site by other industries. If demolished, building foundations will be removed, and the site will be cleaned and graded. Piping associated with the facility will be dismantled and removed from site. The ammonia loading infrastructure such as loading lines and loading arms will be fully cleaned and dismantled prior to removal from site for disposal. The ammonia tank and water tanks will be purged, cleaned, disassembled, and removed from site for recycling or disposal at the appropriate facility. The Argentia Green Fuels Facility will be reclaimed with minimal disturbance to shorelines and waterways. Rehabilitation of any shoreline erosion and bank restabilization will be carried out, if required. Storm water ponds, will be remediated by pumping out standing water, removing the piping and liners from site, infilling the ponds with overburden, grading the area and applying a single application of seed. These facilities will be included in the Project decommissioning plan.

2.3.5.3 Emissions and Energy Use

The decommissioning and rehabilitation phase of the Project will have similar fuel consumption requirements as the construction phase. As such, emissions generated from within the Project Area from fossil fuel consumption will be comparable, and likely not exceed to those detailed in Section 2.3.3.1. Additionally, mobile equipment requirements for decommissioning and rehabilitation will be similar to those outlined in Table 2.3.3-6.

2.4 Alternative Methods of Carrying Out the Undertaking

Argentia Renewables considered several alternatives in the process of developing the optimum project — a project that is financially viable, employs proven but innovative technology, has minimal negative environmental effects, and addresses sustainability objectives in an environmentally responsible manner.

One major consideration is the “no project” alternative. The failure or withdrawal of a proposal to construct a green energy project on private land would likely be viewed as a shortfall in the implementation of the Province’s Renewable Energy Strategy. While the potential negative effects on both the biophysical and socio-economic environments of the Placentia area would be avoided, so too would be the potential benefits, especially to the socio-economic environment. For Argentia Renewables, a decision to cancel this Project would be unlikely to trigger a search for another suitable site within the province; consequently, there is no “other location” alternative for the Project.

Several alternatives within the Project are still under consideration or may be carried as possibilities should the preferred approach become unattractive or unavailable. Final selections have yet to be made as to the make/model of the wind turbines, electrolysis technology, and ammonia synthesizer. Where alternatives remain under consideration, each are described below, and the alternative with the greatest potential for interaction with the environment will be assessed. In this manner, the assessment will be conservative and a future decision to select another alternative will result in less, not greater potential environmental consequences. The major Project alternatives and their potential environmental consequences are described below.

2.4.1 Argentia Green Fuels Facility Alternatives

The Argentia Green Fuels Facility will be located on POA Property and sited based on property availability, ease of construction and infrastructure access, proximity to suitable dock space, adequate buffer space allowance from other industrial activities, and foundation conditions. While there may be minor relocations of the plant footprint or specific features, these will remain within the boundaries of the site identified in this Registration.

AtkinsRéalis (formerly SNC-Lavalin Group) conducted a first-order plant optimization study by assessing different technologies and financial sensitivities to determine the best configuration to bring forward to the next level of engineering cost estimation. Determination of the minimum hydrogen storage requirements, as well as optimal electrolyzer type and size, ammonia plant, ASU and storage sizes were all considered. Financial risks were incorporated into the decision-making. The study concluded that a 160 MW alkaline electrolyzer connected to a 140 kilo-tonnes per annum (kTpa) (384 MTPD) ammonia plant is the optimal facility size accounting for both economic and Project risk considerations. The optimal plant sizing summary is provided in Table 2.4.1-1.

Table 2.4.1-1 Results of Plant Optimization Study.

Parameter	Optimal Value
Electrolyzer installed capacity, MW	160
Ammonia installed capacity, MTPD	400
Hydrogen storage, tonnes	15
Water consumption, m^3/day	1,185 (assumes 40% reject water from water treatment)
Electrolyzer load factor, %	95
Ammonia plant load factor, %	93
Firm NLH grid power import assumed, MW	10

Summaries of alternatives considered regarding the electrolyzer technology, the water-cooling system, and the size of the overall plant are provided in the following sections.

2.4.1.1 Electrolyzer Selection

Three candidate hydrogen electrolysis technologies were considered for the Project: Alkaline, Proton Exchange Membrane (PEM), and Solid-Oxide Electrolyzer Cells (SOEC). Each technology uses an electric charge (electrolysis) to break water molecules into their two constituents, oxygen and hydrogen. The required inputs are similar among the technologies and include clean water (treated to reduce mineral content and adjust pH) and electricity. Alkaline electrolysis uses potassium hydroxide or sodium hydroxide at around 20-40 percent by weight (wt%) as the cell electrolyte. The PEM process is widely considered to have the largest market share in the coming decades as the process is well-suited to the generation profile of renewable energy. PEM uses a solid polymer as both the electrolyte and the cell membrane. An SOEC operates at high temperatures to achieve electrolysis by using a solid oxide or ceramic electrolyte and high-pressure steam to produce hydrogen gas and oxygen.

All electrolysis methods produce similar discharges (hydrogen, oxygen, slightly saline-warmed wastewater). As well, ammonia-rated capacities (100-125 kTpa) vary due to the differing efficiencies of each technology. Table 2.4.1-2 presents key indicators for the candidate technologies and serves to indicate a preference for SOEC and alkaline mixed technology. After a qualitative assessment of key performance indicators (such as logistics, and manufacturing capability) it was found that SOEC had excessive Project risk to schedule and was therefore discounted from the study. The alkaline technology exhibited slightly better financial results relative to PEM technology and has slight advantages with respect to lower water consumption and maintenance ease. Hence, alkaline electrolyzers were selected as the optimal choice to be carried forward.

Table 2.4.1-2 Comparison of PEM, Alkaline, and SOEC Electrolyzer Technologies.

Input	PEM	Alkaline	SOEC	Unit
Module size	10	10	10	MW
Efficiency (at BOL)	55	55	40	kWh / kgH_2
Efficiency (at EOL)	59.31	58.47	40.09	kWh / kgH_2
Stack Lifetime	10	10	6	years
Degradation	1	1	0	% / year
Hydrogen outlet pressure	30	0.3	0.0	barg
Turndown	10	10	10	% of total MW
CAPEX	720	570	1200	$/kW

2.4.1.2 Plant Size Optimization

The key factor determining optimal facility size is the Argentia Wind Facility electricity production capacity and profile. The average electrical production and variability determines the sizing and utilization of installed electrolyzers and ammonia plant. The land area available to host wind turbines, plus the wind profile for candidate generation sites enables the construction of a 300 MW Argentia Wind Facility. Varying sizes and combination of the above-mentioned electrolyzers were considered to balance demand from the NLH grid on a net-zero annual basis (i.e., total annual import from the grid equals total annual export to the grid). Note, provision has been made in planning to allow for plant expansion should there be a future expansion to other Argentia Wind Facilities.

2.4.1.3 Water Supply Selection

The amount of water required for the plant was examined as part of the optimization study. The size of the electrolyzer, the hydrogen production rate, requirements for cooling water, and the physical and chemical properties of the potential feedwater all contributed to the calculation. The POA is supplied with water from the Town of Placentia municipal water supply, which includes Larkins Pond, Clarke's Pond, and Barrows Ponds, with backup provided from Gull Pond. Water quality records (both historical records obtained from the Water Resources Division and samples collected from the freshwater environment in 2023) indicate that the water is amenable to treatment and suitable for use by the Project. A Source Water Hydrology Analysis (Appendix C1) demonstrates that there is availability of water for both municipal and Project requirements. For these reasons, the Placentia municipal water supply was selected as the water source for the Project.

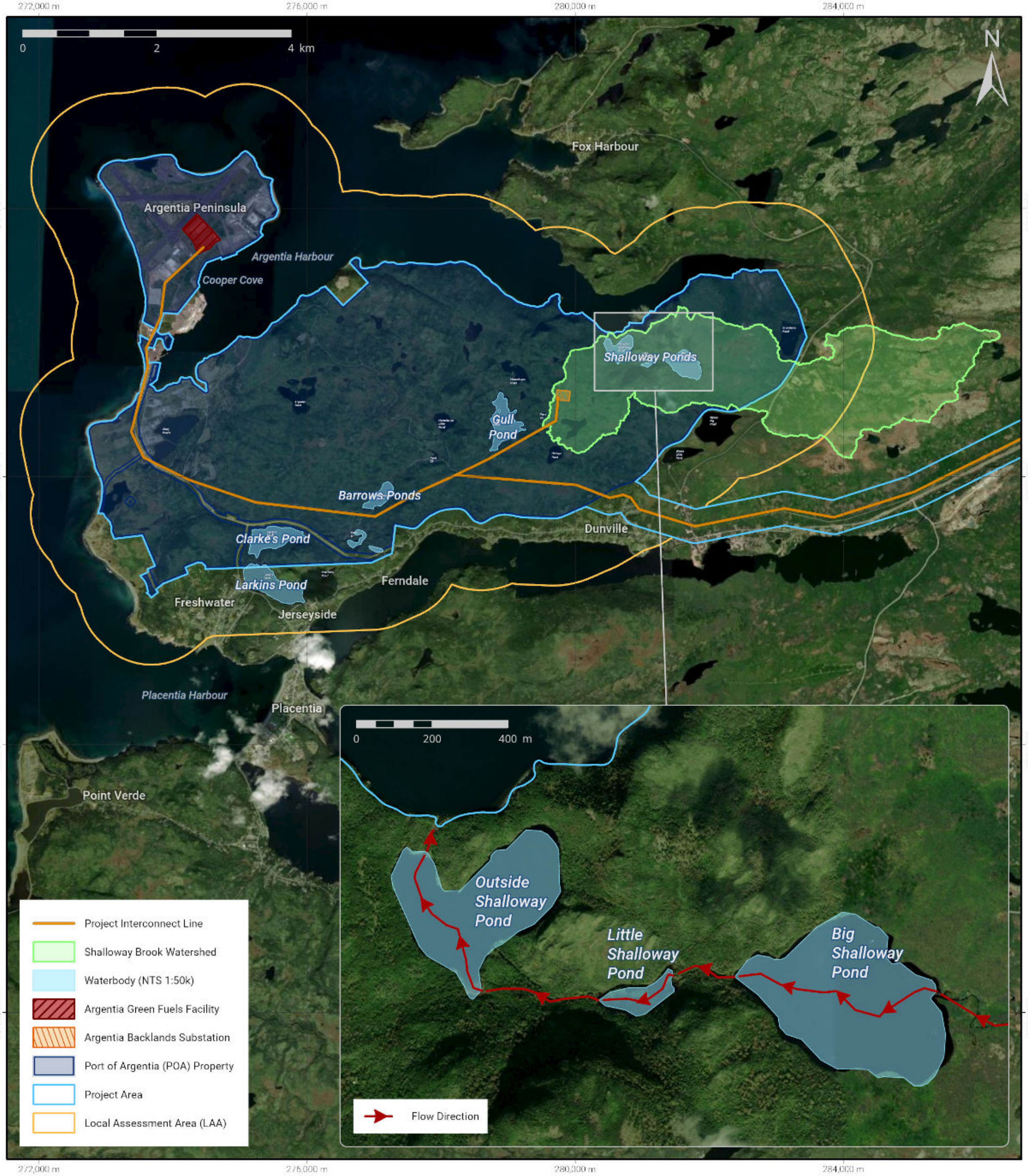
Should water quantity or quality become an issue, an alternative would be the development of a separate water supply dedicated to the Project. One potential supply is the Shalloway Ponds watershed which has a total drainage area of 8.3 km^2 as shown in Figure 2.4.1-1. As existing historic data within this watershed was unavailable, the hydrology of Shalloway Ponds was evaluated by transposing average daily streamflow measurements from the nearby Water Survey of Canada (WSC) hydrometric station, Northeast River near Placentia (02ZK002), using the drainage area ratio method, whereby streamflow data is multiplied by the drainage area ratio of the ungauged and gauged location (CPL, 2023). The Northeast River watershed near Placentia has an upstream drainage area of 90 km^2. One limitation of transposing streamflow data from one location to another is that it does not account for the differences in physical geography of the watersheds. The Northeast River watershed has a larger portion of pond/ lake area than the Shalloway Pond watershed, and therefore greater water storage potential and likely a more stable flow regime. The Shalloway Pond watershed would likely experience more extreme peak inflows and lower minimum inflows. This intermittency in flow regime could be accounted for by including additional storage in the Shalloway Pond water supply.

A preliminary investigation of the expected natural exceedance inflows (using transposed WSC daily flow data) for Shalloway Ponds suggests that this watershed would have adequate supply required to meet Project needs without considering storage (Table 2.4.1-3) (CPL, 2023). For redundancy purposes, additional storage would likely be built into the design.

Table 2.4.1-3 Shalloway Ponds Exceedance Flows (CPL, 2023).

Probability of Exceedance	Shalloway Ponds Inflow (L/s)
99.9%	26
99%	35
95%	58
90%	82
50%	243
10%	687

Additional infrastructure required to advance this alternative would include a 1.5 km access road, a containment dam, a low-level outlet, a pump house, and a water transmission main pipeline (CPL, 2023). Should this alternative be selected for the Project, surveys would be required to characterize the aquatic and terrestrial environments, as well as the watershed hydrology, minimum flow requirements, and water quality. Other investigations would be required to identify suitable locations and design parameters for containment dams, intakes, and water supply pipeline routing.



Pattern | Argentia Renewables

FIGURE NUMBER: 2.4.1 - 1		COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/25
FIGURE TITLE: Shalloway Ponds Alternative Project Water Supply		NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change. Watershed delineation derived from NRCan HRDEM Digital Terrain Model. Waterbodies and flow direction sourced from Canadian National Topographic System (NTS).	REVIEWED BY:	
			APPROVED BY:	
PROJECT TITLE: Argentia Renewables			sem	

SEM MAP ID: 238-005-GIS-042-Rev0

2.4.1.4 Feedwater Treatment and Cooling Systems

The electrolyzer will require a reliable supply of demineralized feedwater. Water consumption by an alkaline electrolyzer is in the range of 9 -11 kg of water per kg of hydrogen produced. The amount of water rejected was assumed to be in the range of 25 - 40%, based on the historic quality of the source water in the PPWSA. In addition, the low-temperature water electrolyzers will generate heat which will be removed via cooling towers. Non-evaporative cooling will also be used for the plant to decrease water demand significantly. Additionally, alternative methods such as a seawater cooling system will be considered at later stages of design. For these reasons, the quantities of both water intake and discharge can be regarded as highly conservative.

2.4.1.5 Wastewater Treatment System

In producing feedwater for the electrolyzer, reject water will be generated of a higher salinity than the intake. Other discharge water will be produced by the ammonia process and may require treatment before discharge. Wastewater treatment packages will be defined to suit the composition of wastewaters produced and ensure regulatory compliance at a minimum. Further design efforts will also seek means to reduce water throughout (e.g., closed loop, dry cooling) and thereby minimize water supply demand.

Argentia Renewables is evaluating the existing water treatment system related to the West White Rose Project to determine if the facility can be re-used as a permanent wastewater treatment facility for the Project. The following sewer systems will be included in the facility and designed as per permits issued to Argentia Renewables: Clean Storm Water Sewer System, Potentially Contaminated Sewer System, Oil-Water Separator and Retention System, and Sanitary Water System. These were described earlier in Section 2.3.4.

2.4.1.6 Product Storage, Transfer, and Shipping

Several options are being considered for storage and transfer of the ammonia produced at the facility. The preferred configuration which utilizes a continuous transfer line, and up to two permanent loading arms fixed to the Cooper Cove wharf extension is described above in Section 2.3.1.5. The wharf extension is included as part of the Cooper Cove Marine Terminal Expansion Project (Registration No. 2279). It is the only in-water infrastructure required for the loading of ammonia. Pending progression of the Cooper Cove Marine Terminal Expansion Project, Argentia Renewables will consider alternate Loading Facility arrangements.

2.4.2 Argentia Wind Facility Alternatives

In order to best utilize the available space, generate electricity at optimum efficiency, and ensure environmental sustainability, a number of choices for the Argentia Wind Facility have been considered, including the size of each wind turbine generator, the type of foundations, and the optimal location for each structure.

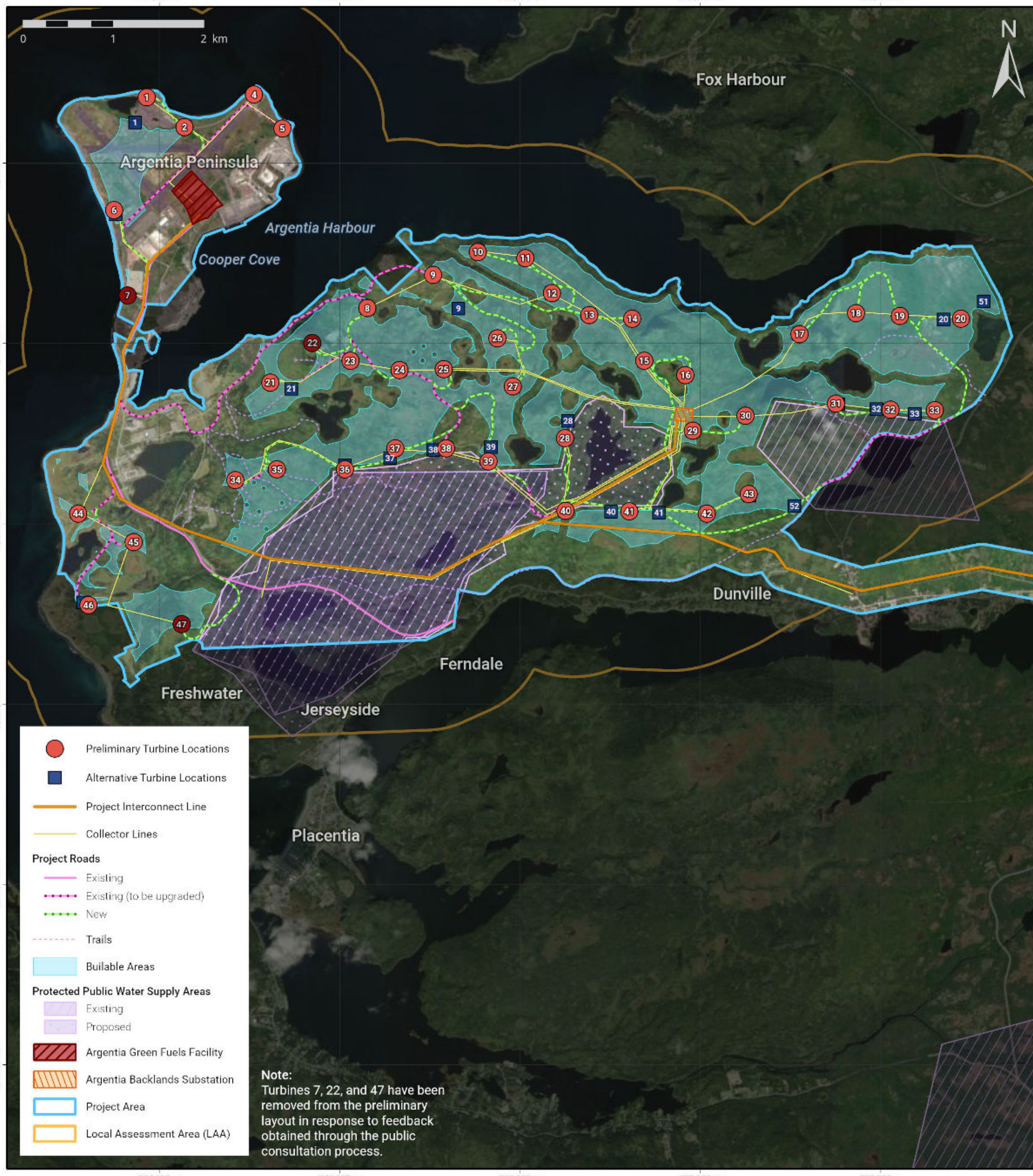
2.4.2.1 Selection of Wind Turbines

The Project has taken into consideration a variety of turbine sizes and configurations, including a 6.8 MW and 7.2 MW wind turbine. The selection of a wind turbine manufacturer is determined from the rated power capacity, rotor diameter, and tower heights of the wind turbines. In general, the larger the turbine, the greater its power generation capacity. This results in a trade-off between turbine size and turbine numbers. The current Project layout is based on a 6.8 MW wind turbine. Alternative, smaller power output models were also considered. A greater number of 6.6 MW or 5.0 MW wind turbines would be needed to meet the Project requirement of 300 MW of generation capacity. As a result of the larger generating capacity of the 6.8 MW wind turbine, the Project will produce more energy annually per turbine, will incur less in operational and capital expenditures for the Project, and will result in a reduced footprint for the Argentia Wind Facility.

2.4.2.2 Siting of Turbines and Linear Features

The detailed siting of each wind turbine will be a combination of factors including wind profile, spacing to clear other turbines, avoidance of interference with other uses/users, foundation conditions, and accessibility for construction and service maintenance. The routing of surface access will be determined by nature of surface features (existing roads/trails, presence of wetlands, sensitive habitat (especially for species at risk) natural gradients, design requirements for road surface grade and turning radius.

As more information is gathered, especially concerning site geotechnical conditions, some adjustments to access road and electrical system alignment will be made, along with slight adjustments to turbine foundations. Such minor realignments of generation sites and linear features will also serve to reduce the degree of physical disturbance to vegetation and terrain features. All siting choices will be contained within the defined Project Area and located to reduce or avoid negative environmental effects or restrictions on development (such as within the PPWSA). Accounting for these siting constraints, the "Buildable Areas" below in Figure 2.4.2-1 depict the areas considered for wind turbine siting.



Pattern | Argentia Renewables	FIGURE NUMBER: 2.4.2 - 1	COORDINATE SYSTEM: NAD 1983 CSRS UTM Zone 22N	PREPARED BY: C. Burke	DATE: 24/07/26
	FIGURE TITLE: Wind Turbine Alternative Buildable Areas	NOTES: The location of proposed project infrastructure is considered preliminary and is subject to change. Public Water Supply data sourced from the NL Government Land Use Atlas.	REVIEWED BY:	
	PROJECT TITLE: Argentia Renewables		APPROVED BY:	
			sem	

SEM MAP ID: 238-005-GIS-C08-Rev2

Throughout the early engagement process, as described in Chapter 8, Argentia Renewables has sought to gather feedback from the public, key stakeholders, Indigenous peoples, and government departments and agencies regarding siting of wind turbines. Wind turbine sites which were specifically discussed in early engagements are highlighted in Figure 2.4.2-1. In each of these discussions Argentia Renewables has committed to continue exploring alternative wind turbine placement, technology, or other mitigations with the interested party to come to a mutually beneficial solution (e.g., to accommodate wind turbine micrositing relative to Canadian Coast Guard radar use in the Project Area). In response to feedback obtained through the public consultation process, turbines 7, 22 and 47 have been removed from the preliminary layout.

Alternative interconnection locations within the Project Area will be considered. During a later stage of the Project, an assessment will be made to determine if the Collector Lines will be constructed underground or overhead. There may also be a need to upgrade or "twin" the high-voltage transmission line which connects the Long Harbour Terminal Station to the rest of the NLH grid. These decisions will be made in close consultation with NLH and appropriate agencies.

2.4.2.3 Foundations for Wind Turbine Alternatives

Site conditions will dictate the choice of foundation type. Factors include depth to groundwater, presence of bedrock and type of overburden. Geotechnical evaluations will be required to determine the most suitable foundation design for each wind turbine. The soils and terrain in the Project Area vary greatly and thus several wind turbine foundation types were considered: cast-in-place gravity, cast-in-place rock anchored, segmental pre-cast concrete girder, pre-cast cross girders, post-tensioned pre-cast concrete, and pre-cast steed girder with reinforced concrete base slab. Based on preliminary site reconnaissance most of the foundations will be rock-anchored concrete cap type, with gravity cast-in-place concrete making up the remainder.

2.4.2.4 Construction Labour Force Accommodation

The construction labour force could be accommodated in a construction camp located proximate to the Project site. Alternately, personnel could commute from their homes or arrange local temporary housing in the adjacent communities. Based on a comparison of construction labour requirements (numbers and work classifications) and the available local workforce, it has been concluded that most of the construction labour force can be obtained locally through contractor hires, and there is an adequate supply of short-term rental accommodation available from the nearby communities. As Project planning and implementation develops, supplemental Project-specific accommodation may be required. In such a case, the most likely alternative will be to utilize the construction work camp at Long Harbour and provide bus service between the camp and the Project site. Therefore, a dedicated construction camp will not be required at the POA.

2.5 Regulatory Framework

Following the announcement made by the Honourable Andrew Parsons, Minister of Industry, Energy and Technology on April 5, 2022, lifting the moratorium on wind development in NL, the private sector has been in a position to generate electricity from wind energy for their own consumption and export. This proposed undertaking falls within the scope of Government Policy and will endeavour to comply fully with all applicable regulatory processes.

The primary environmental regulatory requirement for this and similar undertakings is laid out in the NL **Environmental Protection Act, 2002,** and associated **Environmental Assessment Regulations**. As a first step in the environmental regulatory process, this Registration is submitted for consideration. Once a determination has been made by the Minister under the **Environmental Protection Act**, other permitting and approval processes are able to commence. Additionally, work associated with early Project phases (such as meteorological towers to characterize wind resource availability) are allowed to proceed, subject to compliance with applicable Federal, Provincial and Municipal permitting processes. The other required environmental permits and approvals are typically fulfilled once a release is granted from the EA review process. These permits and approvals are listed in Table 2.5.2-1.

The Project will also be subject to provisions of federal legislation that may not have specific permits and approvals including:

- **Canadian Environmental Protection Act, 1999 (CEPA).**
- **Fisheries Act.**
- **Species at Risk Act (SARA).**
- **Migratory Birds Convention Act, 1994 (MBCA).**
- **Aeronautics Act.**
- **Canadian Navigable Waters Act.**

To avoid or reduce potential negative environmental effects and to enhance benefits, the principles and practices of sustainability and environmental and social responsibility are incorporated into resource management plans that form part of the proponent's internal organization and approval structure. Several such plans will be developed by Argentia Renewables to apply throughout the Project, as detailed in Section 4.6. Typically, these management plans are required as a condition of environmental registration approval.

The Argentia Renewables Project will be located primarily upon the POA Property within the Town of Placentia Municipal Planning area (D.W. Knight Associates, 2015). The Project Interconnect Line may intersect both private and Provincial Crown Land. The Argentia Peninsula and lands to the south-west are zoned as Industrial, whereas the eastern portion of the Argentia Backlands are zoned as Rural. A portion of the POA Property also includes PPWSAs (listed as Clarkes Pond, Larkins Pond, and Wyses Pond), which include prohibitions and protection measures for development to protect drinking water quality.

Project execution will involve regular engagement with communities and other stakeholders. This Project will have a long-term presence in the communities where it is being proposed, therefore Argentia Renewables is committed to utilizing community engagement to foster support for the Project and establish mutually beneficial partnerships with the community. This commitment plays a fundamental role in achieving long-term partnerships with landowners and stakeholders.

2.5.1 Environmental Assessment Process

There are two environmental assessment processes that could apply to the Argentia Renewables Project – Federal and Provincial.

The Government of Canada **Impact Assessment Act, 2019** (IAA 2019) is the legislative basis for federal EA in Canada. Federal EA focuses on potential Project effects that are within federal jurisdiction, including on:

- Fish and fish habitat;
- Other aquatic species;
- Migratory birds;
- Federal lands;
- Effects that cross provincial or international boundaries;
- Effects that impact on Indigenous peoples, such as their use of lands and resources for traditional purposes; and
- Changes to the environment that are directly linked to or necessarily incidental to any federal decisions about a project.

The **Physical Activities Regulations** issued under IAA 2019 list projects which would be subject to federal EA. These regulations clearly exclude the Argentia Renewables Project from the federal process. The Minister of Environment and Climate Change Canada may, however, designate a project that is not currently listed in the regulations if there is the potential for environmental effects in areas of federal jurisdiction or in response to public concerns about such effects.

The **NL Environmental Protection Act** (NLEPA) has associated **Environmental Assessment Regulations** (Part 3) that list those projects that require registration and review. As well, the Minister has the authority to order an environmental impact assessment for any project. The Argentia Renewables Project requires Registration following the provincial process. On April 6, 2022, the NL Environmental Assessment Division (NLEAD) issued "Environmental Assessment Guidance for Registration of Onshore Wind Energy Generation and Green Hydrogen Production Projects". This set of Guidelines is specific to the wind-to-hydrogen industry and is supplemental to the NL EAD document "Environmental Assessment – A Guide to the Process".

Upon receipt and acceptance of a Registration document, the Minister of Environment and Climate Change will conduct a public and governmental review of the submission. The Minister then determines whether the Project may proceed, subject to any terms and conditions and other applicable legislation, or whether further assessment is required.

2.5.2 Approvals

Table 2.5.2-1 provides a preliminary list of permits, approvals, licences, and authorizations that may be required for the Project. This list will be continuously updated throughout the Project to confirm and adjust as necessary, through consultation with regulatory authorities.

Table 2.5.2-1 List of Potential Permit/Approval/Licence/Authorization Requirements for the Project.

Permit / Approval / Licence / Authorization	Legislation / Regulation Reference	Agency
Municipal		
Development Permit	**Urban and Rural Planning Act**	Town of Placentia
Provincial		
Environmental Assessment Approval	**Environmental Protection Act and Environmental Assessment Regulations**	Department of Environment and Climate Change - Environmental Assessment Division
Certificate of Approval for Construction and/or Operation of Industrial Facilities	**Environmental Protection Act**	Department of Environment and Climate Change - Pollution Prevention Division, Industrial Compliance Section
Certificate of Approval for Generator Operation	**Environmental Protection Act and Air Pollution Control Regulations**	
Development Activity In A Protected Public Water Supply Area	**Water Resources Act**	Department of Environment and Climate Change - Water Resources Management Division
Permit to Alter a Body of Water (Culvert, Bridge, Dam, Fording, Pipe Crossing/Water Intake, Stream Modification, Infilling/Dredging, Flood Risk Area, Miscellaneous works within 15 m)		
Water Use Licences		

Permit / Approval / Licence / Authorization	Legislation / Regulation Reference	Agency
Commercial Cutting Permit	**Forestry Act**	Department of Fisheries, Forestry, and Agriculture
Operating Permit		
Crown Lands Lease	**Lands Act**	Department of Fisheries, Forestry, and Agriculture - Lands Branch
Section 19 – Economic Activity Permit	**Endangered Species Act (ESA)**	Department of Fisheries, Forestry, and Agriculture – Wildlife Division
Quarry Development Permit	**Quarry Materials Act, Quarry Materials Regulations**	Department of Industry, Energy, and Technology, Mining and Mineral Development
Building Accessibility Registration Exemption Request and Fire and Life Safety Plans Review (National Building Code of Canada)	**Building Accessibility Act, Fire Protection Services Act**	Digital Government and Service NL
Certificate of Approval for Waste Management System (Landfill or Incinerator if applicable)	**Environmental Protection Act, Air Pollution Control Regulations, Storage of PCB Wastes Regulations and Waste Management Regulations, 2003**	
Food Establishment Licence	**Food Premises Act** **Food Premises Regulations**	
Fuel Storage Tank Registration	**Storage and Handling of Gasoline and Associated Products Regulations, 2003, under the Environmental Protection Act**	
Preliminary Permit to Develop Land (Highway Access Permit)	**Urban and Rural Planning Act, Protected Road Zoning Regulations, & Works, Services and Transportation Act**	
Used Oil or Glycol Storage Application for Registration / Approval	**Used Oil and Used Glycol Control Regulations, Used Oil Control Regulations**	
Certificate of Approval for Transportation of Waste Dangerous Goods / Hazardous Waste	**Environmental Protection Act**	NL DECC; Pollution Prevention Division, Waste Management Section
Federal		
Fisheries Act Authorization Permitting harmful alteration, disruption or destruction of fish habitat, and/or the death of fish.	**Fisheries Act**	Department of Fisheries and Oceans Canada (DFO)
Permits Authorizing an Activity Affecting Listed Wildlife Species	**Species at Risk Act**	Environment and Climate Change Canada (ECCC)
DND Letter of Non-Objection	**Civil Air Navigation Services Commercialization Act**	Department of National Defense
Storage Tank Regulations	**Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations, Canadian**	Environment and Climate Change Canada (ECCC)

Permit / Approval / Licence / Authorization	Legislation / Regulation Reference	Agency
	Environmental Protection Act, 1999	
Weather Radar Assessment	N/A - ECCC Guidelines for Wind Turbine and Weather Radar Siting	
Land Use Approval (General)	**Civil Air Navigation Services Commercialization Act**	Nav Canada
Land Use Approval (Cranes)		
Aeronautical Assessment for Obstruction Evaluation	**Aeronautics Act; Canadian Aviation Regulations**	Transport Canada
Approval under the Canadian Navigable Waters Act (CNWA)	**Canadian Navigable Waters Act (CNWA)**	
Notice Regarding Substances Located at a Facility (Schedule 2)	**Environmental Emergency Regulations, 2019**	ECCC
Notice Regarding the Preparation of an Environmental Emergency Plan (Schedule 3)		
Notice Regarding the Bringing Into Effect of an Environmental Emergency Plan (Schedule 4)		
Notice Regarding Simulation Exercises (Schedule 5)		