EVREC GREEN ENERGY HUB

Environmental Assessment Registration Document

Prepared for: Exploits Valley Renewable Energy Corporation

strum CONSULTING

October 1, 2024

EXECUTIVE SUMMARY

Exploits Valley Renewable Energy Corporation (EVREC), is proposing to develop, construct, and operate a wind to green ammonia project on the brownfield, former Abitibi lands, near Botwood in central Newfoundland, Canada (the "Project"). The Project is positioned to be one of the lowest cost, certified green hydrogen/ammonia, producers globally. Subject to a small utility grid connection, the Project will utilize 100% renewable energy for production of hydrogen. EVREC will develop an onshore wind farm consisting of up to 530 wind turbines, a 150 megawatt (MW) solar farm and associated off-site infrastructure (export and import terminals, access roads, collector substations, and water pipelines). Included as part of the Project will be an industrial facility comprised of 2.6 GW of electrolysers utilizing a combination of proton exchange membrane and aqueous solution units, air separation plants, ammonia plant, electrical energy storage facilities, molecular storage, water purification systems, warehousing, administrative buildings, and other associated utility infrastructure (switchyards, transformers, pipelines, emergency generators, and cooling systems) including an electrical grid connection for critical loads. The facility will be designed to meet the best available technology economically available and meet or exceed all regulated safety and environmental standards. The Project nameplate capacity will be up to 3.5 gigawatts of electrical power and produce 925,000–1,000,000 tons per year of certified green ammonia. The Project will be commissioned and started in a phased approach.

In 2007, the province released a target to reduce greenhouse gas emissions by 10%, to reach 1990 levels by 2020 and 75-85% of 2001 levels by 2050, in an effort to reach Canada's net zero goal by 2050 [The Way Forward on Climate Change in Newfoundland and Labrador (NLECC, 2019)].The province adjusted its marker in 2015 to reduce 1990 levels of GHG emissions by 35-45% by 2030. The development of this Project will support Newfoundland and Labrador in achieving these targets.

The Project is considered an undertaking under Section 34 (1f) of the Newfoundland and Labrador Environmental Assessment Regulations, where electrical power generation that has a capacity greater than 1 MW and engages in the manufacturing of green hydrogen and ammonia, requires the registration of an Environmental Assessment Registration document. The Environmental Assessment Registration Document has been completed according to methodologies and requirements outlined in the provincial guidance document entitled "Environmental Assessment: A Guide to the Process and has incorporated guidance from the Guidance for Registration of Onshore Wind Energy Generation and Green Hydrogen Production Projects in Newfoundland and Labrador" (NLECC, 2023a).

EVREC has established a world class team to assist in the management and interaction with all stakeholders and will continue to engage and collaborate with local communities, the First Nations of Newfoundland and Labrador, and government representatives to ensure that any potential concerns identified in development of the Project are addressed and mitigated.

Several valued components were identified and evaluated as part of this assessment. Based on provincial guidance, desktop analysis, and subsequent field studies, valued components determined for assessment were as follows:

- Atmospheric Environment
- Geophysical Environment
- Aquatic Environment
- Terrestrial Environment
- Land and Resource Use
- Heritage and Cultural Resources
- Communities (Socio-economic)
- Economy, employment, and business

DISCLAIMER

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TABLE OF CONTENTS

page

LIST OF FIGURES

LIST OF TABLES

LIST OF DRAWINGS

LIST OF APPENDICES

LIST OF ACRONYMS

ACCDC	Atlantic Canada Conservation Data Centre
ALK	Alkaline
AM	Amplitude modulation
AS	Aqueous Solution
asl	above sea level
ATSC	Advanced Television Systems Committee
ATV	All-terrain Vehicle
BMPs	Best Management Practices
CAAQS	Canadian Ambient Air Quality Standards
CanREA	Canadian Renewable Energy Association
CCME	Canadian Council of Ministers of the Environment
CH_4	Methane
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COD	Commercial Operations Date
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWS	Canadian Wildlife Service
dBA	Decibels (A-weighted)
DFO	Fisheries and Oceans Canada
DND	Department of National Defence
DWCP	Domestic Woodcutting Consultation Plan
DTV	Digital Television Station
DWT	Dead Weight Tonnage
EA	Environmental Assessment
EARD	Environmental Assessment Registration Document
ECCC	Environment and Climate Change Canada
EMF	Electromagnetic Fields
EMI	Electromagnetic Interference
EPP	Environmental Protection Plan
ERP	Emergency Response/Contingency Plan
ERT	Emergency Response Team
ESA	Endangered Species Act
EVREC	Exploits Valley Renewable Energy Corporation
FEED	Front End Engineering Design
FFA	Fisheries, Forestry and Agriculture
FM	Frequency Modulation
FWI	Fire Weather Index
GDP	Gross Domestic Product
GHGs	Greenhouse Gases
GIS	Geographic Information System
GPS	Global Positioning System
HMRTP	Hazardous Materials Response and Training Plan

HSE	Health, Safety and Environment
IEEE	Institute of Electrical and Electronics Engineers
IMO	International Maritime Organization
IPCC	United Nations Intergovernmental Panel on Climate Change
ISED	Innovation, Science and Economic Development Canada
ISPS	International Ship and Port Facility Security
km	kilometre
kV	kilovolt
kVA	kilovolt amps
kt	kiloton per year
kWh/year	kilowatts per hour per year
Lpm	litres per minute
m/s	Metres per second
MARI	Maritime Archaeological Resource Inventory
MBCA	Migratory Bird Convention Act
MSA	Maintenance Service Agreements
mg/L	milligrams per litre
MJ	Mega Joules
ML/d	million liters per day
m	metre
mm	millimetre
MOUs	Memorandums of Understanding
mS/cm	MilliSiemens per centimetre
MW	Megawatt
N_2O	Nitrous Oxide
NI	No Indicator Status
NLAPCR	Newfoundland Air Pollution Control Regulations
NL Hydro	Newfoundland Hydro
NF Power	Newfoundland Power
NL	Newfoundland & Labrador
NLECC	Newfoundland and Labrador Environment and Climate Change
NLFFA	Newfoundland Fisheries, Forestry and Agriculture
NLIPS	Newfoundland Immigration, Population Growth and Skills
NLIET	Newfoundland & Labrador Industry, Energy and Technology
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NRCan	Natural Resources Canada
NTSC	National Television Standards Committee
O_3	Ozone
PAO	Provincial Archeology Office
PBA	Project Benefits Agreement
PEM	Proton Exchange Membrane
PM	Particulate Matter

POI	Point of Interconnection
PPE	Personal Protective Equipment
PV	Photovoltaic
Q_{20}	Long term safe yield
QRA	Quantitative Risk Assessment
RABC	Radio Advisory Board of Canada
RBP	Rate-based Procurement
RCMP	Royal Canadian Mounted Police
RFNBO	Renewable Fuel of Non-Biological Origin
RFP	Request for Proposal
ROW	Right of Way
RFWTP	Raw Freshwater Treatment Plant
SAR	Species at Risk
SARA	Species at Risk Act
SO_2	Sulfur Dioxide
SOCI	Species of Conservation Interest
SO_x	Sulfur Oxides
SUV	Sports Utility Vehicle
tCO_2e	Tonnes of Carbon Dioxide Equivalent
tCO_2e/kg	Tonnes of Carbon Dioxide Equivalent per kilogram
tCO_2e/km	Tonnes of Carbon Dioxide Equivalent per kilometre
$tCO_2e/tonne{\cdot}km$	Tonnes of Carbon Dioxide Equivalent per tonne-kilometre
tCO_2e/y	Tonnes of Carbon Dioxide Equivalent per year
TIS	Transportation Impact Study
TMP	Traffic Management Plan
TPD	Tonnes Per Day
TSP	Total Suspended Particulate
UNKW	Unknown
UTM	Universal Transverse Mercator
µg/m3	micrograms per cubic metre
µm	Microns or micrometres
VC	Valued Component
VHF	Very High frequency
WERP	Wildlife Emergency Response Plan
WHMIS	Workplace Hazardous Material Information System
WMP	Waste Management Plan
WSS	Wetlands of Special Significance
WTG	Wind Turbine Generator
WWTP	Wastewater Treatment Plant

1.0 INTRODUCTION

Exploits Valley Renewable Energy Corporation ("EVREC", the "Proponent") is proposing the development of a wind to green ammonia project (the "Project") in central Newfoundland and Labrador (NL), Canada. The Project is positioned to be one of the lowest cost, green hydrogen and ammonia producers globally, utilizing 100% renewable energy. The Project is planned to have a small grid connection for critical loads and will be powered by off-grid renewable energy (wind and solar). The facility will produce certified green ammonia that is expected to be utilized predominantly in the Canadian, United States, and European markets.

The Project will involve development, construction, operations, and decommissioning and reclamation of wind farms, a solar farm, an industrial facility, and water supply for green hydrogen production and ammonia synthesis, including air separation, water treatment, and ammonia storage. The Project will use the existing Port of Botwood for its shipping needs, which has historically served various clients across industrial sectors, for over 100 years.

During 2022 and 2023, EVREC participated in the Wind Nomination Submission and subsequent Land Bid Process conducted by the Newfoundland and Labrador Industry, Energy, and Technology (NLIET). Through this process, EVREC was rewarded as a successful proponent and obtained its wind application recommendation letters granting exclusive rights to pursue the development for wind power generation and green ammonia production near Botwood (NLIET 2023). The Proponent is working with Newfoundland and Labrador Fisheries, Forestry, and Agriculture (NLFFA) to secure the Crown lands required for the Project.

The Project is required to be registered with the Newfoundland and Labrador Environment and Climate Change (NLECC) pursuant with the Newfoundland and Labrador *Environmental Protection Act* (NL *EPA*, 2002) and its associated Environmental Assessment (EA) Regulations (2003). Part 34 of the EA Regulations (2003) requires electrical power generation greater than 1 megawatt (MW) to be registered for an EA.

To facilitate the environmental permitting activities, the Proponent engaged Strum Consulting with other global specialists to lead the preparation of the Project's Environmental Assessment Registration Document (EARD). Strum is an independent multi-disciplinary team of consultants with extensive experience undertaking EAs throughout Atlantic Canada, including the successful approval of several wind EAs in Nova Scotia

1.1 Proponent Information

EVREC's parent company is Abraxas Power Corp. ("Abraxas"). Abraxas is a global green energy developer focused on creating a portfolio of assets diversified by geography, technology, and scale. EVREC has developed a world class team of experienced management professionals who have a significant depth across a number of disciplines and sectors, including renewable power, speciality gases, electrical distribution and storage; and the development of large scale complex industrial facilities, including construction, commissioning, and operations throughout the globe. The team is also complimented with strong project finance and capital markets experience.

The Abraxas and EVREC Team is complimented by global experts in their fields, each with decades of experience in fields ranging from energy, utilities, mining, and metallurgy, across all facets of large-scale project lifecycles. Examples of projects Abraxas is undertaking include:

- Romania: European Union (EU) jurisdiction, the company is working with the largest oil refinery in the country to develop, finance, build and operate a grid-connected 11 kt green hydrogen production facility within the refinery platform. The project is anticipated to start construction in 2026 with Commercial Operation Date (COD) by the end of 2027.
- Maldives: Abraxas has received the approval under the country's first Special Economic Zone to develop a 150 MW floating solar photovoltaic (PV) project off the coast of capital Male. The project is well into its development cycle, with planned start of construction in 2025 and COD in 2026.
- Sri Lanka: Abraxas is developing a large-scale Power to X (turning renewable energy into electricity) project in Southern Sri Lanka, aimed at using solar PV and wind energy amounting for approximately 1.3 gigawatts (GW) (280 MW PV and 1120 MW onshore wind) to produce green hydrogen and ammonia. Project planned ammonia output is 500,000 tonnes (t) per year. The company has already received the government approval for the first phase of the project.

Contact information for the Proponent and their consultant is included in Table 1.1.

Table 1.1: Proponent and Consultant Contact Information

Proponent Information	
Project Name	EVREC Green Energy Hub
Proponent Name	Exploits Valley Renewable Energy Corporation (EVREC)
Mailing and Street Address	Stewart McKelvey PO Box 5038 Suite 100 New Gower Street St. John's, NL A1C 6K3
Proponent Contact Information for the EA Registration	James Colter Eadie Founder and Chief Executive Officer jceadie@abraxaspower.com Phone number: +40.736.372.724 Ravi Sood Chairman rsood@abraxaspower.com Phone number: +1.647.987.7663 Dean Comand President Chief Operating Officer Dcomand@abraxaspower.com Phone number: +1.416.648.0202

Consultant Information	
Name of Consultant	Strum Consulting
Mailing and Street Address	#E120 – 120 Torbay Road St. John's, NL A1A 2G8
EA Contact	Nicole Thomas Manager, Environmental Assessment and Approvals Email: nthomas@strum.com Phone: 709.765.2917

1.2 Overview of Undertaking

The Project is proposed on land parcels totaling 32,633 hectares (ha) (consisting of 30,712 of nominated Crown land and 2,174 ha under Crown land application, with a 251 ha overlap) in central Newfoundland and Labrador (Drawing 1.1, Appendix A) (defined hereafter as the Project Area; Section 2.2). The Project is centered at 49.161441° N, 55.486669° W. Within the Project Area, siting of wind turbine generators (WTGs) will be within three areas: Botwood, Twin Lake, and Leading Tickles. The Industrial Facility and Solar Farm, along with associated infrastructure, are co-located on a parcel southwest of the Town of Botwood.

For the purposes of this EA, the Project consists of four components: (i) Wind Farms; (ii) Solar Farm; (iii) hydrogen and ammonia production facilities (defined hereafter as the Industrial Facility); and (iv) Water Supply.

Wind Farms

- Botwood Wind Farm: ~328 WTGs - 20,881 ha and has primary access from the Town of Botwood
- Twin Lake Wind Farm: ~150 WTGs - 7,643 ha and is located between North Twin Lake and South Twin Lake
- Leading Tickles Wind Farm: ~52 WTGs - 2,189 ha in the Leading Tickles area
- Collectively, the wind farms will also require the following supporting infrastructure:
    - Approximately 900 kilometres (km) of medium voltage and 75 km of high voltage transmission lines, collection systems, and substations. Infrastructure footprint and routing is ongoing for the Leading Tickles route at the time of writing this EARD and therefore not shown on Drawings.
    - Gravel borrows pits and excess soil management facilities
    - Approximately 240 km of existing primary, secondary and resource roadways available (215 km to be upgraded), and approximately 40 km of new road construction
    - Access bridges, crane pads, and inspection and maintenance lay down points
    - Emergency power and black start generators
    - Warehousing and satellite offices/control rooms

Solar Farm

- Approximately 150 MW of monocrystalline n-type, 450 W monofacial PV arrays
- Solar electrical infrastructure

Industrial Facility

- Hydrogen Plant and Storage
  - Storage tanks, electrolyzers, and an administration building associated with the hydrogen plant (12 ha)
  - Aboveground hydrogen storage facility (approximately300 t)
  - Hydrogen electrolyzer plants (total 2.600 MW capacity; ~17000 kT/year product output)

- Ammonia Plant, Storage, and Transport
  - Ammonia plant and associated storage tanks
    - Total nameplate production capacity of 5,000 tonnes per day (tpd) through various ammonia trains are required
  - Cryogenic double-walled tanks with a total volume of 75,000 cubic metres (m^3), located at the Industrial Facility

- Air Separation Plants
  - Plants will be installed to provide ~4200 tpd nitrogen plant with potential capability to produce liquid nitrogen for storage and backup

- Molecular Storage
  - Up to 125,000 m^3 of above ground hydrogen storage (bullets, spheres, gas collector system)

- Electrical Infrastructure
  - Main switchyard to receive power from all the wind turbine collector stations
  - Grid connection to the Newfoundland grid [132 kilovolt (kV)/230 kV]
  - Electrical energy storage system [capacity up to 1,050 megawatt hours (MWhrs) and a discharge rate of ~100 MW/hour]

- Service Facilities
  - Water treatment facilities
    - One raw water retention pond
    - One stormwater and process collection pond, including monitoring and discharge piping
  - Flares
  - Diesel/Hydrogen/Ammonia-fired emergency backup generators to support critical facility load in the event of a power interruption (not normally operated except for monthly reliability testing)
  - Ammonia export loading line
  - Access and heavy haul roads
  - Ship loading system able to load vessels at a rate up to 2,500 tonnes per hour
  - Canteens, emergency services, telecommunications, laundry
  - Helipads
  - Custom clearance yards

- Recreational facilities, change houses
- Training facilities
- Public centre
- Inventory yards
- Aboveground heat exchangers
- Control building
- Administration building
- Maintenance shops
- Fire suppression stations
- Secure perimeter chain link fencing with two site access points, a main entrance gate, and service gates

Water Supply

- Water is used for the production of hydrogen (76% of total demand), potable water uses (~3%), cooling water (~8.5% of demand) and make up/auxiliary water (~12.5% of the total demand)
- Water supply pumphouse [~21 megalitres per day (ML/d)] for electrolyzers and cooling water services
- Pump station building at Peters Pond and associated infrastructure [1,500 square metres (m^2)]
- Freshwater pipeline [~6 km, twinned - 660-millimetre (mm)] from Peters Pond to on-site reservoir storage
- Access and service roads
- Emergency generators
- Satellite office/ control rooms

Transhipment Terminal

The Project will be utilizing existing port facilities that have historically serviced various clients (forestry, mining, aquaculture, newsprint) for over 100 years, with ships varying in size over 25,000 DWT. The facility is under the care and control of the Port of Botwood.

The Port is a deep-water access port for large ships. The navigational channel into the Port is over 1000 m x 2000 m, allowing ample room for vessels to berth. The Port of Botwood is also unique in that it has required little to no dredging throughout its history. The normal depth of the Port at berth is expected to be greater than 13 m which allows for vessels up to 385 m in length to enter. Ammonia carriers are typically in the range 5,000 to 30,000 DWT (the three common vessel sizes are 10,000, 20,000, and 30,000 DWT). This would signify that the Port is capable to accommodate vessels to transport ammonia in and out of the Port.

As the Port will be also used for other ventures and users, EVREC has entered into a lease arrangement with the Port of Botwood. Project requirements will be provided to the Port of Botwood. As the Port and associated infrastructure are under the care and control of the Town and Port of Botwood, any future modernization will undergo a separate approvals process, as an undertaking of the Port of Botwood and is not a component of this EARD.

The Project includes feasibility, biophysical, geological, geotechnical, EA surveys, testing, sampling, surveying, engineering design, community engagements, a wind measurement campaign (met masts and LiDAR) and other typical development activities (i.e. geotechnical investigations) prior to construction activities.

1.3 Regulatory Framework

Various approvals are required from the federal, provincial, and/or municipal regulators to construct and operate the Project (Tables 1.2 to 1.4).

A federal impact assessment is not required for the Project as it is not listed as a physical activity that constitutes a designated project as listed in the Physical Activities Regulations, SOR/2019-285, under the *Impact Assessment Act*, S.C. 2019, c. 28, s. 1.

Federal approval, permit, notification, and compliance requirements for the Project are provided in Table 1.2.

Table 1.2: Federal Regulatory Requirements

Requirement	Regulatory Body	Status/Comments
Notification of Project	Royal Canadian Mounted Police (RCMP)	To be done following registration.
Aeronautical Assessment Form	Transport Canada	Future approval.
Canadian Navigable Waters Act (*CNWA*)	Transport Canada	Future approval.
Transportation of Dangerous Goods Act (*TDGA*)	Transport Canada	Compliance Legislation
Canada Shipping Act, 2001	Transport Canada	Compliance Legislation
Final design, location, and height of turbines	Natural Resources Canada (NRCan)	Future approval.
Electromagnetic Interference (EMI) consultation and radio communication layout authorization	Various	Future approval.
Fisheries Act, R.S.C., 1985, c. F-14	Fisheries and Oceans Canada (DFO)	Potential future approval.
Species at Risk Act, S.C. 2002, c. 29 (*SARA*)	Environment and Climate Change Canada (ECCC), DFO	Potential future approval.
Migratory Birds Convention Act (*MBCA*)	ECCC	Compliance legislation – there is no expectation that a *MBCA* permit will be required
Environmental Emergency Regulations (EER), 2019	ECCC	Future approval.
Explosives Act, R.S.C. 1985, c. E-17	NRCAN	Licence to store, manufacture, or handle explosives, Future approval
Radiocommunication Act Radio Licence	Minister of Industry (Canada)	Future approval.

The Project is subject to section 34 (1f) of the Environmental Assessment Regulations, N.L. Reg. 54/03 under the Newfoundland and Labrador *Environmental Protection Act*, S.N.L. 2002, c. E-14. As such, this submission has been prepared per the Guidance for Registration of Onshore Wind Energy

Generation and Green Hydrogen Production Plants (NLECC, 2023a). An EARD is a formal record required to initiate an environmental review process for a proposed project. It typically serves as the first step in assessing potential environmental impacts and ensuring that they are properly considered before a project proceeds. The Proponent is actively collecting and analyzing additional data to support Project planning and design. This information is expected to be provided as part of an environmental assessment (EA) as directed by regulatory authorities or prior to construction.

Required provincial approval, permit, notification, and compliance requirements are provided in Table 1.3.

Table 1.3: Provincial Regulatory Requirements

Requirement	Regulatory Body	Status/Comments
Body of Water Alteration Permit	NLECC	Alteration applications, if required, will be submitted to NLECC following EA approval.
Endangered Species Act (*ESA*)	NLFFA	Potential Future Approval – permit request submitted for American Marten hair snag study.
Use of Crown lands	NLFFA	Application submitted. In progress.
Notification of blasting (if required)	NLECC, Newfoundland and Labrador Health and Safety	Future approval.
Overweight/Special move permit	Service Newfoundland and Labrador	Future approval.
Access permit Work within the highway right-of-way Use of right-of-way for pole lines	Service Newfoundland and Labrador	Future approval.
Electricity standard approval	NLFFA	Future approval.
Elevator lift license	Service Newfoundland and Labrador	Future approval.
Archaeology Research Permit	Provincial Archaeology Office	Future approval.
Newfoundland Temporary Workplace Traffic Control Manual	Service Newfoundland and Labrador	Compliance for using provincial roads during the construction, operation, and decommissioning phases of the Project.
Certificate of Approval for Construction and Industrial Operation	NLFFA, Wildlife	Future approval.
Permit to control nuisance animals	NLFFA, Wildlife	Future approval.
Application for approval for generator operation	NLECC, Water Resources	Future approval.
Permit certificate of approval for transportation of waste dangerous goods/hazardous waste	NLECC, Pollution Prevention Industrial Compliance	Future approval.
Forestry Act • Permit to cut • Permit to burn • Forest travel permit to travel through “restricted travel area” • Operating permit to carry out a logging or industrial operation on forest land during the forest fire season	NLFFA, Forestry	Future approval.

Requirement	Regulatory Body	Status/Comments
Certificate of approval for a sewage system	Service Newfoundland and Labrador	Future approval.
Quarry development permit	NLIET, Mining and Mineral Development	Future approval.
Certificate of approval for electrical system interconnection	Service Newfoundland and Labrador	Future approval.
National building code-fire, life, safety and building safety	Service Newfoundland and Labrador	Future approval.
Buildings accessibility registration and permit or building accessibility exemption	Service Newfoundland and Labrador	Future approval.
Food establishment licence	Service Newfoundland and Labrador	Future approval.
Food Premises Act • Approval of plans and specifications for construction of food premises • Approval of water supply and sewage disposal for the food premises	Service NL	Future approval.
Electrical permits	Service Newfoundland and Labrador	Future approval.
Blaster safety certificate	Newfoundland Immigration, Population Growth and Skills (NLIPS)	Future approval.
Fire Protection Services Act Review and approval of plans and specifications for construction of structure, approval of fire alarm and detection systems and fire extinguishing system	NL Fire Commissioner	Future approval.
Health and Community Services Act/Sanitation Regulations • Certificate of Approval and final approval certificate for sewage systems having capacities of less than 4,546 litres/day • Certificate of Approval and final approval certificate for water supply system for human consumption	Service NL	Future approval.
Occupational Health and Safety Act/Occupational Health and Safety Regulations Explosives magazine permit	Director Occupational Health and Safety Division	Future approval.
Public Safety Act and Boiler, Pressure Vessel and Compressed Gas Regulations	Service NL	Future approval.

Requirement	Regulatory Body	Status/Comments
• Certificate of Inspection authorizing the operation or use of a boiler or pressure vessel • If the Project involves any filling or dispensing plant (gas), need to (i) register such plant, (ii) have gas plant personnel certified, and (iii) register plans and specifications for gas installations/plant • If the Project involves any "pressure plant", need (i) to submit specifications and obtain a design registration number, (ii) register engineers and operators of pressure plant, and (iii) register the pressure plant • If the Project involves any gas piping systems, appliances or fittings exceeding 211,000 kilojoules, need for an installation permit Amusement Rides and Elevating Devices Regulations Certificate of approval for an elevating device	Service NL	
Works, Services and Transportation Act • Consent of Minister to lay down a drain, sewer, water pipe, conduits or structures beneath the surface of a highway • Permission of Minister to erect a structure near highways under Building Near Highways Regulations, 1997	Newfoundland and Labrador Transportation and Infrastructure	Includes Route No. 350, Botwood Highway (from Bishop's Falls to Leading Tickles via Botwood and Point Leamington).
Air Pollution Control Regulations, 2004 Air Quality Management Plan	NLECC	Future approval.
Storage and Handling of Gasoline and Associated Products Regulations, 2003 • Fuel storage tank registration • Approved contingency plan for storage tank system Used Oil Control Regulations • Certificate of registration for a storage tank system for collection and storage of used oil	Service NL	Future approval.
Pesticides Control Regulations, 2012 Applicator licence	NLECC	Future approval.
Water Resources Act • Water Use Licence	NLECC	Water use licence application will be submitted to NLECC following EA approval, for supply of freshwater to the Industrial Facility.

Requirement	Regulatory Body	Status/Comments
• Permit to construct sewage works for more than 4546 Litres/day • Permit to construct water works • Permits under section 48 to (i) alter a body of water, (ii) for works within 15m of a body of water, (iii) to construct bridges and/or culverts and (iv) for fording/stream crossings. • Well construction permit for a non-domestic well.		
Fire Protection Services Act Review and approval of plans and specifications for construction of structure, approval of fire alarm and detection systems and fire extinguishing system.	NL Fire Commissioner	Future approval.

Project activities will require the construction of buildings and infrastructure, temporary structures, and the disposal of waste. Municipal approvals and/or permits may be applied to the Project for developments or land use in the Town of Botwood. The Town of Botwood Development Regulations (2022) apply to this Project.

Municipal approval, permit, notification, and compliance requirements are provided in Table 1.4.

Table 1.4: Municipal Requirements

Requirement	Regulatory Body	Status/Comments
Building and Development Permits	Municipality of Botwood	Development Permit applications will be submitted and will be updated following EA Approval. Project Building Permit applications will be submitted at a later date.
Approval for Waste Disposal	Municipal council	Future approval.
Licence to operate a temporary work camp	Municipal council	Future approval.

The freshwater supply will be sourced from Peters Pond. Historically, Peters Pond was used as the municipal water source for the Town of Botwood. Over the years, the Town of Botwood switched its water supply point to the Grand Falls reservoir, and Peters Pond is currently not used for any water debits.

1.4 Structure of the EA Registration Document

An outline of the content of each section of the EARD is provided in Table 1.5.

Table 1.5: EA Registration Document Structure

Section	Content
Section 1	INTRODUCTION
Section 2	PROPOSED UNDERTAKING
Section 3	DESCRIPTION OF THE EXISTING ENVIRONMENT AND VALUED COMPONENTS
Section 4	ENVIRONMENTAL STUDIES
Section 5	ENVIRONMENTAL EFFECTS
Section 6	RESIDUAL EFFECTS
Section 7	CUMULATIVE EFFECTS
Section 8	ASSESSMENT SUMMARY AND CONCLUSIONS
Section 9	PUBLIC AND INDIGENOUS ENGAGEMENT
Section 10	ENVIRONMENTAL PROTECTION PLAN
Section 11	PERSONNEL
Section 12	COMMITMENTS MADE IN THE EA REGISTRATION DOCUMENT
Section 13	REFERENCES
Appendix A	Drawings
Appendix B	CO_2 Summary from EVREC
Appendix C	ACCDC Report
Appendix D	Archaeology Report
Appendix E	Public Meetings/Information Sessions
Appendix F	Environmental Protection Plan (EPP) TOC

2.0 PROPOSED UNDERTAKING

2.1 Rationale for the Undertaking

Demand for green hydrogen and ammonia is expected to grow substantially within the next few years, with a global drive towards decarbonization, energy independence, and security. Being at the forefront of these developments will position Newfoundland and Labrador and Canada as global leaders in producing green hydrogen and ammonia. Central Newfoundland has a world-class on shore wind resource, abundant fresh water supplies, numerous deep-water ports, and low shipping costs to key Canadian, United States and European markets. Newfoundland and Labrador's unique geography, vital onshore wind resource, and proximity to large centres of demand will make it a globally competitive green hydrogen-production region. End-use applications of green ammonia include maritime fuel, electricity generation, industrial feedstock (steel, mining extraction for metals, crude oil refining, and acid neutralization), transportation energy source, and industrial fuel.

The Project has been designed to be completely off-grid; however, the Proponent hopes to conclude a beneficial arrangement with Newfoundland and Labrador Hydro (NL Hydro) and Newfoundland Power (NF Power) for future electrical grid connections. Project benefits for future grid connections

include:

- Provides facility stability and a higher level of energy security for critical loads.
- Supplies the province with surplus power when the facility is not in need.
- Provides auxiliary services to the province.
- Provides regional emergency power to the provincial grid.
- Reduces transmission line infrastructure upgrades, thereby lowering energy costs for consumers (long-term stability in energy prices).
- Facilitates local economic growth through employment opportunities and investment in local communities.
- Acts as an enabler for other industries in the region.
- Contributes to lower energy costs to system users.

Newfoundland and Labrador has Canada's second-highest renewable energy mix and the highest amount of renewable energy (undeveloped wind, forestry, and solar resources) per capita (Government of NL, 2021). NL Hydro expects to replace isolated diesel-powered electricity systems with renewable energy sources. The provincial Renewable Energy Plan (Government of NL, 2022) and the Way Forward on Climate Change in Newfoundland and Labrador (Government of NL, 2017) include actions to build opportunities for green products such as green hydrogen and ammonia for export within two years and grow capacity for the province's undeveloped renewable energy resources related to hydrogen produced from the renewable energy grid in 2 to 5 years. The province has reserved several Crown land areas as being available for wind projects, and this Project was submitted as part of a bid process to use a portion of the identified parcels.

The Proponent has signed non-disclosure agreements with several European off-takers and has also executed an offtake agreement subject to permitting approval. The Proponent continues to progress in developing local offtake customers within the Canadian industrial markets and with maritime operators to support fuel bunkering development.

A third-party analysis of the EU regulations relevant to the Project was carried to assess the likelihood that the Project would produce RED II compliant Renewable Fuel of Non-Biological Origin (RFNBO) and to address the associated mandatory market in Europe. A preliminary assessment of potential compliance-related risks was conducted based on current technical and operational hypotheses associated with Project design and evaluated against the CertifHyTM Voluntary Scheme requirements for RED II RFNBO compliance.

This assessment process was carried out in a two-step approach:

1. A preparatory analysis conducted by Hinicio identified suitable scenarios for the Project business and design case to set the audit scope for both on renewability and GHG emissions assessment.
2. The completion of an audit exercise conducted by Bureau Veritas, which is a certification body recognized under the CertifHyTM Voluntary Scheme.

Based on the work conducted to date, and assuming the Project will be built and operated as per the

designs and documents provided, the audit exercise concluded that the ammonia produced from the Project would meet RED II RFNBO requirements and there is an overall net benefit on emission reductions from the Project. As such, the Project was pre-certified through the audit exercise conducted by Bureau Veritas certification body recognized under the CertifHyTM Voluntary Scheme.

The Proponent has also obtained significant support from a variety of stakeholders including several municipalities in the Exploits Valley (e.g., the Town of Botwood). Additionally, a Memorandum of Understanding (MOU) and support letters have been obtained from the Qalipu First Nation, the Port of Botwood, various associations, and several local contractors that contemplate future cooperation and support between the parties. The Project has also completed an Economic Benefit Analysis and presented it to stakeholder groups and the outlying communities. As part of the initial development, the Project maintains the support of NLIET through the nomination process with the issuance of a Wind Application Recommendation Letter for the Project.

The federal and provincial governments have announced several clean technologies and clean hydrogen investment tax credits to support sustainable energy transition projects. A key driver of the increased demand for the green ammonia energy market in Europe over the past 18 months is the Repower EU Plan (2022), which targets 10 million tonnes of green hydrogen imports by 2030. The EU Renewable Energy Directive specifies that electrolysis-derived hydrogen must be based on new renewable electricity sources that provide energy above grid needs. The Proponent's plan to build a purpose-built wind and solar farm to produce green ammonia with a small utility grid interconnection (if available) aligns with this Directive. Canada recently signed an MOU with Germany to establish transatlantic supply corridors for green ammonia, with eastern Newfoundland providing an advantageous location to meet this target. Delegations from the Netherlands, Belgium, and Denmark have also continued to demonstrate cooperation with Canada.

Canada introduced the Hydrogen Strategy of Canada in December 2020 that would see 30% of the country's energy coming from hydrogen by 2050, allowing the government to reach zero carbon emissions by 2050 (Natural Resources Canada, 2020). Canada is already established as a significant ammonia producer (4.7 million metric tonnes in 2021) and the world's fourth-largest natural gas producer (Natural Resources Canada, 2020).

Locally, the Project and its supporters believe that its existence will stimulate the local economy and provide economic and social benefits to the region and the province. The impacts of the Project are expected to be long lasting on both the local and provincial economies as the Project is committed to be a model citizen as it enters into Project benefits agreements with various stakeholders. The Project is also poised to increase benefits that will flow to the province through royalties, taxes, employment, innovation and skill development, and contracting opportunities during all phases.

2.2 Project Area

The Project Area is located in the north-central part of Newfoundland (Drawing 1.1, Appendix A), spanning across the Central and Notre Dame Bay Census Division. It consists of the large geographic area encompassing all of the primary Project components (Wind Farms, Solar Farm, Industrial Facility, Water Supply) and associated infrastructure included in the Wind Reserve Lands, and an

additional smaller area of Crown land currently under application (Table 2.1).

Table 2.1: Summary of Land Parcels within the Project Area

Land Parcel	Size (ha)	Project Component	Classification
Botwood	20,880.66	Wind Farm	Abitibi/Crown Land, Protected River, Botwood townsite, Agriculture, Water Resource Management Area
Twin Lakes	7,643.25	Wind Farm	Abitibi/Crown Land
Leading Tickles	2,188.52	Wind Farm	Private Land, Aquaculture, dump site buffer
Ongoing Crown land application	2,172.63	Wind Farms (electrical infrastructure) Solar Farm Industrial Facility Water Supply	Agricultural, Abitibi Crown Land, Municipal Land
Overlap between Wind Reserve Area and Crown Land Application	(251.79)	NA	NA
Total	32,633.27	NA	NA

A preliminary layout has been generated for key Project components, based on an initial constraints analysis. However, the final footprint will be updated to reflect the growing knowledge of the Project Area through the EA process and an assessment of constructability and wind resources. WTG locations have been constrained to the wind reserve lands identified as the Botwood Wind Farm, Twin Lakes Wind Farm, and Leading Tickles Wind Farm. The Solar Farm and Industrial Facility (Drawing 2.1, Appendix A) is comprised of lands currently under Crown Land Application (and associated Wind Reserve overlap area).

Additional spatial boundaries [regional or Valued Component (VC) specific] may be included as part of an EA as directed by regulatory authorities or prior to construction.

2.3 Site Considerations

In selecting areas to be developed, current data on Newfoundland's forests, wildlife, water resources, wetlands, Crown lands, and protected areas was reviewed to ensure the Project Area avoids and/or minimally impacts environmentally sensitive areas. A summary of minimum setback distances is provided in Table 2.2.

Table 2.2: Summary of Minimum Setbacks and Separation Distances

Project Component	Setback Category	Setback Distance	Reference
All	Watercourses	30 m[1]	Industry best practice, Gov NL (NLECC) policy for development in public water supply areas
All	Wetlands	30 m[1]	Industry best practice, Gov NL (NLECC) policy for development in public water supply areas
Wind Farms and Solar Farm	Protected Areas and Public Resources	300 m	NLECC
All	Rare Plants and Species at Risk (SAR)	Species-specific (Section 3.5.1)	*SARA* and *ESA*
All	Archaeology Sites	TBD by regulatory agency	Gov NL, Provincial Archeology Office (PAO)
All	Public Roads	1.5 x total turbine height or 330 m (from government managed roads), whichever is greater	CanREA Best Practices for Wind Farm Icing and Cold Climate Health and Safety 2020
Wind Farm and Associated Infrastructure	Powerlines	1.5 x total turbine height or 330 m (from government managed roads), whichever is greater	CanREA Best Practices for Wind Farm Icing and Cold Climate Health and Safety 2020
Wind Farm	Shadow Flicker	Designed to meet maximum threshold of 30 minutes/day or 30 hours/year	Health Canada Wind Turbine Noise and Health Study 2012
All	Sound / Noise	40-45 dB	Government of Ontario.Ministry of Environment, Conservation and Parks, 1995. NPC-232 Sound Level Limits for Stationary Sources in Class 3 Areas (Rural)
All	Residences (except for residences on participating lands)	550 m from noise receptors	Section 54 (1) Ontario Regulation 359/09
Industrial Facility	Consequence Impact Ammonia Release at Ship Vessels and Tanks	Currently 300 m	Underwriters are reviewing current design from a risk perspective and will incorporate the identified setback into the final design
Industrial Facility	Ammonia/Hydrogen Plants distance to residence/community	Being assessed by Insurance Underwriters and will be outlined in HAZOP and HAZID	Underwriters are reviewing current design from a risk perspective and will incorporate the identified setback into the final design

[1]Unless authorized by NLECC

2.4 Process Description

Renewable energy generated predominantly from the WTGs will be converted and collected in substations and transmitted to the Industrial Facility through high-voltage transmission cables. The electricity will supply the power to the Industrial Facility and be used to produce green ammonia and for auxiliary systems (Figure 2.1). The green ammonia will be stored in product storage tanks prior to shipment to end users via specialized sea vessels.

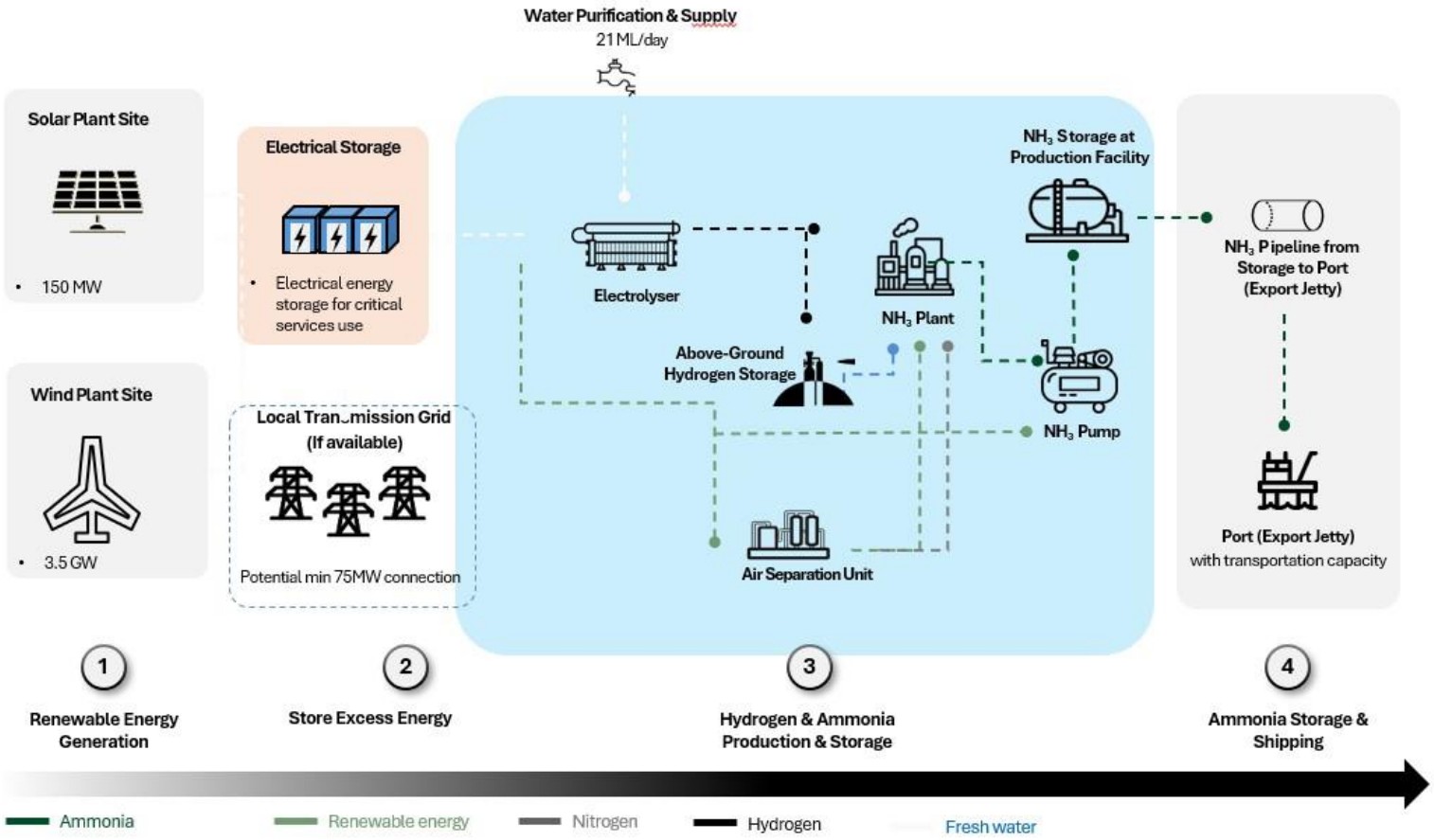

Figure 2.1: Green Hydrogen and Ammonia Production Process Flow Diagram

2.4.1 Wind Farm

While the specific WTG model has not yet been selected, general, conservative ranges of WTG characteristics being considered are as follows:

Hub height: up to 135 m
Blade length: up to 91 m
Rotor diameter: up to 182 m
Maximum WTG height (including tip of the blade at highest vertical position): up to 226 m

The Project layout will be designed in consideration of the setbacks identified in Table 2.2, wind resource data, topography, constructability, and minimizing potential interactions to the environment and communities. Specific details will be provided as part of an EA as directed by regulatory authorities or prior to construction.

Electrical transmission lines, collection systems, and substations indicate that there will be a requirement for approximately 900 km medium voltage transmission lines and 75 km high voltage transmission lines to support the electrical infrastructure. The power from the WTGs will be collected through a series of medium voltage electrical systems and collected at substations where the power will step up to the high voltage line and be cabled to the Industrial Facility to a central switchyard (Drawing 2.2, Appendix A). The transmission line route for the Leading Tickles Wind Farm is still under review and two concepts have been prepared, in which the team is evaluating to determine optimal routing to mitigate social and environmental impacts.

The Project currently resides on former Abitibi Consolidated lands with approximately 240 km of existing primary, secondary, and resource roadways (Drawing 2.3, Appendix A). Additionally, the Project has identified 215 km of former resource roads through the identification of high resolution LiDAR, which was conducted in fourth quarter 2023. Approximately, 450 km of new road will be constructed and 215 km of existing road will be upgraded to provide direct access to the WTGs in the current design. Additional road upgrades and access will be determined upon final design of the Project layout. Access roads will have a 7 to 9 m wide road surface and include ditching and grading, which will be 17 to 20 m wide. Wider roads (12 m road surface) are required for heavy equipment to move from turbine to turbine, and narrower roads (8 m road surface) will be utilized in areas in which smaller loads can be managed.

2.4.2 Solar Farm

To meet the base power requirements of the Industrial Facility and to reduce electrical storage requirements while maximizing load balancing needs, the Project is planning the installation of a 150 MW solar array and step-up substation (Drawing 2.4, Appendix A). The Solar Farm will be used to provide power to the batteries when excess wind power is not available. The implementation of solar will reduce the battery storage facility size, and in conjunction with the batteries, provide sustainable power for critical electrical loads during low wind production periods. Newfoundland receives around 1,000 kilowatts per hour per year (kWh/m^2) of solar irradiance on a surface perpendicular to the sun rays each year. The Solar Farm is expected to require approximately 130 ha of land adjacent to the Industrial Facility to reduce line losses,

utilize established right of ways (ROW) for maintenance, and adjoin the electrical storage facility. Additional Crown land parcels for this purpose have been applied for.

2.4.3 Electrical Energy Storage

As the Project is planned to operate 100% off-grid, an electrical energy storage is required for system stability and load balancing. The Project has integrated a long-term electrical energy storage solution into its base design (Drawing 2.5, Appendix A). This incorporates solar as a storage solution to enhance the stability of the operation and provide additional benefits related to operational efficiency (such as power for critical and emergency loads). The system has currently been defined as a 100% battery system but is expected to be optimized during the front end engineering design (FEED) process as a combination of a battery, hydrogen fire/bio diesel turbine, ammonia fired generators, and steam turbine solution. Energy storage would help meet short duration electrical requirements and long duration energy supply. The designed profile would help smooth out variations in power quality, providing a consistent and stable power supply to sensitive equipment in the plant. This is particularly important for certain processes within the ammonia production chain that may be sensitive to fluctuations in power. As such, the electrical energy storage for the Project will only provide power to life safety systems and critical operating loads (these processes are more sensitive to intermittent power fluctuations).

The battery storage system will be used to store excess energy generated during periods of high renewable energy production and release it during periods of low production or high demand of power, ensuring a more stable and continuous energy supply. As the ammonia production processes have specific energy requirements, the electrical storage system will provide some level of load shifting allowing for continuity of the production and minimizing system trips for lack of power.

Although a robust electrical storage system will be implemented which will provide a high degree of grid independence, the Industrial Facility plans to have a small grid connection for construction power and ongoing operations. It is currently estimated that there is approximately 75 MW of grid availability local to the Project, which will provide some baseload power to safety and critical systems on an as available basis. The connection to the grid during the construction phase will reduce carbon emissions by reducing the requirement to run diesel generators.

An application has been submitted to NF Power and NL Hydro for grid connections for construction and operation following several engagements with the two entities to present the Project, provide updates, and discuss the technical possibility for the electrical connection.

2.4.4 Electrolyzer System

The power from the renewable energy sources will be used for the electrolysis system (Drawing 2.5, Appendix A), which facilitates the electrochemical reaction that produces hydrogen gas from the injected purified water. Electrolyzers, in general, are devices that use electrical energy to drive a non-spontaneous chemical reaction. In this case, the splitting of water into hydrogen and oxygen.

The facility's design will incorporate up to 2.6 GW of electrolyzers using water-based electrolytes. Specifically, the Project will utilize Proton Exchange Membrane (PEM) electrolyzers, which feature a solid polymer electrolyte membrane to separate the anode and cathode compartments. PEM electrolyzers are characterized by their lower operating temperatures compared to aqueous electrolyzers, enabling them to achieve faster response times. The current planned installation capacity will have a minimum 50% allocation to PEM electrolyzers.

The other potential 50% will be dedicated to alkaline electrolyzers, which use either potassium hydroxide or sodium hydroxide as the electrolyte. These alkaline electrolyzers are designed to function as base load units, providing steady and continuous operation within the overall system. The final decision on the mix of electrolyzer technology will be concluded through the FEED process.

The oxygen that is separated through the process will be safely vented to the atmosphere and the hydrogen produced will be safely collected and then compressed for use in the synthesize of ammonia.

The majority of the hydrogen produced will be utilized as a feedstock to the ammonia plant and a small portion may also be used as a feedstock to a fuel cell/hydrogen gas turbine for power production in lower power situations.

2.4.5 Hydrogen Molecular Storage

Hydrogen molecular storage refers to storage of hydrogen gas as H_2 molecules. Storing hydrogen is a critical aspect of the process and will be utilized to assist in preserving a consistent operating profile and minimizing the number of plant trips due to the potential wind variability. The electrolysis system will be coupled with the ammonia trains through a pipeline and an aboveground molecular storage system.

The Project is forecasting 85,000 to 125,000 m^3 of aboveground hydrogen storage (Drawing 2.5, Appendix A). Although this is costly compared with underground storage, the Project has elected to utilize only proven technologies and avoid potential execution and quality risks associated with underground storage alternatives.

The Project plans to store hydrogen using a combination of spheres, bullets, and piping in which the medium pressure hydrogen will be stored and used as a buffer for feedstock into the ammonia synthesis loop.

All necessary fire stops and fire separation and containment systems will be incorporated as required into the design ensuring the required safeguarding and prevention for loss control.

2.4.6 Ammonia

2.4.6.1 Ammonia Synthesis Loop

The ammonia synthesis unit (Drawing 2.5, Appendix A) is a crucial component of the Industrial Facility. The ammonia synthesis loop utilizes the hydrogen produced from water electrolysis and

combines it with nitrogen (obtained from air separation units) in the presence of a catalyst to produce ammonia (NH_3). The hydrogen and nitrogen are raised to high temperature and high pressure in the presence of an iron catalyst to form green ammonia. This process is known as the Haber-Bosch process.

The Project plans to utilize up to three independent ammonia trains to obtain a nameplate plant capacity of 5,000 tpd. The ammonia plant will be designed to operate at a turndown of 10% or less to balance with the hydrogen production and maintain a consistent operating profile.

The Industrial Facility will export anhydrous ammonia. Based on modern practices and the effective removal of oxygenates, the expected ammonia purity will be close to 100%.

2.4.6.2 Product Storage and Distribution

The produced green ammonia will be stored in on-site tanks or vessels specially designed for ammonia storage. These tanks will be stored at the Industrial Facility in the vicinity of the ammonia production trains (Drawing 2.5, Appendix A). The tanks will be manufactured in carbon steel, be double walled with insulation on the outside walls of the tank and have the appropriate level of containment to meet codes and regulations. The product will be refrigerated to maintain product at necessary temperatures to avoid flashing.

A minimum of two tanks are planned and each will be equipped with safety systems to suppress vapours. The ammonia storage tanks will be located within the plant boundaries and will be sized to a n+0.5 design to allow for routine maintenance and inventory control to coincide with vessel scheduling. The total storage amounts are anticipated to be 75,000 to 125,000 m^3 at full capacity.

The system will be designed to adhere to the International Fire Code and National Fire Protection Association’s definitions of ammonia (liquefied compressed, flammable, and corrosive gas).

2.4.6.3 Purification and Conditioning

The Project may require purification and conditioning processes before it can be used by customers. These steps involve removing impurities and adjusting the ammonia concentration, depending on the specific needs of the end-users and the quality control requirements by the vessel operators to prevent product contamination. The definitive requirements will be reviewed through the FEED phase of the Project.

2.4.6.4 Safety and Environmental Considerations

Due to the hazardous nature of ammonia, safety measures will be of utmost importance. Adequate safety systems, including leak detection and emergency response plans, will be implemented to ensure the safe handling and storage of ammonia. Environmental considerations, such as minimizing greenhouse gas emissions and waste disposal management will also be an integral part of the facility's operations.

2.4.6.5 Control and Monitoring Systems

To ensure the smooth and efficient operation of the green ammonia facility, advanced control and monitoring systems will be implemented. These systems will constantly monitor the production process, power supply, and other critical parameters to maintain optimal performance and detect any deviations or issues promptly.

2.4.7 Water

Water used to produce hydrogen and ammonia will be supplied from Peters Pond, approximately 4 km from the Industrial Facility (Drawing 2.6, Appendix A). Water will be supplied to the Industrial Facility through the installation of a new pumphouse and two 610 mm diameter high-density polyethylene pipelines (underground or aboveground to be determined) that will deliver water to the Industrial Facility and discharge into a holding reservoir and associated tanks. The reservoir will be designed to allow up to one to three days of raw water storage. From the holding reservoir, raw water will be pumped to an on-site raw water treatment plant. The anticipated average water volume for the facility is expected to be up to 21 ML/day.

There are four primary uses for water at the Industrial Facility, classified as:

- Production water
- Potable water
- Cooling water
- Make up/Auxiliary water

The Project is expected to have various effluent water streams from the processing plant. These effluent streams will either be discharged directly as non-contact cooling or passed through appropriate treatment as prescribed by regulatory standards in place, before being discharged. Any water discharged to the environment will be treated to meet the parameters in Schedule A of the NL Environmental Control Water and Sewage Regulations, 2003.

The identified effluent discharge streams are:

- Non-contact water
- Process water streams
- Stormwater/rainwater
- Sanitary water streams

2.4.7.1 Production Water

Production water is expected to include approximately 76% of the water demand as it is a key input for the green hydrogen and ammonia plant. The electrolyzer system requires water that is filtered, purified, and demineralized. As such, the raw water will be treated via:

- Ultrafiltration (UF) to remove suspended fine colloidal (insoluble) particles using a semipermeable membrane. The UF system will be designed to treat raw water for both process and potable water supply to the Industrial Facility.
- Reverse osmosis (RO) will serve as a backwash water source for the UF system and a

feed source for the RO system. RO uses a high-pressured process to force the raw water through a semipermeable membrane, removing unwanted contaminants (i.e., salts, bacteria, metals, etc.).

- Electro-deionization (EDI) removes ionized or ionizable substances from water using ion exchange membranes, electrically active media (ion exchange resin), and a direct current (DC) electric potential.

The average demineralized water consumption of the electrolyzer system is approximately 10 m^3 per produced metric ton of hydrogen. The anticipated average volume of water for production is anticipated to be 21 ML/day. This assumes that approximately 30 to 36% of the water supplied will be used for backwashing in the purification process and as such will be discharged from the facility. The Project is reviewing the ability to utilize this water stream for cooling, and flushing water purposes. If this water cannot be used, it will be considered wastewater and discharged accordingly.

2.4.7.2 Potable Water

Potable water is expected to comprise approximately 3% of the water demand. The Project will include a potable water generation and distribution system at the Industrial Facility. This system is designed to provide treated water for drinking, as well as greywater for common facilities (such as offices and washrooms), and for occasional use in the process facilities for washing and flushing purposes. All potable water will meet the Health Canada Guidelines for Canadian Drinking Water Quality (2022), ensuring it is safe for consumption and personal hygiene.

For off-site locations, the Project will implement its own potable water treatment systems where the water demand is high enough to justify centralized systems, such as in large camp areas. In these areas, the Project will consider the installation of localized groundwater wells, or the use of water drawn from nearby lakes. For temporary construction zones or areas with lower water demands, potable water will be transported from the main treatment facility to these sites by truck. The sizing of all systems will be based on an estimated water requirement of approximately 75 litres per day per person.

2.4.7.3 Cooling Water

Cooling water is expected to require approximately 8.5% of the water demand. Several processes will require the use of cooling water to avoid overtemperature and to maintain stable and efficient operations. Cooling water will be essential for removing excess heat generated during electrolysis and various stages of the ammonia production process. The cooling water will be used in non-contact heat exchangers to maintain optimal operating temperatures and prevent overheating of equipment such as compressors, synthesis reactions, condensation, and other auxiliary systems (generators, electrical equipment, pumps, seals, vacuum systems).

2.4.7.4 Make Up/Auxiliary Water

Make up water is expected to account for approximately 12.5% of the water demand. The Project will also entail several closed loop water systems in which there will be a requirement for

auxiliary water to be introduced to support these system's operation. This will include water for makeup, chemical treatment, and maintenance purposes. Although the closed-loop systems are designed to recirculate water continuously, over time they will experience small losses which can occur due to leaks, evaporation, or routine maintenance activities. As such, make up water will be added to replenish these losses and maintain the required water volume and pressure within the system.

Make up water will also be required for the ammonia plant boiler feedwater system, in which this closed system will require some blow down of water to maintain water quality to prevent corrosion, scaling, and biological growth. Purified water along with chemical additives will be introduced into these systems.

Like the boiler feed water systems, flushing and cleaning of closed-loop water systems will require flushing to remove accumulated debris, sediment, or chemical byproducts. Water will be required during maintenance procedures to clean systems and ensuring the operability and plant efficiently.

2.4.7.5 Non-Contact Water

Non-contact industrial water refers to water used at the Industrial Facility that does not come into direct contact with products or other materials. Non-contact water is expected to be generated through cooling or other utility uses where the water serves as a medium for temperature regulation, without becoming contaminated by the process. Non-contact water that is not able to be recycled will be directly discharged to the environment without treatment, subject to testing and meeting regulatory guidelines, as applicable.

2.4.7.6 Process Water Streams

Processing water discharge streams are classified as water that has been in contact with productor altered physically/chemically, or water that does not meet environmental and regulatory standards without treatment before being released into the environment or reused. This may include reverse osmosis backwash, off spec demineralized water, ammonia plant blowdown, cooling tower blowdown, condensate, closed loop water, and service water drains. The streams will be treated through a water treatment process prior to being either reused or discharged into the environment.

Treated wastewater and cooled blowdown water from the ammonia plant boilers will also be discharged to the stormwater/sedimentation collection pond. This water may be used for fire suppression water or discharged to a natural receiving waterbody after treatment. The precise specifications required for effluent treatment is to be developed in FEED based on both local regulations and industry best practices.

2.4.7.7 Stormwater / Rainwater

Stormwater will be diverted away from Project infrastructure via natural and graded ditches. Graded ditches will divert runoff into catchment areas that drain into the on-site stormwater/sedimentation collection pond. Treated wastewater and cooled blowdown water from

the ammonia plant boilers will also be discharged to the stormwater/sedimentation collection pond. This water may be used for fire water or discharged to a natural receiving waterbody. Any water discharged to the environment will be treated to meet parameters in Schedule A of the Newfoundland and Labrador Environmental Control Water and Sewage Regulations, 2003.

The Project will consider a dedicated rainwater collection system from the roofs of applicable buildings at the Industrial Facility. This water will be collected and potentially segregated into the new water staging pond and will be used to reduce water draw from Peters Pond, promoting sustainability. The anticipated rainfall in the area is forecasted to be 1,208 mm annually.

2.4.7.8 Sanitary Water Streams

Sanitary wastewater generated at the Industrial Facility will be collected and treated at the sanitary wastewater treatment facility and effluent water will be discharged with other treated water streams.

The anticipated sanitary water treatment facility process consists of a biofiltration process that will remove contaminants from wastewater using biological processes. The intent is that naturally occurring microorganisms will be used to degrade and metabolize organic pollutants, through filter beds, microorganisms, aeration, clarification, and disinfection (if required). The wastewater will then be discharged directly, or combined with, an on-site stormwater pond and discharged. Removed solids will be collected as sludge in designated containers for off-site disposal at an approved disposal facility.

Sanitary wastewater from human-occupied buildings such as camps and temporary washroom facilities will be collected and conveyed to an on-site sanitary wastewater treatment facility. In areas in which there are significant volumes, the Project will implement specific sanitary treatment facilities. Accumulated sludges will be periodically removed and disposed of at an off-site approved disposal facility.

2.4.7.9 Effluent Treatment & Discharge

An effluent treatment package is specified at the Pre-FEED stage to treat all facility effluent prior to discharge. The effluent treatment process will consist of neutralization, clarification, and filtration (if required). Acid and caustic feed systems will supply the necessary reagents to the neutralization tank containing the various effluents. A polymetric flocculant may be added to improve sedimentation with added pH adjustment as needed. The treated water will then be discharged into sedimentation/stormwater ponds or, if required, pumped through filters to remove fine particles before discharge. Removed solids will be collected as sludge and will be disposed of at an off-site discharge facility. As part of the FEED phase, a comprehensive waste management plan shall be developed. This plan will detail how sludge is to be managed, stored, treated, and finally disposed of, ensuring all processes align with recommended best practices and regulatory demands. The facility must also adhere to municipal waste requirements. Different municipalities might have varying stipulations based on their local needs, environmental factors, and infrastructure

There are different types of effluents that will either be discharged directly or passed through appropriate treatment as prescribed by regulatory standards in place, before being discharged. While 73% of the raw water volume is expected to be utilized in processing and other processes, the reverse osmosis process will strip various concentrations of water quality parameters from the raw water and re-introduce them at different concentrations upon treatment and discharge (27%). Final discharge points will be determined during the FEED process. Any water discharged to the environment will be treated to meet parameters in Schedule A of the Newfoundland and Labrador Environmental Control Water and Sewage Regulations (2003). Before effluent is discharged into the natural receiving waterbody, the facility will adhere to the guidelines set out by the Canadian Council of Ministers of the Environment (CCME). This ensures that any effluent released into the environment is treated to a standard that safeguards both the environment and public health. All waste originating from the Industrial Facility is mandated to align with national and local regulation standards to ensure both environmental protection and human health. Table 2.3 lists the potential contaminants and their concentrations that could be released into the environment following processing. Projected discharges are all below the limits established by NLECC.

Table 2.3: Projected Potential Contaminants and their Concentrations that could be Released into the Environment Following Processing*

Parameter	Average Concentration of Raw Water[1]	Expected Discharge Concentration of Treated Water[2]	Units	Guideline Limit[3]
Alkalinity	18.05	64.85	mg/L as CaCO3	-
Colour	45.03	43.68	TCU - 15(A)	-
Conductivity	55.60	199.76	µS/cm	-
Hardness	26.29	94.43	mg/L as CaCO3	-
Ph	7.07	6.85	N/A - 8.50(A)	5.5 - 9
TDS	39.32	141.26	mg/L - 500(A)	1,000
TSS	1.46	1.42	mg/L	30
Turbidity	0.40	0.39	NTU - 1(C)	-
Boron	0.02	0.07	mg/L - 5(C)	-
Bromide	0.02	0.08	mg/L	-
Calcium	6.16	22.13	mg/L	-
Chloride	3.15	11.33	mg/L - 250(A)	-
Fluoride	0.06	0.22	mg/L - 1.50(C)	-
Potassium	0.28	1.02	mg/L	-
Sodium	2.53	9.07	mg/L - 200(A)	-
Sulphate	2.71	9.73	mg/L - 500(A)	-
Ammonia	0.02	0.09	mg/L	2
DOC	5.54	19.91	mg/L	-
Nitrate_ITE	0.10	0.36		10
Kjeldahlnitrogen	0.28	1.01	mg/L	-
Total phosphorus	0.01	0.03	mg/L	-
Aluminium	0.09	0.31	mg/L	-
Antimony	0.00	0.00	mg/L - 0.0060(C)	-
Arsenic	0.00	0.00	mg/L - 0.01(C)	0.5
Barium	0.01	0.04	mg/L - 2(C)	5
Cadmium	0.00	0.00	mg/L - 0.0070(C)	0.05
Chromium	0.00	0.01	mg/L - 0.05(C)	1
Copper	0.01	0.03	mg/L - 2(C)	0.3
Iron	0.11	0.39	mg/L - 0.30(A)	10
Lead	0.00	0.00	mg/L - 0.0050(C)	0.2

Parameter	Average Concentration of Raw Water[1]	Expected Discharge Concentration of Treated Water[2]	Units	Guideline Limit[3]
Magnesium	1.24	4.47	mg/L	-
Manganese	0.01	0.03	mg/L - 0.12(C)	-
Mercury	0.00	0.00	mg/L - 0.0010(C)	0.005
Nickel	0.00	0.01	mg/L	0.5
Selenium	0.00	0.00	mg/L - 0.05(C)	0.01
Uranium	0.00	0.00	mg/L - 0.02(C)	-
Zinc	0.01	0.02	mg/L - 5(A)	0.5
Temperature Source	11.69	11.34	Celsius	32

[1] Average concentration taken from historical drinking water quality at WS S-0075 1987-2005. NLECC, 2024b Water Resources Management Division
[2] Discharge concentrations calculated from assumption of 63% volume of raw water lost to processing, 10% volume lost to wash down and other processes, and 27% water to be cycled in reverse osmosis, on an assumption of 1000L.
[3]Government of Newfoundland and Labrador, Environment and Climate Change (NLECC) Environmental Control Water and Sewage Regulations, 2003, under the Water Resources Act (O.C. 2003-231), Schedule A - Discharge to the Environment [missing data for parameters of Biological Oxygen Demand, Total Petroleum Hydrocarbons, Boron, Cyanide, Phenol, Phosphates (total as P2O5), Sulfides, and Silver]
*Table provided by EVREC

2.4.8 Ammonia Transport and Ship Loading

The Project proposes to utilize the existing infrastructure and enhance the Port of Botwood by designing a specific transport and loading system for ammonia, including the associated piping, venting and isolation systems, emergency response facilities, back up power systems, control/administration offices, and security.

The liquid ammonia stored at the Industrial Facility will be piped to the Port via an underground ammonia line (approximately 4 km). All cooling for the ammonia will remain at the Industrial Facility in the vicinity of the bulk tanks. The loading system design contemplated is the placement of a loading arm or loading hose structure on the previous jetty or on a purpose-built structure to be defined by the Port of Botwood. The anticipated ammonia fill rate for vessels of is up to 2,500 t per hour.

Detailed design of the ammonia pipeline and loading system is ongoing. Further details will be provided as part of an EA as directed by regulatory authorities or prior to construction.

2.5 Project Schedule

The Project schedule is presented in Table 2.4.

Table 2.4: Project Schedule

Project Activity	Timeline
EA Registration	Q3 2024
EA Surveys	2023 to 2025
Wind Measurement Campaign [meteorological (MET) masts]*	2023 to 2025
Feasibility Study	Complete
Pre-FEED	Complete
FEED	Q1 2024 to Q2 2025
Geologic and Port Surveys for Product	Q2 2024

Project Activity	Timeline
Transportation	
Value Engineering Design – Early Works	Q4 2024 to Q4 2025
Permit Submissions	Q2 2025
Municipal and Service Agreements	Q3 2024
Vegetation Clearing and Infrastructure Transportation	Q2 2026 – Q2 2030
Start of Civil Construction	Q2 2026
Commencement of Commissioning	Q3 2028
Operation & Maintenance	Q4 2028 to 2060 onward
Decommissioning	2060 to 2063

* Wind data will be collected pre-construction to measure a multi-year weather pattern. Met masts will be installed in second half of 2024. Each met mast will have its own renewable energy power supply consisting of either solar PV panels, a micro wind turbine, a battery storage system and/or a fuel cell.

2.6 Construction

The construction phase will entail the buildout of the Wind Farms, Solar Farm, Industrial Facility, Water Supply, and other supporting infrastructure. The construction phase will include site preparation and construction. Main activities include:

- Civil works, including temporary accommodation facilities, site preparation, site clearing and grading and access road upgrades and new construction
- Wind farm construction, including WTG transportation and installation
- Solar Farm construction
- Electrical infrastructure, including connector systems, substations, transmissions lines, and hydrogen / ammonia plant terminal station
- Industrial Facility construction (hydrogen and ammonia plants)

The Project will have numerous Engineering, Procurement, and Construction teams allocated to various scopes.

Table 2.5 lists the equipment that will most likely be required for construction activities across the entire Project Area. Additional equipment may be required based on site access.

Table 2.5: Project Equipment for Construction

Equipment	Roads/ Buildings	WTG Pad	WTG Assembly	Electrical Infrastructure	H_2 and NH_3 Plants	Water Systems
Excavators/ Backhoes	X	X		X	X	X
Dump Trucks	X	X		X	X	X
Articulating Trucks		X		X		
Bulldozers	X	X		X	X	X
Brush Clearing	X					
Roller/Compactors	X	X			X	X
Skidders/Mulchers	X	X				
Graders	X	X	X	X	X	X
Crushers	X	X	X			
Concrete Trucks		X		X	X	X
Pump Trucks		X		X	X	X
Light Trucks	X	X		X	X	X

Equipment	Roads/ Buildings	WTG Pad	WTG Assembly	Electrical Infrastructure	H_2 and NH_3 Plants	Water Systems
Float/tractor Trailers	X			X		
Pile Drivers/Augers	X				X	
Air Compressors	X				X	X
Vacuum Trucks	X					
Drill Rigs	X			X	X	X
Welders	X				X	X
Generators	X	X	X	X	X	X
Light Towers	X	X	X	X	X	
Manlift/bucket trucks	X		X	X	X	X
Water pumps	X	X		X	X	X
Off road vehicles	X	X		X		
Power tools and hand equipment	X	X	X	X	X	X
Main Crane Units			X			
Light Cranes	X			X	X	X
Assembly Cranes			X	X	X	X
Manufacturer Support Vehicles			X			
Boats/Barges					X	X

Prior to, and throughout construction, a geotechnical program will be conducted in the areas of proposed infrastructure. The purpose of the geotechnical program is to determine the site-specific condition of existing subsurface soil and bedrock and its suitability for infrastructure development including, but not limited to, roadways, buildings, wind turbines, and MET towers. Subsurface soil and bedrock will be assessed based on field observations and measurements obtained during test pitting and/or drilling programs, as well as through laboratory testing of soil and rock samples.

The test pit program will use an excavator to facilitate the field assessment and collection of soils. Test pits will be advanced to a minimum depth of 4 m (unless bedrock is encountered) and soil samples will be collected at regular intervals during the advancement of each test pit.

The drilling program will use a geotechnical drill rig to facilitate the field assessment and collection of soils and bedrock. Boreholes will be advanced to depths of at least 6 m. A minimum of 3 m of bedrock will be cored at each borehole location, if encountered. During a drilling program, soils will be sampled at regular intervals using a 50 mm outside diameter split-spoon sampler while conducting the Standard Penetration Test. N-Values obtained from the Standard Penetration Test are used as an indication of the soil's relative density. When encountered, bedrock will be cored using a diamond bit core barrel. Rock quality designation will be measured on recovered core samples of the bedrock to provide an indication of the rock quality, and the degree of fracturing, jointing, and shearing in the given rock mass assessed. A 25 mm internal diameter standpipe will be installed in select boreholes to allow for static groundwater measurements. Site specific measures will be put in place to control generated waste such as drill cuttings and return water during the drilling process.

Each test pit/borehole will be backfilled following the completion of the program using imported fill and/or existing natural overburden. Laboratory testing on soil and bedrock samples will include, but is not limited to, sieve analysis, moisture contents, and unconfined compressive strength testing.

Prior to a geotechnical program, documentation including underground utility locates, a Water Use License from the NLECC, and other permits required for site access or site activities will be obtained and reviewed, where necessary.

2.6.1 Site Preparation (for all components)

Site preparation includes site clearing (vegetation removal and grubbing), excavation, grading and compaction, installation of temporary drainage systems, stabilization, dirt preparation, and implementation of erosion control measures prior to the commencement of construction activities.

Prior to site preparation and construction activities, surveyors will clearly mark the perimeter of all areas to be developed, including WTG pads, laydown areas, road construction or upgrades, transmission line ROWs, solar development area, hydrogen and ammonia plant and facilities areas, and port upgrade areas (land based). Adequate buffers will be retained near wetlands and sensitive areas, roads and adjacent facilities, as directed by NLECC. An Erosion and Sediment Control Plan will be developed and implemented as described in Section 5.4.3 of Best Management Practices for the Protection of Freshwater Fish Habitat in Newfoundland and Labrador (DFO 2022). Rare plant surveys will be conducted in accordance with NLECC direction. All merchantable timber will be salvaged, and non-merchantable timber will be disposed of off-site. All vegetation clearing activities will be conducted outside the migratory bird breeding season (i.e. annually from April 1 to August 31) or nest sweeps will be conducted prior to vegetation clearing if activities must occur during breeding season. Once clearing activities are completed, roots and stumps will be removed and shredded/mulched on site, and topsoil/organic matter will be left in place where appropriate.

Activities for this stage include:

- Removing or securing boulders and similar objects near excavation sites for the safety of workers and/or machinery.
- Substituting suitable construction material for existing unsuitable soils (i.e., overburden).
- Placing and compacting fill materials over the proof-rolled subgrade to achieve adequate bearing capabilities.
- Implementing dust control measures.
- Encouraging sound soil conservation throughout the process for use in rehabilitation activities.

Should blasting be required as part of site preparation for the WTG foundations or other infrastructure, a certified blasting contractor (holding a valid blasters certificate issued by the NLECC) will be contracted to develop a conservative blast design for review and approval prior

to carrying out the work. The blast design will be required to meet vibrational limits at appropriate distances from existing infrastructure and buildings and fish habitat. Should a temporary explosives storage facility be required, it will meet government regulations including required separation distances as regulated by the Explosives Regulatory Division of Natural Resources Canada, with explosives and accessories stored at the approved explosive storage facility. If blasting is required, an Explosives and Blasting Management Plan would be developed by the licenced blasting contractor to provide direction for the safe storage, handling and use of explosives and explosive components, to address the safety of the public and Project personnel, and protection of both the environment.

During construction, the Project will require significant temporary support infrastructure to be installed, including:

- Quarries/borrow pits
- Batch plants
- Accommodations
- Warehousing and fuel stations

Quarries and Borrow Pits

The Project identified several locations to explore and establish quarries to provide the construction teams with aggregate material for road construction and concrete mix. The Project will use excavated materials from the road network corridor to minimize the need for quarries.

Access will be prohibited in main quarry locations with chain link fences. The main quarries will also have visibility berms surrounding the areas and vegetation will be maintained to prevent line of sight. The Project is expected to have up to six main quarries in strategic locations to mitigate movement of material. Each quarry, when in operation, will have one immobile crusher and an associated concrete batch plant. In large areas of cut for road construction, a mobile crusher may also be used at the blasting location for local aggregate production. Cuts in road corridor for extra material will be sloped for drainage and stability.

Where feasible, material will be directly pushed from the quarry area adjacent to roadways into the road network footprint. As haul distance progresses, excavators and loaders may be used to load haul trucks for transport to the placement areas.

Quarrying near waterways will be avoided to prevent harm to aquatic life. However, crushers will require the use of water from nearby ponds. The exact location and waterways to be used will be determined and applied for through the Water Resources Management Division with NLECC.

Drainage around the quarries will be designed to avoid the risk of potentially contaminated water from backflowing into waterways. Most quarry operations will be within the construction footprint and stemming will be used to reduce noise in areas closer to communities and cabins. Power for crushing and batch plant activities will be provided by local diesel generators. The generators will have a containment liner and granular cover installed, prior to commissioning, and will be removed after construction is complete.

Treelines will be maintained to lower quarry visibility and main quarry faces will be fenced/barricaded to prevent human and wildlife accidental falls. A combination of water trucks and/or calcium will be used to minimize dust impacts.

Quarries outside of the road corridor will have traffic plans created such that no reversing is required.

The material will be transported from several local off-site quarries and stored on the site temporarily. Any excess material removed for road construction will be feathered, stored or disposed of, in accordance with appropriate regulations and best practices for road construction. Any material storage will be managed with appropriate erosion and sedimentation control measures.

Concrete Production Batch Plants

The Project will utilize concrete for structural use throughout the development for foundations, separations walls, buildings, bridges, pipe rack construction, roadways, floors, catwalks, etc. The Project plans to produce the concrete on site by combining local aggregate with cement. Cement will be procured and transported to the Port of Botwood, where temporary dry storage facilities will be erected for the cement storage.

The Project will produce the aggregate for the concrete from the on-site developed quarries and or existing quarries in the area. Concrete will be manufactured using mobile concrete batch plants. It is currently contemplated that up to six batch plants will be situated throughout the Project Area (including the wind farms and industrial plant areas) to reduce the transportation of off-site materials to minimize potential environmental impacts. These plants will be powered by diesel generators in areas where grid power cannot be provided. It is expected that grid power will be made available for construction of the Industrial Facility. Typical mobile batch plant depictions are illustrated in Figures 2.2 to 2.4.

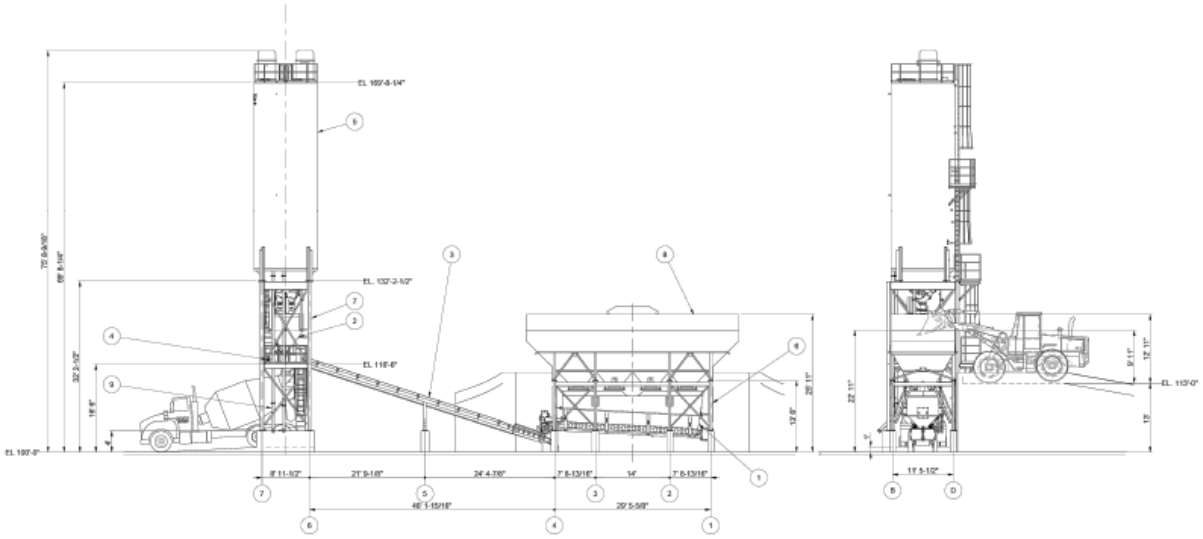

Figure 2.2: Batch Plant Schematic 1

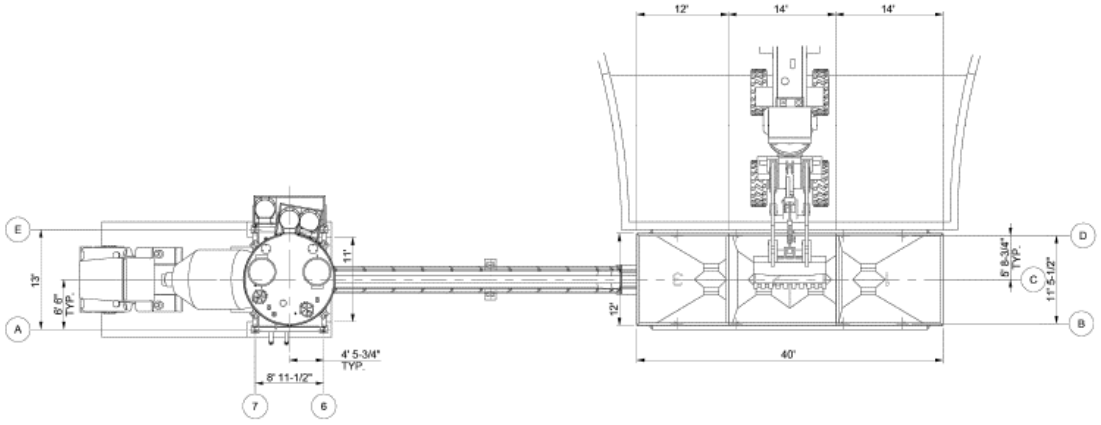

Figure 2.3: Batch Plant Schematic 2

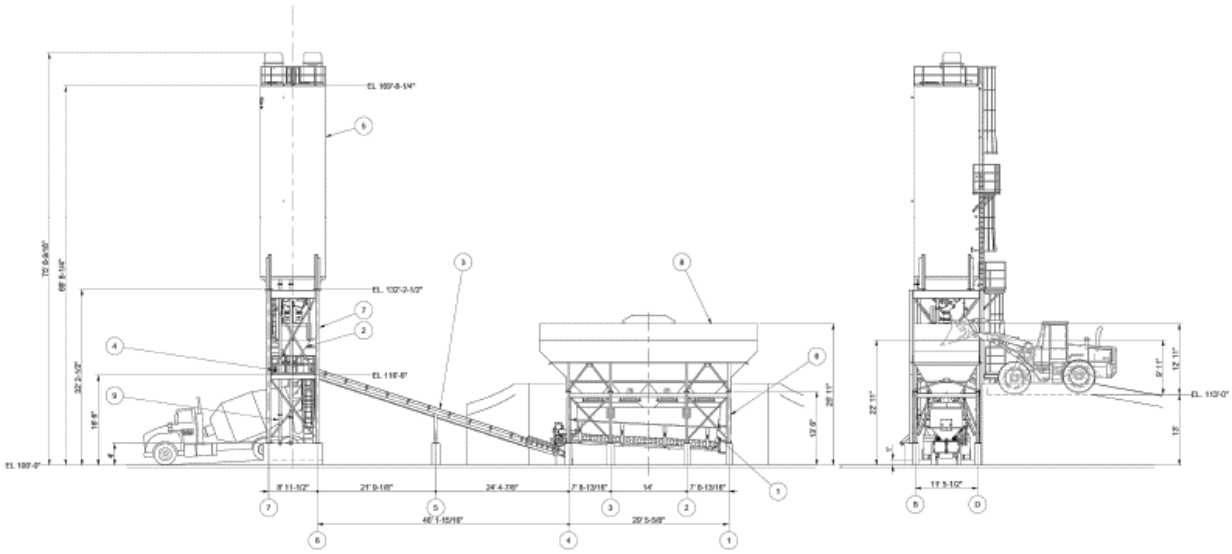

Figure 2.4: Batch Plant Schematic 3

Worker Accommodations

The Project plans to establish an accommodation strategy that will provide a high level of safety and wellness for the workforce while considering the social impacts on the community. The Project expects to build both temporary and long-term worker accommodations that include:

- Accommodation
- Recreational facilities
- Canteen services
- Benefit services
- Laundry
- Transportation to and from site
- Utility services (e.g., emergency power, water, waste management, telecommunications)

Temporary accommodation facilities will be located within each wind farm (~ 500 units each) to reduce the logistical impacts of the Project. A centralized facility near the Industrial Facility is also expected to house approximately 2,000 to 2,500 workers during the construction phase. Each accommodation facility is expected to have its own water supply, water treatment, and wastewater system installed to provide the necessary potable water requirements (estimated at 75 litres per day per person). As part of the long-term accommodation strategy, the Project is also examining the early development of long-term housing within the community areas for key staff positions.

Transportation to and from the sites will be minimized by sharing vehicles and using busing services throughout the Project road network.

Potable water will be from groundwater sources, and wastewater will be discharged in compliance with the NL Water and Sewer Regulations. Power supply to the remote accommodation sites will be provided by diesel generators where grid power is not available. The main camp is expected to be provided power from the grid.

Through the early works of the Project, workforce accommodation will be provided using cabin rentals, outfitter camps and local hotels.

Warehousing & Maintenance Buildings, Fuel stations

The Project will develop temporary and permanent warehousing on each wind farm to ensure that materials, parts, and equipment are stored and handled efficiently. The Project plans to have these warehousing areas located within the vicinity of the temporary accommodation sites and quarry locations to minimize transportation, security, and environmental impacts. The warehousing sites will consist of steel-cladded buildings that facilitate access, storage, and maintenance activities. It is expected that consumable equipment, high turn-over rate materials, and low-value spare parts will be housed in the off-site warehousing, and other critical components will be warehoused at the Industrial Facility.

The warehouses will be equipped with racking systems for different types of components, internet, offices, security, and emergency response equipment. Each warehouse will also be designated as a muster point to allow for evacuation and critical response protocols to be conducted.

The receiving and inspection of the equipment stored in the warehouse will follow the inventory management systems of the Industrial Facility. These facilities will also be used as staging areas for equipment such as cranes, forklifts, ATV’s, drone equipment, and other service equipment (graders, backhoes, snow clearing equipment) that will be required to maintain the wind farm infrastructure.

Fuel storage will be located at the various warehouses for light vehicle mobile fleets. For larger equipment, it is anticipated that mobile fuel trucks will be utilized to fill various large scale mobile equipment, generators, and various fuel fired heaters.

The warehouse and fuel storage facilities will have access control measures to restrict unauthorized entry to the areas. These areas will be fenced and monitored with appropriate levels of security, including alarms. The Project will also ensure compliance with local regulations and standards related to the warehousing, including the implementation of waste management practices to handle packaging materials, damaged items, and other waste products responsibly.

2.6.2 Road Network, Temporary Laydown, and Workforce Areas

Approximately 215 km of existing roads and trails will require upgrading and 450 km of new road will be constructed for the current layout design (Drawing 2.3, Appendix A). This will be further defined during the FEED. The Industrial Facility and Solar Farm (Drawing 1.1, Appendix A) are accessible by Highway 350, while the majority of the Wind Farms will be accessed by new and existing forestry roads. Additional roads may be upgraded or constructed upon final design completion. Roads will be constructed from clean fill sourced from quarries and borrow pits. Most new road construction will be associated with the wind farms. New road construction will be minimized by using shortest routes possible and will establish positive drainage by following the natural ground slope, with required ditching designed to reduce disturbance to the natural drainage pattern. Ditches will be lined to reduce erosion in the areas where flow velocity is high. Fill requirements and ROW widths will be included in the selection of road gradients, to maximize road use and meet design parameters. Access roads will have a 7 to 9 m wide road surface and include ditching and grading, which will be 17 to 20 m wide. Wider roads (12 m road surface) are required for heavy equipment to move from turbine to turbine, and narrower roads (8 m road surface) will be utilized in areas in which smaller loads can be managed.

Surveys of access road water crossings will be completed for all access roads associated with the wind farms, quarries, buildings, camps, laydown areas, etc. Construction of the roadways and temporary lay down areas will involve the removal of topsoil, grading, and placement of granular materials. Laydown areas for construction materials will also serve as parking areas during construction. Any security fence, roadways, and laydown areas for the Solar Farm, and Industrial Facility will likely be constructed concurrent with site levelling activities.

Access road construction and upgrades will require water crossings in some locations. Water crossings will be identified through a desktop analysis of existing satellite imagery; the 1:50,000 topographic mapping; and the location of the proposed access road, transmission line ROWs, collector line ROWs, and substations. In-water or near-water works could include culvert installation and/or bridge foundation installation. Some minor fording may be required. The duration of in-water works will be minimized and conform to timelines established by regulators. Changes to natural flow regimes will be reduced through careful detailed design. Removal of stream side vegetation will be limited to the footprint of crossing abutments, and re-vegetated as soon as works are completed. Culvert sizing will be determined during detailed design, along with inclusions of embedded or bottomless arch culverts for fish-bearing watercourses. Detailed design assessments will be performed to specify appropriate use of materials, aggregates, slope armouring and vegetative cover, along with spatial requirements for exact location, length, diameter, and slope.

During construction, roads will be maintained with additional gravel or periodic grading. Aggregate material for road construction will be transported from several local off-site quarries and stored temporarily until used. Any excess material removed for road construction will be feathered, stored, or disposed of in accordance with regulations and best practices for road construction. Any material storage will be managed with appropriate erosion and sedimentation control measures or re-used.

Removal of temporary works following completion of construction, will include the removal of access road crossing infrastructure and rehabilitation of crossings, as well as reclamation and revegetation of temporary laydown and infrastructure support areas.

2.6.3 Wind Farm Construction

Each WTG typically consists of a tower, nacelle, three rotor blades, and hub assembly. The towers are supported by the generator step up transformer, electrical and grounding wires, and buried grounding grid at the perimeter of the foundation. Typical foundations are illustrated in Figures 2.5 and 2.6.

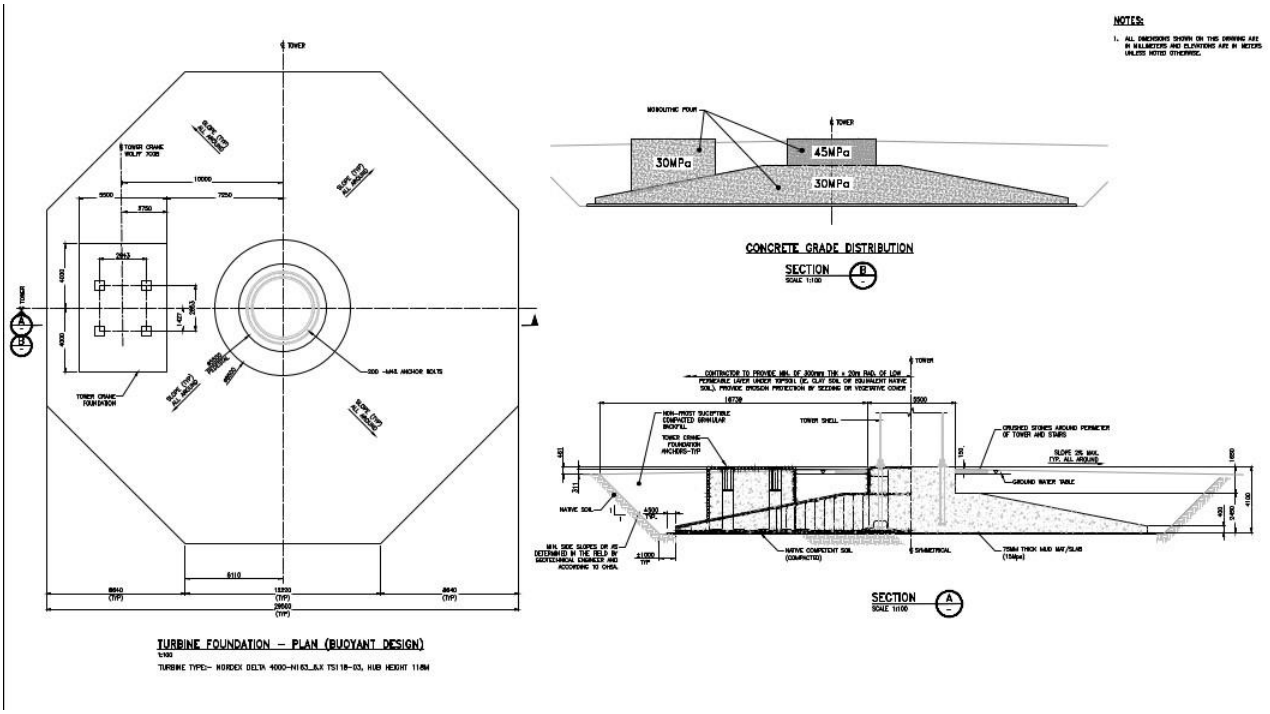

Figure 2.5: Typical Buoyant Foundation

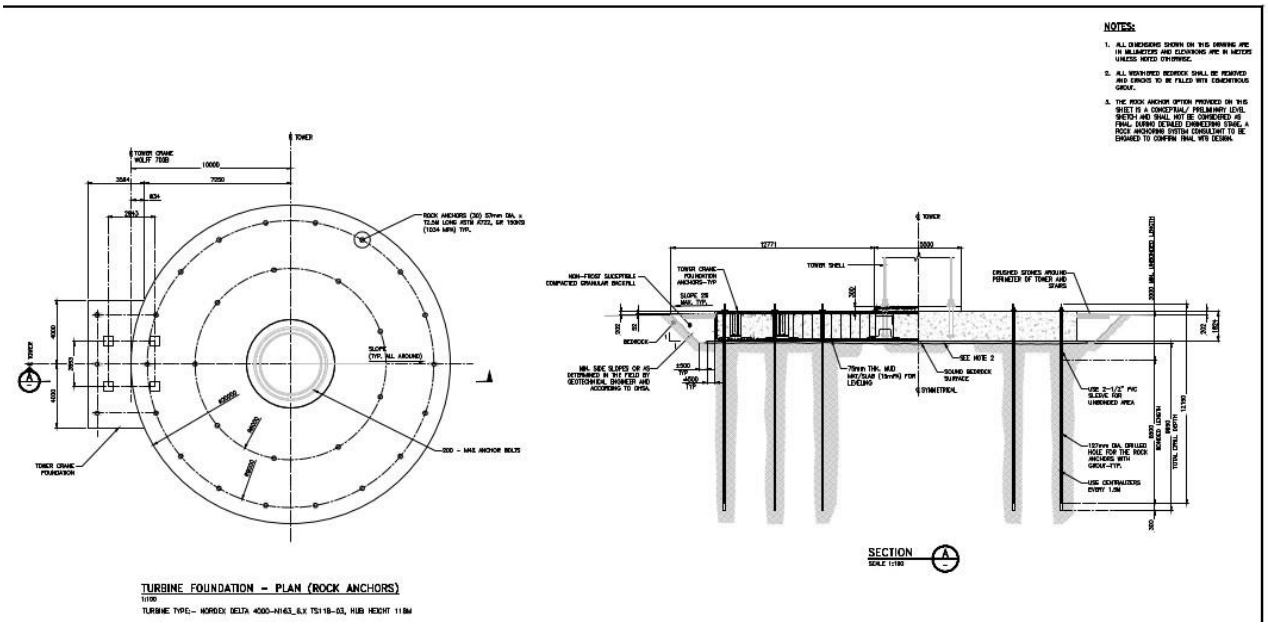

Figure 2.6: Typical Rock Anchor Foundation

Each WTG pad and laydown area will be approximately 150 m x 100 m which includes clearing limits and overburden management. The exact arrangement of each WTG pad and crane pad will be designed to suit the specific requirements of the WTG and the surrounding topography during the detailed design process. To mitigate the environmental impact of the road works and WTG laydown area, the Project is attempting to implement integrated crane pads as part of the WTG mounting foundations. Self-erecting tower cranes are planned to complete the installation of the WTG support structure, the WTG nacelle, and the WTG blades thus reducing the over build of roadways and WTG laydown areas during construction and mitigating disturbance during operation. Construction of a typical WTG pad (from clearing to final preparation for erecting the WTG) is expected to take one to five months, depending on weather, soil, and construction vehicle access.

Foundation installation involves the transport and fixing of the foundation in position. Ground investigations and site preparation works, such as geotechnical calculations, boreholes, and laboratory sample testing will be completed prior to the removal of soils and foundation build. WTG foundations are generally divided into two types:

- Gravity foundations, which rely on the mass of foundation concrete, steel reinforcing, and larger bearing area to provide a solid foundation for the WTG.
- Rock anchor foundations, which use a combination of concrete mass, steel reinforcement, and anchor rods drilled and grouted into the rock.

As local geotechnical conditions dictate the optimal foundation style, it is anticipated that both types will be required for the Project. WTG foundations will include an envelope of engineered gravel to provide positive drainage away from the foundation. Surface grading will provide

positive runoff and avoid ponding of rainfall. Construction activities will seek to reduce the excavation of materials and focus on minimizing the potential environmental impacts such as effects on water resources and effects of drainage on vegetation.

The WTG assembly includes tower sections, the nacelle, the hub, and three-blade rotors. Flatbed trucks and floats will deliver sections of the WTG from the point of delivery to the various staging areas using purpose-built transport corridors that avoid public roadways, minimizing deterioration to current provincial infrastructure. The WTG components will require cranes to offload the equipment at each WTG laydown area. Additionally, the Project is examining custom made transport vehicles to mitigate the overbuild of the road network by reducing the ground pressure requirements.

The tower sections will be erected (in sequence) on the WTG foundation, followed by the nacelle, hub, and rotors. Rotors are usually attached to the hub on the ground prior to lifting. This assembly will occur with the use of dedicated cranes. Erection will depend on the weather, specifically wind and lighting conditions. The typical assembly duration per WTG is expected to be between 10 and 15 days.

Each WTG will have a buried grounding grid around the perimeter of the foundation, which will be interconnected to the collector neutral wire. The ground wire will be at the base and perimeter of the foundation within the foundation excavation limits. Grounding protection and final ground wire configuration for each WTG will be determined by a detailed grounding study. Typically, the ground wire is located 30 cm outside of the foundation and within the foundation excavation. This ground wire will be connected to the ground conductor in the buried collector system cables and connected to the generator tie line ground wire.

2.6.4 Electrical Infrastructure Construction

The wind farm collector systems will be comprised of 66 kV overhead distribution lines along a typical 15 to 20 m ROW or the existing road allowance. The allowance will also be used for the access roads to the various WTGs and connecting the WTGs to the collector substations. Access corridors will be cleared where necessary for the construction of the lines and provide for line maintenance after construction. Due to the geology and the remoteness of the wind farms, the Project has elected to proceed with an aboveground, rather than belowground, collection system.

The current route planned for the transmission lines follows the road network where applicable. Final routing will be confirmed after further surveys and analysis and will seek to optimize construction costs and minimize environmental and social impacts.

Each collector line will consist of single pole design with collector circuits carrying aluminum conductor steel reinforced conductors arranged in a parallel circuit configuration. Composite or steel poles are anticipated to range from 15.2 m to 22.9 m in height; pole foundations are anticipated to consist of normal burying with log anchors, guying with some cribbing, and rock anchors as needed.

Surge arresters will be installed along the overhead line to provide lightning protection to the collector circuits. An optical fiber cable will be located below the circuit neutral to provide high-speed communications between the WTGs and the control room at the terminal station. The configuration will be finalized during the detailed design phase. A typical 66 kV tangent structure layout is illustrated in Figure 2.7. The layout is based on a proposed 6.6 to 8.0 MW WTG.

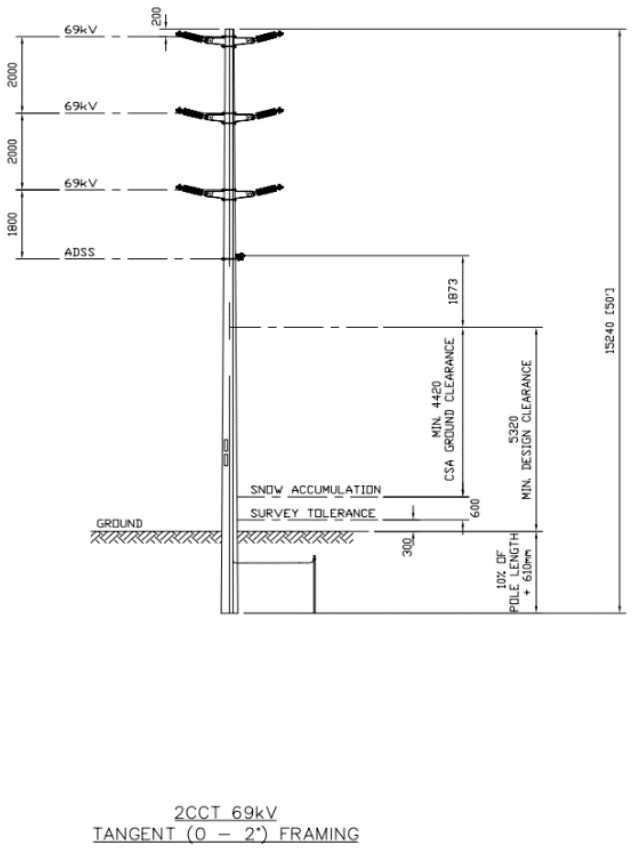

Figure 2.7: Tangent Structure

Approximately forty-five 66 kV collector feeder circuits will deliver power to the collector substations from the WTGs, assuming each collector string will carry up to 12 WTGs. Should a larger conductor be available, the number of collectors could be reduced. The configuration of the feeders is primarily overhead distribution lines with underground cables from the WTGs to the overhead collector circuits for connection of the wind farms to the collector substations. Final configurations will be confirmed in the detailed design. The Botwood Wind Farm will have two 4-transformer substations. The Twin Lakes Wind Farm will have a single 4-transformer substation. The Leading Tickles Wind Farm collector substation will have a reduced footprint compared to the other two areas, since only nine collector circuits are connected to this substation. The collector substations will have a similar overall design and footprint and will include up to 14 main power transformers 66 kV /230 kV, 3-Phase, up to 550 megavolt amperes each and may have up to four synchronous condensers, if needed.

The three wind farm substations will also include:

- Associated electrical equipment for protection, isolation, and control such as conductors, circuit breakers, disconnect switches, capacitor banks, insulators, voltage and current transformers, and a control building with relays and wind farm control system.
- Civil and structural design includes station grading, drainage, fencing, structure foundations, yard gravel, and steel structures for the installation of the collector substation equipment and dead-end structures for the transmission circuits.

The initial design of the substations will be a breaker and a half configuration. Depending on the load assumptions, this design may be reduced to a ring bus configuration. The following (Figure 2.8) is a generic drawing of a breaker and a half configuration, designed to capture several circuits.

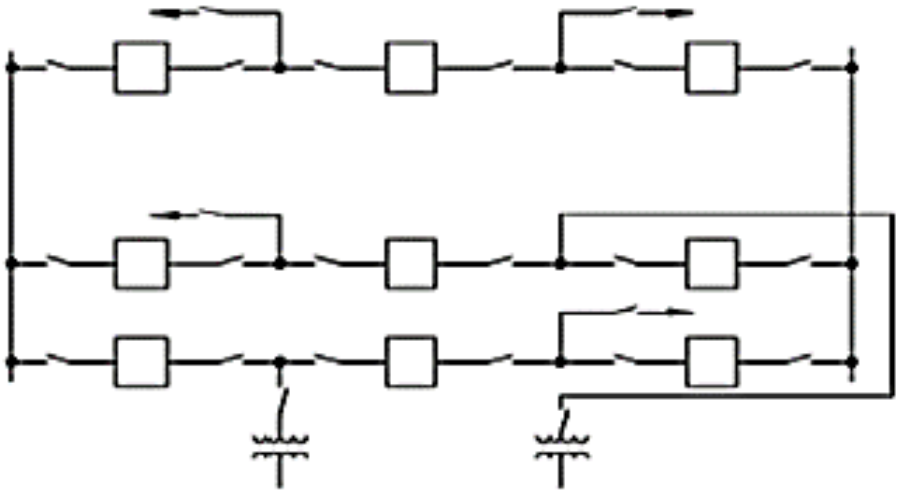

Figure 2.8: General Layout – Breaker and a Half Configuration

A breaker-and-a-half configuration has two buses that are energized during normal operation. For every two circuits there are three circuit breakers with each circuit sharing a common center breaker. Any breaker can be removed for maintenance without affecting the service on the corresponding exiting feeder, and a fault on either bus can be isolated without interrupting service to the outgoing lines. If a center breaker should fail, this will cause the loss of two circuits, while the loss of an outside breaker would disrupt only one.

Once poles have been erected and the necessary framing (i.e., insulators, cross arms, and bracing) has been installed, conductors will be strung by pulling the conductor off a stationary wire spool located at the start of each line segment and connecting the conductor to insulators. Appropriate tension is applied to adjust the line sag and to bring the conductor to the design specifications once conductors are in place.

A 230 kV high-voltage transmission line will connect the area substations associated with each wind farm (Botwood, Twin Lakes, Leading Tickles) to the Industrial Facility. Infrastructure footprint, routing and additional land is undergoing detailed design for the Leading Tickles route at time of writing this EARD and therefore not shown on Drawings. The total length of these high voltage transmission lines will be approximately 70 km. During construction, an additional temporary easement will be secured. This temporary easement would add approximately 15 m to the proposed easement.

The current layout provides for a single substation in the Twin Lakes area that will transition the voltage from 66 kV on the collector systems to 230 kV. From this substation, two 230 kV circuits will then connect directly into the main substation in Botwood. The 230 kV transmission line will require a 35 to 40 m ROW for a three-circuit system.

The Botwood layout provides for two substations that will transition from 66 kV on the collector systems to 230 kV. From these two substations, four 230 kV circuits will then connect directly into the main substation in Botwood. The 230 kV transmission line will require a 35-40 m ROW for the 4-circuit system.

The proposed routing of the gathering system transmission lines will take into consideration existing transmission corridors, private property boundaries, existing access roads, and the need to reduce routing through populated areas and environmentally sensitive areas.

Dependent on the final transmission line routing and proximity to adjacent residential areas, the following designs (Figure 2.9) are proposed for the gathering system transmission line construction.

Monopole steel structures with bundled conductors (two per phase) consist of structures that will be equipped with overhead shield ground wire or overhead optical ground wire for lightning protection and control, and guy wires for additional support where required. Each circuit may be built on a separate structure to reduce the risk of concurrent multiple circuit outage, with 35 m spacing between adjacent circuits.

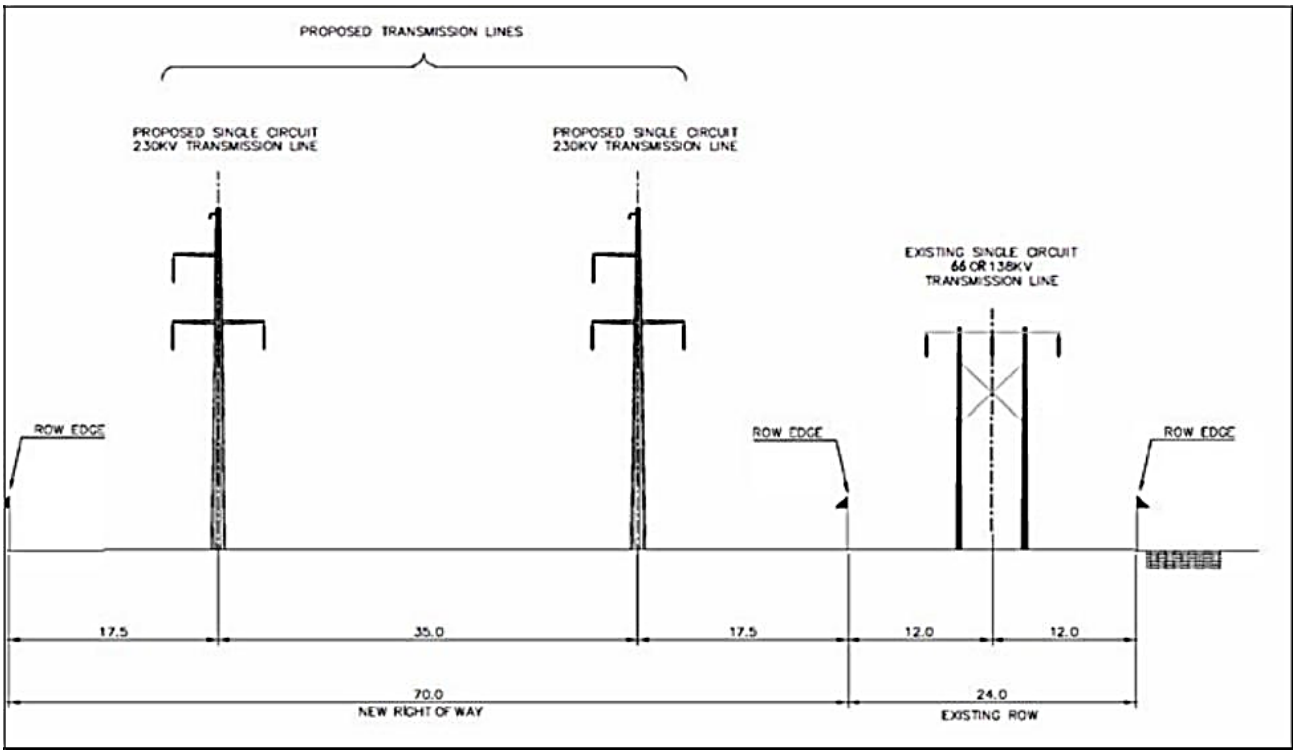

Figure 2.9: Gathering System Construction

Typical wind farm collection systems are run underground. Due to the geology and the remoteness of the proposed wind farms, the project has elected to proceed with an aboveground collection system. This will reduce the amount of cultural/historical review required during the permitting phase and allow for faster maintenance if there is a system issue.

Each wind farm will collect all the relevant circuits into a central location(s). These substations will then connect into the gathering system that will connect the sections into the main project.

The Botwood area incorporates 28 collector strings that will gather 328 turbines. These collector strings will connect into two substations. These two substations will then transition the power from 66 kV up to 230 kV and connect into a gathering system that will connect into the main substation in Botwood.

For the Twin Lakes area, there are 12 collector strings that will gather the 150 turbines. These collector strings will connect into a single substation. This substation will then transition the power from 66 kV up to 230 kV and connect into a gathering system substation that will connect into the main substation in Botwood.

For the Leading Tickles area, there are 5 collector strings that will gather the 52 turbines. These collector strings will connect into a single substation. This substation will then transition the power from 66 kV up to 230 kV and connect into a gathering system substation that will connect into the main substation in Botwood.

Transmission line easements vary in width depending on the operating voltage and design of the infrastructure. Generally, the higher the voltage, the wider the easement. Figure 2.10 below shows the typical widths of transmission line right-of-ways. The distances in the IEEE easement guidelines are based on the typical easement widths shown in Figure 2.11. The proposed permanent easement for EVREC's 230 kV line is approximately 40 m.

During construction, an additional temporary easement would be secured. This temporary easement would be approximately 15m on the proposed easement.

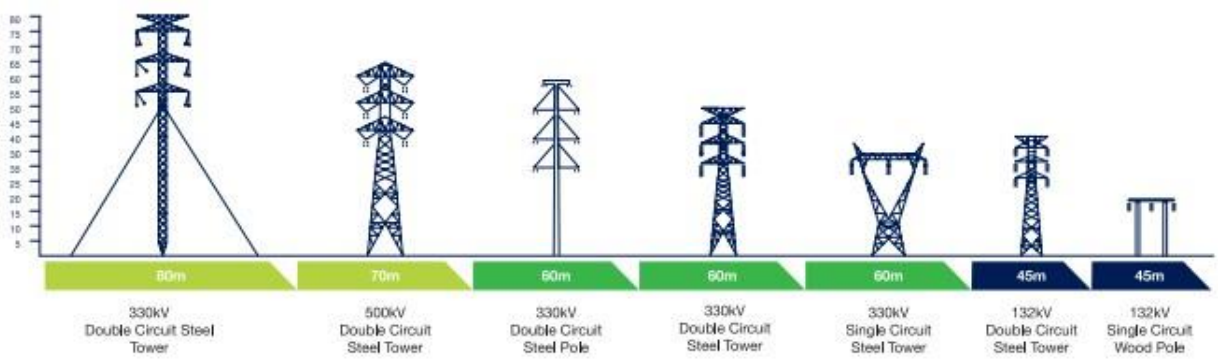

Figure 2.10: Typical Right of Way Widths

The transmission line will be constructed to IEEE standards for a utility transmission line.

EVREC has an exclusion zone to enable suitable activities within easements, while providing a safe clearance area around EVREC transmission lines and structures to protect public safety and the network.

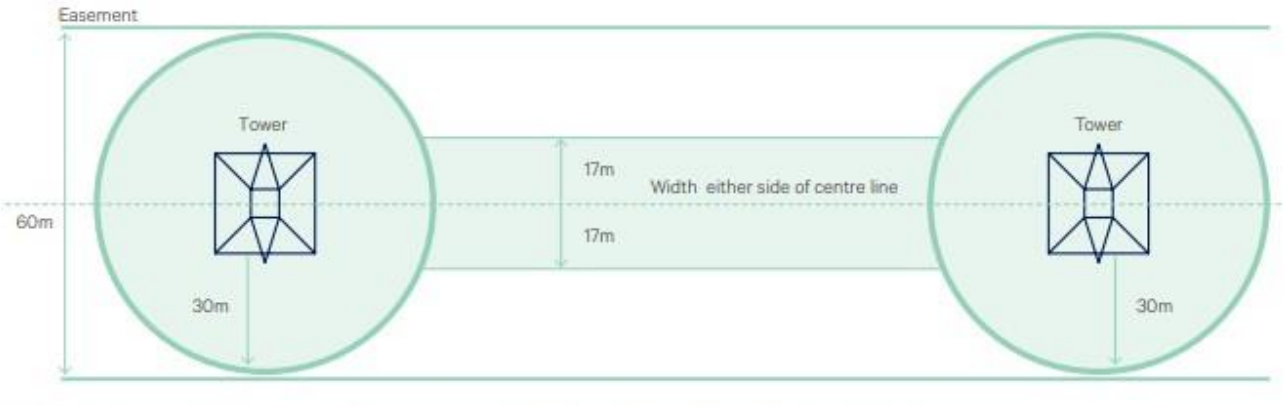

Figure 2.11: Transmission Line Easement

The current route planned for the transmission lines follows the road network where applicable, avoiding water bodies, potential bogs, and any identified sensitive areas. At this stage, preliminary detailed analysis has been done concerning the proposed routes. In doing so, the

Project has applied for additional lands that outline the transmission and roadway network that the Project plans to utilize in its final design. The selection of the routing was optimized to reduce environmental and social impact as well as optimize construction costs and mitigate execution risk. These plans are anticipated to be adjusted once the final turbine layout has been finalized and a more in-depth site analysis is completed.

The Project is evaluating and engaging NF Power and NL Hydro regarding a connection into the existing Grand Falls - Botwood 138 kV transmission line. This would allow the Industrial Facility to draw power from NF Power and NL Hydro for the plant construction.

2.6.5 Solar Farm Construction

Following site preparation activities, construction of the Solar Farm will involve installation of vertical steel/treated wood posts to support the galvanized steel/aluminum racking tables supporting the solar panels. Anchor or foundation types could include steel/treated wood posts driven into the ground, steel posts attached to screw piles/helical anchors installed in the ground, or steel/treated wood posts attached to concrete foundations/forms (methods and depths depending on site/ground conditions, orientation, weight, wind load, snow load, etc.).

Once the racking system is installed, the solar panels will be installed on top. The units will be wired in series and run to the end of each cluster of arrays to enter the small huts protecting the inverters, switches, etc. Electrical cables running between the panels and inverters will be buried in approximately 3- to 4-foot-deep trenches, in PVC conduits. A ROW for the feeder line, extending from the Solar Farm to the transmission line, will be cleared and utility poles will be installed (pressure treated wood, 40 feet high, 10 feet in the ground).

A perimeter road and maintenance pathways, approximately 3 m wide, will be constructed around and between clusters of PV arrays. Topsoil will be removed along those pathways and crushed rocks/pit run gravel with possibly vegetation control (e.g. geotextile) will be placed on the subsoil. The roadway network will allow vehicle access directly to electrical equipment (i.e. inverters, arrays) and for general maintenance of the Solar Farm. While no parking lot and/or storage building should be required for the long-term operation and maintenance of the site, a storage shed could be installed. During construction, and within the Project Area, a temporary storage/laydown area and temporary parking area will be designated for materials, equipment and construction trailers. A permanent chain link security fence will be erected along the perimeter of the site.

2.6.6 Industrial Facility and Water Supply Construction

The activities described below include those for the Industrial Facility and Water Supply (i.e., hydrogen and ammonia plants, electrical and molecular storage, air separation plant, and product storage tanks).

Following site preparation activities (Section 2.6.1), construction of the Industrial Facility will include:

- Access road construction
- Hydrogen and ammonia plant construction
- Water supply, treatment, and processing facilities construction
    - Utilities, auxiliary and support works

2.6.6.1 Access Road Construction

The Industrial Facility is approximately 1 km from the Botwood Highway (Route 350) and approximately 4 km from the Port of Botwood. An access road from the existing Botwood Highway (Route 350) will be constructed to access the Industrial Facility and will be the main delivery point for all major equipment. A laydown area off the main highway will be constructed as a custom clearing yard and staging area for the entire Project. This access road will be 15 to 20 m in width to accommodate two-way traffic and movement of speciality equipment. Most of its materials and supplies for the Project will be received through the Port of Botwood to minimize the use of public roadways.

A dedicated heavy haul road (15 m width) will be constructed to connect the Port of Botwood to the Industrial Facility. The heavy haul road will be along the waterfront and will follow the existing railbed and Water Street. The distance from the shoulder of the heavy haul road to the high-water mark will vary based on the centerline of the existing railbed. The average distance is 18.3 m from waters edge. All road construction activities will follow best practices as outlined in Section 0.

The Proponent does not anticipate any upgrades to existing road crossing infrastructure. Should axle loadings exceed existing road crossing design, allowances for upgrading will be included in the Project works. Required upgrades, if any, will be determined during the FEED process.

2.6.6.2 Hydrogen and Ammonia Plant Construction

The hydrogen plant will require 12 ha of land and include the construction of short-term storage for up to 125,000 m^3 of hydrogen, administrative buildings, and several electrolyzer plants. The Industrial Facility does not intersect any large waterbodies or watercourses according to the CanVeC dataset; however, the digital elevation model based on project LiDar does indicate that the facilities intersect several small tributaries. More information will be available following detailed per-construction surveys.

The ammonia plant will encompass approximately 17 ha of the Project Area and will include the construction of the ammonia plant with a 50,000 tpd nameplate capacity, cryogenic double-walled storage tanks with a capacity of up to 75,000 m^3 each for 150,000 t liquid ammonia, chilling plants to keep the tanks cold, vent systems, flares and emergency systems, control buildings and electrical buildings, and steam turbines and chilling plants.

The construction of the hydrogen and ammonia plant will include:

- Excavation, backfill and installation of foundations and footings.
- Excavation for underground water supply, electrical conduits, sewers systems, and other utility and safety services.
- Construction of temporary laydown areas for the assembly of components
- Piling installation, pile caps, grouting.
- Installation of steel structure, pipe racks, piping systems.
- Installation of buildings, electrical rooms, control rooms, offices.
- Installation of boiler systems, catalyst vessels, safety valves, vents, monitoring equipment.
- Installation of compressor stations, safety valves, vents, monitoring equipment.
- Installation of leak detection systems, purging and venting systems.
- Electrolyzer assembly and installation.
- Installations of HV electrical circuits, transformers, rectifiers and switch gear.
- Installation of hydrogen and ammonia storage facilities.
- Installation of fencing, monitoring, and security systems.
- Rainwater and stormwater management systems.
- Installation of Instrumentation, IT, and low voltage electrical systems.
- Fire protection - piping, water storage tanks, reservoir design and installation.
- Various heat exchangers, vessels, heat destruction units.
- Various pumps and piping.

Final certified product from the Industrial Facility will be conveyed via an insulated underground pipeline from the main ammonia storage tanks to the ammonia export terminal located at the Port of Botwood. The system will consist of insulated pipeline, chilling plants, vents, and loading infrastructure including safety monitoring and emergency devices to load the ammonia into the transport vessels. The pipeline and transfer pumps will allow for the loading of ammonia at a rate of up to 6700 m^3/hr, resulting in a 24-hour fill time for an empty transport vessel.

Following site preparation, construction of the pipeline system will involve:

- Installations of inspection chambers.
- Installation of barriers, signs, electrical in instrumentation, light stands, markings.
- Installation of pipe racks, grading, lighting, loading arms.
- Installations of vents, water lines, and pumps.
- Chilling plants, control rooms, transformer stations, electrical rooms.
- Electrical transmission lines, and emergency generators (if applicable).

2.6.6.3 Water Supply, Processing, and Treatment Facilities Construction

The water for process and cooling water systems will come from Peters Pond. An intake structure and pump station, capable of pumping 21 ML/day, will be installed. The exact location will be determined following detailed site evaluation but will be chosen to minimize environmental

impacts and maximize efficiency. The raw freshwater pipeline will transport water from Peters Pond to the Industrial Facility. The pipeline will follow the 5 km access road that will be installed from the Industrial Facility to the pump station. Two 610 mm diameter high-density polyethylene pipes will be installed either below or above grade to support the Industrial Facility water requirements. Water from the pumphouse will be directly fed into water treatment feed tanks and/or buffering/settling ponds located at the Industrial Facility. These tanks and ponds will also be used for fire suppression systems.

Effluent streams from the various industrial processes will be collected and treated (as necessary). The Project will also manage stormwater and rain collection systems throughout the site. Effluent streams will be separated where appropriate and any process effluents requiring treatment will be conveyed to various treatment sites, including settling, neutralization, clarification, and filtration processes. The construction of the wastewater treatment facilities will require site clearing, installation of footings, foundations, underground piping, pond linings, sump and pump basins, and low lift stations. Control rooms and monitoring and sampling stations will be constructed to ensure regulatory compliance with effluent discharge. The size of the effluent discharge streams and settling ponds will be reviewed following detailed engineering with the intention of recycling water where economically and technically feasible.

2.6.6.4 Utilities and Support Works

The main utility components that have been defined through the completion of pre-FEED are:

- Air separations facilities
- Electrical storage
- Molecular storage facilities
- Heat destruction systems
- Electrical collection, distribution, transformation and control substations
- Air/nitrogen compressor stations
- Fire systems

Support works include, but are not limited to:

- Camps
- Canteens
- Maintenance shops
- Administration buildings
- Warehousing
- Washroom stations
- Helipads centers

Construction of these facilities will require:

- Site preparation
- Installation of footings, and foundations

- Installation of aboveground and underground piping
- Steelworks
- Electrical works
- Welding and fabrication

2.7 Commissioning

Once construction has been completed, all temporary works will be removed, and appropriately restored to meet the operational requirements. Components will be commissioned in a phased manner once construction of a subsystem has been completed.

A series of quality checks will be conducted as part of its pre-commissioning and commissioning program for each of the subsystems. The pre-commissioning process for each individual subsystem and electrical infrastructure will ensure that each system and subsystem is safe for start-up. Once these tests are completed, each system and subsystem will then undergo another series of tests for mechanical, electrical, and operational controls as part of the commissioning process and unit start-up sequence. Once these are completed, the units will be put into operations and retested prior to initiating full load performance tests.

Operations will commence in a phased approach, with early systems being identified in the construction sequence, completed, and brought into operation, while other systems remain in the construction, pre-commissioning, and commissioning phase. A ramp-up schedule that provides early operation of common systems and transition into early production of ammonia upon completion of base production systems will be implemented. This staged start-up will allow the Project to de-risk the start up and provide early stability in the operations.

Detailed commissioning programs and start-up sequencing that will account for environmental and social risks and emergency response planning as standard practices may be included as part of an EA as directed by regulatory authorities or prior to construction.

2.8 Operations and Maintenance

The operation phase will involve maximizing wind energy generation for use in the production of green hydrogen and green ammonia in a safe and environmentally friendly manner. A detailed operation and maintenance strategy and guidelines will be defined as per manufacturers' specifications and maintenance requirements. Factors that will determine the operation and maintenance strategy include the length and requirements of the performance warranties of the equipment / components, lender requirements, sponsor preferences, and location specifics.

During the life of the Project, appropriate maintenance activities will be conducted on all assets. The Proponent plans to enter into long term service agreements with qualified contractors for critical equipment that requires specialized skillsets (WTG, compressor, catalyst, etc.). These agreements are expected to be 15-year terms with options to extend the period in 5 to 10-year extensions. Vendor agreements for technology and engineering support will also be part of the maintenance strategy.

The Project will rely on local contractors and service groups to provide maintenance support and will be a key economic benefit to the local region. These third-party operation and maintenance contracts will be implemented through the development of the operational readiness planning that the Project will develop during the FEED process. Identifying and developing these supply chains is also part of the community benefits program.

2.8.1 Wind Farms, Solar Farm, and Electrical Infrastructure

The WTGs will operate under typical turbine operational criteria, with low wind speed cut-in at approximately 3 m/s and high wind speed cut-out above 25 m/s, with maximum power delivery at wind speeds greater than 15 m/s. The overall output from the wind farms does not follow similarly strict production profiles as single turbines, with inherent wind diversity across the three Wind Farm (Botwood, Twin Lakes, Leading Tickles). While some WTGs may not be in operation at wind speeds below 3 m/s, other areas may be experiencing adequate wind speeds for production. There will also be cases when wind speeds are around the maximum permitted levels, with some WTGs having lower wind speeds and be able to maintain maximum production while other will come out of service.

The Wind Farms and Solar Farm will be remotely monitored and controlled 24 hours per day from a maintenance building. Trained personnel will monitor plant control software including alarm callouts. Regular activities will include road maintenance (e.g., snow clearing, road maintenance and repair) to facilitate maintenance inspections, as required. Servicing of WTGs, Solar Farm components (e.g., replacement of worn components, lubricants, and drone inspection of turbine blades), and electrical components (e.g., inspection of components, transformer oil, periodic replacement of minor components, and testing) will be conducted at manufacturer recommended intervals and as determined by monitoring equipment.

Access roads and transmission corridors will be used to access the WTGs, Solar Farm, and transmission towers by staff and maintenance personnel. The roads will be maintained with additional gravel and grading, as required in certain areas, and low-level natural vegetation will be allowed to grow in other areas and maintained accordingly. The Project intends to minimize the amount of snow clearing in the winter months and only clear highly travelled roads used by the Project including plowing, sanding, and/or salting, as required for safe driving. Access to low travelled areas will be done via all terrain vehicles (snow mobiles, off road ATVs) in attempts to minimize on-going disturbance. A Vegetation Management Plan will be initiated to ensure access roads and WTG locations remain clear of vegetation. Timing of vegetation management will depend on site-specific conditions and requirements by the Proponent and/or their operations and maintenance contractors. Scheduled maintenance work will be carried out periodically. Maintenance work may require the use of various cranes for brief periods to replace blades or other WTG repairs.

Substations will be remotely monitored and controlled 24 hours per day using dedicated supervisory control and data acquisition and video surveillance systems. Trained and qualified operators are notified and dispatched when required to address issues such as protection trips, equipment operating parameters exceeded, and unauthorized substation entry. The transmission

lines (230 kV) and collector system (66 kV) will require scheduled and emergency maintenance and inspections. Maintenance activities will be carried out by qualified specialists. Typical preventative maintenance would include earth wire integrity, guying integrity, checking for missing or broken hardware, proper operation of isolation switches, and ROW clearing of encroaching vegetation. Vegetation management activities (through application of herbicides and manual cutting of brush) will be conducted in accordance with the Pesticide Control Regulations under the NL *EPA* and are subject to approval from the NLECC Pesticide Control Section. In the event of equipment failure, emergency repairs may be required. Emergency and preventative maintenance will follow detailed protocols and maintenance plans will consider equipment manufacturer recommendations and International Electrical Testing Association standards.

2.8.2 Industrial Facility

The hydrogen electrolyzer plant includes production, cooling, and compression equipment, and other balance of plant systems. The input water source for the Industrial Facility is demineralized, deionized water that is split into hydrogen and oxygen streams using PEM technology. The PEM process allows for more flexible renewable-energy-derived production system, allowing for ramping, shut down, start up, and lower turndown capabilities, and is the current basis of design. The hydrogen electrolyzer plant can follow the wind production profile from a very low load to full production, with a dynamic yield rate varied by the load of the electrolyzer. The hydrogen output stream from the electrolyzer has water and oxygen contamination and is therefore deoxygenated and dried to required purity specifications prior to supplying the ammonia production plant or stored. Hydrogen for storage is captured when hydrogen production exceeds ammonia production requirements. Excess hydrogen gas is fed to hydrogen storage and is used to feed the ammonia production, when required, and to provide fuel for thermal backup power generation. Hydrogen production output is prioritized to the ammonia plant. Dedicated alkaline electrolyzers use either potassium hydroxide or sodium hydroxide as the electrolyte. These alkaline electrolyzers are designed to function as base load units, providing steady and continuous operation within the overall system.

The oxygen that is separated through the process will be safely vented to the atmosphere and the hydrogen produced will be safely collected and then compressed for use in the synthesize of ammonia.

The ammonia production facility will use the Haber-Bosch process, where hydrogen and air-derived nitrogen are blended, compressed, and reacted in an ammonia converter. The ammonia converter consists of multiple reactor “trains”, each consisting of several catalyst beds with heat exchangers between the beds. The heat exchanger cools the output gas from each bed by transferring the heat energy to the incoming feed. The catalyst beds and heat exchangers are contained within a pressure vessel. The gas is fed through a waste heat boiler, which produces steam, and through a feed/effluent exchanger where the gas is further cooled, and the ammonia is separated from the remaining unreacted gases. Ammonia is further cooled to -33°C for storage, and the unreacted gasses are returned to the ammonia converter via the compressor.

Based on the current design basis and wind resource estimates the Project is expected to

annually produce 1,000,000 t of ammonia.

2.8.3 Product Transshipment

Anhydrous ammonia is a common commodity and is typically transported in gas carriers designed for liquefied fuels. Loading and unloading from terminals to ammonia-carrying vessels is handled safely with proper procedures and specialized training. Ammonia is less flammable than other fuels, carries a lower fire risk, and cryogenic burns risks are lower than liquid hydrogen or liquefied natural gas. Ammonia gas is, however, toxic and corrosive, and as such there are existing safety principles and systems used throughout the global ammonia industry, including the maritime transport of ammonia.

All relevant regulations under the *Transportation of Dangerous Goods Act*, S.C. 1992 c.34 will be adhered to. Compliance with Canada's marine safety and security system will be mandatory for all vessels calling at the facility. Vessels will meet or exceed the international standards and Canadian regulations set out by Canada's marine safety and security system, which ensures that navigation by all vessels is carried out safely.

Regular maintenance on ammonia loading systems will be conducted by trained personnel in accordance with maintenance schedules established by manufacturers and government regulatory agencies.

2.9 Decommissioning and Rehabilitation

Project infrastructure for both the Wind Farms and the Industrial Facility is expected to last a minimum of 30 years, with most of the WTGs and industrial components being recycled, recovered, or salvaged upon decommissioning. An asset retirement plan has been drafted, that outlines options for decommissioning and rehabilitation for the Project. This plan considers all factors of the lifecycle of the components, social, and environmental impacts, and will be finalized upon final design. Elements of the plan have also been incorporated in the design phase of the Project to mitigate further risks and challenges.

The plan will involve the following:

- Isolate and secure all components.
- Place equipment in zero energy states.
- Drain all fluids and purge all pipelines.
- Complete a full inventory of assets.
- Complete a risk assessment.
- Obtain all necessary approvals.
- Sell all surplus equipment and spares.
- Dismantle and remove equipment in a stage manner.
- Decommission assets as per the conditions of the land lease agreement minimizing any further environmental impacts.
- Remove, recycle (where possible), and dispose of materials.

- Remove all other equipment and reinstatement and stabilization of land.

It is anticipated that these activities will take approximately three years from date of shutdown to complete, with certain planning, valuation and equipment marketing activities scheduled prior to plan execution.

Prior to the start of decommissioning, the plan will be submitted to the NLECC – Director of Regulatory Compliance. The submitted plan will identify and discuss the proposed decommissioning activities and schedule for the energy centre site, transmission line corridor, and all appurtenant facilities constructed as a part of/or because of the Project.

The decommissioning and demolition activities will comply with all applicable laws, ordinances, regulations and standards, and should not result in any significant adverse environmental impacts.

Table 2.6 provides a summary of with the potential impacts for decommissioning of the Project infrastructure at the end of Project life. A full effects assessment of the decommissioning phase will be included as part of an EA as directed by regulatory authorities or prior to construction.

Table 2.6: Summary of Potential Impacts for Decommissioning Activities

Component	Potential for Impacts
Air Quality and Greenhouse Gases	Emissions during decommissioning and demolition are significantly lower than during construction or operation for criteria air pollutants and lower than during operation for greenhouse gases.
Public Health	Emissions during decommissioning and demolition are expected to be lower than during construction or operation for criteria air pollutants and contaminants.
Hazardous Materials Management	Implementation of the mitigation measures and compliance with regulations should ensure minimal to no impact.
Visual Resources	As the areas are predicted to be returned to its original state and the dominant Project Area landscape is forested, the visual character of the Project Area should remain unchanged.
Noise and Vibration	Ambient noise levels during decommissioning and demolition are expected to be similar or less than during construction.
Socioeconomics	The socioeconomic impact from closure of the full Project could be significant since the Project will provide a significant boost to the local economy. There is a potential for continued use of the majority of the Project Ares for renewable energy forms, which will retain jobs and create new jobs.
Traffic and Transportation	Decommissioning and demolition traffic is expected to be minimal.

Component	Potential for Impacts
Biological Resources (Terrestrial Fauna, Avifauna, Flora, etc.)	Effects will be evaluated prior to decommissioning and follow relevant legislation.
Archaeology/Culture	No subsurface work will occur outside areas where subsurface work occurred during construction.
Geologic Hazards and Soil Resources	There will be minimal movement of soil on-site and in the areas of the wind turbines; thereby reducing potential for effects on soil and geologic resources.
Soil and Water Resources	Compliance with General Environmental Permit for Discharges of Storm and Ground Water Associated with the operating activity will be sufficient to protect water resources during decommissioning and demolition.
Waste Management	It is expected that there will be sufficient capacity in future landfills to accommodate non-recyclable material.
Worker Safety and Fire Protection	Implementation of the mitigation measures and compliance with legislation will ensure any potential impacts are reduced and minimized.

2.10 Alternative Methods

The Proponent reviewed other locations for this type of project globally and within the province. The Proponent selected the Botwood location through the nomination process based on the area's strong wind resources and undervalued ports with Crown-owned land in low-density populated areas. The area is expected to produce large amounts of electric energy for use by the existing grid and international markets. The Project makes effective use of the province's renewable resources and adds economic benefits to a central part of the province.

An off-grid and on-grid comparative analysis was completed with an off-grid wind design overbuild (for spill and shortages scenarios) to be incorporated in the base design. This strategy ensures a competitive design that can compete in the global marketplace while also providing some additional economic and social benefits to the local community and the province. Utilizing the renewable wind generation with a relatively high-capacity factor, combined with solar power, will ensure enough power for production and operability stability. The Proponent hopes to connect to the grid for additional power provided they can conclude a beneficial arrangement with NF Power and NL Hydro for a future electrical connection.

The alternate water source considered for the Project was North Bay Pond. Peters Pond was selected as it is not within a protected watershed and would provide the necessary water supply requirements.

Additional Project considerations included the utilization of the existing Port of Botwood versus greenfield Northern Arm Bay (northwest of the Town of Botwood and Port of Botwood on a greenfield site). Ultimately, the Port of Botwood was selected to reduce traffic risks. The Port is also a deep harbour, that remains ice free most of the year, and has been used historically by

similar sized vessels that is required for this Project.

3.0 DESCRIPTION OF THE EXISTING ENVIRONMENT AND VALUED COMPONENTS

3.1 Overview

The Project is primarily located within the Central Newfoundland Forest Ecoregion (Northcentral Subregion) (Drawing 3.1, Appendix A). Maritime conditions produce cool summers and short, cold winters. It is the most continental part of the island. The mean annual temperature is around 4.5°C, with a mean summer temperature of 12.5°C and a mean winter temperature of -3.5°C. The mean annual precipitation ranges from 1000 mm to 1300 mm.

The Central Forest Ecoregion in the Botwood and Twin Lakes Wind Farms is dominated by balsam fir (*Abies balsamea*) and black spruce (*Picea mariana*) on steep, moist, upland slopes. Black spruce, paper birch (*Betula papyrifera*), and aspen (*Populus tremuloides*) grow on disturbed sites. *Kalmia* heath and lichens are found on drier sites. Some areas lack good forest growth due to exposure to winds and poor soil conditions. The higher elevations are rugged and rocky, while lower areas have a rolling terrain. Forestry is main industry in the Central Newfoundland Ecoregion. The major communities include Gander, Grand Falls-Windsor and Botwood.

The Leading Tickles Wind Farm is in the North Shore Forest Ecoregion and is characterized by cool summers and short, cold winters. It has the warmest summers of the coastal areas. The mean annual temperature is around 4°C, with a mean summer temperature of 12.5°C and a mean winter temperature of -3.5°C. This ecoregion is the driest part of the island, with a mean annual precipitation ranging from 900 mm to 1000 mm.

The North Shore Forest Ecoregion is also dominated by black spruce, and balsam fir but also has white spruce (*Picea glauca*) as a dominant tree species. There is an understory of feathermoss. The forest is less developed, and barrens are more common, towards the coast due to increased wind exposure. Elevations range from sea level to approximately 150 m above sea level (asl). Bedrock outcrops are common. Fishing, mining, and forestry are dominant land-use activities in this ecoregion. The major communities include Twillingate, Wesleyville, and Springdale.

To evaluate and mitigate the potential environmental concerns, desktop reviews and preliminary field studies have been initiated. Specific environmental components, referred to as a VC, were selected for evaluation. VCs are specific components of the atmospheric, geophysical, biophysical, and socioeconomic environments. The sections that follow provide a summary of information collected and preliminary study design and results, where available. A full assessment of the potential effects the Project may have on VCs will be documented as part of an EA as directed by regulatory authorities or prior to construction.

3.2 Atmospheric Environment

An assessment of the current atmospheric environment was conducted through a review of the following resources:

- NLECC Climate Data [NLECC, 2022b, 2022d; ECCC Weather and Climate (ECCC, 2022)]
- NLECC Air Quality Data (NLECC, 2023c)

3.2.1 Weather and Climate

Newfoundland has a humid continental climate influenced by coastal currents and icebergs. Island precipitation usually peaks in November, with minimums reached in April (ECCC 2022).

Local temperature and precipitation data were obtained from the Badger, Newfoundland and Labrador, meteorological station (Climate ID 8400301) located approximately 60 km southwest of the Project (Table 3.1, NLECC 2022b). In 2022, the mean annual temperature was 4.9°C, with a mean daily maximum of 19.7°C and a mean minimum of -10.6°C. January and February were the coldest months, while July and August were the warmest. Most precipitation occurred in January and March (157 mm and 132 mm, respectively).

Table 3.1: Climate Data from the Badger Meteorological Station (2022)

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Year
Avg Temp (°C)	-6.6	-7.5	-3.8	2.8	6.2	14.0	16.9	18.6	12.4	8.4	0.0	-2.3	4.9
Max Temp (°C)	9.4	8.9	11.6	16.1	22.4	29.4	32.0	31.5	27.4	21.2	19.4	7.1	19.7
Min Temp (°C)	-26.2	-30.4	-18.5	-7.6	-7.6	-4.7	4.7	4.1	-2.1	-3.7	-17.0	-18.4	-10.6
Precipitation (mm)	157.2	125.9	132.4	84.3	74.1	48.6	67.9	68.4	75.5	74.8	131.6	69.9	92.5

NLECC (2022b)

Wind speed and direction data were also obtained from the Badger meteorological station (Table 3.2). The average hourly wind speeds recorded in 2022 ranged from 22 km per hour (km/h) in July to 45 km/h in March. The wind direction most observed at the meteorological station was from the southwest, though wind directions may occur in all directions (ECCC, 2022d).

Table 3.2: Wind Data from the Badger Meteorological Station (2022)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maximum Hourly Speed (km/h)	32	42	45	40	44	32	22	28	37	36	42	35
Most Frequent Direction	S	SW	S	SW	SW	S	S	SW	SW	SW	SW	S

NLECC 2022d

A wind rose plot (Figure 3.1) is provided for the Badger meteorological station (CZDB), demonstrating that between January and December 2022, the wind directions above 12 m per second (m/s) (43.2 km/h) occurred the most frequently from the southwest, particularly during the spring and fall season.

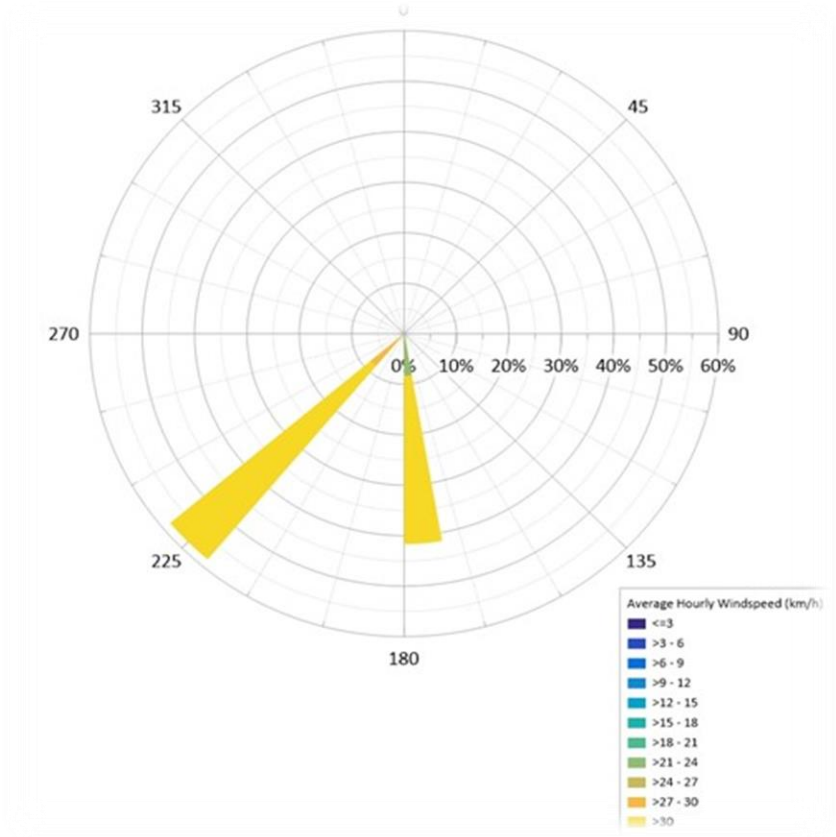

Figure 3.1: Wind Rose of Badger Meteorological Station (CZDB) Data between January and December 2022

3.2.2 Air Quality

The CCME has established Canadian Ambient Air Quality Standards (CAAQS) for fine particulate matter [≤2.5 micrometres (µm) ($PM_{2.5}$) or ≤10 µm (PM_{10}) in size], ozone (O_3), sulphur dioxide (SO_2), and nitrogen dioxide (NO_2) over select averaging periods (CCME, 2023); while the Government of Newfoundland and Labrador has legislated Air Pollution Control Regulations (NLAPCR), N.L. Reg. 11/2022 under the *Environmental Protection Act*. The province adopted the CAAQS for SO_2 and NO_2 under the NLAPCR. The province has not adopted the CAAQS for $PM_{2.5}$ and O_3 as they are not as stringent as the current legislation. Proposed changes to the current NLAPCR are underway and will govern future air quality criteria once implemented (NLECC, 2023e). Current and proposed provincial standards are provided for comparative purposes (Table 3.3).

Table 3.3: Summary of Regulations Pertaining to Ambient Air Quality in Newfoundland and Labrador

Contaminant	Averaging Period	Regulatory Threshold (ppb except for $PM_{2.5}$)	
		Existing Provincial[1]	Proposed Provincial[2]
Carbon Monoxide (CO)	1-hour	-	-
	8-hour	-	-
Nitrogen Dioxide (NO_2)	1-hour	60	42
	24-hour	-	-
	Annual	17	12
Ozone (O_3)	1-hour	82	
$PM_{2.5}$	24-hour	25 µg/m^3	
	Annual	8.8 µg/m^3	
PM_{10}	24-hour	-	-
	Annual	-	-
Sulphur Dioxide (SO_2)	1-hour	70	65
	24-hour	-	-
	Annual	5	4
Total Suspended Particulate (TSP)	24-hour	-	-
	Annual	-	-

[1] Current Ambient Air Quality Standards (NLAAQS) [Air Pollution Control Regulations, N.L. Reg.11 /2022].
[2] Proposed Ambient Air Quality Standards (subject to change) (NLECC, 2023e).

Newfoundland and Labrador monitors air quality at seven ambient air quality monitoring stations throughout the province (NLECC, 2023). The Grand Falls-Windsor location (Station ID 010501) was selected for air quality data for the Project Area. It is approximately 30 km southwest of the Town of Botwood, at 48.92689° N, 55.65956° W.

Measured parameters at this location include:

- Carbon monoxide (CO)
- Ozone (O_3)
- Nitrogen oxides (NO_x)
- Nitric oxide (NO)
- Nitrogen dioxide (NO_2)
- Particulate matter ($PM_{2.5}$ and PM_{10})
- Sulfur dioxide (SO_2)

Table 3.4 summarizes the current (baseline) maximum ambient air quality conditions observed at the Grand Falls-Windsor air quality monitoring station from February 13 to March 15, 2023. Existing air quality conditions indicate the measured contaminants are well below the respective Newfoundland Ambient Air Quality Standards.

Table 3.4: Current (Baseline) Maximum Ambient Air Quality Conditions in Proximity to the Project

Parameter	Averaging Period	O_3 (ppb)	SO_2 (ppb)	NO_X (ppb)	NO (ppb)	NO_2 (ppb)	$PM_{2.5}$ (ug/m^3)
Grand Falls-Windsor Ambient Monitoring	1 hour	30	0	-	-	12.5	-
	24 hours	-	-	37.5	30.1	-	14
	Annual	-	-	-	-	-	-
NLAAQS	1 hour	82	70	-	-	60	-
	24 hours	-	-	-	-	-	25
	Annual	-	-	-	-	-	8.8
Fraction of NLAAQS	1 hour	37%	0%			21%	
	24 hours						56%
	Annual						

Source: NLECC 2023e

3.2.3 Climate Change

Climate change is a long-term alteration of weather patterns and conditions strongly impacted by changes in temperature and precipitation. Climate change typically involves changes in average conditions, as well as changes in variability. The main contributor to climate change is GHGs from anthropogenic sources. Since GHGs disrupt the natural heat transfer processes within the Earth's atmosphere, a build-up of these gases has enhanced the natural greenhouse effect. These human-induced enhancements are especially of concern since ongoing GHG emissions have the potential to warm the planet to levels that have yet to be experienced (Government of Canada, 2019a).

GHG Emission Sources

The main GHGs of concern include:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)
- Halocarbons
- Water vapour

GHGs may be natural or anthropogenic in origin, except halocarbons, which are human-made (Government of Canada, 2019b). The following subsections describe the GHGs and their contributors (sources) as anticipated during each phase of the Project.

Carbon Dioxide

The primary sources of atmospheric CO_2 result from site construction vehicles and deforestation/land clearing activities that release stored carbon.

Site preparation will include several activities likely to produce CO_2, such as:

- Use of heavy equipment (excavators, dozers, cranes, etc.)
- Use of light-duty vehicles and equipment (pick-up trucks, light plants, generators, etc.)
- Land clearing, including burning or the decay of cut foliage (which releases CO_2 slowly)
- Cement production - heating of the limestone releases CO_2 (Government of Canada, 2019)

During the operations phase, CO_2 emissions will be produced by light- and heavy-duty vehicles, diesel generators, maintenance activities associated with off-site road maintenance, and indirectly from electricity supplied by the grid.

Overall, CO_2 contributions are expected to be localized, intermittent, and insignificant during the operational phase.

Methane

Methane is produced when fossil fuels and trees are burned with insufficient oxygen to complete combustion (Government of Canada, 2019a). Another source of methane is the decay of organic solid wastes.

The Project's construction and operation phase will rely on different light- and heavy-duty equipment (which produce methane) and will result in vegetation management, waste decay expected from non-salvageable biomass (i.e., decomposing cleared vegetation), resulting in the contribution of methane generation.

Overall, methane contributions are expected to be localized, intermittent, and insignificant.

Nitrous Oxides

The primary sources of NO_X are related to the use of nitrogen-based synthetic fertilizer and manure. These sources have added significant amounts of reactive nitrogen to the Earth's ecosystems. Other contributors include the release of nitrous oxides into the atmosphere during the combustion of fossil fuels and biomass (e.g., trees or wood-based fuels) and from some industrial sources (Government of Canada, 2019).

The Project's construction phase will rely on different heavy- and light-duty equipment, which can contribute to nitrous oxide emissions. While these sources may contribute to emissions, the primary contributor will likely relate to land restoration activities (i.e., soil amendments and reclamation) following construction. Overall, the production of NO_x in association with this Project is anticipated to be relatively minimal as the need for synthetic fertilizer and manure applications will be considered on a case-by-case basis.

During the operations phase, NO_x emissions will be limited to using light- and heavy-duty vehicles and equipment for material handling and transportation.

Overall, NO_x emissions are expected to be localized, intermittent, and insignificant.

Halocarbons

Halocarbons are a group of synthetic chemicals containing a halogen group (e.g., fluorine, chlorine, and bromine) and carbon (Government of Canada, 2019). They are typically used in refrigerants, fire-extinguishing agents, solvents, foam-blowing agents, and fumigants (Government of Canada, 2013). There are various industrial sources, but the main contributor relates to the production of aluminum (US EPA, 2022).

The primary source of halocarbon emissions from the Project will be coolants in air conditioning units found in vehicles, portable construction buildings (i.e., trailers), Industrial Facility buildings (i.e., office buildings) and other small-scale equipment. Air conditioning units will be used during the Project's construction and operations phases. Fire-extinguishing agents (containing halocarbons) may also be used at the Project in the event of a fire-fighting emergency response.

Overall, the contribution of halocarbons anticipated to be produced by air conditioning units and fire-fighting response activities is expected to be localized, intermittent, and not significant.

Water Vapour

Water vapour is the most important naturally occurring GHG. Human activities do not directly influence the amount of water vapour in the atmosphere to any significant degree. Instead, the amount of water vapour in the atmosphere is a function of the atmosphere's temperature. The atmosphere can hold approximately 7% more water vapour for every additional degree Celsius in air temperature. When the air becomes saturated with water vapour, the water vapour condenses and falls as rain or snow, leading to climate change effects (i.e., variances in weather patterns).

As climate warming gases (i.e., CO_2, CH_4, NO_x) increase in the atmosphere, the temperature rise increases water evaporation from the Earth's surface and increases the atmospheric water vapour concentrations. This increased water vapour, in turn, amplifies the warming effect caused by the GHGs, resulting in the cycle repeating and temperatures continuing to rise (Government of Canada, 2019a).

Although a direct effect on water vapour concentration by the Project is not anticipated, the Project activities contributing to GHG emissions may indirectly affect water vapour concentrations in the atmosphere; however, the impact is expected to be negligible.

Carbon Dioxide Equivalent (CO_2e)

CO_2e is a measurement used to compare the emissions from various GHGs and their global-warming potential. According to Canada Energy Regulator (2023), Newfoundland and Labrador's 2020 GHG emissions were approximately 9.5 $MTCO_2e$.

Anticipated sources of CO_2e for the Project will primarily be associated with the emissions produced by the construction of the Industrial Facility and WTGs, and emissions during the Industrial Facility’s operations. A GHG assessment will be completed for the Project as part of an EA as directed by regulatory authorities or prior to construction.

To mitigate the carbon emissions through the phases of the Project, the Project has applied for a grid connection supply for construction power as well, as "as available" electrical power during the operations and decommissioning phases of the Project. Applications have been submitted to NF Power and NL Hydro for the supply of power.

Table 3.5 shows CO_2 production estimates during the construction, operation, and decommissioning phases of the Project and offset based on green ammonia production.

During the operation phase of the Project:

- Production is estimated at 940,000 to 1,000,000 t per year of clean renewable ammonia produced using exclusively renewable power and resulting in zero tCO2e/tNH3 GHG emissions.
- Product will be shipped to Europe where it will replace carbon intense fossil-based conventional ammonia production process, as the benchmark ammonia production emission factor in the EU is 1.57 tCO2e/tNH3 (source: Update of benchmark values for the years 2021 – 2025 of phase 4 of the EU Emissions Trading System).
- From 2030 onwards, the Project could represent a GHG emissions reduction potential of up to 1,570 ktCO2e/annum with a total emissions reduction potential of 47,100 ktCO2e, assuming minimum 30 years of operation.

During the construction and decommissioning phases of the Project, it is expected that the Project may trigger requirements under the provincial *Management of Greenhouse Gas Act* (MGGA) as emitting more than 15,000 tonnes of GHG emissions. The calculations in Table 3.5 included emission sources from the manufacturers of equipment, projected distances and equipment types, fuel consumption and published carbon coefficients. Shipping weights and CO_2 factors were also incorporated into the calculation (Appendix B).

Table 3.5: CO_2 Production and Offset Estimates

	Phase			
	Construction	Operational	Decommissioning	Total
$KtCO_2$ Generated	754		53	807
$KtCO_2$ Offset		47,100,000		47,100,000
EXPECTED NET CO2 PROJECT REDUCTION kt CO_2				**47,099,193[1]**

[1] *CO_2 calculations table provide by EVREC*

In addition, the green hydrogen/ammonia produced by the Project will contribute significantly to Newfoundland and Labrador and Canada's GHG emission reduction goals. GHG reductions will be realized through the following commitments:

- Developing a plan for green hydrogen and green fuel supply to the province.
- Establishing relationships and strategies with the marine sector for the provision of clean fuel bunkering on the east coast of Canada. An MOU with the Port of Antwerp-Bruges as a key partner has been entered into by the Project.

3.3 Geophysical Environment

The assessment of the geophysical environment included a review of topography, surficial geology, bedrock geology, and hydrogeology/groundwater. The assessment was completed through a review of the following resources:

- Aerial imagery and topography
- Newfoundland and Labrador Geoscience Atlas (Gov. of NL, 2023a)
- Newfoundland and Labrador Land-Use Atlas (Gov. of NL, 2023b)
- Well Logs Database (NLECC, 2023e)

3.3.1 Geology

Surficial Geology

Surficial geology in the Project Area primarily consists of glacial till with areas of bedrock which is either exposed at surface or concealed by vegetation (Drawing 3.2, Appendix A). Glacial till in the Project Area consists of unsorted to poorly sorted sediment ranging from clay to boulders. Glacial till, deposited by, or from, glacier ice with no significant sorting by water, exists as plains, gullies and channels, knobs, mounds, and ridges at various thicknesses throughout the Project Area.

Small bog areas (i.e., poorly drained accumulations of peat, peat moss, and other organic matter) are present at the Botwood, Twin Lakes, and Leading Tickles Wind Farms. Glaciofluvial deposits of fine-grained sand to coarse-grained cobbly gravel are present in small areas at the Botwood Wind Farm, Solar Farm, and Industrial Facility. Alluvium consisting of silt and clay to bouldery gravel deposited by fluvial action is present in a small area at the Twin Lakes Wind Farm and marine sediments consisting of clay, silt, gravel, and diamicton with some sand is present in a small area at the Leading Tickles Wind Farm.

Bedrock Geology

Bedrock geology within the Project Area consists of various rock units of Cambrian to Ordovician age from the Exploits Subzone of the Dunnage Tectonic Zone with volcanic and sedimentary overlap sequences of Silurian age and volcanic intrusive rocks of Silurian to Jurassic age (Drawing 3.3, Appendix A). The Dunnage zone is characterized by Cambrian to Middle Ordovician submarine volcanic rocks and Early Ordovician ophiolite suites. In the Exploits Subzone, volcanic rocks are associated with thick sedimentary units and are overlain by black shales of Middle or Late Ordovician age. The black shales pass upwards into Late Ordovician to Early Silurian turbidite deposits, which are overlain by shallow marine and non-marine Silurian strata (Coleman-Sadd, et al., 1990).

Bedrock geology at the Twin Lakes and Leading Tickles Wind Farms generally consists of tuff and tuffaceous sandstone, greywacke, argillite and chert from the Wild Bight Group with intrusive igneous rocks of a younger age (i.e., Silurian to Jurassic age). The Leading Tickles Wind Farm also contains grey to black greywacke and silty argillite known as the Point Leamington Greywacke (Kean, 1977).

Bedrock geology at the Botwood Wind Farm is primarily a mix of sedimentary (i.e., shale, siltstone, argillite, sandstone, greywacke, conglomerate, and chert) and volcanic (i.e., pillow lavas, pillow breccia and flows, agglomerate and tuff) rocks from various groups and formations including the Frozen Ocean Group, Point Leamington Greywacke, Shoal Arm Formation, Wild Bight Group, and New Bay Formation (Kean, 1977).

The bedrock geology at the Industrial Facility consists of Silurian aged red, brown and green micaceous sandstone, siltstone, and quartzite with minor pyroclastic rocks and vesicular basalt from the Wig Wam Formation in the Botwood Group (Kean, 1977).

3.3.2 Hydrogeology

The hydrogeology within the region where the Project Area is located, is a mixture of low to moderate yield igneous rocks, primarily comprised of granite, diorite, basic pillow lava, flows, breccia, and tuff, along with moderate yield sedimentary rocks primarily comprised of siltstone, conglomerate, argillite, and greywacke (AMEC 2013).

Groundwater Wells

Water supplies near the Project Area are generally derived from surface water through municipal water supply dams. However, based on information provided in provincial Drilled Water Well Database (NLDEC 2008) for wells drilled between 1975 and 2007, there are 183 drilled or dug wells either within the Project Area or within 2 km of the Project Area (summary provided in Table 3.6). Of the 183 water wells, 108 are located within the Project Area (i.e., wells located within the communities of Botwood, Northern Arm and Grand Falls-Windsor).

Based on information included on the driller's records, for the wells located within 2 km of the Project Area, well depth varied between 12 m and 217.3 m. Static water levels generally ranged from 0.2 m and 17 m below the surface, with well yields ranging from 0 Lpm to 230 Lpm (litres per minute).

Table 3.6: Summary of Water Well Records within 2 km of the Project Area in Central Newfoundland and Labrador

Minimum/Maximum	Drilled Date (year)	Well Depth (m)	Bedrock Depth (m)	Static (m)	Yield (Lpm)
Bishop's Falls					
Minimum	1996	27.5	3	0.2	0
Maximum	2007	80	17	6.1	48
Botwood					
Minimum	1996	12.2	0.3	1.8	0
Maximum	2007	73.2	18.8	17	136.4
Grand Falls-Windsor					
Minimum	1965	2.1	3	3.7	0
Maximum	2007	118.9	18.3	9.1	225
Northern Arm					
Minimum	1966	19.2	1	-	0
Maximum	1994	133	23.7	-	90.9
Point Leamington					
Minimum	1968	12	2.5	-	0
Maximum	1991	217.3	27.4	-	230
Point of Bay					
Minimum	1970	15.2	0.3	-	0
Maximum	1994	101.5	7	-	45.5

Source: Well Logs Database (NLECC, 2023f).

Groundwater Quality and Quantity

NLECC monitors 20 groundwater quality parameters from the province's Drilled Well Database (i.e., alkalinity, colour, hardness, pH, total dissolved solids, turbidity, boron, bromide, calcium, chloride, fluoride, potassium, sodium, sulfate, ammonia, dissolved organic carbon, nitrate/nitrite, dissolved nitrogen and total phosphorus). The nearest groundwater quality data to the Project Area is in Badger, Newfoundland and Labrador, approximately 60 km to the southwest. The data was collected between 2001 and 2007 and except for turbidity, the groundwater data falls within the accepted ranges for the Government of Canada Drinking Water Quality guidelines. Generally, groundwater water within the Island of Newfoundland is an acceptable quality (NLECC, 2023f).

3.4 Aquatic Environment

3.4.1 Waterbodies and Watercourses

A desktop review was conducted to identify waterbodies and watercourses within the Project Area and a 5 km buffer. The following data sources were used:

- CanVec Database – Hydrographic Features (NRCan, 2023)
- Newfoundland and Labrador Land Use Atlas (Gov. of NL, 2023b)
- Newfoundland Angler's Guide (Gov. of NL 2024)

The Project Area intersects 615 waterbodies. Nine of the waterbodies are named: Askel Lake, Lewis Lake, Marks Lake, Budgell Pond, Long Pond, New Bay Pond, Peters Pond, Rocky Pond, and Twin Ponds. The largest lake is New Bay Pond, measuring 16.06 km^2. The median size of all waterbodies in the Project Area is 0.002 km^2 (0.053 ± 0.66; mean ± standard deviation). When considering an additional 5 km buffer around the Project Area, there are an additional 2,273 waterbodies. The largest waterbody in the buffer is North Twin Lake with a total estimated area of 39.52 km^2. Drawings 3.4a to 3.4c (Appendix A) show the distribution of waterbodies in relation to the Project components.

Analysis of the CanVec waterbody and watercourse databases (NRCan 2023) and the Newfoundland Angler's Guide (Gov. of NL 2024) identified 465 watercourses in the Project Area (Drawings 3.4a to 3.4c); however, only eight watercourses are named: Peters River, Northern Arm Brook, New Bay River, Muddy Hole Brook, Two Mile Brook, West Arm Brook (also called Western Arm brook), Badger Bay Brook, and Shoal Arm Brook. Peters River, which runs southeast of the Solar Farm and Industrial Facility, is the longest river with an estimated length of 26.4 km, followed by New Bay River (also called Leamington River). The 5 km buffer around the Project Area includes an additional 1,270 watercourses, of which nine are named: the Exploits River – the largest watercourse in the Project Area spanning 246 km – Northwest Arm Brook, North Twin Brook, Rattling Brook, Charles Brook, Matties Brook, Sops Arm Brook, Seal Bay Brook, and Penny's Brook. All other watercourses in the buffer are unnamed. Table 3.7 indicates named waterbodies and watercourses within the Project Area and within 5 km of the Project Area.

Peters River, Northern Arm River, New Bay River, and Western Arm Brook are scheduled salmon rivers that fall within the Project Area (Drawing 3.5, Appendix A), whereas the Exploits River, Northwest Arm Brook, and Charles Brook are scheduled salmon rivers that occur outside the Project Area but within the 5 km buffer (Gov. of NL 2024).

Table 3.7: Named Waterbodies & Watercourses within the Project Area and within 5 km of the Project Area

Name	Waterbody Approximate Area (km^2)	Watercourse Approximate Length (km)
Within the Project Area		
Peters River	-	26.4
New Bay River	-	22.2
Shoal Arm Brook	-	13.2
Northern Arm Brook	-	18.9
Badger Bay Brook	-	7.48
Two Mile Brook	-	5.01
West Arm Brook	-	29.1
Muddy Hole Brook	-	2.9
Peters Pond	1.1	-
Askel Lake	0.6	-
Rocky Pond	<0.0	-
Twin Ponds	0.1	-
Budgell Pond	0.3	-

Name	Waterbody Approximate Area (km²)	Watercourse Approximate Length (km)
Long Pond	0.0	-
Lewis Lake	1.7	-
Marks Lake	0.9	-
New Bay Pond	16.1	-
Within 5 km of the Project Area		
Exploits River	-	246
Rattling Brook	-	16.2
Charles Brook	-	23.2
Northwest Arm Brook	-	16.1
North Twin Brook	-	4.3
Matties Brook	-	0.2
Sops Arm Brook	-	9.8
Seal Bay Brook	-	6.4
Penny's Brook	-	4.2
West Arm Brook	0.1	-
North Twin Brook	0.4	-
Lewis Lake	0.4	-
Babies Cove Pond	<0.0	-
Cleaves Lake	0.1	-
Otter Pond	0.1	-
Big Otter Pond	0.1	-
Southern Lake	1.7	-
Mud Lake	0.1	-
Grassy Pond	0.1	-
Bard Pond	0.3	-
Twin Pond	0.2	-
Big Lake	0.6	-
Mill Pond	0.5	-
Fall Pond	0.2	-
Big Twins Ponds	0.2	-
Fall Pond	0.1	-
Long Pond	0.1	-
Grassy Pond	0.1	-
Side Pond	0.1	-
Matties Pond	<0.0	-
Four Mile Lake	0.7	-
Little Martin Lake	0.1	-
Stowaway Pond	0.1	-
Middle Pond	0.1	-
Burnt Pond	0.1	-
Nanny Bag Lake	0.8	-
Diver Pond	0.4	-
Bobbies Pond	<0.0	-
Daws Pond	<0.0	-
Side Pond	0.1	-
Martin Lake	0.5	-
Island Pond	<0.0	-

Name	Waterbody Approximate Area (km^2)	Watercourse Approximate Length (km)
Askel Pond	0.2	-
Line Pond	0.1	-
Cooks Pond	0.5	-
Mine Pond	0.1	-
Mill Pond	0.9	-
Laceys Pond	<0.0	-
Bog Dam Pond	0.1	-
Sharrons Pond	0.1	-
Little Pond	0.1	-
Shoal Arm Pond	0.2	-
North Twin Lake	39.5	-
South Twin Lake	35.3	-
Goose Pond	0.3	-
Frozen Ocean Lake	8.2	-
Trouble Pond	0.3	-

The protected water supplies closest to the Project Area are Northern Arm Lake, Little Pond, and Indian Cove Pond, which are located adjacent to the Botwood wind farm in the south, north and east respectively. Other protected water supplies (NLECC, 2022) within 20 to 90 km of the Project Area include:

- Indian Cove Pond watershed with an approximate area of 52 km^2, servicing Point of Bay.
- Little Pond watershed with an approximate area of 41 km^2, servicing Point Leamington.
- Northern Arm Lake watershed with an approximate area of 61 km^2, servicing Wooddale, Northern Arm, Peterview, Bishop's Falls, Grand Falls-Windsor, and Botwood.
- Stanhope Pond watershed with an approximate area of 26 km^2, servicing Lewisporte.
- Mill Lake watershed with an approximate area of 3 km^2, servicing Norris Arm.
- Indian Arm Brook watershed with an approximate area of 306 km^2, servicing Campbellton.
- Southeast Pond watershed with an approximate area of 77 km^2, servicing Loon Bay.
- Gander Lake watershed with an approximate area of 1,680 km^2, servicing Glenwood, Gander, and Appleton.

According to the NLECC (2023), Corduroy Brook and Pond are recorded as protected wetland stewardship areas. A portion of the Exploits River near Grand Falls-Windsor is recorded as a protected waterfowl habitat.

3.4.2 Peters Pond Watershed Water Balance

The Industrial Facility requires sufficient water supply for the electrolyzers to separate hydrogen and oxygen for further use in ammonia production. The pumps at the water supply are expected to fill a freshwater pond and then circulate the water following a treatment process, to further reduce dependency on the freshwater supply. A preliminary desktop water balance of the Peters Pond watershed was prepared to demonstrate that sufficient water is available to sustain the requested withdrawal rate of 21 ML/d.

The water balance equation is used to quantify the movement of water in a defined area. In this document, it is assumed that the Peters Pond watershed represents the boundary for the calculation. Total precipitation (*P*) accounts for water that falls as both rain and snow and contributes to the amount of water available for direct surface runoff and infiltration (i.e. groundwater recharge). The ratio of surface runoff to infiltration varies throughout the year due to seasonally frozen ground (i.e. late winter) and periods when the shallow subsurface is already saturated. A water balance also considers the amount of water that returns to the atmosphere via evaporation and transpiration (referred to as evapotranspiration, *ET*). Finally, the water balance considers other natural or anthropogenic inputs and outputs that are site specific.

The water balance equation can be defined as follows for Peters Pond watershed:

$$Q_{in} = Q_{out} + \Delta S$$

where; Q_{in} and Q_{out} represents the sum of inputs and outputs of the water budget, respectively, and ΔS represents the change in storage in the system.

Inputs to the pond include total precipitation (Q_P) on the entire Peters Pond watershed as river inflow data was not available. This includes direct precipitation on the pond, as well as upgradient inflows and surface runoff from areas draining into the pond. It was assumed that for the duration of the year, all the precipitation contributes to direct surface runoff feeding into upstream rivers. Outputs from the pond include evapotranspiration from the entire watershed (Q_{ET}), any water withdrawals at or upstream of the pond (Q_W), and a desired ecological maintenance outflow for the downstream river network (Q_R). Therefore, the water budget for Peters Pond can be estimated by the following equation:

$$\Delta S = Q_{in} - Q_{out}$$

$$\Delta S = (Q_P) - (Q_{ET} + Q_W + Q_R)$$

If the change in storage (ΔS) is positive in the above equation, there is sufficient water to sustain the proposed withdrawal rate. Note that in a large watershed over a duration of a year, it can be assumed that the groundwater exchange in the system is equal to zero. Therefore, groundwater storage was not included in the water budget calculation.

The watershed area for Peters Pond extends from the outlet of the pond approximately 23 km to the east to a topographic high to the north of the town of Grand Falls-Windsor. Elevation rises from approximately 30 m asl at the pond outlet to a high of approximately 215 m asl. The area of the watershed was calculated in GIS to be approximately 150 km^2.

ET is the sum of evaporation and transpiration from terrestrial and aquatic environments to the atmosphere and is dependent on topography, latitude, solar radiation, wind, humidity, temperature, type and extent of vegetation, and availability of water. Based on data published by NLECC the mean annual potential evapotranspiration for the Botwood area ranges from 500 to 525 mm. The upper limit (525 mm) was used to be conservative.

Water withdrawal from the pond or its upstream watershed was considered to be removal of water that is not returned to the Peters Pond watershed. A desktop review identified four approved water withdrawals in Peters Pond watershed (Table 3.8). The total active water withdrawals in the watershed were calculated to be 193,200 m^3 per year. The proposed water withdrawal for the Project is 21 ML per day (7,665,000 m^3 per year). Therefore, the total proposed annual water withdrawal from Peters Pond and its watershed is 7,858,200 m^3.

Table 3.8: Active Water Withdrawals in Peters Pond Watershed

Withdrawal License Number	Maximum Annual Rate (m^3)	Expiry Date
20-11427	10,000	10/26/2025
20-11523	120,000	12/9/2025
20-11548	61,700	12/30/2025
20-11222	1,500	8/6/2025

Data obtained from the nearest hydrometric station downstream from ECCC (Peters River near Botwood) was assumed to be the pond outflow. The hydrometric watershed area is 177 km^2. Data downloaded from 2022 was used to estimate an ecological maintenance flow to ensure the desired water withdrawal from the pond does not negatively impact the aquatic environment downstream. The ecological maintenance flow was calculated by taking 30% of the mean annual flow from 2000 to 2022. As a result, the 30% mean annual flow of the pond outflow was calculated to be 1.34 m^3 per second.

For the analysis, the precipitation (Q_P) and potential evapotranspiration terms (Q_{ET}) were multiplied by the area of the watershed (150 x 10^6 m^2). The total annual water withdrawal (Q_W) was calculated to be 7,858,200 m^3 (including the proposed and current water withdrawal rates) and the total annual maintenance flow (Q_R) was calculated to be 42,258,240 m^3. As a result, the change in storage would be 29,451,501 m^3 per year. As the storage term is a positive value, this indicates that there is sufficient water available to sustain the withdrawal of 21 ML/day from Peters Pond. However, a more detailed analysis would be required to determine the seasonal effects on flow in the watershed, the climatic impacts of wet and dry years, and the elevation storage area relationship of Peters Pond.

3.4.3 Fish and Fish Habitat

To assess the fish and fish habitat within the Project Area, a desktop review was conducted prior to field surveys to identify potential fish species presence. The findings informed the design of field surveys. Results of the desktop and field studies will inform the design of the Project footprint, which will be presented and assessed as part of an EA as directed by regulatory authorities or prior to construction.

3.4.3.1 Desktop Review

A desktop review of available literature on fish and fish habitat was completed using the following resources and databases:

- Aquatic Species at Risk Map (DFO, 2023)
- Atlantic Canada Conservation Data Centre (ACCDC) Data Report (ACCDC, 2023)
- CanVec Database – Hydrographic Features (NRCan 2023)
- Newfoundland and Labrador Land Use Atlas (Gov. of NL 2023b)
- NLFFA GeoHub Aquaculture Licenses dataset (NLFFA, 2023)
- Scientific literature and government documents (cited in text below)
- Consultation with local outfitters

No publicly available database outlining fish species presence in the Project Area was identified during the desktop review. The review of the sources listed above identified 10 species occurring in the Project Area (Table 3.9), including socio-economically valuable Atlantic salmon (*Salmo salar*; both sea run and ouananiche - land locked Atlantic salmon), brook trout *(Salvelinus fontinalis*), and Arctic char (*Salvelinus alpinus*).

Table 3.9: List of Freshwater Fish Species Potentially Occurring in the Project Area

Species	Common Name	Source	Species status		
			SARA	NL *ESA*	COSEWIC
Salmo salar	Atlantic salmon‡	(Government of Newfoundland and Labrador n.d.; NLECC n.d.)	-	-	-
Salvelinus fontinalis	Brook trout	(Government of Newfoundland and Labrador n.d.; NLECC n.d.)	-	-	-
Salvelinus alpinus	Arctic char	(Government of Newfoundland and Labrador n.d.; NLECC n.d.; pers. comm. with outfitters)	-	-	-
Anguilla rostrata	American eel	(Government of Newfoundland and Labrador n.d.; NLECC n.d.)	-	Vulnerable (2006)	-
Gasterosteus aculeatus	Threespine stickleback	(Government of Newfoundland and Labrador n.d.; NLECC n.d.)	-	-	-
Pungitius pungitius	Ninespine stickleback	(Government of Newfoundland and Labrador n.d.; NLECC n.d.)	-	-	-
Osmerus mordax	Rainbow smelt	(Government of Newfoundland and Labrador n.d.; NLECC n.d.)	-	-	-
Petromyzon marinus	Sea lamprey	(Government of Newfoundland and Labrador n.d.; NLECC n.d.)	-	-	-
Chrosomus neogaeus	Finescale dace	(Keefe et al. 2019)	-	-	-
Fundulus diaphanus	Banded killifish	(DFO 2022; Government of Newfoundland and Labrador n.d.)	-	Vulnerable (2003)	-

‡*Northeastern population*

The Aquatic Species at Risk Map (DFO, 2023) is a federal database showing the distribution of SAR and their associated critical habitat within Canadian waters. A SAR is defined as those species that are:

- Species listed under *SARA* as “Endangered”, “Threatened”, or “Special Concern” (*SARA*, 2022).
- Species listed under the Newfoundland and Labrador *ESA* as “Endangered”, “Threatened” or “Vulnerable” (NL *ESA*, 2023).

A review of the NL *ESA* list determined that the Project Area includes habitat for two inland SAR:

- banded killifish (*Fundulus diaphanous*)
- American eel (*Anguilla rostrata*)

A review of Aquatic Species at Risk Map determined that the northeastern portion of the Project Area along the Exploits River and Notre Dame Bay is classified as a potentially extirpated, endangered, or threatened habitat. The species listed within this area are the fin whale (special concern), blue whale (endangered), spotted wolffish (threatened), North Atlantic right whale (endangered), leatherback sea turtle (endangered), and white shark (endangered). However, the Project Area does not overlap with the habitat for these species, as the Project is inland and coastal, whereas the aforementioned species occur offshore.

The ACCDC is part of a network of NatureServe data centres and heritage programs that maintain records of rare flora and fauna species and habitat areas of ecological interest that exist within the majority of North and South America. ACCDC records (Appendix C) were reviewed to identify records of SAR and species of conservation concern (SOCC). Throughout this EARD, SOCC are defined as follows:

- Species listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) but not *SARA* as “Endangered”, “Threatened”, or “Special Concern” (Government of Canada, 2022).
- Species having a subnational (provincial) rank (S-Rank) of “S1”, “S2”, or “S3” (ACCDC, 2023).

The ACCDC database did not identify any fish species considered to be SOCC or SAR within 5 km of the Project Area.

Banded killifish

Banded killifish are a euryhaline species that inhabit freshwater streams and lakes but can tolerate more saline environments. Their habitat preferences include clear, shallow slow-moving water with mud, sand, or gravel substrate and aquatic vegetation (DFO 2022). Banded killifish live for 3 to 4 years, reaching 7 to 9 cm in length at maturity and contribute as an important prey for other fish species, including Atlantic salmon, brook trout, and American eel (DFO 2022c; Government of Newfoundland and Labrador n.d.). Spawning occurs in the summer (July to August) when water temperatures are between 19 and 24°C (Chippett 2004). Currently there are only 10 known populations of banded killifish in Newfoundland, only one occurs in northeast Newfoundland and it is outside the Project Area (DFO 2022).

American eel

American eel is a catadromous species, meaning individuals spawn in the ocean and mature in saltwater bays, estuaries, or freshwater rivers and lakes (NLFFA 2011). Juvenile American eels, referred to as “glass eels”, are long, slender, and clear in appearance. As glass eels grow, they become pigmented and mature into elvers for 3 to 12 months, then develop into yellow eels for up to 30 years, and fully mature (i.e., silver eels) for 9 to18 years. American eels are panmictic, meaning all spawners are from a single breeding population in the south Atlantic. Furthermore, individuals only spawn once and fast during their spawning migration, leaving individuals with a finite energy reserve to migrate and reproduce.

Marine habitat preferences include protected shallow waters containing submerged vegetation (e.g., eelgrass) and woody debris (COSEWIC 2012). Freshwater habitat preferences include rivers and lakes with mud, sand, fine gravel, or cobble substrate for burrowing and woody debris. A recent laboratory experiment determined that American eels have a 26˚C upper thermal tolerance limit (indicated by heightened mortality rates) and the optimal temperatures for rearing ranged between 18 to 22˚C (Blakeslee et al. 2018). American eels are known to move over obstacles, through small creeks, or through wet grass (NLFFA 2011).

3.4.3.2 Field Assessments

Fish habitat assessments and stream sampling for fish species presence were completed to characterize existing habitats, fish communities, and identify SAR and SOCC. The results will be used to support the Project design.

Methodology

Fish habitat assessments were conducted at approximately 60 to 70 (~25%) stream crossings within the Project Area (Drawing 3.6, Appendix A), and fish species presence were surveyed (Drawing 3.7, Appendix A) once between June 15 and July 15, 2024. Stream sampling locations were determined by prioritising scheduled salmon rivers within the Project Area and were otherwise selected using a random stratified sampling approach, based on number of proposed crossings in a watershed area, and site accessibility. Stratified random sampling enables sampling locations to be selected without human bias and is an effective method to assess habitat diversity in the Project Area and species distribution across the landscape. If selected streams were not accessible, the nearest accessible stream was assessed instead.

For streams where electrofishing was possible, a 100 m electrofishing transect was conducted on each selected site. The transect started 50 m downstream from the crossing (T0) and ended 50 m upstream from T0 (100 m total). Captured fishes were stored in a bucket filled with stream water and oxygenated using an aerator. All captured fish were identified and measured fork length (mm) was recorded before release. All transects included two passes with the electrofisher, and any fish caught was released downstream between passes.

If a watercourse was not suitable to electrofish, fish species presence was determined using four minnow traps baited with cat food for small streams, and four minnow traps and a fyke net (mesh size ≤3/4 inches) for large streams with sufficient depth. Traps were also deployed with a

labelled float and retrieved within a 24-hour soak period. All fish captured were identified and fork length (mm) measured.

Each watercourse was characterized at the road crossing location (T0), 100 m downstream (T1), and 100 m upstream (T2). This approach meets DFO's requirements of characterize at a minimum 50 m upstream and 100 m downstream, ensuring that all stream components are captured in the assessment (i.e., pool riffle, run sequence). Assessments included recording water quality at T0 (e.g., pH, salinity, temperature, dissolved oxygen) and channel characteristics (e.g., bank width, channel depth) at T0, T1, and T2. Water quality was measured using a hand-held YSI. If a stream crossing had an established culvert, the culvert dimensions and outflow depth was recorded. Finally, photographs of the stream crossing location (T0) and the start of the transects at T1 and T2 was captured, as well as any other potential fish barriers.

Preliminary Results

Preliminary analysis indicates, three fish species were captured in the Project Area: Atlantic salmon, Brook trout, and American eel (Figure 3.2). The plateau in the resulting species accumulation curve indicates a strong likelihood that the fish surveys accounted for the community composition in the watercourses in the Project Area (Figure 3.3).

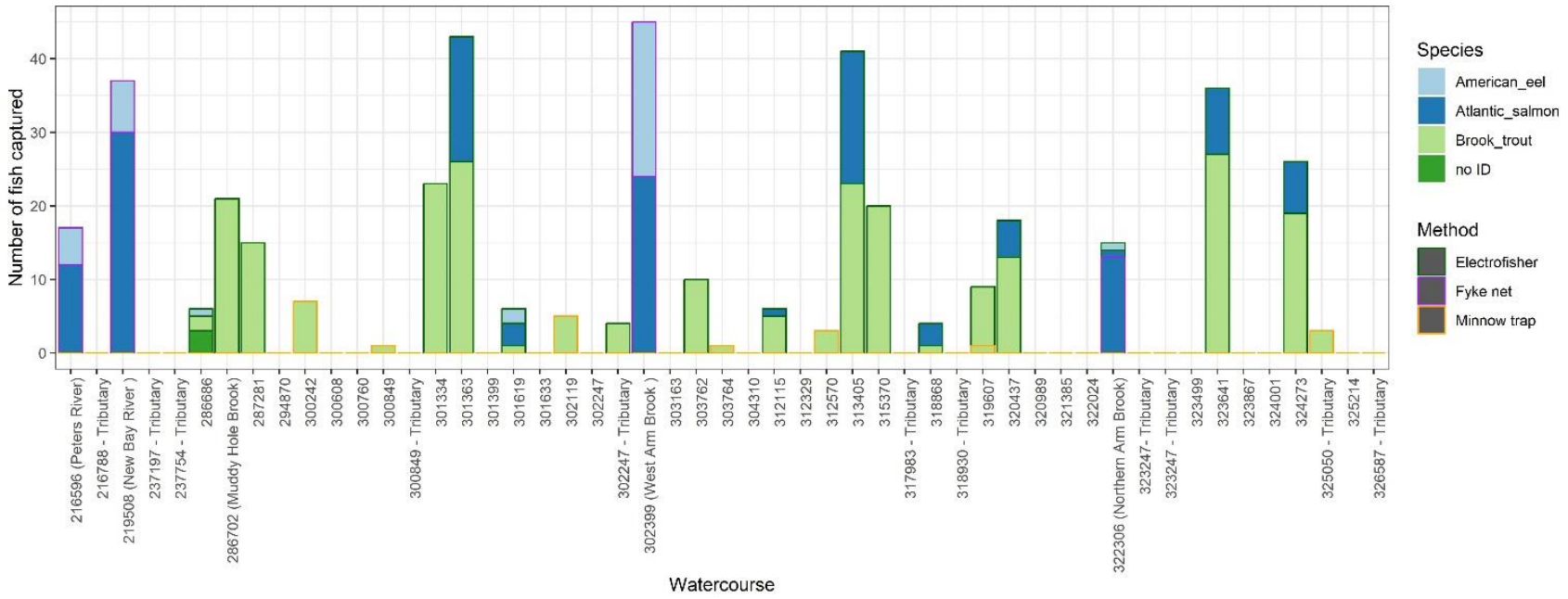

Figure 3.2: Fish Species Captured by Location in Project Area

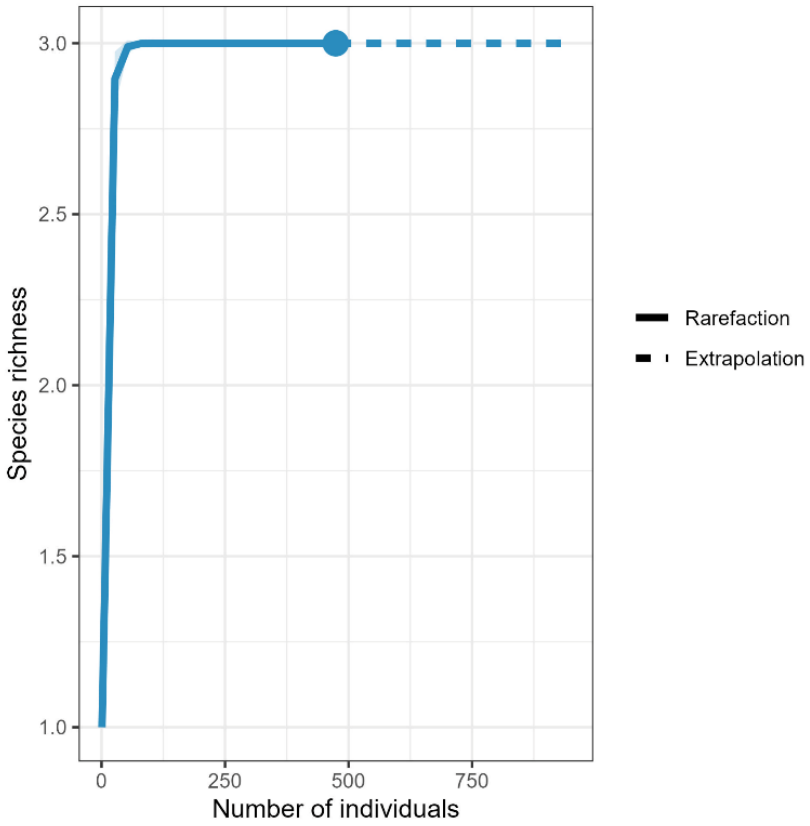

Figure 3.3: Species Accumulation Curve Showing the Chao 1 Species Richness Estimator for the Project Area

Data analysis for fish species and habitat survey data is ongoing. A full assessment of the information will be provided as part of an EA as directed by regulatory authorities or prior to construction.

3.4.4 Wetlands

Wetlands provide valuable ecosystem services including flood control, erosion control, water purification, soils and water conservation, carbon storage, wildlife habitat, and recreational opportunities. To assess the wetlands within the Project Area, a desktop review was conducted. Results of the desktop and future analysis will inform the design of the Project footprint.

3.4.4.1 Desktop Review

A desktop review for the location and extent of potential wetlands across the Project Area (Drawings 3.8a to 3.8c, Appendix A) was completed using the following information sources:

- Newfoundland and Labrador Land Use Atlas (Gov. of NL, 2023b)
- Fisheries, Forestry, and Agriculture Land Cover database (NLFFA, 2023)
- CanVec Hydrological Layers – Saturated Soil

Preliminary Results

The NLFFA Land Cover Database identifies wet areas found within the Project Area and defines them as bog (22.8 km^2), treed bog (4.2 km^2), wet bog (2.9 km^2), and soil barrens (1.3 km^2). Collectively these make up 31.2 km^2 of the Project Area. The CanVeC Hydrological data identifies 18.3 km^2 of saturated soil within the Project Area ranging in size from 32 m^2 to 1.8 km^2 (Table 3.10).

Table 3.10: Total Area (km^2) of Wetlands within the Project Area

Dataset	Wetland Type	Botwood (km^2)	Twin Lakes (km^2)	Leading Tickles (km^2)	Additional Area (km^2)	Totals
NLFFA Wetlands	Bog	15.1	5.3	0.4	1.9	22.8
	Treed Bog	3.4	0.1	0.3	0.3	4.2
	Wet Bog	2.0	0.2	0.2	0.6	2.9
	Soil Barrens	0.9	0.3	0.1	0.1	1.3
Totals for NLFFA		**21.4**	**5.9**	**1.0**	**2.9**	**31.2**
CanVec	Saturated Soils	11.1	4.6	0.4	2.4	16.1

3.5 Terrestrial Environment

3.5.1 Vegetation and Habitat

To assess the terrestrial habitat within the Project Area, a desktop review was conducted prior to field surveys to identify different habitats and key areas of interest. The findings informed the design of field surveys with the goal of assessing all habitat types, including habitats in both their natural state and habitats that have been subject to anthropogenic disturbance. Results of the desktop and field studies will inform the design of the Project footprint, which will be presented and assessed as part of an EA as directed by regulatory authorities or prior to construction.

3.5.1.1 Desktop Review

To describe the terrestrial habitat, a desktop review was undertaken prior to any field activities using the following resources:

- Newfoundland and Labrador Land Use Atlas (Gov. of NL, 2023b)
- Fisheries, Forestry and Agriculture Land Cover Database (NLFFA, 2023)
- Provincial Aerial Imagery

Most of the Project Area is recorded with the NLFFA as silvicultural land use, with the eastern portion of the Project Area recorded as an agricultural development area (Drawings 3.9 and 3.10, Appendix A).

The Project Area falls within the Central Newfoundland Ecoregion (Drawing 3.1, Appendix A). This ecoregion is characterized by lowlands, wetlands, and an abundance of rivers, streams,

ponds, lakes, and bogs. It is densely forested, with softwood being the dominant forest type, comprised primarily of black spruce (*Picea mariana*) and balsam fir (*Abies balsamea*). The maritime climate provides for cold winters (annual mean temperature of -3.5°C) and warm summers (annual mean temperature of 12.5°C). This region has a high risk of forest fires. In areas where fires, or historic cutting have occurred, the dominant habitat type is a kalmia heath, species found in these areas include sheep laurel (*Kalmia angustifolia*), Rhodera (*Rhododendron canadense),* Sweet gale (*Myrica gale*), and Labrador Tea (*Rhododendron groenlandicum*).

The ACCDC Data Report (2023) was used to identify SAR and SOCC potentially occurring near or within the Project Area. The ACCDC database contains records of 90 SAR and SOCC flora occurrences (57 flora species) within a 5 km radius of the Project Area (Table 3.11). Of these species, only red pine (*Pinus resinosa*) is listed under the NL *ESA*.

Table 3.11: SAR and SOCC Flora within 5 km of the Project Area (ACCDC)

Common Name	Scientific Name	S-Rank	*SARA*	NL *ESA*	COSEWIC
Red Pine	*Pinus resinosa*	S2	--	Threatened	--
Dry Spiked Sedge	*Carex foenea*	S3	--	--	--
Water Smartweed	*Persicaria amphibia*	S2	--	--	--
Alpine Milk-Vetch	*Astragalus alpinus var. brunetianus*	S2S3	--	--	--
Few-Flower Spikerush	*Eleocharis quinqueflora*	S3S4	--	--	--
Big-Fruit Hawthorn	*Crataegus macrosperma*	S1	--	--	--
Pretty Milk-Vetch	*Astragalus eucosmus*	S3	--	--	--
Alternate-Leaf Dogwood	*Cornus alternifolia*	S3S4	--	--	--
Houghton's Sedge	*Carex houghtoniana*	S1	--	--	--
Macoun Buttercup	*Ranunculus macounii*	S2S3	--	--	--
Fineberry Hawthorne	*Crataegus chrysocarpa var. chrysocarpa*	S2	--	--	--
Cyperus-Like Sedge	*Carex pseudocyperus*	S2	--	--	--
Bristly Crowfoot	*Ranunculus pensylvanicus*	S2S3	--	--	--
Purple False Oats	*Graphephorum melicoides*	S2S3	--	--	--
Fresh Water Cordgrass	*Spartina pectinata*	S3S4	--	--	--
Field Sedge	*Carex conoidea*	S2	--	--	--
Crowded Sedge	*Carex adusta*	S3	--	--	--
Northeastern Sedge	*Carex cryptolepis*	S1	--	--	--
Bushy Naiad	*Najas flexilis*	S2	--	--	--
Spiral Pondweed	*Potamogeton spirillus*	S2	--	--	--
Bayonet Rush	*Juncus militaris*	S3	--	--	--

Common Name	Scientific Name	S-Rank	*SARA*	NL *ESA*	COSEWIC
Least Spike-Rush	*Eleocharis acicularis*	S3S4	--	--	--
Northern Pondweed	*Potamogeton alpinus*	S3S4	--	--	--
Grassleaf Arrowhead	*Sagittaria graminea*	S3S4	--	--	--
Clasping-Leaf Dogbane	*Apocynum cannabinum*	S3	--	--	--
Self-Heal	*Prunella vulgaris*	S3S5	--	--	--
Northern Witchgrass	*Dichanthelium boreale*	S3S4	--	--	--
Spreading Dogbane	*Apocynum androsaemifolium*	S3	--	--	--
Marsh Muhly	*Muhlenbergia glomerata*	S3S4	--	--	--
Bulb-Bearing Water-Hemlock	*Cicuta bulbifera*	S3	--	--	--
Black Grass	*Juncus gerardii*	S2S3	--	--	--
Chamomile Grape-Fern	*Botrychium matricariifolium*	S2S3	--	--	--
Common Wintergreen	*Chimaphila umbellata*	S2	--	--	--
Cottongrass Bulrush	*Scirpus cyperinus*	S3S4	--	--	--
Crested Wood Fern	*Dryopteris cristata*	S3S4	--	--	--
Fresh Water Cordgrass	*Spartina pectinata*	S3S4	--	--	--
Fragrant Cliff Wood-Fern	*Dryopteris fragrans*	S2S3	--	--	--
Gaspe Peninsula Arrow-Grass	*Triglochin gaspensis*	S3	--	--	--
Golden Groundsel	*Packera aurea*	S3S4	--	--	--
Horned Pondweed	*Zannichellia palustris*	S2S3	--	--	--
Humpbacked Elves	*Buxbaumia minakatae*	S2	--	--	--
Longstalk Sedge	*Carex pedunculata*	S3	--	--	--
Meadow Horsetail	*Equisetum pratense*	S3	--	--	--
Necklace Sedge	*Carex projecta*	S3	--	--	--
Northern Bush-honeysuckle	*Diervilla lonicera*	S3S4	--	--	--
Northern Gentian	*Gentianella amarella subsp. acuta*	S3	--	--	--
Northern Shorthusk	*Brachyelytrum aristosum*	S3S4	--	--	--
Northern Water-Plantain	Alisma triviale	S2	--	--	--

Common Name	Scientific Name	S-Rank	*SARA*	NL *ESA*	COSEWIC
Northern Witchgrass	Dichanthelium boreale	S3S4	--	--	--
Ostrich Fern	*Matteuccia struthiopteris var. pensylvanica*	S3S4	--	--	--
Red Fescue	*Festuca rubra*	S2S3	--	--	--
Running Serviceberry	*Amelanchier spicata*	S3S4	--	--	--
Rusty Woodsia	*Woodsia ilvensis*	S3S4	--	--	--
Short-Scale Sedge	*Carex deweyana var. deweyana*	S2	--	--	--
Slender Cotton-Grass	*Eriophorum gracile*	S1S2	--	--	--
Spreading Dogbane	*Apocynum androsaemifolium*	S3	--	--	--
Slender Spike-Rush	*Eleocharis elliptica*	S3S4	--	--	--

Red pine (*Pinus resinosa*)

Red pine is an eastern hard pine, with 10 to 16 cm long, straight, brittle, pointed, sharply toothed, dark shiny green evergreen needles, in bundles of two. Buds are sharp-pointed, reddish brown, and resinous, with overlapping, hairy scales. Twigs are stout, orange to reddish brown, shiny, grooved, and ridged. The bark is reddish to pinkish, progressively scaly with age, furrowed into broad, flat, scaly plates. It is this coloured bark that gives red pine its common name (SSAC, 2016). This species is listed as threatened under the NL *ESA*.

Red pine occurs on very dry nutrient-poor sites, usually on shallow soils, sands, and gravels. Red pine is less shade-tolerant than its primary competitor, black spruce, and requires fire to create the light and seedbed conditions necessary for its survival. The Forest Resource Inventory (FRI) data was used to delineate known Red pine stands within the Project Area. Two stands totaling 0.17 km^2 were identified within the Project Area and 5 km buffer. The locations and extent of these stands will be considered when determining final Project design.

A preliminary ecological land cover (ELC) analysis was created from the NLFFA Land Cover database (Drawings 3.11a - 3.11c, Appendix A; Table 3.12) (NLFFA 2023). The ELC was also used to identify habitat types within the 5 km buffered Project Area with a heightened potential to host SAR or SOCC, such as wetlands or barrens. This analysis informed the field survey design, which placed an emphasis on habitats more likely to support SAR and SOCC species.

Table 3.12: Habitat Classes Delineated in the ELC for the Project Area

Habitat Class	Area (ha)	% of Project Area
Softwood	16609.7	50.9
Mixed wood	4983.4	15.3
Wetland	3072.5	9.4

Habitat Class	Area (ha)	% of Project Area
Coniferous scrub	4772.9	14.6
Hardwood	159.3	0.5
Deciduous Scrub	282.3	0.9
Regenerating Forest	701.3	2.2
Barren	55.6	0.2
Anthropogenic	470.8	1.4
Total	31107.8	95.4

3.5.1.2 Field Assessments

Habitat and vegetation community assessments and surveys for vascular plants and lichens were completed to characterize the resident flora and habitat and identify SAR and SOCC and/or their specific habitat. The results will be used to support the Project design.

Methodology

Field assessments were completed during two, dedicated survey sessions throughout the Project Area, for both early (June 2 to 6, 2024) and late (August 6 to 10, 2024) flowering plants, with emphasis on areas that will be impacted by WTGs or other infrastructure (Table 3.13). Data was supplemented by opportunistic observations compiled during other Project related field work. A total of 119 vegetation surveys were conducted between May and September of 2024 (Drawing 3.12, Appendix A).

Additional vegetation and rare plant surveys were also conducted within the Project Area. Stratified random sampling was based on the relative proportion of habitat types within the Project Area to ensure thorough coverage of the Project Area.

A random meander search pattern was used for field studies, as it is an accepted method for detecting presence or absence of plant species, including rare flora. GPS tracks and time spent surveying were recorded for each location. All species were noted in the species inventory. Photos were taken for identification and when necessary, specimens were collected for identification if the species was abundant at the location. GPS locations were taken for any SAR or SOCC encountered or for any plant where identification was uncertain. Lichens, mosses, and other non-vascular species were recorded as encountered during the surveys.

Table 3.13: Summary of Targeted Plant Survey

Habitat Class	Number of sampling locations	Survey Time (hours)	Area covered (ha)	% Habitat Class Covered
Softwood	35	29.4	272.32	1.64
Mixedwood	19	16	137.17	2.75
Wetland	26	21.8	477.34	15.54
Coniferous Scrub	15	12.6	63.04	1.32
Hardwood	9	7.5	34.9	21.91
Deciduous Scrub	2	1.6	32.62	11.56

Habitat Class	Number of sampling locations	Survey Time (hours)	Area covered (ha)	% Habitat Class Covered
Regenerating Forest	5	4.5	205.17	29.26
Barren	6	5	15.7	28.24
Anthropogenic	2	1.6	18.92	4.02
Total	**119**	**100 hrs (50 hours early / 50 hours late vegetation)**	**1257.18 ha**	4.04

Habitat classifications was done concurrently with other field surveys. Classifications were based on Damman forest types of Newfoundland (Meades et al. 1989). Full methodology and results will be provided as part of an EA as directed by regulatory authorities or prior to construction.

Preliminary Results

Surveys identified 128 species, including 10 tree species, 20 shrub species, 79 herbaceous plants, five grass species, three rush species, five moss species, and four lichen species. Data analysis for vegetation and habitat survey data is ongoing. A full assessment of the botanical information will be provided as part of an EA as directed by regulatory authorities or prior to construction.

Of the forest types described in the Forest site classification manual: a field guide to the Damman forest types of Newfoundland (Meades et al. 1994), six classes were found in the Project Area (Table 3.14). Although results are preliminary, the black spruce forest type was identified as the dominant habitat type within the Project Area.

Table 3.14: Dominant Forest Types within the Project Area

Forest type	Description
Balsam Fir Forest	Closed canopy softwood stands with less than 75% black spruce canopy cover. Balsam fir dominant.
Kalmia-Black Spruce Forest	Open black spruce forest with understory dominated by ericaceous shrubs and lichens/sedges and forbs sparse or absent.
Hardwood	Hardwood (white birch/Trembling aspen) forests with merchantable sized trees covering 50% or greater of the site.
Black Spruce Fen	Open black spruce forest with sedges and forbs dominant; ericaceous shrubs may be abundant but not dominant.
Black Spruce Forest	Closed canopy softwood stands greater than 75% black spruce canopy cover
Hardwood Thickets and Heath	Hardwood thicket vegetation usually less than 3.0 m in height with birch, alder, mountain or ericaceous dominant.

3.5.2 Mammals

3.5.2.1 Desktop Review

Terrestrial mammals in the Project Area include caribou (*Rangifer tarundus caribou*; NLFFA 2024a), moose (*Alces alces*; NL Wildlife Division 2022), black bear (*Ursus americanus*), lynx (*Lynx* canadensis), coyote (*Canis latrans*), American marten (*Martes americana*; COSEWIC 2022), mink (*Neogale vison*), fox (vulpes vulpes), river otter (*Lutra canadensis*), muskrat (*Odontra zibethicus*), beaver (*Castor canadensis*), snowshoe hare (*Lepus americanus*), and a variety of other small mammals and mesocarnivores (NLDFFA 2024b).

The ACCDC Data Report (2023) indicated the American marten (*Martes americana)* as the only listed species that may occur in the Project Area (Table 3.15). American marten was downlisted from threatened to vulnerable under the provincial ESA and downlisted to special concern by the Committee on the Status of Endangered Wildlife in Canada in 2023 (COSEWIC 2022). (Table 3.15).

Table 3.15: Mammal Species Recorded within a 5 km Radius of the Project Area

Common Name	Scientific Name	COSEWIC Status[1]	S-Rank (2015)[2]	SARA Status[1]	NL *ESA* Status[3]
American Marten	*Martes americana*	Special Concern	S3	Threatened	Vulnerable

Source: [1]Government of Canada 2023, [2]ACCDC 2023,[3] Government of NL 2023.

3.5.2.2 Field Assessments

Methodology

Camera traps are an effective method of detecting forest wildlife and greatly increase the chances of making a direct observation of larger-bodied wildlife species. The presence and distribution of large mammals across the Project Area was assessed using camera traps (Drawing 3.13, Appendix A), with marten and caribou being of primary interest.

Camera traps were deployed in December 2022 within selected representative and suitable habitat where animals are most likely to be detected (e.g., game trails).

Preliminary Results

Trail cameras analyzed to date identified several mammal species, including moose and fox (Figure 3.4). No marten or caribou have been detected to date by the camera traps (Table 3.16). However, incidental observations of caribou have been made by field staff during other surveys. Additional camera data is being collected and assessed. A full evaluation of the mammal species will be provided as part of an EA as directed by regulatory authorities or prior to construction.

Figure 3.4: Photos from Trail Cams

Table 3.16: Summary of Trail Camera Results

Trail Camera No.	Dates Captured	Animals Observed	No of Observations*
Strum 10	December 17, 2022 to February 2, 2023	Snowshoe hare	12
		Squirrel	8
Strum 25	December 14, 2022	Moose	1
Strum 26	December 26, 2022 to January 31, 2023	Moose	1
		Snowshoe hare	Tracks on snow
Strum 29	December 16, 2022 to February 2, 2023	Canadian Lynx	8
		Eastern Coyote	5
		Moose	3
		Snowshoe hare	6
Strum 43	January 28, 2023	Eastern Coyote	1
Strum 44	December 21, 2022 to January 14, 2023	Snowshoe hare	2
		Moose	3
Strum 48	December 24, 2022	Moose	1
Strum 49	January 28, 2023 to January 29, 2023	Eastern Coyote	2

*Number of observations adjusted based on likelihood of photos belonging to the same animal; a general rule of one hour between photos was applied to consider photos of the same species to be separate observations.

3.5.3 Bats

3.5.3.1 Desktop Review

Although no records were identified by the ACCDC Data Report for bats, three species of bats are native to the Island of Newfoundland and are expected to be present within the Project Area (Table 3.17).

Table 3.17: Bat Species Expected to be Present within the Project Area

Common Name	Scientific Name	COSEWIC Status[1]	S-Rank (2015)[2]	*SARA* Status[1]	NL *ESA* Status[3]
Little Brown Bat	*Myotis lucifugus*	--	--	Endangered	--
Northern Long-eared Bat	*Myotis septentrionalis*	--	--	Endangered	--
Hoary Bat	*Lasiurus cinereus*	Endangered	--	--	--

Source: [1]Government of Canada 2023, [2]ACCDC 2023,[3] Government of NL 2023.

3.5.3.2 Field Assessment

Acoustic surveys for bat species were completed to characterize their presence and distribution, and to identify SAR and SOCC, using Acoustic Recording Units (ARUs). The results will be used to inform the placement of WTGs, and to aid in development of appropriate mitigation strategies

Methodology

Bat surveys were conducted using Song Meter Mini Bat 2 Li-Ion Acoustic Recorders (Wildlife Acoustics 2024), following the protocols outlined by the North American Bat Monitoring Program (Loeb et al. 2015). The 10 km x 10 km NABat grid was superimposed over the Project Area. Areas of potential habitat, based on the ELC, were mapped within the 5 km x 5 km quadrats for each grid cell. Deployment locations were generated within potential habitat inside the Project Area, for each quadrat, with no more than one sampling location per quadrat. This generated 43 potential sampling locations. A total of 39 bat-targeted ARUs were deployed (Drawing 3.13, Appendix A). Where accessibility was limited, bat monitors were deployed near the originally identified locations in similar habitat. Four 5 km x 5 km quadrats did not receive ARUs as the entire 10 km x 10 km quadrat was inaccessible.

ARUs were deployed from April 13 to 17, 2024, and will be collected after October 31, 2024, to allow the detection of bat species throughout the active bat season. At each sampling location, acoustic recorders were attached to trees at a height of greater than 1.5 m. ARU placement was chosen to encompass the various habitat types found within the Project Area such as wetland, softwood forest, mixed forest, hardwood forest, scrub, shoreline and barren. Recorders were set to run for 30 minutes before sunset to 30 minutes after sunrise. ARUs were checked monthly throughout the season to replace batteries and exchange data storage cards. The bat ARUs were set to record in full spectrum audio recordings at a 256 kilohertz (kHz) sample rate with a minimum trigger frequency of 16 kHz. The ultrasonic recordings had a trigger window of 3 seconds and a maximum recording length of 15 seconds.

Analysis of recordings will follow the CWHC Guide for Bat Monitoring in Atlantic Canada (2021). Acoustic monitoring data will be processed using Wildlife Acoustics' Kaleidoscope Pro software. The data processing through Kaleidoscope Pro involves running the software's automatic identification, which screens out noise files (that were not previously screened out by the detector) and provides a suggested species for each bat call file. In some cases, species cannot

reliably be identified based on the quality of the call. These calls are categorized as No ID by the software.

Calls will be manually reviewed by a qualified biologist to confirm the identification. Where a call is reviewed and determined to be in the Myotis genus, but a species ID is not possible, it will be categorized as Myotis species. In other instances, if a call is manually reviewed and of a high frequency (>35 kHz), but no ID is possible, it will be categorized as “high frequency unknown.” Alternatively, low frequency calls (<35 khz) that can not be identified to species will be categorized as “low frequency unknown”.

Data analysis is ongoing and the full assessment will be provided as part of an EA as directed by regulatory authorities or prior to construction.

3.5.4 Avifauna

3.5.4.1 Desktop review

The ACCDC Data Report (2023) identified 20 SOCC bird species within 5 km of the Project Area (Table 3.18). Of these, Gray-cheeked Thrush (*Catharus minimus minimus*), Olive-sided Flycatcher (*Contopus cooperi*), Red Crossbill (*Loxia curvirostra percna*), and Rusty Blackbird (*Euphagus carolinus*) are protected under federal or provincial legislation (Table 3.18). Field survey data will inform WTG placement and ensure that monitoring programs are designed to provide the best indication of potential impacts.

Table 3.18: Bird SAR or SOCC within 5 km of the Project Area

Common Name	Scientific Name	S-Rank	*SARA*	NL *ESA*	COSEWIC
American Woodcock	*Scolopax minor*	S1B,SUM			
Bay-breasted Warbler	*Dendroica castanea*	S2B,SUM			
Boreal Snake Tail/ Club Tail	*Ophiogomphus colubrinus*	S3			
Cape May Warbler	*Dendroica tigrina*	S2B,SUM			
Chipping Sparrow	*Spizella passerina*	S2S3B,SUM			
Crimson-ringed Whiteface	*Leucorrhinia glacialis*	S3S4			
Gray-cheeked Thrush	*Catharus minimus*	S2B,SUM		Threatened	Candidate (Mid Priority)
Greater Yellowlegs	*Tringa melanoleuca*	S3B, S4M			
Mallard	*Anas platyrhynchos*	S3B,SUM			
Northern Goshawk	*Accipiter gentilis*	S3			
Northern Parula	*Parula americana*	S1B?,SUM			
Olive-sided Flycatcher	*Contopus cooperi*	S3B,SUM	Threatened	Threatened	Special Concern
Ovenbird	*Seiurus aurocapilla*	S3B,SUM			
Philadelphia Vireo	*Vireo philadelphicus*	S3B,SUM			

Common Name	Scientific Name	S-Rank	*SARA*	NL *ESA*	COSEWIC
Red Crossbill	*Loxia curvirostra*	S1S2	Threatened	Threatened	Threatened
Red-winged Blackbird	*Agelaius phoeniceus*	S1B,SUM			
Rusty Blackbird	*Euphagus carolinus*	S2S3B,SUM	Special Concern	Vulnerable	Special Concern
Silvery Blue	*Glaucopsyche lygdamus*	S3			
Veery	*Catharus fuscescens*	S2B,SUM			
Winter Wren	*Troglodytes hiemalis*	S3B,SUM			

Source: [1]Government of Canada 2023, [2]ACCDC 2023,[3] Government of NL 2023.

3.5.4.2 Field Assessments

Winter Birds

Winter bird surveys were conducted from February 7 to 22, 2024 to identify winter residents within the Project Area.

- Methodology

  Point counts were completed using NL Breeding Bird Atlas protocols. Counts were only done in fair weather, when wind and precipitation would have negligible impact on hearing bird calls. Counts only took place in the period from 0.5 hours prior to sunrise to 4.5 hours after sunrise. Upon arriving at a point count location, all engines were turned off and at least one minute was allowed to pass prior to the start of the count to allow birds to settle to field staff's presence. Each count lasted 5 minutes during which field staff would listen and watch for any birds in complete silence. Any detected birds would be counted and identified to species. During the count, a tripod-mounted microphone was used as an auxiliary method to identify bird calls/songs. Recorded data was used to verify and quality check the field observations.

  A total of 135 points were randomly generated along existing paved and resource roads across Project Area (Drawing 3.14, Appendix A). Points were a minimum of 300 m apart. Eleven locations were deemed to be inaccessible by field personnel (overgrowth, alders, etc.); in these cases, alternative points were chosen as close as possible to the originals with similar habitat. Generated sites were labeled 1.0 to 135.0, with alternative sites labeled as the same number of the original with point 1 (.1) added to the end (i.e., alternative to 134.0 is 134.1). Field staff accessed point count locations via snowmobile and personal vehicles.

  The FRI data and satellite imagery was used to generate a land classification for each point. Points located on paved roads were classified as such and all other points were assigned to their respective FRI class. Those points considered under forest were further subdivided into coniferous and deciduous scrub, mixed forest, softwood dominant forest, and unclassified forest (classified as forest in the FRI with no further information given).

- Preliminary Results

  Initial results from the winter bird surveys indicate a diversity of 16 species, with 90% occurring in forested areas, 53% in softwood forest habitat and 14% in mixed wood. Other habitat types identified with a 0 to 3% occurrence included anthropogenic (paved areas) as well as scrub/bog. No SAR or SOCC were detected. Table 3.19 shows the total number of birds recorded in the 2024 winter bird counts. A full analysis of the winter bird surveys will be presented as part of an EA as directed by regulatory authorities or prior to construction.

Table 3.19: Winter Bird Count Summary

Habitat Class	Points	Number of Species	Total Number of Birds Seen or Heard
Softwood Forest	88	13	78
Unclassified Forest	22	8	29
Mixed Forest	9	7	20
Coniferous Scrub	5	3	4
Paved Road	5	5	6
Cleared Land	3	4	9
Deciduous Scrub	2		-
Bog	1		-
Total	**135**	**40**	**146**

Breeding Birds

- Methodology

  Surveys were conducted using the protocols outlined in the Canadian Wildlife Services (CWS) document Recommended protocols for monitoring impacts of WTGs and birds (2007). CWS protocols recommend at least 20 point count locations per major habitat type across a wind power development (CWS, 2007). Stations must be a minimum of 250 m apart in forested habitats and 500 m apart in open habitats. Each station must be at least 100 m from the habitat edge, wherever habitat configuration allows. Nine habitat types were identified and targeted for breeding bird surveys based on the ELC for the Project Area (Table 3.20). Some habitat types occurred in patches across the landscape making 20 points per habitat type impossible to achieve given the constraints on distance between points and distance to edge habitat. A total of 105 point counts were completed for 2024 breeding season (Drawing 3.15, Appendix A).

Table 3.20: Habitat Classes Delineated in the ELC and used for Stratification and Selection of Bird Survey Sites for the 2024 Breeding Bird Surveys in the Project Area

Habitat Class	Area (ha)	% of Project Area	# Point Count Locations	% of Total Counts
Softwood	16609.7	50.9	23	22.0
Mixed wood	4983.4	15.3	26	24.7
Wetland	3072.5	9.4	22	20.9

Habitat Class	Area (ha)	% of Project Area	# Point Count Locations	% of Total Counts
Coniferous scrub	4772.9	14.6	12	11.4
Hardwood	159.3	0.5	6	5.7
Deciduous Scrub	282.3	0.9	2	1.9
Regenerating Forest	701.3	2.2	4	3.8
Barren	55.6	0.2	7	6.7
Anthropogenic	470.8	1.4	3	2.9
Total			105	100

Point count surveys conducted during the 2024 breeding season occurred between June 15 and 23, and July 3 and 15 for the Botwood Wind Farm; June 14 and 6, and June 28 and July 15 for the Twin Lakes Wind Farm; and June 15 and July 5 for the Leading Tickles Wind Farm. Each site in Botwood and Twin Lakes was visited twice, with a minimum of 10 days between visits. Leading Tickles was only visited once in the 2024 breeding season but will be visited again in the 2025 breeding season. Point counts were performed in the early morning beginning one half hour before sunrise until four hours after sunrise. Point counts were conducted when wind speeds were light [Beaufort level of 3 (8-12 mph) or less] to ensure auditory detection of birds was possible. Observers listened for 10 minutes at each station, during which time the species detected (either visually or auditory) and number of each species identified were recorded. Any evidence of breeding, including active nests, eggs, mating behaviour, or evidence of chicks, was also noted. The GPS coordinates and a description of the point count location (e.g., observers names, date, time, habitat type, noise level, wind level, precipitation, and cloud cover) was also recorded. All data was digitized for analysis.

- Preliminary Results

  Preliminary data for the breeding bird surveys demonstrated higher bird diversity and abundance during breeding season than for winter. A total of 268 different species were identified. Table 3.21 shows the number of point count locations, and the total number of birds seen or heard in each habitat type for each Wind Farm. Olive-sided flycatcher (Threatened – *SARA* and NL *ESA*) was detected in all three Wind Farms and Rusty blackbird (Special Concern – *SARA*, Vulnerable – NL *ESA*) was detected in Botwood. A full analysis of breeding bird data will be completed as part of an EA as directed by regulatory authorities or prior to construction.

Table 3.21: Breeding Bird Survey Summary

Habitat Class	Total Points	Number of Birds Seen or Heard		
		Parcel 1 (Botwood)	Parcel 2 (Twin Lakes)	Parcel 3 (Leading Tickles)
Softwood	23	162	140	--
Mixedwood	26	47	303	--
Wetland	22	75	251	30[1]

Habitat Class	Total Points	Number of Birds Seen or Heard		
		Parcel 1 (Botwood)	Parcel 2 (Twin Lakes)	Parcel 3 (Leading Tickles)
Softwood Scrub	12	82	133	--
Hardwood	6	44	37	--
Hardwood Scrub	2	13	14	--
Regenerating Forest	4	5	66	--
Barren	7	15	122	--
Anthropogenic	3	-	-	--
Total	**105**	**443**	**1066**	**30**

[1]*The focus of the breeding bird work in Leading Tickles was on wetland species including shorebirds and waterfowl as Leading Tickles has significantly more coastline than the other two Wind Farms*.

Spring/Fall Migratory Birds

- ### Methodology

The province of Newfoundland lies within the North American Atlantic Flyway zone. Flyways represent generalized migration movements of birds with most using only portions of the flyways. Actual regions of flyways used by migratory birds are dependent on species breeding and wintering locations. Species that use the North American Atlantic Flyway generally have a stronger presence along the North Atlantic Coastline (La Sorte et al., 2014) with passage through the central region of the island being less frequent. Migrants fly at lower heights in coastal areas compared to central regions (Horton et al., 2016). Migratory species that have been identified as being particularly susceptible to mortality associated with wind farms include raptors and nocturnal migrants.

The ECCC CWS (Atlantic Region) - Wind Energy & Birds EA Guidance Update (ECCC, 2022) and the CWS document Recommended protocols for monitoring impacts of WTGs and birds (ECCC, 2007) were referenced to develop the migratory bird survey protocols and for risk category determination. Due to the size of the proposed Project, and the anticipated turbine heights, the Project risk level is Category 4 (highest risk level). Category 4 projects require 1 to 2-year intensive baseline studies with targeted studies for issues of concern and intensive follow-up studies (post-construction) for a minimum of 2 years with targeted follow-up studies for issues of concern.

ECCC recommended that methodology be designed to maximize the probability of detecting migrating raptors. The design used for the surveys is ideal for species such as raptors (which are often too sparsely distributed to be well sampled by the breeding bird survey), long-distance migrants which breed in the boreal forest and winter in the neotropics (escaping coverage both by breeding bird surveys and winter bird counts), and short-distance migrants that breed in arctic and northern boreal zones (Dunn, 2005). Survey sites were selected based on the literature provided by ECCC (Horton, 2016) regarding flight pathways of migrating birds. A desktop model was used to compare the maximum turbine height above sea level with the flight height of inland migrants. The

height of the turbine was measured using its highest point [turbine blade length (~ 91 m) above hub height (~135 m)]. Seven turbine locations were selected as survey sites based on the risk of disrupting the migratory zone (Drawing 3.16, Appendix A). For these sites, the combination of ground elevation and the turbine height would put the turbine blades at an elevation of 400 m asl, and potentially within the migration airspace.

Surveys were conducted between April 22 and 26, 2024, and May 5 and 9, 2024 (spring); and August 29 and September 1, 2024, and September 11 and 14, 2024 (fall), during daylight hours. Surveys were conducted on days when weather conditions were favorable for migration. A team of two was stationed at each survey location and scanned the skies for any in-flight birds. A survey window of two hours was chosen with emphasis on performing surveys in the afternoon to enhance the chance of capturing raptor observations. The observer stood at a vantage point and recorded the number of individuals of each species passing by, taking note of whether they were flying through the areas where turbines will potentially be located. The data recorder noted the date, start time and end time, GPS coordinates, habitat, cloud cover, temperature, precipitation, wind level and noise.

- Preliminary Results

  Species identified were placed in two categories, flyover and stopover. Flyover height and stopover locations were recorded when they could be determined. Preliminary results indicated that waterfowl, raptors, songbirds, seabirds, and shorebirds were all identified during the surveys. Table 3.21 identifies preliminary number of species and birds counted during the spring 2024 migration surveys. Data for fall 2024 migration is currently being analyzed.

Table 3.22: Preliminary Number of Species and Birds Counted during the Spring 2024 Migration Surveys

Station ID	Spring	
	# Species	# Individuals
Mig-01	6	7
Mig-02	3	7
Mig-03	2	2
Mig-04	4	4
Mig-05	1	1
Mig-06	3	3
Mig-07	3	3

No SAR or SOCC were identified during the spring migration surveys. Data analysis is not yet complete, and a full analysis of migratory bird survey data will be presented as part of an EA as directed by regulatory authorities or prior to construction.

Radar Stations and Acoustic Recording Units

- Methodology

  Five avian radars and five ARUs were deployed in fall 2023 and again in spring 2024, with nine additional ARUs deployed in spring 2024 that are further discussed in targeted species methodology below (Drawings 3.13 and 3.17, Appendix A). Locations were chosen to allow radars and ARUs the optimal chance for detecting nocturnal migrants that might be flying over the Project Area. Radars consisted of Simrad Halo 20+ pulse compression marine surveillance radar angled diagonally at 45°. Each radar was deployed with an off grid 12 V system that was designed for optimal active monitoring and was powered using solar panels, a wind turbine, and a battery bank. Radars were deployed in open areas, clear of obstructions, and facing south. This deployment criteria maximizes solar irradiance to power the system while providing visibility for the radar. Where possible, radars were deployed in locations where landscape features (i.e. hills, bodies of water, etc.) improved sightlines of the radars. Each radar deployment included an ARU, scheduled to record between sunset and sunrise. ARUs can detect sounds to a maximum heigh of approximately
  135 m and will aid in the determining the species composition of nocturnal migrants. The avian acoustic assessment was be conducted using Song Meter SM4 (Wildlife Acoustics 2024) ARUs. ARUs were set to record from approximately sunset to sunrise while spring and fall radar sampling occurred. The recorded data was saved as compressed .wav files on high-capacity secure digital cards inside the units. Secure digital cards were retrieved and replaced with each radar maintenance check, approximately once per month.

  A combination of software and manual analysis will be used to analyze the Avian Radar and ARU recordings. The software ‘Bird Net’ will be used to process recordings for bird species composition. An experienced technician will listen to segments of the recordings to confirm the software results, thus ‘training’ the software to become more precise while also validating results. All recorded data will be digitized for analysis.

  Avian radar scans will be processed using the radR platform—an open-source platform designed for the processing of radR data for biological applications—and outputs analyzed using Microsoft Excel (Taylor et al, 2010). Standard settings for the identification of biological targets, such as birds, and bats will be used. Targets reflected by the radar generate blips in the image of the radar scan. RadR helps filter sequential images of radar scans to identify blips that occur in the same area over at least four out of five scans. Should these constraints be met, a target is generated. Biological targets are most likely to be generated by birds, but could also be bats and insects, or even drones and planes. Weather occurrences, such as fog, rain, and low cloud cover, may cause interference with the radar (similarly to weather radar), which lowers the effectiveness of the system and reduces the reliability of the system’s ability to detect birds.

  Data collection and analysis is ongoing and a full assessment of the Radar and ARU

data for migratory birds will be presented as part of an EA as directed by regulatory authorities or prior to construction.

Waterfowl Studies

The Birds Canada Maritimes Marsh Monitoring Program Survey Protocols (2022) were used to develop survey methods to identify waterfowl, migratory gamebirds, other wetland-associated species, and their habitats in the Project Area. Surveys were conducted in 2024 from May 6 to 10; May 25 to 2; and August 7 to 12, with a second round of fall surveys underway at the time of writing.

Survey sites were identified through a desktop exercise that looked at suitable waterfowl habitat and suitable vantage point (elevation) for observers. Ten potential sites that had a suitable location where observers could view the entire wetland, bog, or marsh were identified. Seven of these sites, which had summer access, were selected for surveys. Three sites were in the Botwood Wind Farm, three sites were in the Twin Lakes Wind Farm, and one site was in the Leading Tickles Wind (Drawing 3.18, Appendix A).

Waterfowl are typically more active at dawn or dusk therefore surveys were conducted 30 minutes before sunrise until 10:00 am. Surveys were conducted in ideal conditions with low wind (Beaufort of 3 or less) and no precipitation.

Each survey consisted of a 15-minute observation period. All species were recorded along with the number of individuals. Aerial foragers and outside flythroughs were also noted. Additional data recorded included date, start time, end time, GPS coordinates, wetland type, observer names, noise, and weather (temperature, wind speed, wind direction, cloud cover, precipitation).

Preliminary Results

Seven species and 10 individuals were observed during the waterfowl surveys (Table 3.23).

Table 3.23: Waterfowl Survey Summary

Survey Site	# Species	# Individuals
Botwood		
WF-01	1	1
WF-02	1	2
WF-03	1	2
Twin Lakes		
WF-04	-	-
WF-05	1	2
WF-06	1	1
Leading Tickles		
WF-07	2	2

Data analysis is ongoing as surveys are still being conducted on a seasonal basis with each survey location being visited twice per season, no more than 14 days apart. To date, no SAR or SOCC have been identified. A full analysis of the waterfowl survey data will be presented as part

of an EA as directed by regulatory authorities or prior to construction.

The Project Area intersects with one of ECCC-CWS' Eastern Waterfowl Survey plots (Nanny Bag Lake), which has been surveyed annually since 1990. The survey is conducted by helicopter in May by flying 5 x 5 km^2 plots and recording all birds seen. The survey targets breeding waterfowl, but other breeding birds are recorded when detected. On the Nanny Bag Lake plot, ECCC-CWS has observed American Black Duck (*Anas rubripes*), American Green-winged Teal (*Anas carolinensis*), Canada Goose (*Branta canadensis*), Common Goldeneye (*Bucephala clangula),* Common Loon (*Gavia immer*), Common Merganser (*Mergus merganser*), Common Snipe (*Gallinago gallinago*), Ring-necked Duck (*Aythya collaris*), Spotted Sandpiper (*Actitis macularius*), Yellowlegs species. This plot was last surveyed in May 2024. Results of the CWS survey plot data will be incorporated into the waterfowl analysis for this Project.

Shorebird Studies

The shorebird survey program was based on the Birds Canada and Point Blue Conservation Science program protocols (Point Blue Conservation Science, 2014). The survey consists of searching a set of pre-defined survey areas (preferably defined based on ideal habitat) with specific boundaries within a coastal site. Ideal habitat is defined as intertidal mudflats, sandy beaches, rocky coastlines and freshwater wetlands with tidal influence as shorebirds feed mainly on mollusks, small crustaceans, marine worms, and insects.

Potential sites were identified using desktop GIS analysis and the ELC. As much of the Project Area is inland, ideal habitat was only identified in the coastal area of Botwood Wind Farm and in the northern portion of the Leading Tickles Wind Farm. Within each suitable habitat area, one site was chosen based on proximity to Project Area boundaries, habitat, and accessibility (Drawing 3.19, Appendix A).

A total of 12 shorebird surveys were conducted in 2024. Surveys were conducted at either low tide falling, low tide or low tide rising to capture shorebirds feeding. Survey time of day depended on the tide schedule. The survey was conducted by a team of two, one observer with a scope to ID shorebirds and a note taker. The surveys involved walking a transect that began at the access point to the shoreline and followed the shoreline until its natural end or to the end of the visible shoreline. All shorebirds seen or heard were identified to species. Incidental species were also identified including waterfowl, seabirds, raptors and songbirds. Other information recorded during the shorebird surveys included date, time, observers' names, GPS track, weather conditions, shore type, tide level, visibility of the search area and vegetation details.

Preliminary Results

The following species were identified during the 2024 shorebird surveys: Greater yellowlegs (*Tringa melanoleuca*), Lesser yellowlegs (*Tringa flavipes*), Least sandpiper (*Calidris minutilla*), Spotted sandpiper, and Semipalmated plover (*Charadrius semipalmatus*). Incidentals observations included Bald eagle (*Haliaeetus leucocephalus*) in the Leading Tickles Wind Farm and arctic tern (*Sterna paradisaea*) in the Botwood Wind Farm. Data analysis is ongoing as surveys are still being conducted on a seasonal basis. To date, no SAR or SOCC have been

identified. A full analysis of the shorebird survey data will be presented as part of an EA as directed by regulatory authorities or prior to construction.

Nocturnal Owl Surveys

The nocturnal owl survey protocols were adapted from the Birds Canada Newfoundland and Labrador Nocturnal owl survey methods (Dale, 2021). Survey routes of 10 km are selected along permanent roadways so that routes are easily accessible, and surveys can be repeated in subsequent years. Secondary roads are preferred as noise levels are lower than primary roads. The routes should predominantly encompass forested habitat while avoiding residential or industrial areas that may have high noise levels. Surveys must be completed between April 1 and May 15.

Only two routes meeting the above criteria were identified in the Project Area (Drawing 3.20, Appendix A). One route in the Botwood Wind Farm and another in the Twin Lakes Wind Farm. Leading Tickles did not have a suitable 10 km section of permanent road that could be used as a route.

Botwood Wind Farm surveys were conducted on May 8, 9, and 10, 2024 and Twin Lakes Wind Farm surveys were conducted on May 13, 14, and 15, 2024. Surveys began a half an hour after sunset and took approximately three hours to complete. Survey routes were driven with stops at 0, 2, 4, 6, 8 and 10 km for a total of six locations. At each point location, recorded owl calls (Boreal owl and Saw-whet owl) were played. Observers would start the recording and move at least 20 m from the playback device. The first two minutes were silent listening where owl calls and visuals were recorded as voluntary and not in response to the playback. Boreal owl calls were then played for 20 seconds, followed by a one-minute silent listening period. This protocol was repeated once for Boreal Owl (*Aegolius funereus*) calls and twice with Saw-whet owl (*Aegolius acadicus*) calls. All owl responses were recorded by species and, if possible, number of birds calling as well as distance and direction to each owl were recorded. Any non-owl species heard during the listening period were also noted. At each point location the GPS coordinates, observers' names, date, time, noise level, wind, weather, and habitat type were also recorded.

Preliminary Results

Preliminary results indicate the presence of Great horned owl, Northern Saw-whet owl, and Boreal owl in both the Botwood and Twin Lakes Wind Farms. Analysis is ongoing and a full assessment of nocturnal owl presence in the Project Area will be completed as part of an EA as directed by regulatory authorities or prior to construction.

Targeted Species Surveys

Targeted species surveys were designed to provide additional data on SAR or SOCC. Nine ARUs were deployed in habitat types that would be likely to support SAR or SOCC (Drawing 3.17, Appendix A). The units were deployed from May 25 to 27, 2024 and are scheduled to be collected in October 2024. Two units were deployed in barren habitat to detect the presence of Whimbrel; two units were deployed in wetland habitat to detect the presence of Rusty Blackbird and Olive-sided flycatcher; two units were deployed in coniferous forest habitat to detect the presence of Red Crossbill; two units were deployed in mixed wood forest habitat to detect the presence of Red crossbill and Gray-cheeked thrush; and one unit was deployed in mixed wood

scrub habitat to detect the presence of Gray-cheeked thrush and Olive-sided flycatcher (Drawing 3.17, Appendix A).
The recorded data is saved as compressed .wav files on high-capacity secure digital cards inside the units. Secure digital cards were retrieved and replaced with each maintenance check, approximately once per month. A combination of software and manual analysis will be used to analyze the recordings. The software 'Bird Net' will be used to process recordings for bird species composition. An experienced technician will then listen to segments of the recordings to confirm the software results, thus 'training' the software to become more precise while also validating results. All recorded data will be digitized for analysis. A full analysis of targeted survey data will be presented as part of an EA as directed by regulatory authorities or prior to construction.

3.6 Land and Resource Use

A desktop review was completed using public mapping records and the Newfoundland and Labrador Land Use Atlas (2023) to describe how the Project may interact with local land and resource use (Drawings 3.9 and 3.21, Appendix A). This database provides publicly available information on provincial protected areas, human recreational and municipal use, forestry and agriculture operations, and mineral resources. Drawings 3.9, 3.10, 3 21, and 3.22 (Appendix A) indicate the proximity of these land uses to the Project Area.

No public protected lands or parks are in the Project Area. There are no First Nations reserve lands within 10 km of the Project Area, nor any mineral leases known to be held for the Project Area. However, there are 12 permits issued for quarries which are fully or partially within the Project Area (Drawing 3.22, Appendix A).

The main land uses in the area, outside residential areas and commercial and industrial centers are hunting, fishing, outfitting, and outdoor recreation activities (Drawing 3.21, Appendix A). Forestry activities still occur for domestic woodcutting and commercially, to supply local sawmills (Drawing 3.9, Appendix A).

3.6.1 Heritage and Cultural Resources

The Arts and Heritage Division of the Department of Tourism, Culture, Arts, and Recreation with the Government of Newfoundland and Labrador is responsible for supporting the preservation and management of arts and heritage across the province, including the operation of the Provincial Archeology Office (PAO). The Division is guided by the *Historic Resources Act*, RSNL 1990, c H-4, with a mandate to protect historic resources and paleontological resources. A permit is required for any archaeological or paleontological investigations. The PAO reviews the need for historic resources impact assessments through the review of land use referrals submitted by government agencies and the private sector, including the Environmental Assessment Division.

Strum engaged local heritage consultant Stephen Mills to conduct a desktop survey of cultural resources in the Botwood, Twin Lakes, and Leading Tickles areas in Newfoundland and Labrador (Appendix D). This included a review of the database in the PAO and a literature review of publications, reports, and library sources. The proposed zones for development were

divided into three parcels, totaling just over 562 km^2 (Twin Lakes: 110 km^2; Botwood: 410 km^2; Leading Tickles: 49 km^2, peninsula between Osmonton Arm, and Seal Arm).
While outside the Project Area, Notre Dame Bay has been the focus of archaeological investigations since the mid-1960s. Several surveys were conducted along the Exploits River, from Botwood to Beothuk Lake. This part of Notre Dame Bay, specifically around the Exploits River basin, was, at various times, home to all Indigenous populations in Newfoundland. This was also the last area of Newfoundland known to have been inhabited by the Beothuk. South Twin Lake was included in this area and the Beothuk used this area even after they abandoned the Exploits River as an access route from the coast to the interior.

The PAO Archaeological Sites Database lists over 200 archaeological sites in the Exploits Bay region, mostly along the coastline near Leading Tickles. There are no paleontological resources recorded in the Project Area (*Historic Resources Act*, 2023). However, should paleontological resources be discovered during the Project, the PAO will be notified immediately.

3.6.2 Communities

The assessment of the economy included consideration of local demographics, income, and businesses, as well as the economic contributions of the Project to the local economy through a review of the following resources:

- Census of Population – Statistics Canada (2022)
- Taxation legislation
- Public mapping resources
- Economic data from the Proponent's project

The Project is located within the boundaries of Division 8 (subdistrict E) and Division 6 (subdistrict C), near the communities of Botwood, Point Leamington, and Leading Tickles. The largest community is Botwood (population 2,778) Drawing 3.21 (Appendix A) indicates the municipal areas in relation to the Project Area.

Population statistics for the 2016 and 2021 Census are described in Table 3.24.

Table 3.24: Local Population

Population Statistics	Botwood	Point Leamington	Leading Tickles	Div 8 (sub E)	Div 6 (sub C)
Population in 2021	2,778	574	296	496	354
Population in 2016	2,875	591	292	548	681
Population change from 2016-2021 (%)	-3.4	-2.9	+1.4	-9.5	-48.0
Total private dwellings in 2021	1,389	341	189	817	752
Land area (km^2)	14.56	26.80	26.59	707.99	4,007.24
Population density (per km^2)	190.8	21.4	11.1	0.7	0.1

Source: Statistics Canada 2022

The age distribution in Botwood reveals a median age of 56.4 years, which is higher than the provincial median age (48.4), with the remaining divisions also higher than the provincial median (59.6-64.6) (Statistics Canada 2022). An overview of age distribution for 2022 in both subdivisions is outlined in Table 3.25.

Table 3.25: Age Distribution in the Project Area

Age Statistics	Botwood	Point Leamington	Leading Tickles	Div 8 (sub E)	Div 6 (sub C)
0 – 14 years	295 (11%)	35 (6%)	20 (7%)	30 (6%)	40 (11%)
15 – 64 years	1,525 (55%)	320 (56%)	170 (57%)	265 (54%)	190 (54%)
65+ years	955 (34%)	220 (38%)	110 (37%)	200 (40%)	125 (35%)
Total Population	2,775	575	300	495	355

Source: Statistics Canada 2022; note that due to rounding, total percentage may be ± 100%.

Average housing costs and average individual incomes for Botwood and surrounding divisions were compared to the provincial and federal averages (Table 3.26).

Table 3.26: Housing Costs and Average Individual Income

Jurisdictions	Average Dwelling Value in 2020	Average Total Income in 2020
Botwood	$165,200	$52,200
Point Leamington	$131,000	$50,000
Leading Tickles	$104,000	$50,000
Division 8 (sub E)	$114,000	$30,000
Division 6 (sub C)	$260,000	$38,000
Province of Newfoundland	$246,800	$42,640
Canada	$618,506	$54,450

Source: Statistics Canada 2022

Most residents (99%) in Botwood speak English (Statistics Canada, 2022). All public communication for the Project has been and will continue to be in English. There is some knowledge of other languages in the Project Area, though no communication has been requested in other languages.

There are Volunteer Fire Departments in each of the communities of Botwood, Point Leamington, and Leading Tickles along Highway 350, located within the Project Area, all within 20 km of the center of the Project.

Health and emergency services exist in the area and are accessible to Project workers if the need should arise at both the Botwood Central Health Centre (within Botwood) and at the Grand Falls-Windsor Central Health Emergency Centre (approximately 30 to 60 km south of the Project Area).

Statistics for Botwood and the surrounding areas indicate that the unemployment rate in 2021 was 21.7% to 48%, higher than the provincial rate of 15.2% (Statistics Canada, 2022). The local employment rate varied from 21.2% to 41.5% (34% in Botwood), with the highest employment rate in Leading Tickles (41.5%) and lowest employment rate in Division 6 (21.2%), all of which are lower than the provincial employment rate of 47.5% (Statistics Canada, 2022).

A breakdown of the labour force is provided in Table 3.27. The highest proportions of workers in the Project Area fall into the "manufacturing" and "health" trade categories (29% Point Leamington and 27% Botwood, respectively). Other significant industries include retail trade, construction, and agriculture, forestry, fishing, and hunting (Statistics Canada, 2022).

Table 3.27: Top Industries for the Employed Labour Force with the Project Area

Industry	Botwood %	Point Leamington %	Leading Tickles %	Division 8 (sub E) %	Division 6 (sub C) %
Total Employed Labour Force 15 years +	1,015	240	200	130	75
Construction	65 (6%)	35 (15%)	15 (8%)	15 (12%)	0
Retail Trade	195 (19%)	10 (4%)	0	10 (8%)	0
Health Care and Social Assistance	270 (27%)	20 (8%)	40 (20%)	20 (15%)	0
Manufacturing	65 (6%)	70 (29%)	30 (15%)	30 (23%)	0
Agriculture, Forestry, Fishing, Hunting	15 (1%)	10 (4%)	50 (25%)	15 (12%)	10 (13%)

Source: Statistics Canada 2022

The towns of Botwood, Badger, and Grand Falls-Windsor are considered the closest economic centres, located approximately 10 to 20 km from the Project, and offer a range of business services (Table 3.28).

Table 3.28: Local Businesses and Proximity to Project Area

Business	Distance and Direction to the Project Area*
Exploits Meadow Farms	10 km southeast, along Highway 350
The Oasis Hotel B&B	15 km east, just south of Botwood
Green Valley Farm	15 km east, just within the Town of Botwood
Oceanside Country Lodge	15 km north, along Highway 350

*All distances measured from center of the Project Area, using the most direct route.

Aside from the immediate area and associated businesses, the communities are all highly dependent on the greater municipal centres of Grand Falls-Windsor and Gander for many of their regular shops and services, including indoor recreation, big-box stores, and health care facilities (i.e., emergency services and inpatient care). Another key factor in the workforce is that many residents of the communities surrounding the Project Area may commute daily to Grand Falls-Windsor.

As of February of 2023, according to the Government of Newfoundland and Labrador, employment is up by 3.1% and actual hours worked are up by 4.5% compared to the previous year. With an increasing population because of newcomers, Newfoundlanders and Labradorians returning home due to the economic climate among other reasons, and upcoming opportunities in the province, there is a strong labour force, but undoubtedly it will require additional support to carry the demand of mega projects.

Newfoundland and Labrador is anticipating a new labour demand of approximately 12,000 because of proposed wind energy projects. Despite the current and forecasted labour demand deficit, the Proponent is ahead of the curve with strong community, Indigenous, and minority group connections, and progress on recruiting foreign workers through the Temporary Foreign Worker Program and the Atlantic Immigration Program, where applicable.

The Proponent partnered with Marine Contractors Inc. who is equipped with a strong labour force, and significant equipment and material capacity and has also established relationships with strategic partners ensuring they are prepared to meet the Project scope when it is approved.

Table 3.29 shows the anticipated person days of employment, period of employment, and number of jobs generated by the Project for each Project phase. A detailed estimate of the number of employees required for each phase including occupation, duration of employment, full time/part time/seasonal status, contractor requirements, and anticipated workforce source will be completed during the FEED process and will be incorporated as part of an EA as directed by regulatory authorities or prior to construction.

Table 3.29: Estimates of Person Days of Employment, Duration, Average Number of Positions Created by the Project*

Estimated Person Days				
Phase	**Newfoundland and Labrador**	**Canada**	**International**	**TOTAL**
Development	56	33	173	263
Construction	6,889	1,215	1,487	9,591
Operational	8,466	375	359	9,199
Decommissioning	530	17	24	570
PERIOD (Years)				
Development	1.67	1.67	1.67	--
Construction	3.50	3.50	3.50	--
Operational	30.50	30.50	30.50	--
Decommissioning	3.00	3.00	3.00	--
Estimated Average Headcount				
Phase	**Newfoundland and Labrador**	**Canada**	**International**	**TOTAL**
Development	34	20	104	158
Construction	1,968	347	425	2,741
Operational	278	12	12	302
Decommissioning	177	6	8	190

**Provided by EVREC*

The Proponent intends to set-up a strong presence in Newfoundland and Labrador to ensure the success of delivering the Project by addressing all relevant communication perspectives with: (i) local business partners, (ii) public authorities, and (iii) local community.

The Proponent will have offices in Corner Brook, St. John's, and Botwood.

The Proponent has entered a MOU with Qalipu Holdings LP. Through this MOU, the shared objective is to provide local benefits and opportunities to the community's members in relation to employment and supplier contracts.

The Proponent will leverage various avenues for employment advertising to ensure a wide range of candidates have access to opportunities.

4.0 ENVIRONMENTAL STUDIES

The detailed methodologies and results for the assessment of the VCs, as listed in Table 4.1 will be provided as part of an EA as directed by regulatory authorities or prior to construction.

Table 4.1: VC Schedule

VC	Component	Project Component
Atmospheric Environment	Air Quality	Plants Wind and Solar Farms
	GHGs	Wind Farms Solar Farm Industrial Facility
Aquatic Environment	Watersheds, Waterbodies, and Watercourses	All Project Infrastructure
	Fish and Fish Habitat	All Project Infrastructure
	Wetlands	Wind Farms
Terrestrial Environment	Vegetation Communities and Rare Plants	All Project Infrastructure
	Mammals	Wind Farms
	Bats	Wind Farms
	Avifauna	Wind Farms
Land and Resource Use	EMI	Wind Farms
	Sound and Vibration	Wind Farms Solar Farm Industrial Facility
	Visual Impacts	Wind Farms Solar Farm
	Shadow Flicker	Wind Farms
	Socio-economic	All Project Infrastructure
Cultural & Heritage	Archeological Resources	All Project Infrastructure

4.2.1 Atmospheric Environment

4.2.1.1 Air Quality

As part of the planning process for the Project, a quantitative risk assessment will be carried out. The CALMET/CALPUFF modelling system may be used to determine potential effects of air contaminant releases during on operation on ambient air quality, conducted within the Newfoundland and Labrador Guidance for Plume Dispersion Modelling (NLECC 2002). Hourly meteorological data from CALMET could provide dispersion modelling that predicts concentrations from the Project combined with ambient background concentrations.

The EA will evaluate the potential for adverse effects to air quality from the Project, including from fugitive dust and exhaust emissions during construction for all Project components. The EA will compare air quality to acceptable standards and assess the effects of air quality on nearby receptors.

4.2.1.2 GHGs

Baseline GHGs will be quantified using published emission factors and current electricity generating practices from NF Power. Project-generated GHGs will be quantified in accordance with the specifications described in the International Standard ISO 14064 (2019) and using published values.

The EA will provide a quantitative estimate of the Project's contribution to GHG. These results will be compared to the expected GHG offsets achieved by the Project during operation. Baseline GHGs will be quantified using published emission factors and current electricity generating practices from NF Power and NL Hydro. Project-generated GHGs will be quantified in accordance with the specifications described in the International Standard ISO 14064 (2019) and using published values.

4.2.2 Aquatic Environment

4.2.2.1 Watersheds, Waterbodies, and Watercourses

The Industrial Facility requires an on-site raw freshwater treatment plant to receive and treat the raw water obtained from Peters Pond. A preliminary desktop water balance determined there was adequate amount of water to withdrawal from Peters Pond for operation purposes. Monitoring data will be used to refine the water balance to determine the seasonal effects of flow in the watershed along with climatic impacts of wet and dry years.

As part of the baseline surface water assessment, it is proposed that seven stilling wells and 14 water quality sampling locations be installed within the Project Area to assess the surface water quantity and quality. Three stilling wells (SW1 to SW3) will be installed in the Peters Pond watershed at the inlet, outlet, and within Peters Pond. Four stilling wells (SW4 to SW7) will be installed in the New Bay Pond watershed at the two inlets, the outlet, and within New Bay Pond. The purpose of the stilling wells is to collect information to characterize the hydrological baseline conditions of the watershed upstream, near the outlet, and downstream of Peters Pond. The

stilling wells will also be used for long-term monitoring during the operational phase of the Project. Specific data that will be collected from the upstream (SW1, SW4, and SW5) and downstream (SW3 and SW7) stilling well locations include:

- Continuous water level
- Continuous water temperature
- Description of the river substrate
- Flow (stream gauging to be conducted in spring, summer, and fall) to develop a stage-level relationship
- Point measurements of river depth and bank width
- Point measurements of standard field water quality parameters (e.g., TSS, pH, water temperature, DO, electrical conductivity).

Specific information from the monitoring wells will include the following:

- Description of the underlying soil and/or bedrock
- Depth to groundwater
- Groundwater level fluctuations
- Groundwater flow direction
- Hydraulic conductivity of underlying soil and/or bedrock
- Baseline soil and groundwater quality sampling (organic and inorganic constituents)
- Identify nearest waterway/surface water source

4.2.2.2 Fish and Fish Habitat

Analysis of fish and fish habitat surveys will be provided as part of an EA as directed by regulatory authorities or prior to construction. Additional fish and fish habitat surveys will be conducted within the Project Area pre-construction, with a focus on assessing streams that will be subjected to road crossings associated with wind turbine construction, the transmission line, and Project facilities ($N_{crossings}$ = 250) to support avoidance and mitigation strategies to minimize impacts.

4.2.2.3 Wetlands

Further field delineation and assessment of wetlands will be completed pre-construction by qualified biologists to support Project planning and maximize opportunities for Project infrastructure to avoid these sensitive habitats. Delineation of features, including permanency, habitat type, substrate, water flow, channel dimensions, and watershed, will be used to assess drainage and potential environmental effects. Potential effects such as alterations to the hydrologic regime and damage to aquatic habitat, degradation of water quality, erosion, and displacement of aquatic species will be evaluated as part of an EA as directed by regulatory authorities or prior to construction.

4.2.3 Terrestrial Environment

4.2.3.1 Vegetation Communities and Rare Plants

Analysis of 2024 vegetation and plant surveys will be provided as part of an EA as directed by regulatory authorities or prior to construction. If additional surveys are required, they will be completed during appropriate seasons, prior to construction.

4.2.3.2 Mammals

Surveys are ongoing within the Project Area at the time of writing this EARD. Analysis of desktop and field collected data will be provided as part of an EA as directed by regulatory authorities or prior to construction.

4.2.3.3 Bats

Bat surveys will be continued in 2025 to further determine the bat species present in the Project Area and Bat Acoustic Recording Units (ARUs) will be redeployed in 2025. Once MET towers are erected, bat ARUs may be placed at a height up to 30 m using a steel pulley cable system. This will provide for greater area coverage for detection of resident and migratory bats.

An ELC delineation of mature/overmature (80+years) hardwood and mixed wood stands will be completed as part of the EA to identify potential roost habitat. This information will be used to inform WTG placement and if maternity roost surveys are required prior to construction. If determined to be required, areas to be cleared will be assessed for suitable roost trees (upland hardwood, > 30cm dbh, existing cavities). Abandoned dwellings will be checked for bat presence. No maternity roosts will be removed without consultation with the regulatory authority.

Analysis of desktop and field collected data will be provided as part of an EA as directed by regulatory authorities or prior to construction.

4.2.3.4 Avifauna

Bird surveys conducted in 2024 according to CWS guidance may be repeated or expanded in 2025 to ensure bird distribution, abundance, and migratory behaviour is adequately understood and assessed. ARUs and avian radars will be re-deployed for a second year across the Project Area to aid in detection of nocturnal flight call, nocturnal migrants and rare species.

Acoustic studies were completed for the spring migration season (April 1 to May 31) and are ongoing for the fall migration season (August 15 to October 31). The stationary ARUs are programmed to record starting at 30 minutes before sunrise to 4 hours after sunrise. ARUs are checked monthly to ensure the memory cards and batteries are changed to prevent data loss. Data from bird surveys, radars, and acoustic monitoring will be presented and evaluated as part of an EA as directed by regulatory authorities or prior to construction.

4.2.4 Land & Resource Use

There are access roads and trails that exist throughout the Project Area, which are frequented by recreationalists for snowmobiling, hunting, and ATV use (Drawing 2.3, Appendix A). The impacts

from the Wind Farms (and associated infrastructure) on recreational activities, land use and resource use will be assessed as part of an EA as directed by regulatory authorities or prior to construction, following NLECC guidance, and with the goal of minimizing potential impacts.

Future studies on electromagnetic interference (EMI), sounds and vibrations, visual impact, and shadow flicker are discussed within the context of land and resource use as these factors can be perceived to have negative effects on human use of the Project Area.

4.2.4.1 EMI Consultation

The rotating blades and support structures of WTGs can interfere with various types of electromagnetic signals emitted from telecommunication and radar systems (RABC & CanWEA, 2020).

EMI created by a WTG can be classified into two categories: obstruction and reflection. Obstruction occurs when a WTG is placed between a receiver and a transmitter, creating an area where the signal is weakened and/or blocked. Reflection is caused by the distortion between a raw signal and a reflection of the signal from an object. Scatter is a sub-category of reflection caused by the rotor blade movement.

The EMI assessment will identify point-to-point, broadcast systems, radar, navigation, and communications systems susceptible to the effects of windfarm interference. The specific characteristics of a WTG will influence the type and magnitude of the interference. Other factors that influence interference include blade dimension and design, tower height, diameter of the supporting tower, as well as the material used for blade and tower construction.

The Radio Advisory Board of Canada (RABC) and CanWEA developed guidelines for assessing the EMI potential from a WTG development: Technical information and coordination between Wind Turbines and Radiocommunication and Radar Systems; hereafter referred to as the RABC Guidelines (RABC & CanWEA, 2020). These guidelines outline a consultation-based assessment protocol that establishes areas, called “consultation zones”, around transmission systems, based on the type and function of the system.

Consultation is generally the best method of notification, and this process typically begins with a letter distribution to those parties affected by the development. Early consultation has already commenced. A summary of the RABC Guidelines for determining consultation zones can be found in

Table 4.2.

Table 4.2: RABC Guidelines – Recommended Consultation Zones

Systems	Consultation Zone
Point-to-Point Systems above 890 MHz	**1 km**
Broadcast Transmitters (AM, FM, and TV stations)	AM station: **5 km** for omnidirectional (single tower) antenna system **15 km** for directional (multiple towers) antenna system FM station: **2 km** TV station: **2 km**
Over-the-Air Reception (TV off-air pickup, consumer TV receivers)	Analog TV Station - National Television Standards Committee (NTSC): **15 km** Digital TV (DTV) station - Advanced Television Systems Committee (ATSC): **10 km**
Cellular Type Networks, Land Mobile Radio Networks, and Point-to-Point Systems below 890 MHz	**1 km**
Satellite Systems (Direct to Home, Satellite Ground Stations)	**500 m**
Air Defence Radars, Vessel Traffic Radars, Air Traffic Control Radars, and Weather Radars	Department of National Defence (DND) Air Defence Radar: **100 km** DND or Nav Canada Air Traffic Control Primary Surveillance Radar: **80 km** DND or Nav Can Air Traffic Control Secondary Surveillance Radar: **10 km** DND Precision Approach Radar: **40 km** Canadian Coast Guard Vessel Traffic Radar System: **60 km** Military or Civilian airfield: **10 km** Environment Canada Weather Radar: **50 km**
Very High Frequency (VHF) OmniRange	**15 km**

The following information regarding turbine design and placement is generally required to complete EMI notifications:

- Turbine UTM coordinates

- Number of turbines
- Ground elevation
- Tower/hub height of each turbine
- Nacelle height
- Rotor diameter
- Turbine blade sweep diameter (or length of blades)
- Turbine base diameter
- Substation/converter location coordinates and height(s) along with new transmission line(s) to connect to a grid

Response time and feedback from the various organizations varies and can take up to 12 weeks. If turbine type, layout, or design changes, many organizations will need to be re-consulted prior to proceeding.

Consultation with relevant agencies will be completed upon selection of a final layout and as part of the EA as directed by regulatory authorities or prior to construction. Notification agencies are listed in Table 3.28.

Table 4.3: EMI Notification Agencies

Signal Source	Operator
Air defense and air control radar systems DND Radio Communications	DND
Maritime vessel traffic system radars	Canadian Coast Guard
VHF omnidirectional range Primary air traffic control surveillance radar	NAV Canada
Weather radar	ECCC
Radiocommunication Systems	RCMP
Regulator	Innovation, Science and Economic Development Canada (ISED formerly Industry Canada)
Telecom	Bell Telus Rogers Communications
Emergency Services	Botwood Volunteer Fire Department Grand Falls Windsor Volunteer Fire Department

4.2.4.2 Sound & Vibration

During construction, heavy equipment, machinery, and light vehicles will emit sound to the surrounding environment from activities associated with the development of WTG pads, roads, the transmission line corridor and grid connection, the subsequent assembly of WTGs, construction of the Solar Farm, and development of the Industrial Facility and infrastructure. To quantify potential impacts, noise levels of equipment anticipated to be used for the Project's construction will be used to calculate noise levels at set distances from the Project Area in consideration of nearby receptors.

During construction activities, sound will predominantly be generated through the operation of construction equipment and heavy machinery such as cranes, backhoes, excavators, dump trucks, graders and transportation vehicles. A summary of sources and anticipated volumes of sound produced during the Project's construction activities are provided in Table 4.4.

Table 4.4: Decibel Limits of Construction Equipment Required for the Project

Equipment	Average Noise Level Ranges (in dBA)
Road, Transmission Line, Grid Connection, Substation and Turbine Pad Development	
Backhoe	85-104[1]
Dozer	89-103[1]
Dump Truck	84-88[1]
Excavator	97-106[3]
Concrete Truck/Pump	103-108[3]
Roller	95-108[3]
ATV	97[4]
Pickup Trucks	95[4]
Harvesting Equipment (log truck, manual faller, etc.)	85-103[5]
Loaders	88[5]
Tracked Drilling Units	91-107[6]
Tracked Dump Truck/Decks	91[7]
Tracked Man Lift/Bucket Machines	85[7]
Tracked Radial Boom Derricks/Cranes	93-98[3/7]
Turbine Assembly	
Crane	78-103[1]
Handheld Air Tools	115[2]
Compressor (drilling, etc.)	85-104[2]

Note that measurements shown are relevant to the decibel level ranges within close proximity (i.e., less than 15 m of distance) between a receptor and the relevant piece of equipment.
Sources: [1]WorkSafe BC (undated)
[2]Government of Ontario (2021)
[3]Transport Scotland (undated)
[4]Government of Oregon (undated)
[5]WorkSafe BC (2016)
[6]The Driller (2005)
[7]SCE (2016)

During the operational phase of the Project, WTGs will emit sound to the surrounding environment from mechanical equipment operation and the turbine's interaction with the surrounding air (aerodynamic sound). To quantify potential impacts to nearby receptors, detailed sound modeling will be completed as part of the EA as directed by regulatory authorities or prior to construction. Information regarding turbine tonality will be finalized when the final turbine model is selected. If additional assessment related to low frequency sound is required based on turbine model selection, this will be completed and provided to NLECC and Health Canada during the EA. EVREC is aiming to meet the noise levels of 40-45 dBA as indicated in current modelling of expected layout design.

There may also be additional noise emissions from the Industrial Facility and general maintenance with the associated infrastructure, including the Solar Farm. This will also be evaluated as part of an EA as directed by regulatory authorities or prior to construction.

4.2.4.3 Visual Impacts

The Wind Farms, Solar Farm, and Industrial Facility will change the visual landscape of a local area. The level of change varies depending on the significance of the landscape, local topography, and the degree to which the turbines alter or modify the landscape. Locations of concern may include:

- Public viewpoints
- Protected areas
- Areas of local significance
- Recreational areas (hiking trails, biking routes, etc.)

Lighting associated with WTGs may also result in visual impacts, especially during the nighttime. There are no provincial or federal guidelines related to viewscape. Operational turbine lighting is regulated by NAV Canada and Transport Canada.

Visual simulations will be undertaken to assess the renewable energy and industrial infrastructure's impact on the visual landscape and local aesthetics, as part of the EA as directed by regulatory authorities or prior to construction. Locations for the visual assessment will be selected based on known significant viewpoints (i.e., lookouts, hiking trails, etc.) within the area surrounding the Project and through engagement with and consideration of local stakeholders/users.

4.2.4.4 Shadow Flicker

Shadow flickers can occur when rotating blades of a WTG cast flickering shadows during times of direct sunlight. The magnitude of shadow flicker is determined by the position and height of the sun, wind speed and direction, geographical location, time of year, cloud cover, turbine hub height and rotor diameter, and proximity to the turbine.

For shadow flicker to occur, the following criteria must be met:

- The sun must be shining and not be obscured by clouds/fog.
- The source turbine must be operating.
- The WTG must be situated between the sun and the shadow receptor.
- The WTG must be facing directly towards, or away from, the sun such that the rotational plane of the blades (i.e., rotor plane) is perpendicular to the azimuth of incident sun rays. For this to occur, the wind direction would have to be parallel to the azimuth of the incident sun rays throughout the day.
- The line of sight between the turbine and the shadow receptor must be clear. Light-impermeable obstacles, such as vegetation, tall structures, etc., will prevent shadow

flicker from occurring at the receptor.
- The shadow receptor must be close enough to the turbine to be in the shadow.

There are no municipal, provincial, or federal guidelines related to shadow flicker, but many jurisdictions (including NLECC) have adopted the industry guideline of no more than 30 hours of shadow flicker per year, or no more than 30 minutes of shadow flicker on the worst day of the year at residential receptors.

Initial shadow flicker assessments are being completed for the Project to ensure minimal impacts. If impacts do occur, the Project will attempt to mitigate those impacts by modifying the design and or entering into agreement with impacted stakeholders. Once final selection of the turbines has been completed, the full detailed assessment will be updated and provided as part of the EA as directed by regulatory authorities or prior to construction to:

- Identify nearby receptors that may potentially experience shadow flicker from the Project's operation.
- Quantify and assess the duration and frequency of shadow flicker for nearby residents under worst-case and real-case scenarios (if required).
- Determine if applicable guidelines are met/exceeded.
- Mitigate and minimize shadow flicker experienced by nearby residents, as necessary.

4.2.5 Heritage and Cultural Resources

The desktop review of the heritage and cultural resources identified over 200 archaeological sites listed in the Exploits Bay region, mostly along the coastline. The EA will identify best management practices and mitigation measures to ensure the potential for encountering any archaeological resources remains low and Project activities do not impact any cultural heritage resources including historic including burial, cultural and heritage sites.

An archaeological research permit will be requested from the PAO and an archaeological investigation conducted to help identify any specific high potential areas for archaeological resources prior to construction. Specific requirements for the archeological investigation will be reviewed with the PAO.

All activities implemented in the archaeological investigation will adhere to the guidelines and requirements of the Archaeological Investigation Permit Regulations and *Historic Resources Act* and will be recorded as part of an EA as directed by regulatory authorities or prior to construction.

4.3 Predicted Future Condition of the Environment Without the Undertaking

The Project Area primarily comprises of black spruce forests with persistent bogs, wetlands, and waterbodies on low slope near Botwood but variable terrain near Twin Lakes, and Leading Tickles. Land use around the Project Area is varied and, cabin and recreational land, residential properties, and fishing grounds (lakes, ponds). The Project Area also contains:

- Crown lands with no public protected lands within 10 km of the Project
- Land described in the Wind Energy Land Reserve Order O.C. 2022-294(Gov. of NL, 2023b)
- Commercial forest land designated for silviculture
- Agricultural development areas

Should this Project not proceed, it would either be replaced by another wind energy project, or the land would remain as a forested region designated as a wind land energy reserve and agricultural development area. The Industrial Facility land may remain vacant.

5.0 ENVIRONMENTAL EFFECTS

5.1 Potential Interactions

Table 5.1 provides a summary of the potential interactions between Project components and VCs during the life cycle phases: construction, operations and maintenance, and decommissioning and reclamation. Interactions have the potential to result in negative and positive effects. A full effects assessment, including identification of effects, effects pathways, mitigation, and residual effects will be completed for all VCs as part of an EA as directed by regulatory authorities or prior to construction.

Table 5.1: Summary of Potential Project and VC Interactions During Construction, Operation and Maintenance, and Decommissioning and Reclamation

VC	Wind Turbine Generators	Wind and Solar Energy Infrastructure	Hydrogen Plant (including Water Supply)	Ammonia Plant
Construction				
Atmospheric Environment	x	x	x	x
Geophysical Environment	x	x	x	x
Aquatic Environment	x	x	x	
Terrestrial Environment	x	x	x	x
Land and Resource Use	x	x	x	x
Heritage and Cultural Resources	x	x	x	x
Communities	x	x	x	x
Human Health	x	x	x	x
Electromagnetic Interference	x			
Shadow flicker	x			
Visual impacts	x	x	x	x
Sound	x	x	x	x
Operation and Maintenance				
Atmospheric Environment			x	x
Geophysical Environment				
Aquatic Environment			x	x
Terrestrial Environment	x	x		
Land and Resource Use	x	x	x	x

VC	Wind Turbine Generators	Wind and Solar Energy Infrastructure	Hydrogen Plant (including Water Supply)	Ammonia Plant
Heritage and Cultural Resources				
Communities	x	x	x	x
Human Health	x			
Electromagnetic Interference		x		
Shadow flicker	x			
Visual impacts	x	x	x	x
Sound	x	x	x	x
Decommissioning and Reclamation				
Atmospheric Environment	x	x	x	x
Geophysical Environment	x	x	x	x
Aquatic Environment	x	x	x	x
Terrestrial Environment	x	x	x	x
Land and Resource Use	x	x	x	X
Heritage and Cultural Resources				
Communities	x	x	x	x
Human Health				
Electromagnetic Interference				
Shadow flicker				
Visual impacts	x	x		
Sound	x	x	x	x

5.2 Accidents and Malfunctions

Without proper mitigation, accidents and malfunctions can result in adverse effects. However, effective planning and preventative measures limit the probability of occurrence and having appropriate response procedures in place reduces the magnitude of residual effects.

The Project will employ good engineering practices to mitigate risks to reduce the likelihood of an accident and potential consequences. The Project will adhere to a range of safety and design standards set by government regulatory authorities and industrial practices. Adherence to these standards will help ensure the likelihood of accidents is minimized and potential consequences can be effectively mitigated. The key regulatory and design considerations include:

1. Process Safety Management:
2. Risk Management Plan:
3. Design Standards and Best Practices:
4. Probability of Accidents analysis through Hazard and Operability, Hazard Identification, Fault Tree Layers of Protection Analyses which will be all part of FEED and detail design. The Project has adopted a design in which all technologies are a Technology Readiness Level 8 or higher.

A risk management strategy will be developed that includes:

- Assessment of the likelihood and potential severity of accidents and malfunctions (incidents) for all Project components and activities.
- A list of control measures to reduce the likelihood and/or severity of each incident (e.g. elimination or substitution, engineering controls, administrative controls, personal protective equipment).
- A comprehensive training program to ensure all employees and contractors are aware of and follow all safety protocols.
- A comprehensive emergency response program with detailed response plans for all foreseeable incidents including reporting requirements following the resolution of the incident.

Accidents, malfunctions, and unplanned events considered for this Project include, but may not be limited to:

- Erosion and sediment control failure
- Fire
- General hazardous material spill
- Safety and security incidents
- Sabotage, threats and other risks

The Project will have its own Emergency Response Plan (ERP) and Emergency Response Team (ERT) for the Industrial Facility and will have staff trained for emergency response for the other Project components. These employees will act as first responders and may assume the role of on-scene commander during an incident. Additionally, all operations and production personnel will be trained in firefighting. This will provide emergency response coverage 24 hours a day, 7 days a week. Detailed mitigation and response plans for all foreseeable incidents will be developed and presented as part of an EA as directed by regulatory authorities or prior to construction.

With the implementation of preventative measures (Section 5.4), the likelihood of an accident or a malfunction is low. Appropriate response plans will be put in place to ensure any interactions with VCs from an accident or malfunction are limited, and the effects can be quickly contained.

5.3 Effects of the Environment on the Project

The following section discusses potential effects of the natural environment, including natural hazards and weather events, on the infrastructure and operation of the Project. Mitigation and design strategies for reducing the significance of residual effects are also presented.

The primary mitigative measure employed during the construction and operation of the Project will be to educate and train site personnel. Environmental and safety orientations will be conducted prior to the start of construction and all staff will be informed of the potential effects of the environment on the Project. Staff responsible for the operation and maintenance of the

Project will be trained in the design and/or operation of the Wind, Solar, Electrical, and Industrial Facility infrastructure, including applicable operating procedures, safety protocols, and evacuation plans. To further mitigate damages that cannot be controlled by education and training alone, all applicable infrastructure will be equipped with safety mechanisms to limit damage resulting from extreme weather events.

5.3.1 Climate Change

Climate change is the persistent change in the state of the climate which lasts for decades or longer (IPCC, 2018). It is not expected that climate change could impact the Project through increased occurrences of extreme weather, precipitation, and subsequent flooding. Project infrastructure, including fuel storage, hydrogen ammonia storage and production, water treatment facilities, and solar infrastructure will be properly designed to contain excess rainfall and withstand extreme heat events. In addition, all facilities will be maintained regularly to check for leaks or damage associated with storm events. The infrastructure will also be designed for a one in 100-year storm. Climate change can impact the Project through the increased frequency and severity of severe weather events including heavy rainfall, hurricanes, blizzards and ice storms.

5.3.2 Severe Weather Events

Newfoundland and Labrador is subject to severe weather events, including heavy rainfall, hurricanes, blizzards, and ice storms which may lead to power outages, health related emergencies, infrastructure damage, and road damage, and therefore may pose direct risks to Project infrastructure (Government of Canada, 2018). Heavy rainfall is a common, highly probable natural hazard in Newfoundland and Labrador. Short duration heavy rainfall is defined as 25 mm or more of rain within one hour, while long duration heavy rainfall can range from 25 mm of rain or more within 24 hours during winter, or 50 mm of rain or more within 24 hours during summer (ECCC, 2020). Heavy rain or snow melt has the potential to deposit high quantities of water within the Project Area in a short period of time. Project design features will incorporate erosion control measures that will mitigate the effects of heavy rainfall and snow melt to maintain road access to all Project infrastructure during severe precipitation events.

Wind and lightning, which may be associated with heavy rainfall or hurricane conditions, may increase the risk of mechanical issues or electrical fires. Restricted access to the Project Area during severe weather events may limit the ability to shut down the system to prevent damage. To mitigate this risk for WTGs, they will be equipped with an automatic shut down when thresholds for wind are reached and will also be designed with a built-in grounding system for lightning strikes. Industrial operations will also monitor these severe weather events for temporary shutdowns.

Blizzards and ice storm occur during the winter months and can result in disruption of power supply, downed power lines, road closures, ice build-up on infrastructure, including buildings and plants. Mitigation for such events would include back-up power supplies for critical systems, remote monitoring and operation capacity for critical systems, and construction and maintenance protocols to ensure minimal build-up of snow and ice in critical infrastructure.

5.3.3 Flooding

Flooding in the Project Area may increase due to more frequent severe precipitation associated with climate change (US EPA, 2022c). Flooding may impact both terrestrial and aquatic habitat, damage Project infrastructure, and limit site access. The Project will mitigate the risks of flooding by concentrating the road and turbine layout in high elevation areas, maintaining regular upkeep and grading of roads to reduce formation of ruts, designing roadside ditches and water off-take infrastructure next to all roads to encourage drainage of rainwater off the roads, and revegetating roadsides to absorb excess water. Similarly, the Industrial Facility infrastructure will be located at higher elevations to minimize risk of flood damage or site accessibility issues.

5.3.4 Turbine Icing

Turbine icing occurs when ice accumulates on the surface of turbine blades, a condition created by specific temperatures and levels of humidity or the presence of freezing rain. The chances of turbine icing increase when the blades reach 150 m above ground, where the lower clouds may contain supercooled rain (Seifert et al., 2003). Turbine icing may lead to ice throw or ice fall, and the distance and direction in which the ice is thrown/falls is dependent on factors such as wind speed, rotor speed, rotor azimuth, the position of the ice on the blade, and the characteristics of the ice itself. Due to the numerous factors contributing to where these ice fragments may land when thrown/fallen, the likelihood of a human being struck is insignificant and thus the risk of injury is minute (LeBlanc, 2007). To further reduce the risk of injury from ice throw or falling ice, restricted site use may be enforced when the ideal weather conditions for turbine icing are present. Education of operators, adequate signage warning of falling ice, and the requirement to wear hardhats around operational turbines will also be implemented. Additionally, the turbines will be equipped to automatically shut down when thresholds for ice formation are detected.

5.3.5 Wildfire

The Forest Fire Regulations, NL Reg. 11/1996 outline restrictions for burning and operating timber harvesting equipment. Burning restrictions are determined by the Fire Weather Index (FWI). The Newfoundland and Labrador government employs an FWI during the fire season to determine fire danger across the forested areas in Newfoundland and Labrador (NLFFA, 2023). A higher FWI score indicates that if a fire were to start, it would be of high intensity and pose greater danger than a lower FWI score. Operation of timber harvesting equipment and/or clearing saws in forested areas within the Project Area will only occur when and as permitted under the Forest Fire Regulations and the FWI. Any activities requiring burning during the Project lifetime will be timed according to local burning restrictions.

As a best practice, the FWI can be used to determine fire danger associated with activities that may result in burning. The FWI during the summer months across the Project Area ranges from low (0-5) to high (10-20) (NRCan, 2022). Furthermore, the FWI will be checked regularly at nearby weather stations during summer months to determine the potential for highly dangerous wildfires. Precautions should be taken when undergoing construction or maintenance activities that could result in fires on days when FWI scores are >5, such as mechanical brushing/land clearing, using spark-producing tools, or piling of woody debris (Wildfire Regulation, BC Reg. 38/2005). Should the risk of fires increase throughout the lifetime of the Project, mitigation strategies to protect Project infrastructure and relevant VCs will be adapted accordingly.

5.4 Mitigation

Although a full effects assessment for individual VCs will be completed as part of the EA as directed by regulatory authorities or prior to construction, the following sections outline the general mitigations that are expected to apply to the Project.

5.4.1 Atmospheric Environment

General mitigation measures for fugitive emissions, exhaust emissions, and GHG emissions include:

- Conduct grading and site preparation in phases to minimize disturbed soil areas until just prior to construction activities.
- Stabilize exposed soil surfaces by sloping or using vegetation, stone, soil, or geotextiles to prevent dust and airborne particles.
- Compact and/or ridge disturbed soil to prevent dust formation.
- Cease dust-generating construction activities during periods of excessive wind.
- Enclose or cover soil storage and/or stockpile areas.
- Wet (with water) aggregate and soil stockpiles to control dust.
- Design storage areas and material stockpiles with prevailing wind directions in mind.
- Wet roadways and heavy traffic areas with water or dust suppressant technologies to minimize airborne emissions.
- Tie down, cover, and/or store loose site materials and/or products prior to inclement weather and wind events to prevent materials from becoming airborne.
- Wash down vehicles and equipment using hoses and water to remove accumulated mud/dirt on undercarriages, tracks, or wheel wells.
- Require that Project personnel adhere to all safety protocols and wear appropriate personal protective equipment (PPE) in the event of significant fugitive emissions events (i.e., wind and dust storms).
- Enforce site speed limits to minimize dust generation.
- Require that equipment meets all applicable provincial and air quality regulations and emissions standards.
- Require that equipment is fueled using low-sulphur diesel (to reduce SO_x air emissions).
- Maintain engines and exhaust systems according to the manufacturer's specifications and the recommended maintenance schedule.
- Remove from service malfunctioning equipment and/or equipment generating excess amounts of smoke, odour, or noise, until an assessment and necessary repairs can be completed.
- Remove from service construction equipment with improperly functioning emissions control systems.
- Use locally sourced materials, to reduce CO_2, CH_4, and NO_x emissions associated with transport.
- Incorporate the shortest construction/transport routes to minimize the use of fossil fuels during construction.
- Recover and recycle construction and demolition waste.

- Recycle and compost workforce waste (i.e., food waste). Diverting this waste will reduce methane generated in landfills as it decomposes.
- Minimize deforestation during land clearing by only clearing the area that will be needed.
- Plan construction activities to reduce the double handling of materials, reducing GHG emissions associated with heavy equipment operations.
- Use recycled or repurposed materials to reduce GHG emissions associated with embodied energy (i.e., the energy associated with manufacturing a product or service).
- Require that construction equipment with an improperly functioning emission control system is not operated.
- Require that regular equipment maintenance is undertaken to maintain good operations and fuel efficiency.
- Require that equipment containing coolant (i.e., air conditioning units) undergo preventative maintenance and inspections (i.e., leak testing).
- Train Project personnel (as appropriate) in the proper disposal of halocarbon-containing substances.
- Dispose of halocarbon-containing substances at an approved hazardous waste facility per applicable regulations and in compliance with local requirements.
- Require that trucks removing waste from or bringing materials to the Project are filled to the maximum allowable capacity where practical (dependent on the truck size and load weight) to reduce transportation requirements and limit the number of trips, where practical.
- Implement an anti-idling policy to limit GHG/exhaust emissions from vehicles and equipment, limit the use of fossil fuels, and reduce excessive sound.
- Incorporate energy-efficient infrastructure (i.e., solar panels) to limit GHG emissions and the use of fossil fuels resulting from standard equipment (e.g., diesel-powered generators or light stands).
- Maintain flare equipment in accordance with original equipment manufacturer recommendations and monitor/adhere to air quality regulations.
- Ensure fuel gas strainers, inspirators, and jets are free of debris and blockages.
- Ensure the flares are located in an area distant from on-site and off-site receptors.
- Ensure personnel are adequately trained and specialized to perform daily inspections and maintenance on the flare equipment.

Mitigations to minimize the impacts of a potential ammonia or hydrogen release include:

- Develop and implement a Project-specific ERP including emergency evacuation procedures and muster stations outside any potential blast radius.
- Equip and automate shut-off valves on the connection point of the ammonia transfer liquid and gas pipeline feed.
- Equip and automate emergency stops integrated and controlled through gas detection systems (monitors).
- Require appropriate spacing between ammonia tank and the hydrogen plant to minimize secondary risks explosions and domino events (i.e., is located outside the 20 kPa

explosion zone (not closer than 60 m to the hydrogen plant).

- Require ammonia storage/piping areas are cool, dry, and out of direct sunlight to minimize wear and tear and prevent damage.
- Require ammonia storage/piping areas are developed away from heat and ignition sources.
- Require that loading and routine operation procedures are reviewed; equipment inspection, maintenance and/or repairs schedule adhered to.
- Require pumps, motors, instrumentation, and other electrical components associated comply with the applicable electrical hazard zone, which will minimize the probability of ignition and avoid domino events.
- Require that engineering controls (e.g., automatic shut-off valves, sensors) are implemented into the design and can identify an ammonia leak within 15 minutes, allowing for prompt response and isolation controls to engage.
- Install positive pressure and blast-safe enclosures and control rooms to protect operations personnel from the effects of toxic release, explosions, and fire events, as well as to provide safe routes of egress in the event of an emergency.
- Require that critical equipment is located outside the heat radiation zone of concern, or the provision of passive fire protection should be included in the design requirements.
- Require that the selection of pumps, motors, instrumentation, and other electrical components shall comply with the applicable electrical hazard zone, which will minimize the probability of ignition at the hydrogen plant.
- Install positive pressure and blast-safe enclosures and control rooms to protect operations personnel from the effects of toxic release, explosions, and fire events, as well as to provide safe routes of egress in the event of an emergency.
- Design and reinforce buildings (where practical) to protect from potential projectiles in the event of an explosion; include explosion propagation routes and exterior explosion panels to direct projectiles away from critical equipment and/or personnel.

5.4.2 Geophysical Environment

General mitigation measures for the geophysical environment include:

- Conduct blasting, if required, in accordance with provincial legislation and subject to terms and conditions of applicable permits.
    - Conduct a pre-blast survey for wells likely to be impacted by blasting activities.
    - Require that all blasts be conducted and monitored by certified professionals.
    - Require that all protective measures outlined in the Environmental Protection Plan (EPP) (Section 10.0) be implemented in advance of blasting activities.
    - Notify landowners within 800 m of any blasting activities.
    - Recover and revegetate exposed soils or bedrock as required to minimize any exposure following blasting.
- Store any soil needed for backfilling, after foundations have been poured, temporarily adjacent to the excavations until needed. Any remaining excavated material will be used on-site or removed and sent to an approved facility.

- Install erosion and sedimentation control measures prior to excavation activities and inspect controls on a regular basis.
- Remove temporary erosion and sedimentation controls once backfilled material has stabilized. Attention will be paid during site reinstatement to ensure areas will promote wildlife return to the area.

5.4.3 Aquatic Environment

General mitigation measures for impacts to watercourses, waterbodies, fish and fish habitat, and wetlands include:

- Educate Project personnel on the sensitivity of aquatic habitats, including wetlands and watercourses.
- Require that all crossings be installed by a certified professional, and designed to avoid any permanent diversion, restriction, or blockage of natural flow, such that the hydrologic function of the watercourse is maintained.
- Adhere to DFO timing windows for in-water work for Newfoundland and Labrador.
- Plan construction activities to align with low flow periods.
- Develop and implement an Erosion and Sediment Control Plan following the Best Management Practices for the Protection of Freshwater Fish Habitat in Newfoundland and Labrador (DFO 2022).
- Revegetate along the watercourse edge and above the ordinary high-water mark to facilitate the stabilization of the area.
- Redesign existing watercourse crossings to facilitate habitat upgrades, including unblocking culverts and making waterways more conducive to fish passage.
- Avoid impacts to wetlands (including alteration, compaction, or otherwise).
    - Design wetland crossings to occur at the narrow part of the wetland or the wetland's edges.
    - If travel through wetlands is required, use geotextile matting, time work to occur during frozen ground conditions, or travel through the drier portions of the wetland, as appropriate.
- Develop a site-specific erosion and sedimentation plan during the detailed design phase.
    - The plan will target the disturbance to banks (as required) and adjacent land, and will address the type of control structures, proper installation techniques, grading, maintenance and inspection, timing of installation, and revegetation.
- Limit the area of exposed soil and the length of time soil is exposed without mitigation (e.g., mulching, seeding, rock cover).
- Limit the slope and gradient of disturbed areas to minimize the velocity of surface water runoff.
- Require that surface run-off containing suspended materials or other harmful substances be minimized.
- Direct run-off from construction activities away from wetlands.
- Leave riparian vegetation as intact as Project developments will allow.

- Integrate water management systems including diversion and collection ditches, roadside drainage channels, and stormwater retention ponds.
- Design any necessary alterations in a way that maintains the natural grade of a watercourse, to ensure the hydroperiod remains as it was pre-alteration.
- Fit any watercourse crossings with appropriately sized infrastructure, as prescribed by a certified professional.
- Integrate outlet protection features to dissipate flow velocities and decrease erosion at the outflow.
- Utilize vegetated swales for the phytoremediation of contaminated runoff.
- Utilize rock material that is clean, coarse granular, non-ore-bearing, non-watercourse-derived, and non-toxic to aquatic life.
- Use quarried, crushed materials for road construction to reduce the introduction of invasive vascular plant species.
- Ensure wetland crossings will not result in permanent diversion, restriction, or blockage of natural flow, such that hydrologic function of wetlands will be maintained.
- Use the existing roads and access routes.
- Maintain existing vegetation cover, where possible.
- Use water or an approved dust suppressant to control dust on roads, as required.
- Clean and inspect work vehicles prior to use to prevent the introduction of invasive/non-native species.
- Hold pre-construction site meetings to educate staff on the sensitivity of wetlands.

5.4.4 Terrestrial Environment

General mitigation measures for impacts to terrestrial habitat and rare plants, mammals (including bats), and avifauna include the following:

- Complete field studies as required, for wildlife, birds and bats prior to construction and avoid SOCC and their habitat, where possible, if found.
    - Reclaim small roads leading to turbines to minimize long-lasting effects of habitat loss.
- Complete clearing during winter months when bats are overwintering in caves (end of September to late April).
- Minimize use of road salt to minimize attraction of ungulates to roadsides during the winter.
- Require that equipment is clean to prevent the introduction of non-native species into previously untouched areas.
- Install traffic signs to alert road users of speed limits and the presence of wildlife in the area.
- Inform all Project-related staff working on the site of dangers to wildlife and create awareness around wildlife hotspots on the site.
- Minimize Project-related traffic to reduce chances of wildlife collisions and traffic-related stress to wildlife.
- Impose restrictions to site access if deemed necessary due to a substantial increase in wildlife collisions and mortality.

- Avoid removal of vegetation/habitat alteration in key habitat areas during sensitive windows for SOCC.
- Minimize loss of important habitat required by any identified SOCC (i.e., for reproduction events).
- Maintain all equipment and machinery on site so that a level of good working condition is kept, reducing noise and vibration emissions. Where practical, install vehicles and machinery with noise muffling equipment to limit disturbance.
- Restrict on-site lighting, especially at night, to limit disturbance.
- Prohibit harassment and feeding of wildlife by Project personnel.
- Incorporate a lighting plan for construction-related activities into the EPP.
- Maintain good housekeeping practices during construction to avoid indirectly feeding birds, and potentially attracting nuisance wildlife.
- Develop a Spill Response Plan, and an ERP within the EPP to mitigate the impacts of spills, hazardous substances, and other emergencies.
- Educate Project personnel about the potential for plant or lichen SOCC during construction, if identified during baseline surveys.
    - Guidance will be provided to Project personnel to raise awareness of terrestrial flora SOCC if found within the Project Area to increase the number of trained eyes looking for these species.
- Consult with NLFFA if an unexpected flora SOCC is encountered during construction activities. Potential mitigation measures based upon recognized practices to transplant or collect seeds can be used as a contingency if flora SOCC are unexpectedly encountered during construction activities. A transplantation plan will be developed along with a monitoring protocol through consultation with NLFFA should this be required during construction.
- Minimize overall area to be cleared, road density, habitat fragmentation, and habitat isolation by utilizing pre-existing roads and previously altered areas (i.e., clearcuts).
    - Avoid and minimize disturbance to important habitat features (e.g., caves, wetlands, mature forest stands) identified during desktop and field assessments.
    - Avoid topographic funnels, such as within lake or river valleys, for turbine placement to reduce the likelihood of interactions with concentrated bird movements.
- Restore cleared areas to reduce impacts from habitat loss and promote continued growth of terrestrial flora, primarily through revegetation of road rights of way, and limit effects of fragmentation.
    - Revegetate cleared areas using native seed mixes, and particularly use seed mixes that do not contain clover to avoid attracting deer to the area.
    - Augment connectivity by creating semi-artificial pathways such as wildlife corridors, greenbelts, and vegetated buffers around wetlands and watercourses.
- Conduct bat and bird mortality studies in consultation with the regulatory authority, during the operation phase of the Project.
    - If high bat mortalities are detected then additional mitigation measures may include mitigation such as decreased turbine speed, change in lighting, and acoustic/ultrasonic deterrents will be employed to reduce the risk of bat mortality associated with turbine operation.

- Develop a Fire Response Plan in accordance with provincial standards.
- Install avian deflectors on powerlines, including any powerline spans, or areas of line that are identified in the EPP as requiring mitigation, based on monitoring results.
- Develop a site reclamation plan in accordance with engineering standards and in consultation with NLECC and NLFFA.

5.4.5 Socio-Economic Environment

General mitigation measures for traffic, transportation, recreation, and tourism include:

- Conduct engagement and education with local recreational users regarding the safe continued use of lands within the Project Area.
- Install notices in public areas to inform residents of signage removal or road infrastructure alterations.
- Replace removed signage and guardrails immediately with appropriate temporary signage to ensure the safety of travelling public.
- Complete upgrades to roads and overhead wires, branches, and signs if conflicts arise.
- Complete modifications and associated reinstatement to relevant specifications.
- Avoid transportation through urban areas during high traffic times (e.g., 7-9 am and 3- 6 pm; Monday to Friday).
- Conduct all travel using safe work practices for transporting oversized loads.
- Utilize the minimum number of vehicles possible to minimize impacts to road-way flow and air quality due to exhaust emissions.
- Require that vehicles only visit and work on-site during normal daytime hours of operation and avoid high-traffic times of day to reduce local traffic congestion.
- Work with local recreation groups to ensure continued access to recreation sites, including development site-specific safety plans in coordination with landowners, recreational groups, and the Project operations team.
- Require no net loss of ATV trails, as a means of maintaining access to all specific points of interest.

5.4.6 Archaeological Resources

General mitigation measures for impacts to archaeological resources include:

- Complete an archeological assessment as directed by PAO.
- Immediately notify PAO of any paleontological finds.
- Implement mitigation for any identifies archeological resources identified as part of an EA as directed by regulatory authorities or prior to construction.

5.4.7 Land and Resource Use

General mitigation measures for impacts to human health, shadow flicker, EMI, visual impacts, and sound include the following:

- Design the Project's Wind Farms to comply with industry standards for operational sound and shadow flicker.
- Develop a complaint response protocol, which will consider complaints related to shadow flicker and sound and outline a process to investigate complaints.
- Install signage illustrating and warning of potential hazards associated with ice throw and fall around WTGs.
- Equip staff and workers accessing the Project Area for maintenance or other purposes with necessary PPE and associated safety protocols and procedures to mitigate risk of injury and/or fatality, especially during potential icing conditions.
- Implement a fire prevention and evacuation plan for Project personnel as part of the EPP, in addition to general safety protocol and training.
- Complete consultation with operators of radiocommunication and radar systems within the consultation zones for EMI assessments.
- Limit lighting on turbine hubs and blades to minimum levels while still meeting requirements of NAV Canada and Transport Canada.
- Minimize general lighting within the Project Area. Lighting will only be used when technicians are working on-site and for security and safety purposes.
- Maintain noise levels within design parameters.
- Require that workers are trained to properly install and repair erosion and sediment controls.
- Require that all fuels, lubricants and chemicals are stored in designated, adequately sized containers and areas.
- Provide secondary containment in storage areas.
- Require that equipment used is inspected, clean, and free of fluid leaks, damage, and corrosion.
- Require that fuel storage areas, refueling and equipment lubrication are located a minimum of 30 m from any surface water.
- Require that the storage of all dangerous goods comply with WHMIS.
- Require that all equipment, including mobile, are equipped with spill kits and appropriate spill mitigation materials.
- Require that workers are fully trained in spill response.
- Implement the Outfitter Effects Monitoring Program to address effects on outfitter operators and their clients.

5.5 Plans

The EARD identified several plans that should be developed in consultation with the Environmental Assessment Division and government agencies. The EPP is described in Section 10.0.

5.5.1 Emergency Response/Contingency Plan

The ERP is applicable to the Wind Farms, Solar Farm, and Industrial Facility activities related to the Project for all phases.

The Project will establish its own ERT to act as the first responder for any incidents and primarily respond to minor or major injuries related to unplanned accidents or incidents at the Industrial Facility, Solar Farm, and Wind Farms. Operations and production personnel will be trained in firefighting, emergency response, and certain members will be active members of the ERT. This allows for emergency response coverage 24 hours a day, 7 days a week. The ERP will also include:

- Ambulance services capable of organizing a regional response in case of simultaneous injuries.
- A base hospital for treatment needs.
- Base hospital or triage centre should have capabilities to manage multiple burns and respiratory distress cases.
- Fire service education needs related to hydrogen fires/explosions and how to fight them, ammonia boiling liquid expanding vapour explosions/fires and how to fight them, and toxicity of ammonia in air and respiratory protections.

The plan components will include firefighting, accidental release, PPE, training, response procedures and testing.

Firefighting

- Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, self-contained breathing apparatus.

- Relevant guidelines include:
  - EN 469 Protective clothing for firefighters. Performance requirements for protective clothing for firefighting
  - EN 15090 Footwear for firefighter
  - EN 659 Protective gloves for firefighters
  - EN 443 Helmets for fire fighting in buildings and other structures
  - EN 137 Respiratory protective devices - self-contained open-circuit compressed air breathing apparatus with full face mask

Accidental Release

Response teams will:

- Evacuate the area. Provide adequate ventilation. Consider the risk of potentially explosive atmospheres.
- In case of leakage, eliminate all ignition sources. Monitor the concentration of the released product. Prevent from entering sewers, basements and work pits, or any place where hydrogen accumulation can happen.
- Wear self-contained breathing apparatus when entering an area unless the atmosphere is proved to be safe. Refer to - EN 137 Respiratory protective devices - self-contained open-circuit compressed air breathing apparatus with full face mask.
- Prevent further leakage or spillage if safe to do so.

PPE

- Wear eye protection according to EN 166 when handling gas products. Guideline: EN 166 Personal Eye Protection.
- Skin protection:
    - Hand Protection: Wear working gloves while handling containers. Guideline: EN 388 Protective gloves against mechanical risks.
    - Body protection: Wear fire-resistant or flame-retardant clothing. Guideline: ISO/TR 2801:2007 Clothing for protection against heat and flame - General recommendations for selection, care, and use of protective clothing.
    - Wear safety shoes while handling containers. Guideline: ISO 20345 Personal protective equipment - Safety footwear.

Each operating company having a piping system transporting anhydrous ammonia should follow guidance from the Code ASME B314 (Design code for pipelines transporting liquid between facilities and storage), which states the following:

- Suitable safety equipment shall be available for personnel use at all work areas and operating facilities where liquid anhydrous ammonia is transported. Such safety equipment shall include at least the following:
    - Full face gas mask with anhydrous ammonia refill canisters
    - Independently supplied air mask
    - Tight-fitting goggles or full-face shield
    - Protective gloves
    - Protective boots
    - Protective slicker and/or protective pants and jacket
    - Easily accessible shower and/or at least 50 gal (190 liters) of clean water in an open top container
    - Personnel shall be instructed in effective use of masks and limited shelf life of refill canisters
    - Protective clothing shall be of rubber fabric or other ammonia impervious material.

Training

- Reading requirements in Canadian Hydrogen Installation Code CAN/BNQ 1784-000/2022.
- Attend the online training course: Introduction to Hydrogen Safety for First Responders, for example by the Center for Hydrogen Safety (CHS).
- Reading Educational materials: Hydrogen safety basics for first responders.
- Responders by the European-funded HyResponse project, including:
    - Hydrogen properties relevant to safety.
    - Safety of hydrogen storage.
    - Harm criteria for people and environment, damage criteria for structures and equipment.
    - Unignited hydrogen releases, their prevention and mitigation.

    - Sources of hydrogen ignition and prevention measures.
        - Hydrogen fires.
        - Dealing with hydrogen explosions.
- Written detailed plans and training programs for employees covering operating and maintenance procedures for the transportation piping system during normal operations and maintenance shall be established.
- The plan shall provide for training of personnel responsible for the prompt execution of emergency action. Personnel shall be informed concerning the characteristics of the liquid or slurry in the piping systems and the safe practices in the handling of accidental discharge and repair of the Industrial Facility, with emphasis on the special problems and additional precautions in the handling of leaks and repair of systems transporting liquid anhydrous ammonia. The operating company shall establish scheduled reviews with personnel of procedures to be followed in emergencies at intervals not exceeding six months, and reviews shall be conducted such that they establish the competence of the emergency plan.

Response Plan

- A written ERP shall be established for implementation in the event of system failures, accidents, or other emergencies, and shall include procedures for prompt and expedient remedial action providing for the safety of the public and operating company personnel, minimizing property damage, protecting the environment, and limiting accidental discharge from the piping system.
- Procedures shall cover liaison with provincial and local civil agencies such as fire departments, police departments, and other entities in or near the pipeline ROW (e.g., electrical and other utilities) to provide prompt intercommunications for coordinated remedial action; dissemination of information on location of system facilities; characteristics of the liquids or slurries transported, including additional precautions necessary with leaks from piping systems transporting liquid anhydrous ammonia; and joint preparation of cooperative action as necessary to ensure the safety of the public in the event of emergencies.
- A line of communication shall be established with residents along the piping system to recognize and report a system emergency to the appropriate operating company personnel. This could include supplying a card, sticker, or equivalent with names, addresses, and telephone numbers of operating company personnel to be contacted.
- In the formulation of emergency procedures for limiting accidental discharge from the piping system, the operating company shall consider formulating and placing in operation procedures for an area cooperative pipeline leak notification emergency action system between operating companies having piping systems in the area.
- Lists of hazardous materials and location would be made available to the emergency response teams, including updated Safety Data Sheet information so that first responders have a complete understanding of the facility.

5.5.2 Wildlife Emergency Response Plan

The Wildlife Emergency Response Plan (WERP) is applicable to the renewable energy infrastructure. There are several federal and provincial laws which govern land-use and acceptable practices regarding wildlife and habitat protection. All procedures implemented by the Proponent in protecting, managing, and responding to wildlife emergencies will be in keeping with the applicable legislation, including but not limited to:

- *Fisheries Act*
- Newfoundland and Labrador *Endangered Species Act*
- Newfoundland and Labrador *Wildlife Act*
- *Migratory Birds Convention Act (MBCA)*, S.C. 1994, c. 22
- *Species at Risk Act* (*SARA)* S.C. 2002, c. 29

Key government departments include (list not exhaustive):

- ECCC
- ECCC-Canada Wildlife Service
- Government of NLFFA

The Proponent will develop a comprehensive WERP for addressing wildlife concerns and emergencies at the renewable energy infrastructure and in the surrounding habitat. Implemented mitigation measures will reduce the effects and/or consequences to wildlife in the vicinity of the Project during all phases. Key plan components will include the identification of potential wildlife emergencies and sensitive species, communication strategies, and general and species-specific response procedures. The WERP will be updated on an annual basis and/or following a response.

Desktop reviews of the Project Area and photo-trap assessments identified wildlife presence in the vicinity of the proposed WTGs and infrastructure. Additional wildlife field studies will be completed as the Project progresses, which will contribute to the development of the WERP. Sensitive timing windows will be established for known SAR to reduce disturbances to wildlife, particularly during vulnerable life stages such as breeding, birthing, and overwintering period.

5.5.3 Waste Management Plan

The Waste Management Plan (WMP) is applicable to the Wind Farms, Solar Farm, and the Industrial Facility. All waste management procedures implemented by the Proponent will adhere to applicable legislation including, but not limited to:

- Newfoundland and Labrador *Environmental Protection Act*
    - Waste Management Regulations, 2003
    - Storage and Handling of Gasoline and Associated Products Regulations, 2003
    - Environmental Control Water and Sewage Regulations, 2003

Key government departments include:

- Service NL – Environmental Protection, Environmental Health
- NLECC – Pollution Prevention
- Transport Canada

The Proponent will develop a comprehensive WMP for dealing with waste management. Implemented mitigation measures (as discussed in Section 5.4) will reduce the effects to the environment and communities surrounding the Project during pre-construction, construction, operation and decommissioning phases. Key plan components include proper collection and adequate storage of liquid waste from the wastewater treatment plant as well as designated containers for solid waste resulting from construction, demolition, and recyclable activities. Drainage and erosion control will be considered in the development of the WMP, as well as recycling and compost opportunities. Efforts will be concentrated on limiting and controlling treated discharge to the environment or disposal at approved waste management facilities.

5.5.4 Hazardous Materials Response and Training Plan

The Hazardous Materials Response and Training Plan (HMRTP) is applicable to the Industrial Facility and the construction phase of the Wind Farms and Solar Farm.

All hazardous materials procedures implemented by the Proponent will adhere to applicable legislation including, but not limited to:

- Newfoundland and Labrador *Environmental Protection Act*
  - Waste Management Regulations, 2003
  - Storage and Handling of Gasoline and Associated Products Regulations, 2003
- *Transportation of Dangerous Goods Act*, S.C. 1992 c.34

Key government departments include:

- Service NL – Environmental Protection
- NLECC – Pollution Prevention
- Transport Canada

The Proponent will develop a comprehensive HMRTP for dealing with hazardous materials. Implemented mitigation measures (Section 5.4) will reduce the effects to the environment and communities surrounding the Project during all phases. Key plan components include adequate storage of hazardous materials, including secondary containment, spill kits, PPE, and dedicated training and resources.

A specialized fire department and response team will be put in force through the lifecycle of the Project. The Project will develop the requirements in consultation with the Town of Botwood. The Project will also require that appropriate equipment and training will be available in the Project

Area including, but not limited to, standard protective equipment, hazmat suits, specialized leak sealing equipment, rescue equipment, and medical facilities.

Operational and maintenance personnel may be exposed to an ammonia and or hydrogen leaks, and potential fire events during normal activities while working at the Industrial Facility. These situations are standard occupational hazards for such workers performing activities in these traditional hazardous areas. The Project will develop industry standard protocols and procedures to mitigate such events, and the Project will require that each individual working in these areas will be trained to the practices emergency response methods to mitigate potential risks. The proposed ammonia and hydrogen plants will apply world class maintenance strategies, and asset management practices to ensure that the integrity of all systems are held to industrial and design standards.

Through the design process, Hazards and Operability and Hazard Identification evaluations will be conducted to minimize and maintain a very low probability of loss of containment of any hazardous and dangerous substance from the facility. For risks that cannot be fully mitigated by design considerations, the Project will adapt procedural solutions. The Project will also implement emergency response programs and procedures which will be communicated to the local municipality. The Project will develop a thorough ERP and will require that all stakeholders are consulted and trained accordingly to the developed plans.

A Quantitative Risk Assessment (QRA) will also be carried out, aligned with the Project's Risk Management Policies. A QRA will systematically describe the risks management process utilized within Project, and identify the process to rate, score, track, and mitigate the identified risks. The Project will also align personnel on the processes and procedures used to:

- Assemble the risk identification and mitigation team.
- Identify risks, both initially and on an ongoing basis.
- Score and prioritize risks.
- Designate accountability for specific risk mitigation efforts.
- Develop and review risk mitigation plans.
- Track, review, and communicate the performance of risk mitigation plans.

Hazardous spills resulting from fuel (i.e., storage, refueling, operation of combustion vehicles) and other on-site chemicals may occur during the Project's construction and operations activities. Hazardous spills can adversely impact air, soil, surface water, groundwater quality, human health, and safety. In addition, hazardous spills may risk the health of aquatic, avian, and terrestrial wildlife. The severity of the impacts will depend on the nature of the hazardous material and the quantity spilled.

5.5.5 Transportation Impact Study and Traffic Management Plan

The Transportation Impact Study (TIS) and Traffic Management Plan (TMP) are applicable to the Wind Farms, Solar Farm, and Industrial Facility.

There are several federal and provincial laws which govern transportation access. The TIS and TMP will implement procedures according to applicable legislation including, but not limited to:

- Newfoundland and Labrador *Highway Traffic Act*
    - Vehicle Regulations, 2002

Key government departments include:

- Service NL – Environmental Protection
- Transport Canada

It is estimated that the maximum weight per turbine blade for transportation will be 80 metric tonnes. The Project is assessing the unloading and staging plans and currently anticipates it will occur at the Port of Botwood and the Project will install a “non public” haul road from the Port to the Industrial Facility and from the Industrial Facility to the Wind Farms. These details will be used to design the TIS and TMP.

The following permits and considerations are anticipated to be required for the transportation of turbine components:

- Preliminary Application to Develop Land Permit (Service NL)
    - Required for any alteration, including adjacent development, to existing highway access.
- Overweight Special Permit (Service NL and National Safety Code)
    - Required to transport oversized and overweight components, under the *Highway Traffic Act*. In some cases, due to the size and weight of the components, some may only be transported on Sundays.
- Provincial road weight restrictions will also need to be considered, especially spring weight restrictions, for heavier equipment and materials that will be transported to the Project Area.
- Access points will be designed with proper height and width to accommodate large trucks and will adhere to commercial stopping sight distances.

During the Project’s construction phase, trucks and other vehicles will be frequently visiting the area resulting in increased vehicular sound and air emissions. Outside of the construction phase, the Project will only require a small number of technicians to access the site to perform regular maintenance/equipment checks.

Ammonia Transport

Ammonia is transported via pipelines to the Port of Botwood, where it can be loaded onto specialized vessels designed for ammonia transport. The ammonia can then be shipped to various markets for use as a fuel, fertilizer, or for other industrial applications. The export of the produced green ammonia will be carried out through ammonia vessels which are going to be loaded at a dedicated jetty terminal. Common ammonia vessels range between 20,000 DWT and

60,000 DWT. Assuming the most common ammonia vessel would have 50,000 DWT and using standard industry practice ratio of 1.5 between terminal storage capacity and vessel capacity, a storage of approximately 75,000 tonnes of ammonia is required.

The ammonia storage will be near the Industrial Facility which will allow for operational and security oversight and will maximize the distance of the storage to residential areas. Transportation of the liquid ammonia from the storage location to the loading jetty will be through an ammonia pipeline which is tentatively planned to be partially underground. Because ammonia vessels do not typically possess on board regasification units, the ammonia pipeline will transport liquid ammonia at 240 K under pressures up to 10 to 20 bar between the production/storage and the jetty. Currently, the ammonia pipeline is planned to come from the Industrial Facility to the loading jetty though an easement on the south end of the Town of Botwood. The anticipated loading rates of the pipeline will allow the Project to fill a 50,000 DWT ammonia vessel over 3.5 days. The pipeline will be designed to industry standards and all safeguards will be in place. During the operating phase the appropriate level of asset management and predictive maintenance programs will be enforced by company policies.

The ammonia pipeline is intended to be pressurized and cold only during vessel loading. During the non loading times the line will be allowed to depressurize and contain ammonia gas and will be purged and cooled down prior to the next shipment. The operation and loading practices will be controlled by the Project operators.

5.5.6 Public Participation Plan

The Public Participation Plan is applicable to Wind Farms, Solar Farm, and Industrial Facility.

The Proponent is dedicated to local community investment through the development of a Community Benefit Agreement identifying various programs that will be jointly developed focusing primarily on sustainability concepts, and services that are beneficial to both the Project and the community. These include emergency response training, support through the local fire department, and sharing of infrastructure such as water treatment. Elements of the Community Benefit Agreement may also include:

- Support for job training to facilitate employment of community members during construction.
- Establishment of a training support system with vocational schools, apprenticeship programs and institutions for training programs that align with the Project development and operation.
- Sponsorship for community sport teams and support local high schools in raising industry awareness.
- Community redevelopment and infrastructure upgrades.
- Programs to stimulate new business within the region.

The Proponent will collaborate with local environmental organizations and authorities to develop and implement environmental monitoring and mitigation plans throughout the Project’s lifecycle.

As well, the Proponent will establish a monitoring and reporting framework to track progress on the Project and Community Benefit Agreements commitments and objectives, including regular reporting to stakeholders and the public.

The Project has established a website (https://evrec.energy). It includes information about the Project, the forward-looking statement, and continues to be updated regularly. Emails can be received at info@evrec.energy.

5.5.7 Workforce and Employment Plan

The Workforce and Employment Plan is applicable to Wind Farms, Solar Farm, and Industrial Facility.

The Project will contribute to the local economy through employment and contract opportunities of over 2,000 jobs during construction and 640 direct and indirect jobs during the operational period. Over 17 specific roles are required for the construction, operation and decommissioning of the Project including those in the fields of project management, environmental scientist/specialist, biologist, hydrogeologist, archeologist, health and safety, GIS, consultation, engineering, remediation, and waste management.

The Proponent would incorporate fair opportunity gender equity and diversity initiatives in including:

- Prioritize the hiring of qualified local residents, suppliers, and contractors.
- Establish training programs to develop the local workforce talents.
- Foster partnerships and growth with local businesses.
- Implement inclusive hiring practices that promote gender equity and diversity such as gender-neutral job postings, diverse interview panels and flexible work arrangements.
- Develop training programs that focus on underrepresented groups such as women, Indigenous peoples, and other minority groups to support equal representation in the workplace.
- Create policies that foster an inclusive work environment such as anti-harassment policies, resource groups and diversity targets for leadership roles.
- Include transparent pay structures and an established benefits package.

5.5.8 Domestic Wood Cutting Consultation Plan

The Domestic Wood Cutting Consultation Plan (DWCP) is applicable to the Wind Farms, Solar Farm, and Industrial Facility.

The DWCP will include a description of methodology and frequency of engagement on domestic woodcutting within the Project Area, including types of messaging such as print and social media.

The objective of the DWCP is to engage local users of the Project Area in a meaningful manner to collect and incorporate spatial and temporal information on where, when and by whom, the areas are being used for domestic woodcutting. These areas will be avoided, and mitigation communicated to the local users on an ongoing basis throughout the life of the Project.

Every effort will be made to collect data on access trails, harvesting plots, seasonal use, and user lists to develop a comprehensive database to inform the consultation plan. This includes engagement with local organizations and NLFFA for information on land use zones and restricted activity. The information will be integrated in the construction and operation plans and will include feedback received from the local community users. This engagement may be held alongside local public engagement in the community and with local First Nations, in the form of in person meetings, mailout/online surveys, and other media.

5.6 Environmental Effects Follow up and Monitoring Programs

As part of the EA as directed by regulatory authorities or prior to construction, the need for an Environmental Effects Follow up and Monitoring Program (EEMP) for each VC and each Project phase will be evaluated. Where it is determined to be required, EEMPs will be developed in consultation with the public, Indigenous Peoples, and stakeholders, particularly around wildlife management and land use.

Existing mitigation measures may be reviewed and adjusted accordingly, throughout the EEMPs, to determine the effectiveness of the current measures and develop new ones if necessary.

6.0 RESIDUAL EFFECTS

Residual effects refer to environmental effects which cannot be avoided or mitigated, or that remain after control technologies and best management practices (NLECC, 2023)

This EARD provides an overview of the Project and the surrounding environment. A comprehensive EA will be completed, which will include an evaluation of potential environmental effects, proposed mitigations, and residual adverse effects. Residual effects may be determined as significant or not significant based on frequency, likelihood of occurrence, severity, reversibility, and effectiveness of proposed mitigation. Evaluation criteria of the effects assessment are described in Table 6.1 and 6.2.

Table 6.1: Effects Assessment Criteria

Rating Criteria	Rating
Magnitude The amount of change in measurable parameters or the VC relative to existing conditions	**VC-specific as outlined in individual chapters.**
Geographic Extent The geographic area in which an effect occurs	**Project Area –** residual effects are restricted to the Project Area
Timing Considers when the residual effect is expected to occur	**Not applicable –** seasonal aspects are unlikely to affect the VC **Applicable –** seasonal aspects may affect the VC
Duration The time required until the measurable parameter or VC returns to its existing condition, or the residual effect can no longer be measured or otherwise perceived	**Short term –** residual effect restricted to no more than the duration of the construction phase **Medium term –** residual effect extends through the operation and maintenance phase **Long term –** residual effect extends beyond the decommissioning phase
Frequency Identifies how often the residual effect occurs and how often in a specific phase	**Single event –** occurs once **Intermittent –** occurs occasionally or intermittently during one or more phase of the Project **Continuous –** occurs continuously
Reversibility Describes whether a measurable parameter or the VC can return to its existing condition after the activity ceases	**Reversible –** the residual effect is likely to be reversed after the activity is completed **Irreversible –** the residual effect is unlikely to be reversed

Table 6.2: Definition of Significant Residual Environmental Effect

Significance Level	Definition
Significant	The potential effect could threaten sustainability of a resource or result in a moderate to high change in baseline levels within the Assessment Area (AA). The effect is anticipated to last for a medium to long-term duration and will occur on a continuous basis. Research, monitoring, and/or recovery initiatives should be considered and may be required.
Not Significant	The potential effect may result in a negligible to low change in a resource or condition in the AA but should return to baseline levels within the short-term and occur only once or on an intermittent basis. Research, monitoring, and/or recovery initiatives are not recommended.

7.0 CUMULATIVE EFFECTS

Cumulative effects are changes to environmental, social, and economic values caused by the combined effect of past, present, and potential future human activities and natural processes (Government of British Columbia, 2016). Concerns are often raised about long-term changes that may occur not only because of a single action but of the combined effects of each

successive action on the environment (Hegman et al., 1999). While a single undertaking might not cause significant adverse effects, multiple undertakings may result in incremental impacts, referred to as cumulative effects. These cumulative effects may potentially result in an overall impact to a VC of interest.

7.1 Other Undertakings in the Area

There are no other undertakings of this scale or any major industry in the Project Area, except ongoing forestry activities, in which the Project has consulted with the various counterparties and are working at coordinating activities that could reduce environmental and social impacts.

Cumulative effects will be assessed for the Project by taking into consideration the potential residual effects of significance in relation to activities that have taken place in the past, those that currently exist and those that can be reasonably expected to be developed within the area surrounding the Project (undergoing approval/construction). As the Project is maximizing the use of existing roads and there are no other undertakings of this scale in the Project Area, it is expected that a cumulative effects assessment is not required, with appropriate mitigation measures in place. Active forestry activities have resulted in habitat removal and an existing road network, such that this area would be further subjected to in the absence of the Project.

8.0 ASSESSMENT SUMMARY AND CONCLUSIONS

Preliminary desktop analyses and field surveys have been initiated, with other studies ongoing to support an effects assessment of VCs in the EA. Early findings indicate:

- Potential presence of avifauna and flora SOCC and SAR.
- A positive effect on GHG emissions.
- A positive water balance, indicating that the watershed area should be able to sustain the withdraw of up to 35 ML/d average from Peters Pond.
- Low likelihood of paleontological resources in the Project Area.

Planned baseline studies will improve understanding of interactions between the Project and VCs and cumulative impacts while fulfilling commitments of the regulatory process.

9.0 PUBLIC AND INDIGENOUS ENGAGEMENT

Community stakeholder engagement activities have been designed and intended to build trust and confidence between the local communities and Project stakeholders throughout the development phase, construction phase, and eventually the operation of the Project. The approach has been one of transparency and has included one-on-one engagement. Over 250 such engagements have taken place to date. Potential concerns have been identified during the consultations and the information has been incorporated into benefits and the environmental assessment. The information will also be considered during the ongoing operations of the Project. Early and continued engagement has allowed all groups with an active interest in or that

are potentially impacted by the Project to engage, ask questions, express opinions, and contribute meaningful dialogue. This level of engagement is expected to continue throughout the life of the Project.

Throughout the engagement process, all inquiries have been responded to in a timely manner with fact-based information. Information from public meetings, community outreach and queries from various stakeholders were integrated into an initial engagement plan. The plan outlined issues and concerns, along with an action plan to support measures that would mitigate negative effects on the social and environmental components valued by the communities.

Several open houses have been held to date, with the latest being held on April 25, 2024, in Botwood with approximately 300 attendees from various communities including Bishop Falls, Leading Tickles, and Grand Falls-Windsor. Summary of open houses and all engagement are included in Appendix E.

Notices were delivered through advertisements, Facebook, community boards, meetings, interviews, and VOCM Radio. The communities and their membership remain supportive with all nine letters of support requested and received remaining relevant. The mayors of the towns were also in attendance and separate sessions with Town representatives, the Qalipu First Nations, and the Outfitters Association took place. Other groups continue to be consulted through one-on-one discussions throughout the development cycle. Support continues to remain very strong from most, if not all, parties consulted. Letters of support and engagement materials are in Appendix E.

From all the engagement events, various comments have been received around potential effects on wildlife, smell, ammonia dangers, vibrations, noise and decommission plans. Some responses have been provided below, with a full question and answer table in Appendix E.

- Wildlife impacts will be reviewed as part of an EA as directed by regulatory authorities or prior to construction.
- Ammonia dangers and smells would be mitigated by a leak detection system, regular inspections, and implementation of mitigation measures outlined in the QRA.
- Modelling will be completed as part of an EA as directed by regulatory authorities or prior to construction to identify if there is a potential impact to receptors from operational noise.
- The turbines are expected to have a lifespan of 30 to 35 years with the decommissioning plans being incorporated in the Project assessment documents. The Project has prepared a detailed Asset Recovery Plan outlining its decommissioning strategy.
- Residents of Northern Arm and Phillips Head have indicated that they prefer not to have any turbines in the vicinity of their town. The Project has modified the Wind Farms to remove turbines initially to be located in those areas.

10.0 ENVIRONMENTAL PROTECTION PLAN

An EPP will be developed following EA approval. The EPP is the primary mechanism for ensuring that mitigation is implemented, as determined through the EA process, to avoid or mitigate potential adverse environmental effects that might otherwise occur from construction activities, and as required by applicable agencies through the permitting processes.

The EPP is developed for all Project personnel, including contractors, and describes the responsibilities, expectations, and methods for environmental protection associated with Project activities. The EPP will incorporate:

- Means to comply with requirements of relevant legislation.
- Environmental protection measures identified as part of the EA.
- Environmental commitments made as part of the EA.

A suggested Table of Contents for the EPP is provided in Appendix F. The EPP will be provided to NLECC prior to the start of construction for review.

11.0 PERSONNEL

This EA Registration Document was completed by Strum Consulting, an independent, multi-disciplinary team of consultants with extensive experience with submission of EA Registration Documents for undertakings within Atlantic Canada. Curriculum vitae for EA Report contributors and Project Team members are available. A list of the Project Team and their associated roles is provided below.

Senior review and oversight

- Shawn Duncan, BSc., Executive Director
- Melanie Smith, MES, Vice President, Environmental Assessment and Approvals

Environmental Assessment Authors

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- Diedre Park, MMS, B. Tech, Senior Environmental Scientist
- Robert Macleod, M.Sc., P.Geo., Senior Hydrogeologist
- Kathryn Smith, EIT, Intermediate Engineer-in-Training
- Stephen Mills, M.A., Senior Archaeologist

12.0 COMMITMENTS MADE IN THE EA REGISTRATION DOCUMENT

In preparing this EA Registration Document, the Proponent commits to the following:

Section 2.3

- Complete a full service agreement and maintenance service agreement for 5 to 15 years and renew for further 15 years (2030-2060).

Section 2.8

- Develop and implement an Erosion and Sediment Control plan for protection of fish and fish habitat.
- Develop a Vegetation Management Plan.

Section 3.1.1.1

- Develop a plan for green hydrogen and green fuel supply to the province.

Section 4.0

- Require that all surveys and monitoring programs be implemented as outlined for pre-construction, construction, and operations phases of the Project

Section 5.4

- Develop a Complaint Response Protocol.

Section 5.4

- Require that all mitigation measures described in Section 4.4 are implemented.

Section 5.4

- Ensure a safe work environment by requiring that all workers receive ongoing health and safety related training. Coordinated by the Occupational Health and Safety and the Diversity, Equity, and Inclusion Committee and Coordinator, with the assistance of management.
- Maintain communications between management and employees, and through leading by example.
- Hold our management team, employees, and all hired subcontractors to high standards guaranteeing that all policy and legislation is followed to protect every individual on the site.
- Develop and implement the following plans:
    - Emergency Response/Contingency Plan
    - Wildlife Emergency Response Plan
    - Waste Management Plan
    - Hazardous Materials Response and Training Plan
    - Transportation Impact Study and Traffic Management Plan

- Public Participation Plan
- Workforce and Employment Plan, including gender equity
- Domestic Wood Cutting Consultation Plan

Section 5.5

- Work with local recreation groups to ensure continued access to recreation sites, including development site-specific safety plans in coordination with landowners, recreational groups.
- Complete job training to facilitate employment of community members in the construction of the Project.
- Create a Specialized Fire and Rescue Department to address any associated risks in relation to the Project.
- Establish a training support system with vocational schools, apprenticeship programs and minority serving institutions for training programs which would support the business of the Project.
- Sponsor community sport teams and contribute with the support of local high schools to the education of students in raising awareness in the industry.
- Implement activities during construction of the Project, maintaining active engagement with the beneficiary communities throughout implementation.
- Collaborate with local environmental organizations and authorities to develop and implement environmental monitoring and mitigation plans throughout the project lifecycle.
- Establish a monitoring and reporting framework to track progress on the Project Benefits Agreement commitments and objectives, including regular reporting to stakeholders, Indigenous Peoples, and the public.
- Develop an Emergency Response/Contingency Plan (including Wildlife Emergency Response Plan), Waste Management Plan, Hazardous Materials Response and Training Plan, Transportation Impact Study and Traffic Management Plan, Public Participation Plan, Workforce and Employment Plan, Domestic Wood Cutting Consultation Plan, Environmental Effects follow up and monitoring Programs (EEMPs).

Section 10.0

- Develop an Environmental Protection Plan (including Spill Prevention and Response Plan).

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