Brighton Mountain Wind Farm

Environmental Impact Assessment Registration

April 2024

BOREAL ENVIRONMENTAL

HATCH

IRVING

J.D. Irving Limited

Environmental Impact Assessment Registration

2024-04-15	1	Approved for Use	I. Walker	S. Evans	S. Evans
DATE	REV.	STATUS	PREPARED BY	CHECKED BY	APPROVED BY

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Appendix F **Terrestrial Wildlife and Wildlife Habitat Report**

Appendix G **Avian Report**

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Appendix I **Bat and Bat Habitat Report**

Appendix J **Visual and Noise Impacts to Adjacent Protected Natural Areas**

Appendix K **Communications and Facility Interference Report**

Appendix L **Public Consultation Summary Report**

Appendix M **Environmental Protection Plan**

Appendix N **Adaptive Bird & Bat Management Plan**

Executive Summary

This Environmental Impact Assessment (EIA) Registration has been compiled for the proposed Brighton Mountain Wind Farm Project (The Project) by Hatch Limited, on behalf of the Proponent, J. D. Irving, Limited (JDI). This document assesses the potential socioeconomic and environmental impacts of the proposed Project, on select Valued Components (VCs).

The Project will be located within New Brunswick (NB), on freehold lands privately held by the Proponent. Its location is situated 5 kilometers (km) south of the community of Juniper, NB, 26 km east of the community of Florenceville-Bristol, NB, and 20 km northeast of the community of Hartland, NB.

The Project will consist of a maximum of 58 wind turbine generators (WTGs) for a total proposed installed capacity of 350 megawatts (MW). New infrastructure required for the Project includes the need to construct two substations connected via high-voltage generator lead lines, and a terminal station to tie into the existing electrical grid. A network of pre-existing resource access roads, present throughout the property, have traditionally facilitated logging enterprise. Some of these existing roads require upgrades to accommodate transportation of project components, as well, some upgrades will be required on roads that are located on crown lands to access the site.

Once commissioned, the Project's 350 MW of wind energy will reduce green-house gas (GHG) emissions within NB, by approximately 1.1 million metric tonnes of Carbon Dioxide equivalent, annually. This will result in a reduction of NB's total GHG emissions year over year by approximately 9%, based on 2021 levels. When examining the GHG emissions associated with electricity generation in NB, the Project would reduce those GHGs by as much as 33%. These reductions, align with provincial, regional, and federal targets towards the phase-out of coal-fired electricity generation by 2030, achieving net-zero electricity by 2035, and a net-zero economy by 2050.

Modernization of supply chains and industrial operations, that are sustainable for the future, is also becoming a necessity to compete in today's global economy. Securing clean energy sources to support traditional industries within NB, such as pulp and paper, will help to maintain the longevity and viability of current JDI operations throughout the province. Environmental and economic sustainability will increase competitiveness within international markets and continue to keep current industries secure for NB workers. The Project represents a significant private investment into the NB economy, which will contribute to economic prosperity, create hundreds of construction jobs, as well as create permanent, local jobs during operations.

As part of determining the Projects viability for the Proponent, this EIA has been completed to regulatory standards and guidelines, to identify and assess potential impacts to biophysical, physical, and socio-economic VCs. Various studies and field surveys have been undertaken throughout 2023 to collect and present information regarding the following VCs:

- Groundwater;
- Atmospheric Conditions;
- Noise;
- Visual Impacts, including Shadow flicker;
- Wetlands, and Vegetated Habitat;
- Birds;
- Bats;
- Terrestrial Wildlife;
- Fish and Fish Habitat;
- Community and Local Economy;
- Land Use and Property Value;
- Transportation and Vehicular Traffic;
- Public Health and Safety, including Electro Magnetic Fields (EMF);
- Interference with Radio and Communication Facilities; and
- Effects of the Environment on the Project.

As outlined by the NB-Department of Environment and Local Government (NB-DELG) EIA Sector Guideline Document, "*Additional Information Requirements for Wind Turbines* (2019)", a minimum of two (2) years of environmental baseline data is required for migratory birds and bats. Although 'Year 1' of baseline of the following VCs has been collected and presented within this EIA, addendum studies will be submitted for 'Year 2' data for the following:

- Birds; and
- Bats.

Additional field studies and surveys to be undertaken in 'Year 2', with results to be submitted in Addendum will also include:

- Updated wetland, watercourse and vegetation studies for area's not surveyed in 2023; and
- Archaeological field testing (sub-surface shovel tests), resultant of recommendations from pedestrian surveys undertaken in 2023 by a licenced professional archaeologist.

The Project's footprint has been optimized to reduce environmental impact to the greatest extent possible. JDI, is also fully committed to the implementation of mitigation measures, and post construction monitoring efforts, to ensure that environmental impacts from the Project are minimized for all phases of development, through planning, construction, operation, and decommissioning. From the assessment of available data on the VCs presented within this EIA, and through the application of identified mitigation measures, no significant residual effects to VCs are predicted.

The Brighton Mountain Wind Farm, will become an important step for the Proponent in meeting long-term renewable energy goals, reducing GHG emissions, as well as creating long-term, sustainable and secure jobs within NB. The Project will also be an important step for the Province of NB, and the Country as a whole, in actualizing goals toward a sustainable, decarbonized future.

Concordance Table

Table 1: Concordance Table

Legislated Minimum Requirements for an EIA Registration Document, NB Regulation 87-83	Section Addressing Requirements
1.0 The Proponent	**Section 1 (Proponent)**
(i) Name of Proponent	Section 1.1 (Project Proponent)
(ii) Address of Proponent	Section 1.1.1 (Proponent Address)
(iii) Principal Proponent Contact	Section 1.1.2 (Project Proponent)
(iv) Principal Contact Information for the EIA	Section 1.1.3 (Principal Contact)
(v) Property Ownership	Section 2.2 (Project Location)
2.0 The Undertaking	**Section 2 (Project Description)**
(i) Name of Undertaking	Section 2.1 (Project Name)
(ii) Project Overview	Section 2.3 (Project Overview)
(iii) Purpose and Need of Undertaking	Section 2.5 (Purpose/Rationale/Need for Project)
(iv) Project Location	Section 2.2 (Project Location)
(v) Siting Considerations	Section 2.7 (Siting Considerations)
(vi) Physical components and project dimensions	Section 2.8 (Physical Components and Dimensions)
(vii) Construction Details	Section 2.9 (Construction Details)
(viii) Operation and Maintenance Details	Section 2.10 (Operation and Maintenance Details)
(ix) Future Modifications, extensions, or abandonment	Section 2.12 (Future Modifications, Extensions, or Abandonment)
(x) Project Related Documents	Section 14 (Project-Related Documents)
3.0 Existing Environment	**Section 5 (Description of Existing Environment)**
(i) Physical and Natural Features	Section 5.1 (Physical Environment) and Section 5.2 (Biophysical Environment)
(ii) Cultural Features	Section 5.3 (Socio-Economic Environment)
(iii) Existing and Historic Land Uses	Section 5.3.2 (Socio-Economic Environment)
4.0 Summary of Environmental Impacts	**Section 6 (Predicted Environmental Impacts and Mitigation)**
Sector Specific: Biota Impacts	Section 6.2.4 and 6.2.5 (Assessment of Biophysical Valued Components)
Sector Specific: Noise Impacts	Section 6.1.3 (Noise)
Sector Specific: Visual Impacts	Section 6.1.4 (Visual Aesthetics and Shadow Flicker)

Legislated Minimum Requirements for an EIA Registration Document, NB Regulation 87-83	Section Addressing Requirements
Sector Specific: Impact on Communication Facilities	Section 6.3.5 (Interference with Radio Communications)
Sector Specific: Impact on Hydrology	Section 6.1.1 (Groundwater), 6.2.1 (Wetlands) and 6.2.2 (Fish Habitat)
Sector Specific: Impact of Electromagnetic Fields	Section 6.3.3 (Public Health and Safety- EMF)
Sector Specific: Impact on Public Safety	Section 6.3.3 (Public Health and Safety), Section 7.4 (Effects of the Environment on the Project-Wildfires), 7.5 (Effects of the Environment on the Project-Wildfires Accidents) 7.6 5 (Effects of the Environment on the Project – Mitigation Measures.
5.0 Summary of Proposed Mitigation	**Section 13 (Summary of Commitments and Mitigations)**
6.0 Public Involvement	**Section 9.1 (Public and Stakeholder) Section 9.2 (Indigenous Consultation)**
7.0 Approval of the Undertaking	**Section 10 (Approval of the Project)**
8.0 Funding	**Section 12 (Funding)**
9.0 Signature	**Section 16 (Signature)**

Abbreviations and Acronyms

Table 2: Abbreviations and Acronyms

µg/m³	Micrograms per Cubic Meter
AAQM	Ambient Air Quality Monitoring
ACCDC	Atlantic Canada Conservation Data Centre
AGL	Above Ground Level
AM	Amplitude Modulated
ANFO	Ammonia Nitrate Fuel Oil
AO	Aesthetic Objective
ANB	Ambulance New Brunswick
AR5	IPCC 5th Assessment Report
ARU	Acoustic Recording Unit
ATV	All-terrain Vehicle
BACI	Before-After/Control Impact
BBS	Breeding Bird Survey
BCR	Bird Conservation Region
bgs	Below ground surface
BMP	Best Management Practice
BRS	Broadband Radio Service
BSC	Bird Studies Canada
BSI	British Standards Institute
CAA	Cumulative Assessment Area
CAAQS	Canadian Ambient Air Quality Standard
CanWEA	Canadian Wind Energy Association
CBC	Canadian Broadcast Corporation
CCG	Canadian Coast Guard
CCME	Canadian Council of Ministers of the Environment
CDA	Command and Data Acquisition
CEAA	Cumulative Effects Assessment Area
CFS	Canadian Forest Services
CH_4	Methane
CITES	Convention on the International Trade in Endangered Species
CMIP5	Coupled Model Intercomparison Project Phase 5 Climate Models
CMIP5	Coupled Model Intercomparison Project Phase 5
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2eq	Carbon Dioxide Equivalent

COSEWIC	Committee on the Status of Endangered Wildlife in Canada
COSSAR	Committee on the Status of Species at Risk
CSA	Canadian Electrical Code
CWS	Canadian Wildlife Service
D1HM	Daily 1-Hour Maximum
DBH	Diameter at Breast Height
DD	Data Deficient
DFO	Department of Fisheries and Oceans
DO	Dissolved Oxygen
DTINB	Department of Transportation & Infrastructure of New Brunswick
EAP	Enhanced Approval Process
EC	Environment Canada
ECCC	Environment and Climate Change Canada
EF	Enhanced Fujita Scale
EIA	Environmental Impact Assessment
EMF	Electromagnetic Fields
END	Endangered
EPA	Environmental Protection Act
EPP	Environmental Protection Plan
ESA	Environmentally Sensitive Areas
ESC	Erosion and Sediment Control
EXT	Extirpated
FM	Frequency Modulated
FWA	Fixed Wireless Access
GBA+	Gender-based analysis plus
GCDWQ	Guidelines for Canadian Drinking Water Quality
GeoNB	New Brunswick online GIS resource maintained by Service New Brunswick
GHG	Greenhouse Gas
GNB	Government of New Brunswick
GoC	Government of Canada
GSC	General species composition
GWh	Gigawatt Hour
GWh/a	Gigawatt Hour per Year
H_2S	Hydrogen Sulphide
Ha	Hectare
HADD	Harmful alteration, disruption, or destruction
HDF	Headwater Drainage Feature
HGVL	High-voltage Generator Lead Line

HTPR	High target passage rate
ID	Identification
IDF	Intensity-Duration-Frequency
IH	Intolerant Hardwood (forest dominated by broad-leaved species intolerant of shade)
IPCC	Intergovernmental Panel on Climate Change
JDI	J. D. Irving Limited
kg/h	Kilograms per hour
Km	kilometer
Kt	Kilotonne
kV	Kilovolt
kW	Kilowatt
kWh	Kilowatt Hour
L/hr	Litres per Hour
L/min	Liters per minute
LAA	Local Assessment Area
LCWB	Little Clearwater Brook
LiDAR	Light Detection and Ranging
LPL	Lightning Protection Level
LW	Large Perennial Watercourse
m	Meter
m/s	Meters per Second
magl	Meters above ground level
MAC	Maximum Acceptable Concentration
masl	Meters above sea-level
MBBA	Maritimes Breeding Bird Atlas
MBCA	Migratory Birds Convention Act
MBR	Migratory Bird Regulation
MET	Meteorological
MHz	Megahertz
MPGLC	New Brunswick Maximum Permissible Ground-Level Concentrations
Mt	Megatonne
MW	Megawatt
MWF	Mixedwood (forest with mix of broadleaf and deciduous trees)
MWh	Megawatt Hour
N_2O	Nitrous Oxide
NAPS	National Air Pollution Surveillance Program
NAR	Not at Risk
NB	New Brunswick

NBAFC	New Brunswick Association of Fire Chiefs
NBBS	North Branch Becaguimec Stream
NBC	Canadian National Building Code
NBDELG	New Brunswick Department of Environment and Local Government
NBDERD	New Brunswick Department of Energy and Resource Development
NBDNR	New Brunswick Department of Natural Resources
NBDNRED	New Brunswick Department of Natural Resources and Energy Development
NBNRED	New Brunswick Natural Resources and Energy Development
NBR	New Brunswick Railway
NBSARA	New Brunswick Species at Risk Act
NCDC	U.S. National Climatic Data Center
NFD	National Forestry Database
NM	Noise Monitoring
NO_2	Nitrogen Dioxide
NOAA	U.S. National Oceanic and Atmospheric Administration
NO_x	Oxides of Nitrogen
NPRI	National Pollutant Release Inventory
NRCan	Natural Resources Canada
NRS	Noise Reduction System
NTP	The Northern Tornados Project
NTU	Nephelometric Turbidity Units
NWS	US National Weather Service
O_3	Ozone
OHS	Occupational Health and Safety Act
OWLS	Online Well Log System
PAN	Property Account Number
PAR	Precision Approach Radar
PB	Port of Bayside
PCS	Personal Communications Service
PDA	Primary Development Area
PGA	Peak Ground Acceleration
PGV	Peak Ground Velocity
PID	Parcel Identifier Number
PKB	Pokiok Brook
PM_{10}	Particulate Matter with Aerodynamic Diameters ≤ 10 Micrometers
$PM_{2.5}$	Fine particulate matter, Particulate Matter with Aerodynamic Diameters ≤2.5 Micrometers
PNA	Protected Natural Area
ppb	Parts Per Billion (volume basis)

PPE	Personal protective equipment
Pr/Ab	Present/Absent
PSJ	Port of Saint John
PSR	Primary Surveillance Radar
Q1	Quarter 1
Q3	Quarter 3
Q4	Quarter 4
QA	Quality Assurance
QC	Quality Control
RAA	Regional Assessment Area
RABC	Radio Advisory Board of Canada
RAP	Restricted Activity Period
RCMP	Royal Canadian Mounted Police
RCP	Representative Concentration Pathway
RD	Roadside Drainage
ROW	Right of Way
RAA	Regional Assessment Area
RSC	Regional Service Commission
RSZ	Rotor-swept Zone
Sa	Horizontal Spectral Acceleration
SAR	Species at Risk
SARA	Species at Risk Act
SC	Special Concern
SCADA	Supervisory Control and Data Acquisition
SO_2	Sulphur Dioxide
SOCC	Species of Conservation Concern
SOMC	Species of Management Concern
SP	Sample Point
Spp.	Species
SSR	Secondary Surveillance Radar
SVA	Subtended Vertical Angle
SW	Softwood (Forest dominated by coniferous trees)
SW	Small Perennial Watercourse
t/a	Metric Tonnes per Year
TB	Tamarack Brook
TC	Transport Canada
TH	Tolerant Hardwood (forest dominated by broad-leaved species tolerant of shade)
THR	Threatened

TRC	Technical Review Committee
TRS	Total Reduced Sulphur
TSP	Total Suspended Particulates
TV	Television
U.S. EPA	United States Environmental Protection Agency
ULSD	Ultra-Low Sulphur Diesel
UWC	Unnamed Watercourse
VC	Valued Component
VHF	Very High Frequency
VOR	VHF Omni-Range
WAWA	Watercourse and Wetland Alteration
WBNR	West Branch Nashwaak River
WBS	Wireless Broadband Service
WC	Watch count
WEC	Wind Energy Conversion
WHO	World Health Organization
WMZ	Wildlife Management Zones
WNS	White Nose Syndrome
WRAP	Western Regional Air Partnership
WTG	Wind Turbine Generator
ZOI	Zone of Influence

1. The Proponent

1.1 Project Proponent

The Proponent for the Brighton Mountain Wind Farm (The Project) is J. D. Irving, Limited (JDI).

1.1.1 Proponent address

The Proponent address is:

Secretary
J. D. Irving, Limited
300 Union Street,
Saint John, NB,
E2L 4Z2,
Canada.
Email: secretary@jdirving.com

1.1.2 Proponent Contact

The principal Proponent contact for the Project is:

Ms. Renée Morais, P.Eng.
Director of Environmental Affairs
J. D. Irving, Limited
300 Union Street,
Saint John, NB,
E2L 4M3,
Canada
Phone: 506-647-0418
Email: morais.renee@jdirving.com

1.1.3 Principal Contact for Purposes of EIA

Hatch Ltd. has prepared this Environmental Impact Assessment (EIA) Registration Document. The principal contact at Hatch Ltd with respect to this EIA is:

Mr. Shem Evans, M.A., C. Tech.
Hatch Ltd.
80 Hebron Way, Suite 100
St. John's, Newfoundland and Labrador,
A1A 0L9,
Canada
Phone: 709-702-6700
Email: shem.evans@hatch.com

1.2 Proponent Qualifications

JDI operates through numerous divisions in a wide range of businesses such as forestry, ship building, building supplies, agricultural products, construction, and more. While the Brighton Mountain Wind Project will be JDI's first wind development project as a proponent, JDI (through its afflitate companies and divisions) has experience in the erection, maintenance and decommissioning of wind turbines, as well as working in various other capacities for wind energy Projects throughout the region. JDI has also successfully executed many large capital projects across a diverse range of industries and has significant project management experience and expertise in maintaining and operating industrial sites.

Hatch Ltd. has been contracted by JDI to undertake Project Engineering and compile the EIA registration for the Project. Hatch has extensive experience in wind energy projects over its 75+ year history. While Hatch is a global company with experience from all over the world, Hatch also has had a long-standing presence in Atlantic Canada and the province of New Brunswick with offices in both Hanwell and Saint John.

With experiences from environmental permitting, design, construction, and decommissioning; JDI, its subsidiaries, and Hatch have the full suite of experience required for the lifecycle of the Project.

1.2.1 J.D. Irving, Limited Qualifications

JDI's experience with wind energy projects has primarily been executed through two of its subsidiary companies, 'Irving Equipment Limited' and 'Gulf Operators'. Irving Equipment Limited has supported crane work and heavy lifts required for the installation and removal of turbines, whereas Gulf Operators has undertaken civil construction work generally related to foundation or road construction for wind energy projects.

1.2.1.1 Irving Equipment Limited

Irving Equipment limited has experience in the installation and removal of wind turbines across a number of projects for a variety of clients. With their extensive fleet of over 100 pieces of equipment, and involvement in wind projects internationally, Irving Equipment Limited is one of the most experienced lift companies in Atlantic Canada and the northeastern United States. Experiences are summarized below in Table 1-1.

Table 1-1: Irving Equipment Wind Development Experience

Project Name	Location	Capacity	Description of Role
Kent Hills Foundation Base Refit	NB, Canada	150 MW	Dismantle each of the 50 turbines (Vestas V90s) from their foundations in succession and re-erect each tower on their new foundations.
Burchill Windfarm	NB, Canada	42.6 MW	Erection of 10 Enercon E138 turbines - 6 tower sections, 1 nacelle, 1 stator; 1 hub; 3 blades. Hub height 127 m (center of hub to base).
Wocawson	NB, Canada	21.3 MW	Erection of 5 Enercon E138 turbines - 11 tower sections, 1 nacelle, 1 stator; 1 hub; 3 blades. Hub height 135 m (center of hub to base); (Note tower sections were fabricated on site, very time consuming).
Richibucto	NB, Canada	4.26 MW	Erection of 1 Enercon E138 turbines - 11 tower sections, 1 nacelle, 1 stator; 1 hub; 3 blades. Hub height 135 m (center of hub to base).
Kent Hills (Phase III)	NB, Canada	17.25 MW	Erection of 5 Vestas V126 turbines - 5 tower sections, 1 nacelle (includes the generator), 1 drive train; 1 hub; 3 blades. Hub height 117 m (center of hub to base).
Oakfield Windfarm	ME, USA	148 MW	Erection of 48 Vestas V112 turbines - 4 tower sections, 1 nacelle (includes the generator and drive train), 1 hub; 3 blades. Hub height 84 m (center of hub to base).
Kent Hills (Phase II)	NB, Canada	54 MW	Erection of 18 Vestas V90 turbines - 4 tower sections, 1 nacelle (includes the generator and drive train); 1 hub; 3 blades. Hub height 80 m (center of hub to base).
Kent Hills (Phase I)	NB, Canada	96 MW	Erection of 32 Vestas V90 turbines - 4 tower sections, 1 nacelle (includes the generator and drive train); 1 hub; 3 blades. Hub height 80 m (center of hub to base).
DEME Offshore (Vinyard Wind Project)	NS, Canada	800 MW	Assisting in loading and unloading of both supply ships as well as the Orion crane ship as they return every 2 weeks from the Vinyard Wind Farm off the coast of Massachusetts.

1.2.1.2 Gulf Operators

Gulf Operators has experience in the civil works for a variety of wind projects in Canada and the United States. These projects included road construction, foundation excavation/backfill, concrete work, and other civil tasks required by wind projects. Experiences are summarized in Table 1-2.

Table 1-2: Gulf Operators Wind Development Experience

Project Name	Location	Capacity	Description of Role
Kent Hills (Foundation Base Refit)	NB, Canada	150 MW	Demolition of 50 turbine foundation, excavation/backfill for new turbine foundation, excavation/backfill for new underground electrical, road maintenance, snow removal, general labour support.
Burchill Windfarm	NB, Canada	42.6 MW	Drill/Blast for all road construction/trenching/site grading, construct 7 km of 12 m wide road, excavate/backfill 700 m underground electrical, site maintenance/restoration
Wocawson	NB, Canada	21.3 MW	Construction of 2.5 km of 12 m wide road, excavate/backfill 350 m of underground electrical, upgrade 6 Km of existing roadway, all civil works and concrete for new substation, site maintenance/restoration
Kent Hills (Phase II)	NB, Canada	54 MW	Construction of 23 km of 12 m wide road, excavate/backfill 1400 m of underground electrical, site maintenance and restoration
Kent Hills (Phase I)	NB, Canada	96 MW	Construction of 30 km of 12 m wide road, excavate/backfill 2100 m of underground electrical, site maintenance and restoration

1.2.2 Hatch Qualifications

Hatch has been involved in wind energy projects in a variety of roles such as engineering, procurement, and construction management (EPCM); environmental permitting, geotechnical investigations, noise impact assessments, wind resource analysis, to name a few. Some relevant projects of note are listed in Table 1-3.

Table 1-3: Hatch Wind Development Experience

Project Name	Location	Capacity	Description of Role
Amherst Island Wind Farm	ON, Canada	75-MW	Hatch designed the wind farm layout and performed the noise impact assessment for Algonquin Power's Amherst Island Wind Project, a 75-MW wind farm in Ontario, Canada. The facility was the first in Canada to use Siemens SWT 2.3-113 wind turbine generators. In addition, a new submerged cable was required to transfer the electricity produced by the wind farm on the island to the point of interconnection, located onshore.
Pierre-de Saurel Wind Farm Construction Project	QC, Canada	24.6-MW	As part of the Pierre-de Saurel Wind Farm Construction project, Hatch was commissioned by Construction Sorel Ltd. to design and develop the designs for the construction of the foundations of the wind turbines planned for the project.
Coram Wind Project	CA, USA	102-MW	Hatch provided owner's engineering services for the design and construction of the 102 MW Coram wind project located near Tehachapi, California.
Wintering Hills Wind Power Project	AB, Canada	88-MW	Hatch provided full EPCM services for the Wintering Hills wind power project. Hatch's services included, substation design, collection system design, foundation design, roads and pad design, supervisory control and data acquisition (SCADA) system design, procurement of engineered equipment, construction and project management.
Ripley Wind Project	ON, Canada	76-MW	Suncor and Acciona retained Hatch to manage the project and oversee implementation. The scope of work included design, procurement and specialized wind farm engineering, including modeling of the wind turbine generators (WTG) in the Independent Electricity System Operator (IESO) power system and specialized foundation engineering.
South Kent Wind Project	ON, Canada	270-MW	Hatch assisted Samsung in meeting the Province of Ontario's Renewable Energy Approval (REA) requirements, a part of the Environmental Protection Act.
Kettles Hill Wind Project	AB, Canada	63-MW	Hatch was the owner's engineering, procurement and construction management consultant for the Kettles Hill wind project. Hatch's services included substation design, collection system design, foundation design, roads and pad design, SCADA system design, procurement, construction and project management.
Bear Mountain Wind Project	BC, Canada	102-MW	Hatch provided full EPCM services for the design, construction and commissioning of access roads, turbine pads, substation, and associated 34.5-kV collection and 138-kV transmission systems for the Bear Mountain Wind Project.
Chin Chute Wind Farm	AB, Canada	30-MW	Hatch provided full EPCM services including collection system, roads, foundation and substation design.
Kent Breeze Wind Power Project	ON, Canada	20-MW	Hatch conducted the wind resource assessment, permitting, geotechnical investigations and interconnection engineering for the Kent Breeze wind power project.

Project Name	Location	Capacity	Description of Role
Prince Wind Farm	ON, Canada	189-MW	Hatch performed preliminary engineering; cost estimates; prepared balance-of-plant (BOP) bid documents, drawings, and specifications; planned and coordinated geophysical investigations; prepared the Plan of Development (POD) and Environmental management plan (EMP); environmental permitting, design review of EPC Contractor drawings; full-time field monitoring; review and quality auditing of civil works; and value engineering.
Raleigh Wind Farm	ON, Canada	78-MW	Hatch acted as independent engineer for the wind farm and provided independent field inspections to provide certification of commercial operation for IESO and Hydro One.

2. Project Description

2.1 Project Name

The name of the project is the 'Brighton Mountain Wind Farm' (hereby defined as "The Project").

2.2 Project Location

The Project is located approximately 65 km northwest of Fredericton, New Brunswick, as shown in Figure 2-1.

The proposed location is adjacent to two '100 series' highways, with Highway 107 bordering to the north, and Highway 104 to the southwest. The Project will be situated directly south of the municipal locality of Juniper, 26-km east of the community of Florenceville-Bristol, and approximately 20 km east of the community of Hartland.

2.2.1 Property Ownership

The proposed site spreads across privately owned land held by the New Brunswick Railway Company, which is an affiliate of JDI. The land consists mainly of forested areas, with elevations ranging from 173 to 553 meters above sea level (masl).

The Parcel Identifier Number (PID) and corresponding Property Account Number (PAN), for the properties held by the Proponent are as follows:

- PID: 10011690, PAN: 00374645 (153 – Carleton North, Hayden Ridge Rd.);
- PID: 10011690, PAN: 00384878 (152 – Hartland, South Knowlesville Rd.);
- PID: 10011641, PAN: 00384828 (152 Hartland, Route 104);
- PID: 10002392, PAN: 00374629 (153 – Carleton North, Route 107 Forks); and
- PID: 75463687, PAN: 00384886 (152 Hartland, Route 104 – Brighton LSD).

All of these PIDs are currently zoned as 'Freehold Timberland' with the exception of lands along the northeastern section (PID: 10002392) listed as 'Timberland and Camps'. The Property is currently managed by a division of JDI, 'Irving Woodlands' which has a long history of sustainable forestry operations throughout NB.

The proponent's property holdings are primarily surrounded by Crown lands, including various protected Natural Areas located to the east, west and south. Some crown land holdings are also present within the property limits, as shown in Figure 2-2. There are also other private land holdings located along the property's southwestern borders where the Project will be developed.

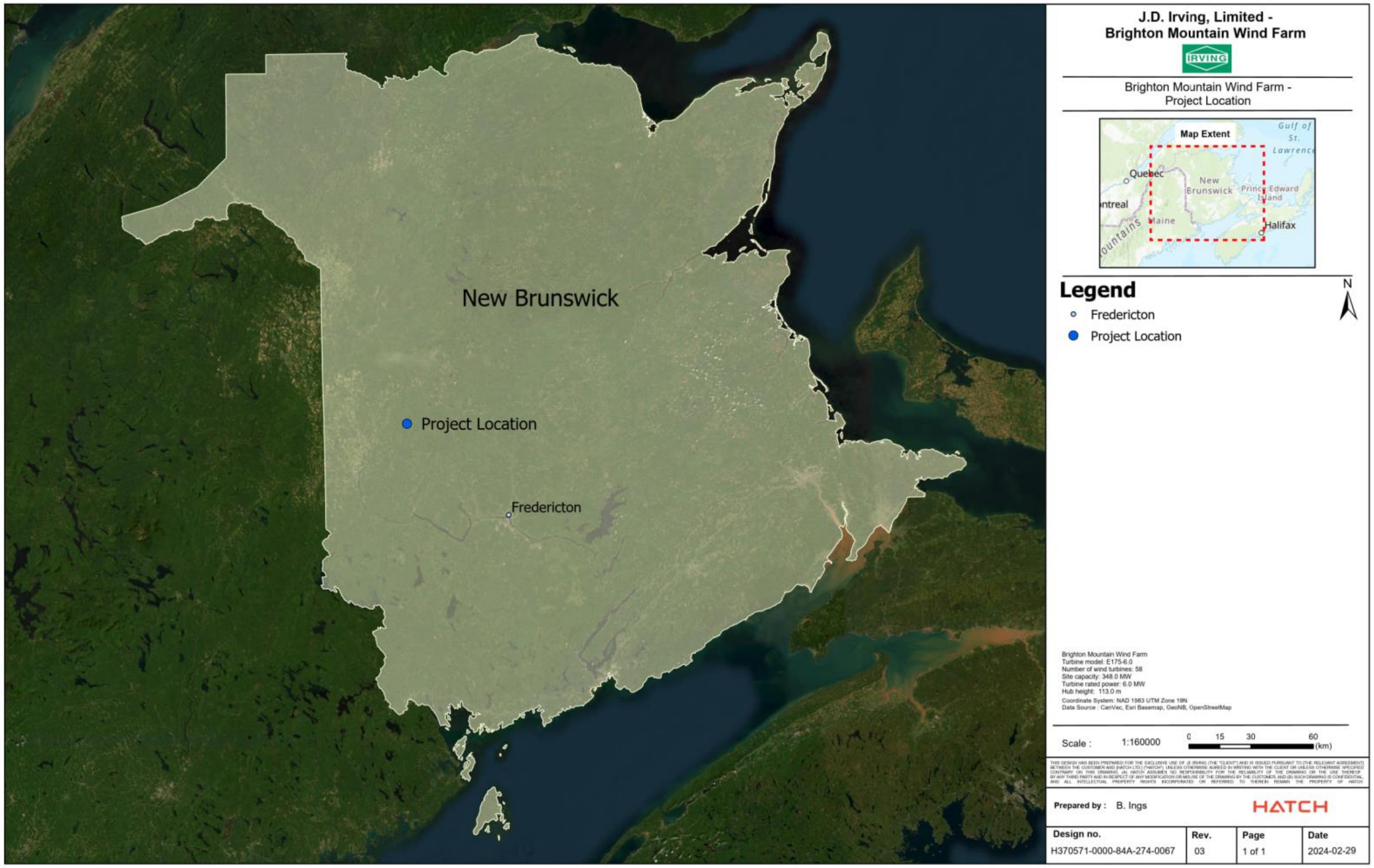

Figure 2-1: Location of the Brighton Mountain Wind Farm

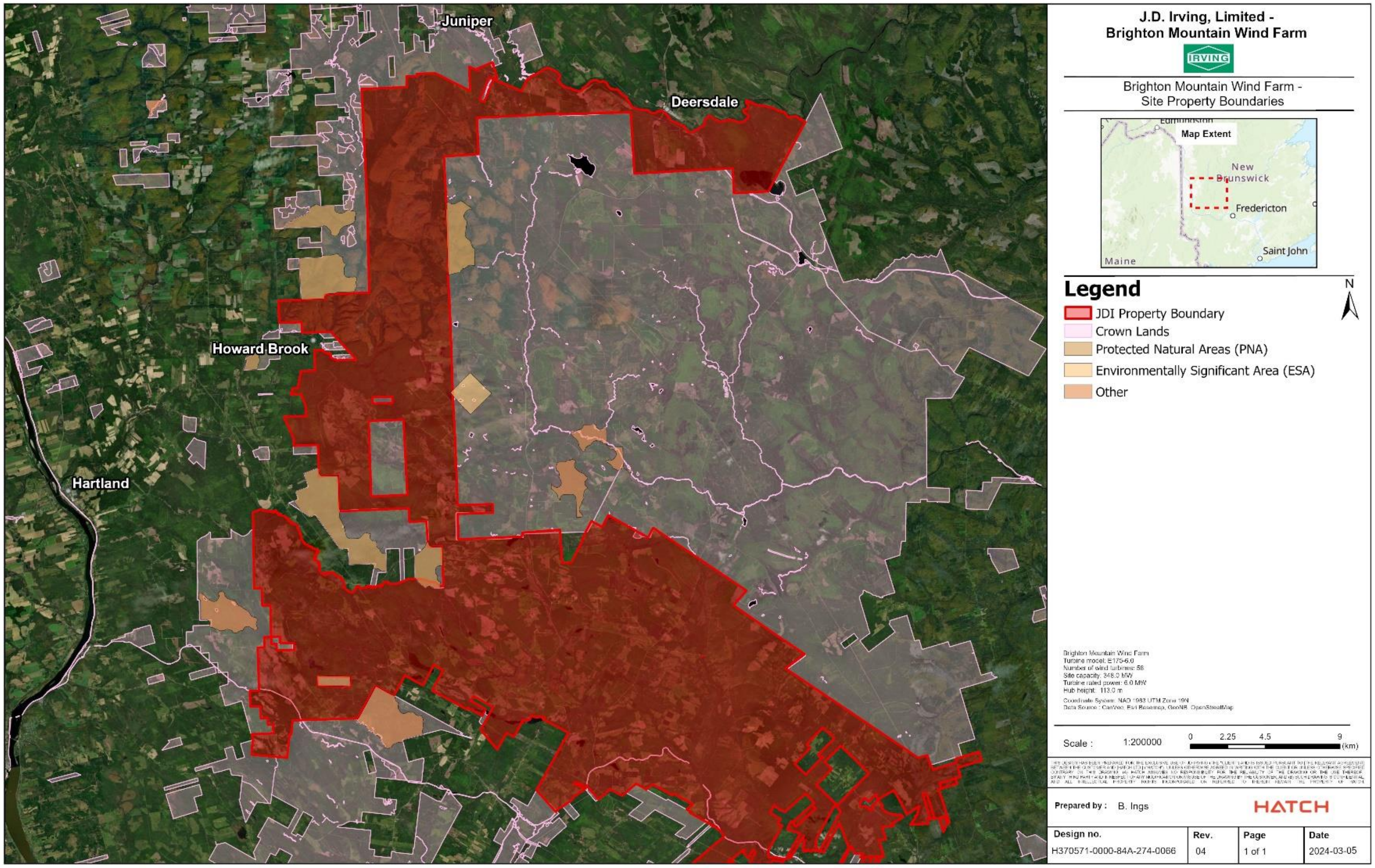

Figure 2-2: Proponent Owned Property Boundaries and Adjacent Properties

2.3 Project Overview

The Project will consist of a maximum of 58 wind turbine generators (WTGs) for a total installed capacity of 350 megawatts (MW). The WTGs will be arranged into two distinct geographical groups, in the 'north' and 'south' section of the Project, separated by a valley that intersects the two areas of higher elevations. The northern portion of the project will have a nameplate capacity of approximately 200 MW, and the southern portion of the project, will have approximately 150 MW of nameplate capacity.

A network of pre-existing resource access roads is present throughout the property, which has facilitated traditional logging enterprise. Some of these existing roads require upgrades to accommodate transportation of project components, as well some upgrades will be required on roads that are located on crown land. An additional 30 kilometers (km) of new roads will need to be constructed to access each planned WTG location and construct WTG assembly pads. These WTG assembly pads, measuring approximately 100 m by 100 m will be required to adequately assemble cranes and WTG components, as well as physically erect each WTG. On-site aggregate quarries will be required to support road development and upgrades, creation of turbine pads, as well as an additive in the production of concrete.

From each WTG, underground and overhead collector lines would be constructed, and typically follow along the civil upgrades throughout access roads. These collector lines will culminate toward two planned substations, one required in the northern section of the Project, and one in the nouthern section.

A 345 kilovolt (kV) high voltage transmission line, (TL3011) owned and operated by New Brunswick Power Corporation (NB Power) transects the JDI Property within the northern section of the property boundary. At the request of the Project, NB Power conducted a System Impact Study (SIS) in 2023 to determine the feasibility of integrating energy produced from the Project into the grid under various scenarios. The SIS indicated all 350 MW produced could viably tie into TL3011, however the Project would require the construction of high voltage interconnection infrastructure including a terminal. As such, the construction of a high-voltage generator lead (HVGL) line will be required to connect the northern and southern sections of the Project, via the two respective sub-stations. HVGL lines, will have a ROW width of approximately 60 m, which will span approximately 9 km in length between the south substation to the north substation, and an additional 10 km from the north substation to the Terminal at TL3011.

Figure 2-3 shows the Primary Development Area (PDA), inclusive of 58 turbine locations with respective turbine pads, new access roads, five (5) potential quarry locations, upgraded roadways, collector lines, substations and HVGL line right of way (ROW). It is important to note, that the PDA represents a 'worst-case' development solution and will be further reduced as Project engineering is advanced in detailed design. The Projects PDA extends across the four (4) PIDs that the Proponent holds as Freehold land, with the exception of the road upgrades in two parcels of crown land required to access the southern section of the Project.

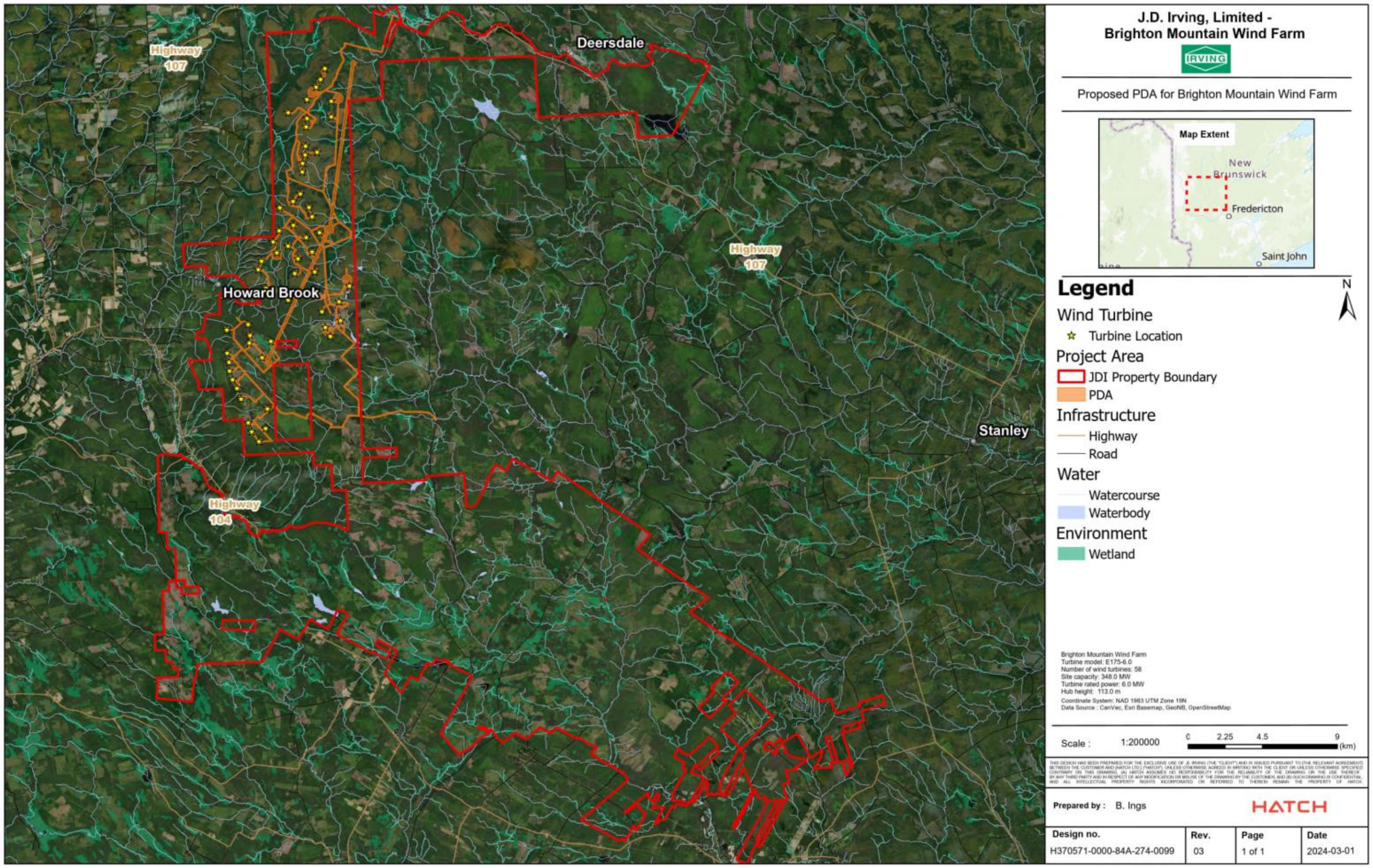

Figure 2-3: Primary Development Area

2.4 Regulatory Framework

An in-depth review of federal, provincial, and municipal regulatory requirements pertinent to the Project was undertaken to identify the governance framework in which the works must adhere to for compliance pursuant to various statutes, and legislation as well as identify current guidance provided by the various agencies, governing windfarm development in NB, regionally within Atlantic Canada, and Canada as a whole.

2.4.1 Federal

Several federal acts and regulations apply to the project. Federal agencies have also created various guidance documents to aid in regulatory compliance and implement best management practice, which are cited throughout this document, and included in the Reference list.

2.4.1.1 Federal Impact Assessment Act Review

Under the federal *Impact Assessment Act* (IAA, 2019), federal impact assessments are completed on designated projects located outside of Federal lands. The Physical Activities Regulations (commonly known as the project list) is the regulation that designates those projects under the IAA.

Sections 42 - 45 of the Regulation, prescribes designated renewable energy projects with thresholds requiring a federal assessment. More specifically, regarding wind Energy:

> "44 *The construction, operation, decommissioning and abandonment in an offshore area or in boundary water of a new wind power generating facility that has 10 or more wind turbines*", and;
>
> "45 *The expansion in an offshore area or in boundary water of an existing wind power generating facility, if the expansion would result in an increase in production capacity of 50% or more and a total number of wind turbines of 10 or more*".

A federal impact assessment should not be required, as the Project will be developed onshore, and not in boundary waters. The Project will also be located on privately held freehold land (i.e., will not be constructed on Federal Lands), within New Brunswick.

Below is a list of relevant legislation and guidance documents which are understood to be applicable to the project.

2.4.1.2 Applicable Federal Legislation

- *Aeronautics Act*
  - Canadian Aviation Regulations
- *Canada Labour Code*
  - Canada Labour Standard Code
  - Canada Occupational Health and Safety Regulations

  - Policy Committees, Workplace Committees and Health and Safety Representatives Regulations
  - Workplace Harassment and Violence Prevention Regulations
- *Canadian Environmental Protection Act*
- *Civil Air Navigation Services Commercialization Act*
- *Environmental Violations Administrative Monetary Penalties Act*
  - Environmental Violations Administrative Monetary Penalties Regulations
- *Fisheries Act*
  - Authorizations Concerning Fish and Fish Habitat Protection Regulations
- *Migratory Birds Convention Act*
  - Migratory Birds Regulations, 2022
- *Species at Risk Act*
  - Permits Authorizing an Activity Affecting Listed Wildlife Species Regulations
- *Transportation of Dangerous Goods Act*
  - Transportation of Dangerous Goods Regulations

2.4.2 Provincial

Several provincial acts and regulations apply to the project. Provincial agencies have also created various guidance documents to aid in regulatory compliance and best practice, which are cited throughout this document, and included in the Reference list.

Environmental Impact Assessment (EIA) in NB is governed by Regulation 87-83 under the *Clean Environment Act*. Under the provincial legislation, the EIA process is triggered if the undertaking (or project) is listed in Schedule A of Regulation 87-83. As currently defined, a provincial EIA process is required for the Project as it falls under Schedule A, category (b) of Regulation 87-83 (i.e., “all electric power generating facilities with a production rating of three megawatts or more”).

Below is a list of relevant legislation and guidance documents that are understood to apply to the project.

2.4.2.1 Provincial Legislation

- *Clean Environment Act*
  - 87-83 - Environmental Impact Assessment Regulations (Schedule A, Category (b))
  - 90-80 - Watercourse and Wetland Alteration Regulations
- *Crown Lands and Forests Act*

- 2009-62 - Lands Administration Regulations
- 86-160 - Timber Regulations

- *Electricity Act*
  - 2015-60 - Electricity from Renewable Resources Regulations
- *Fish and Wildlife Act*
  - 97-141 - Nuisance Wildlife Control Regulations
- *Heritage Conservation Act*
  - 2010-132 - General Regulations
- *Highway Act*
- *Motor Vehicle Act*
  - 2001-67 - Vehicle Dimensions and Mass Regulations
- *Occupational Health and Safety Act*
  - 2004-130 First Aid Regulations
  - 91-191 General Regulations
  - 2007-33 Training and Designated Trades Regulations
  - 2016-6 Workplace Hazardous Materials Information System Regulations
- *Oil and Natural Gas Act*
  - 86-191 - Geophysical Exploration Regulations
- *Topsoil Preservation Act*
  - 95-66 - General Regulations
- *Regional Service Delivery Act*

2.4.3 Municipal

The project sits adjacent to the town of Hartland and the District of Carleton north. Both local governments contract their planning services with Western Valley Regional Service Commission who has authority for planning services under the provincial *Regional Service Delivery Act*. All necessary municipal permits will be attained from Western Valley Regional Service Commission before construction commences.

2.4.3.1 Hartland

The southern portion of the project lays within the Town of Hartland. Relevant building permits and approvals will be acquired.

2.4.3.2 *District of Carleton North*

The northern portion of the project lays within the District of Carleton north. Relevant building permits and approvals will be acquired.

2.5 Purpose/Rationale/Need for the Project

Globally and on a national scale, the urgency for decarbonization across economic drivers such as energy production and consumption, has become a challenge for governments and industry alike. In 2015, the Government of Canada (GoC) became a signatory to the Paris Climate Accord, a multi-national effort to limit global temperature rise associated with climate change to <1.5°C. The GoC committed to a 30% reduction of GHG emissions from 2005 levels by the year 2030, with the Paris Accord formally ratified in parliament, late 2016. The GoC has since set the goal of carbon neutrality by 2050. Renewable energy projects are one of the keys to accomplishing this goal. In 2018, the federal government also announced the phase-out of coal fired generation by 2030.

In October of 2023, the Governments of Canada, New Brunswick, and Nova Scotia agreed to a Joint Policy Statement on "*Developing and Transmitting Clean, Reliable and Affordable Power in Nova Scotia and New Brunswick".* The policy statement's goal is to collaborative work toward the regional phase-out of coal-fired electricity generation by 2030, achieve net-zero electricity by 2035, and a net-zero economy by 2050.

In line with national efforts, New Brunswick is prioritizing the implementation of initiatives to transition away from energy sources that emit GHGs into the atmosphere. In December of 2023, the Province released a clean energy strategy titled "*Powering our Economy and the World with Clean Energy – our path forward to 2035*". Amongst the various initiatives described within the document, the strategy outlines the provinces intentions to significantly grow NB's wind generation capacity and establish targets to acquire as much as 1400 MW of wind power being required by 2035.

Decarbonization of the NB grid also aligns with NB Power's '*2023 Integrated Resource Plan'* (IRP), which seeks pathways to a net-zero provincial electricity system. In addition to phasing out coal, the IRP aims to achieve a net-zero electricity utility by 2035 through the decarbonization of the grid with carbon-free generation, including new wind energy projects (IRP, 2023). In 2021/22 New Brunswick's industrial customers accounted for approximately 35% of the total in-province energy use, with customers served at high transmission voltages (i.e., 69 kV and above, such as pulp and paper) making up the bulk of those respective sales. As depicted in Figure 2-4, the provincial pulp and paper industry accounts for 64.7% of large industrial transmission sales in 2021/22 (IRP, 2023).

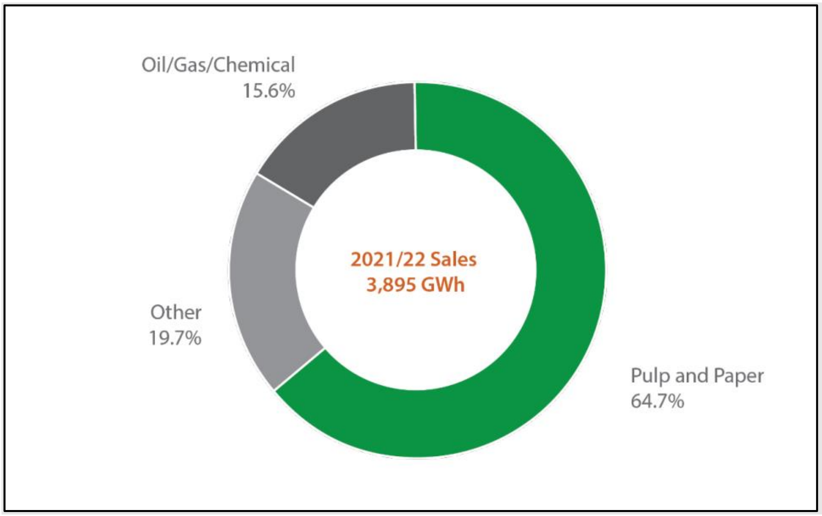

Figure 2-4: 2021/22 NB Power Industrial Transmission Sales (NB Power, 2023)

JDI's pulp and paper division has progressively reduced GHG emission to achieve below 2005 GHG levels emitting from their operations. To date the pulp and paper division has achieved a 54% reduction from its 2005 levels and aspires to continue reductions of GHGs and Carbon Dioxide equivalent (CO_2eq).

JDI envisions renewable technologies such as wind energy, to be essential in reducing CO_2eq emissions from the 'Irving Forest Supply Chain. The Irving Forest Supply Chain as shown in Figure 2-5, is made up of businesses in the Forestry and Forest Products and Consumer Products sectors, which encompasses all activities in JDI's lumber, pulp and tissue businesses. The Supply Chain includes the land, forests, wood supply, tree nurseries, silviculture (tree planting and tending), logging operations, sawmills, peat and gardening products, pulp, paper, corrugated medium, consumer tissue and diaper manufacturing facilities.

Figure 2-5: Irving's Forest Supply Chain

Pulp production is one of the major contributors of CO_2eq emissions along this supply chain through intensive energy consumption. JDI plans to offset the carbon intensity of the NB Grid by integrating wind energy production. This will effectively reduce CO_2eq emissions associated with energy consumption along the Irving Forest Supply Chain and help to decarbonize New Brunswick.

As depicted in Figure 2-6, GHG reductions from wind energy projects, such as the proposed Brighton Mountain Project, are part of a broader climate impact strategy of investing in GHG removals and reductions that are being implemented right across the Irving Forest Products Supply Chain.

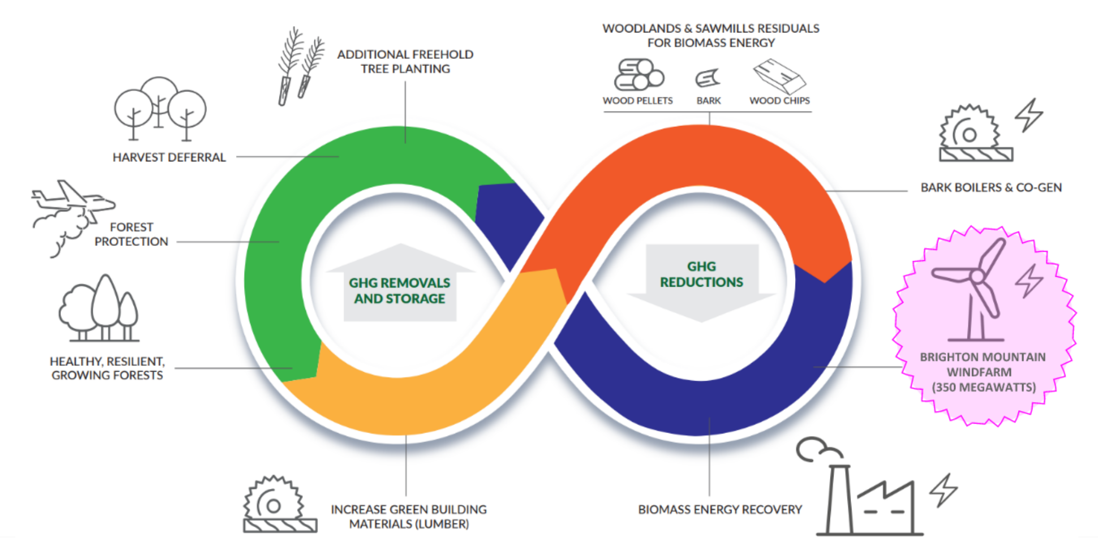

Figure 2-6: Irving Forest Supply Chain Impact – Investing in GHG Removals and Reductions

According to the 2023, 'Canadian National Inventory Report (NIR) (1990 – 2021)', in 2021, NB's GHG emissions were estimated at 11.9 million metric tonnes per year (MMT/yr) of CO_2eq. Of the 11.9 MMT/yr, 3.38 MMT/yr were released from electricity generated through the combustion of fossil fuels. In consideration of the total electricity generated (from generation with no direct GHG emissions combined with generation from fossil fuel combustion), the NB grid had a carbon generation intensity of 290 g CO_2eq/kWh in 2021.

As depicted in Figure 2-7, when fully implemented, the Project's 350 MW of wind energy will reduce GHG emissions by approximately 1.1 MMT/yr of CO_2eq (based on information from the 2023 NIR for the 2021 calendar year). This will result in a reduction of NB's total GHG emissions year over year by approximately 9%. When examining the GHG released due to electricity generation in NB alone, the Project would reduce those GHGs by 33%. This percentage is resultant of the decrease of as much as 100 g CO_2eq/kWh in grid GHG intensity from 2021 levels (i.e., decrease from approximately 290 g to 190 g of CO_2eq/kWh).

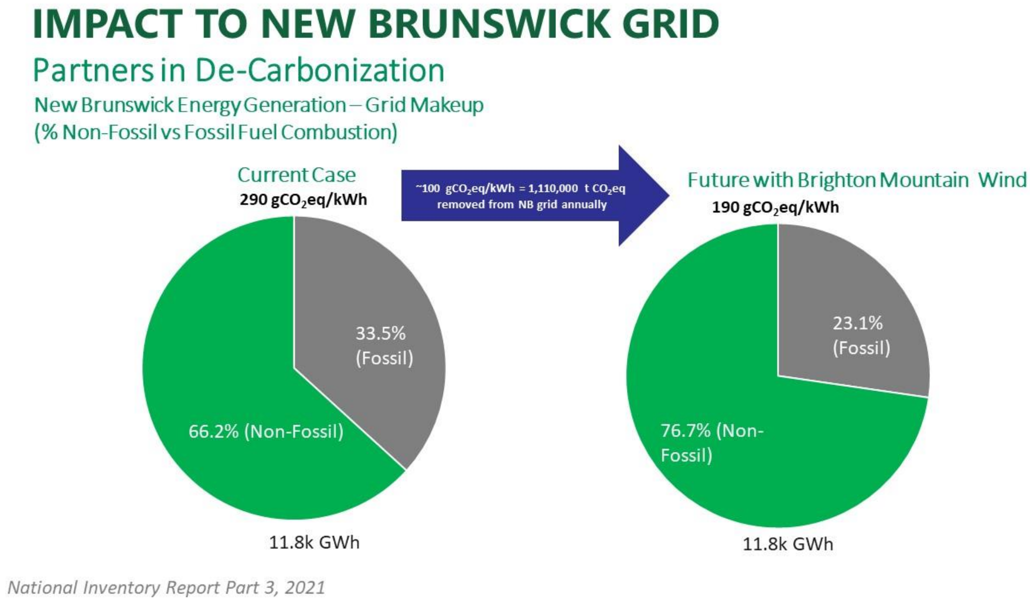

Figure 2-7: Changes to the NB Energy Generation with the Project Fully Implemented (Precent of Non-Fossil vs Fossil Fuel Combustion)

In addition to pursuing emissions reductions and clean energy sources, it is critical to pursue the stabilization of future energy prices to ensure socioeconomic sustainability of operations along the Irving Forest Supply Chain. Reducing international and interprovincial volatility of energy pricing, by investing in local renewable energy production enables longer-term competitiveness for various industries, including the proponent's operations. This will ensure that JDI is better insulated from external energy market forces that may impact the economic viability of the pulp and paper division mills and will secure present and future jobs along the Irving Forest Supply Chain, into the future. Modernization of supply chains and operations that are more just, and sustainable for the future, is becoming a necessity to compete in today's global economy.

The Project will also positively contribute economic prosperity in the region, through the creation of hundreds of jobs during the construction phase, and the creation of some permanent jobs associated with operations.

The steady development of wind energy projects throughout Canada and its growing international market has shown the potential of WTGs to directly reduce harmful GHG emissions associated with carbon-based energy sources, whilst simultaneously providing economic benefits such as new employment opportunities within NB and appealing return on investment (ROI) metrics. Not adopting this Project would lead to less electrification from renewable sources, which would hinder progress towards federal and provincial carbon neutrality goals and lessen job creation within the renewable energy sector in New Brunswick.

2.6 Choice of Site

As the property is owned by JDI, there are no other site locations being considered for this Project.

2.6.1 Assessment of Alternatives

An alternatives assessment was undertaken to determine project development options. Four (4) scenarios were examined, including “maintaining the status quo’, which was ruled out.

Three alternative turbine models and respective layouts were studied. Based on their rated powers, the actual installed capacity would be the following for each model to achieve the desired site capacity of 350 MW:

- 53 x Siemens WTG (Model SG 6.6-170), 6.6 MW each;
- 56 x Vestas WTG (Model V162), 6.2 MW each; and
- 58 x Enercon WTGs (Model E175), 6.0 MW each.

Figure 2-8, Figure 2-9, and Figure 2-10, illustrate the proposed site layouts for the Siemens, Vestas, and Enercon WTGs, respectively.

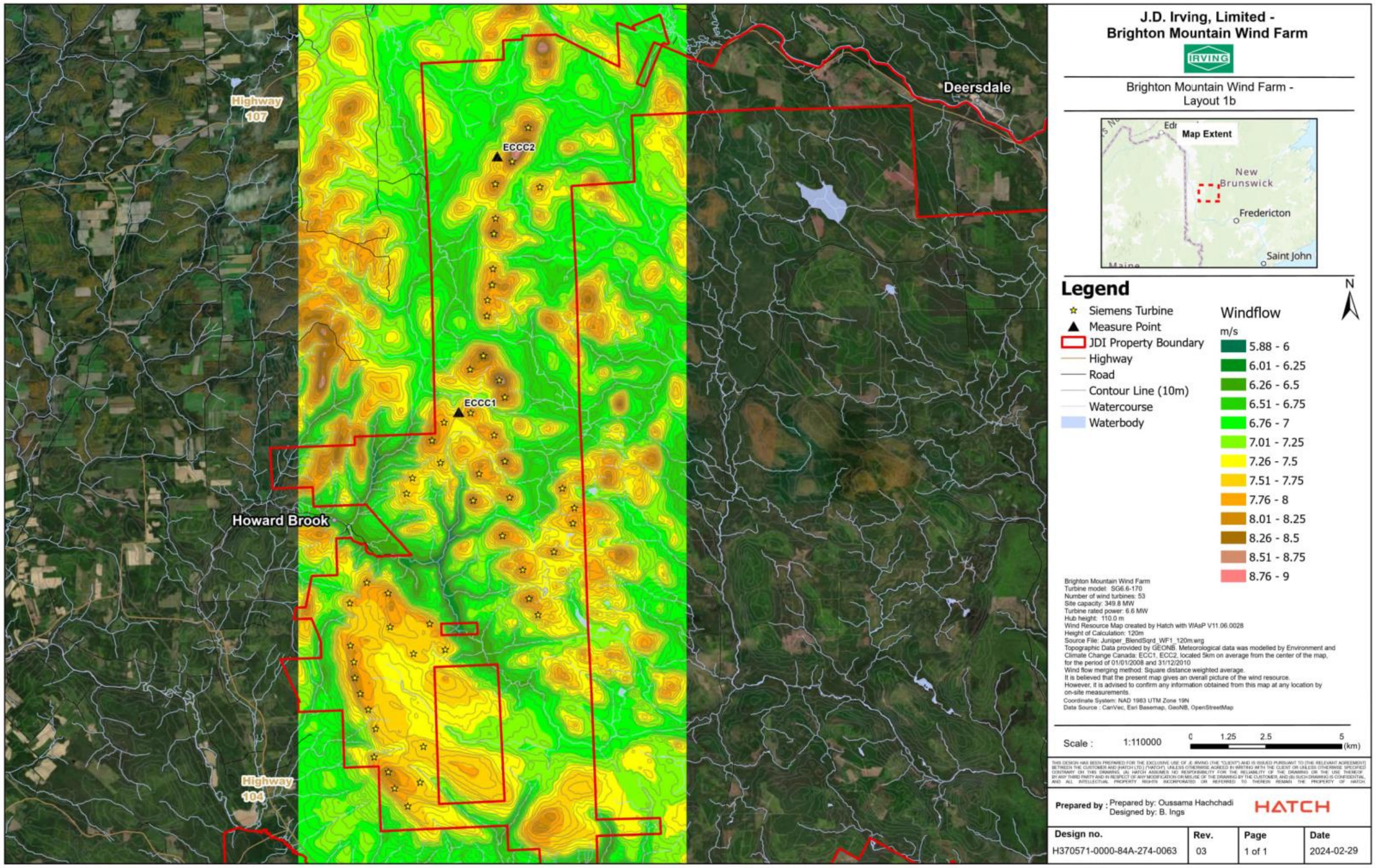

Figure 2-8: Siemens SG 6.6-170 Layout

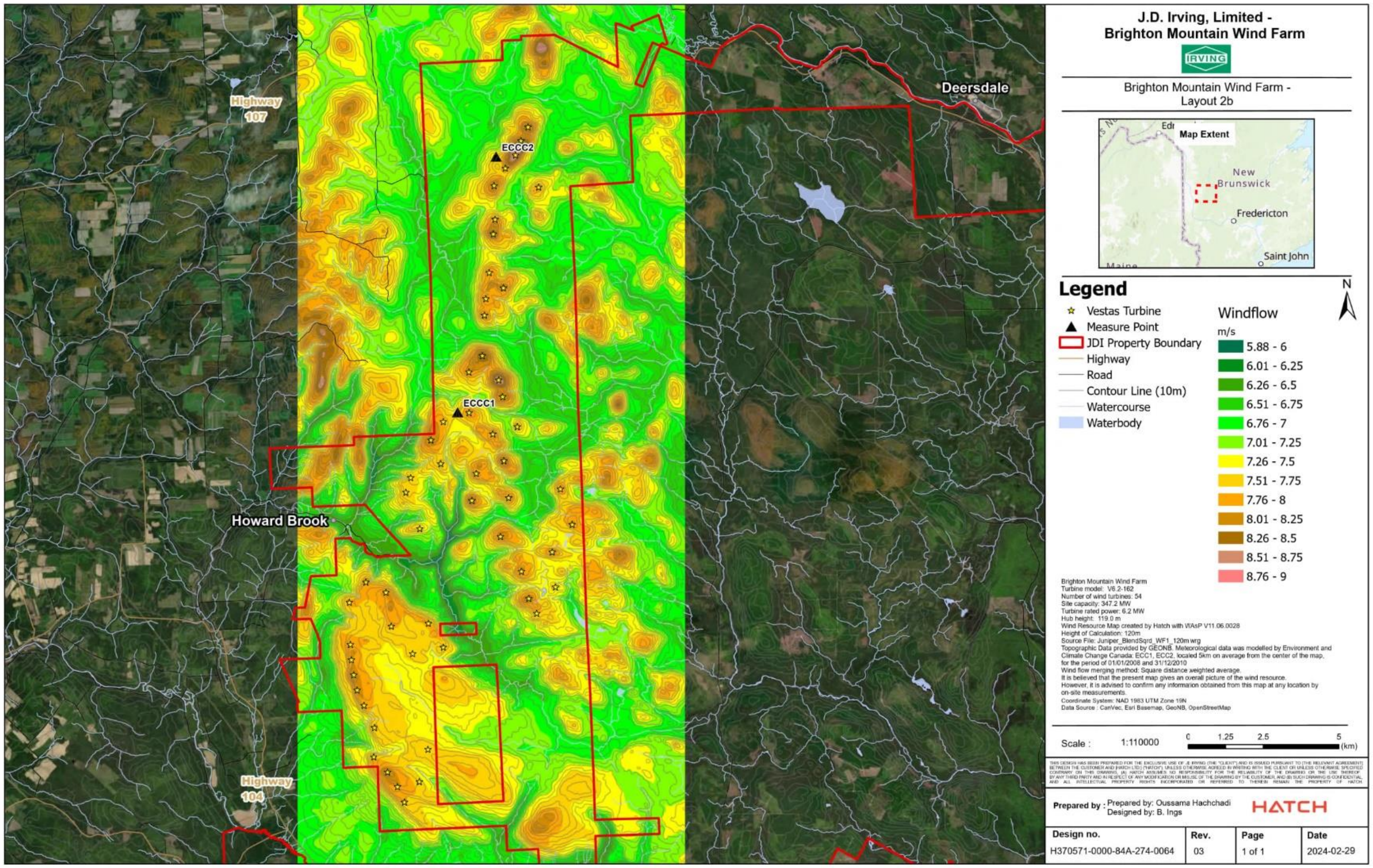

Figure 2-9: Vestas V162 Layout

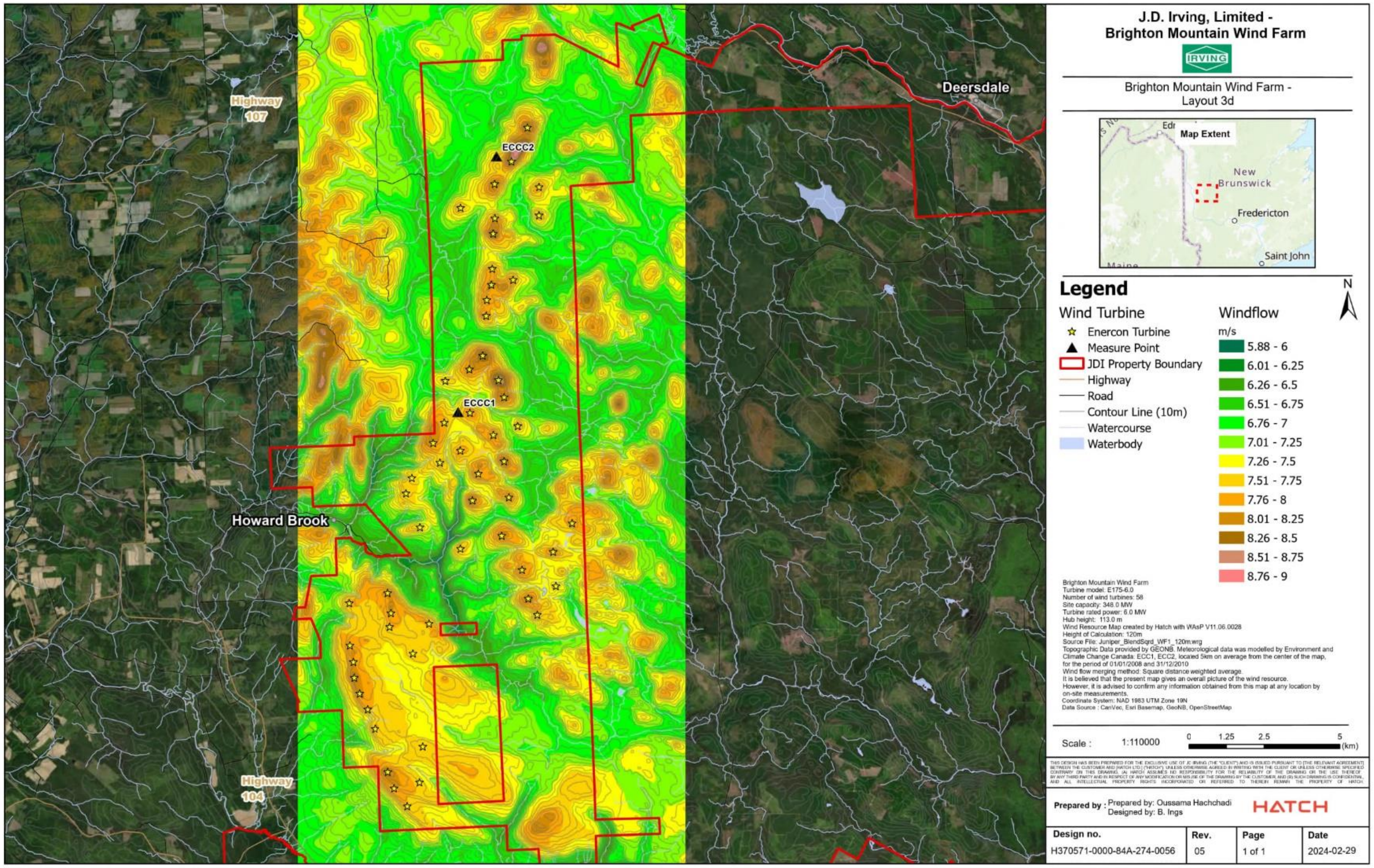

Figure 2-10: Enercon E175 Layout

2.6.2 Option Assessment Results

For the purpose of this EIA Registration, the Project has modelled the Enercon E175 Model, at 58 optimized locations throughout the Site Property Boundary. This scenario was selected as it was the greatest number of turbines required to be installed onsite, as well as the tallest (200.5 m tall from tower base to tip of blade in the upright position), and therefore a ‘worst-case’ scenario for potential impacts. Final WTG model will be selected at a later date, during detailed design, but will be commensurate with or less than the specifications of the Enercon E175. Figure 2-11 shows the layout of the 58 Enercon WTGs, that was brought forward for additional engineering purposes. This layout was further optimized, to reduce impact to offsite receptors in terms of visual impacts (shadow flicker) and noise. WTG location coordinates are also presented in Table 2-1.

Table 2-1: Turbine Location Coordinates

Turbine Locations		
Turbine Number	Latitude	Longitude
1	46.49417	-67.24035
2	46.48829	-67.24395
3	46.48419	-67.24756
4	46.47758	-67.25505
5	46.47638	-67.2359
6	46.46734	-67.25526
7	46.46276	-67.25614
8	46.4523	-67.25688
9	46.44752	-67.25741
10	46.44302	-67.25952
11	46.43832	-67.25991
12	46.42645	-67.26181
13	46.42245	-67.26767
14	46.41906	-67.25523
15	46.41394	-67.25299
16	46.40948	-67.26784
17	46.40673	-67.27903
18	46.40272	-67.25796
19	46.40071	-67.28395
20	46.39483	-67.2536
21	46.39482	-67.28128

Turbine Locations		
Turbine Number	Latitude	Longitude
22	46.39128	-67.26479
23	46.39044	-67.29347
24	46.44886	-67.24796
25	46.38589	-67.29614
26	46.38401	-67.25189
27	46.38335	-67.26758
28	46.39828	-67.27232
29	46.37588	-67.2249
30	46.37262	-67.25533
31	46.3675	-67.23335
32	46.36231	-67.2469
33	46.35025	-67.30372
34	46.35626	-67.30499
35	46.35371	-67.2445
36	46.3535	-67.32181
37	46.34881	-67.24075
38	46.34686	-67.28742
39	46.34617	-67.30443
40	46.34088	-67.32194
41	46.36903	-67.27322
42	46.33806	-67.29462
43	46.33594	-67.32058
44	46.33122	-67.32035
45	46.32646	-67.31816
46	46.3217	-67.31484
47	46.31585	-67.31177
48	46.31025	-67.29126
49	46.41919	-67.27816
50	46.30292	-67.30657
51	46.29961	-67.293
52	46.298	-67.30401

Turbine Locations		
Turbine Number	Latitude	Longitude
53	46.29257	-67.29849
54	46.46793	-67.23619
55	46.47068	-67.26994
56	46.40524	-67.24738
57	46.37568	-67.29045
58	46.35724	-67.23248

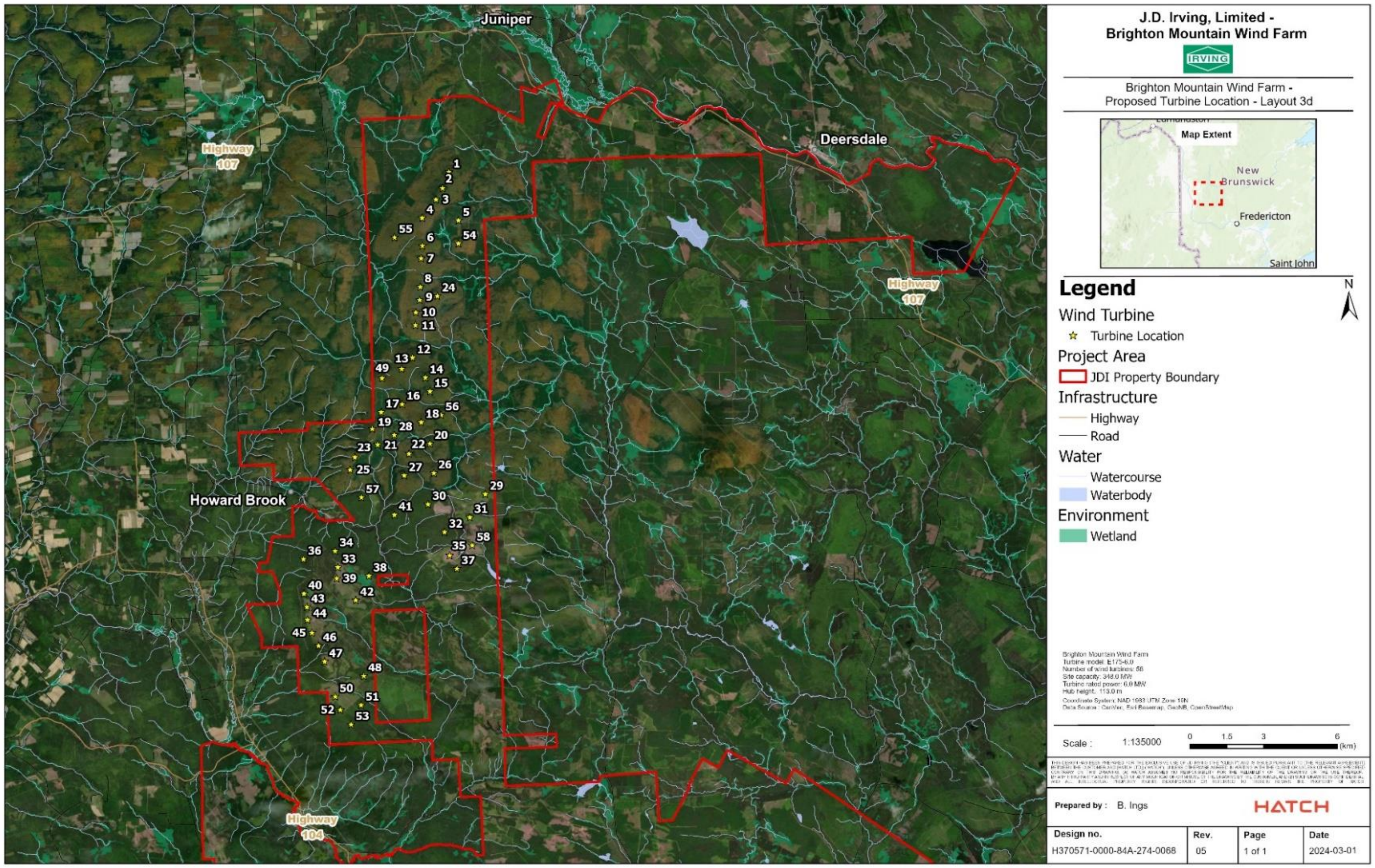

Figure 2-11: 58 Enercon WTG Within the JDI Property Boundary

2.7 Siting Considerations

The following sections detail the list of factors and constraints that have been considered during the proponent's analysis.

2.7.1 Technical Considerations

- Sufficient wind resource;
- Regional topography;
- Proximity to existing transmission system; and
- Turbine technology.

2.7.2 Environmental Considerations and Setbacks

- Proximity to wetlands;
- Proximity to residential dwellings or other noise and shadow flicker receptors;
- Sensitivity of flora & fauna;
- Proximity to provincial or national parks, nature reserve, protected natural areas, as well as environmentally sensitive areas; and
- Risk of archaeological resource disturbance.

2.7.3 Land Use Considerations

- Known culturally significant areas;
- Site accessibility;
- Land ownership;
- Communication corridors;
- Current land use;
- Future land use; and
- Proximity to residential properties, communities, and towns.

2.7.4 Planning Considerations

- Electricity from Renewable Resources Regulation, NB Reg 2015-60;
- New Brunswick Department of Environment and Local Government (NBDELG). New Brunswick Sector Specific Guidelines: Additional Requirements for Wind Turbines – 2019 (NBDELG 2019);
- NBDELG. Guide to Environmental Impact Assessment in New Brunswick – 2018 (NBDELG 2018);

- New Brunswick Department of Natural Resources (NBDNR). Allocation of Crown Lands for Wind Power Projects" (NBDNR 2012);
- The Clean Environment Act; and
- NB regulation 87-83.

2.8 Physical Components and Dimensions

2.8.1 Property

The property is currently owned by JDI. The Project Footprint (PF) is the anticipated area of physical disturbance and infrastructure installed as per the design. The Primary Development Area (PDA) is the area of physical disturbance (i.e., physical footprint) associated with the Project, plus an additional buffer where either direct, or indirect effects might occur as a result of ground disturbance or construction. This buffer is established as 30m along roads, 60m for high voltage generator lead lines, and 100m around turbine pads and ancillary facilities. The PDA and PF within the property is provided in Table 2-2 as follows:

Table 2-2: Approximate Area of the PDA vs the PF

Category	Approximate Area of the PDA (km^2)	Approximate Area of the PF (km^2)
Existing Roads	7.31 km^2	1.45 km^2
New Roads	3.73 km^2	0.74 km^2
Turbine Pads	4.77 km^2	0.61 km^2
Substation -North	0.224 km^2	0.14 km^2
Substation – South	0.224 km^2	0.14 km^2
Terminal	0.092 km^2	0.092 km^2
High Voltage Generator Lead Line (ROW)	3.42 km^2	1.13 km^2
Quarry Locations (5 Total)	1.41 km^2	1.41 km^2
Totals	**~18.77 km^2 (Accounts for overlap)**	**3.72 km^2 (Accounts for overlap)**

Efficiencies between cleared areas will be further explored in subsequent project phases to reduce the PF and the PDA.

The total area of the JDI Property where the Project will be located, is 681.15 km^2. Given that the total area of the Project Footprint (Table 2-2) is anticipated to be 3.72 km^2 this equates to 0.33% of the JDI Property being developed for the wind farm. If the full PDA area was to be developed, this would represent 2.7% of the total area of the JDI Property. The final total amount of forestry cleared will be relayed to the appropriate regulatory body once it has been determined.

2.8.2 *Surveying, Siting and Logistic Activities*

Prior to advancing Projects execution, a number of enabling work needs to be performed. These will include:

- Engineering and logistics site visits to evaluate the Project site and soil conditions, as well as additional roads surveys at site access points;
- Improvements on Site Drainage; and
- Widening and improvement of the site entrance and existing roads for safe access to the trucks, trailers, lowboys, amongst others as required.

The Proponent selected Engineering Consultant, Procurement, Construction Manager, and selected WTG manufacturer will coordinate transportation of oversize and overweight WTG components that will require special transportation permits. Such components include, but are not limited to the nacelle, tower sections, and rotor blades. Given the type of cargo being transported, Service New Brunswick, the Department of Transportation and Infrastructure of New Brunswick (DTINB), and certain local municipalities (e.g., City of Saint John and City of Fredericton) will be consulted to ensure the following:

- There are no gaps in the list of potential permits to be obtained;
- All transportation regulations are followed (e.g., general DTINB regulations for oversize load restrictions with respect to the time of day);
- There are no conflicts with school session times; and
- Commercial vehicle enforcement (CVE) is employed.

2.8.3 *Wind Turbine Generator*

The project anticipates as many as 58 WTGs to be installed. The model for the wind turbine is under evaluation and currently includes Siemens, Enercon and Vestas. For the purposes of this EIA Registration, the turbines will be assumed to have the Enercon E175 maximum height of 200.5 m, the greater of the heights available from the three WTG models being evaluated to account for a worst-case assessment. Additional technical characteristics of the WTG to be evaluated are presented in Table 2-3 below.

Table 2-3: WTG Technical Characteristics

Characteristic	Measurement and Unit
Hub Height	113 m
Total Height	200.5 m
Rotor Diameter	175 m
Rotor Swept Zone (RSZ)	25.5 m to 200.5 m (AGL)
Swept Area	23,848 m²
Revolutions per Minute (RPM)	4 to 12 RPM

Characteristic	Measurement and Unit
Cut Out Wind speed	20 m/s
Tower Material	Steel tower or hybrid steel tower
Design Service Life	25 years

All turbines being considered appropriate for site will be designed and certified according to the latest international standards. Notably, the International Electrotechnical Commission (IEC) 61400 standard serves as the core basis for design and all turbines must have documented proof of compliance.

In the case of Enercon, by default, all of their WTGs are equipped with the Enercon Supervisory Control and Data Acquisition (SCADA) system that connects them to their technical service dispatch. A remote dispatch can retrieve each WTG's operating data at any time and instantly respond to any irregularities or malfunctions. The manufacturer has also implemented methods to make their WTG suitable for use at Cold Climate sites. Per the definition of Germanischer Lloyd in “GL Guidelines 067 Revision 3; 26.01.2009”, a site is considered a Cold Climate site if minimum temperatures below -20°C are measured during long-term measurements (10 years or longer where possible) at an average of more than nine days per year. The nine-day criterion is fulfilled if the temperature at the site remains below -20°C for one hour or longer on the respective days. The methods include an ice detection system and adjustments to mechanical and electrical components to be verified for temperatures down to -30°C to -40°C.

2.8.3.1 Turbine Lighting Requirements

Turbine lighting is outlined in Transport Canada's *Standard 621 – Obstruction Marking and Lighting – Canadian Aviation Regulations* (CARs) in *Chapter 12: Marking and Lighting of Wind Turbines and Wind farms* (2021).

For wind turbines, day marking requirements include one of the following depending on the wind turbine structure:

- For turbines with a solid silhouette, the rotor blades, nacelle and upper 2/3 of the supporting mast are painted an aviation white or an off-white colour. White colours have a luminance factor Y of not less than 0.80. Off-white colours have a luminance factor Y of not less than 0.57; or
- For turbines with a lattice work support mast, the mast painted in bands of orange and white as for skeletal structures.

For twilight and nighttime markings, it is understood that the turbines require all the following:

- Two CL-864 lights installed on the nacelle, with one light operating and the second light serving as backup in case of failure of the operating light. The lights are installed on top of each other so that the output of an operating light is not blocked by the standby light for angles of approach or are installed with a horizontal separation of not less than 1 m;

- For a solid support mast, at least three CL-810 lights are installed for an intermediate level at half the nacelle height (± 10 m) and configured to flash at the same rate as the CL-864 light on the nacelle;
- The CL-864 lights are installed in such a manner as to provide an unobstructed view for aircraft approaching from any direction; and
- The CL-864 lights are designed to draw power from the electric grid in case of a wind turbine power failure to ensure continuous illumination.

Figure 2-12 outlines the windfarm lighting requirements according to Transport Canada.

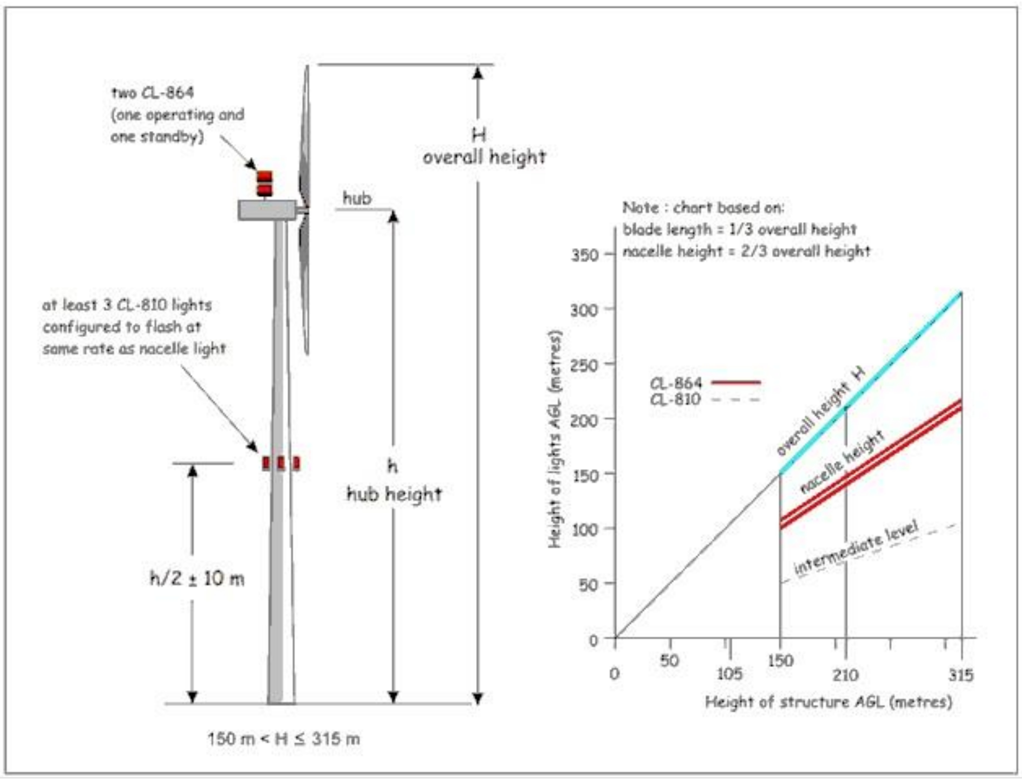

Figure 2-12: Transport Canada Lighting Requirements

During construction, temporary lighting is required once the turbine structure reaches 60 meters or higher. As construction progresses, temporary lights will be moved to the highest point of the completed structure, and additional temporary lights will be used at each level where the structure intervenes.

2.8.4 *Turbine, Crane Pad and Turbine Foundation*

2.8.4.1 Turbine and Crane Assembly Pad

The turbine pad typically encompasses both the crane pad and hardstands where the latter refer to an area where WTG components, WTG equipment, transport equipment, and storage equipment can be stored. The purpose of crane pads is to safely accommodate the weight of the crane required for installation of the WTGs and to perform maintenance. For this Project, the installation of the WTGs will require turbine pads that will be approximately 100 x 100 m in size. Turbine pads will be constructed "High and Dry', away from watercourses and wetlands, with appropriate erosion and sedimentation control installed around each pad.

Crawler cranes will be considered for the erection of WTGs. Crane mobilization and assembly at each WTG site would be required, as well, partial crane 'teardown' would be required to transport crane components between different turbine pad sites. Crane pads will be adjusted accordingly to ensure ground stability and safe operations during the construction phase. Tower cranes may also be utilized on the Project to erect WTGs. If tower cranes are selected for use., they will require a spread footing foundation to be constructed. It has been determined that approximately 350 m³ of soil and inorganic materials (i.e., bedrock) needs to be excavated for site preparation of the Spread footing. This will be replaced by 109 m³ of engineered backfill, 25 m³ of mud slab at 15 megapascal (MPa), and 216 m³ of concrete at 30 MPa. Reinforcing steel and 2" anchor bolts (American Iron and Steel Institute AISI 4140) will also be used. Figure 2-13 below shows a schematic of the spread footing foundation. The crane pads will be maintained throughout the operation of the wind farm to allow for maintenance and replacement. Ultimately, a detailed geotechnical investigation will be undertaken to establish the nature of the soil at the various WTG locations and will influence the final design of the pads and foundations alike.

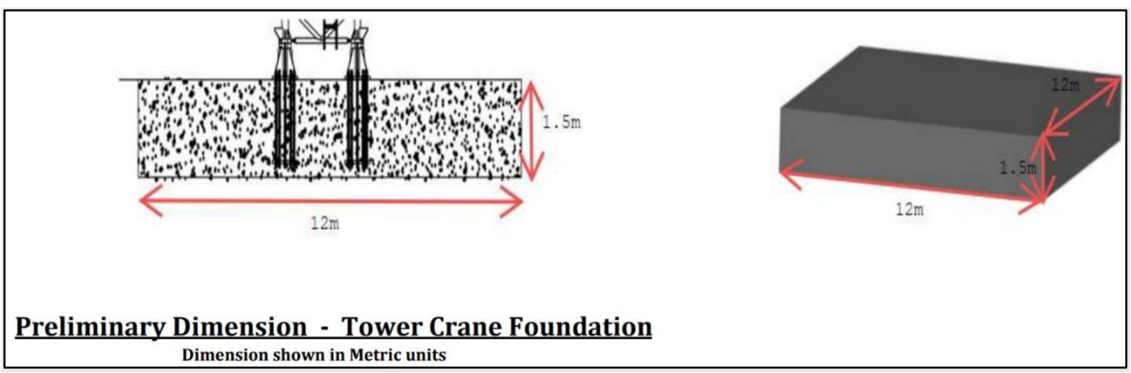

Figure 2-13: Spread Footing Foundation for the Crane Pad

2.8.4.2 Turbine Foundation

The base diameter of the concrete turbine foundations will differ depending on the type of foundation that will be utilized. A detailed geotechnical investigation will be required to determine the final design of the concrete turbine foundations which will be drafted, reviewed, and approved by a registered Engineer recognized by the Association of Professional Engineers and Geoscientists of New Brunswick (APEGNB). Several preliminary foundation designs have been investigated with base diameters ranging from 16 m to 28 m. These include the rock anchor foundation, the typical shallow concrete foundation with no ground water, and the combined concrete foundation for tower crane and turbine with no ground water as shown in Figure 2-14, Figure 2-15, and Figure 2-16, respectively. The depth of excavation will vary between 2 m to 3.5 m.

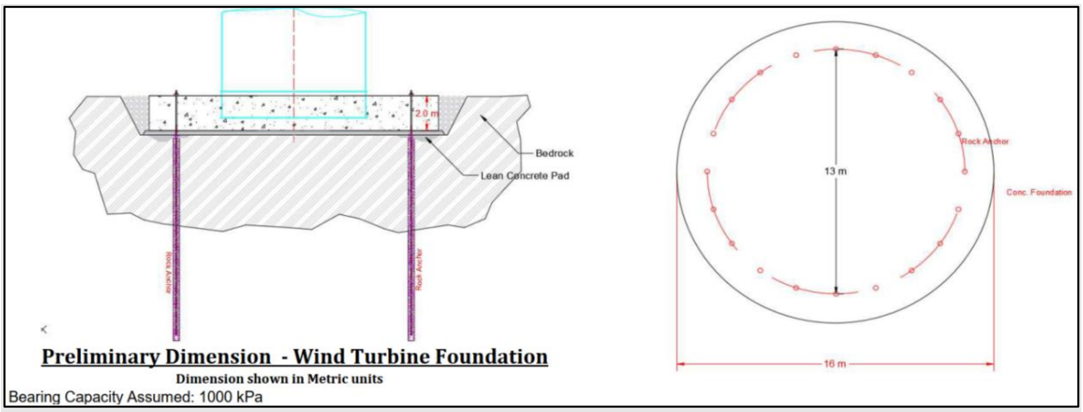

Figure 2-14: Turbine Rock Anchor Foundation Schematic

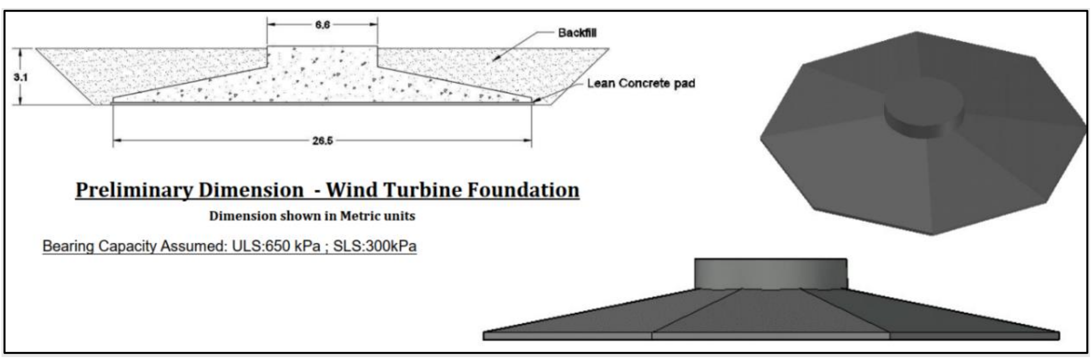

Figure 2-15: Typical Shallow Concrete Foundation with no Ground Water Schematic

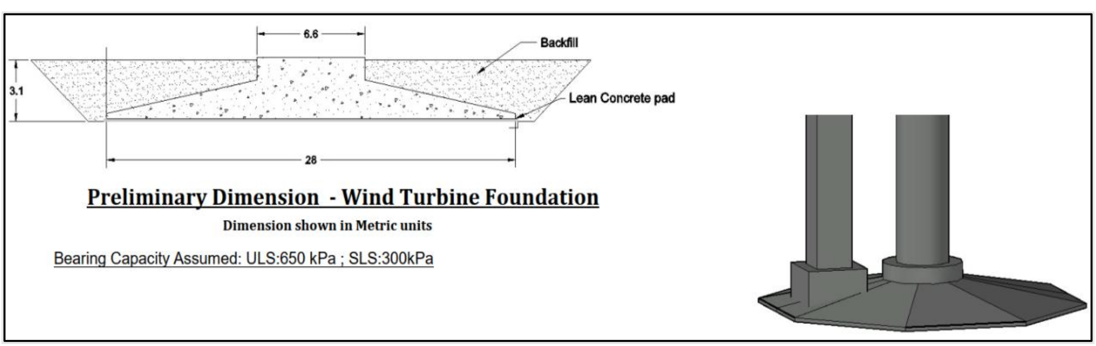

Figure 2-16: Combined Concrete Foundation for Tower Crane and Turbine with no Ground Water Schematic

Table 2-4 presents the characteristics of the different turbine foundations.

Table 2-4: Turbine Foundations Details

Description	Rock Anchor	Typical Shallow Concrete	Combined Concrete
Unclassified Excavation (m^3)	720	2,700	3,000
Engineered Fill (m^3)	285	1,925	2,080
Mud Slab – 15 MPa (m^3)	35	85	95
Concrete Slab – 35 MPa (m^3)	400	690	825
Formwork (m^2)	115	125	160
Reinforced steel – 400 MPa (kg)	40,000	69,000	82,500
Rock Anchors – 65 mm diameter Grade 1030 MPa	20	-	-

The construction of the various foundations will include excavation to a depth of several meters, the placement of formwork steel reinforcement, the pouring of concrete within the formwork, and the placement of rock anchors if required. Excavators such as the CAT 336 (or equivalent) will be used to facilitate excavation, although other alternatives such as blasting will be considered if they are deemed necessary in future Project phases. Following placement of a turbine foundation, backfill will be compacted in layers on top of the foundation to level it with the existing ground level. The soils that will be removed during excavation would be stored in accordance with provincial regulations and best practice guidelines. This will be done in consultation with the appropriate Crown Lands department if required.

2.8.5 Civil and Electrical Works

In the case of the Enercon E175 WTG, a ≤34.5 kV LV/MV transformer is located inside of the nacelle and a ≤34.5 kV 2-cell switchgear is located inside of the tower.

A typical grounding method for WTGs is comprised of grounding rods that are bounded to a grounding ring which in turn is bonded to a foundation reinforcement. This will serve as the main protection against lightning for the WTGs. Grounding will also be installed at other areas as determined by the electrical engineers of the Project.

The collector network transmission lines (ranging to 34.5 kV to 69 kV voltage) that connect individual WTGs to each substation will partially be routed underground. Specifically, the collector network goes from overhead transmission to subsurface at 90 m from each turbine and substation. Trenches are therefore required for the safe burial of the underground cables. The following preliminary trenching requirements were considered for the Project:

- 1075 mm of depth, 780 mm of width, and 200 mm of sand depth at the bottom; and
- 1380 mm of depth, 1350 mm of width, and 530 mm of sand depth at the bottom.

In addition to the layer of sand at the bottom of the trench, typical electrical safety practice for underground cables calls for a minimum of 300 mm of sand be deposited on top of the cables prior to backfilling procedures. Other safety procedures such as marking the full of the trench with permanent warning signs to advise of the potential hazards of unsupervised and unauthorized excavation will also be put in place. Final trench and warning sign specifications will be designed in accordance with best engineering and safety standards. If required, the design engineer will consult the Crown Lands department for feedback.

2.8.6 Access Roads

The civil design layout utilized an existing road network previously used to haul out forestry materials. For the Project, these roads are to be upgraded to accommodate wide and heavy loads passing through them as per the design parameters listed in the developer package of the WTG manufacturer. Additionally, new access roads branching out from the existing road network are to be constructed to access the WTG pads.

2.8.6.1 New Access Roads

New access roads will be built on the property to accommodate the construction and maintenance of the wind turbines. The maximum width for new roads and existing roads to be upgraded will accommodate the delivery of WTG components. The construction of these access roads includes, but is not limited to, clearing and grubbing, excavation (possibly dynamiting rock) and drainage (ditches and culverts), and roads will be constructed Moreover, the profile grade, cross slopes as well as turning radius will be constructed as per the turbine’s manufacturer specifications. Per best practice standards and guidelines, the removed topsoil would be stored appropriately and later used for site restoration.

2.8.6.2 Upgraded Existing Access Roads

An approximate total of 95 km of existing road will be upgraded to accommodate the construction and maintenance of the wind turbines. The upgrade of these roads includes, but is not limited to, clearing and grubbing, excavation (possibly dynamiting rock) and drainage (ditches and culverts). Excavated material will be used as much as possible as fill material reducing the need to haul in aggregates. Moreover, the profile grade, cross slopes as well as turning radius will be constructed as per the turbine’s manufacturer specifications.

These existing roads are in use for the forestry industry of the Proponent. For roads that only need to be widened, only clearing and grading will be required which will greatly minimize environmental disturbance on the proposed Project site.

In the map illustrated in Figure 2-17, existing roads to be upgraded are indicated in light purple, the new access roads are in dark purple, and the turbine pads are located at the extremities of each new access road. Figure 2-18 through to Figure 2-28 show watercourses, and existing culverts along access routes to quarries and turbine pads. The extent and nature of work for culvert upgrades required, will be determined in detailed design, and be provided to NB-DELG through the Wetlands and Watercourse Alteration (WAWA) Permitting Process.

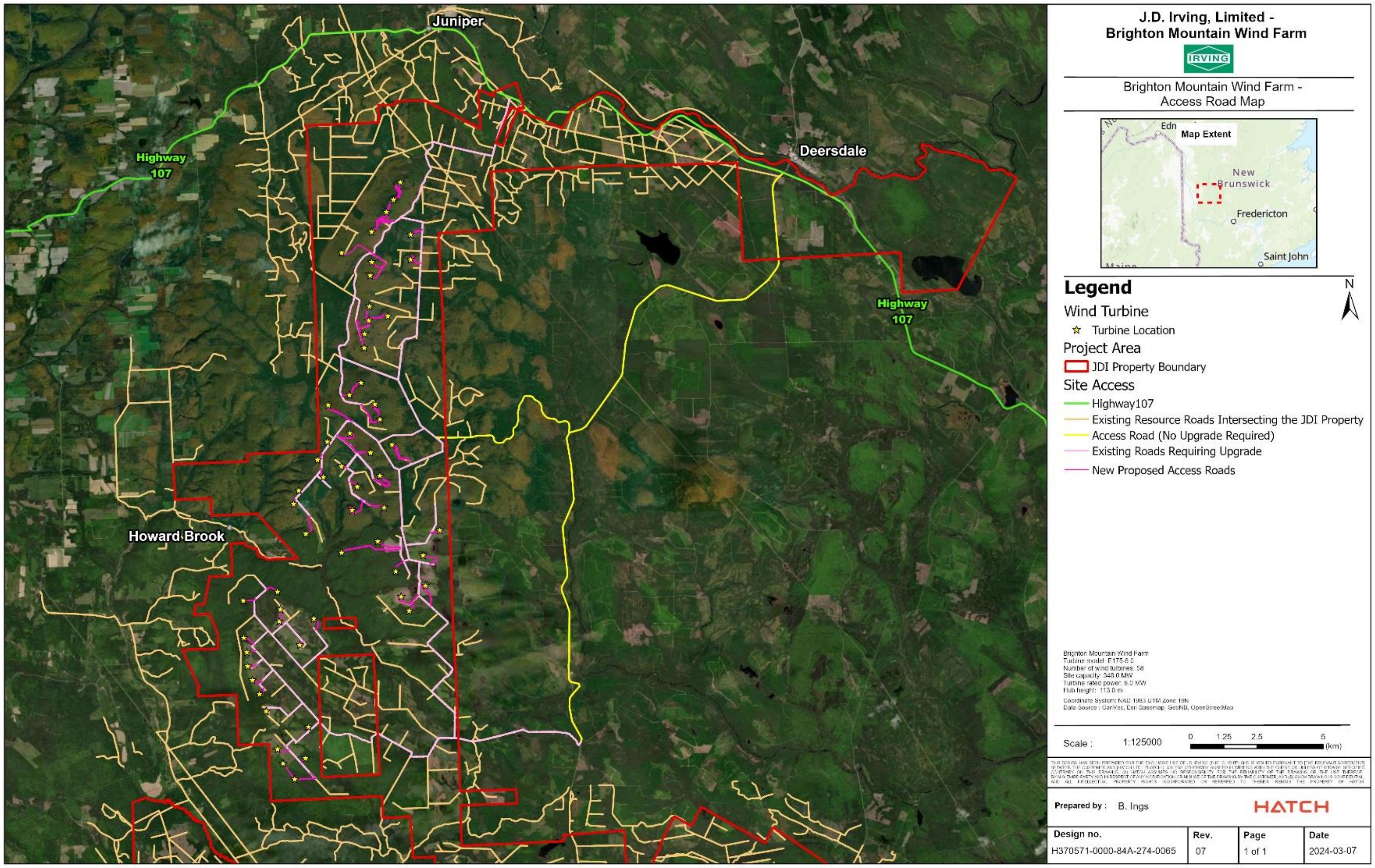

Figure 2-17: New and Existing Road Upgrades Required for Site Access

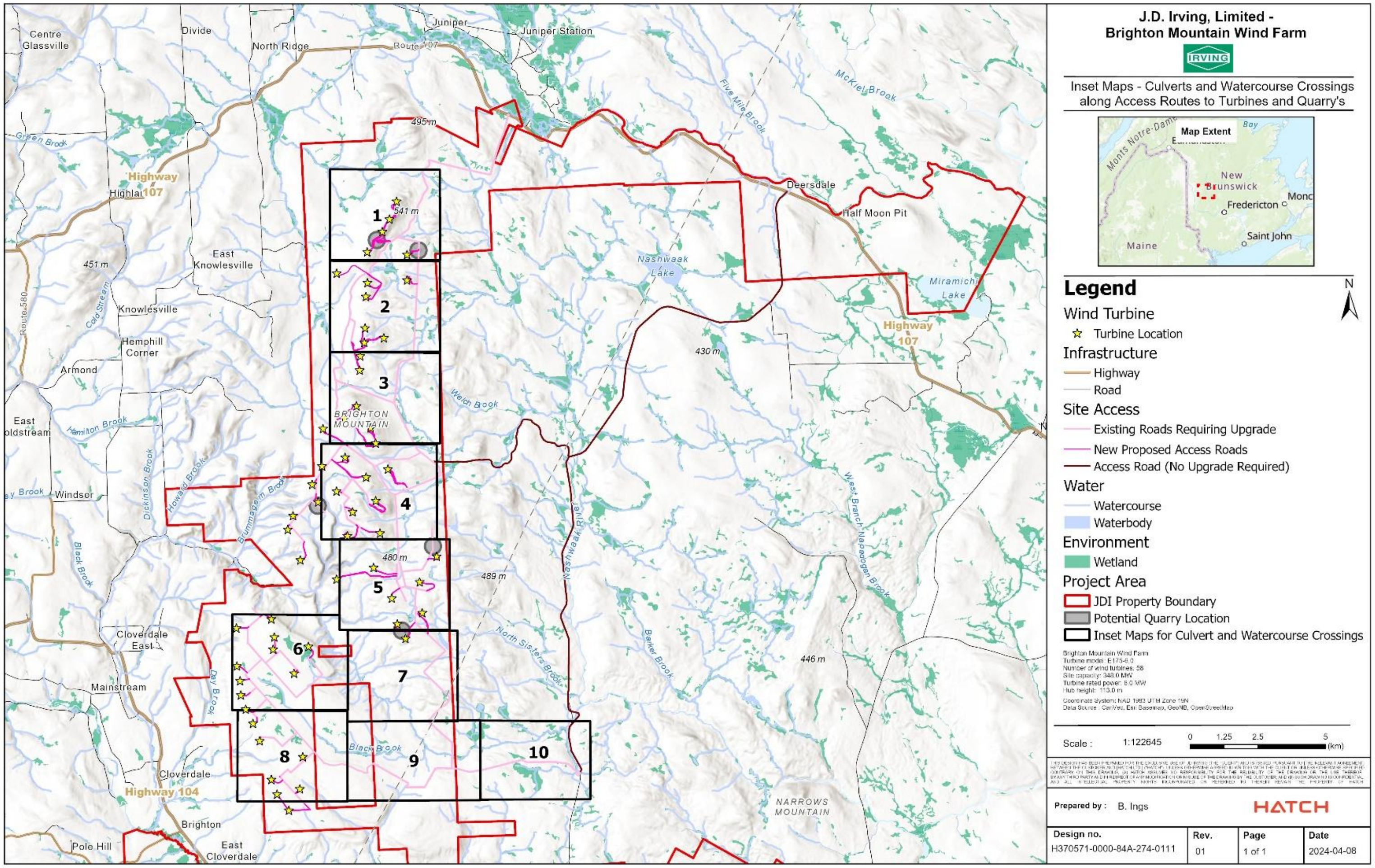

Figure 2-18: Culverts and Watercourse Crossings along Access Routes to Turbines and Quarry's

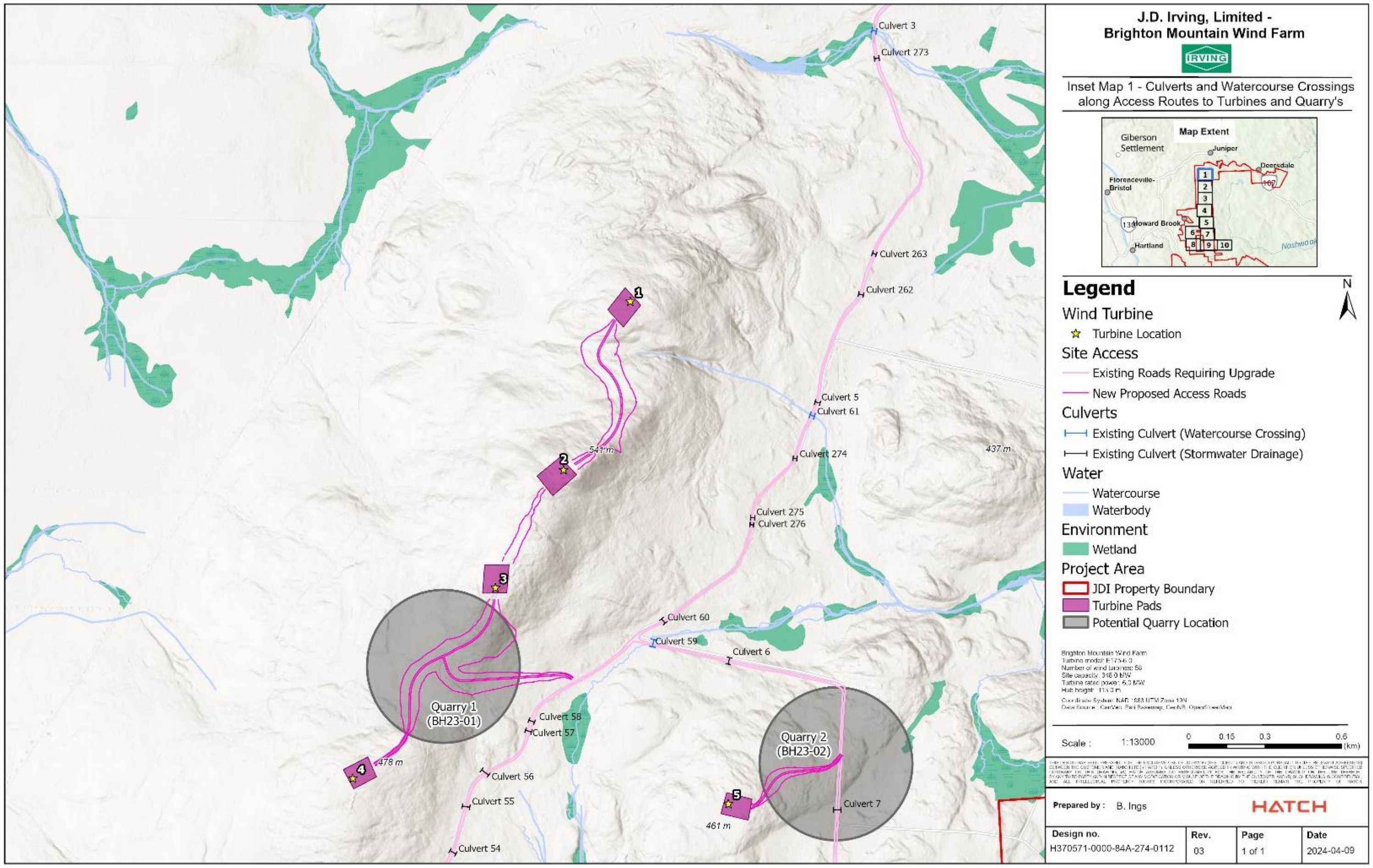

Figure 2-19: Culverts and Watercourses Along Access Routes- Inset Map 1

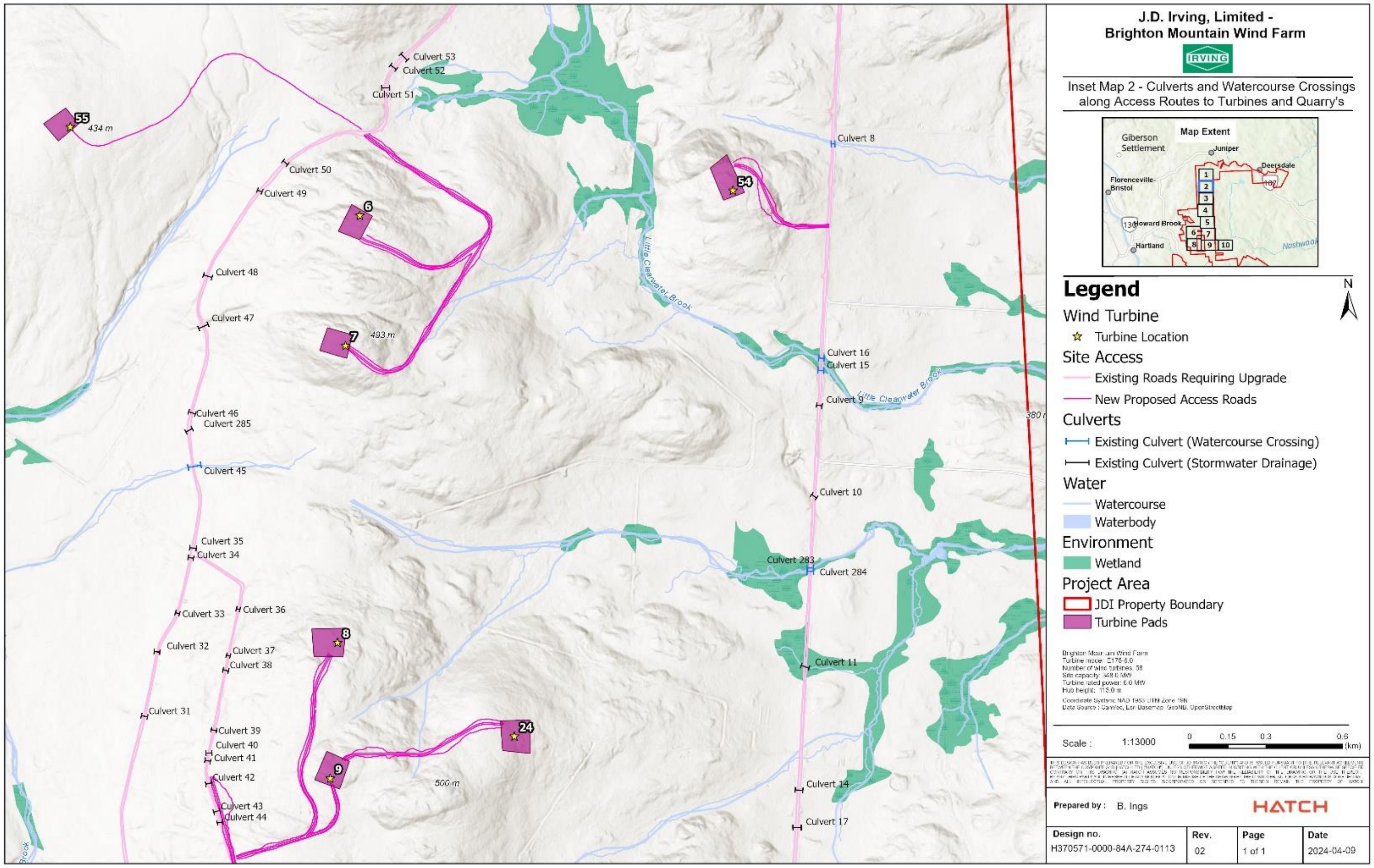

Figure 2-20: Culverts and Watercourses Along Access Routes - Inset Map 2

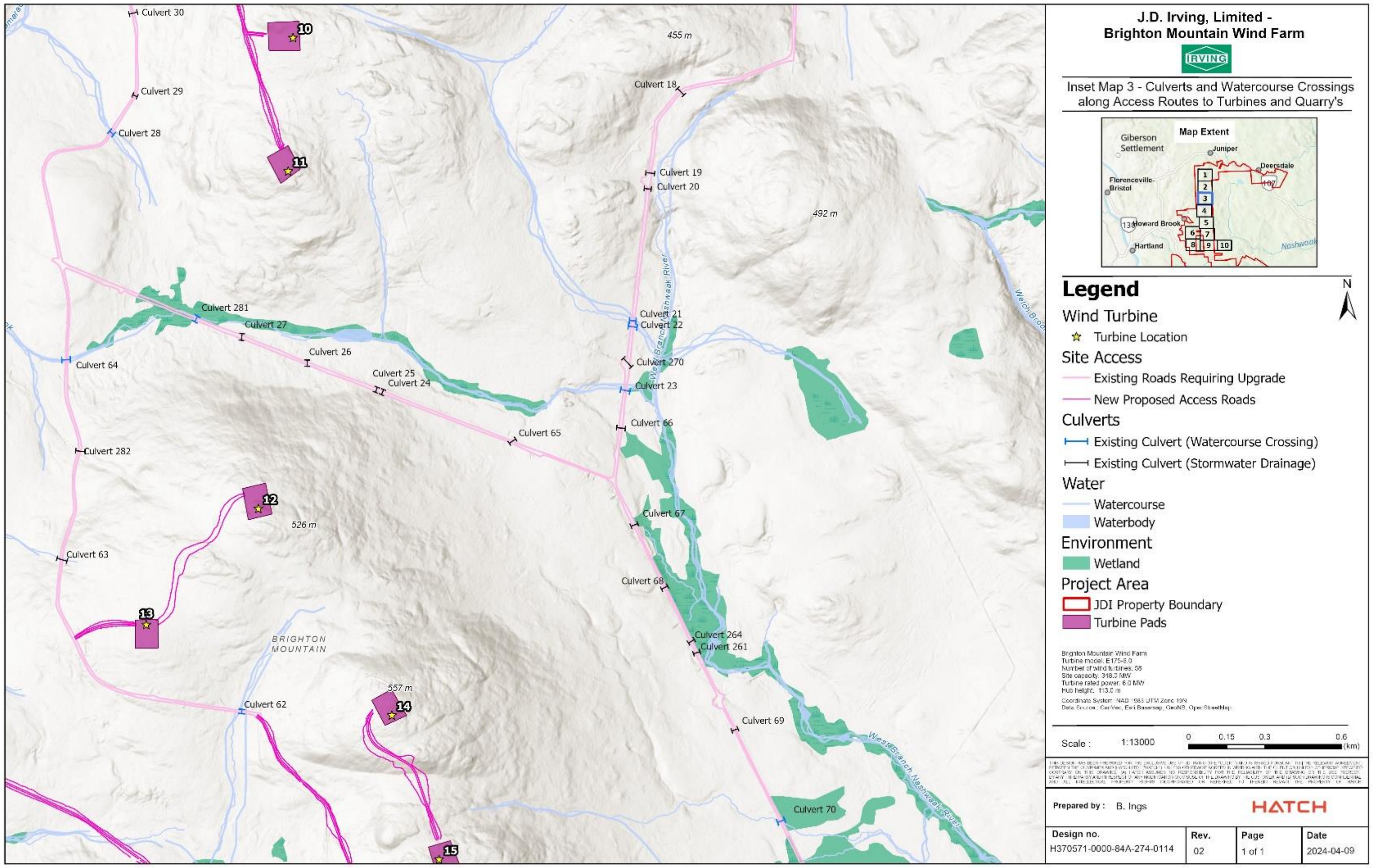

Figure 2-21: Culverts and Watercourses Along Access Routes - Inset Map 3

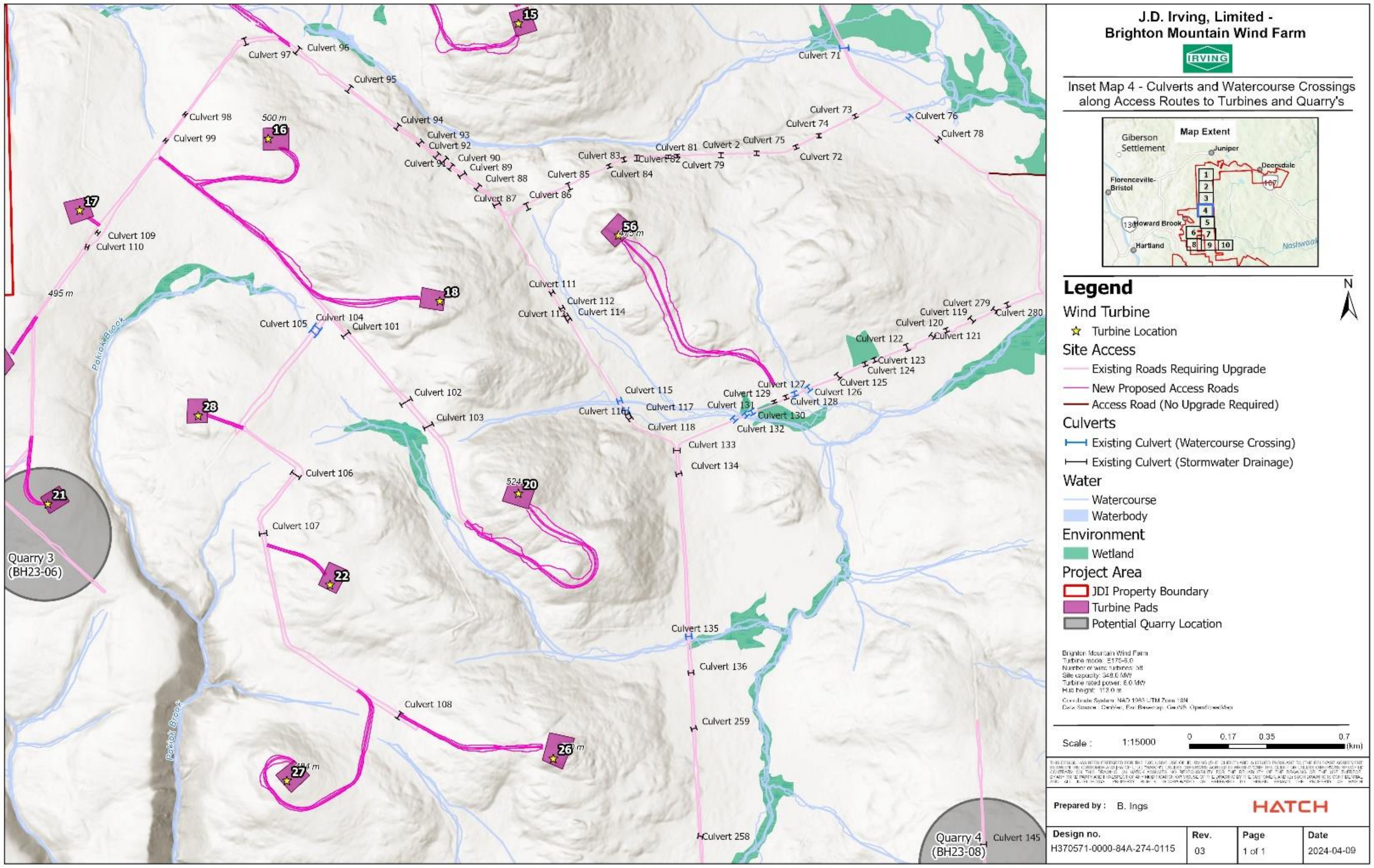

Figure 2-22: Culverts and Watercourses Along Access Routes - Inset Map 4

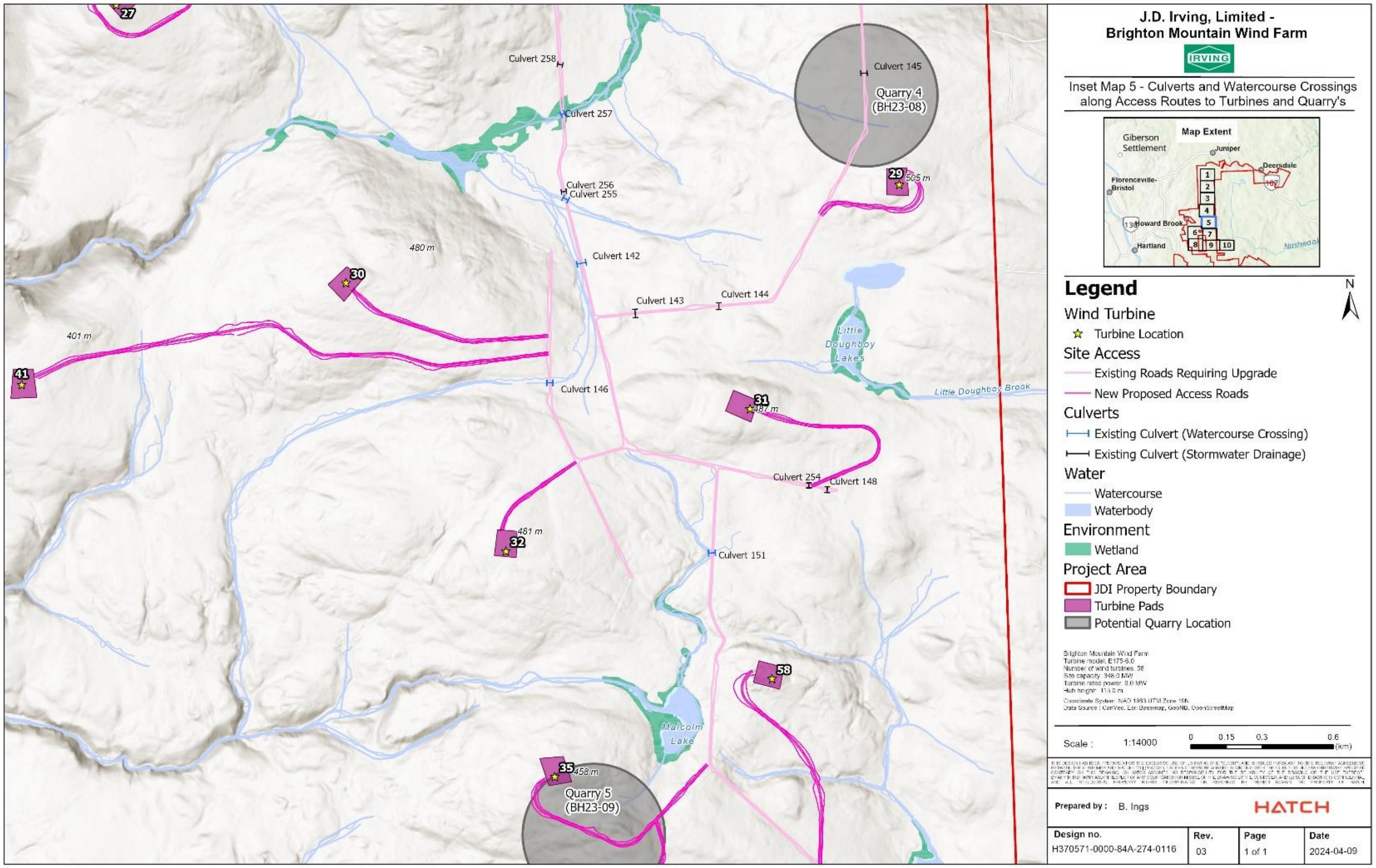

Figure 2-23: Culverts and Watercourses Along Access Routes - Inset Map 5

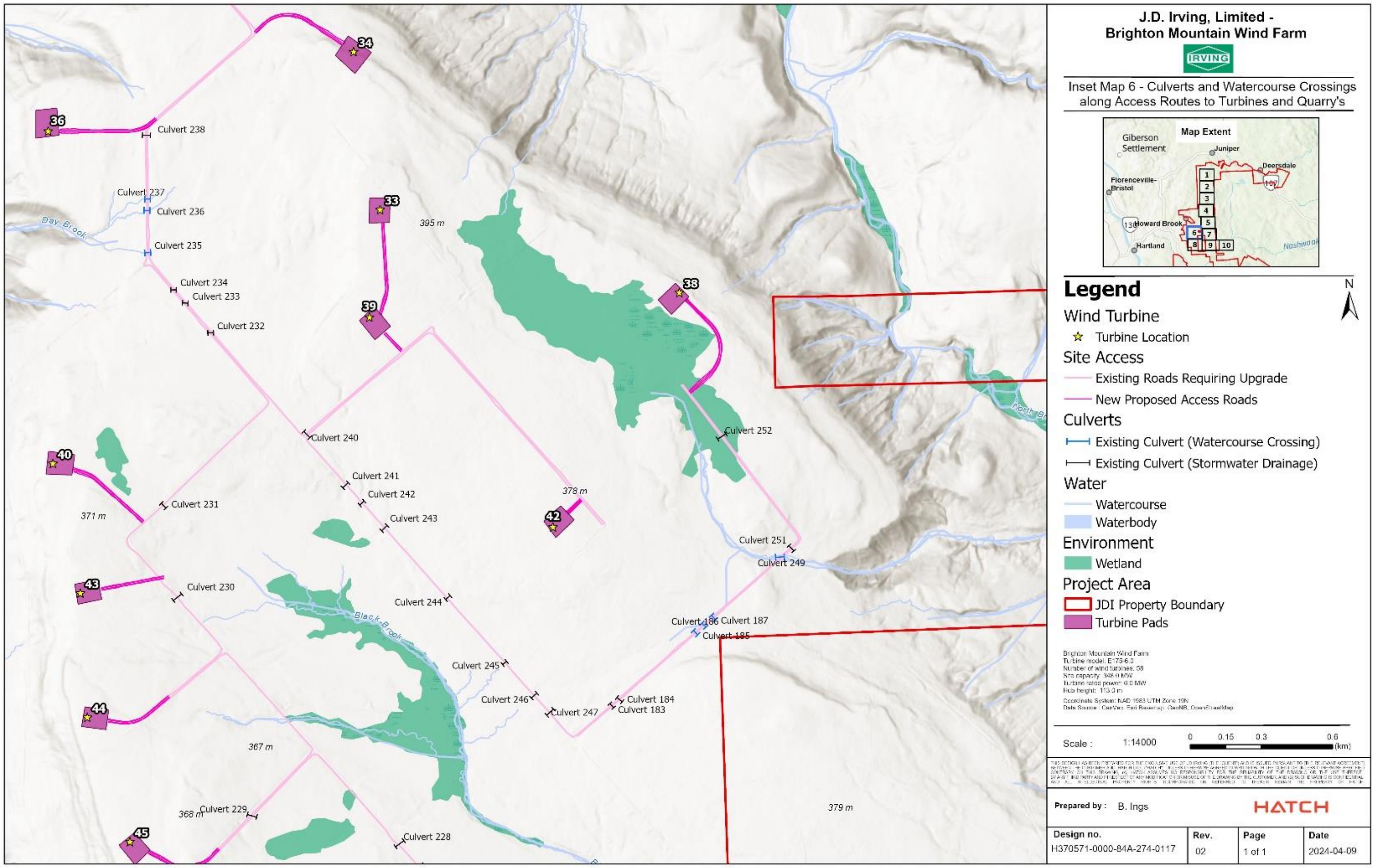

Figure 2-24: Culverts and Watercourses Along Access Routes - Inset Map 6

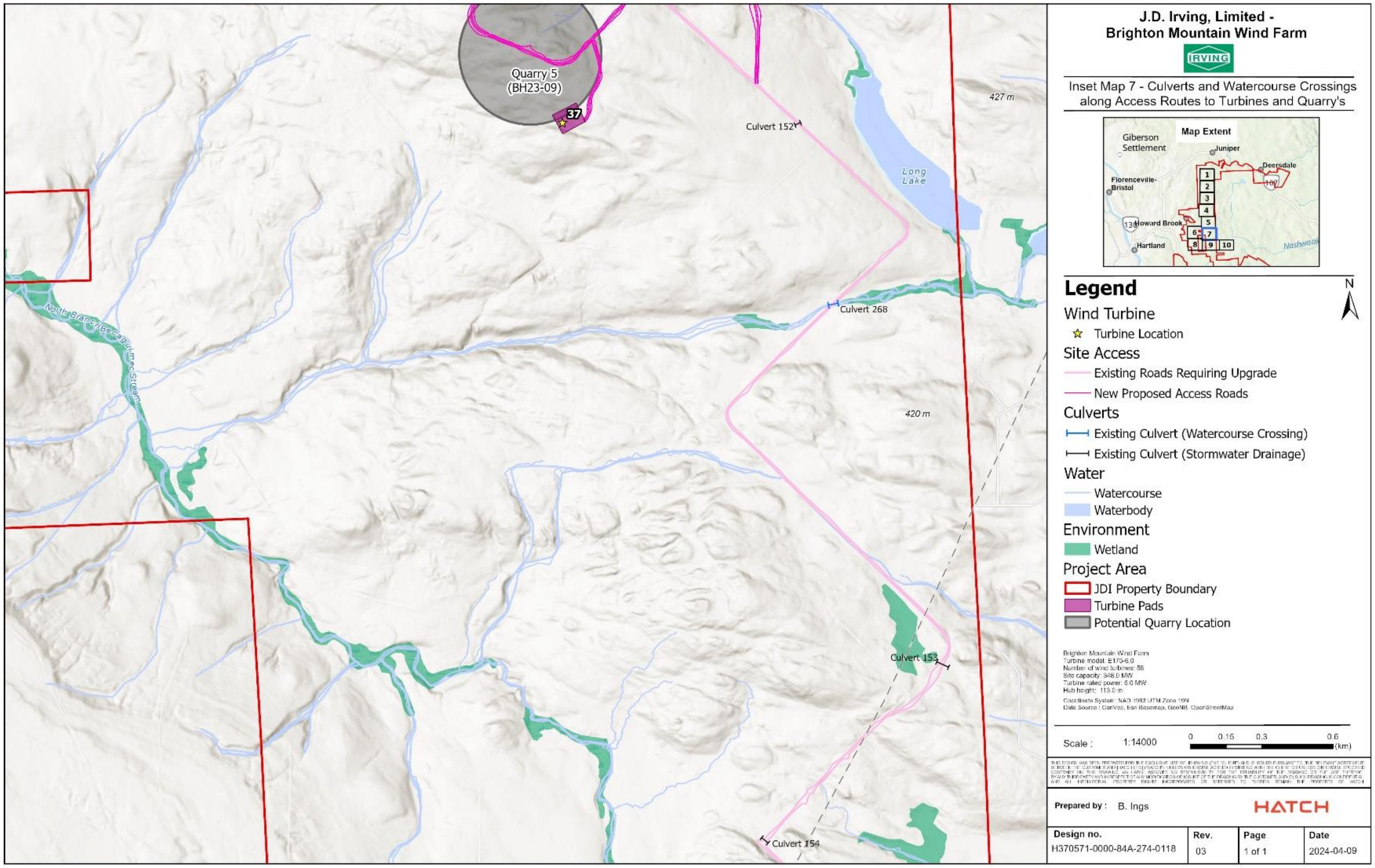

Figure 2-25: Culverts and Watercourses Along Access Routes - Inset Map 7

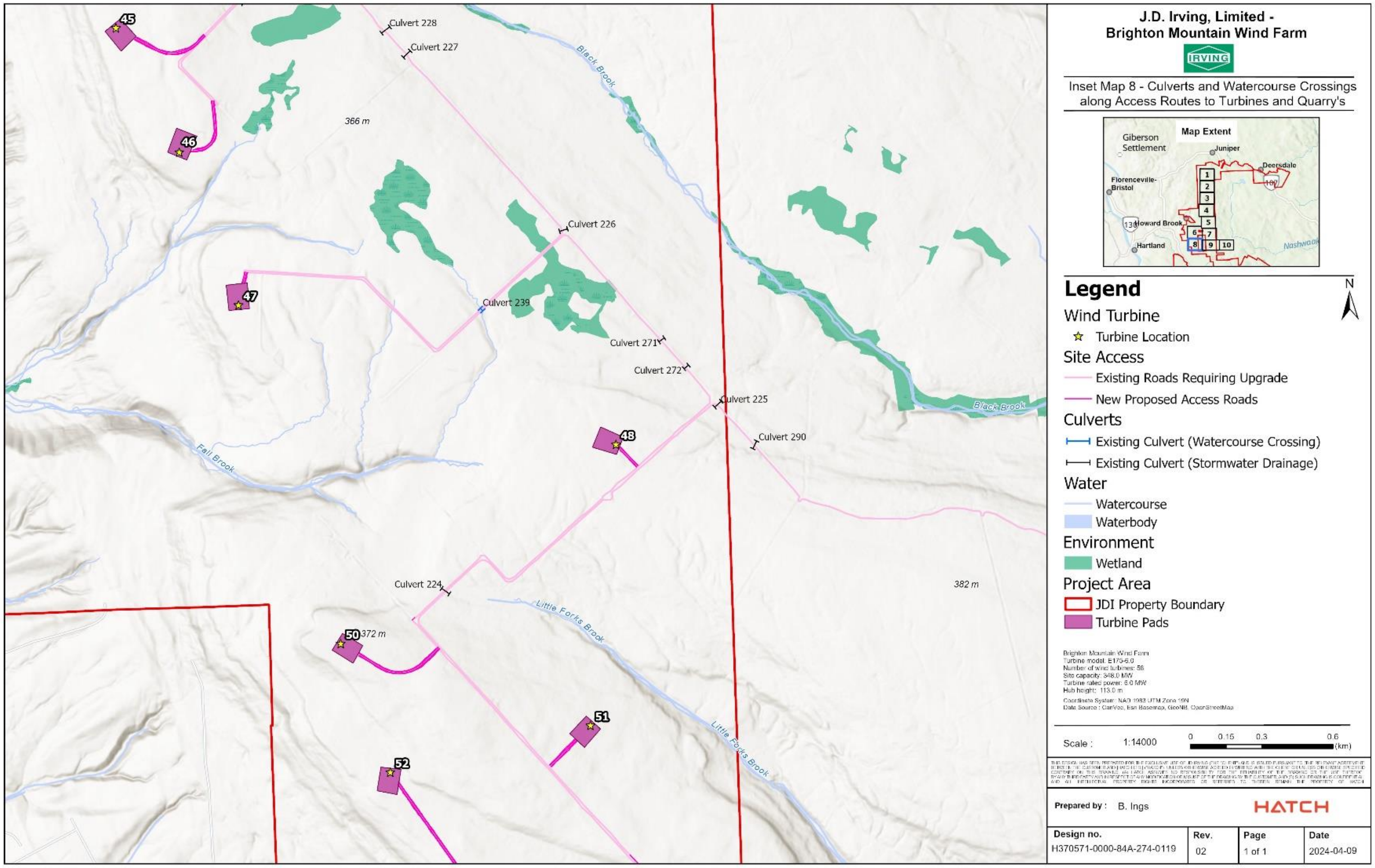

Figure 2-26: Culverts and Watercourses Along Access Routes - Inset Map 8

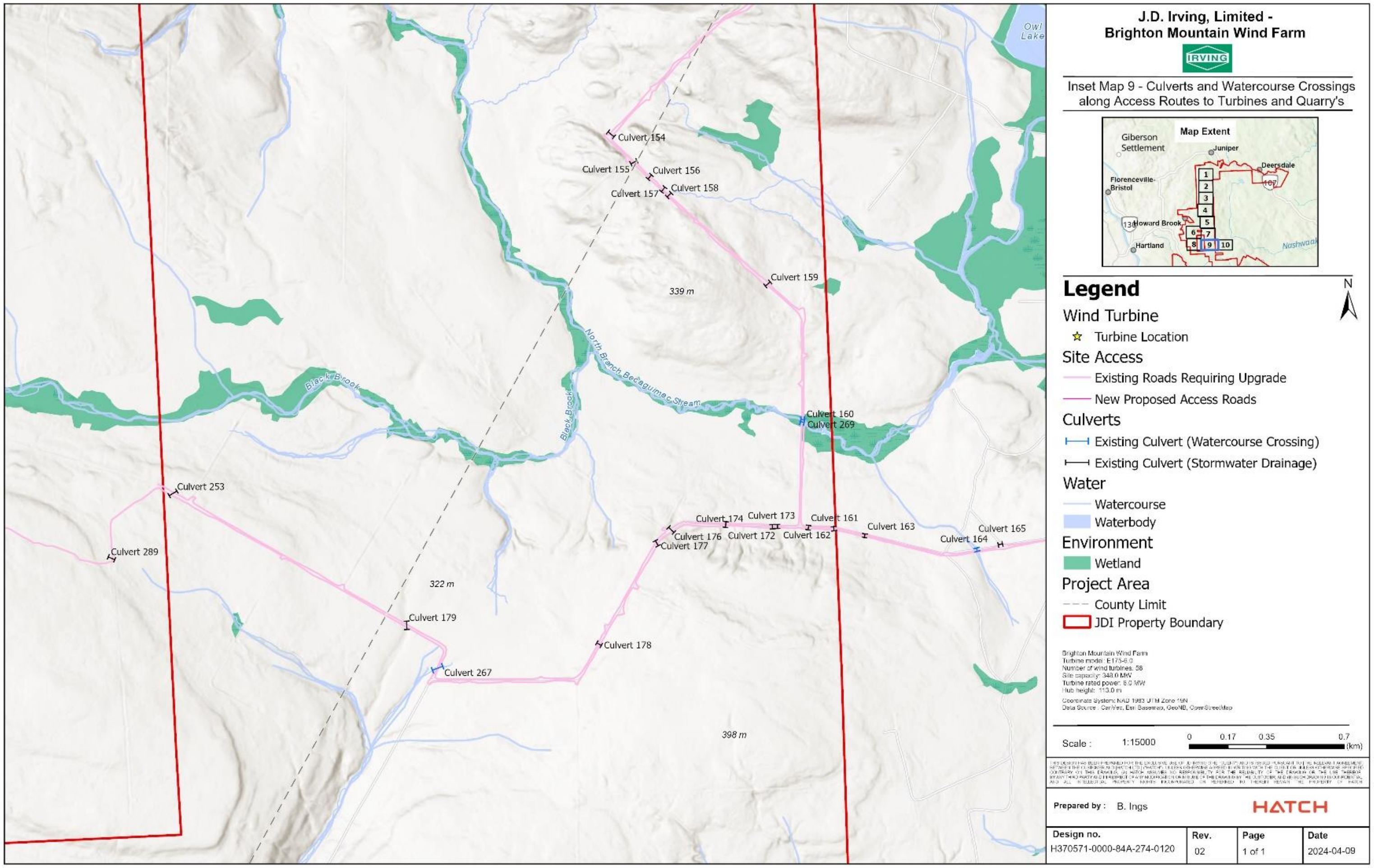

Figure 2-27: Culverts and Watercourses Along Access Routes - Inset Map 9

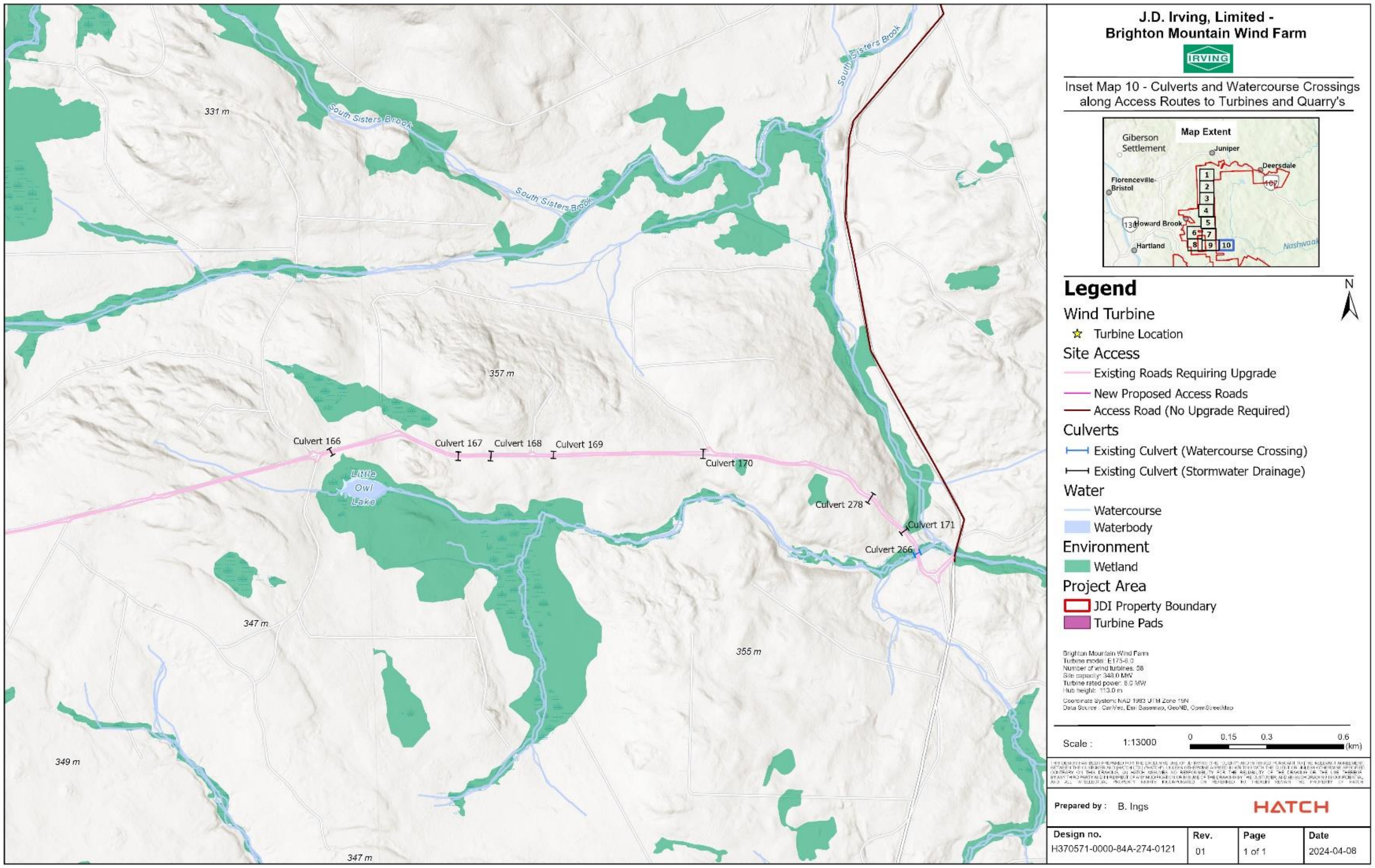

Figure 2-28: Culverts and Watercourses Along Access Routes - Inset Map 10

2.8.7 Interconnection to Grid

The Project will consist of an extensive 34.5 kV (MV) collector network that connects the WTGs to the site's main substations. A HVGL line is envisioned to link both substations (north and south to the 345 kV Transmission Line (TL3011) owned and operated by NB Power.

A typical collector network design that will be explored for use on the Project includes the 'Hendrix aerial system'. This type of collector network is favourable, due to its reliability, reduced tree clearing requirements along the overhead line, and minimal maintenance requirements which makes it advantageous for the site's rural location.

The wind farm collector system has been designed such that throughout the site, multiple WTG in proximity will be grounded together and connected to the substations via a single overhead aerial line circuit. The overhead collector lines will run along existing roadways, however, alternative paths within the PDA can be considered and optimized during the detailed design phase of the Project. The northern and southern portions of the Project site will have an independent collector system, routing to each of their respective substations. The structure type to be used for the overhead collector network is the wooden utility pole and will most likely run adjacent to rods which are used for primary access and have been upgraded.

Standardly, the pole line stands at 10 m tall (excluding standard 2 m buried into the ground) and are chemically treated to preserve structural integrity, protect their appearance, and extend their lifespan by fending off pests and the elements. The Hendrix system may also include insulated ground wires to meet the basic insulation level (BIL) requirement to withstand surge voltages, spacers to separate and clamp the phase conductors, support brackets and angle clamps to support the wires, guy wires to stabilize the freestanding utility poles, anchors to pin down the guy wires, amongst other components. The final design of the Hendrix system will be determined by the design engineer and manufacturer during the detailed design phase.

The trajectory of the proposed HVGL Lines would start from the southern substation, pass through the northern substation and interconnect with the existing NB Power 345 kV line (Line 3011). This new line would remain on the Proponent's land. HVGL Line towers, otherwise referred to as 'pylons', are tall, latticed towers made of steel that will be used to support the overhead transmission line. Approximately 90 pylons will be required for the total length of the HVGL line assuming a span of 250 m between each pylon.

The choice of the tower structure will be based on prescribed standards from the Canadian Standards Association (CSA) such as the "CSA C22.3 No. 1, *Overhead systems*" and the "CSA C22.3 No. 60826, *Overhead transmission lines*" both which are issued by the CSA Group under Part III of the Canadian Electrical Code. Engineering and environmental considerations such as climate, transmission characteristics, topography, terrain, electrical clearances, structural requirements, and many more will also influence the choice of tower structure to be used in the Project.

Per standard practices, both substations will be fenced to exclude entry, however, the dimensions of the fenced yards will be determined during detailed design. Each substation's preliminary single line development was completed in accordance with the applicable codes and standards. Each substation includes MV and HV electrical equipment as well as the necessary controls and protection infrastructure and auxiliary equipment. These include an electrical house, transformer, circuit breakers, instrumentation for protection and control, UPS system (as required), and supervisory control and data acquisition (SCADA) system.

Each substation will include an E-house, a transformer, circuit breakers, instrumentation for protection and control panels, an uninterruptible power supply (UPS) system, and a SCADA system.

2.9 Construction Details

The total construction period including site preparation, construction and commissioning is estimated to take approximately 31 months. The stages of the construction of the Project will include:

1. Stage 1 – Civil work and the beginning of electrical installation for a duration of 20 months.
2. Stage 2 – Electrical installation completion, turbine erection, and testing and commissioning over a period of 11 months.

Turbines cannot typically be erected when wind speeds exceed 7 to 8 m/s, and the optimal time for assembly often occurs during the early evening. As a result, some construction in the early evening may be necessary. It is important to note however that with the use of a tower crane offers several advantages over conventional cranes as they can operate loads under 60 tons at operating wind speeds of 20 m/s and loads over 60 tons at 15 m/s. This may shorten the duration of construction if labor and logistics are properly managed.

The equipment and construction procedures that will be used to construct the major features of the Project include:

- Harvesters and processing equipment for tree clearing;
- Excavation using backhoe(s);
- Site clearing using bulldozer(s); and
- Turbine installation using cranes.

After the initial tree and land clearing activities are complete, the following main construction activities will occur:

- Upgrading existing roads, construction of access roads and wind turbine pads (if crane pad is not combined to turbine foundation);

- Pouring of turbine foundations;
- Installation of power poles, power lines and underground electrical;
- Installation of the substation;
- Turbine erection;
- Commissioning of the WTGs; and
- Removal of all temporary works and restoration of the site.

The proposed dates of the different construction activities can be seen in Table 2-5 below.

Table 2-5: Construction Activity and Proposed Date

Activity	Proposed Date
Clearing and grubbing	Q2 2024 to Q2 2025
Construction of access roads and crane pads	Q3 2024 to Q3 2025
Construction of turbine foundations	Q2 2025 to Q4 2026
Installation of collector/transmission infrastructure and substations	Q1 2025 to Q4 2026
WTG erection	Q2 2026 to Q4 2027
Project commissioning	Q4 2026 to Q4 2027
Removal of all temporary works and restoration of site	Q1 2028 to Q2 2028

2.9.1 Logistics

Transportation of the Project equipment, components, and WTG from their manufacturing origin to the Project site is necessary for construction to commence.

To date, the Project has considered two unloading ports for use. Specifically, the port of Bayside and the port of Saint John, which are located on the southern edge of New Brunswick. Given the dimensions and weight of the various WTG components, it has been determined that the rotor blades would be shipped to and stored at the port of Saint John and the rest of the components (e.g., towers, nacelle, etc.) would be shipped and stored at the port of Bayside if using road transportation. Alternatively, some WTG or Project components may be transported to a laydown area by Deersdale through a rail system adjacent to the port of Saint John if deemed necessary, and technically feasible. All components will be stored at designated laydown yards at both unloading ports and will be progressively shipped to the Project site around mid-May due to the spring thaw in southern New Brunswick.

The specific routes to be taken, are further described in Section 5.3.3 (Vehicular Traffic). Selected routes will be confirmed prior to shipment, and all appropriate permits received from DTINB prior to material movement.

It is to be noted that along these routes, certain turn areas will need to be modified to allow for the blades and tower sections to pass through. Such modifications will be done in consultation with a specialized heavy hauler, the DTINB, and the WTG manufacturer. The specifics of the routes into the Project site to the individual WTG locations will be determined once a final WTG model has been selected. Furthermore, the logistics for the transportation of the construction, civil works, and electrical works equipment will be determined during detailed engineering.

2.9.2 Site Access

The Juniper site is accessible via existing roadways and ATV/snowmobile trails, with future access roads planned to access individual turbines. Most of the access roads will make use of existing designated roadways and private roads that will require upgrades to support oversized vehicle movements. Roads that require upgrades such as culvert replacements and widening of existing roads will follow environmental mitigations such as fish rescues, rare plant searches, and nest sweeps, as required, and under applicable permits (e.g., WAWA).

2.9.3 Clearing and Grubbing

The pre-construction activities for the site include tree harvesting, clearing, and grubbing as well as general leveling of the lands as possible with mechanical equipment. Harvesting, clearing and grubbing activities are to be performed outside of the breeding bird season as much as possible. If clearing activities conflict with this breeding season, a qualified biologist will be onsite to conduct monitoring to identify possible breeding birds in the area and their active nests.

Merchantable timber will be bucked, limbed, stacked, and will be placed in designated areas for pick up. On the subject of topsoil compaction and removal, efforts will be made during construction to minimize compaction to the extent possible and removed topsoil may be placed in a designated location near its source and reused for restoration in future.

Clearing will be required along current resource roads that will be upgraded to accommodate Project components transport, as well as new roads to access turbine locations, turbine pads, collector lines, substation locations, and vegetation clearing required for the 345 kV HVGL ‘Right of Way’ between the north and south substations. Clearing will also be required at the connection point to the existing NB Power 345 kV line (Line 3011) located in the northern extent of the Project.

2.9.4 Fill Material

Fill materials will be sourced from the Project site within the PDA. If additional fill material is required, it will likely be sourced from a local supplier.

2.9.5 Mobile Batch Plant

A mobile batch plant is a mobile unit such as a truck or trailer that can be physically dispatched to job sites and be used to produce concrete as needed to meet any specification. Specifically, the mobile batch plant would be dispatched to produce concrete for the numerous concrete pads required for foundations (e.g., WTG, substations, wind turbine pad, etc.).

Given the remote geographical location of the Project, it was determined that a mobile batch plant was significantly more advantageous than its stationary counterpart or drum trucks given that on average they produce less emissions, produce less waste as the amount of concrete can be adjusted at a moment's notice, will be in proximity to where the concrete is to be poured, and is less costly than installing a permanent batch plant.

2.9.6 On-site Quarrying

The materials used to produce concrete by the mobile batch plant will likely originate from on-site quarrying that will be prepared within the PDA to lessen transportation requirements and to ensure an expedited process if additional resources are required to produce concrete pads. Five (5) potential locations for aggregate quarries have been shortlisted for development to support construction activities. Final locations to be developed will be communicated to the NB DELG as required, with NR Canada applicable explosive/blasting permits obtained prior to quarry operations.

The five (5) potential quarry locations are as follows:

- Quarry 1 (BH23-01) - Lat/Long (46.481439°, -67.250308°).
- Quarry 2 (BH23-02) - Lat/Long (46.477694°, -67.230362°).
- Quarry 3 (BH23-06) - Lat/Long (46.393574°, -67.281511°).
- Quarry 4 (BH23-08) - Lat/Long (46.379278°, -67.226597°).
- Quarry 5 (BH23-09) - Lat/Long (46.351456°, -67.242433°).

Each potential quarry location has been selected based upon available geotechnical data from boreholes collected in 2023. The areas shortlisted for quarrying, as shown in Figure 2-18, Figure 2-19, Figure 2-22, Figure 2-23, and Figure 2-25 are indicative of a 300-meter radius from the borehole logged, which represents a larger PDA than what will be required for quarry operations at each location. This gives flexibility in each location to avoid watercourses (minimum 60 m setbacks), or other constraints that have yet to be identified within the 300m radius. The boundaries of the final operational perimeters for proposed rock quarries will be provided to NB-DELG once finalized. The boundary will adhere to the setback distances specified by NB-DELG in the '*Rock Quarry Siting Standards'* (NB-DELG, 2014).

Only two potential quarry sites, at Quarry 4, and Quarry 5, have watercourses that fall within the 300 m radius (tributaries to Pokiok Brook, and Malcom Lake, respectively), which will require special consideration to mitigate impacts to surface hydrology, as well as additional archaeological investigation, planned for 2024.

2.9.7 WTG Assembly and Installation

The main WTG components typically include the nacelle, hub, rotor blades, and tower sections. The latter comes divided into multiple sections for ease of transportation and assembly.

Once the WTG components are delivered to their respective turbine pads, the tower sections are the first to be erected in sequence on the foundations. Following this is the installation of the nacelle and its associated pieces with the rotor blades being installed on the hub at the very end. As of this Project phase, either crawler cranes (such as Liebherr 1700), or tower cranes (Kroll K1650L (max capacity of 135 metric ton)), an all-terrain crane (max capacity of 350 ton), and an assist crane (max capacity of 200 ton) will be used throughout the installation of the wind farm. Specifically, crawler cranes and/or the tower crane will be used for the assembly of the WTGs and the other two mobile cranes will be used to assist in the mobilization and demobilization of the larger cranes.

The tower crane presents several advantages such as no tie-ins to the tower are needed, operability in wind speeds of 20 m/s for loads under 60-ton, shorter boom length which reduces clearing of land for boom construction, hook to hook ready between 24 to 36 hours, amongst other benefits to construction efficiency.

2.9.8 Post Construction - Site Restoration

The Proponent is committed to site restoration in accordance with best management practices, and industry standards.

Once construction is completed and the Project is in its operational phase, all temporary works will be removed, and the land will be re-graded. Stored topsoil will be placed over disturbed area, stabilized and seeded to prevent erosion and sedimentation, while promoting regeneration, respectively.

2.10 Operation and Maintenance Details

2.10.1 Operation Features

It is anticipated that normal operation of the wind farm will be achieved following a structured operational readiness, commissioning, and ramp-up program. During this program, all routine activities, processes, and operations, including any pollution control or waste treatment program, will be defined for daily reference. This also extends to preventive maintenance where maintenance activities will be detailed in manuals in accordance with their frequency (e.g., daily, weekly, bi-weekly, monthly, bi-yearly, yearly, etc.).

2.10.2 Site Access and Traffic

Minimal vehicle activity will be required once the wind farm is operational. Periodic safety checks and maintenance will cause site road traffic to increase, but the traffic impacts to the community of Juniper are expected to be minimal. Heavy equipment, designed for traversing through snow and remote locations may be utilized onsite, to assist in repairs to infrastructure during the winter months, if needed.

2.10.3 Project Safety Signs

Project signs will be present and maintained throughout the operational life of the Project. They will include information such as the emergency contacts for the site, any relevant information about the Project, and the companies involved. A sign will be posted at each entrance to the site and periodically throughout the site as required by the Proponent and/or its affiliated Project partners.

2.10.4 Maintenance Plans

Preventive maintenance will be scheduled and performed at regular intervals throughout each operational year of the project to achieve the anticipated operation span of the Project. Maintenance activities will include, but will not be limited to:

- Maintenance of blade roots of the WTGs by service technicians;
- Collector and transmission lines inspections to check for deterioration and weakened support structures; and
- During the operational phase of the Project vegetation management along HCGL ROWs will be undertaken in accordance with established protocols developed and used by NB Power.

A definitive maintenance activities list with setpoints will be defined during the execution stage of the Project following commissioning. In the exceptional cases where an unscheduled maintenance event calls for the replacement of turbines components (e.g., rotor blades), the tower crane and other support cranes will likely be used.

2.10.5 Supervisory Control and Data Acquisition (SCADA)

Reactive or unscheduled maintenance is projected to be minimal, as the presence of the SCADA system allows for 24-hour monitoring of the turbines by the operations team of the Proponent and the manufacturer, if applicable.

2.11 Decommissioning

The expected project lifetime is for an approximate operation span of 25 years. The following describes how the Project will be decommissioned. The process includes removing the WTG including the tower, generator, above ground cabling, and auxiliary equipment to reinstate the land to original use.

Decommissioning will typically begin within six months of the end of operational life. The components of the WTG will be dismantled and removed from the site. Similar traffic movements to the delivery of the turbine components are anticipated. The decommissioning phase will require lower vehicular support than the construction phase. The phases of decommissioning include:

- The wind turbines will be dismantled and removed from the site for sale or scrap. The bases should be removed to below plough depth or covered adequately, and the topsoil should be returned so that the land may return to its former use.
- Approximately 85-90% of a wind turbines total mass can be reused, or recycled (CanREA, n.d.). Various recycling methods will be explored during the decommissioning phase, to ensure that WTG component parts without high value at end of life (e.g., blades comprised of fibers, epoxy, etc.) are disposed of in a responsible fashion, to future industry standards.
- The internal site roads and site entrance may be removed if deemed necessary. After removal, the land will be reinstated to its former use.
- The underground cables will be below ploughing depth and have no threat of harmful substances. If economical, they may be recovered or remain in the ground. Any terminal connections will be cut back to plough depth.
- Any other equipment would be dismantled and removed, and the land would be reinstated to former use.
- Removal of crane pads, if deemed necessary.
- Re-seeding or replanting.

A final Decommissioning Plan will be required for review and approval by the Director, EIA Branch, NB-DELG closer to the decommissioning date.

2.11.1 Site Restoration

Following the removal of the WTGs, ancillary structures, and associated cables, site restoration activities such as reseeding and revegetation would commence. Per good practices, the use of plants endemic to the site for revegetation will be necessary. Where possible, the topsoil would be removed prior to the removal of the WTGs and would be worked to ensure its density and consistency match its immediate surrounding before backfilling. Grading will also be necessary to ensure that the site is restored to an agreed use or condition. Erosion control and storm water management during site restoration will also be critical and should follow measures and best management practices as outlined in any applicable standards or specifications.

Waste management must be a thorough and continuous practice throughout the site restoration process to ensure no foreign materials remain on site. Lastly, reclamation monitoring will be undertaken by JDI, to ensure native vegetation and land use is re-established following decommissioning and that the site has successfully been restored to pre-construction conditions. These efforts would be conducted if the Proponent decides to proceed with decommissioning instead of registering the Project anew.

2.12 Future Modifications, Extensions, or Abandonment

There are no future modification or extension plans for the Project. The Proponent will operate the wind farm for a period of approximately 25 years which is consistent with the WTG life expectancy. Prior to the end of the Project's operational life, decommissioning and site reclamation plans would begin, or the Proponent may instead consult with the Department to extend the life of the project.

2.13 Project Schedule

The current Project schedule is provided in Table 2-4. The schedule is still preliminary and will be refined future engineering studies. Many factors may cause inevitable delays such as long lead items, logistical and construction issues, workforce availability, etc. The current Project Schedule accounts for pre-construction, clearing and grubbing, and foundation work expected to begin around the second quarter (Q2) of 2024. The start of electrical equipment shipments is expected to occur in the first quarter (Q1) of 2025, or earlier for long lead items. The shipping of WTG components from overseas is expected to begin in the second quarter (Q1) of 2026, with erection following shortly thereafter. Commissioning of the Wind Farm will happen throughout 2027 and will the Project have an operational phase of up to 25 years, prior to decommissioning in 2053. The schedule will be updated following release from Environmental Assessment, and upon the final selection of the WTG model to be used.

3. Environmental Impact Assessment Methodology

The methodology followed in this EIA consists of the following key steps:

- Selecting valued components;
- Defining assessment boundaries;
- Characterizing baseline conditions (describing existing conditions and baseline survey results);
- Identifying potential impacts and mitigation;
- Residual impacts and significance determination; and
- Cumulative impacts assessment.

3.1 Valued Component Selection

As part of the scoping process, the physical, biophysical, and socioeconomic valued components (VCs) that may be subject to impact from the proposed Project work were identified. Based on current understanding and available information on the Project site and surrounding areas, Hatch's professional experience with similar project in New Brunswick, and a review of the regulatory requirements (e.g., NB DELG "*Additional Guidance for Wind Turbine Projects"* (2019) and NB DELG "*A Guide to Environmental Impact Assessment in New Brunswick*"(2018), the following VCs for the Project are as listed in Table 3-1.

Table 3-1: Project Valued Components (VCs)

Physical	Biophysical	Socio-economic
Groundwater*	Wetlands and Vegetation	Land Uses and Property Values (includes Archaeological Resources*)
Atmospheric Conditions	Fish and Fish Habitat	Community and Local Economy
Noise*	Terrestrial Wildlife and Wildlife Habitat	Public Health & Safety (Includes Electromagnetic Fields) *
Visual Aesthetics and Shadow Flicker*	Birds*	Vehicular Traffic
Environmental Effects on the Project	Bats*	Communication Facilities (Interference)*

* VC identified as a required study component from NB DELG "*Additional Guidance for Wind Turbine Projects*" (2019), and or NB DELG "*A Guide to Environmental Impact Assessment in New Brunswick*" (2018).

3.2 Baseline Studies

Several field studies are required to meet NBDELG EIA Sector Guidelines. To establish a baseline for environmental monitoring, a minimum of 2 years of monitoring is required, specifically for birds and bats and informs the biophysical chapters of this EIA. Sector specific sub-chapters that are included in this EIA include:

- Biota Impacts, including bird and bat mortality, and disturbance to bird lifecycles;
- Noise Impacts, including a noise impact study;
- Visual Impacts including a "worst case" viewshed and shadow flicker;
- Impacts on communication facilities including the potential for moving turbines to disrupt or deflect communication, radar, or semi-acoustic transmission systems;
- Impacts on Hydrology, including groundwater quality and quantity, as well as fish habitat and wetlands; and
- Impacts on Public Health and safety including the results of a catastrophic failure, public injury potential and Impacts of Electromagnetic fields (EMF) on human health.
- Baseline studies conducted to date are summarized in Table 3-2.

Table 3-2: Baseline Studies Conducted to Date in 2023

VC	Study	Year
Avian	Winter Resident Transect Surveys	2023
Avian / Wetlands & Vegetation	Helicopter flyovers (2) to assess site conditions, vegetation types and document raptor nest observations.	2023
Avian	Spring Nocturnal Migration Monitoring (Acoustic and Radar)	2023
Avian	Spring Passage Migration - Diurnal Watch Counts	2023
Avian	Spring Migratory Transects	2023
Avian	Spring Breeding Owl Surveys	2023
Avian	Summer Breeding Bird Point Count Surveys	2023
Avian	Crepuscular Surveys - Common Nighthawk & Eastern Whip-poor-will	2023
Avian	Fall Nocturnal Migration Monitoring (Acoustic and Radar)	2023
Avian	Fall Passage Migration - Diurnal Watch Counts	2023
Avian	Fall Migratory Transects	2023
Bat	Spring, Summer, and Fall presence/absence (Stationary Acoustic Monitoring and Radar)	2023
Terrestrial Wildlife	Incidental Observations Recorded during all Survey types	2023
Wetlands & Vegetation	Botanical – Rare Plant Surveys	2023
Wetlands & Vegetation	Wetland Delineation (South Section of the Project)	2023
Fish &Fish Habitat	Watercourse Characteristics and Fish Habitat Suitability	2023
Fish & Fish Habitat	Fish Community Sampling	2023

VC	Study	Year
Noise	Baseline Noise Collection	2023
Land Use (Heritage Resources)	Archaeological Pedestrian Surveys at 236 locations throughout the PDA.	2023

Baseline studies remaining that will be completed in 2024 with results submitted to the Technical Review Committee in Addendum, are provided below in Table 3-3.

Table 3-3: Baseline Studies to be Completed in 2024

VC	Study	Year
Avian	Winter Resident Transect Surveys	2024
Avian	Spring Nocturnal Migration Monitoring (Acoustic and Radar)	2024
Avian	Spring Passage Migration - Diurnal Watch Counts	2024
Avian	Spring Migratory Transects	2024
Avian	Spring Breeding Owl Surveys	2024
Avian	Summer Breeding Bird Point Count Surveys	2024
Avian	Crepuscular Surveys - Common Nighthawk & Eastern Whip-poor-will	2024
Avian	Fall Nocturnal Migration Monitoring (Acoustic and Radar)	2024
Avian	Fall Passage Migration - Diurnal Watch Counts	2024
Avian	Fall Migratory Transects	2024
Bat	Spring, Summer, and Fall presence/absence (Stationary Acoustic Monitoring and Radar)	2024
Wetlands & Vegetation	Botanical – Rare Plant Surveys	2024
Wetlands & Vegetation	Wetland Delineation (North Section of the Project)	2024
Fish &Fish Habitat	Watercourse Characteristics and Fish Habitat Suitability	2024
Fish & Fish Habitat	Fish Community Sampling	2024
Land Use (Heritage Resources)	Archaeological Sub-Surface Testing	2024

Addendum Studies, summarizing the Baseline Studies to be completed in 2024 (Table 3-3) and to be submitted will be grouped according to VC and submitted as the following Reports to the TRC:

- 2024 Avian Survey Addendum Report;
- 2024 Bat Survey Addendum Report;

- 2024 Wetlands, Vegetated Environmental and Watercourse Addendum Report; and
- 2023-2024 Archaeological Impact Assessment – Addendum Report.

3.3 Assessment Boundaries

3.3.1 Temporal Boundaries

Temporal boundaries identify the period over which potential impacts will be assessed during each Project phase. The following temporal boundaries were used to support the impact assessment, and are the same across all VCs:

- Planning Phase: Q4 2022 – Q4 2024;
- Construction phase: Q2 2024 – Q4 2027;
- Operations phase: Q1 2028 – 2053; and
- Decommissioning phase: Expected to occur in 2053, based on 25 Year WTG Lifespan.

3.3.2 Spatial Boundaries

The spatial boundaries for the Project are defined as the area(s) where physical project elements, aspects, and facilities are constructed and operated, and the geographic extent of where potential impacts may occur.

Potential impacts will be assessed over the following spatial boundaries:

- **Project Footprint (PF)**: the anticipated area of physical disturbance and infrastructure installed. This encompasses a footprint of 3.72 km². The PF is the same for all VCs.
- **Primary Development Area (PDA)**: The PDA is the area of physical disturbance (or physical footprint) associated with the Project, plus an additional buffer where either direct, or indirect effects might occur as a result of ground disturbance or construction. This buffer is established as 30m along roads, 60m for high voltage generator lead lines, and 100m around turbine pads and ancillary facilities. The PDA is the same for all VC's.
- **Local Assessment Area (LAA)**: The Local Assessment Area is the direct physical disturbance expected throughout all Project phases that includes the PDA and a maximum area adjacent to the footprint where Project-specific interactions and impacts (e.g., noise emissions) and/or benefits can be predicted and measured with a reasonable degree of accuracy and confidence. The Assessment Area can vary based on the VC; the selection of the appropriate Assessment Area for each VC is based on past experiences with similar projects and the current understanding and conditions of the environment.
- **Regional Assessment Area (RAA)**: Broader, regional area selected to buffer the PDA, and used to determine regional characteristics.

The LAA and RAA for each VC is summarized in Table 3-4, below:

Table 3-4: The Projects LAA and RAA for Project VCs

Valued Component	Local Assessment Area	Regional Assessment Area
Groundwater	*PDA plus 500 m buffer*	*3 Kilometres from the JDI Property Boundary*
Atmospheric Conditions	*PDA plus 10 km buffer*	*Within the boundaries of the Province of New Brunswick*
Noise	*PDA plus 1 km buffer*	*5 km from the PDA*
Visual Aesthetics and Shadow Flicker	*50 km from WTG Locations*	*Within the boundaries of the Province of New Brunswick*
Environmental Effects on the Project	*PDA plus 10 km buffer*	*Within the boundaries of the Province of New Brunswick*
Avian	*PDA, plus 250 m from Roads, and 500 m from WTGs*	*5 km from the PDA*
Bats	*PDA, plus 250 m from Roads, and 500 m from WTGs*	*5 km from the PDA*
Wetlands and vegetation	*PDA, plus 250 m from Roads, and 500 m from WTGs*	*5 km from the PDA*
Fish and Fish Habitat	*PDA, plus 250 m from Roads, and 500 m from WTGs*	*5 km from the PDA*
Terrestrial Wildlife and Habitat	*PDA, plus 250 m from Roads, and 500 m from WTGs*	*5 km from the PDA*
Communication Facilities (Interference)	*Up to 100 km from WTG locations*	*Within the boundaries of the Province of New Brunswick*
Land Uses and Property Value, including Heritage Resources	*PDA plus lands within the JDI Property Boundary*	*5 km from the JDI Property Boundary*
Vehicular Traffic	*Highway routes located between the Port of Bayside, Port of Saint John, and the PDA.*	*Within the boundaries of the Province of New Brunswick*
Public Health and Safety (incl. EMF)	*PDA, plus 250 m from Roads, and 500 m from WTGs*	*Within the boundaries of the Province of New Brunswick*
Community and Local Economy	*50 km from the Property Boundary*	*Within the boundaries of the Province of New Brunswick*

3.4 Potential Interactions of the Project with the Environment

Based on the Project description (Section 2), the and the existing environment for each VC, a screening exercise was conducted to determine the potential interactions between the Project and the environmental and social VCs. This includes screening Project Related activities across the Planning, Construction, Operation and Decommissioning Phases, for each selected VC, as depicted in Table 3-5.

Table 3-5: Environmental and Social Screening Matrix

Number	Activities/Physical Works Associated with the Project	Physical Environment VCs				Biophysical Environment VCs							Socio-Economic Environment VCs				
		Hydrology and Groundwater	Atmospheric Conditions	Noise	Shadow Flicker & Visual Aesthetics	Avian	Bats	Wetlands	Fish and Fish Habitat	Terrestrial Wildlife and Wildlife Habitat	Vegetation	Effects of the Environment on the Project	Interference with Radio & Communciation	Land Uses and Property Value	Vehicular Traffic	Public Health and Safety	Community and Local Economy
Planning																	
1	Community Engagement			x								x	x	x	x		x
2	Planning Phase Equipment Accidents and Malfunctions (biophysical/geotechnical surveys)		x			x			x	x		x					x
3	Planning Phase Equipment Operations (biophysical/geotechnical surveys)			x		x	x		x	x		x					x
4	Biophysical Surveys					x		x	x	x	x			x			x
5	Geotechnical Surveys					x			x	x				x			x
Construction																	
6	Continued Community Relationships			x										x	x		x
7	Construction Phase Equipment Accidents and Malfunctions	x	x			x		x	x	x	x	x			x	x	x
8	Construction Phase Equipment Operations		x	x		x	x	x	x	x	x	x			x	x	x
9	Clearing and Grubbing		x	x		x	x	x	x	x	x	x		x		x	x
10	Construction of Access Roads, Lay Down Areas and Crane Pads		x	x		x	x	x	x	x	x	x		x		x	x
11	Delivering Components to Site (blades, towers, nacelle, etc.)		x	x		x			x	x					x		x
12	Construction and Operation of Quarry's	x	x	x		x	x	x	x	x	x	x		x		x	x

Number	Activities/Physical Works Associated with the Project	Physical Environment VCs				Biophysical Environment VCs							Socio-Economic Environment VCs				
		Hydrology and Groundwater	Atmospheric Conditions	Noise	Shadow Flicker & Visual Aesthetics	Avian	Bats	Wetlands	Fish and Fish Habitat	Terrestrial Wildlife and Wildlife Habitat	Vegetation	Effects of the Environment on the Project	Interference with Radio & Communciation	Land Uses and Property Value	Vehicular Traffic	Public Health and Safety	Community and Local Economy
13	Rock Crushing and Batch Plant Operation		x	x		x	x		x	x		x				x	x
14	Excavating and Pouring of Turbine Foundations	x	x	x		x	x		x	x		x		x		x	x
15	Clearing of the Right of Way (ROW) for the High-voltage generator lead (HVGL) Line		x	x		x	x	x	x	x	x	x				x	x
16	Installation of Underground Electrical Lines, Power Poles & Electrical Collector System		x	x		x	x		x	x		x		x		x	x
17	Installation of Towers, and Power Lines for 345 kV HVGL Line		x	x		x	x		x	x		x				x	x
18	Construction and Installation of Substation and Components		x	x		x	x	x	x	x	x	x		x	x	x	x
19	Crane Assembly and Demobilization		x	x		x				x		x			x	x	x
20	Turbine Erection		x	x		x	x			x		x				x	x
21	Removal of All Temporary Works and Restoration of the Site			x					x	x					x	x	x
Operations and Maintenance																	
22	Ongoing Community Relationships			x	x								x	x	x		x
23	Operations Phase Equipment Accidents and Malfunctions	x	x			x		x	x	x	x	x		x	x	x	x
24	Operations Phase Equipment Operations			x		x	x	x	x	x	x	x		x	x		x
25	WTG Operation (power generation)				x	x	x					x	x	x			x
26	Vegetation Management (e.g. ROWs)		x			x	x	x	x	x	x	x		x			x

Number	Activities/Physical Works Associated with the Project	Physical Environment VCs				Biophysical Environment VCs							Socio-Economic Environment VCs				
		Hydrology and Groundwater	Atmospheric Conditions	Noise	Shadow Flicker & Visual Aesthetics	Avian	Bats	Wetlands	Fish and Fish Habitat	Terrestrial Wildlife and Wildlife Habitat	Vegetation	Effects of the Environment on the Project	Interference with Radio & Communciation	Land Uses and Property Value	Vehicular Traffic	Public Health and Safety	Community and Local Economy
27	Infrastructure Maintenance (WTGs, roads, culverts, etc.)		x			x	x	x	x	x	x	x		x	x	x	x
28	Crane Assembly and Demobilization for WTG Maintenance and Repair		x	x						x		x		x	x	x	x
29	Turbine Equipment Delivery/Removal (replacement parts)		x	x		x			x	x				x	x	x	x
Decommissioning																	
30	Ongoing Community Relations			x										x	x		x
31	Decommissioning Phase Equipment Accidents and Malfunctions	x	x			x		x	x	x		x			x	x	x
32	Decommissioning Phase Equipment Operations		x	x		x	x	x	x	x	x	x			x	x	x
33	Crane assembly and Demobilization (decommissioning)			x				x		x		x				x	x
34	WTG, Infrastructure, and Equipment Removal	x	x	x		x	x	x	x	x	x	x		x	x		x
35	Site Rehabilitation	x	x	x		x	x	x	x	x	x	x				x	x

3.5 Mitigation Measures and Monitoring Framework

If it is determined that an interaction between the Project and a VC occurs and there is a need to manage adverse environmental and social impacts, appropriate mitigation and control measures are proposed and applied in each assessment. For each VC, a standard mitigation hierarchy in line with the NB DELG (2018) '*Guide to Environmental Impact Assessment in New Brunswick'*, of "avoidance, reduction, and compensation" will be implemented for each potential impact. The Project will consider standard mitigation measures, best management practices (BMPs) and/or unique active management and monitoring requirements appropriate for each VC and corresponding impacts. For any assessments where there is higher uncertainty in the effectiveness of mitigation measures, adaptive management measures and follow-up monitoring programs has also been described. A summary of all Project commitments and mitigations is provided in Section 13.

3.6 Potential Residual Impacts and Significance

Environmental impacts that remain after mitigation measures have been applied are further characterized for their potential to cause a significant residual impact using the following criteria in Table 3-6.

Table 3-6: Residual Impacts and Significance Criteria for VCs

Factor	Criteria	Description
Magnitude	Negligible	No detectable change from baseline condition.
	Minor	Differs from the average value for baseline conditions but remains within the range of natural variation and below a guideline or threshold value.
	Moderate	Differs substantially from the average value for baseline conditions and approaches the limits of natural variation and may be equal to or slightly above a guideline or threshold value.
	Major	Differs substantially from baseline conditions and is significantly beyond a standard, guideline, or threshold value resulting in a detectable change beyond natural variation.
Duration	Short term	Impact lasts < 4 years (the length of Construction Phase).
	Medium Term	Impact lasts 5 to 10 years.
	Long Term	Impact lasts 11 to 29 years.
	Far Future	Impact lasts >30 years (i.e., post decommissioning and beyond).
Frequency	One Time	Impact is confined to one discrete event.

Factor	Criteria	Description
	Sporadic	Impact occurs rarely and/ or at sporadic intervals
	Regular	Impact occurs on a regular basis
	Continuous	Impact occurs constantly
Geographic Extent	PF/PDA	Impact is limited to the Project Footprint or Primary Development Area
	LAA	Impact may occur outside of the Project Footprint and within the LAA.
	Beyond	Impact occurs beyond the LAA.
Reversibility	Reversible	Impact can be reversed
	Partially reversible	Impact can be partially reversed
	Permanent	Impact cannot be reversed; permanent
Ecological/ Social Resilience	High	The receiving environment or population has a high natural resilience to imposed stresses and can respond and adapt to the impact (assimilative capacity is good).
	Neutral	The receiving environment or population has a neutral resilience to imposed stresses and may be able to respond and adapt to the impact (assimilative capacity is fair).
	Low	The receiving environment or population has a low resilience to imposed stresses and will not easily adapt to the impact (e.g., at or near the tipping point; assimilative capacity is low or exceeded).
Significance	Not Significant	Residual impacts have low or moderate magnitude; local geographic extent; short- or medium-term duration; could occur at any frequency and are reversible or partially reversible in either the short or long term. The impacts on the VC are either indistinguishable from background conditions, or distinguishable at an individual level.
	Significant	Residual impacts have high magnitude; regional or larger geographic extent; duration is long-term or far into the future and impact may occur at all frequencies. Residual impacts on VCs are consequential at the population or community level and may be permanent.

Factor	Criteria	Description
Likelihood	High	Impact is likely to occur
	Medium	Impact is likely, but may not occur
	Low	Impact is unlikely, but could occur
Certainty	High	There is good understanding of the cause-effect relationship, and all necessary data are available for the Project. The effectiveness of the mitigation measures is well known. There is a low degree of uncertainty and variation from the predicted impact across a wide range of conditions is expected to be low. High confidence intervals / statistical reliability and robustness good.
	Medium	The cause-effect relationships are not fully understood, there are a number of unknown external variables or data for the Project are incomplete. The effectiveness of mitigation measures is moderately well understood. There is a moderate degree of uncertainty; while results may vary under a range of conditions, predictions are relatively confident.
	Low	The cause-effect relationships are poorly understood, there are a number of unknown external variables, and data for the Project are incomplete. The effectiveness of the mitigation measures may not yet be proven. High degree of uncertainty and final results may vary considerably across a range of conditions. Low confidence intervals and statistical reliability and robustness is poor.

4. Cumulative Effects Assessment

Project residual impacts that have the potential to interact cumulatively with residual environmental effects of other projects and physical activities (past, present, and reasonably foreseeable future) are identified and the resulting cumulative impacts assessed. Cumulative effect occurs if a residual effect of the Project acts cumulatively with the effects of other physical activities that have been or will be carried out.

For the purposes of this cumulative impact assessment, a 10 km radius from the Project site was established as the Cumulative Effects Assessment Area (CAA).

The NB-DELG publicly available list of 'Registrations and Determinations' were reviewed to determine if there were any present or planned project within the CAA. As well, the Federal 'Common Project' Registry was also consulted. A GIS exercise was then undertaken to determine the proximity of various Projects. Research undertaken for each VC, also informed typical industries that could be found or know to occur with the CAA, and that would not be included on Government Registries. The likelihood of any Past, present, and reasonably foreseeable future projects or industrial activities within 10 km of the Site are summarized in Table 4-1 below:

Table 4-1: Past, Present, or Reasonably Foreseeable Projects that may Interact with the Project

Past, Present or reasonably foreseeable Project	Within RAA	Within CAA
Transportation	X	X
Forestry	X	X
Agriculture	-	X
Residential	-	-
Mining	-	-
Windfarms	-	-
Paper Mills	-	-
Hydroelectric facilities and dams	-	-

There are two major highways near the Project, Highway 107 to the north, and Highway 104 located southwest of the Project. Present and reasonably foreseeable future transportation activities could include road maintenance activities (including upgrading or replacing culverts and bridges as needed) and future road development in the area.

Surrounding agricultural lands are expected to continue to be operational throughout the lifetime of the Project and additional small-scale development of agricultural lands may occur, outside of the JDI property limits. Similarly, small-scale residential development may occur within the foreseeable future. These small-scale activities are unlikely to cause any cumulative impacts in conjunction with the project.

Forestry activities are the most likely source of cumulative effects with the anticipated effects of the Project, although most of the access road network for the project will be based on logging roads and any upgrades and maintenance of these roads can serve as access for future harvest and silvicultural operations. To offset short to medium term cumulative effects with forest harvesting activity in the area, any merchantable timber within the PDA should be used as wood supply for JDI Mills to replace an equivalent merchantable volume slated to be harvested during the construction period elsewhere.

5. Description of the Existing Environment

5.1 Physical Environment

5.1.1 Geophysical

5.1.1.1 Topography and elevation

Elevations onsite range between 173 to 553 meters above sea level (masl), as seen in Figure 5-1. The highest elevations on the site are located in the northern portion of the site at Bradley Mountain and Mount Frederick Clarke and in the central portion of the site at Brighton Mountain as shown on Figure 5-2. There are numerous watercourses, tributaries and wetlands throughout the site that are at lower elevations. Placement of turbines will be at high elevations throughout the site as shown on Figure 5-1 and Figure 5-2.

5.1.1.2 Surficial Geology

The surficial geology within the Project's property boundary, consists of Late Wisconsian morainal deposits of loamy lodgement till, minor ablation till, silt, sand, gravel and rubble ranging in depth from a discontinuous veneer over rock less than 0.5 m thick to a blanket over rock generally 0.5 to 3 m thick (Rampton et al., 1979-1980, and Rampton V.N., 1984). Surficial geology is shown on Figure 5-3.

Based on a preliminary geotechnical assessment completed by Hatch in 2023, in which 16 boreholes were advanced within the Project property boundary as shown on Figure 5-3, encountered soil was generally consistent throughout the area and consists of silty gravel with varying amounts of sand, silty sand and gravel. Cobbles and boulders were encountered throughout the advanced boreholes. Some clay with varying amounts of sand and gravel was also encountered. Additional geotechnical assessments will be undertaken in 2024 to further inform design.

The Site-specific findings were found to be consistent with the surficial geology mapping.

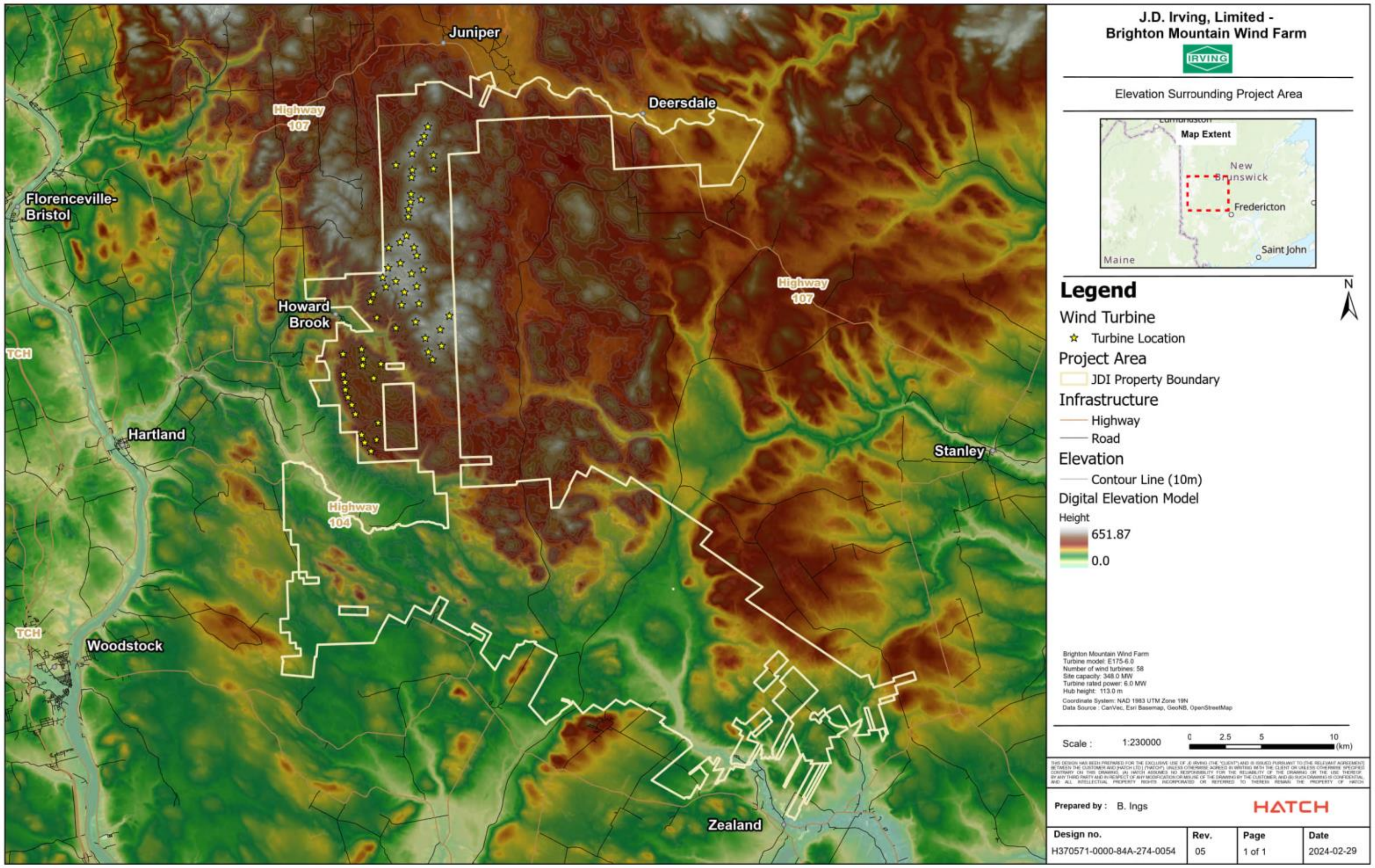

Figure 5-1: Elevations in the Project Area

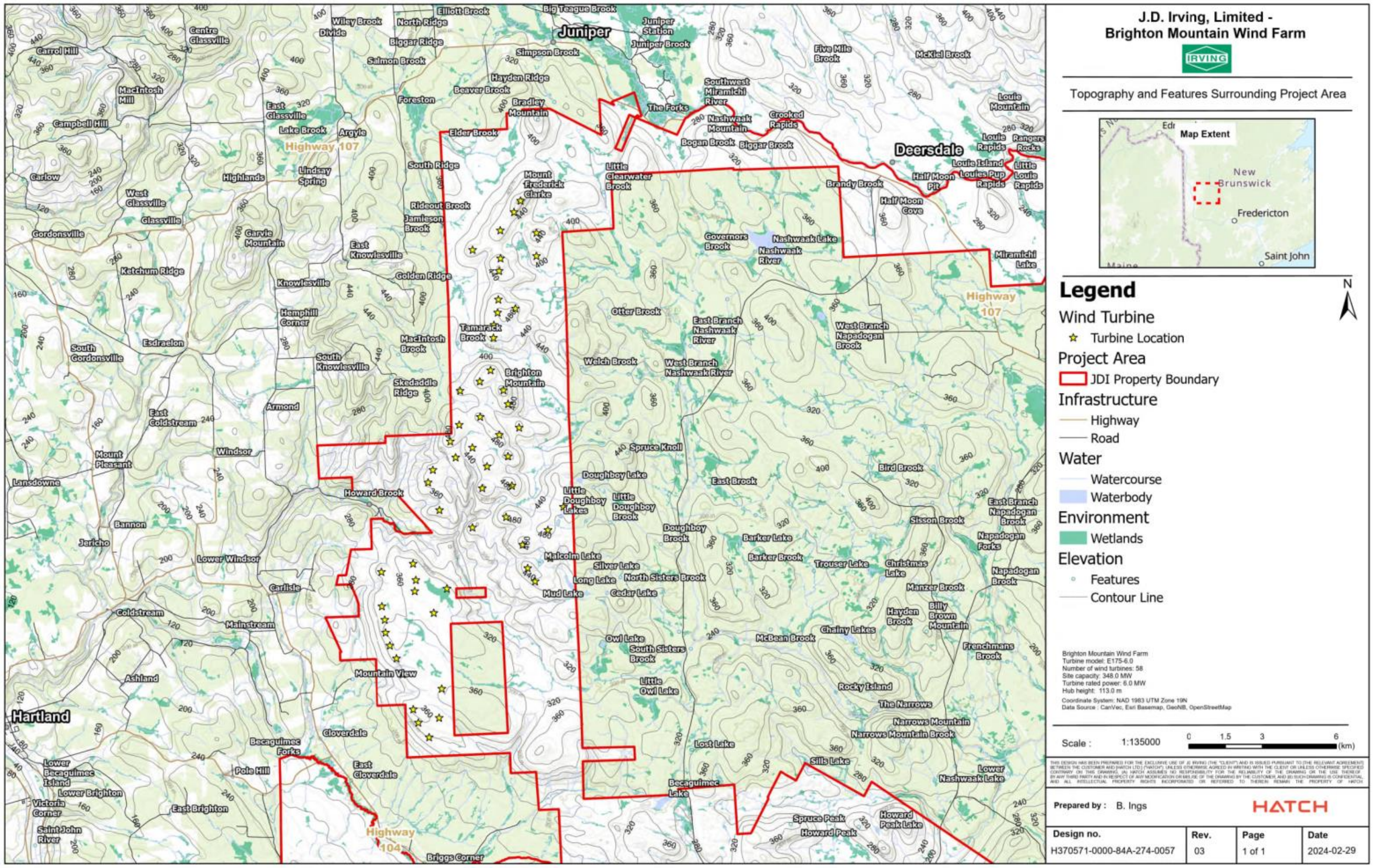

Figure 5-2: Topographical Features around the Project Site

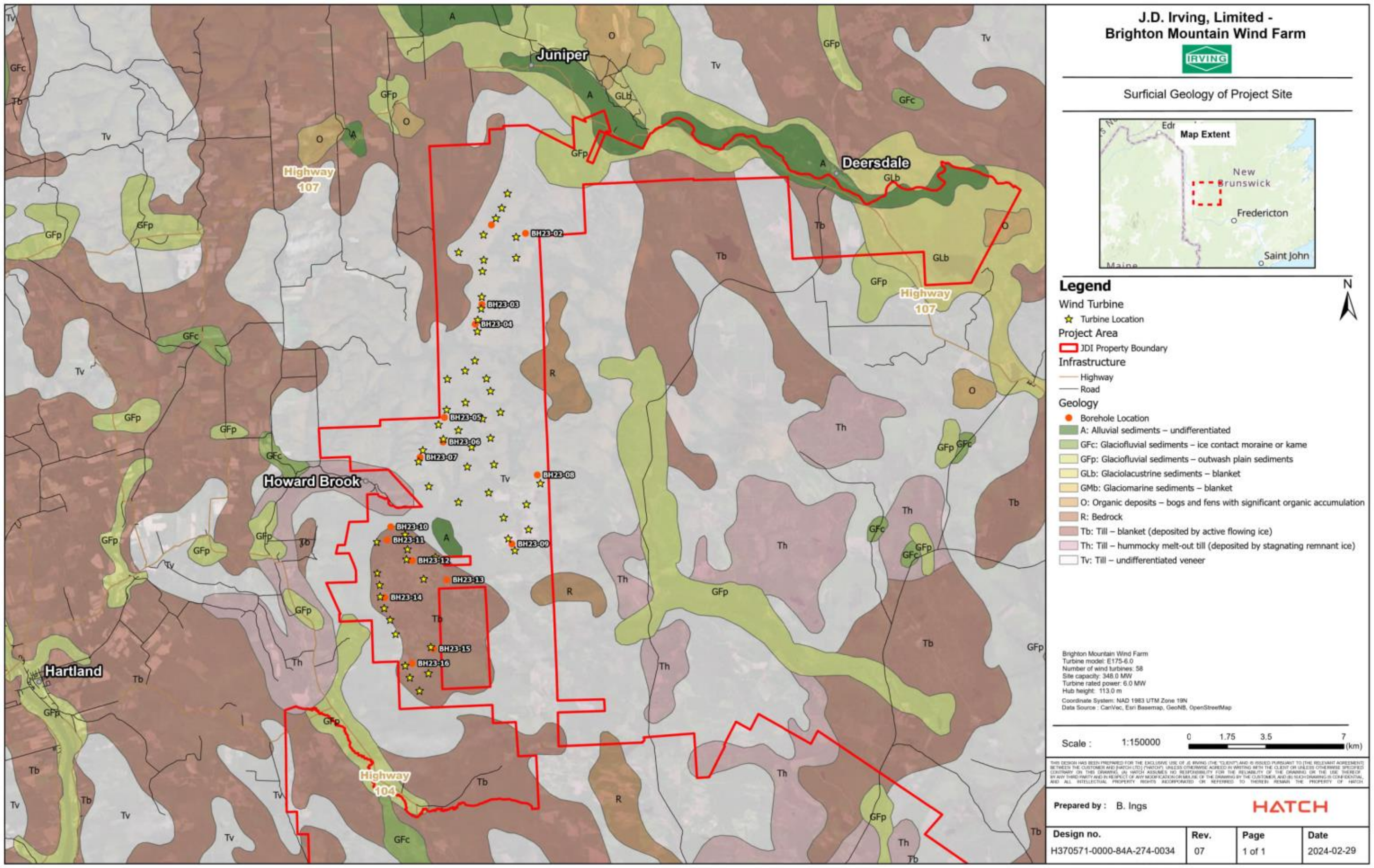

Figure 5-3: Surficial Geology of Project Site

5.1.1.3 Bedrock Geology

Bedrock geology varies across the PDA and includes Early Devionian age rocks of the Tobique Group - Wapske Formation and Costigan Mountain Formation, unnamed mafic and felsic intrusive rocks, and Becagumec Lake Gabbro; Early Carboniferous age rocks of the Mabou Group – Carlisle Formation and Hardwood Ridge Basalt; and Late Carboniferous age rocks of the Pictou Group - Mountain View Formation. A description of each formation is presented below (Smith and Fyffe, 2006), and presented in Figure 5-4.

- The Wapske Formation of the Tobique Group is described as grey, fine-grained, quartzose and lithic sandstone and siltstone, interbedded with polymictic conglomerate.
- The Costigan Mountain Formation of the Tobique Group is described as pink to red, grey, green, and purple rhyolitic ash flow tuff, lapilli tuff, volcanic breccia, quartz-feldspar porphyry, and red to purple flow-layered rhyolite.
- The Becaguimec Lake Gabbro is described as dark greyish green, medium- to coarse-grained, ophitic gabbro.
- The Carlisle Formation of the Mabou Group is described as red polymictic conglomerate interbedded with red lithic sandstone and minor red mudstone, and with red breccia and grey arkose locally present at the base.
- The Mountain View Formation of the Pictou Group is described as light grey quartzose sandstone interbedded with light grey quartz pebble conglomerate.

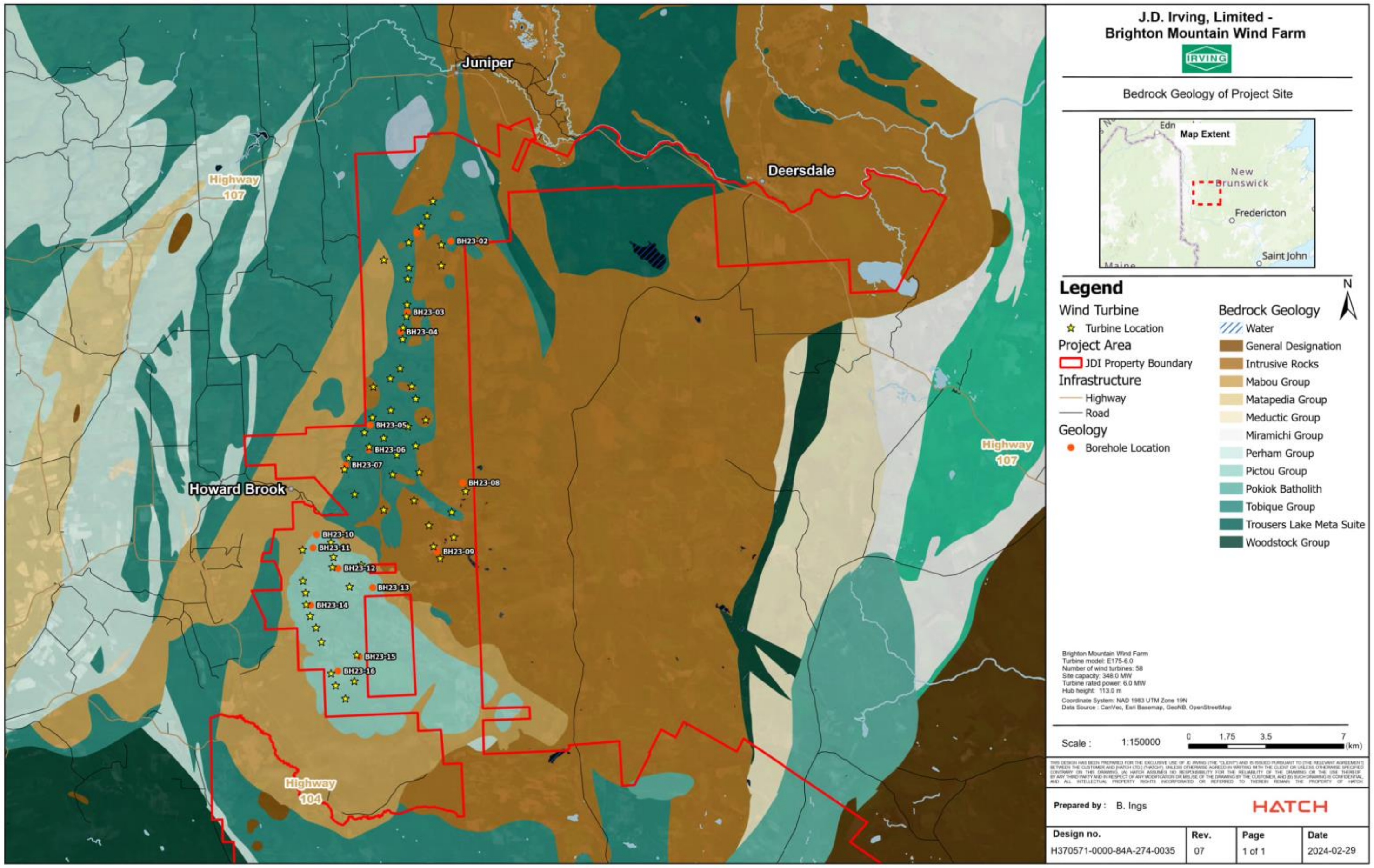

Figure 5-4: Bedrock Geology of Project Site

5.1.2 Groundwater Resources

Over 50% of the population of New Brunswick relies on groundwater as a source of potable water either through municipal groundwater supplies or private wells; 40.5 % of municipal water supplies in New Brunswick use groundwater (Statics Canada, 2021). The New Brunswick Online Well Log System (OWLS) database was searched for groundwater wells located within 3 km of the Site. A total of 73 wells were identified within the search area (one industrial, three “other” drinking water, one “other” non-drinking water, and 68 domestic). Approximately 92% of these wells were completed in bedrock, which was denominally shale or granite (NBDELG, 2023). Well details for all 73 wells located within 3 km of the Site property boundary are presented in Table 5-1, and Figure 5-5 and Figure 5-6. It is important to note that the OWLS only provides information on wells drilled after 1994; therefore, it is possible that there are more than 73 wells within 3 km of the Project property boundary.

A total of eight of the 73 wells, all of which are domestic bedrock wells, are located within 1 km of the Project property boundary. These wells are installed in shale or sandstone bedrock and range in depth from 18.3 to 86.9 metres below ground surface (m bgs). Depth to bedrock ranges from 0.91 and 13.1 m bgs and the driller’s estimated safe yield ranges from 4.55 to 91 L/min. Water bearing fracture zones in all eight wells were greater than 10 m bgs, ranging from 12.19 to 79.3 mbgs. Well details for the eight wells located within 1 km of the Site are presented in Table 3-1. The nearest potable well is 320 m from the Project property boundary and 1.72 km from the nearest turbine. The closest Wellfield Protected Area to the Site, is the Hartland Wellfield, which is located approximately 13 km to the west of the Site.

Table 5-1: Well Details within 1 km and 3 km of Site (OWLS, 2023)

Parameter	Minimum	Maximum	Average
Wells Within 1 km of Project Development Area (8 wells)			
Well Depth (m bgs)	18.3	86.9	43.6
# of Shallow Wells (< 30 m bgs)	-	1	-
Depth to Bedrock (m bgs)	0.91	13.1	4.63
Static Water Level (m bgs)*	3.05	6.1	4.1
Depth of Water Bearing Fractures (m bgs)	12.19	79.3	33.6
Driller’s Estimated Safe Yield (L/min)	4.55	91	21.7
# of Fractures < 10 m (%)	-	0%	-
# of Fractures > 10 m (%)	-	100%	-
All Wells Within 3 km of Project Development Area (73 wells)			
Well Depth (m bgs)	8.53	93	43.2
# of Shallow Wells (<30 m bgs)	-	18	-
Depth to Bedrock (m bgs)	0	39.6	7.13
Static Water Level (m bgs)*	1.52	71.9	7.55
Depth of Water Bearing Fractures (m bgs)	0.30	79	31.6
Driller’s Estimated Safe Yield (L/min)	1.14	1365	49.2
# of Fractures < 10 m (%)	-	5%	-
# of Fractures > 10 m (%)	-	95%	-

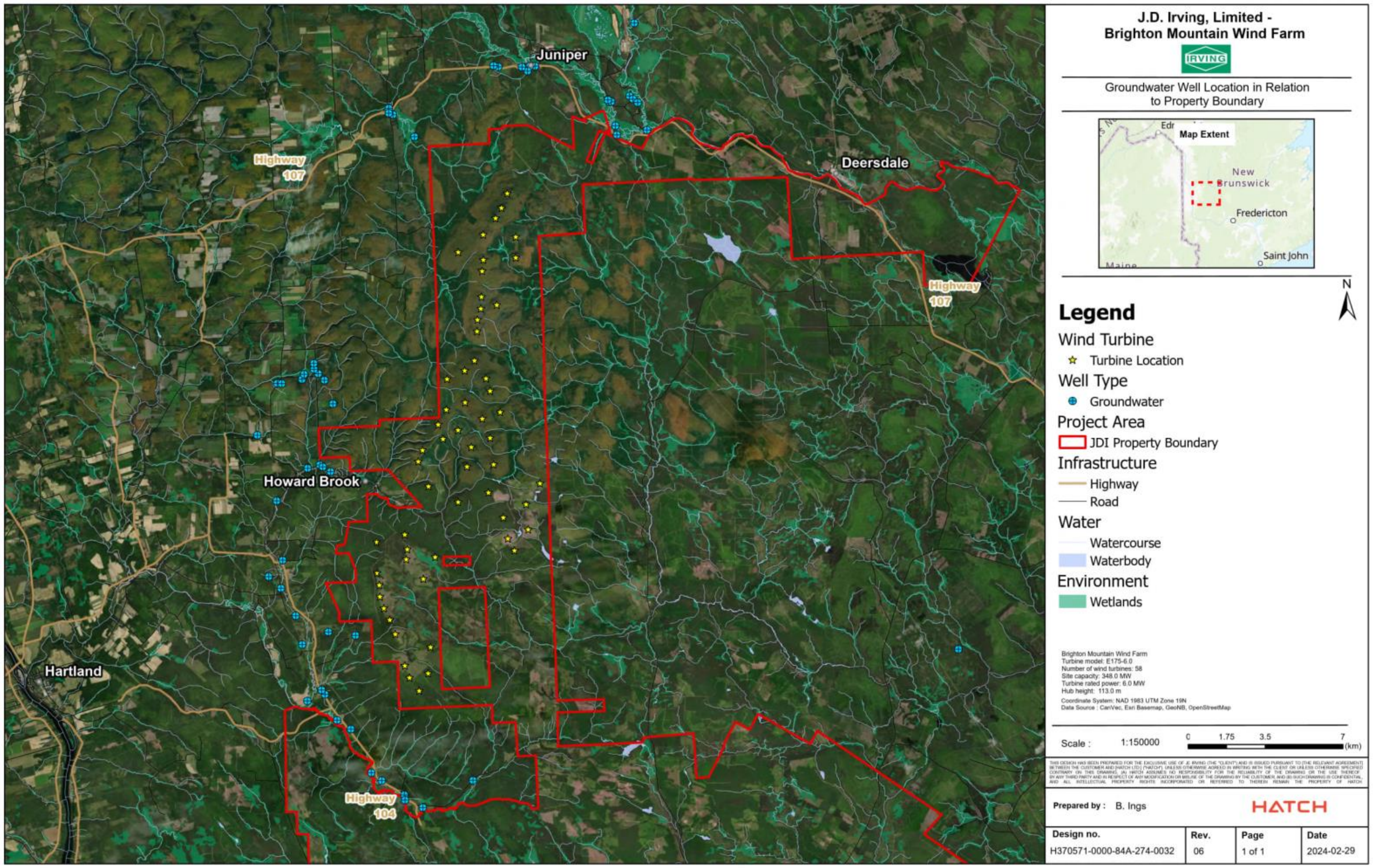

Figure 5-5: Groundwater Well Location in Relation to Site Boundary

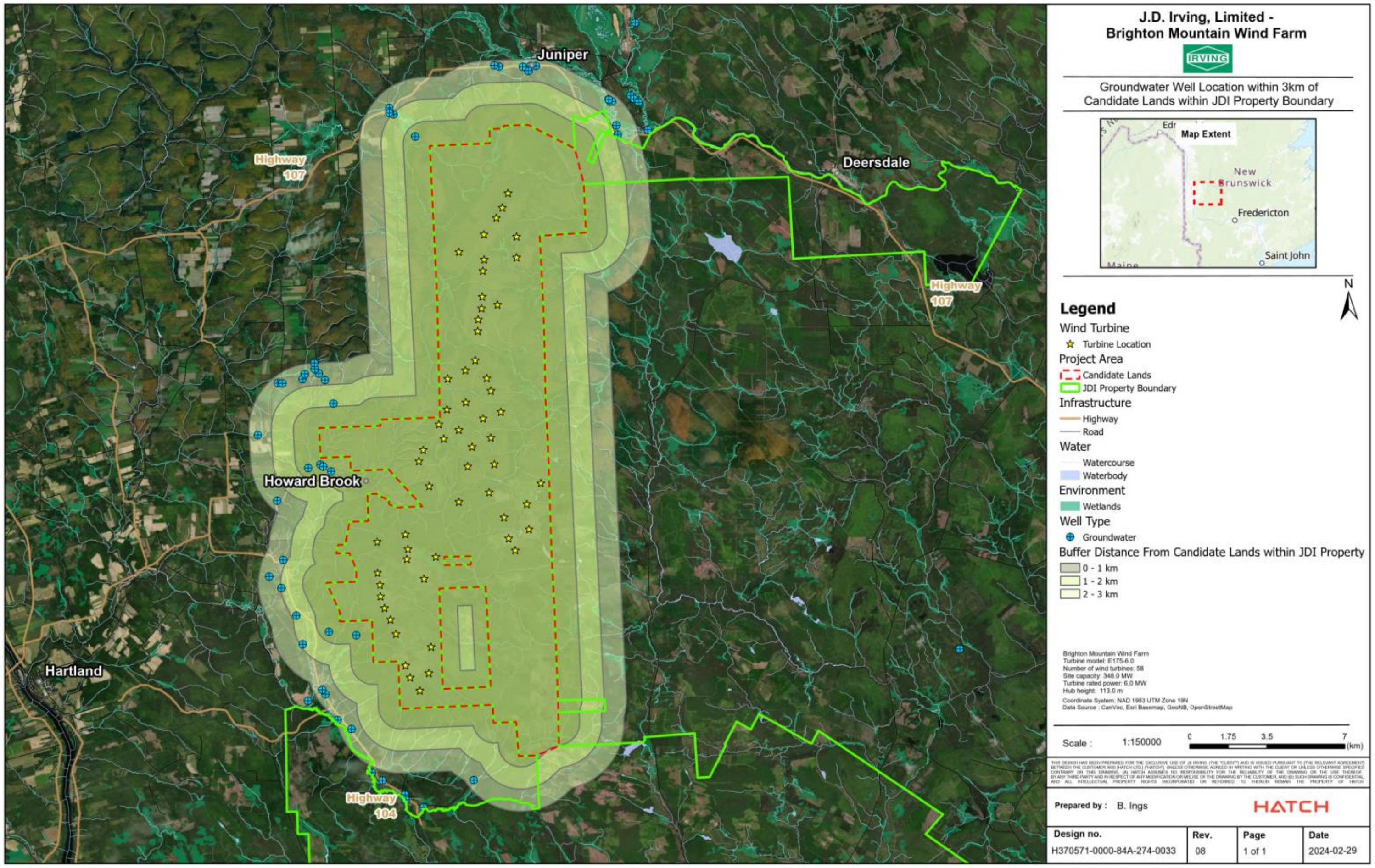

Figure 5-6: Groundwater Well Location within 3 km of Project Site Boundary

5.1.2.1 Groundwater Quality

Available groundwater chemistry data from the NBDELG OWLS were compared to the Guidelines for Canadian Drinking Water Quality (GCDWQ; Health Canada, 2022). Exceedances of the GCDWQ maximum allowable concentrations, which are health-based guidelines, were noted for arsenic, manganese, lead, antimony, and total coliform. Exceedances of the GCDWQ aesthetic objectives, which are based on taste and odour, were identified for chloride, iron, manganese, turbidity, pH, and total dissolved solids. These exceedances could be naturally occurring and based on the local geology in New Brunswick. The presence of total coliform (bacteria) could be due to the timing of the collection of the groundwater sample following drilling (e.g., before chlorinating the well) or could be due to poor well construction. Groundwater with exceedances of the GCDWQ would require treatment prior to consumption.

Groundwater chemistry data from the OWLS for a search area of 3 km from the Project property boundary is presented in Table 5-2. There was no groundwater chemistry data returned for a search area of 1 km from the Project property boundary.

Table 5-2: Groundwater Chemistry Data for Wells within 3 km of Site (OWLS, 2023)

<table>
<tr><th rowspan="2">Parameter</th><th rowspan="2">Units</th><th colspan="2">GCDWQ*</th><th rowspan="2">Number of Samples within 3 km of Project Property Boundary</th><th rowspan="2">Minimum Concentration or Value</th><th rowspan="2">Maximum Concentration or Value</th><th colspan="2"># of Exceedances of GCDWG*</th></tr>
<tr><th>MAC**</th><th>AO***</th><th>MAC**</th><th>AO***</th></tr>
<tr><td>Alkalinity</td><td>mg/L</td><td>-</td><td>-</td><td>30</td><td>15.1</td><td>197</td><td>0</td><td>-</td></tr>
<tr><td>Aluminium (Al)</td><td>mg/L</td><td>2.9</td><td>-</td><td>30</td><td><0.025</td><td>0.211</td><td>0</td><td>-</td></tr>
<tr><td>Arsenic (As)</td><td>µg/L</td><td>10.</td><td>-</td><td>30</td><td>1.2</td><td>47</td><td>6</td><td>-</td></tr>
<tr><td>Boron (B)</td><td>mg/L</td><td>5</td><td>-</td><td>30</td><td>0.006</td><td>0.142</td><td>0</td><td>-</td></tr>
<tr><td>Barium (Ba)</td><td>mg/L</td><td>2</td><td>-</td><td>30</td><td>0.002</td><td>1.4</td><td>0</td><td>-</td></tr>
<tr><td>Bromide (Br)</td><td>mg/L</td><td>-</td><td>-</td><td>30</td><td><0.1</td><td>0.403</td><td>-</td><td>-</td></tr>
<tr><td>Conductivity</td><td>µSIE/cm</td><td>-</td><td>-</td><td>30</td><td>42.4</td><td>1100</td><td>-</td><td>-</td></tr>
<tr><td>Calcium (Ca)</td><td>mg/L</td><td>-</td><td>-</td><td>30</td><td>0.68</td><td>87.4</td><td>-</td><td>-</td></tr>
<tr><td>Cadmium (Cr)</td><td>µg/L</td><td>7</td><td>-</td><td>30</td><td><0.01</td><td><0.5</td><td>0</td><td>-</td></tr>
<tr><td>Chloride (Cl)</td><td>mg/L</td><td>-</td><td>250</td><td>30</td><td>0.494</td><td>267</td><td>-</td><td>1</td></tr>
</table>

Parameter	Units	GCDWQ*		Number of Samples within 3 km of Project Property Boundary	Minimum Concentration or Value	Maximum Concentration or Value	# of Exceedances of GCDWG*	
		MAC**	AO***				MAC**	AO***
Chromium (Cr)	µg/L	50	-	30	11	23	0	-
Copper (Cu)	µg/L	2000	-	30	12	659	0	-
E.coli	Pr/Ab[4]	Ab	-	33	Ab	Ab	0	-
Fluoride (F)	mg/L	1.5	-	30	0.06	1.13	0	-
Iron (Fe)	mg/L	-	0.3	30	0.011	2.6		**7**
Hardness	mg/L	-	-	30	0.65	233	-	-
Potassium (K)	mg/L	-	-	30	0.117	2.35	-	-
Lithium (li)	mg/L	-	-	1	0.0082	0.0082	-	-
Magnesium (Mg)	mg/L	-	-	30	0.147	20.7	-	-
Manganese (Mn)	mg/L	0.12	0.02	30	<0.005	0.65	**4**	**13**
Nitrite (NO_2) as N	mg/L	1	-	29	<0.05	<0.05	0	
Nitrate (NO_3) as N	mg/L	10	-	29	0.03	3.3	0	
NOX as N	mg/L	-	-	30	0.05	3.3	-	-
Sodium (Na)	mg/L	-	200	30	1.48	209	-	0
Nickel (Ni)	µg/L	-	-	1	<1	<1	-	-
Lead (Pb)	µg/L	5	-	30	0.4	18	**1**	-
Sulphate (SO4)	mg/L	-	500	30	1	32.3	-	0
Antimony (Sb)	µg/L	6	-	30	0.2	85	**3**	-
Selenium (Se)	µg/L	50	-	29	1.6	1.6	0	-
Strontium (Sr)	mg/L	7.0	-	1	0.451	0.451	0	-
Total Coliform (TC)	Pr/Ab****	Ab	-	33	Ab	Pr	**7**	-

Parameter	Units	GCDWQ*		Number of Samples within 3 km of Project Property Boundary	Minimum Concentration or Value	Maximum Concentration or Value	# of Exceedances of GCDWG*	
		MAC**	AO***				MAC**	AO***
Turbidity	NTU	-	14	30	0	29	-	**13**
Titanium (Ti)	µg/L	-	-	30	<1	<1	-	-
Uranium (U)	µg/L	20	-	25	0.5	8	0	-
Vanadium (V)	mg/L	-	-	1	<0.001	<0.001	-	-
Zinc (Zn)	µg/L	-	5000	30	<5	52	-	0
pH	no units	-	7.0-10.5	30	6.43	9.56	-	**3**
TDS (Calculated)	mg/L	-	500	26	59.373	570.887	-	1

Notes:
*Guidelines for Canadian Drinking Water Quality (GCDWQ; Health Canada, 2022)
**MAC = Maximum Acceptable Concentration
***AO = Aesthetic Objective
****Pr/Ab = Present/Absent

5.1.3 Atmospheric Conditions

The Project location is located within the Central Uplands Ecoregion of New Brunswick (Zelazny, 2007). According to the Köppen-Geiger climate classification, the region is characterized by a continental snow, fully humid climate with warm summers (Peel et al., 2007). Western New Brunswick is characterized by rolling mountainous terrain in the north that slopes into rolling hills to the south and east. The Highlands to the northeast of the Project Site are an extension of the Appalachian Mountain range, containing the highest elevations in the Maritime Provinces, with Mount Carleton rising to 817 m.

5.1.3.1 Climate

A review of data available from ECCC and the U.S. based National Climatic Data Center (NCDC) was conducted to establish baseline climate conditions in the Atmospheric LAA. Climate normal data from the Juniper, Fredericton CDA and Fredericton Airport met stations were obtained from ECCC. Additionally, hourly surface meteorological data logged at the Fredericton and Houlton Airport stations were also obtained from the NCDC. The locations of the met stations are shown in Figure 5-7.

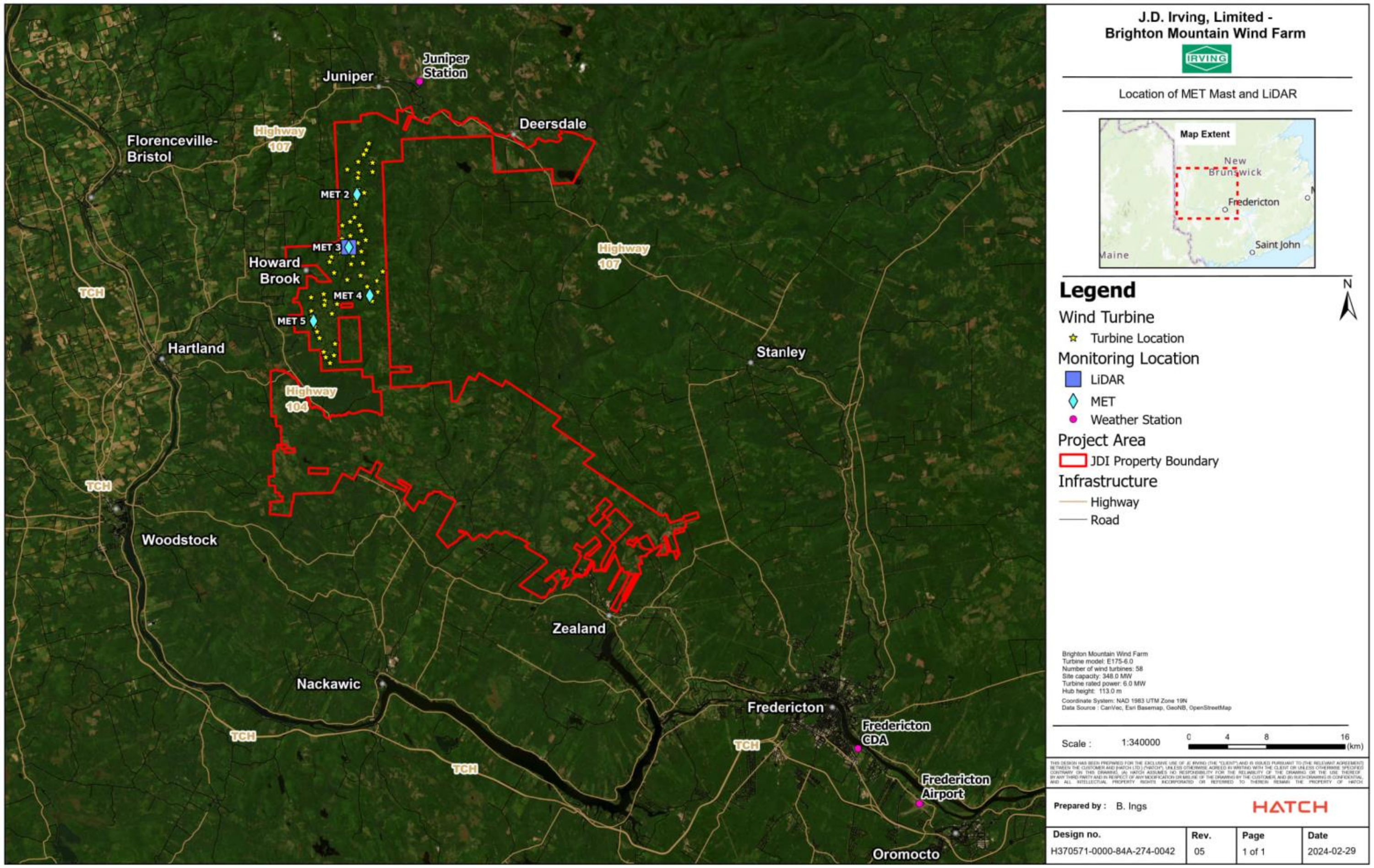

Figure 5-7: Location of Met Mast Towers and LiDAR Unit

The existing conditions for the individual met parameters reviewed are summarized in the following text.

5.1.3.2 Temperature

Monthly climate data between 1969 and 2017 are available for the ECCC Juniper weather station that was located approximately 4.5 km northeast of the Project (ECCC Climate ID 8102275; 46.55°N 67.17°W, elevation 259.1 m). The temperature data measured at this station is summarized in Figure 5-8.

During that period, the mean annual temperature was 3.7 ± 1.7°C with a monthly daily minimum of -24.3 ± 3.85°C in January to a monthly daily maximum of 23.7 ± 1.89°C in July (ECCC, 2023a). The warmest and coolest years on record were 2009 and 1971, respectively, during which years the mean annual temperature were 8.9°C and 0.4°C, respectively. As indicated in Figure 5-8, the extreme minimum mean daily temperature was -42.2°C and this value was measured on January 19, 1971, while the extreme maximum mean daily temperature was 37.2°C and this value was measured on August 2, 1975.

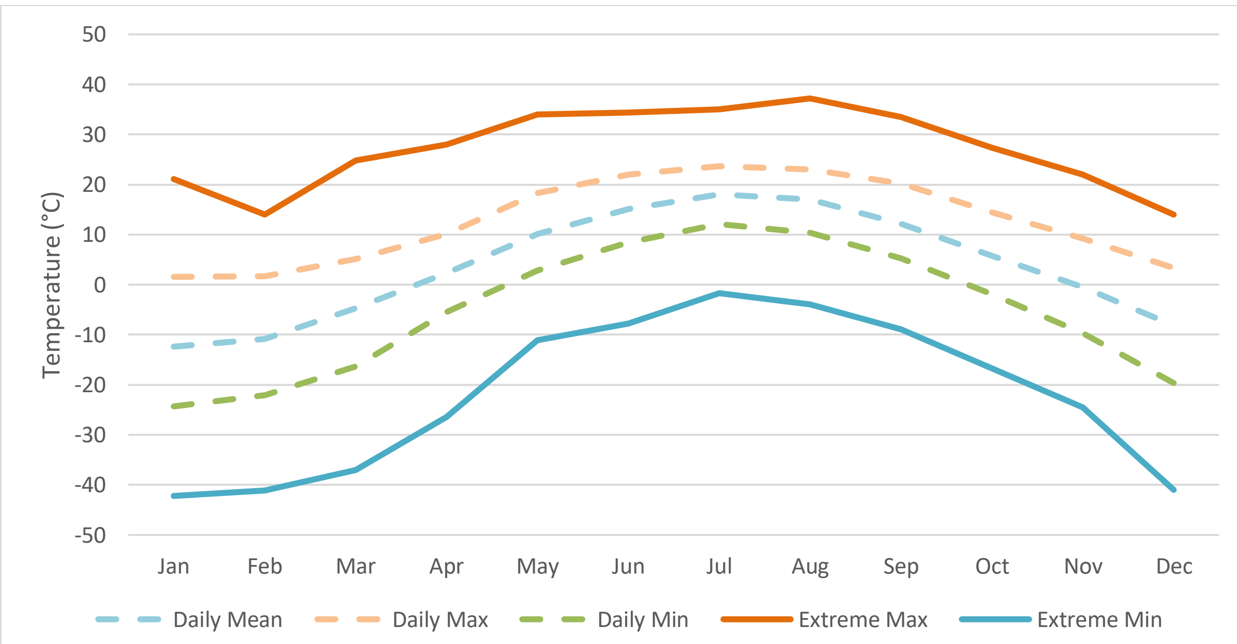

Figure 5-8: Compilation of Mean Daily Temperatures Measured at the ECCC Juniper Meteorological Station Between 1969 and 2017

5.1.3.3 Precipitation

Precipitation data (i.e., rain, freezing rain/ice pellets, and snow) measured at the Juniper met station is generally well distributed throughout all months and the majority (i.e., >75%) falls in the form of rain. Mean annual precipitation between 1969 and 2017 (see Figure 5-9) was 1,128 mm with a mean monthly low of 73 mm in February to a mean monthly high of 108 mm in July (ECCC, 2023a). The driest year on record was 2010 when there was only 573 mm of precipitation, while the wettest year was 1979 when there was 1,399 mm of precipitation. The most extreme daily rainfall of 100 mm was measured on July 6, 2014. The greatest snowfall of 51 cm was recorded on March 17, 1981. Snow depth, during the nine months with snowfall, averages 28.9 cm and almost 185 days each year experience some form of precipitation (ECCC, 2023a).

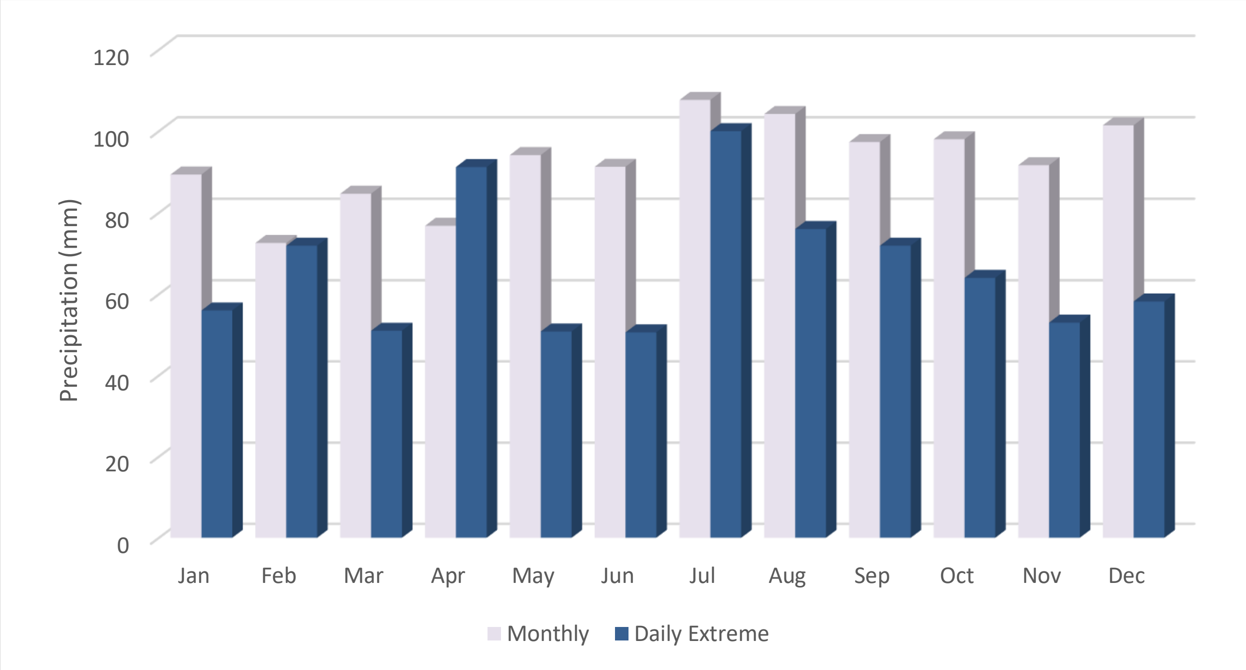

Figure 5-9: Compilation of Mean Daily Precipitation Measured at the ECCC Juniper Meteorological Station Between 1969 and 2017

5.1.3.4 Visibility & Fog

The presence and frequency of fog events at a wind farm site can have a detrimental effect on migratory birds due to collisions during adverse weather conditions (Kearney, 2012). Artificial lighting, particularly work lights inadvertently left on by turbine maintenance crews are also known to have an adverse effect on migratory birds (Kearney, 2012). During adverse weather events, sporadic artificial lighting during dawn and dusk at a wind farm may attract migrating birds, signaling a potential safe area.

Significant fog is not expected in the proposed site location, as indicated in Figure 5-10 (Robichaud, B and Mullock, J, 2001). In this area, westerly to northerly winds are downslope and do not contribute to fog while winds from the south to the east will be upslope and tend to give lower visibility. The Saint John River Valley is prominent in this area and winds tend to be channeled through the valley. Patches of radiation fog are common all along the Saint John River Valley from spring to early fall, during clear nights. The fog, which is typically 150 to 300 m thick, usually develops over the river shortly before dawn and gradually spreads outward to about 5 to 8 km on either side if the river. However, the Project site will be located further than 8 km east of the Saint John River and as such, fog from the Saint John River is not expected to affect the Project area. In northwestern NB, radiation fog will form in the valleys in the summer, but this fog also burns off very quickly (Robichaud & Mullock, 2001).

The closest ECCC met station to the Project site that records fog occurrence and visibility data is the Fredericton Airport met station, which is located approximately 70 km southeast of the Project site. The climate normals fog data from 1981 to 2010 for this station is summarized in Table 5-3, noting again that these conditions may not be completely representative of fog formation at the Project site. Based on the data presented in Table 5-3, fog is expected to occur less than 1% of the time throughout the duration of an average year. Visibility in the vicinity of the Fredericton area is normally good at >9 km about 78% of the time (ECCC, 2023b), noting again that the Project site is expected to exhibit better visibility than the Fredericton area.

The closest meteorological station to the Project site that records bright sunshine data is the Fredericton CDA met station, which is located approximately 60 km southeast of the Project site. As obtained from the climate normals from 1981 to 2010 for this station, annual sunshine was approximately 1971 hours ranging from 96 hours in December to 240 hours in July. The extreme amount of daily sunshine (28.5 hours) occurred on June 4, 1995 (ECCC, 2023c).

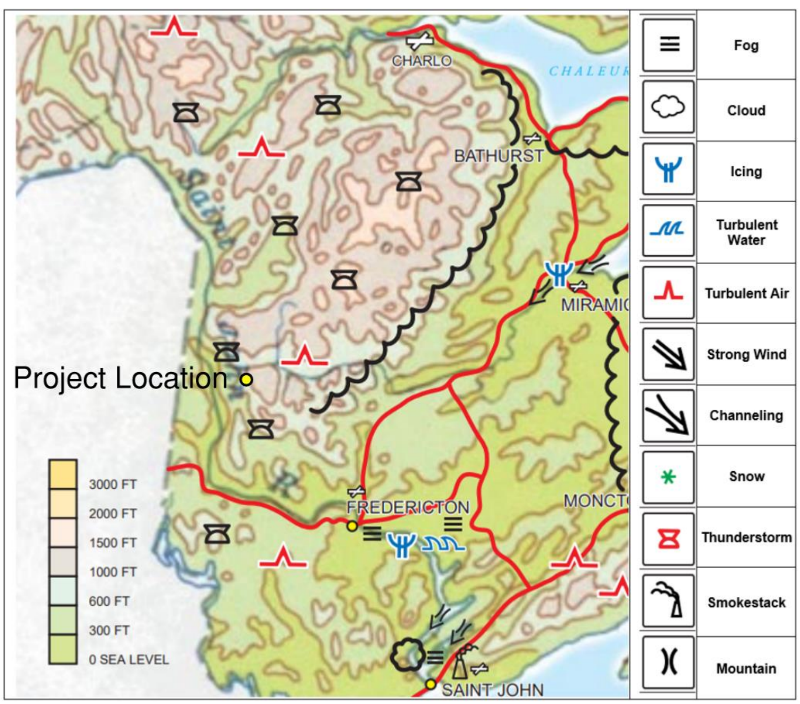

Figure 5-10: Seasonal Weather and Local Effects in Central and Northwestern New Brunswick, (adapted from Robichaud, B and Mullock, J, 2001)

Table 5-3: Fog Data Summary as Obtained from the Fredericton Airport Meteorological Station from 1981 to 2010

Month	Hours with Visibility Less than 1 km	Percentage of Foggy Weather
January	12.9	2
February	9.1	1
March	10.5	1
April	7.8	1
May	3.9	1
June	4.7	1
July	8.3	1
August	7.8	1
September	10.3	1
October	11.1	1
November	9.9	1
December	12.3	2
Annual	108.4	1

5.1.3.5 Wind

5.1.3.5.1 Historical Data

Climate normals wind speed data from 1981 to 2010 recorded at the Fredericton Airport weather station, which is located approximately 70 km southeast of the proposed Site were accessed from ECCC. As indicated in Figure 5-11 wind speed in this area ranges from 9.6 km/h in August to 14.2 km/h in March yielding an annual average of 12 km/h (ECCC, 2023b). Winds tend to be the strongest in the winter and weakest in the summer. The maximum hourly wind speed of 80 km/hr was measured on February 3, 1970, while the most extreme wind gusts of 132 km/h (west winds) were recorded on June 30, 1971 (ECCC, 2023b).

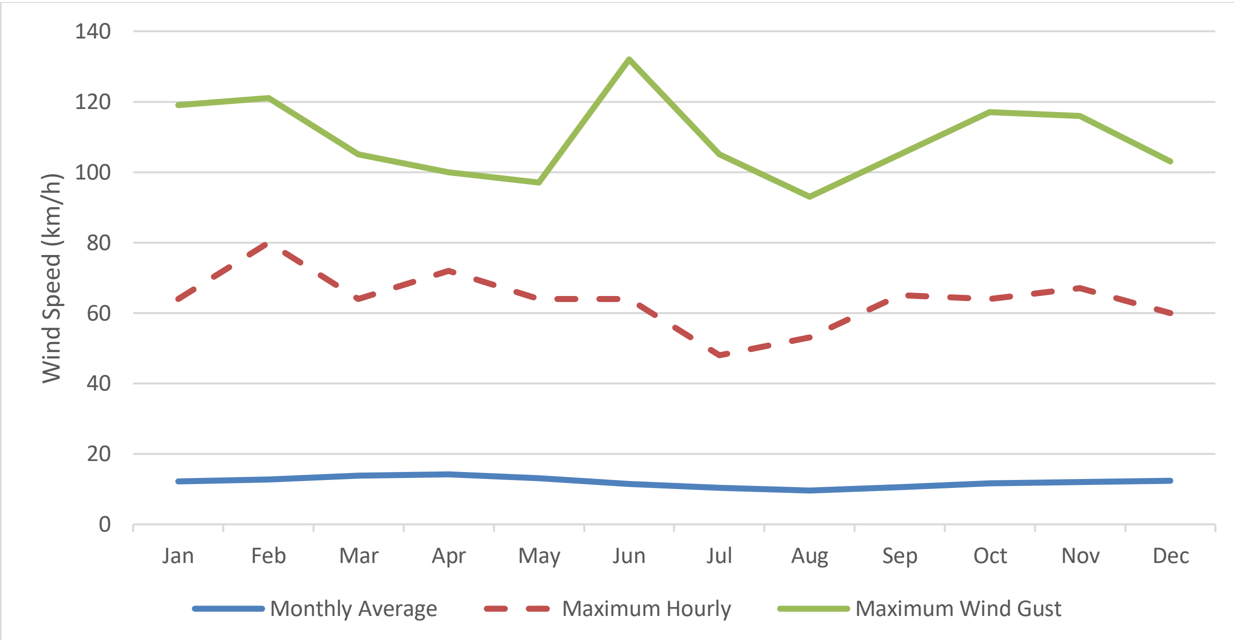

Figure 5-11: Summary of Wind Speeds Measured at the ECCC Fredericton Airport Meteorological Station Between 1981 and 2010

Wind direction data from January 1, 2018, to November 8, 2023, were extracted the Fredericton Airport weather station, and this information is compiled in a wind rose in Figure 5-12 (NCDC, 2023b). As indicated in Figure 5-12, predominant wind direction measured at this weather station is from the south-southwest. Wind data for this period were also extracted from the U.S. NCDC for the Houlton Airport met station, which is located approximately 50 km west-southwest of the proposed Site, noting that this station is possibly more representative of winds at the Project site (NCDC, 2023a). This information is also compiled in a wind rose in Figure 5-12, which shows the predominant wind direction at this weather station is from the south-southwest.

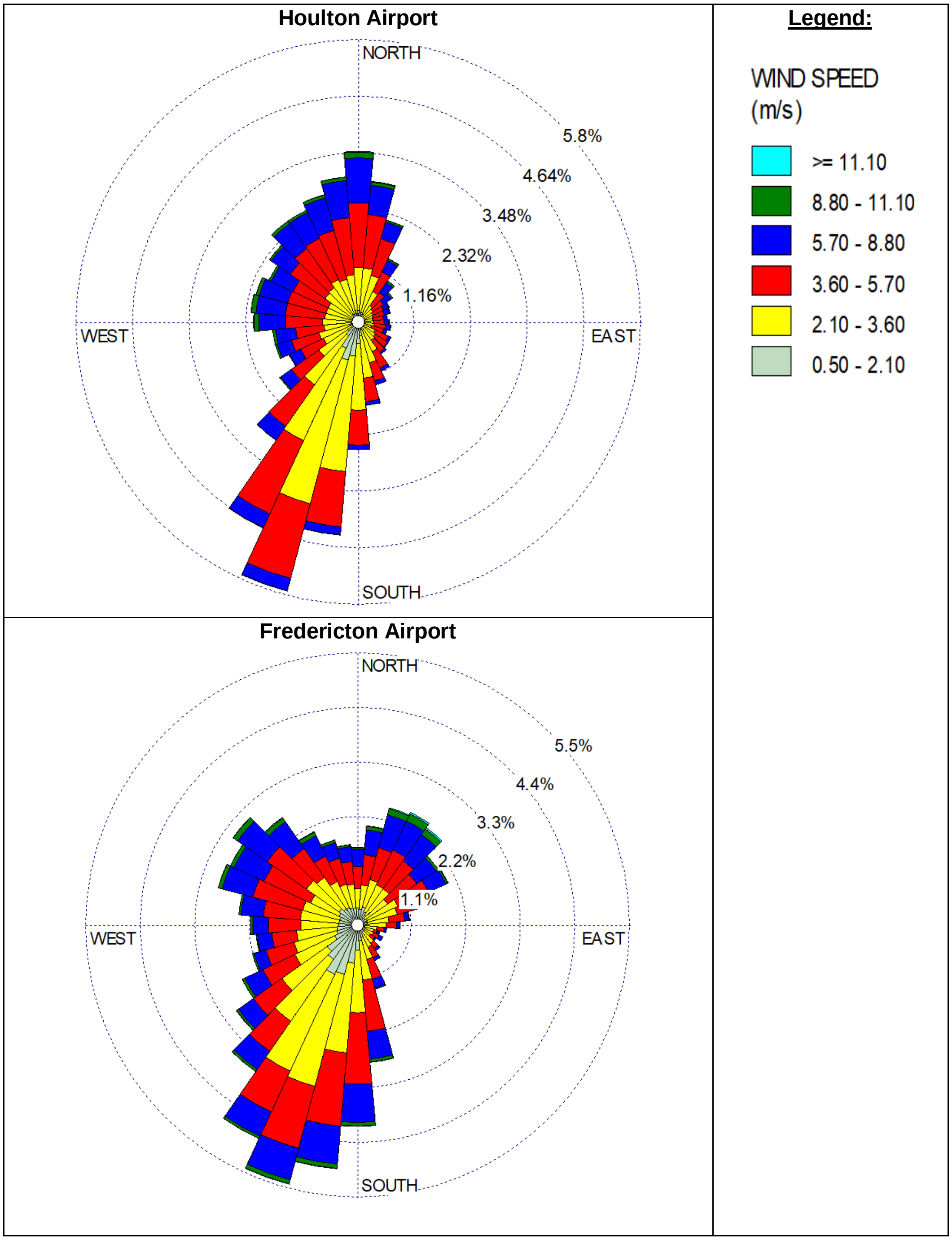

Figure 5-12: Wind Rose of Data Measured from 2018 to 2023 at the Houlton and Fredericton Meteorological Stations

The New Brunswick wind atlas indicates an approximate wind speed of 7 to 8.5 m/s at 80 m Above Ground Level (AGL) (NB Wind Atlas, 2017) for the regional area, at the proposed Project Site location (see Figure 5-13).

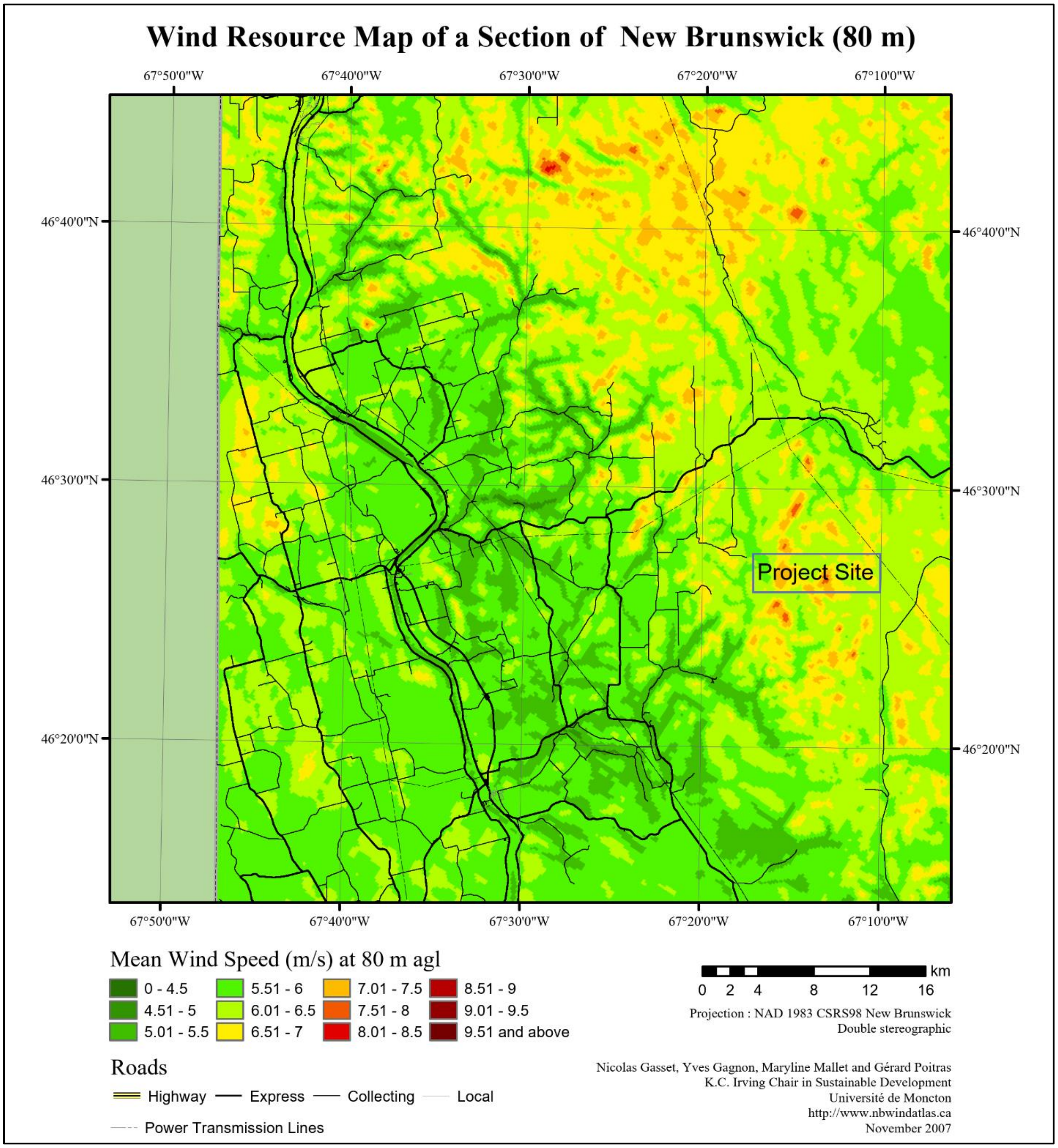

Figure 5-13: The Government of New Brunswick Wind Atlas for the Project Site

5.1.3.5.2 MET Mast Towers and LiDAR Data

To obtain an accurate understanding of wind patterns at the Project site, four met mast towers and one LiDAR unit were installed, in 2023. The LiDAR unit was originally stationed near MET mast #3 but was moved to a new location at the end of December 2023, near Met Mast #2. The locations of the met mast towers and LiDAR are shown in Figure 5-7. The wind speed and directions are measured at 80 metres above ground level at the five stations. The data measured at the project site will provide more accurate representations of the wind resource in the area than the historically measured data at met stations further from the Project site. The calibrated NRGSystems™ sensors were connected to a datalogger that logs measurements in 10-minute intervals. This data will be summarized in the upcoming Amendment to this EIA Registration.

Wind rose plots of the data collected from August 13, 2023, to January 31, 2024, at the met mast towers are provided in Table 5-4. The plots show distribution of wind speed and direction at each location. Missing wind speed or direction data were excluded from the plots. provides a wind rose generated from data measured using the LiDAR unit. From the onsite data collected, generally, winds blow from the southwest and west-northwest at the LiDAR location. Average wind speeds measured at the four stations ranged between 6.5 and 8.6 m/s (10-min log intervals) over the period of record. After more data have been collected, the applicable wind roses will be updated to cover a larger data set for the wind resource at the Project site.

A summary of the 10-minute data logged to date at the LiDAR and met mast tower locations is provided in Table 5-4.

Table 5-4: Summary of Preliminary Wind Data – LiDAR and Met Mast Towers

Station	Data Period		Average Wind Speed (m/s)	Max Wind Speed (m/s)	Data Count (10-min data)
	Start	End			
LiDAR Location 1	6/1/2023 00:00	12/21/2023 23:50	6.48	24.81	20,618
LiDAR Location 2	12/31/2023 00:00	1/31/2024 23:50	8.55	22.96	3,565
1433	8/13/2023 00:00	1/31/2024 23:50	7.03	24.12	22,566
1434	9/24/2023 00:00	1/31/2024 23:50	6.96	23.87	15,519
1435	8/21/2023 00:00	1/31/2024 23:50	6.85	24.63	20,962
1436	8/16/2023 00:00	12/31/2023 23:50	6.72	26.48	18,284

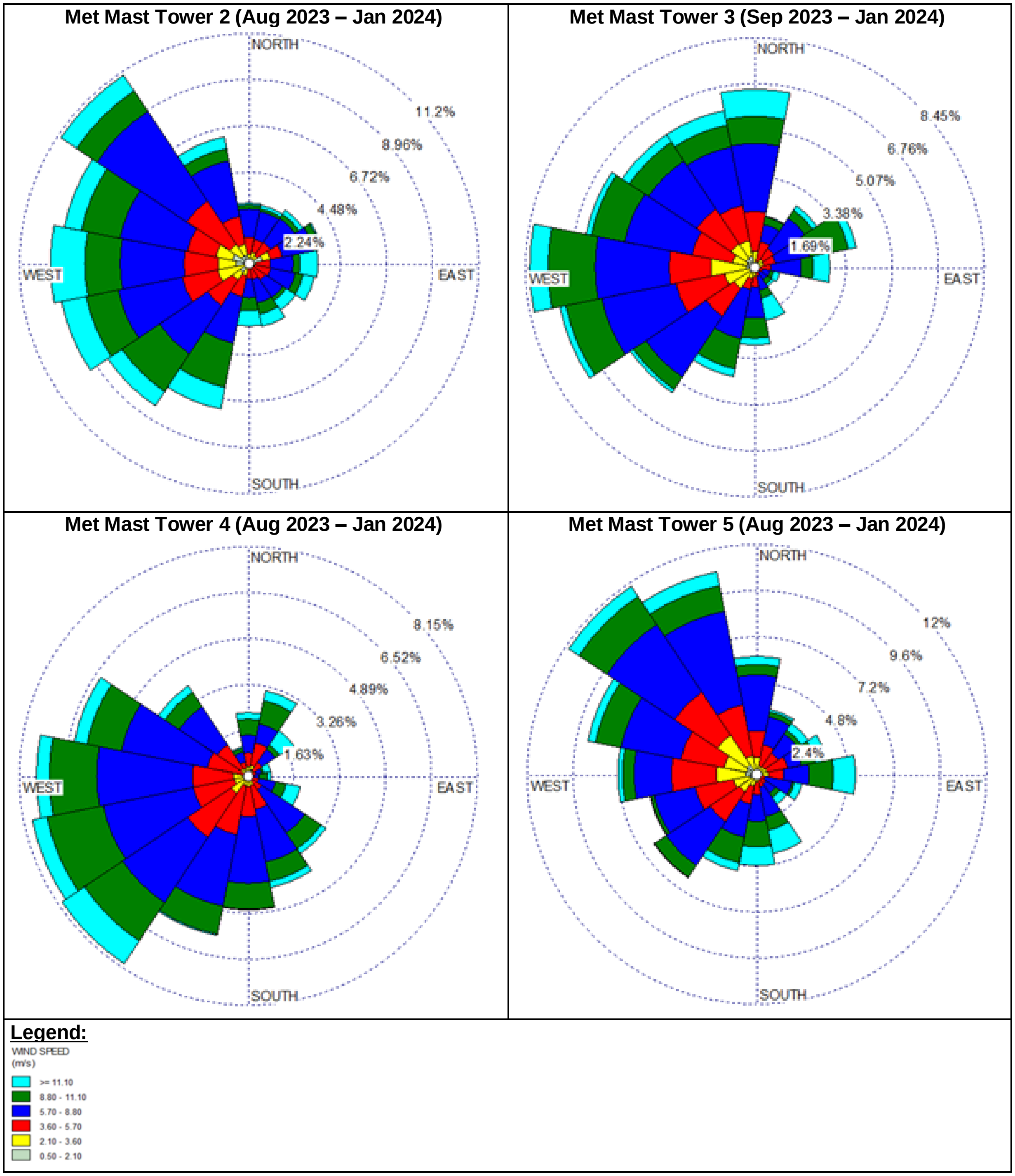

Figure 5-14: Winds at the Met Mast Towers (August 2023- January 2024)

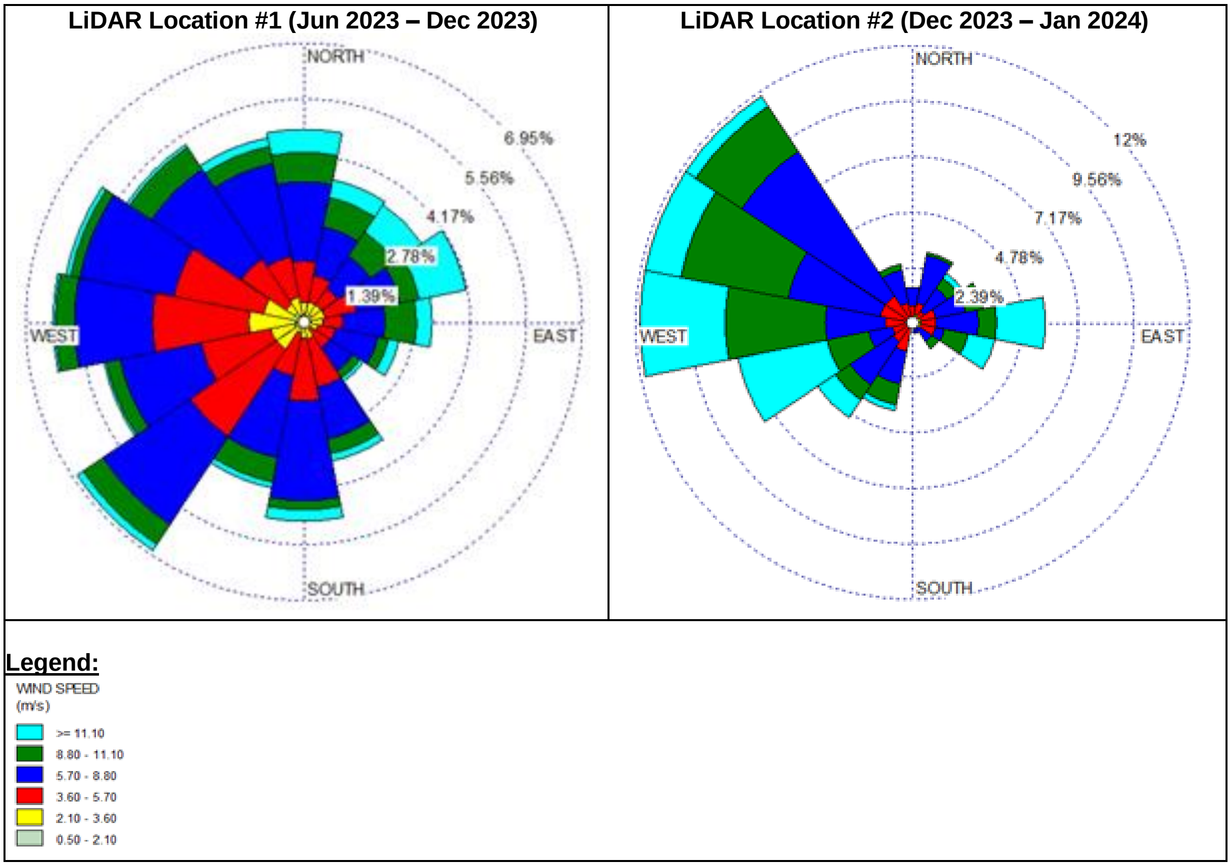

Figure 5-15: Winds at the LiDAR Locations

5.1.3.6 Air Quality

Existing air quality in the Project area is characterized using ambient air quality data measured at the nearest AAQM stations. The AAQM network in New Brunswick consists of government and industry operated monitoring stations and NBDELG publishes ambient air quality summary reports annually. The 2021 annual report is the most recently available version, and this report is used in this assessment (NBDELG, 2022).

The nearest AAQM stations to the Project site are located in Nackawic and Fredericton (see Figure 5-16. Concentrations of $PM_{2.5}$, NO_2 and O_3 are measured at the Fredericton AAQM station. Concentrations of $PM_{2.5}$, SO_2 and TRS are measured at the Nackawic AAQM station.

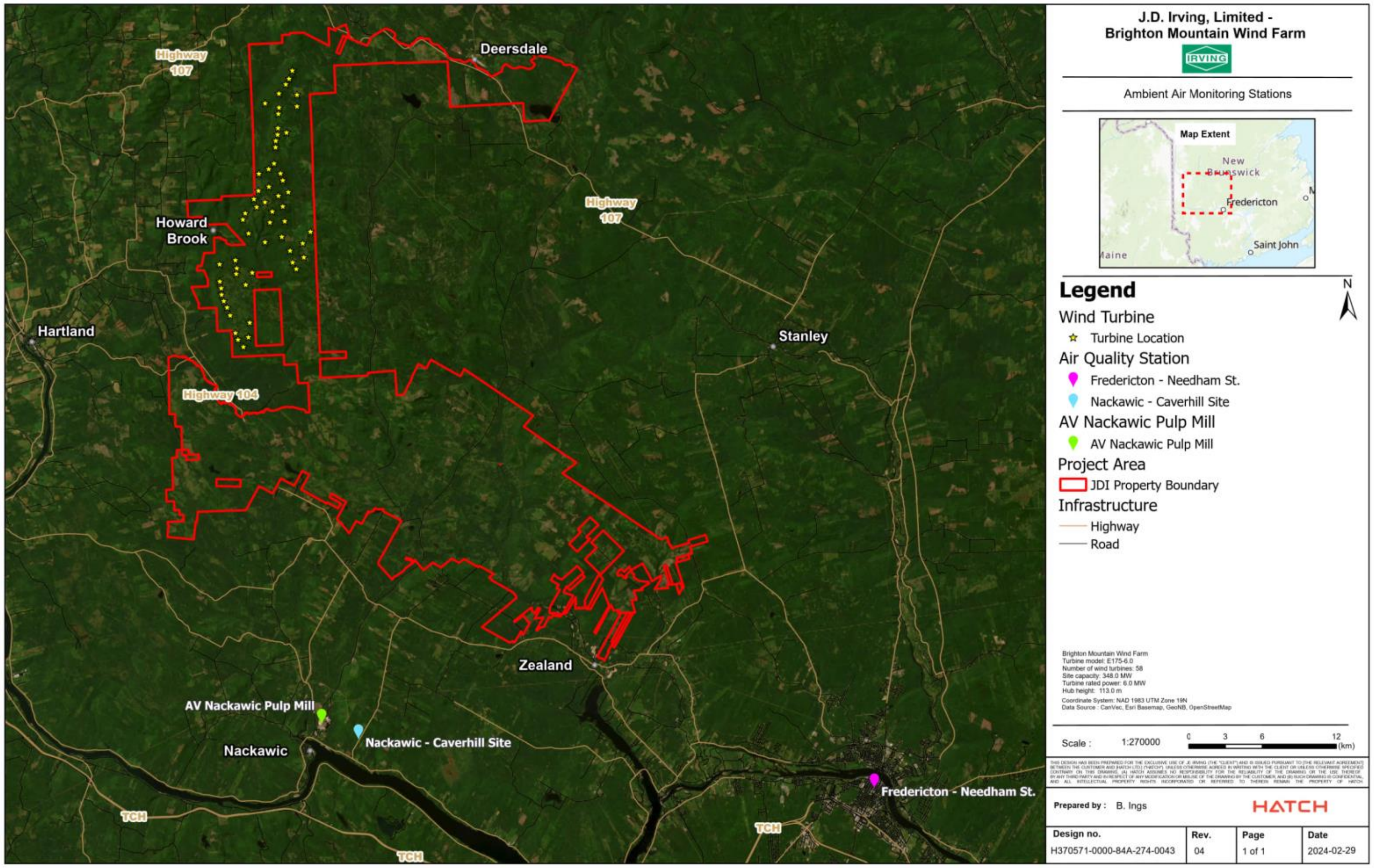

Figure 5-16: Location of the AAQM Stations

The Nackawic AAQM Station is located approximately 40 km south of the Project site, near the AV Nackawic Dissolving Grade Pulp Mill. The Nackawic AAQM Station is operated by AV Nackawic. The Fredericton AAQM station is located approximately 60 km to the southeast of the Project site in the downtown area of the City of Fredericton and is operated by NBDELG. Although the Nackawic AAQM station is located closer to the Project site, it is located near the pulp mill and as such, concentrations measured at this station are not likely to be representative of ambient air quality at the Project site. Therefore, air contaminant concentration data, as well as ambient concentrations of $PM_{2.5}$ and NO_2, measured at the Fredericton AAQM station are used to characterize baseline concentrations in the Project area.

Based on the 2021 NBDELG annual air quality report, there were no exceedances of the NBDELG air quality objectives at the Fredericton station and only one exceedance of the hourly objective for TRS as H_2S (15 µg/m^3) was logged at the Nackawic station (on July 10, 2021).

Continuous monitoring data were also obtained for the period from the beginning of January 2020 to early November 2023 from the NBDELG Air Quality Data Portal (NBDELG, 2023) and the ECCC National Air Pollution Surveillance (NAPS) Program (ECCC, 2023d). A summary of the ambient concentrations measured at the Fredericton AAQM station is provided in Figure 5-14). The measured concentrations are compared with applicable NB objectives for NO_2 and CAAQS for $PM_{2.5}$ and NO_2. As indicated in Table 5-5 and the NBDELG 2021 Annual Air Report, there were no exceedances of the NB objectives or the CAAQS at the Fredericton AAQM station over the data period (2020 to 2023). The Fredericton AAQM station is located in an urban area with local emission sources such as vehicle traffic, as such, it is likely that the baseline concentrations of NO_2 are higher than concentrations at the Project site. However, $PM_{2.5}$ concentrations measured at the Fredericton station are likely similar to those at the Project site, since periods with elevated $PM_{2.5}$ concentrations in the area are typically a result of long-range transport of releases from the northeast United States, southern Ontario and Quebec.

Table 5-5: Summary of Baseline Ambient Concentrations

Air Contaminant	Average Period	Measured Concentration (µg/m^3)	NBDELG Objective (µg/m^3)	CAAQS (2020 / 2025) (µg/m^3)	Percent of Applicable Limit
$PM_{2.5}$	24-hour	30.0[(a)]	-	-	-
		14.8[(b)]	-	27	55%
	Annual	6.01[(a)]	-	8.8	68%
NO_2	1-hour	77.2[(a)]	400	-	19%
		50.0[(c)]	-	113 / 79	63%
	24-hour	44.4[(a)]	200	-	22%

Air Contaminant	Average Period	Measured Concentration ($\mu g/m^3$)	NBDELG Objective ($\mu g/m^3$)	CAAQS (2020 / 2025) ($\mu g/m^3$)	Percent of Applicable Limit
	Annual	5.19[(a)]	100	32 / 23	5%

[(a)] Maximum from January 1, 2020, to November 8, 2023
[(b)] Three-year rolling average of 98th percentile of 24-hour average concentrations
[(c)] Three-year rolling average of 98th percentile of Daily 1-Hour maximum concentrations

Since the project site is located primarily in a rural area, there are few large industrial emission sources in the vicinity of the Project. Annual air contaminant release information for commercial and industrial facilities operating in Canada that meet the applicable NPRI threshold(s) is available from the ECCC NPRI dashboard. A review of the NPRI database for the 2021 and 2022 reporting years was conducted to establish potential releases of air contaminants in the atmospheric LAA (i.e. Within 10 km from the PDA). In 2021 and 2022, only the J.D. Irving Limited (JDI) Juniper Organics Peat Processing Facility within the LAA meet the NPRI reporting threshold(s). Reported releases from this facility are provided in Table 5-6 (NPRI 2023, 2022). Additionally, there may be other emissions generating activities in the area such as forest operations and local vehicle traffic which may result in short-term, localized reductions in air quality in the LAA.

Table 5-6: NPRI Reported Releases - JDI Juniper Organics Facility

Substance	Releases to Air [(a)] (t/a)		Reporting Threshold (t/a)
	2021	2022	
PM_{10}	1.3	1.6	0.5
$PM_{2.5}$	1.2	1.3	0.3

[(a)] Source: NPRI 2021 – 2022 substance release reports (NPRI 2022, 2023)

5.1.3.7 *Greenhouse Gases*

The quantity of Greenhouse Gas (GHG) emissions released to the atmosphere in Canada according to the most recently data published by the Government of Canada (i.e., 2021), was 672 Megatonnes (Mt) of CO_2eq, 11.9 Mt CO_2eq of which were released in New Brunswick (i.e., 1.8% of Canada wide emissions). Annual Canadian GHG emissions increased by 1.8% from 2020 to 2021 but decreased by 8.4% from 2005 to 2020 (GoC, 2023). However, there is no industrial facility within the LAA that emits more than 10 Mt CO_2eq.

5.1.4 Noise

The NB-DELG recommends characterizing the existing noise environment prior to the introduction of the project. As such the Project established the pre-project noise environment to assist with quantifying the change in the noise environment during construction and eventually operation of WTGs. The Project completed a desktop study, and accompanying field visit, to produce a '*Baseline Noise Assessment Report* '(H370571-0000-240-066-0001), as well as an '*Operational and Construction Noise Assessment Report*'(H370571-0000-245-

066-0001), to support the provincial EIA requirements, as prescribed in the EIA Sector Guidance Document. Both reports are included in Appendix A and Appendix B respectively.

The existing noise environment was characterized by taking multiple noise measurements following a qualified method and equipment. Table 5-7 summarizes the applicable wind turbine guidelines, international standards, and best practices that were adopted for the project.

Table 5-7: Applicable Wind Turbine Guidelines, International Standards, and Best Practices

No. & Reference	Title
[1] NB DELG 2019	New Brunswick, Department of Environmental and Local Government Environmental Impact Assessment Branch – Additional Information Requirements for Wind Turbines, 2019.
[2] IEC 61672	International Standard, Electroacoustics – Sound Level Meters – Part 3: Periodic Tests, 2013.
[3] IEC 61260	International Standard, Electroacoustics – Octave Band and Fractional Octave Band Filters Part 2: Pattern-Evaluation Tests
[4] ISO 1996-2	ISO 1996-2, “Acoustics – Description, assessment and measurement of environmental noise – Part 2: Determination of environmental noise levels
[5] CAN/CSA-IEC 61400-11:13	CAN/CSA-IEC 61400-11:13 – Wind Turbines – Part 11: Acoustic Noise Measurement Techniques

Six (6) noise monitoring (NM) locations were established onsite, as representative points of reception (POR), in relation to ten (10) identified receptors. Ambient noise was collected over a period of 48 hours in July of 2023, at the NM locations. NM locations are provided in Table 5-8 and identified in Figure 5-17.

Table 5-8: Summary of Baseline Noise Measurement Locations

POR	WGS 1984 Coordinates	
	Latitude	Longitude
NM1	46.3903	-67.2147
NM2	46.3543	-67.2367
NM3	46.3388	-67.2569
NM4	46.3491	-67.3165

POR	WGS 1984 Coordinates	
	Latitude	Longitude
NM5	46.3104	-67.3055
NM6	46.4682	-67.2623

A total of ten (10) noise-sensitive receptors close to or on JDI property, have been identified and are shown in Figure 5-17. Refer to Table 5-9 for the photos or orthoimages of each receptor, as well as various other attributes.

The majority of noise sensitive receptors are remote cabins which may or may not be inhabited year-round. Each receptor was assessed at the building exterior at the most stringent second-story nighttime height of 4.5 m. These receptors also form the basis of assessment for visual aesthetic and shadow flicker assessment described in further sections.

Table 5-9: Receptors 1 Through 10 Assessed for Noise and Visual Impacts

Receptor ID	Located on JDI Land (Y/N)	Latitude & Longitude (Decimal Degree)	Representative Photo	Comment
Receptor 1	No	46.3868, -67.2148		Remote Cabin off property
Receptor 2	No	46.3438, - 67.2708		Remote Cabin off property

Receptor ID	Located on JDI Land (Y/N)	Latitude & Longitude (Decimal Degree)	Representative Photo	Comment
Receptor 3	No	46.3444, -67.2192		Remote Cabin off property. IN disrepair/flooded
Receptor 4	No	46.3094, -67.3298		Remote Cabin off property
Receptor 5	Yes	46.3091, -67.3087		Remote Cabin located on the JDI property

Receptor ID	Located on JDI Land (Y/N)	Latitude & Longitude (Decimal Degree)	Representative Photo	Comment
Receptor 6	Yes	46.3274, -67.2445		Remote Cabins located on the JDI Property at 'Long Falls' along the North Branch of Becaguimec Stream. Image taken from Google Earth, 2024.
Receptor 7	No	46.3758, -67.3228		Central location of a cluster of structures located at the terminus of Howard Brook Rd. in Howard Brook. Corresponds with 'Viewpoint #3'
Receptor 8	No	46.4666, -67.2886		Remote Structures offsite, associated with a Sugar Maple Operation. Satellite Image utilized (credit Google Earth, 2024).

Receptor ID	Located on JDI Land (Y/N)	Latitude & Longitude (Decimal Degree)	Representative Photo	Comment
Receptor 9	No	46.3159, -67.3387		Private Residence, at the furthest extent of Mountain View Rd. in Cloverdale. Also corresponds with 'Viewshed #2' and Photomontage. Satellite Image utilized (credit Google Earth, 2024).
Receptor 10	No	46.3679, -67.3048		Remote Structure, furthest extent from 'Howard Brook' along an unnamed offshoot of Howard Brook Rd. Located Offsite. Satellite Image utilized (credit Google Earth, 2024).

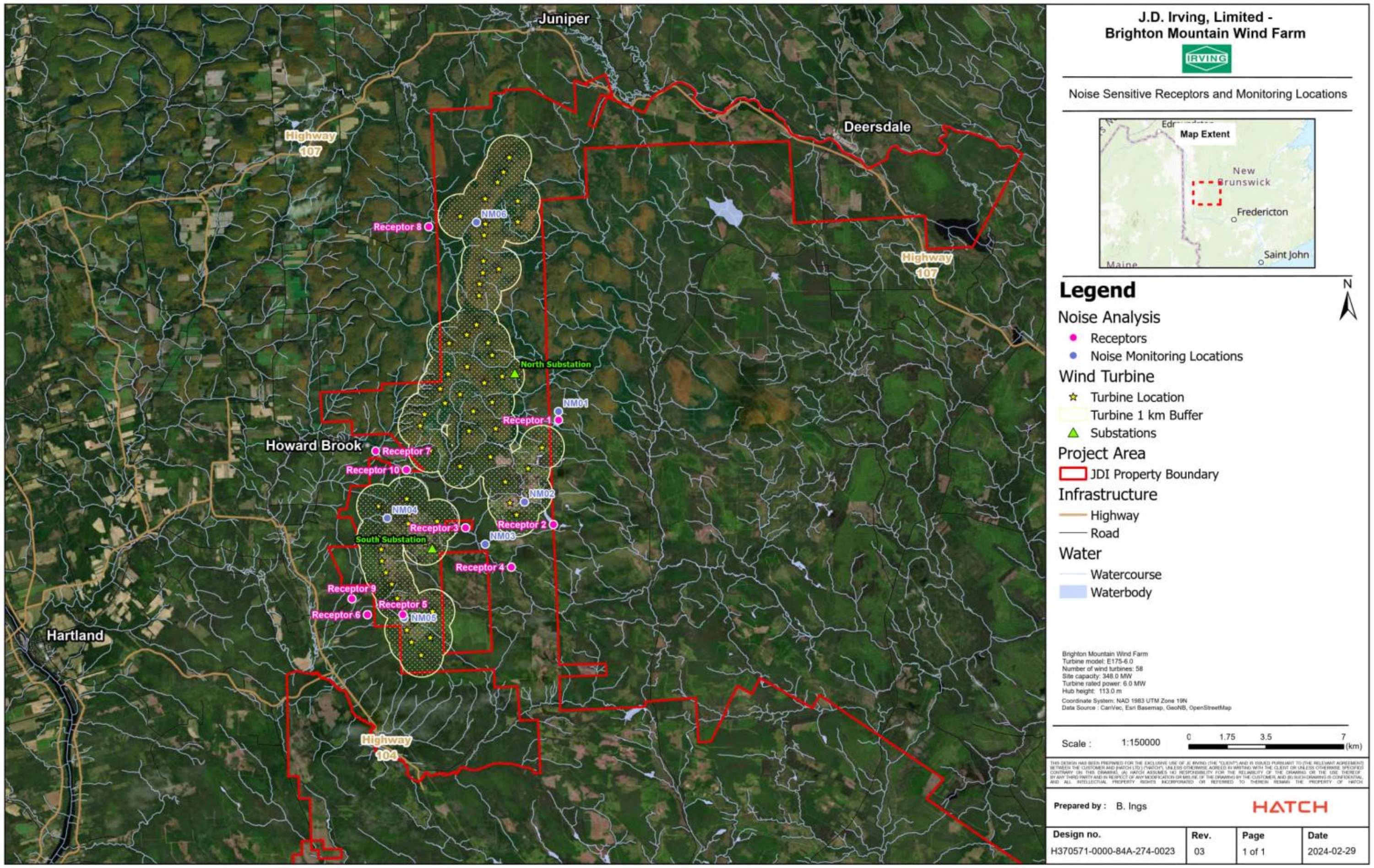

Figure 5-17: Noise/Visual Receptor Locations as well as Baseline Noise Monitoring (NM) Locations

The metrics used for the baseline noise assessment were the minimum one-hour equivalent sound pressure level (Leq1-hr). The minimum Leq1-hr is used to establish a representative background sound level by screening out high peak events and reporting the lowest background sound pressure level.

For the measurement period, wind and precipitation data were retrieved from the Environment Canada Woodstock Newbridge weather station. Measurements taken with windspeeds greater than 15 km/h or during precipitation were categorized as 'Bad Weather Data' periods and were excluded when calculating the minimum Leq1-hr.

The measured Leq1-hr for all locations were taken and found to be relatively low since there was little to no anthropic (man-made) audible noise at all locations, as shown in Table 5-10. There were, however, some observations and recordings that could contribute to brief, localized increases in ambient noise, such as wildlife calls (e.g. birds), and proximity to ATV and Snowmobile trails.

Table 5-10: Minimum measured Leq1-hr at Noise Monitoring Locations

Location	$L_{eq,1hr}$, (dBA)		
	Daytime (06:00 – 18:00)	Evening (18:00 – 23:00)	Nighttime (23:00-6:00)
NM 01	27	23	19
NM 02	29	42	31
NM 03	29	25	39
NM 04	22	24	24
NM 05	22	21	19
NM 06	25	21	19

These results were used to assist in quantifying the change in the noise during construction, operation, and decommissioning of the project.

5.1.5 *Visual Aesthetics and Shadow Flicker*

The Project completed a desktop study, and accompanying field visit, to support the development of the '*Visual Impact & Shadow Flicker Assessment Report'* ((H370571-0000-240-066-0002), to support the provincial EIA requirements, as prescribed in the *EIA Sector Guidance Document.* This Report is included in this EIA Registration as Appendix C.

An assessment of likely viewsheds was physically undertaken and locations investigated were based on worst case modeling (i.e. no vegetation or blocking structures present). However, given the remote location of the Project, the local topography and the prominence of vegetated habitats (e.g. coniferous forest) throughout the LAA, visibility of the JDI property and proposed WTG sites, is limited to a select few receptor sites (10 in total), as well as sporadic viewsheds along highway 104, Mountain view rd. (Cloverdale), Howard Brook Rd (Howard Brook), and onsite along the established ATV trails.

Photographs of the existing landscape were collected from four (4) locations, three (3) of which were located offsite, and one (1) located onsite along the ATV trails. Figure 5-18 through to Figure 5-21, show selected viewsheds anticipated to be impacted aesthetically, and form the basis for photomontage simulations.

Figure 5-18: Viewpoint #1 Looking Northeast from Highway 104

Figure 5-19: Viewpoint #2 Looking NE from Mountain View Rd. (Entrance to Private Residence). Also Corresponds to Receptor 9, Assessed for Visual and Noise Impacts

Figure 5-20: Viewpoint #3 looking SE from Howard Brook Rd, also Corresponds to Receptor #7, Cluster of Structures, Assessed for Visual and Noise Impacts

Figure 5-21: Viewpoint #4 looking SE from Onsite ATV Trails

Figure 5-22 shows a map of the locations where representative photographs were collected, for comparison to photomontage simulations of the landscape with WTGs present.

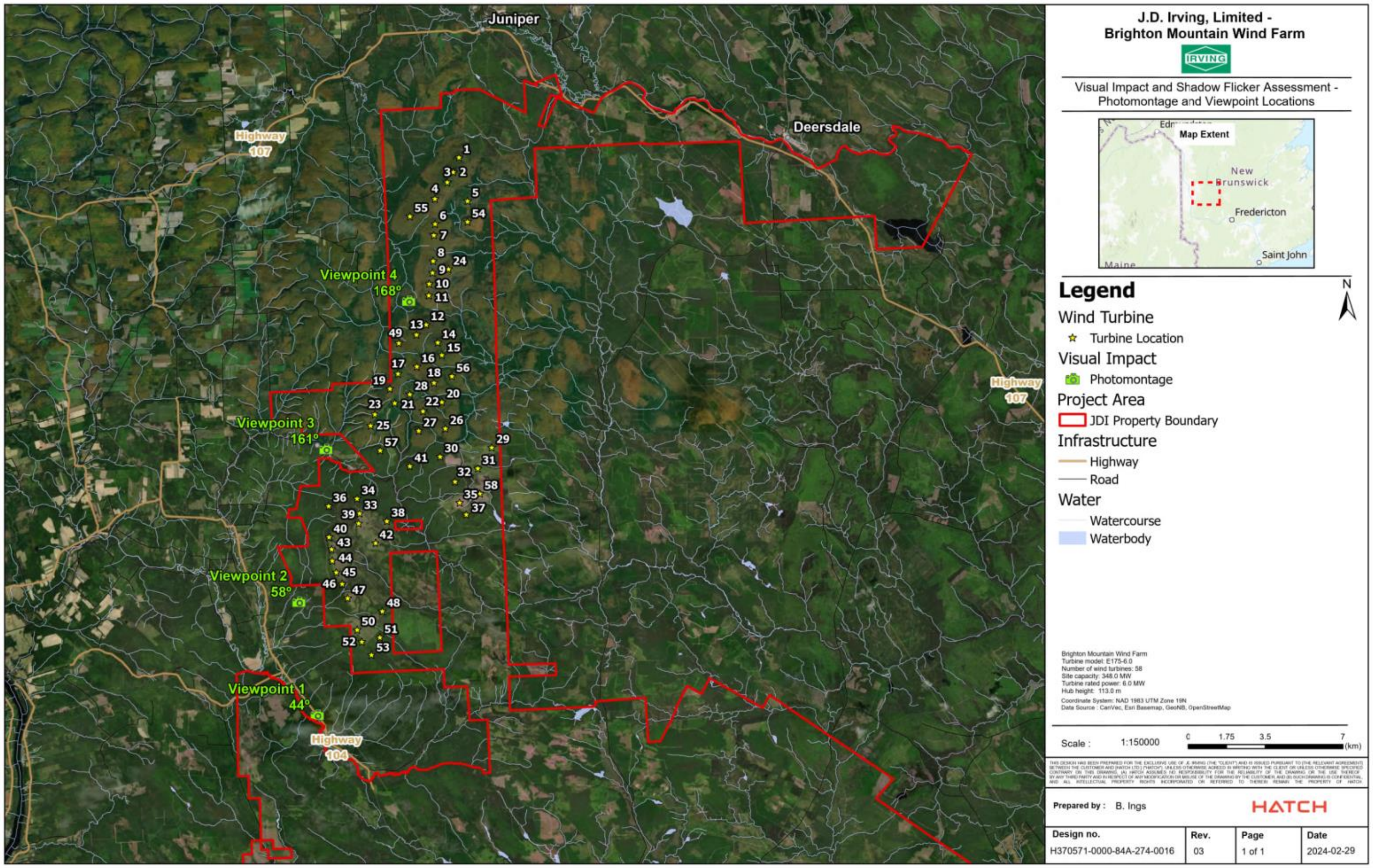

Figure 5-22: Selected Viewpoint Locations Informing Photomontage Simulations

5.2 Biophysical Environment

The Project location spans a range of bio geoclimatic conditions that influence the biophysical environment. The Central Uplands Ecoregion is divided into the Madawaska Uplands (northwestern New Brunswick) and the Caledonia Uplands (southern New Brunswick near the Bay of Fundy). More specifically, the northern portion of the Project is located in the Madawaska Uplands Ecoregion and Brighton Ecodistrict, while the southern Portion is in the Valley Lowlands Ecoregion and Nackawic Ecodistrict (Government of New Brunswick, 2007).

The Madawaska Uplands, Central Uplands Ecoregion is the larger of the two Central Uplands Ecoregions. The northern LAA is in the southern portion of the Madawaska Uplands, and rivers in the southern area flow eastward towards the Miramichi or flow southeast towards the Saint John River. The streams within or near the northern LAA include Elder Brook, Little Clearwater Brook, Southwest Miramichi River, Tamarack Brook, Jamieson Brook, Rideout Brook, MacIntosh Brook, Welch Brook, Brummagem Brook, Pokiok Brook, Little Pokiok Brook, North Branch Becaguimec Stream, Little Doughboy Brook, and Doughboy Brook. There are more lakes in the southern part of the Central Uplands Ecoregion due to impermeable, less fractured granite. Also, wetlands are more diverse and prevalent. Alder swamps are common alongside streams, and shallow open water communities or marshes bracketing lakes are abundant (Government of New Brunswick, 2007).

The Madawaska Uplands are at a higher elevation than the neighbouring Valley Lowlands Ecoregion. Therefore, the northern LAA has a cooler climate and more precipitation than the southern LAA. Due to the steep topography in the northern LAA (about 400m maximum elevation), bedrock defines the wetlands (Government of New Brunswick, 2007).

The Valley Lowlands Ecoregion is the largest Ecoregion in New Brunswick. The Saint John River watershed is the main watershed and is where watersheds in the southern portion of the site drain towards (Government of New Brunswick, 2007). The streams within or near the southern portion of the LAA include North Branch Becaguimec Stream, North Sister's Brook, Black Brook, Fall Brook, Little Forks Brook, South Branch Becaguimec Stream, Day Brook, and Burntland Brook. There are also two lakes in the middle of the LAA named Malcolm Lake and Long Lake.

This Ecoregion contains a variety of wetland types because of the varied bedrock lithology, and climatic variation. In the southern portion of the Project, there is a high, flat plateau of wet coniferous swamps. These wetlands and swamps are desirable and important moose habitat.

The native forests of the Valley Lowlands contain tolerant hardwood species such as basswood, butternut, ironwood, silver maple, green ash, and white ash, and softwood such as red spruce although many of these species do not range as far east as the LAA which tends to be more dominated by sugar maple, yellow birch, red maple, poplar, balsam fir, and red and black spruce.

The valleys and lower slopes of the LAA are populated with red spruce and other softwoods that can endure cool night conditions due to frost pockets. The mid slopes are comprised of mixed forests of red spruce, sugar maple, yellow birch, and white ash, with beech and ironwood in higher elevations. The medium to higher elevations which are common within the PDA and LAA, support the growth of tolerant hardwoods such as sugar maple, yellow birch, beech, and white ash. Also, on rocky ridges, red oak, ironwood, white pine, red spruce, or white spruce may occur (Government of New Brunswick, 2007).

Many young and immature coniferous stands in the Northern and southern LAA are softwood plantations that were established on mixedwood and softwood sites after harvest (Government of New Brunswick, 2007) as a part of the intensive silvicultural management on the Deersdale industrial freehold lands where timber production is the primary land management objective.

5.2.1 Wetlands and Vegetated Habitat

The Project has completed a '*Wetlands and Vegetated Environment' Report* (H370571-0000-840-066-0008), describing the baseline conditions, and methods for the assessment of this VC. This Report is included in this EIA Registration as Appendix D.

A combination of field delineation and desktop interpretation were used to map the extent of wetland within the RAA. Habitat types within the RAA were created, based on the dominant vegetation cover and age of forest. Forest stand types were derived primarily from the provincial forest inventory data where stand types within that data were concatenated into a more concise set of major stand types as well as non-forest, and wetlands.

This desktop habitat mapping was supplemented with JDI forest inventory data, site reconnaissance, and aerial imagery, which were used to spot check the forest cover types and correct as needed. The habitat types identified within the Vegetated Environment were as follows:

- Softwood Forest – Young, Immature, and Mature;
- Mixedwood Forest – Young Immature, and Mature;
- Intolerant Hardwood – Young, Immature, and Mature;
- Tolerant Hardwood – Young Immature and Mature;
- Wetlands; and
- Non-Forest.

All field delineations were conducted within the southern portion of the PDA and covered approximately a quarter of the total PDA. The remainder of the area was interpreted. A wide variety of remote sensing data sources and a high degree of precision were used to map the extent of wetlands within the PDA and LAA, although due to the extremely large size of the

RAA, it was not feasible to invest the same level of effort as at the smaller scales, so it is likely that the extent of wetlands outside the LAA is an underestimation of the actual total area of wetlands in the RAA.

The remainder of wetlands within the PDA will be delineated and WESP-AC functions assessments completed for all regulated wetlands and the information summarized in a Technical Addendum.

For each wetland identified, the New Brunswick provincial wetland classes were used to characterize the wetlands within the RAA. A total of 58 GeoNB-mapped wetlands are located within, or partially within the LAA. There is a total of 161 ha of wetland within the PDA (9% of total area) distributed among six types of wetland:

- Shrub wetland;
- Forested wetland;
- Freshwater marsh;
- Aquatic bed;
- Bog; and
- Fen.

About two thirds of the wetland in the PDA is forested wetland, which is typical of the Central Uplands Ecoregion. Of the 161 hectares of wetland within the PDA, approximately half falls within the proposed HVGL line corridor. The HVGL line may result in some permanent footprints within wetlands, but wetlands can largely be avoided with pole installations, and effects on the wetlands within the corridors are largely temporary, occurring during construction and maintenance where periodic vegetation management is done. The vegetation management should have little effect on the freshwater marshes which make up the majority of the HVGL line portion of the PDA. None of the wetlands within the PDA or LAA are designated as Provincially Significant Wetlands (PSWs). The location and distribution of wetlands (and their types) within the PDA, LAA and RAA are shown on Figure 5-23 and the areas of each wetland type within the PDA (which represents a worst-case scenario for direct and indirect effects on wetlands) are summarized in Table 5-11.

Table 5-11: Summary of Wetland Types and Extent within the PDA (Maximum Potential Impact Area)

Wetland Type	Area of wetland within PDA (ha) - maximum potential permanent impact	Area within HVGL line PDA (ha) area of temporary disturbance
Forested Wetland	49.2	25.2
Freshwater Marsh	16.7	37.6
Bog	8.4	10.4
Shrub Wetland	7.4	4.7
Aquatic Bed	1.0	0
Shrub Swamp	0.2	0
Total Area (ha)	82.9	78.0

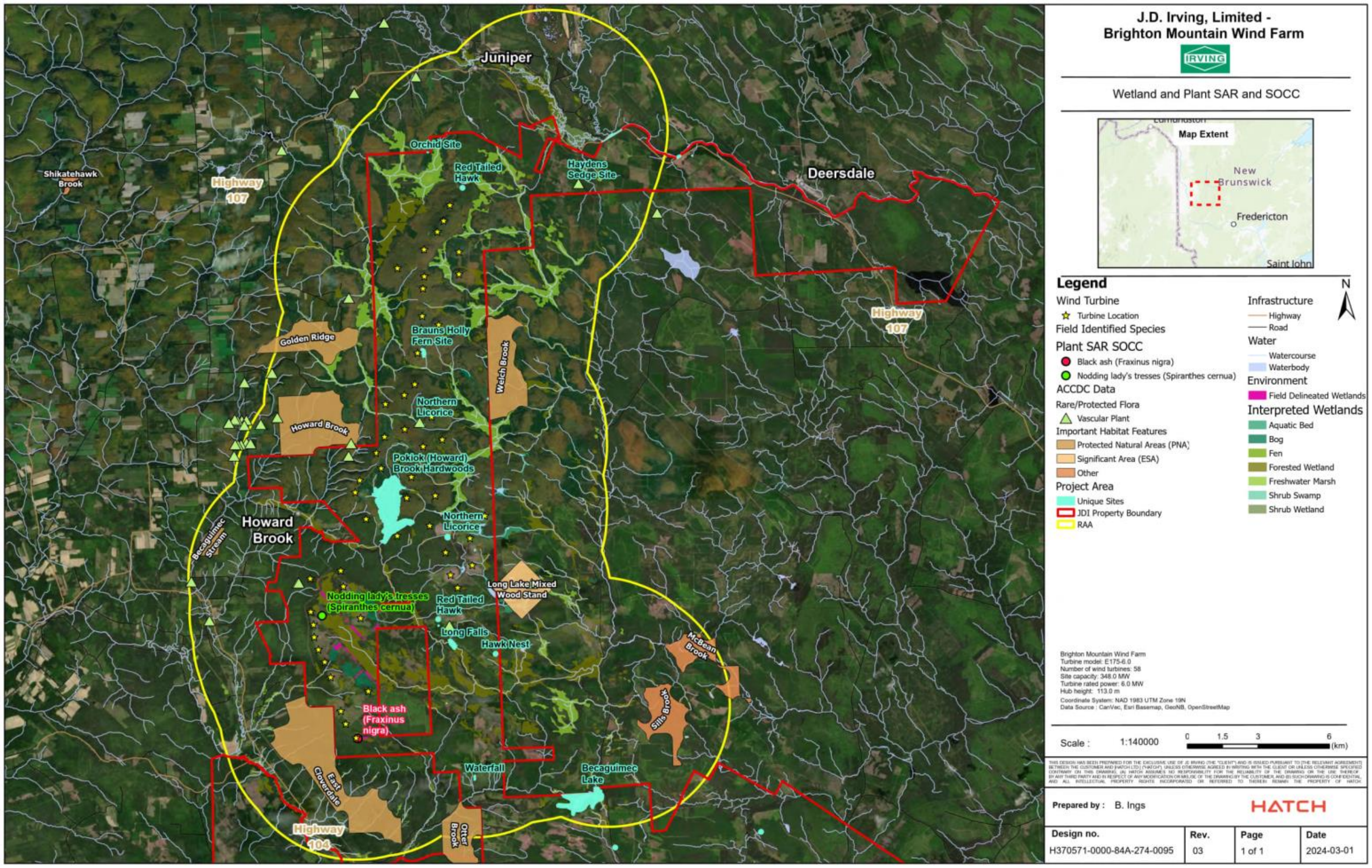

Figure 5-23: Wetland and Plant SAR and SOCC

5.2.1.1 Wetland Complexes

5.2.1.1.1 Bog

There is 8.4 ha Bog wetland within the PDA that could have permanent impacts and 10.4 ha within the HGVL line corridor that is not anticipated to be altered**. Figure** 5-24 shows an example of a bog found within the LAA.

Figure 5-24: Example of a Bog within the LAA

5.2.1.1.2 Aquatic Bed Wetlands

Aquatic beds are permanently flooded wetlands with standing water up to 2 m deep. They contain aquatic plants that can grow on or below the water surface and may or may not be rooted.

Within the PDA, there is only 1 ha of aquatic bed wetland This is a product of this wetland type being uncommon, but also is readily avoided by project design due to the sensitive nature of these wetlands, operability issues, and regulatory issues that would be involved with developing them. An example of an Aquatic Bed Wetland is provided in Figure 5-25.

Figure 5-25: Example of Aquatic Bed Wetland

5.2.1.1.3 Freshwater Marshes

Freshwater marshes are wetlands that are dominated by herbaceous plant species, often grasses and sedges. They are associated with freshwater sources such as stream flow, surface runoff and groundwater discharge, and their water levels typically fluctuate, usually seasonally.

Freshwater marshes are the second most abundant wetland type within the PDA with 54.3 ha of wetland. Of this area, the majority (37.6 ha) is within the HVGL line corridor and will not be lost as a result of the project. An example of a freshwater Marsh is provided in Figure 5-26 below.

Figure 5-26: Example of Freshwater Marsh

5.2.1.1.4 Forested Wetlands

Forested wetlands, also known as treed swamps, are dominated by trees. They can include coniferous, deciduous or mixedwood forest types, and usually have a water table at or below the soil surface (NWWG 1997). Forested wetlands are the least common GeoNB mapped wetland type within the LAA but are the dominant wetland type on the ground, observed during surveys. is the most abundant wetland type with the LAA, occupying approximately 238 ha (9.91% of the total area of the LAA). An example is provided in Figure 5-27.

Figure 5-27: Example of Forested Wetland

5.2.1.1.5 Shrub Wetlands

Shrub wetlands or shrub swamps in the PDA are almost all riparian in nature and tend to be strongly dominated by speckled alder black spruce, and willow near the margins.

Within the PDA, there are only 0.2 ha of shrub wetlands identified although this is likely a product of the narrow-linear nature of shrub wetlands, along stream corridors, where the greater wetland area is forested. Most other wetlands within the PDA have some shrub wetland component. An example is provided below in Figure 5-28.

Figure 5-28: Example of Shrub Wetlands

5.2.1.2 Wetland Assessment Results

5.2.1.2.1 Wetland Functional Assessments – WESP-AC Model Result

WESP-AC functions assessments have not yet been completed for the wetlands within the PDA but will be during 2024 field surveys and submitted in a Technical Addendum along with final field delineations.

5.2.1.3 Vascular Plants and Vegetation Communities

5.2.1.3.1 Existing Records of Plant SAR and SOCC

For the purposes of this study, individual plant species assessed were focused on Species at Risk (SAR) and Species of Conservation Concern (SOCC). These species are those that are rare and sensitive to changes in their environment to the extent that the viability of their regional populations could be compromised by additional loss of individuals or habitat. We define “species at risk” (abbreviated SAR) as those species that are listed as “Extirpated”, “Endangered”, “Threatened”, or “Special Concern” on Schedule 1 of the federal Species at Risk Act (SARA) or in the New Brunswick Species at Risk Act (NB SARA). We also define “species of conservation concern” (SOCC) as those species that are not SAR but are listed in other parts of SARA, NB SARA, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), or are regionally rare or endangered by the Atlantic Canada Conservation Data Centre (AC CDC) (i.e., those species with AC CDC S-ranks of “extremely rare” [S1], “rare” [S2], or “uncommon” [S3]).

Prior to fieldwork, the ACCDC was consulted to obtain data on known records of SAR and SOCC and important habitat features within the RAA.

Table 5-12 presents a list of plant SAR and SOCC that are present within the RAA based on the ACCDC data report.

Table 5-12: ACCDC Records of Vegetative Species at Risk and Species of Conservation Concern within the RAA

Species	Common Name	S-rank	SAR	Within 1 km of PDA	# records in RAA
Juglans cinerea	Butternut	S1	Endangered	No	1
Galium kamtschaticum	Northern Wild Licorice	S1S2	No	Yes	2
Elymus hystrix	Spreading Wild Rye	S2	No	False Record	0
Hepatica americana	Round-lobed Hepatica	S2S3	No	No	1
Sceptridium dissectum	Dissected Moonwort	S3	No	No	5
Platanthera orbiculata	Small Round-leaved Orchid	S3	No	No	1
Fraxinus nigra	Black Ash	S3S4	Threatened	No	1

Butternut (*Juglans cinerea*) (S1-Endagered) There is one record of Butternut on the western edge of the RAA. Butternut is a medium-sized tree that can reach up to 30 m in height. It belongs to the walnut family and produces edible nuts in the fall which have traditionally served as a food source for indigenous people and European settlers. Butternut trees usually grow alone or in small groups in deciduous forests. It prefers moist, well-drained, circum-neutral pH soil and is often found along streams. Butternut Canker is a fungal disease that spreads quickly and can kill a tree within a few years. This fungus has already had a devastating impact on North American Butternut populations and as a result, this species has been listed as *Endangered* under federal SARA despite the species being common in certain parts of the province. The PDA is at or near the northeastern limit of the core range for butternut in New Brunswick but there is some potential to find it in deciduous benches along larger watercourses in the LAA although most of the low-lying valleys are coniferous.

Northern Wild Licorice (*Galium kamtschaticum*) (S1S2) is a small, creeping herbaceous plant in the bedstraw genus that is circumboreal and near its southern range limit in the RAA. It grows in boreal and subalpine forests, seeps and stream banks in northern and/or mountainous areas, often associated with abundant bryophyte cover. Given the availability of these habitat conditions and the high elevation of the PDA, combined with the presence of multiple records nearby, there is a reasonable potential that this species could occur within the PDA. JDI has two designated 'Unique Areas' identified where this species occurs within the JDI freehold land within the LAA.

Spreading Wild Rye (*Elymus hystrix*) (S2) was identified in the ACCDC report, but the location of the record and the description of the location in the ACCDC record strongly suggest that this record is placed at an incorrect location and likely does not occur in the RAA, based on its habitat requirements.

Round-lobed Hepatica (*Hepatica americanum*) (S2S3) There is one old (1968) record of Round-lobed Hepatica near the western extent of the RAA. This species is a perennial herb with distinctive, rounded, three-lobed leaves that stay green throughout the year, and belongs to the buttercup family (*Ranunculaceae*). In early spring, round-leaved hepatica produces delicate flowers in hues ranging from pure white to shades of pink, lavender, or blue. This plant thrives in rich, moist mixedwood forests, often carpeting the forest floor. Observations of this species in New Brunswick, which is near the northern range limit for this species, tend to be limited to the Saint John River Valley. This known record is approximately five kilometers west of the PDA, closer to the Saint John River, and likelihood of finding this species decreases with increase distance eastward.

Dissected Moonwort (*Sceptridium dissectum*) (S3) has several records throughout the western half of the RAA with the closest record, just of one kilometer west of the PDA. Belonging to the *Ophioglossaceae* family, this fern is characterized by its unique fronds, which are deeply dissected into numerous segments, resembling the intricate pattern of a grape leaf. It is often found in rich, moist woodlands, where it thrives in humus-rich soils, often along edges of deciduous forests. This species is somewhat widespread wherever rich hardwood forests can be found in New Brunswick occurring sporadically, often found along old logging roads that are being reclaimed by forest. Given the proximity and the number of records, there is a reasonable potential that this species could be found within the PDA.

Small Round-leaved Orchid (*Platanthera orbicula*ta) (S3) There is a single record of Small Round-leaved Orchid in the western portion of the RAA. Characterized by its distinctive, circular leaves that envelop the stem, this orchid sends up a tall, slender stem bearing small, fragrant, white flowers in Summer. This orchid is often found in damp woodlands, meadows, and bogs, showcasing its adaptability to diverse ecosystems. The Orchid plays a noteworthy ecological role by forming symbiotic relationships with mycorrhizal fungi, aiding in its germination and growth. The occurrence of this species within the PDA cannot be ruled out based on the wide range of habitat types that it is adapted to.

Black Ash (*Fraxinus nigra*) (S3S4 - *Threatened*) In addition to the field identified record, there is a single record of Black Ash located at the western edge of the RAA and several more records outside the RAA in the same area. Black ash is a deciduous tree species native to New Brunswick, thriving in the cool, moist regions throughout the province but is particularly common in the mid and upper Saint John River Valley. This tree, belonging to the olive family (*Oleaceae*), is known for its distinctive, corky dark bark and compound leaves with serrated edges. Black ash is commonly found in wetland areas, such as swamps and marshes, where there is some calcium availability. Indigenous peoples have historically used black ash tree for traditional purposes, crafting baskets, containers, and other items from its flexible and pliable wood. Unfortunately, black ash populations in Canada, like many ash species, are facing significant threats due to the invasive emerald ash borer (*Agrilus planipennis*), which has led to concerns about the conservation of this valuable tree species and its designation as Threatened under federal SARA. This species was found to occur in the southern portion of the PDA and is expected to be encountered in additional forested wetland areas in 2024 field surveys for plants.

5.2.1.3.2 Botanical Survey Results - Plant SAR or SOCC

During the Spring ephemeral and vascular plant surveys a total of 145 plant species were recorded, with one plant species being SAR and one plant SOCC.

Black Ash (S3S4) The plant SAR was a small group of three black ash trees (*Fraxinus nigra*) (S3S4-Threatened) located in a wetland in the extreme southwestern corner of the PDA within the alignment of a proposed turbine access road. These three trees were all less than 10cm diameter and located within 10 m of each other.

Nodding Ladies' Tresses (*Spiranthes cernua*) (S1S3) The plant SOCC encountered was Nodding Ladies' Tresses which was found along a roadside in the southern portion of the PDA (see Figure 5-29). Nodding Ladies' Tresses is a delicate and graceful orchid species native to New Brunswick which is near its northern range limit. A group of approximately 50 plants were found growing near a standing puddle along the edges of an older logging road. There is a moderate potential to find more records of this species in late summer of 2024 along the many logging roads that dominate the PDA. Figure 5-29 shows the Plant SOCC *Spiranthes cernua* (S1S3) found onsite.

Figure 5-29: Plant SOCC Spiranthes cernua (S1S3)

The list of all plants encountered during the 2023 Surveys, is included in Table 5-13.

Table 5-13: Complete Vascular Plant Species List for 2023 Surveys

Scientific Name	Common Name	S Rank	SAR Status	Latitude	Longitude
Acer pensylvanicum	Striped Maple	S5		46.328126	-67.292790
Acer rubrum	Red Maple	S5		46.303855	-67.248200
Acer saccharinum	Silver Maple	S4		46.322427	-67.282174
Acer spicatum	Mountain Maple	S5		46.321651	-67.314528
Achillea millefolium	Common Yarrow	SNA		46.326892	-67.290004
Actaea rubra	Red Baneberry	S5		46.293806	-67.300324
Agrostis capillaris	Colonial Bent Grass	SNA		46.299245	-67.296708
Aralia hispida	Bristly Sarsaparilla	S5		46.321809	-67.313683
Aralia nudicaulis	Wild Sarsaparilla	S5		46.319486	-67.276612
Betula alleghaniensis	Yellow Birch	S5		46.321158	-67.278899
Betula cordifolia	Heart-leaved Birch	S5		46.316061	-67.311755
Betula papyrifera	Paper Birch	S5		46.319486	-67.276612

Scientific Name	Common Name	S Rank	SAR Status	Latitude	Longitude
Betula populifolia	Gray Birch	S5		46.319486	-67.276612
Calopogon tuberosus	Tuberous Grass Pink	S5		46.317643	-67.272893
Cardamine diphylla	Crinkleroot	S4S5		46.463211	-67.241000
Carex canescens	Silvery Sedge	S5		46.317641	-67.272883
Carex crawfordii	Crawford's Sedge	S5		46.325171	-67.287702
Carex echinata	Star Sedge	S5		46.303890	-67.248127
Carex gynandra	Nodding Sedge	S5		46.303667	-67.247962
Carex interior	Inland Sedge	S5		46.317710	-67.272943
Carex intumescens	Bladder Sedge	S5		46.321235	-67.278243
Carex lacustris	Lake Sedge	S4S5		46.292384	-67.297645
Carex pauciflora	Few-Flowered Sedge	S4S5		46.327410	-67.308367
Carex scoparia	Broom Sedge	S5		46.303917	-67.248211
Carex stipata	Awl-fruited Sedge	S5		46.303910	-67.248192
Chamaenerion angustifolium	Fireweed	S5		46.321810	-67.313663
Claytonia caroliniana	Carolina Spring Beauty	S5		46.372416	-67.254827
Claytosmunda claytoniana	Interrupted Fern	S5		46.319486	-67.276612
Clintonia borealis	Yellow Bluebead Lily	S5		46.328123	-67.292795
Coptis trifolia	Goldthread	S5		46.328126	-67.292790
Corylus cornuta	Beaked Hazel	S5		46.321927	-67.314990
Cypripedium acaule	Pink Lady's-Slipper	S5		46.325599	-67.288007
Danthonia spicata	Poverty Oat Grass	S5		46.316502	-67.311481
Dendrolycopodium dendroideum	Round-branched Tree-clubmoss	S5		46.321875	-67.313004
Dennstaedtia punctilobula	Eastern Hay-Scented Fern	S5		46.321770	-67.313751
Dicentra cucullaria	Dutchman's Breeches	S5		46.372414	-67.255172
Dichanthelium acuminatum	Woolly Panic Grass	SNA		46.325607	-67.288638
Diervilla lonicera	Northern Bush Honeysuckle	S5		46.319486	-67.276612
Diphasiastrum tristachyum	Blue Ground-cedar	S4S5		46.317443	-67.272868
Drosera rotundifolia	Round-leaved Sundew	S5		46.317659	-67.272883
Dryopteris carthusiana	Spinulose Wood Fern	S5		46.309466	-67.266069
Dryopteris cristata	Crested Wood Fern	S5		46.318530	-67.272178
Epigaea repens	Trailing Arbutus	S5		46.317457	-67.272878
Epilobium palustre	Marsh Willowherb	S5		46.331424	-67.291620
Equisetum arvense	Field Horsetail	S5		46.317669	-67.272787
Equisetum fluviatile	Water Horsetail	S5		46.332768	-67.297163
Equisetum variegatum	Variegated Horsetail	S5		46.339286	-67.315766
Erechtites hieraciifolius	Eastern Burnweed	S5		46.299269	-67.296668
Erigeron canadensis	Canada Horseweed	S5		46.299220	-67.296718

Scientific Name	Common Name	S Rank	SAR Status	Latitude	Longitude
Erigeron strigosus	Rough Fleabane	S5		46.314413	-67.270406
Eriophorum virginicum	Tawny Cottongrass	S5		46.326896	-67.290010
Eriophorum viridicarinatum	Green-keeled Cottongrass	S4		46.317826	-67.272359
Erythronium americanum	Yellow Trout Lily	S5		46.372157	-67.254751
Euthamia graminifolia	Grass-leaved Goldenrod	S5		46.309466	-67.266069
Fagus grandifolia	American Beech	S3S4		46.295838	-67.292640
Festuca rubra	Red Fescue	S5		46.321724	-67.314026
Fragaria virginiana	Wild Strawberry	S5		46.303738	-67.248098
Fraxinus nigra	Black Ash	S3S4	Threatened	46.292290	-67.297548
Gaultheria hispidula	Creeping Snowberry	S5		46.317443	-67.272868
Gaultheria procumbens	Eastern Teaberry	S5		46.315969	-67.297004
Glyceria striata	Fowl Manna Grass	S5		46.303910	-67.248200
Gnaphalium uliginosum	Marsh Cudweed	SNA		46.317683	-67.272760
Hieracium lachenalii	Common Hawkweed	S5		46.322343	-67.314008
Huperzia lucidula	Shining Firmoss	S5		46.359528	-67.314384
Hypericum boreale	Northern St John's-Wort	S5		46.323556	-67.283014
Hypericum perforatum	Common St. John's-wort	SNA		46.319486	-67.276612
Ilex mucronata	Mountain Holly	S5		46.303917	-67.248211
Juncus bufonius	Toad Rush	S5		46.325171	-67.287702
Juncus effusus	Soft Rush	S5		46.303919	-67.248212
Juncus tenuis	Slender Rush	S5		46.317381	-67.272946
Kalmia angustifolia	Sheep Laurel	S5		46.315970	-67.297008
Lactuca biennis	Tall Blue Lettuce	S5		46.331745	-67.295998
Larix laricina	Eastern larch	S5		46.318535	-67.272604
Leucanthemum vulgare	Oxeye Daisy	SNA		46.317448	-67.272924
Linnaea borealis	Twinflower	S5		46.322418	-67.282222
Ludwigia palustris	Marsh Seedbox	S4		46.292865	-67.289345
Luzula multiflora	Common Woodrush	S5		46.322771	-67.313890
Lycopodiella inundata	Northern Bog Clubmoss	S4S5		46.329567	-67.293697
Maianthemum canadense	Wild Lily-of-The-Valley	S5		46.323556	-67.283014
Medeola virginiana	Cucumber Root	S5		46.293779	-67.299817
Monotropa uniflora	Convulsion-Root	S5		46.357713	-67.308969
Nabalus altissimus	Tall Rattlesnakeroot	S5		46.327416	-67.290810
Oclemena acuminata	Whorled Wood Aster	S5		46.317318	-67.272792
Onoclea sensibilis	Sensitive Fern	S5		46.303916	-67.248211
Osmundastrum cinnamomeum	Cinnamon Fern	S5		46.303675	-67.247947
Oxalis montana	Common Wood Sorrel	S5		46.328126	-67.292790

Scientific Name	Common Name	S Rank	SAR Status	Latitude	Longitude
Petasites frigidus	Northern Sweet Coltsfoot	S4S5		46.317495	-67.272870
Phleum pratense	Common Timothy	SNA		46.303663	-67.247980
Picea abies	Norway Spruce	SNA		46.317418	-67.272927
Picea glauca	White Spruce	S5		46.317417	-67.272931
Picea mariana	Black Spruce	S5		46.303916	-67.248211
Picea rubens	Red Spruce	S5		46.316015	-67.311470
Pilosella caespitosa	Meadow Hawkweed	SNA		46.323713	-67.313022
Pinus strobus	Eastern White Pine	S5		46.317805	-67.272660
Plantago major	Common Plantain	S5		46.332052	-67.296452
Platanthera clavellata	Club Spur Orchid	S4S5		46.316022	-67.272457
Poa annua	Annual Blue Grass	SNA		46.317381	-67.272946
Poa compressa	Canada Blue Grass	SNA		46.303722	-67.248069
Polygonatum pubescens	Hairy Soloman's Seal	S5		46.359766	-67.314472
Populus balsamifera	Balsam Poplar	S5		46.357233	-67.310123
Populus tremuloides	Trembling Aspen	S5		46.303912	-67.248210
Potentilla norvegica	Rough Cinquefoil	S5		46.314420	-67.270594
Prunella vulgaris	Common Self-heal	S5		46.326910	-67.290026
Prunus pensylvanica	Pin Cherry	S5		46.321790	-67.313709
Prunus virginiana	Chokecherry	S5		46.292883	-67.289322
Pteridium aquilinum	Bracken Fern	S5		46.303855	-67.248200
Pyrola elliptica	Shinleaf	S5		46.323032	-67.313273
Rhododendron canadense	Rhodora	S5		46.323289	-67.312970
Rhynchospora alba	White Beakrush	S5		46.327411	-67.308385
Ribes glandulosum	Skunk Currant	S5		46.318519	-67.272141
Ribes triste	Swamp Red Currant	S5		46.318526	-67.272161
Rubus allegheniensis	Alleghaney Blackberry	S5		46.321831	-67.313580
Rubus idaeus	Red Raspberry	S5		46.319486	-67.276612
Rubus pubescens	Dwarf Red Raspberry	S5		46.322423	-67.282205
Rumex acetosa	Garden Sorrel	SNA		46.321806	-67.313664
Running Clubmoss	Lycopode claviforme	S5		46.317443	-67.272868
Salix bebbiana	Bebb's Willow	S5		46.303914	-67.248209
Salix discolor	Pussy Willow	S5		46.303912	-67.248210
Salix eriocephala	Cottony Willow	S5		46.325448	-67.288281
Sambucus canadensis	Common Elderberry	S5		46.299236	-67.296718
Sambucus racemosa	Red Elderberry	S5		46.321809	-67.313683
Scirpus atrocinctus	Black-girdled Bulrush	S5		46.323556	-67.283014
Scirpus hattorianus	Mosquito Bulrush	S5		46.327422	-67.290796

Scientific Name	Common Name	S Rank	SAR Status	Latitude	Longitude
Scorzoneroides autumnalis	Autumn Hawkbit	S5		46.303710	-67.248047
Sisyrinchium montanum	Mountain Blue-eyed-grass	S5		46.317595	-67.272833
Solidago canadensis	Canada Goldenrod	S5		46.303704	-67.248007
Solidago juncea	Early Goldenrod	S5		46.303676	-67.247950
Solidago puberula	Downy Goldenrod	S5		46.326891	-67.290009
Sparganium eurycarpum	Broad-fruited Burreed	S4S5		46.317906	-67.272537
Spinulum annotinum	Stiff Clubmoss	S5		46.317493	-67.272871
Spiranthes cernua	Nodding Ladies' Tresses	S1S3		46.339339	-67.315652
Streptopus lanceolatus	Rose Twisted-stalk	S5		46.359530	-67.314370
Symphyotrichum cordifolium	Heart-leaved Aster	S5		46.321701	-67.314024
Symphyotrichum lateriflorum	Calico Aster	S5		46.338574	-67.282106
Symphyotrichum puniceum	Purple-stemmed Aster	S5		46.303911	-67.248197
Thuja occidentalis	Eastern White Cedar	S5		46.319486	-67.276612
Trifolium arvense	Rabbit's-foot Clover	S5		46.332092	-67.296511
Trifolium hybridum	Alsike Clover	SNA		46.317495	-67.272870
Trifolium pratense	Red Clover	SNA		46.317766	-67.272710
Trillidium undulatum	Painted Trillium	S5		46.323063	-67.312912
Trillium erectum	Red Trillium	S5		46.328156	-67.292830
Tussilago farfara	Coltsfoot	SNA		46.303737	-67.248100
Typha angustifolia	Narrow-Leaved Cattail	SNA		46.316710	-67.304804
Typha latifolia	Broad-leaved Cattail	S5		46.317958	-67.272344
Vaccinium angustifolium	Late Lowbush Blueberry	S5		46.321483	-67.282728
Viola macloskeyi	Small White Violet	S5		46.325422	-67.288437

5.2.1.3.3 Vegetation Communities and Habitat Composition

The PDA and LAA are located within the Deersdale industrial freehold lands owned by JDI where the primary land management value is timber management. Over many decades, JDI has developed a detailed inventory of forest resources on its holdings and used that inventory to track silvicultural and harvesting operations and manage wood supply for the mills that rely on it. To meet this demand, while meeting sustainability objectives, JDI employs a range of silvicultural practices that shape the composition and structure of the plant communities on these intensively managed lands including planting of specially selected and bred strains of softwood species that include white spruce (*Picea glauca*), Norway spruce (*P. abies*), black spruce (*P. mariana*), red spruce (*P. rubens*), jack pine (*Pinus banksiana*) and white pine (*Pinus strobus*). Most of the extensive softwood plantations within the LAA are combinations of Norway spruce, black spruce and white spruce. When mixedwood stands are harvested within the freehold lands, they are typically reforested with planted softwood, while tolerant hardwood stands are typically strip cut, leaving striations of older trees interspersed with strips of regenerating trees. As a result, the relative abundance of tolerant hardwood stands remains constant over time whereas mixedwood stands become less common in areas that have been previously harvested. Much of the LAA has been harvested in some form in the last 30 years although many areas that are difficult to access with trucks and equipment, either due to wetness or high elevations with steep terrain, remain in a mature state. Residual mature stands are also commonly found within the protected buffer zones of watercourses and wetlands.

5.2.1.3.3.1 PDA Habitat Compared to LAA and RAA

The habitat composition of the Project area was conducted at three scales to compare the availability of the various habitat types at each scale. Doing so highlights any potentially disproportionate effects of the project at the PDA level on a particular habitat type, relative to its availability at the greater landscape scale. Immature SW and Mature SW within the PDA relative to the RAA. The PDA also has a much lower proportion of wetland than the LAA due to project design. The low proportion of wetland in the RAA is a product of lower rigor in wetland interpretation at that scale. The proportions of habitat types in each spatial extent are summarized in Table 5-14.

Of note is the higher proportion of Mature TH, and Young TH that is present in the PDA vs the RAA. Conversely, there are low proportions of mature softwood and immature softwood in the PDA vs. the RAA due to the greater proportion of hardwood and more intensive recent harvesting in the PDA in softwood stands.

Table 5-14: Habitat Composition of the PDA, LAA and RAA. Bolded Percentage Numbers Highlight Large Differences in Composition Between LAA and Larger Study Extents

Habitat Type	PDA Habitat Composition		LAA Habitat Composition		RAA Habitat Composition	
	Area (ha)	% of PDA	Area (ha)	% of LAA	Area (ha)	% of RAA
Mature TH	560.86	**30%**	2892.68	28%	9276.18	**17%**
Young SW	341.28	18%	1626.81	16%	6757.62	12%
Immature TH	205.18	11%	1099.50	11%	6240.52	11%
Young TH	179.32	**10%**	818.33	8%	1894.39	**3%**
Wetland	160.86	**9%**	1482.49	**14%**	2937.33	**5%**
Immature SW	127.65	**7%**	593.10	6%	9262.38	**17%**
Mature SW	89.74	**5%**	649.11	6%	5439.30	**10%**
Mature MW	48.98	3%	414.27	4%	3053.55	6%
Young IH	56.01	3%	205.30	2%	1379.64	3%
Young MW	42.90	2%	211.91	2%	1437.41	3%
Immature MW	23.64	1%	133.68	1%	2577.03	5%
Immature IH	17.04	1%	85.86	1%	2283.38	4%
Non-Forest	18.29	1%	14.17	0%	1973.73	4%

Habitat Type	PDA Habitat Composition		LAA Habitat Composition		RAA Habitat Composition	
	Area (ha)	% of PDA	Area (ha)	% of LAA	Area (ha)	% of RAA
Mature IH	1.25	0%	85.11	1%	355.73	1%
Total Area (ha)	**1873**		**10312**		**54868**	

The habitat composition of the PDA, LAA and RAA is presented in Figure 5-30 and Figure 5-31 and summarized by percent in Figure 5-32. Within the LAA, the most common vegetation community is Mature Tolerant Hardwood (30% of PDA), which is typically found at higher elevations and on steep terrain. These hardwood ridges are separated by steep valleys with watercourses that are lined with softwood forest. The lower and flatter terrain tends to be mostly harvested within the last 30 years. The southern portion of the LAA and parts of the eastern LAA are heavily dominated by immature and young softwood stands. These stands are predominantly spruce plantations of various ages, but many of them are around 15 years old and straddle the division between young and immature age classes. The northern and western portions are largely tolerant hardwood forest and are heavily dominated by sugar maple with lesser amounts of yellow birch, red maple, and aspen.

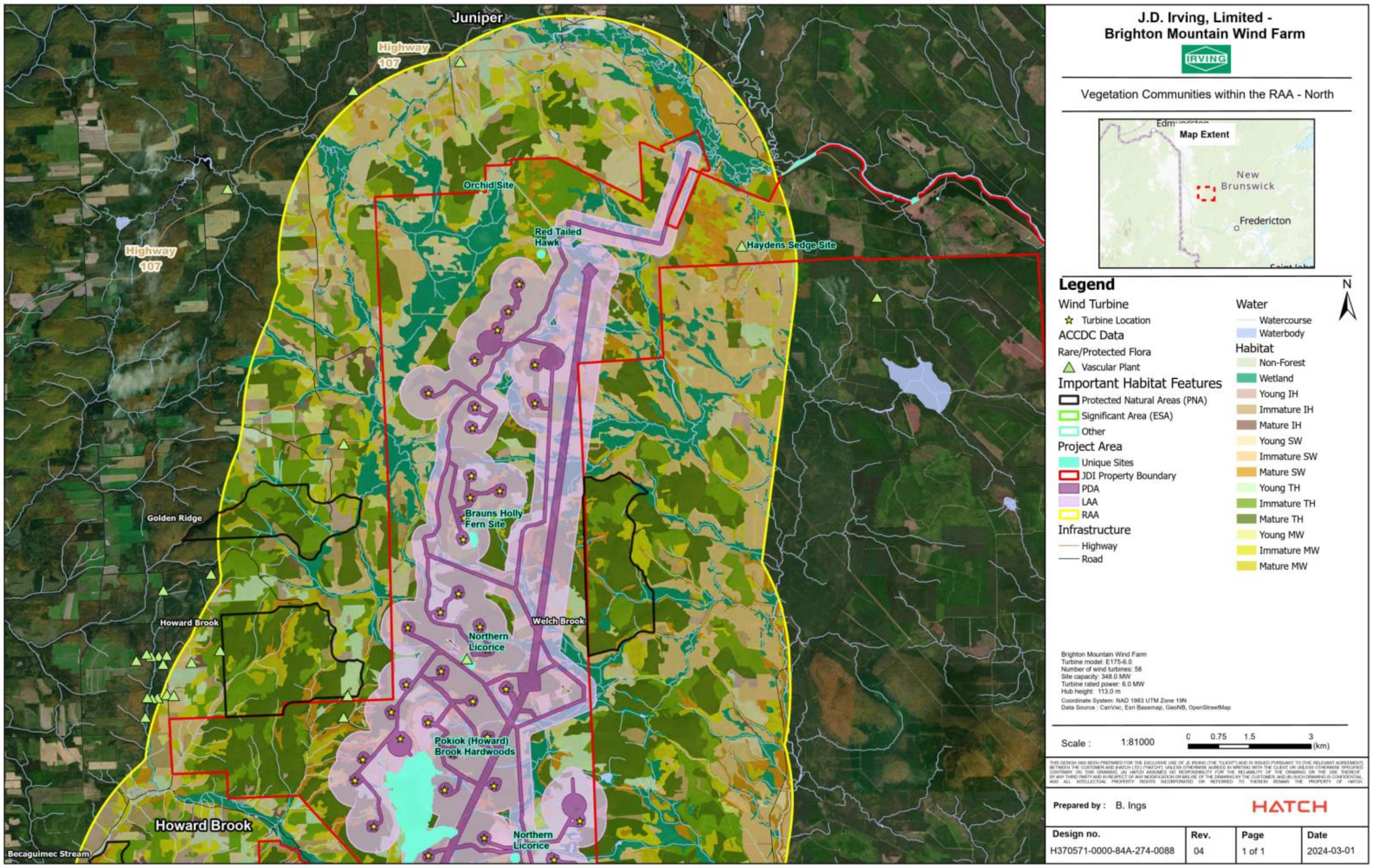

Figure 5-30: Vegetation Communities within the RAA – North

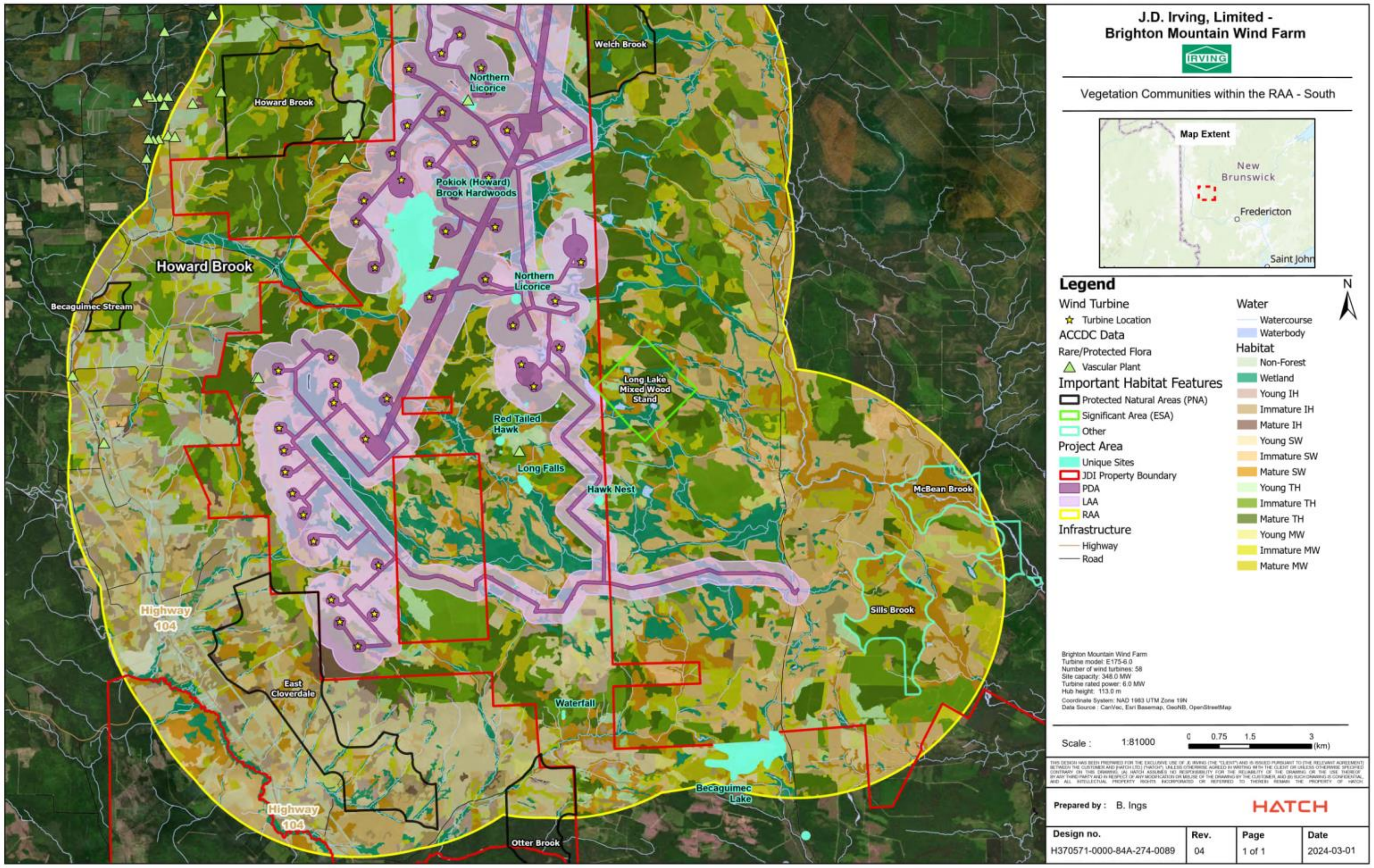

Figure 5-31: Vegetation Communities within the RAA - South

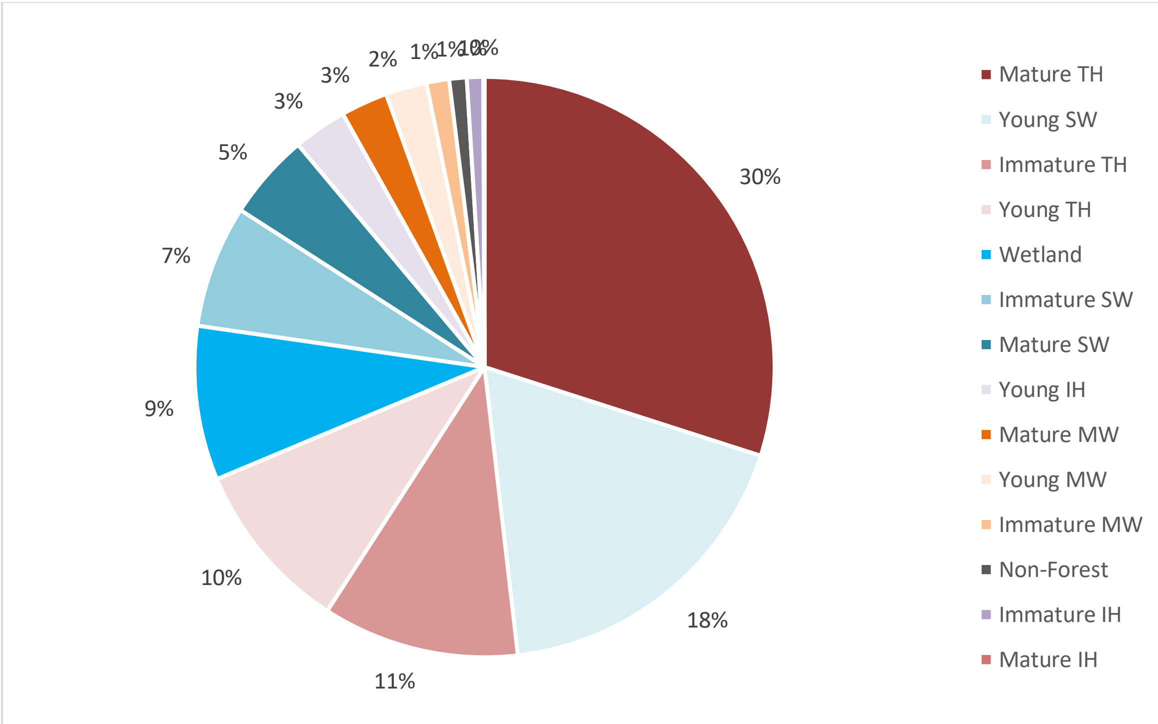

Figure 5-32: Habitat Type Composition of the PDA (TH = Tolerant Hardwood, SW = Softwood, IH = Intolerant Hardwood, MW = Mixedwood)

Tolerant Hardwood (TH)

The most prevalent vegetation community in the PDA is tolerant hardwood forest. All age classes of this stand type comprise a total of 51% of the PDA with the most widespread age

class being Mature (30% of PDA). Mature tolerant hardwood stands are nearly twice as prevalent within the PDA and LAA than within the RAA as a whole. Out of 129 mature tolerant hardwood stands within the PDA, 120 of them have sugar maple (*Acer saccharum*) as the most dominant species in the overstory with most of the remainder having yellow birch as the dominant species. Other species in descending order of dominance in tolerant hardwood stands after sugar maple and yellow birch are beech 'poplar' (*Populus* spp.) and red maple, with lesser components of spruce (*Picea* spp.), balsam fir, white ash, white birch, and eastern cedar. TH stands in the LAA are generally restricted to higher slopes where soils are richer, drainage is good, and sun exposure and frost drainage are better than in valleys. Tolerant hardwood stands in the LAA are dominated in the overstory layer by sugar maple, yellow birch, and beech (*Fagus grandifolia*), with scattered amounts of white birch, red spruce, and balsam fir. On more southerly exposures, recently harvested, regenerating stands are often dominated by dense regrowth of red raspberry, and sapling-sized pin cherry, beech, and/or white birch, with shade tolerant species scattered throughout. The woody understory is primarily dominated by immature or stunted beech (beech canker is quite advanced in the LAA), hobblebush, striped maple, or other immature overstory species. The herbaceous ground cover community is dominated by wood ferns (primarily evergreen woodfern (*Dryopteris intermedia*), shining firmoss (*Huperzia lucidula*), common wood sorrel (*Oxalis montana*), and uncommon members of the lily family (Liliaceae), such as purple trillium (*Trillium erectum*), yellow trout lily (*Erythronium americanum*), Indian cucumber root (*Medeola virginiana*), and rose twisted-stalk (*Streptopus lanceolatus*). The tolerant hardwood stands in the LAA are representative of only moderately rich sites, with few rich site indicator species such as ironwood (Ostrya virginiana), white ash, and white baneberry (*Actaea pachypoda*), which are common in tolerant hardwood stands with more calcareous soils in the province.

Intolerant Hardwood (IH)

Intolerant Hardwood stands are shade-intolerant forests comprised of tree species that are not tolerant of shade and do not regenerate well under a closed tree canopy. dominated by poplar (*Populus* spp.). Most of the intolerant hardwood habitat in the LAA is relatively young (regenerating, sapling, or young growth stage). There are two main intolerant hardwood stand types within the LAA. One of these types has an overstory canopy layer that is strongly dominated by red maple, with smaller amounts of yellow birch, balsam fir, red spruce, and white birch. The other type of intolerant hardwood stand within the LAA has an overstory layer dominated by trembling aspen. Both of these intolerant hardwood stands have a woody understory layer dominated by a combination of red maple, striped maple, mountain maple, yellow birch, and/or sugar maple. The herbaceous understory is dominated by common forest species such as bunchberry, wood sorrel, and wood ferns.

Mixed-wood Forest (MWF)

Mixed-wood habitat are uncommon throughout the PDA amounting to less than 10 % of the total forest area. This may be a product of many of these stands having been converted to

softwood plantations which occupy nearly 20 % of the PDA. Mixed-wood stands are typically transitional between hardwood stands on upper slopes, and softwood stands at lower elevations. Some mixed-wood stands have been recently harvested, while others are in a young or regenerating state; there are only a few mature-overmature mixed-wood stands in the LAA. The tree canopy stratum, when present, is typically dominated by red spruce, yellow birch, poplar, balsam fir, red maple, and/or white birch. The woody understory includes species such as regenerating balsam fir, red maple, yellow birch, and/or red spruce, hobblebush, and striped maple. The herbaceous understory is usually dominated by wood sorrel, evergreen woodfern, goldthread (*Coptis trifolia*), wild sarsaparilla (*Aralia nudicaulis*), and hayscented fern (*Dennstaedtia punctilobula*).

Softwood Forest (SW)

Softwood stands are among the most abundant within the PDA comprising approximately 30% of the area, of which two thirds are in a young age class. The smaller amount of mature

softwood stands within the PDA (5%) tend to be in poorly drained, low-lying areas, either around the fringes of forested wetlands or in ravines along watercourses where frost drainage creates a cooler microclimate. Nearly all of the young softwood in the PDA is spruce plantation ranging in age from recently planted to less than 35 years old. The southern portion of the LAA is dominated by young softwood stands, whereas the northern portion of the LAA is mostly tolerant hardwood. Softwood is also abundant outside the LAA in the outer portions of the RAA. The overstory in these stands is dominated by red, black or Norway spruce, with natural stands also having balsam fir, some red maple, and white birch. The woody understory is often sparse to non-existent depending on age and competition management regimes, but natural softwood stands have regenerating balsam fir, red spruce, red maple, and some mountain paper birch, with pin cherry (*Prunus pensylvanica*), and red raspberry (*Rubus idaeus*). The herbaceous ground layer is dominated by bryophytes (such as Schreber's feathermoss (*Pleurozium schreberi*), a moss (commonly known as broom moss, (*Dicranum scoparium*)), waxyleaf moss (*Dicranum polysetum*), and stairstep moss (*Hylocomium splendens*), bunchberry (*Cornus canadensis*), wood ferns (primarily evergreen woodfern (*Dryopteris intermedia*), velvet-leaved blueberry (*Vaccinium myrtilloides*), and wild lily-of-the-valley (*Maianthemum canadense*). More productive natural softwood sites are dominated by red spruce, with smaller amounts of yellow birch, red maple, and/or balsam fir. The woody understory layer is dominated by regenerating red spruce, balsam fir, and/or yellow birch.

5.2.1.3.4 Protected Natural Areas (PNAs)

The province of New Brunswick created the "Protected Natural Areas (PNA) Act" in 2001 to protect the biodiversity in specific areas from development, new roads, mining, and forestry. In these areas, outdoor recreational activities, educational activities, and scientific research that have minimal environmental impact are usually permitted. However, there are prohibitions that depend on the "class" assigned to the PNA (CPAWSNB, 2023; Government of New Brunswick, 2023).

No person may enter a Class I PNA or carry on any activity within the PNA without permits to conduct scientific research, educational activities, or maintain biodiversity (Government of New Brunswick, 2023). There are no Class I PNAs near the proposed Project.

Class II PNAs have fewer prohibitions. The restrictions include forestry, agriculture, aquaculture, mining, boring/drilling, quarrying, gas/petroleum exploration/development, excavation, leveling, construction, industrial/commercial activities, camping, keeping a horse/donkey/mule/llama, using a vehicle other than a watercraft, or disturbing the ecosystem/biodiversity within the area (Government of New Brunswick, 2023).

There are six (6) Class II PNAs located within the 5 km Project Site (See Figure 5-23):

- **Golden Ridge PNA** is 393.3 ha in size, and ownership is administered by the Crown. The area has been protected since 2014. The Golden Ridge Protected Natural Area PNA is 0.5 km from the boundary of northwestern side of the JDI Property, north of the Howard Brook PNA, and is in the Saint John River Basin and Miramichi River watershed. The Golden Ridge PNA contains mostly mature and intermediate-aged stands, and one old stand.
- **Howard Brook PNA** is 681.5 ha in size and ownership is administered by the Crown. The area has been protected since 2008. The Howard Brook Protected Natural Area PNA borders the northwestern side of the JDI Property and is in the Saint John River Basin. The Howard Brook PNA contains mostly mature and intermediate-aged stands.

- **East Cloverdale PNA** is 1088 ha in size and ownership is administered by the Crown. The area has been protected since 2014. The East Cloverdale PNA borders the southern part of the JDI property where the Project will be located and is in the Saint John River Basin. The East Cloverdale PNA contains a combination of mature, intermediate, young, and several smaller, old stands.
- **Otter Brook PNA** is 334 ha in size and ownership is administered by the Crown The area has been protected since 2014. The Otter Brook Protected Natural Area PNA is 0.5km from the southern boundary of the JDI Property and is in the Saint John River Basin. The Otter Brook PNA contains mostly young and intermediate stands, with several mature and old stands.
- **Becaguimec Stream PNA** is about 3km from the western part of the JDI Property Boundary and is located in the Saint John River Basin. It is approximately 75 ha, administered over by the Crown, and protected since 2014. The Becaguimec Stream PNA contains mostly mature stands, along with a couple intermediate and one larger old stand
- **Welch Brook PNA** is 551 ha in size and ownership is administered by the Crown. The area has been protected since 2014. Welch Brook PNA borders the northeastern boundary line of the JDI Property and is located in both the Saint John River Basin and Miramichi River watershed. It is a class II PNA. The Welch Brook PNA contains mostly mature and intermediate-aged stands, and one young stand.

5.2.1.3.5 Environmental Significant Areas (ESAs)

In the 1990s, the Nature Trust of New Brunswick, in partnership with the New Brunswick Department of Environment and the New Brunswick Department of Natural Resources and Energy, identified more than 900 ESAs throughout New Brunswick. Today, Nature NB is also involved with updating the ESA database (NTNB 2012). Tims and Craig (1995) defined ESAs as “places that are distinctive because (a) they contain rare species of animals or plants or a rich diversity of species representative of an ecological zone; (b) their disturbance would have serious ecological consequences, or; (c) they contain geological or other features of specific scientific interest.”

There are three (3) ESAs within or near the RAA, including:

- **Howard (Pokiok) Brook Hardwoods (ESA)** this area is northeast of the community of Howard Brook, south of Skedaddle Ridge within the LAA. This ESA is inside the JDI Property Boundary. It contains mature open hardwood stands including sugar maple, white ash, and beech over a large undisturbed area. Uncommon ground vegetation such as dutchman's breeches, bloodroot, spring beauty, Selkirk’s violet, red trillium, yellow violet, and foamflower have been recorded in this area. American martens have also been recorded in this area. While the ESA database does not provide full boundaries and extents, for the ESAs, JDI also designates this area as a Unique Area (described below) and this area overlaps the transmission line portion of the at the southeastern tip of the ESA.

- **Long Lake Mixed Wood Stand (ESA)** This area is located at the headwaters of the Becaguimec and Nashwaak Rivers on the boundary of Carleton and York counties. This ESA is about 1 km from the southeastern point of the LAA boundary. It contains forests, bogs, marshes, lakes, springs, and streams. Trees such as balsam fir, white spruce, red spruce, black spruce, and white birch are abundant in this area, and the white birch snags suggest that the softwood forest is reaching climax stage. The upland ridge is comprised of hardwoods such as sugar maple, beech, and yellow birch. This is recorded as one of the least disturbed areas in this portion of the province.
- **Juniper Barrens String Bog Complex (ESA)** This area is north of Juniper Station, between the north and south branches of the Southwest Miramichi River, with road access from Irving Ltd.'s Juniper Tree Nursery. This ESA is over 5km from the northernmost part of the LAA and is just outside the RAA. It is the largest bog complex and contains a large ombrotrophic peatland (BOG #846) is 4.2 km long and 0.9 km wide, with many lakes scattered over the surface. Wood ducks use this area as nesting habitat, and many waterfowl use this ESA as a migratory stopover site.

5.2.1.3.6 JDI Unique Area's

JDI maintains an internal-use inventory of ecologically unique areas for a variety of wetland, wildlife, and scenic purposes. These areas align with known rare plant or raptor nesting locations, and outline unique forest stands, scenic areas, or woods camp clusters. These areas are general protected and protective buffers are established around them to protect their integrity and character.

5.2.2 Fish and Fish Habitat

The Project has completed a '*Fish and Fish Habitat Report'* (H370571-0000-844-066-0001), describing the baseline data collection methodologies, baseline conditions, methods for the assessment of this VC. This Report is included in this EIA Registration as Appendix E. The Fish and Fish Habitat Report, also classifies watercourses, to compliment other VC that address aspects of hydrology (i.e., Wetlands, and Groundwater VCs).

A desktop analysis was carried out to determine the relevant watercourses and watersheds, as well as fish species and habitat historically found within NB and the RAA, including SAR, this included a request to AC CDC, and subsequent report.

Full methodologies for undertaking Field Surveys related to fish and fish habitat, including watercourse assessments and water quality, are further described in Appendix E.

5.2.2.1 Aquatic Features Adjacent and within the Project Boundaries

The RAA overlaps two major watershed basins in central NB. The Miramichi River basin in the northern portion of the RAA, and the St. John River Basin in the south. Specifically, the

RAA falls within the Southwest Miramichi River watershed, which contributes to the broader Miramichi River Basin. While the mid to southern portion of the RAA straddles the Saint John River Basin with catchment from both Becaguimec Stream watershed, and the Nashwaak River watershed.

Within the RAA, there are seven named lakes, 38 named watercourses, and numerous unnamed watercourses (NBHN, 2023). The various watercourses and tributaries that flow throughout the project boundaries, including the RAA are as shown in Figure 5-33.

Of the thirty-eight (38) named watercourses identified within the RAA, a total of fifteen (15) are found within the LAA, and nine (9) of these watercourses (and/or their tributaries) flow through the PDA, including:

- Black Brook;
- Little Clearwater Brook;
- Little Forks Brook;
- Little Pokiok Brook;
- North Branch Becaguimec Stream;
- Pokiok Brook;
- Tamarack Brook;
- South Branch of the Southwest Miramichi River; and
- the West Branch of the Nashwaak River.

Seven named watercourses and their respective tributaries found within the PDA were assessed during the 2023 surveys: Black Brook, Little Clearwater Brook, North Branch Becaguemic Stream, Little Forks Brook, West Branch Nashwaak River, Pokiok Brook, and Tamarack Brook. Other unnamed and potential watercourses including tributaries of and drainage connections to these seven named watercourses were also assessed within the PDA. In total, 66 locations were assessed throughout the PDA as shown in Figure 5-34 and Figure 5-35.

The two (2) remaining water courses within the PDA that were not assessed during the 2023 baseline surveys, will be surveyed in 2024 and results provided as part of a Technical Addendum to the TRC.

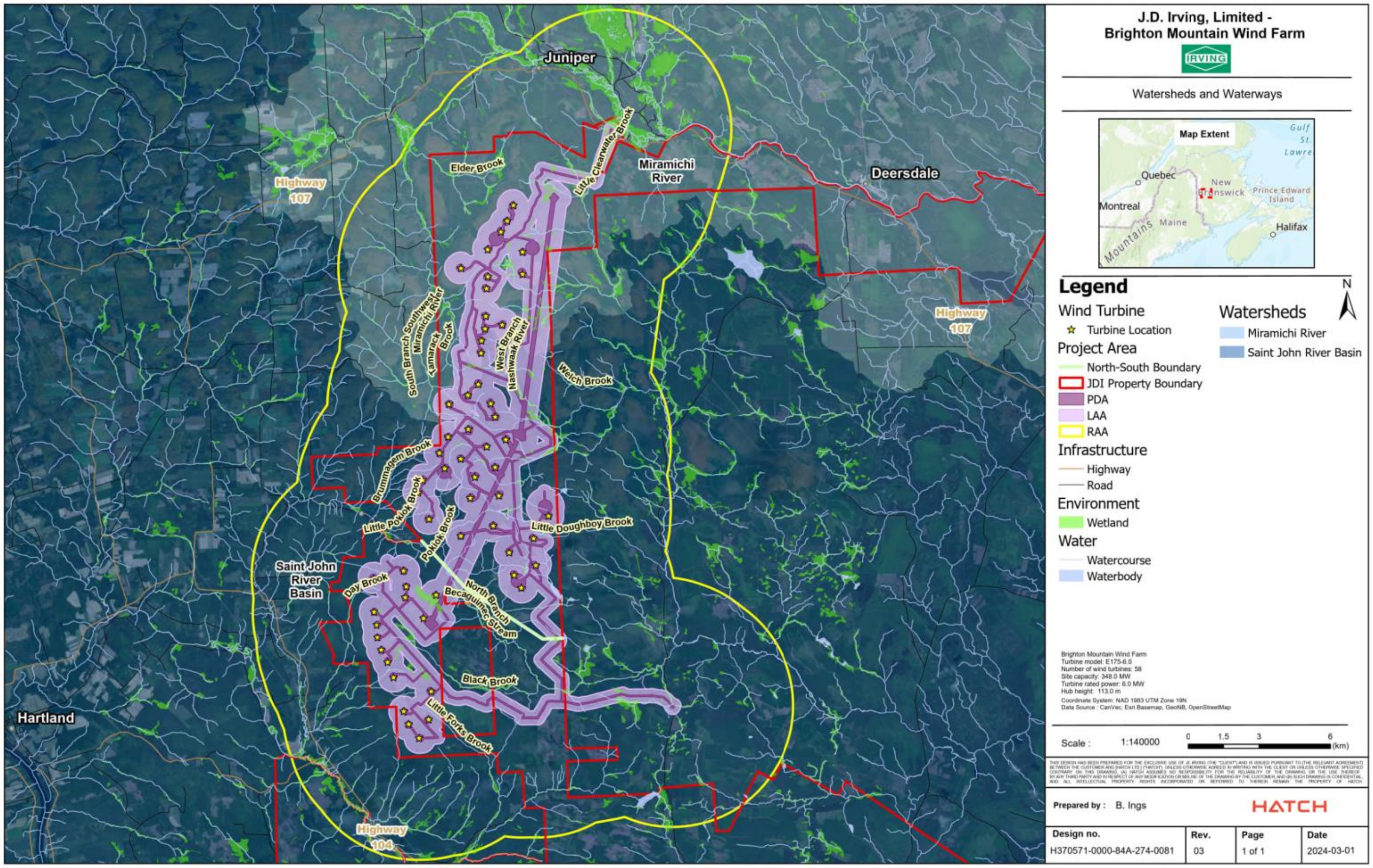

Figure 5-33: Watersheds within the Project's Regional Assessment Area (RAA)

Figure 5-34: Aquatic Assessment Locations in Northern Section of the PDA, LAA and RAA

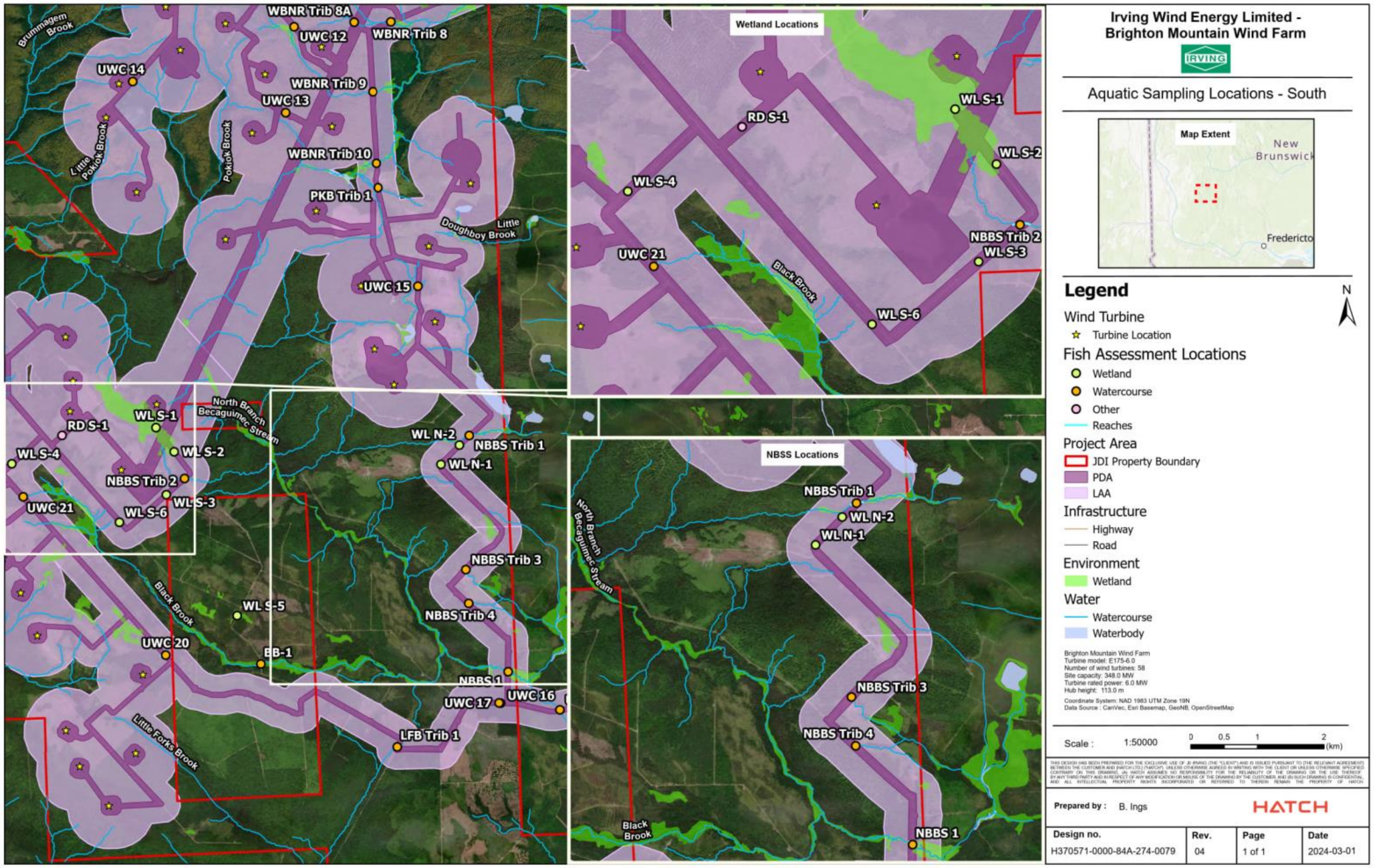

Figure 5-35: Aquatic Assessment Locations in Southern Section of the PDA, LAA and RAA

Of the 66 assessed points, 43 meet the provincial definition for a watercourse classification (i.e., wider than 0.5 m with mineral substrate and incised channel). Of the 43 defined watercourses, 26 are small perennial watercourses, four are large perennial watercourses, and 13 were classified as Headwater drainage feature (HDF). The remaining sites were classified as either potential HDF or roadside drainage (RD). Majority of the watercourses within the PDA and Project boundaries are 'stream order 1' watercourses, are small in size, and already have installed crossings along existing roads. Watercourse characteristics, substrate type, riparian vegetation, fish habitat suitability, and fish passage results. Full results are provided in Appendix E.

5.2.2.1.1 Watercourse Characteristics and Fish Habitat Suitability

Unique site names were given to each sampled water crossing during 2023 surveys. Little Clearwater Brook (LCWB), West Branch Nashwaak River (WBNR), North Branch Becaguimec Stream (NBBS), Tamarack Brook (TB), Pokiok Brook (PKB), Little Forks Brook (LFB), Black Brook (BB), Unnamed watercourse (UWC), and Sample Point (SP). Locations labeled with a prefix 'SP' indicate locations identified in the field with a culvert or wetted feature but were not categorized as a watercourse. Little Clearwater Brook and West Branch Nashwaak River were the most abundant tributaries flowing throughout the PDA. Overviews of each assessed tributary flowing to a named watercourse including specific measurements such as water depth, channel width and fish habitat suitability are summarized in Table 5-15.

Table 5-15: Field Survey Results - Watercourse Characteristics and Fish Habitat Suitability

Watercourse Characteristics									
Sample Location ID	Water Feature Definition	Channel Width (m)	Thermal Regime (cold, cool, warm)	Habitat Type (Riffle, run, pool, flat)	Water Depth (m)	Substrate Type(s)	Fish Habitat Suitability (Confirmed/observed, potential, unlikely)	Riparian Vegetation	Comments
LCWB Trib 1	Perennial (Large)	4.9 to 7	Cold	Riffles, runs, pools	10 to 25	Gravel, cobble, silt, some boulders	Confirmed via fisheries sampling. Suitable trout spawning habitat.	Shrubs (alders) and mixed tree species, ferns, and mosses. Shade 80%, overhanging vegetation.	Considerable amount of woody debris present along edges of banks and within channel, moderately unstable banks. The upstream portion vegetation differs from downstream of the crossing, consisting of mainly willow patches bordered by alders and conifers.
LCWB Trib 2	Perennial (Large)	5.5 to 6.9	Cold	Riffles, runs, step pools	4 to 6	Cobble, gravel, boulders	Confirmed via fisheries sampling. Suitable trout spawning habitat.	Coniferous trees, shrubs (alders), ferns, mosses, jewelweed. Shade 90%.	Upstream is floodplain that channelizes and narrows 10-15 m above crossing. Watercourse connects to wetland further downstream. Groundwater input 5-10 m from downstream crossing, watercress observed in channel.
LCWB Trib 3	Perennial (Small)	1.6 to 2.5	Cold	Riffles, pools, step pools	4 to 6	Cobble, gravel, some boulders, and sand	Confirmed via fisheries sampling.		Upstream portion flows parallel to existing road, edge of bank approx. 1-2 m from road edge. Moderate amount of woody debris in channel and along banks both upstream and downstream.
LCWB Trib 4	Perennial (Small)	0.5 to 1	Cold	Riffles, pools	2 to 5	Cobble, gravel, organics, sand	Observed	Trees, some shrubs (alders), ferns, mosses, jewelweed. Shade 90%, some overhanging vegetation.	Little to no visible channel upstream , upland drainage conveys water to downstream.
LCWB 1	Perennial (Small)	3 to 4.8	Cold	Riffles, runs, pools	11 to 24	Cobble, boulders, gravel, sand	Confirmed via fisheries sampling. Suitable trout spawning habitat.	Trees, shrubs (alders), ferns, moss. Overhanging vegetation. 100% shade.	Moderate amount of woody debris.
LCWB Trib 5	Perennial (Small)	0.3 to 1.2	Cold	Riffles, run	2 to 4	Silt, detritus, gravel	Confirmed via fisheries sampling.	Shrubs bordered by coniferous trees. Shade 60%.	Water flows over road and runs in 2 directions through thick vegetated area (shrubs and grasses). No real channel for the first 0-15 m downstream.
LCWB Trib 6	Perennial (Small)	2.5 to 3.5	Cold	Flats, pools, runs, riffles	10 to 22	Silt, organics, gravel	Confirmed via fisheries sampling.	Trees, shrubs (alders), grasses, ferns. Overhanging vegetation. Shade 85%.	Some woody debris in channel.
WBNR Trib 1	Perennial (Small)	0.5 to 1.5	Cold	Riffles, runs, pool complexes	6 to 7.2	Gravel, sand, cobble, silt	Confirmed via fisheries sampling. Suitable trout spawning habitat.	Trees and shrubs (alders), grasses, ferns, moss, jewelweed. Overhanging vegetation. Shade 90%.	Perched culvert downstream. Undercut banks. Woody debris in channel. Areas where exposed substrate in channel during low flow.
WBNR Trib 2	Perennial (Small)	0.8 to 1.4	Cold	Riffles, step pools	3 to 4	Gravel, sand, some cobble and boulders	Confirmed via fisheries sampling.	Trees, shrubs (alders), ferns, moss, grasses. Shade 90%.	Substantial woody debris. Undercut banks. Perched culvert downstream.
WBNR Trib 3	Perennial (Small)	2.6 to 4.6	Cold	Pools, flats	3 to 7	Silt, organics	Observed in Nashwaak River portion	Mainly shrubs (alders), some trees, grasses, ferns, moss. Shade 50%.	Algae present in stagnant areas. Some woody debris. Water stagnant near outlet.
WBNR Trib 4	Perennial (Small)	1.6 to 2.2	Cold	Riffles, pools	3 to 4	Cobble, gravel, sand, some silt	Observed. Suitable trout spawning habitat	Trees, shrubs (alders), grasses, ferns, jewelweed. Shade 100%. Overhanging vegetation.	Woody debris and stable banks.
WBNR Trib 5	Perennial (Small)	1 to 2.4	Cold	Rapid (shallow), riffles, runs	0.5 to 2	Cobble, silt, organics	Confirmed via fisheries sampling.	Dense grasses and ferns. Bordered by shrubs and trees. Shade 50%.	Upstream pond drains over road to downstream which flows through dense grasses and shrubs.
WBNR Trib 6	HDF	1 to 2.1	Cold	Flats, deep pools, runs	3 to 5	Silt, organics, cobble, gravel	Potential	Trees, shrubs (alders), herbaceous plants, grasses. Dense overhanging riparian vegetation. Shade 90%.	Stagnant water, no flow. Small woody debris.
WBNR Trib 7	Perennial (Small)	1.2 to 2.8	Cold	Riffles, pool complexes	3 to 5	Cobble, gravel, silt	Observed. Suitable trout spawning habitat	Trees, dense with shrubs (alders) and overhanging vegetation. Shade 100%.	Minor undercut banks. Extensive tree roots and woody debris in channel.
WBNR Trib 8	Perennial (Small)	0.5 to 1.5	Cold	Runs, flats, pools, riffles	3.5 to 18	Gravel, silt, cobble	Confirmed via fisheries sampling	Dense shrubs (alders), trees and grasses. Shade 80%.	Channel runs along road to the east where joins crossing. Pools at inlet and outlet. Open and little shade at both inlet and outlet.
WBNR Trib 8A	Perennial (Small)	22 to 3.5	Cold	Riffles, runs, pools	3 to 7	Cobble, gravel, sand	Confirmed via fisheries sampling. Suitable trout spawning habitat.	Mainly grasses, some trees and herbaceous plants. Overhanging woody debris and downed trees. Shade 50%.	Watercress present at outlet, ground water fed.

Watercourse Characteristics									
Sample Location ID	Water Feature Definition	Channel Width (m)	Thermal Regime (cold, cool, warm)	Habitat Type (Riffle, run, pool, flat)	Water Depth (m)	Substrate Type(s)	Fish Habitat Suitability (Confirmed/observed, potential, unlikely)	Riparian Vegetation	Comments
WBNR Trib 9	Perennial (Small)	2.2 to 3.5	Cold	Riffles, runs, pools	3 to 7	Cobble, gravel, sand	Confirmed via fisheries sampling. Suitable trout spawning habitat.	Heavily treed riparian area, some shrubs (alders). Heavily vegetated banks (ferns, grass, moss, jewelweed). Shade 90%.	Medium sized pool upstream of crossing and inlet, exposed substrate and gravel banks in sections of downstream channel and upstream open portion at crossing. Woody debris.
WBNR Trib 10	Perennial (Small)	2.1 to 2.3	Cold	Pools, runs, flats, riffles	4 to 7	Organics over boulders, gravel, and cobble, some silt	Confirmed via fisheries sampling.	Trees, shrubs (alders), grasses. Overhanging vegetation. Shade 80%.	Upstream is grassy floodplain and wetland surrounded by conifers. No flow observed. Beaver dam at end of pool downstream slowing flow and causing flooding.
NBBS Trib 1	Perennial (Large)	6.5 to 9	Cold	Riffles, runs, pools	20 to 45	Large boulders, sand, gravel	Confirmed during fisheries sampling.	Trees and shrubs, 60% shade.	Possible migratory barrier during low flow, isolated pools. Culvert is open, bottom/arch and edges not embedded. Water flowing from sides. Minor woody debris.
NBBS Trib 2	Perennial (Small)	1.8 to 2.1	Cold	Riffles, runs, pools	2 to 3	Cobble, some gravel, sand	Observed. Suitable trout spawning habitat.	Coniferous trees, extensive moss, little to no herbaceous vegetation. Overhanging woody debris and downed trees. Shade 100%.	Some drops and barriers that may present passage issues for fish. Extensive woody debris.
NBBS Trib 3	Dry	To be confirmed in 2024 – during spring flows				No channel observed, leaf litter, detritus, forest floor	N/A	Deciduous forest, ferns, moss, trees.	Dry at time of assessment.
NBBS Trib 4	HDF	0.25 to 0.5	Unknown	Shallow riffles, runs, small pools	1.8 to 2.5	Cobble, gravel, silt, organics	Unlikely	Trees, ferns, moss, grasses, shrubs. Shade 90%.	Iron deposits present. Low flow. Drops and barriers within channel.
NBBS 1	Perennial (Large)	2.8 to 5.6	Cool	Run, flat, pool	40 to 66	Silt, some gravel and cobble	Confirmed and observed.	Shrubs (alders), coniferous trees, ferns, moss.	Open channel upstream of crossing, grassy floodplain along channel.
TB Trib 1	HDF	0.6 to 1.4	Cold	Pools, riffles, runs	2 to 3	Silt, gravel, cobble	Potential	Trees, herbaceous vegetation, moss. Shade 75%.	No passage to upstream, doesn't have a channel to support fish past crossing. Runoff from high gradient forest, water flows through tightly packed cobble upstream.
TB Trib 2	HDF	0.45 to 1.2	Cold	Pools, shallow riffles	1 to 2	Gravel, cobble, sand	Potential	Treed, mosses, ferns, some grasses, and moss. Overhanging and woody debris. Shade 80%.	Outlet perched 1.5m from substrate. Channel conveys drainage from upland.
TB Trib 3	HDF	0.3 to 0.6	Unknown	N/A (dried channel)	N/A	Silt, gravel, some small cobble	Potential (during higher flow)	Trees, some shrubs (alders), and herbaceous plants and moss. Shade 70%.	Upland drainage. High gradient, intermittent dry channel. No flow. Pool of stagnant water at outlet of crossing. Minimal woody debris.
TB 1	Perennial (Small)	1.8 to 3.9	Cold	Riffles, runs, pools	4 to 15	Gravel, cobble, some sand	Confirmed via fisheries sampling. Suitable trout spawning habitat.	Trees, shrubs, grasses, herbaceous vegetation. Overhanging and downed trees and shrubs. Shade 90%.	Flow comes from TB 1W (wetland drainage). Flow from further upstream wetland (TB 1W), heavily vegetated banks, watercress in channel.
BB 1	Perennial (Small)	2. to 4.5	Cold	Riffles, runs, pools	5 to 17	Gravel, cobble, sand, silt	Confirmed via fisheries sampling. Potential trout spawning habitat.	Shrubs, trees, herbaceous vegetation, grasses. Shade 80%.	Open and wide at bridge. Narrows slightly both upstream and downstream. Overhanging and dense shrubs as get further both upstream and downstream. Areas of exposed substrate in channel. Flow low in some areas of channel. Potential barrier 15 m upstream, pile of woody debris in channel.
PKB Trib 1	Perennial (Small)	0.5 to 1.3	Cold	Riffles, pool	2 to 6	Cobble, gravel	Observed. Suitable trout spawning habitat.	Trees, grasses, herbaceous plants, some shrubs. Shade 100%.	Culvert corroded, flow not conveying through outlet properly. Minor undercut banks and woody debris.
LFB Trib 1	HDF	0.35 to 0.65	Unknown	Shallow pool	1 to 2	Silt, minimal cobble, gravel	Potential	Trees, sparse herbaceous vegetation, moss, grasses.	Not flowing. Pooling wet areas in channel. Tea coloured water, humic.
UWC 1	HDF	0.9 to 1	Cold	Riffles, runs, flats, pools	2.5 to 4.5	Cobble, sand, gravel, silt	Potential	Trees, ferns, moss, grasses. Shade 90%.	Watercress present in water, woody debris in channel. Groundwater present. Looks like flows to wetland further downstream.
UWC 2	HDF	1 to 2.3	Cold	Pools, riffles, runs	3 to 5	Silt, some cobble and gravel	Potential	Trees, ferns, shrubs, moss. Shade 100%.	Extensive woody debris in channel. Drainage from upland mixed with road/ditch drainage from upstream of crossing.
UWC 3	HDF	0.3 to 0.8	Cold	Pools, flats, riffles, runs	2 to 6	Silt, gravel, some cobble	Potential	Trees, heavily vegetated by ferns, grasses, and moss. Shade 100%.	Watercourse that drains into nearby wetland (south). Low flow.

Watercourse Characteristics									
Sample Location ID	Water Feature Definition	Channel Width (m)	Thermal Regime (cold, cool, warm)	Habitat Type (Riffle, run, pool, flat)	Water Depth (m)	Substrate Type(s)	Fish Habitat Suitability (Confirmed/observed, potential, unlikely)	Riparian Vegetation	Comments
UWC 4	Perennial (Small)	2.1 to 2.5	Cold	Riffles, runs, small step pools	2 to 4.5	Cobble, gravel	Potential	Trees, ferns, shrubs, moss. Shade 90%.	Small undercut banks, moderate grade along channel. Perched culvert.
UWC 5	HDF	0.5 to 1.6	Cold	Riffles, runs, flats	1 to 3	Silt, detritus, gravel, some cobble	Unlikely	Mainly trees, some herbaceous vegetation, moss. Shade 90%.	Little to no flow. Extensive woody debris
UWC 5a	HDF	0.2 to 0.35	Unknown	Riffles, pools	1 to 3	Silt, detritus, cobble, some small gravel and sand	Unlikely	Trees, ferns, shrubs, herbaceous vegetation. Shade 70%.	Drainage from upland forest area. Drains through tight cobble at crossing and disperses through grassy non structured channel south of crossing.
UWC 6	HDF	0.15 to 0.45	Unknown	Riffle, pools	1 to 3	Silt, detritus, some cobble and gravel.	Unlikely	Trees, ferns, moss. Shade 80%.	Drainage from upland forest area.
UWC 7	Perennial (Small)	0.75 to 2.75	Cold	Riffles, runs, pools	2.3 to 7	Silt, cobble, gravel, sand	Potential	Trees, shrubs (alders), ferns, grasses, moss. Shade 80%.	Watercress present. Woody debris (mainly semi-recent downed trees).
UWC 8	HDF	0.5 to 0.9	Cold	Flat, pool	2 to 3	Silt, gravel	Potential	Trees, shrubs, herbaceous vegetation, moss. Shade 90%.	Watercourse disappears underneath forest floor not far upstream of crossing. Woody debris in channel and overhanging.
UWC 9	HDF	0.5 to 1	Unknown	Shallow riffle, run	1 to 2	Cobble, gravel, detritus	Unlikely	Trees, herbaceous vegetation, moss. Shade 90%.	Relatively flat and few large downed trees.
UWC 10	HDF	0.25 to 0.8	Unknown	Riffles, pool	1 to 3	Gravel, sand, some small cobble	Unlikely	Trees, shrubs, ferns, moss. Shade 90%.	
UWC 11	HDF	0.15 to 0.6	Unknown	Flat, pool	4 to 10	Silt, detritus, organics	Potential	Trees, shrubs, grasses. Shade 50%.	Open at crossing, saturated wetted area on both sides. Stagnant water and algae in non-shaded and open areas.
UWC 12	HDF	N/A	Unknown	N/A	N/A	Gravel, cobble, detritus	Unlikely	Trees, herbaceous vegetation. Shade 60%.	Extensive woody debris and downed trees, channel hard to find and likely only a drainage feature conveying upland drainage, not likely to support fish.
UWC 13	Perennial (Small)	0.4 to 0.9	Unknown	Pool, riffles, runs	4 to 7	Silt, organics, some gravel	Potential	Trees, grasses, moss. Shade 70%.	Watercress present. Semi-perched culvert at crossing. Upstream conveys wetland drainage. Moderate woody debris present.
UWC 14	HDF	N/A	N/A	N/A	N/A	Dry gravel, earth	N/A	Spruce plantation.	No channel or crossing observed.
UWC 15	Perennial (Small)	1.8 to 3.5	Cold	Riffle/pool complexes, runs	4 to 10	Cobble, small boulders, gravel, sand	Observed. Suitable trout spawning habitat	Trees, shrubs, herbaceous vegetation, moss. Shade 90%.	Watercress present. Crossing at road does not have flow and/or channel. Watercourse is below crossing and upstream of crossing only facilitates drainage from upland.
UWC 16	HDF	0.25 to 0.5	Unknown	No flow	0.6 to 1	Gravel, cobble, silt, detritus	Unlikely	Trees, herbaceous vegetation, moss. Shade 90%.	No flow and channel is wetted but nearly dried.
UWC 17	HDF	0.3 to 0.45	Unknown	Small pools, no flow	2 to 4	Silt, detritus	Unlikely		
UWC 18	HDF	0.3 to 0.5	Unknown	Shallow pools	1 to 2.5	Silt, cobble, detritus	Potential	Trees, herbaceous vegetation. Shade 70%.	Low flow and standing water. Saturated flooded area.
UWC 19	Perennial (Large)	3.2 to 5.5	Cold	Riffles, runs, flats	35 to 50	Silt, cobble, sand, gravel	Confirmed via fisheries sampling. Suitable trout spawning habitat.	Shrubs (alders and willows) and grasses. Overhanging shrubs. Shade 60%.	Submerged grasses in channel.
UWC 20	HDF	0.8 to 1.6	Unknown	Shallow riffles, run, pool	2 to 4	Silt, gravel, some cobble	Potential	Trees, moss. 100% shade.	Pooling water along channel, flow more of a trickle that produces enough to create very shallow riffles.
UWC 21	HDF	0.25 to 1.2	Unknown	Pools	2 to 6	Silt, some small gravel, organics	Unlikely	Shrubs and grasses. Shade 80%.	Stagnant non-flowing water, turbidity moderate (not very clear).
Other Assessment Locations (SP's and RD's)									
SP 1	RD	N/A	N/A	N/A	N/A	Silt, organics, earth	N/A	Wet forested and vegetated area	Shallow water drains across road into grassy wet forested area, no channel present.

Watercourse Characteristics									
Sample Location ID	Water Feature Definition	Channel Width (m)	Thermal Regime (cold, cool, warm)	Habitat Type (Riffle, run, pool, flat)	Water Depth (m)	Substrate Type(s)	Fish Habitat Suitability (Confirmed/observed, potential, unlikely)	Riparian Vegetation	Comments
SP 2	HDF	N/A	N/A	N/A	N/A	Silt, organics, earth	N/A	Wet forested and vegetated area	Water drainage from upland area, drains into semi-wetted saturated forested area, no channel.
SP 3	HDF	0.2 to 0.35	Cold	Pools	1 to 3	Silt, organic materials, detritus	N/A	Wet forested and vegetated area	Saturated forested area, no defined channel. Likely very flooded in spring. Large pool at inlet of crossing, stagnant water.
SP 4	HDF	N/A	N/A	N/A	N/A	Detritus, leaf litter	N/A	Deciduous forest.	No channel observed, likely road drainage culvert/crossing.
SP 5	HDF	N/A	N/A	Some small pools	N/A	Detritus, silt	N/A	Deciduous forest, ferns, grasses, moss.	No visible channel, low lying vegetated area. Ground saturated, no flow observed, small stagnant pools of water
SP 6	HDF	N/A	N/A	N/A (dry)	N/A	Detritus, leaf litter, sparse cobble presence	N/A	Deciduous forest, shrubs, ferns, moss.	Depression at roadside, no culvert. Does not support fish, likely just drainage from road. Not a real channel.
SP 7	RD	N/A	N/A	N/A	N/A	Gravel, detritus	Unlikely	Deciduous forest, ferns, shrubs, moss. Heavily vegetated area with herbaceous plants.	No defined channel. Culvert is blocked on inlet (north) side of crossing. Stagnant non-flowing shallow water noticed at outlet.
RD S-1	RD	N/A	N/A	Shallow pools	0.5 to 1	Silt, detritus	Unlikely	Mixed forest, some ferns and moss.	Low lying area, no defined channel. Conveys road drainage. No flow. Little to no herbaceous vegetation.

5.2.2.2 Desktop Results, previously Recorded Fish Species in the RAA

Fish species that have historically been recorded within the RAA (i.e., watersheds contributing to the Miramichi and Saint John River Basins) were identified from the ACCDC Report, and Canadian Rivers Institute (2020). Species are listed in Table 5-16 below.

Table 5-16: Fish Species Within Watersheds of the Miramichi and the Saint John River Basins

Common Name (*Scientific Name*)	NB SARA Status	SARA Status	S-Rank	Watersheds		
				Miramichi River Basin (Southwest Miramichi River Watershed)	Saint John River Basin (Nashwaak River Watershed)	Saint John River Basin (South Becaguimec Watershed)
American Eel (*Anguilla rostrata*)	THR	THR	S4N	X	X	X
American Shad (*Alosa sapidissima*)	-	-	S5B	X	X	X
Atlantic Salmon – Gaspe-Southern Gulf of St. Lawrence population (*Salmo salar*)	SC	No Status (pending consideration)	S5	X	X	-
Atlantic Salmon – Inner Bay of Fundy population (*Salmo salar*)	END (Schedule 1)	END	S2	-	-	X
Atlantic Salmon – Outer Bay of Fundy population (*Salmo salar*)	END	END	SNR	-	X	X
Banded Killifish (*Fundulus diaphanous)*	-	NAR	S5	X	X	X
Blacknose Dace (*Rhinichthys atratulus)*	-	-	S5	X	X	X
Blacknose Shiner (*Notropis heterolepis*)	-	-	S4	X	X	X
Blueback Herring (*Alosa aestivalis*)	-	NAR	S5B	-	X	X
Brook Trout (*Salvelinus fontinalis)*	-	-	S4	X	X	X
Brook Stickleback (*Culaea inconstans*)	-	-	S4	X	-	-
Brown Bullhead (*Ameiurus nebulosus)*	-	-	S5	X	X	X

Common Name (*Scientific Name*)	NB SARA Status	SARA Status	S-Rank	Watersheds		
				Miramichi River Basin (Southwest Miramichi River Watershed)	Saint John River Basin (Nashwaak River Watershed)	Saint John River Basin (South Becaguimec Watershed)
Brown Trout (*Salmo trutta*)	-	-	SNA	X (uncommon), likely anadromous	X	X
Burbot (*Lota lota*)	-	-	S4	X (uncommon)	X	X
Chain Pickerel (*Esox niger*)	-	NAR	SNA	-	X	X
Common Shiner (*Notropis cornutus*)	-	-	S5	X	X	X
Creek Chub (*Semotilus atromaculatus*)	-	-	S5	X	X	X
Fallfish (*Semotilus corporalis*)	-	-	S5	X	X	X
Fathead Minnow (*Pimephales promelas*)	-	-	SU	-	-	X
Finescale Dace (*Chrosomus neogaeus*)	-	-	S4	X	X	X
Fourspine Stickleback (*Apeltes quadracus*)	-	-	S5	X	X	X
Gaspereau (Alewife) (*Alosa pseudoharengus Alewife*)	-	-	S5B	X	X	X
Golden Shiner (*Notemigonus crysoleucas)*	-	-	S5	X	X	X
Lake Chub (*Couesius plumbeus*)	-	-	S5	X	X	X
Lake Whitefish (*Coregonus clupeaformis)*	-	-	S4	-	X	X
Longnose Sucker (*Catostomus Catostomus*)	-	-	S4	X	X	X
Mummichog (*Fundulus heteroclitus*)	-	-	S5	X	-	-

Common Name (*Scientific Name*)	NB SARA Status	SARA Status	S-Rank	Watersheds		
				Miramichi River Basin (Southwest Miramichi River Watershed)	Saint John River Basin (Nashwaak River Watershed)	Saint John River Basin (South Becaguimec Watershed)
Muskellunge (*Esox masquinongy)*	-	-	SNA	-	X	X
Ninespine Stickleback (*Pungitius pungitius*)	-	-	S5	X	X	X
Northern Redbelly Dace (*Chrosomus eos*)	-	-	S5	X	X	X
Northern Pearl Dace (*Margariscus nachtriebi*)	-	-	S4	X	X	X
Pumpkinseed Sunfish (*Lepomis gibbosus*)	-	-	S5	-	X	X
Rainbow Smelt (*Osmerus mordax)*	-	-	S5B, SUN	X	X	X
Rainbow Trout (*Oncorhynchus mykiss*)	-	-	SNA	X	X	X
Slimy Sculpin (*Cottus cognatus)*	-	-	S5	X	X	X
Smallmouth Bass (*Micropterus dolomieui*)	-	-	SNA	X	X	X
Striped Bass – Bay of Fundy Population (*Monroe saxatilis)*	END	END	S3S4 B, S3S4 N	X	X	X
Threespine Stickleback (*Gasterosteus aculeatus*)	-	-	S5	X	X	X
White Perch (*Monrone americana*)	-	-	S5	X	X	X
White Sucker (*Catostomus commersonii)*	-	-	S5	X	X	X
Yellow Perch (*Perca flavescens*)	-	-	S5	X	X	X

5.2.2.3 Observed Fish Species

Quantitative fishing efforts were conducted at a total of 27 locations where appropriate water depths existed. A total of six species were caught within the PDA. 137 individuals were captured during the field program, 80 via backpack electrofishing and 63 with minnow traps. A total of 8,384 shocking seconds during electrofishing were performed and a total of 665.3 hours of soak time for minnow traps. The most abundant species caught were: Creek chub (n=60), followed by Brook trout (n=55). Brook trout were caught during electrofishing efforts only. One Species of Management Concern, the American Eel was caught in the PDA at sampling locations WBNR Trib 5 and UWC 19, along the West Branch of the Nashwaak River and an unnamed unmapped watercourse, respectively.

A total of 22 locations were sampled via minnow trap, of which six were successful in capturing fish species. 18 locations were sampled via backpack electrofishing methods, of which 12 were successful in capturing fish species. Results from fish sampling can be found in Table 5-17 below.

Table 5-17: Recorded Fish Species in PDA during 2023 Fish Sampling Results

Common Name (*Scientific Name*)	NB SARA Status	SARA Status	S -Rank	Watercourse(s)	Sampling / Catch Location(s)	# of Fish Caught	Sampling Method / Gear Used
American Eel (Anguilla rostrata)	THR	THR	S4N	• West Branch Nashwaak River tributary • Unnamed / unmapped watercourse	• WBNR Trib 5 • UWC 19	2	Electrofishing, Seine net (used for blocking flow)
Blacknose Dace (Rhinichthys atratulus)	-	-	S5	• Little Clearwater Brook tributaries • West Branch Nashwaak River tributaries • North Branch Becaguimec Stream tributaries	• LCWB Trib 1 • LCWB 1 • WBNR Trib 5 • WBNR Trib 8 • WBNR Trib 9 • NBBS Trib 1	15	Electrofishing, minnow traps
Brook Trout (Salvelinus fontinalis)	-	-	S4	• Little Clearwater Brook tributaries • Tamarack Brook • West Branch Nashwaak River tributaries • North Branch Becaguimec Stream tributary • Unnamed and unmapped watercourse (SP 36 location) • Black Brook	• LCWB Trib 1 • LCWB Trib 2 • LCWB Trib 3 • LCWB Trib 5 • LCWB Trib 7 • TB 1 • WBNR Trib 1 • WBNR Trib 9 • NBBS Trib 1 • UWC 19 • BB-1	55	Electrofishing
Common Shiner (Luxilus cornutus)	-	-	S5	• North Branch Becaguimec Stream	• NBBS 01	4	Minnow traps

Common Name (*Scientific Name*)	NB SARA Status	SARA Status	S -Rank	Watercourse(s)	Sampling / Catch Location(s)	# of Fish Caught	Sampling Method / Gear Used
Creek Chub (Semotilus atromacula-tus)	-	-	S5	• North Branch Becaguimec Stream and tributary • West Branch Nashwaak River tributaries • Little Clearwater Brook tributaries	• NBBS 01 • NBBS Trib 1 • WBNR Trib 1 • WBNR Trib 5 • WBNR Trib 8 • WBNR Trib 10 • LCWB 1 • LCWB Trib 6	60	Electrofishing, minnow traps
Slimy Sculpin (Cottus cognatus)	-	-	S5	• West Branch Nashwaak River tributary	• WBNR Trib 9	1	Electrofishing

5.2.2.4 *Fish Species at Risk or Special Conservation Concern*

Within the various Watersheds found in the RAA, the following species are of management concern: Atlantic Salmon, Shortnose Sturgeon, American Eel, Striped Bass, Brook Floater mussel, and Yellow Lampmussel. Although these species are known to occupy areas historically or currently within the RAA, these species may not be present within the LAA or the PDA.

The ACCDC data records show observations of Atlantic Salmon in the Southwest Miramichi River, in the RAA (along Highway 107). Both the Inner Bay of Fundy population (considered Endangered federally and provincially; NB S2) and the Gaspe – Southern Gulf of St. Lawrence population (Special Concern provincially; NB S2S3) were recorded (COSEWIC, 2010). In addition, a search using the DFO Species at Risk Mapping tool identified one aquatic SAR that had the potential of being within the RAA, the Shortnose Sturgeon which has provincial and federal Special Concern status (NB S3). However, the DFO Mapping tool showed no critical habitat found within the PDA. Field surveys during Year 1 did not detect Shortnose Sturgeon or Atlantic Salmon in any of the assessed watercourses. The only SAR detected during 2023 surveys was the American Eel which is discussed in Appendix B.

Table 5-18: Species of Management Concern and Species at Risk in New Brunswick, with Potential for Occurrence in the Project Area

Common Name (Scientific Name)	Federal SARA	COSEWIC (2014)	NB Provincial SARA	Legal Protection under the SARA (MOJ 2014)	Legal Protection under Provincial Designation	Estimated Potential Occurrence in Project Area (Low, Moderate, High)
Atlantic Salmon - Inner Bay of Fundy population (*Salmo salar*)	Endangered, Schedule 1 (2003)	Endangered (2010)	Endangered	Yes	No Prohibitions	Low, known to historically be in the Saint John Watershed
Atlantic Salmon - Outer Bay of Fundy population (*Salmo salar*)	Endangered	Endangered (2010)	Endangered	Yes	No Prohibitions	Low, known to historically be in the Saint John Watershed, especially in spawning habitat
Atlantic Salmon – Gaspe-Southern Gulf of St. Lawrence population (*Salmo salar*)	No Status (pending consideration)	Special Concern (2010)	Special Concern	No Protection	No Prohibitions	Low, known to be in the Miramichi Watershed
Shortnose Sturgeon (*Acipenser brevirostrum*)	Special Concern, Schedule 1 (2015)	Special Concern (2015)	Special Concern (2013)	No Protection	No Prohibitions	Moderate, in the Saint John River System. Barrier at Mactaquac Dam preventing

Common Name (Scientific Name)	Federal SARA	COSEWIC (2014)	NB Provincial SARA	Legal Protection under the SARA (MOJ 2014)	Legal Protection under Provincial Designation	Estimated Potential Occurrence in Project Area (Low, Moderate, High)
						upstream movements
American Eel (*Anguilla rostrata*)	Threatened	Threatened (2012)	Threatened (2012)	No protection	No Prohibitions	High, within the Saint John Watershed and Miramichi Watershed
Striped Bass – Bay of Fundy Population (*Morone saxatilis*)	No status (pending consideration)	Endangered (2012)	Endangered	No protection	No Prohibitions	Low, in Saint John River System
Brook Floater (*Alasmidonta varicose*)	Special Concern, Schedule 1 (2013)	Special Concern (2022)	Special Concern (2009)	Yes	No Prohibitions	Moderate, known to be within the Miramichi Watershed
Yellow Lampmussel (*Lampsilis cariosa*)	Special Concern, Schedule 1 (2005)	Special Concern (2013)	Special Concern (2004)	Yes	No Prohibitions	Moderate, known to be within the Nashwaak Watershed

5.2.2.5 *Fish Habitat within the PDA*

For Watercourses assessed, Fish habitat suitability has been presented in Table 5-14 above with Watercourse Characteristics. Suitable fish habitat was also identified at several other locations throughout the PDA, including wetlands.

Based on Year 1 baseline surveys, limited suitable fish habitat was identified within the southern portion of the PDA. Majority of the southern PDA consists of large, treed wetlands with little to no large open areas in comparison to the northern PDA which presents better quality fish habitat (streams, brooks, etc.) for species such as Brook trout, Blacknose dace, and Creek chub. The northern PDA presents more watercourses in abundance versus the southern extent of the PDA which does not have as many watercourse crossings.

Habitats such as larger coniferous treed wetlands exist within the southern portion of the PDA which present different fish habitat compared to the northern portion. Beaver ponds and associated wetlands exist throughout both assessment areas. Although wetlands were not assessed concurrently with fisheries and watercourse assessments, wetlands that had any potential to support fish within the PDA boundaries were surveyed via minnow trap at a total of 9 locations. Table 5-19 below outlines the locations characteristics as well as result of catches and suitability of fish habitat in wetlands assessed within the PDA.

Table 5-19: Wetland Fish Habitat Suitability within PDA (2023)

Sample ID	Feature Type	Fish Habitat Suitability	Riparian Vegetation	Notes
TB 1W	Wetland, open water areas	Observed	Willows, alders, coniferous trees, grasses.	Large open water pond upstream of crossing, wetland drains across road into a more closed and heavily vegetated wetland which drains to Tamarack Brook.
WL N-1	Wetland, open water areas	Potential	Alders, coniferous trees, grasses, sedges.	Elongated shape, vegetated throughout.
WL N-2	Wetland, open water areas	Observed	Alders, coniferous trees, grasses.	Beaver activity noted in upstream pond. Elongated shape and runs parallel to road. Minnows observed. Flow drains over road, flooding from beaver activity and drains through forest downstream. No proper crossing or culvert installed.
WL S-1	Wetland	Unlikely	Coniferous trees, grasses.	Small portion of open water present along roadside. Not enough to support fish.
WL S-2	Wetland	Unlikely	Coniferous trees, grasses.	Small portions of open water present along roadside. Not enough to support fish.
WL S-3	Wetland, open water areas	Potential	Coniferous trees, grasses.	Long pool of water that runs parallel to road, stagnant isolated water (no connected channel). Not likely to support fish.
WL S-4	Wetland, open water areas	Potential	Coniferous trees, grasses	Long pool of water that runs parallel to road, no flow of

Sample ID	Feature Type	Fish Habitat Suitability	Riparian Vegetation	Notes
				water. Not likely to support fish.
WL S-5	Wetland, small pools	Unlikely	Coniferous trees, grasses	Small, scattered areas of pools present parallel to road. Not likely to support fish.
WL S-6	Wetland, open water areas	Unlikely	Coniferous trees, grasses, moss.	Large pool north side of crossing, flow of water conveys in southward direction through culvert.
TB = Tamarack Brook WL N = Wetland (North) WL S= Wetland (South)				

Habitat quality for species of interest within respective north and south boundaries are discussed below.

5.2.2.5.1 American Eel Habitat

American Eel are found in both saltwater and freshwater environments accessible from the Atlantic Ocean. This species may also be found in both lentic and lotic waters, of any depth, and occupy a broad range of habitats which vary in temperatures and salinities (Government of Canada, 2015). Spawning occurs exclusively in the Sargasso Sea, located south of Bermuda, where they drift north on Atlantic currents for the first year of their life. Eventually they reach coastal waters and enter sheltered saltwater bays, brackish estuaries, and freshwater rivers (DFO, 2011). Eel habitat can be found in depositional environments where fine sediment such as sand, silt, and clay are present, which is used as shelter during the day. Decrease of water temperatures below 5°C cause this species to burrow in sediment and enter a state known as “torpor” (CWS, 2017).

During the Project’s Year 1 aquatic program, American Eel was encountered and captured at two sampling locations. The first location was at a tributary that connects to the West Branch Nashwaak River (WBNR Trib 5), located in the northern PDA boundaries. This habitat consisted of fine material such as a silt substrate with presence of cobble, and submerged vegetation such as aquatic grasses. Observation and catch location occurred within the upstream pond portion.

The second location that American Eel was encountered was at an unnamed and unmapped watercourse (UWC 19), which is outside of the JDI Property boundaries but at a crossing along the proposed resource road that leads to the southern PDA and will be utilized during all phases of the Project. Habitat at this watercourse provided submerged aquatic grasses for cover, as well as substrate consisting of mainly silt with cobble and some gravel. Although captured at this location crossing (UWC 19), American Eel may not be present in the southern portion of the Property boundaries and southern PDA. American Eel capture locations can be seen in Figure 5-36.

5.2.2.5.2 Brook Trout Habitat

Brook trout generally thrive in riverine and lacustrine environments with cold, clear, often spring-fed groundwater, and coarse, silt-free, rocky substrate such as fine gravel. Within the northern PDA, conditions that support Brook trout are present within existing watercourses. Water quality parameters indicate that Brook trout habitat prefer a range of 11 to 16°C, however, will tolerate temperatures that range as low as 0°C to as high as 24°C. At the extreme ends of these temperatures, distribution and reproduction is expected to be limited. Brook trout favour riffle-run areas within streams and areas that have overhanging vegetation and cover. Optimal spawning areas of Brook trout tend to be areas where groundwater upwells in lentic environments with areas of vegetation and coarse substrate. Headwater streams and tributaries are often used during seasonal and sensitive timing such as spawning.

The majority of the northern PDA supports cold-water species such as Brook trout, which tend to prefer cold, clear water with low turbidity. Brook trout and other salmonids tend to be more sensitive to changes in the environment such as water quality fluctuations or alterations, specifically temperature and dissolved oxygen changes (Raleigh. R.F. 1982). Although Brook trout are not listed SAR, presence of Brook trout within watercourses indicates that the watercourses within the PDA and Project boundaries are considered to have good baseline water quality and are healthy. Other species in New Brunswick watersheds such as American Eel and cyprinids (Blacknose Dace and Creek Chub) which often inhabit similar habitats tend to be more tolerant to changes in water quality. Changes in water quality are anticipated to affect Brook trout before other species within a shared watercourse (Raleigh. R.F. 1982). Brook trout were captured at 12 sampling locations throughout the PDA, majority of which exist within the northern portion of the PDA bounds. Locations where Brook trout were caught in the PDA are shown in Figure 5-36 below.

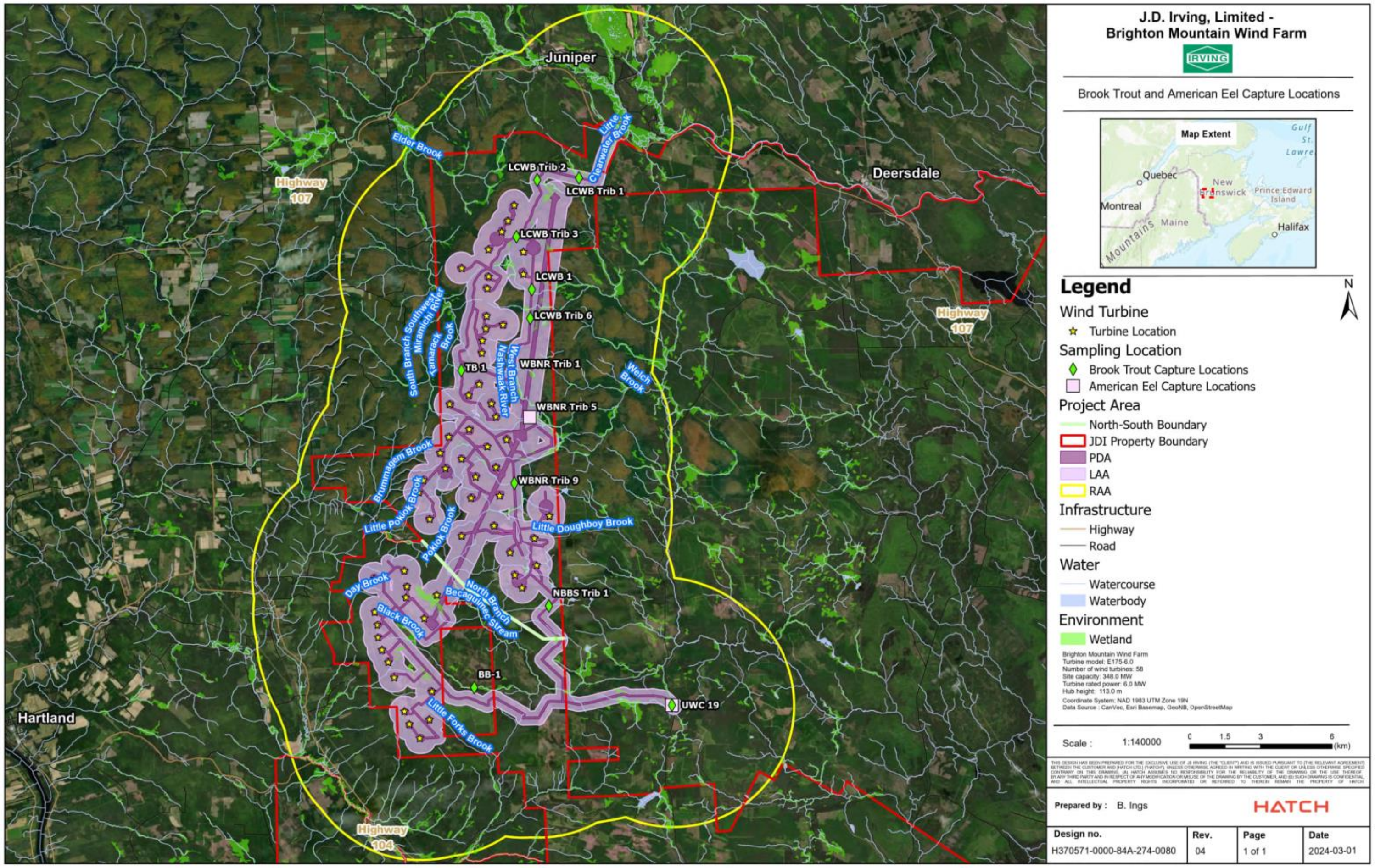

Figure 5-36: American Eel and Brook Trout Capture Locations within the PDA (2023)

5.2.3 Terrestrial Wildlife and Wildlife Habitat

The Project has completed a '*Terrestrial Wildlife and Wildlife Habitat Report'* (H370571-0000-483-066-0003), describing the baseline data collection methodologies, baseline conditions, methods for the assessment of this VC, and results. This Report is included in this EIA Registration as Appendix F.

5.2.3.1 Previously Recorded Terrestrial Wildlife Species (ACCDC Database)

A desktop analysis was carried out to determine various species, including SAR historically found within NB and the RAA. A request was made to the ACCDC to provide a report containing known SAR occurrences up to 100 km of the LAA from their NatureServe Network, with a focus on species within 5 km of the 'Candidate Lands within the JDI property Boundary.

The ACCDC database includes records for a total of 11 provincially rare terrestrial wildlife species (excluding invertebrates) within the Local and/or Regional Assessment Area as shown in Table 5-20. AC CDC records of rare flora and fauna, including vertebrates are also presented inFigure 5-37 for the southern RAA and Figure 5-38 for the northern RAA.

Table 5-20: Terrestrial Species at Risk Desktop Review

Common Name[1]	Scientific Name	SARA Status	NBSARA Status	Habitat Description	Occurrence within Local or Regional Assessment Area	Observed during 2023 baseline studies?
Mammals						
Canada Lynx	*Lynx Canadensis*	NAR	SC	Continental lynx populations reach their highest densities in boreal and mixed wood forests and prefer a habitat of diversified age which supplies habitat required for denning, cover and food. The species is is highly dependent on Snowshoe Hare (*Lepus americanus*) for food.	The Canada Lynx is known to occur in the RAA. Boreal, mixed Wood and plantation exist within the Local Assessment Area. The Snowshoe hare is also known to occur in the area.	Yes
Caribou (Atlantic-Gaspesie pop.)	*Rangifer tarandus*	END	EXT	Require large tracts of land dominated by boreal forests with large quantities of lichens. Utilize isolated areas with highly nutritious vegetation to raise young.	This population can only be found in the Gaspé Peninsula, Quebec. Dispersal is highly unlikely due to the population's isolation.	No
Grey Wolf	*Canis lupus*	NAR	EXT	A habitat generalist, frequenting grasslands, mountains, deserts, forests and more across their global range. Typically prey on large herbivores such as deer, caribou and moose but do prey on small species like the Snowshoe Hare with some frequency.	The Grey Wolf is no longer found in New Brunswick.	No
Cougar Eastern pop.	*Puma concolor*	DD	-	Habitat generalist occurring in forests, wetlands and more throughout its range. Historically thought to have inhabited large tracts of land with minimal human disturbance. Relies on large herbivores as a prey source.	Very little is known about the Eastern Cougar in New Brunswick. Sightings in the province have had mixed reliability and status as native subspecies or exotic animals is unknown.	No
Rock Vole	*Microtus chrotorrhinus*	-	-	Live in small colonies on moist rock-based slopes in mixed forests. Feed mainly on vegetation.	Imagery suggests habitat is widely available within the Regional Assessment Area.	No
Southern Bog Lemming	*Synaptomys cooperi*	-	-	Prefer low lying moist areas (like bogs) but are habitat generalists found in a wide variety of areas where enough herbaceous vegetation Is present. Omnivores but prefer the seed heads of grasses and sedges.	Imagery suggests habitat is widely available within the Regional Assessment Area. Preferred habitat (peatlands) also occurs where the species is more likely to outcompete other grassland inhabitants.	No

Common Name[1]	Scientific Name	SARA Status	NBSARA Status	Habitat Description	Occurrence within Local or Regional Assessment Area	Observed during 2023 baseline studies?
Reptiles						
Snapping Turtle	*Chelydra serpentina*	SC	SC	Prefer shallow waters so they can hide under the soft substrates. Omnivores feeding on vegetation, small vertebrates, and invertebrates. Require loose substrates on land for egg deposition. Hibernation takes place at the bottom of various waterbodies.	Ample aquatic features suitable for the snapping turtle can be found within the Regional Assessment Area. Overwintering, Foraging and Nesting habitat is plentiful. Seasonal migration to nesting sites is possible given lack of hard barriers within the landscape.	Yes
Eastern Painted Turtle	*Chrysemys picta picta*	SC	-	Prefer slow moving water with emergent vegetation including ponds, marshes, lakes, and creeks. They require basking sites, preferably in the form of emergent logs or rocks. Soft substrates on land are require for egg deposition. Overwintering takes place on the bottom of waterbodies	Ample aquatic features suitable for the Eastern Painted Turtle can be found within the Regional Assessment Area. Overwintering, Foraging and Nesting habitat is plentiful. Seasonal migration to nesting sites is possible given lack of hard barriers within the landscape.	No
Wood Turtle	*Glyptemys insculpta*	THR	THR	The Wood Turtle prefers aquatic features with a slight current and sandy or gravelly bottom, where they overwinter. Wooded areas are essential habitat for the Wood Turtle, but they are found in other habitats, such as wet meadows, swamps, and fields.	Known to occur within the PDA; Overwintering, Nesting, and active season habitat occur throughout the Regional Assessment Area and likely the PDA, with limited hard barriers to dispersal between them.	Yes
Amphibians						
Northern Dusky Salamander pop. 2	*Desmognathus fuscus*	NAR	-	They are mainly found on land, but are always close to small groundwater fed streams, seeps, and springs, where they live under rocks, logs or leaf litter within or near water.	The species is known to occur in the Local Assessment Area and imagery suggests suitable habitat features are widespread within the PDA.	Yes
Insects						
Yellow-banded Bumble bee	*Bombus terricola*	SC	-	Specializes in open habitats including fields, meadows, roadsides, and urban centers. Relies on high flower density as foraging habitat.	The species is known to occur within the Regional Assessment Area and open habitat types (wetland, roadsides, meadows) are widespread within the PDA.	No

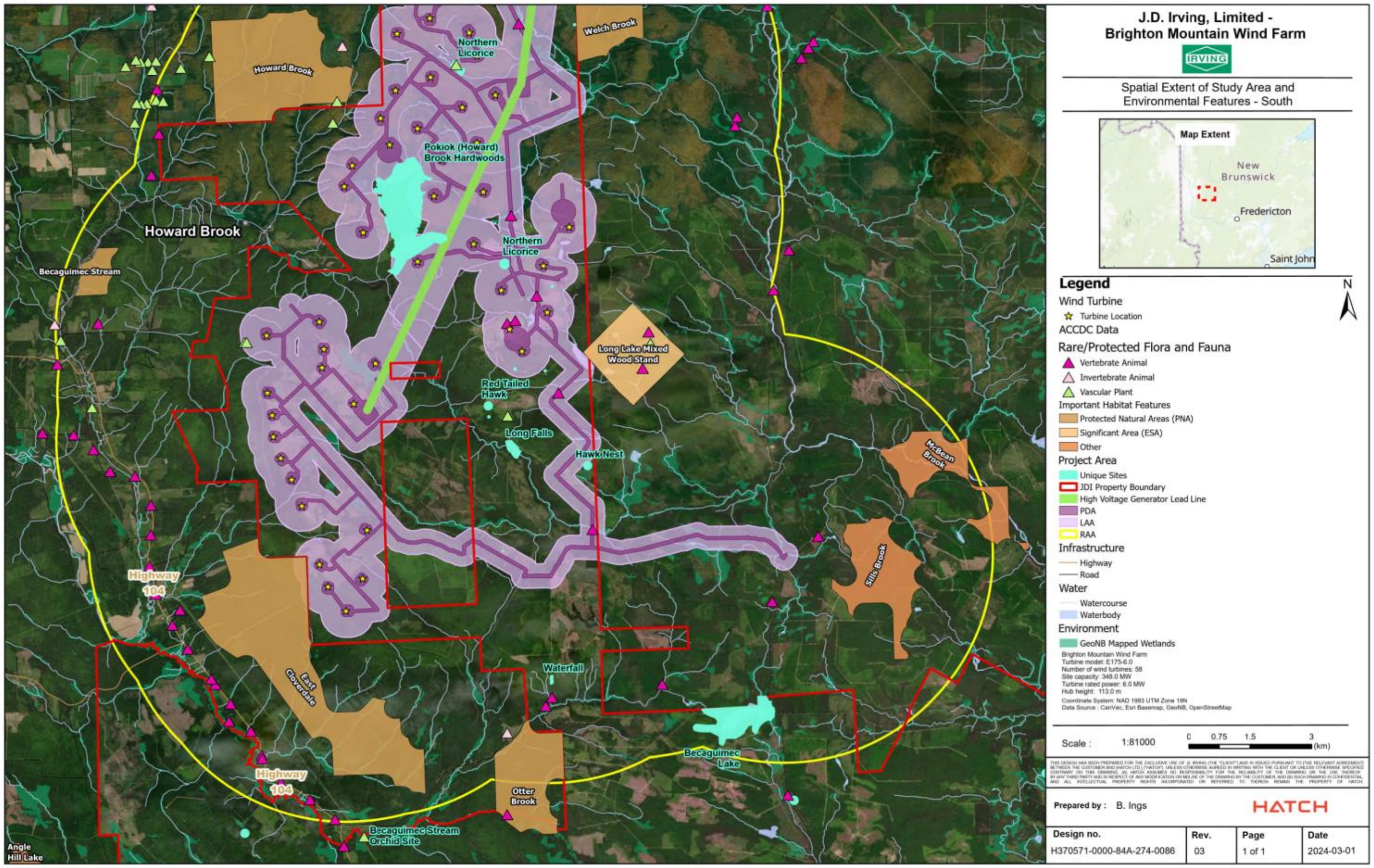

Figure 5-37: Rare / Protected Flora and Fauna from ACCDC Report in the Southern RAA

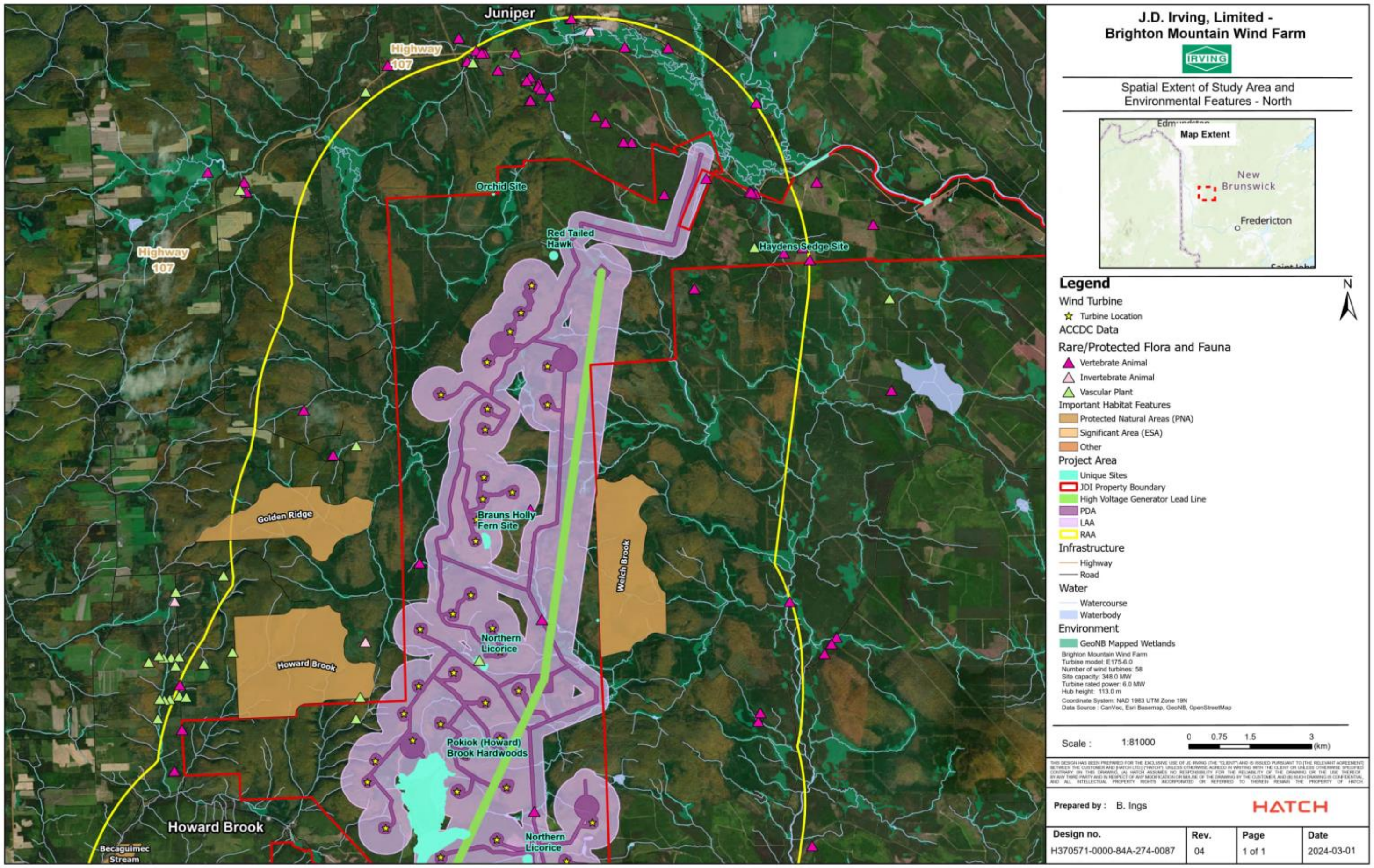

Figure 5-38: Rare / Protected Flora and Fauna from ACCDC Report in the Northern RAA

5.2.3.2 *Critical Terrestrial Wildlife Habitat*

Critical habitat can be defined as habitat that is essential for an organism to carry out necessary life functions such as reproduction, overwintering, migration, feeding or rearing (GoC, 2009). For species that do not have large home ranges, which are a primary focus of this report, this suggests that features essential to a species life process must occur in a species dependent proximity to observations.

5.2.3.2.1 Wood Turtle Critical Habitat

The Wood Turtle (*Glyptemys insculpta*) Recovery Strategy (GoC, 2020) defines Wood Turtle Critical Habitat based on two criteria: habitat occupancy and habitat suitability.

Habitat occupancy is confirmed when:

- A minimum of two distinct turtles have been observed in any year over the last 40 years – this includes nesting records (indicator of site quality); or
- A single individual was seen in multiple years in the past 40 years (indicator of site fidelity).

Suitable habitat for Wood Turtle varies by life phase and includes:

- Shrublands, mixed or deciduous forests, sandy or gravelly areas (e.g., beaches, riverbanks), grasslands, and wetlands for foraging, mating and nesting; and
- Streams with year-round flow and sandy, gravelly or cobble substrates that do not freeze to the bottom for overwintering.

5.2.3.3 *Observed Terrestrial Wildlife Species*

Various baseline field surveys commenced in winter and continued throughout the 2023 field season, with plans to continue surveys as required through 2024. Surveys focused on birds, bats, fish, vegetation, wetlands, and hydrology. During each of these surveys, incidental wildlife observations were also recorded, and are presented below in Table 5-21.

Table 5-21: Incidental Wildlife Observations within the LAA during 2023 Baseline Studies

Common Name	Scientific Name	SARA Status	NBSAR A Status	Observation Type[1]	Season Observed			
					Winter	Spring	Summer	Fall
American Black Bear	*Ursus americanus*	-	-	V	-	X	-	X
American Pine Marten	*Martes americana*	-	-	T, V	X	-	X	-
American Red Squirrel	*Tamiasciurus hudsonicus*	-	-	-	-	X	-	-
Canada Lynx	*Lynx canadensis*	NAR	SC	V, T	X	X	-	X

Common Name	Scientific Name	SARA Status	NBSARA Status	Observation Type[1]	Season Observed			
					Winter	Spring	Summer	Fall
Eastern Chipmunk	*Tamias striatus*	-	-	-	-	X	X	X
Eastern Gray Squirrel	*Sciurus carolinensis-*	-	-	T	X	-	X	-
Moose	*Alces alces*	-	-	V, S, T, B	X	X	X	X
Snowshoe Hare	*Lepus americanus*	-	-	V, T, B	X	X	-	-
White-tailed Deer	*Odocoileus virginianus*	-	-	-	-	-	X	X
Maritime Garter Snake	*Thamnophis sirtalis pallidulus*	-	-	V	-	-	X	-
Spring Peeper	*Pseudacris crucifer*	-	-	A	-	X	-	-
Wood Turtle	*Glyptemys insculpta*	THR	THR	V	-	-	-	X
Green Frog	*Lithobates clamitans*	-	-	A	-	-	X	-
Wood Frog	*Lithobates sylvaticus*	-	-	A	-	X	-	-
Northern Leopard Frog	*Lithobates pipiens*	-	-		-	-	X	-
American Beaver	*Castor canadensis*	-	-	B, L	-	-	X	X
American Mink	*Neogale vison*	-	-	V	-	-	-	X
American Toad	*Anaxyrus americanus*	-	-	H	-	X	-	-
Northern Dusky Salamander	*Desmognathus fuscus*	-	-	V	-	-	X	-
Unisexual or Blue Spotted Salamander	*Ambystoma sp.*	-	-	E	-	X	-	-
American Pine Marten	*Martes americana*	-	-	V, T	X	-	X	-
Muskrat	*Ondatra zibethicus*	-	-	V	-	-	X	-
Spotted Salamander	*Ambystoma maculatum*	-	-	V, E	-	X	-	-

Common Name	Scientific Name	SARA Status	NBSARA Status	Observation Type[1]	Season Observed			
					Winter	Spring	Summer	Fall
Ruffed Grouse	*Bonasa umbellus*	-	-	V, T	X	-	X	X
Northern Raccoon	*Procyon lotor*	-	-	V	X	-	-	-
Eastern Coyote	*Canis latrans*	-	-	V, T	X	-	-	X
Red Fox	*Vulpes vulpes*	-	-	V	X	-	-	-
Fischer	*Pekania pennanti*	-	-	T	X	-	-	-
Tri-coloured Bumblebee	*Bombus ternarius*	-	-	V	-	X	-	-
Ebony Jewelwing	*Calopteryx maculata*	-	-	V	-	-	X	-

[1] V = Visual, T = Tracks, S = Scat, B = Browse, E = Eggs, H = Heard, and L = Lodge.

Additionally, Incidental Wildlife Observations outside of the LAA, in the broader RAA were also documented during the 2023 field season, these observations are presented in Table 5-22 below.

Table 5-22: Incidental Wildlife Observations within the RAA during 2023 Baseline Studies

Common Name	Scientific Name	SARA Status	NBSARA Status	Observation Type[1]	Season Observed			
					Winter	Spring	Summer	Fall
Wood Turtle	*Glyptemys insculpta*	THR	THR	V	-	-	X	
Snapping Turtle	*Chelydra serpentina*	SC	SC	V	-	-	X	-

One Wood Turtle was observed in the fall season on a resource road between Turbine location 43 and 40, within the PDA. Given the time of year and tendency for the species to overwinter in main branch streams, the Black Brook and Day Brook tributaries which are located 0.41 and 1.28km away respectively, have potential of being hydrologically connected to an overwintering feature. Given 95% of Canadian Wood Turtle telemetry observations are within 200 m of a stream, and 90% of pre-overwintering period observations are within 62 m of a stream, from imagery this observation is most likely to be associated with Black Brook (GoC, 2016). The streams’ physical attributes will be assessed to determine habitat quality and Wood Turtle presence in the 2024 field season to better inform mitigation.

One additional Wood Turtle was observed on a road in proximity to the Miramichi River South Branch within the RAA. While presence of Wood Turtle is a primary driver in determining presence of critical habitat, the observation taking place in the summer would suggest the South Branch of the Miramichi River should not receive that designation as foraging, thermoregulation and mating habitat are not considered limiting (GoC, 2020). However, seeing as the observation was made shortly after the end of the nesting season (Table 5-23), assessing the surrounding habitat for potential nests/nesting features (open, well drained sand/gravel) may assist in determining if that habitat has any significance regarding Wood Turtle essential life processes.

Table 5-23: Timing Windows for SAR Observed within the Local or Regional Assessment Area

Common Name	Life Process	Timing Windows
Reptiles		
Wood Turtle	Overwintering	October – April
Wood Turtle	Nesting	Late May – Mid June
Snapping Turtle	Overwintering	October – April
Snapping Turtle	Nesting	Late May – Late June
Mammals		
Canada Lynx	Birth	May – June

One Snapping Turtle was observed during the summer on an ATV trail within the RAA. Being within 0.5 km of several waterbodies, it is difficult to associate the observation with any single feature. Given the time of year, it is likely that the turtle would have been a female searching for a nesting site, either using the ATV trail to nest or as a corridor to travel. Given the designation of the Snapping Turtle as SC, this nesting habitat would not be protected, unless a nest was present.

All SAR Observed within the PDA, LAA and RAA during the 2023 Baseline Surveys, are presented in Figure 5-39.

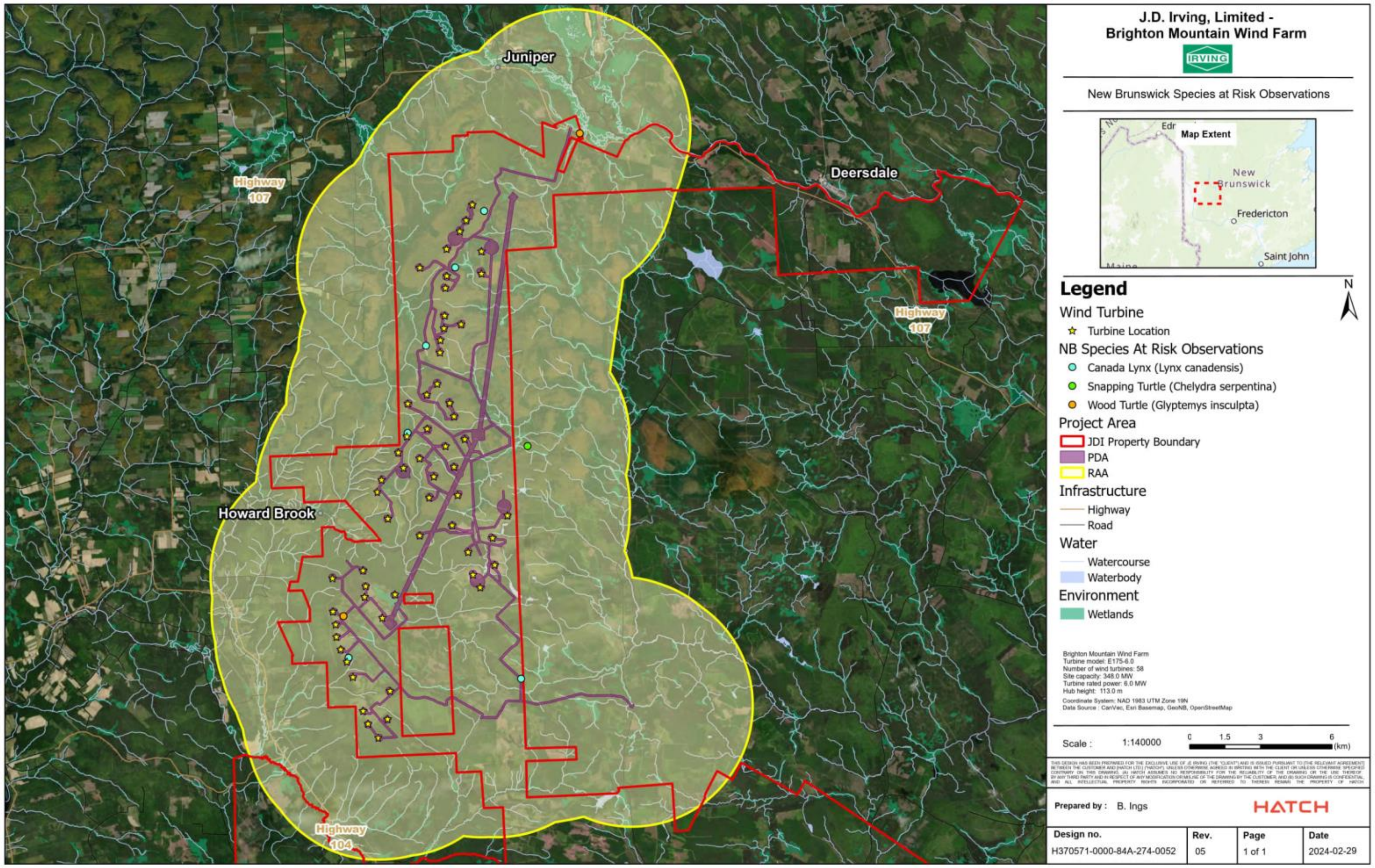

Figure 5-39: All Terrestrial SAR Observed within the PDA, LAA and RAA during the 2023 Baseline Surveys

5.2.4 Birds

The Project has completed an '*Avian Report'* (H370571-0000-483-066-0004), describing the baseline data collection methodologies, baseline conditions, methods for the assessment of this VC, and results. This Report is included in this EIA Registration as Appendix H.

5.2.4.1 Bird Habitat

The habitat types identified are based on species composition and development stage (See Section 5.2.1 Wetlands and Vegetated Habitat). The proportion of each habitat type found within the PDA and LAA is presented in Table 5-24, and the habitat of each proposed turbine location are provided in Table 5-25. Development stage is donated by Young, Immature and Mature, while species composition is denoted by:

- IH – Intolerant Hardwood Forest Group;
- TH = Tolerant Hardwood Forest Group;
- MW = Mixed-wood Forest Group; and
- SW = Softwood Forest Group.

Table 5-24: Terrestrial Vegetation and Wetland Habitat Types Within the Project Boundaries (PDA, LAA, RAA)

Habitat Type*	% of PDA	% of LAA	% of RAA
Young IH	3.0	2.0	2.5
Immature IH	0.9	0.8	4.2
Mature IH	0.1	0.8	0.6
Young TH	9.6	7.9	3.5
Immature TH	11.0	10.7	11.4
Mature TH	29.9	28.1	16.9
Young MW	2.3	2.1	2.6
Immature MW	1.3	1.3	4.7
Mature MW	2.6	4.0	5.6
Young SW	18.2	15.8	12.3
Immature SW	6.8	5.8	16.9
Mature SW	4.8	6.3	9.9
Wetland*	8.6	14.4	5.4
Non-Forest	1.0	0.1	3.6
*Wetland is consolidated in this table for the sake of visibility.			

Table 5-25: Summary of Turbine Specific Habitat

Turbine	Habitat Type	Turbine	Habitat Type
1	Mature TH, Immature TH, Mature SW	30	Young SW, Mature TH
2	Mature SW, Mature MW, Immature TH	31	Young TH, Mature TH
3	Mature SW, Mature MW, Immature TH	32	Mature TH
4	Non forest, Immature TH, Mature TH	33	Young SW, Immature SW
5	Young SW, Mature SW, Mature TH	34	Young SW, Immature SW, Immature TH, Mature TH
6	Young TH, Immature TH, Mature TH	35	Young SW, Mature TH
7	Young TH, Immature TH	36	Young SW, Mature TH
8	Young TH, Immature TH	37	Young SW, Mature TH
9	Immature TH	38	Young SW, Immature MW, Young MW, Mature SW, Wetland
10	Immature TH, Young TH, Mature TH	39	Immature SW
11	Immature TH, Young TH	40	Wetland, Young TH, Young MW, Young SW
12	Mature TH, Young TH	41	Mature SW, Mature TH
13	Young TH	42	Immature SW, Young IH, Young MW, Immature TH
14	Non forest, immature TH	43	Young TH, Young SW
15	Mature TH	44	Young TH, Young SW, Young MW
16	Mature TH	45	Young TH, Young SW
17	Young TH, Mature TH	46	Young SW, Mature TH, Mature SW, Mature IH
18	Mature TH	47	Immature TH, Young SW
19	Mature TH, Immature TH	48	Young TH, Immature TH, Young SW, Mature SW
20	Mature TH, Mature MW	49	Mature TH, Mature MW
21	Young SW, Mature SW	50	Young SW, Immature TH
22	Wetland, Mature MW, Mature TH	51	Young TH, Young SW
23	Young SW, Mature TH	52	Wetland, Young SW, Immature TH, Mature TH
24	Immature TH, Mature TH	53	Wetland, Mature MW, Immature TH, Immature MW, Young SW, Mature TH
25	Young SW, Mature TH	54	Mature TH, Mature MW, Young SW, Mature SW
26	Mature TH, Mature SW	55	Mature TH, Immature TH
27	Mature TH	56	Young IH, Mature MW, Mature TH

Turbine	Habitat Type	Turbine	Habitat Type
28	Young SW	57	Mature TH, Mature MW
29	Young TH, Mature TH	58	Young TH, Young MW, Young SW

5.2.4.2 *Previously Recorded Bird Species (ACCDC Database)*

A desktop analysis was carried out to determine various species, including SAR historically found within NB and the Regional Assessment Area. A request was made to the Atlantic Canada Conservation Data Center (ACCDC) to provide a report containing known SAR occurrences up to 100 km of the Local Assessment Area from their NatureServe Network, Observe Bird Species.

Table 5-26 presents a list of avian SAR and SOCC (as defined by the ACCDC), species that are rare to uncommon (S1 to S3 S-Rank status in New Brunswick), as well as raptors, owls, and large-bodied woodpeckers.

Table 5-26: Avian Desktop Analysis Summary from the ACCDC Report

Common Name	Scientific Name	SARA / NBSARA	S-Rank (NB)
SAR (Canada and/or New Brunswick)			
Bald Eagle	*Haliaeetus leucocephalus*	Endangered (NB)	S4
Bank Swallow	*Riparia riparia*	Threatened (Schedule 1) Endangered (COSSAR NB)	S2B
Barn Swallow	*Hirundo rustica*	Threatened	S2B
Bobolink	*Dolichonyx oryzivorus*	Threatened	S3B
Canada Warbler	*Cardellina canadensis*	Threatened	S3S4B
Chimney Swift	*Chaetura pelagica*	Threatened	S2S3B,S2M
Common Nighthawk	Chordeiles minor	Threatened	S3B,S4M
Eastern Meadowlark	*Sturnella magna*	Special Concern	S2S3B, S3M
Eastern whip-poor-will	*Antrostomus vociferus*	Threatened	S2B
Eastern Wood-Pewee	*Contopus virens*	Special Concern	S3B
Evening Grosbeak	*Coccothraustes vespertinus*	Special Concern	S3B, S3S4N,SUM
Olive-sided Flycatcher	*Contopus cooperi*	Special Concern (Schedule 1) Endangered (COSSAR NB)	S3B

Common Name	Scientific Name	SARA / NBSARA	S-Rank (NB)
Rusty Blackbird	*Euphagus carolinus*	Special Concern	S2S3B, S3M
Wood Thrush	*Hylocichla mustelina*	Threatened	S1S2B
Non-SAR Species of Conservation Concern (SOCC) from the ACCDC			
American Three-toed Woodpecker	*Picoides dorsalis*	-	S3S4B,S5M
Baltimore Oriole	*Icterus galbula*	-	S2 S3B
Black-backed Woodpecker	*Picoides arcticus*	-	S2S3
Black-billed Cuckoo	*Coccyzus erythropthalmus*	-	S3B,S3S4N,SUM
Boreal Chickadee	*Poecile hudsonicus*	-	S2B
Brown Thrasher	*Toxostoma rufum*	-	S2S3B
Brown-headed Cowbird	*Molothrus ater*	-	S2B
Canada Jay	*Perisoreus canadensis*	-	S2B
Cliff Swallow	*Petrochelidon pyrrhonota*	-	S1B,S4N,S5M
Eastern Kingbird	*Tyrannus tyrannus*	-	S3B
Great Crested Flycatcher	*Myiarchus crinitus*	-	S3
Killdeer	*Charadrius vociferus*	-	S3
Lincoln's Sparrow	*Melospiza lincolnii*	-	S3B
Northern Mockingbird	*Mimus polyglottos*	-	S3
Pine Grosbeak	*Pinicola enucleator*	-	S3B
Pine Siskin	*Spinus pinus*	-	S2S3B
Ring-billed Gull	*Larus delawarensis*	-	S3B
Sandhill Crane	*Antigone canadensis*	-	S3S4B,S4M
Scarlet Tanager	*Piranga olivacea*	-	S2S3B
Solitary Sandpiper	*Tringa solitaria*	-	S3B
Spotted Sandpiper	*Actitis macularius*	-	S2B,S4S5N,S4S5M
Vesper Sparrow	*Pooecetes gramineus*	-	S3B

Common Name	Scientific Name	SARA / NBSARA	S-Rank (NB)
Willow Flycatcher	*Empidonax traillii*	-	S2B
Wilson's Snipe	*Gallinago delicata*	-	S2B,S4S5M
Raptors, Owls, and large-bodied Woodpeckers			
American Kestrel	*Falco sparverius*	-	S4B,S4S5M
American Three-toed Woodpecker	*Picoides dorsalis*	-	S2S3
Barred Owl	*Strix varia*	-	S5
Black-backed Woodpecker	*Picoides arcticus*	-	S3
Great Horned Owl	*Bubo virginianus*	-	S4
Merlin	*Falco columbarius*	-	S5B
Northern Harrier	*Circus hudsonius*	-	S4B,S4S5M
Northern Saw-whet Owl	*Aegolius acadicus*	-	S5B
Osprey	*Pandion haliaetus*	-	S4S5B,S5M
Pileated Woodpecker	*Dryocopus pileatus*	-	S5
Red-tailed Hawk	*Buteo jamaicensis*	-	SUB
Sharp-shinned Hawk	*Accipiter striatus*	-	S4B,S5M
Turkey Vulture	*Cathartes aura*	-	S4B

5.2.4.3 Bird Species at Risk or Special Conservation Concern

The desktop analysis determined the potential of significant species to be within the proposed Project site as well as Avian surveys and ground-truthing confirmed the presence of several significant species. Significant species include both SAR, listed under either federal or provincial SAR assessments, and SOCC; species ranked rare to uncommon in New Brunswick as per the ACCDC, or which may be particularly vulnerable to changes or disturbances in their environment. These results as well as additional details and habitat requirements for each species are presented in Table 5-27.

5.2.4.4 Summary of 2023 Avian Field Survey Results

Comprehensive bird survey results from 2023 baseline data collection are provided in the 2023 '*Avian Report'* (H370571-0000-483-066-0004), in Appendix H.

A total of 632.75 hours (37,965 minutes) of surveys were completed over the course of 2023 avian surveys. These surveys resulted in the observation of 19,435 individual birds representing 121 species. A higher number of birds were recorded during the fall migration period in comparison to the spring migration and breeding period. Fall migratory transects had the highest count of all survey types, with 8,500 individuals recorded.

The White-throated sparrow was the most abundant bird species across all seasons with over 1,480 individuals observed, followed by the Common grackle (1,247), Black-capped chickadee (1,090), and Blue jay (1,047). The White-throated sparrow is a migratory species, whereas the Common grackle, Blue jay, and Black-capped chickadee are resident birds. White-throated sparrows are also known to remain in New Brunswick throughout the winter (eBird, 2023). Other species observed in high numbers in 2023 include: Dark-eyed junco (807), Canada goose (803), Pine siskin (753), Golden-crowned kinglet (651), American robin (646), and Red-eyed Vireo (578).

All Canada goose records were flocks or individuals migrating or flying over the site. It is not expected this species would use the LAA or PDA as a stop-over site.

Table 5-27: Species at Risk (SAR) and Species of Conservation Concern (SOCC) Recorded in the 2023 Desktop Analysis

Common Name	Scientific Name	SARA	S-Rank (NB)	# of Records	Distance (km)	Observed during 2023 Surveys	Species Details and Habitat Requirements
Species at Risk (SAR)							
Bald Eagle	*Haliaeetus leucocephalus*	Endangered (NBSARA)	S4	575 Records	11.9 km ± 0.0	Y	Bald Eagles favor mature forests near water bodies for nesting. They have been removed from Schedule 1 of the Species at Risk Act; however, they remain listed as Endangered in New Brunswick (Government of Canada, 2023h). They are common across the province with an S rank of S4. They are strongly associated with open-water habitats for nesting (Government of Canada, 2023h), which are not present in the PDA. It is not expected that there is nesting habitat within the PDA. In the surrounding area of the RAA, there are small lakes present which may serve as nesting habitat.
Barn Swallow	*Hirundo rustica*	Threatened	S2B	46 records	10.6 ± 0.0	N	Barn Swallows often nest in human-made structures, in areas that have access to water (COSEWIC 2021). There are 46 records of Barn Swallows about 2-4km from the PDA from 1986-2019. Within the PDA there are no structures that would be ideal for nesting, however, clearcut plantations and wetlands present may offer foraging habitat. In the RAA there may be barns, sheds, or houses that could be used for nesting.
Bank Swallow	*Riparia riparia*	Threatened	S2B	7 records	12.6 ± 0.0	N	Bank Swallows require natural or artificial vertical banks for nesting such as riverbanks, lake bluffs, and pits (COSEWIC 2013). There are 7 records from 1986-2013 of Bank Swallows approximately 2-3km from the PDA. There are no habitats with vertical banks within the PDA that would be ideal for nesting, however, clearcut plantations and wetlands present may offer foraging habitat. In the RAA, barns, sheds, or houses may be used for nesting.

Common Name	Scientific Name	SARA	S-Rank (NB)	# of Records	Distance (km)	Observed during 2023 Surveys	Species Details and Habitat Requirements
Bobolink	*Dolichonyx oryzivorus*	Threatened	S3B	33 Records	10.6km ± 0.0	N	Bobolinks historically used native tall-grass prairie habitat, and now use pastures, hay fields, and large grassy clearings (Government of Canada, 2023a). This habitat is not found within the PDA or LAA, and this species is not expected to use the site for nesting. There are 33 records of Bobolink within the RAA during breeding season in suitable nesting habitat, which suggests they may be present and/or breeding in the RAA.
Canada Warbler	*Cardellina canadensis*	Threatened	S3 S4B	1076 Records	4.3 km ± 0.0	Y	Canada Warblers nest in mixed forests with developed shrub understory for nesting. They will often use wet habitats such as forested wetlands or sloped riparian shrub forests (Government of Canada, 2023e). This habitat can be found within the PDA. There have been multiple records of Canada Warblers within the RAA, as well as a record of probable breeding within the PDA.
Chimney Swift	*Chaetura pelagica*	Threatened	S2S3B S2M	357 Records	4.0 km ± 0.0	Y	Chimney Swifts use chimneys and other human-built structures for roosting and nesting, as well as large hollow trees (Government of Canada, 2023c). There are areas within the PDA with trees that may be suitable for nesting. Within the LAA and RAA there may be presence of ideal tree-types for nesting, as well as human-built structures that would serve as potential nesting habitat as well in the RAA. There is a MBBA record from 2010 of a Chimney Swift with possible breeding evidence within the LAA.

Common Name	Scientific Name	SARA	S-Rank (NB)	# of Records	Distance (km)	Observed during 2023 Surveys	Species Details and Habitat Requirements
Common Nighthawk	*Chordeiles minor*	Special Concern	S3B S4M	400 Records	4.5 km ± 7.0	Y	Common Nighthawks are crepuscular birds that nest on the ground in a variety of open to partially open habitats, such as prairies, bogs, disturbed areas, and forest openings. The main requirement is short-cropped vegetation cover (Government of Canada, 2023f). Throughout the PDA there are areas that may be suitable for nesting, including previously disturbed areas and cleared forests. It is likely they are present within the PDA.
Eastern Meadowlark	*Sturnella magna*	Threatened	S1B	7 Records	10.4 km ± 7.0	N	Eastern Meadowlarks use pastures, and grasslands for nesting (Government of Canada, 2023b). This habitat is not found within the PDA or LAA, and this species is not expected to use the site for nesting. There are records of Eastern Meadowlarks within the RAA during breeding season in suitable nesting habitat, which suggests they may be breeding in the RAA (about 3km from the LAA). The last record, however, was in 2001. Land-use changes within the RAA may have affected the availability of nesting habitat since then.
Eastern Whip-poor-will	*Anstromus vociferus*	Threatened	S2B	1 record	16.3 ± 0.0	N	Eastern Whip-poor-wills nest in most early successional forest, as well as open rocky or sandy areas, open conifer plantations, and other disturbed areas (COSEWIC 2022). The ACCDC report shows one record from the year 2000, southwest of the PDA off highway104 (approximately 4km from the southern LAA). The southern portion of the PDA encompasses more patchy forests and wetlands, which may provide nesting or foraging habitat for this species.

Common Name	Scientific Name	SARA	S-Rank (NB)	# of Records	Distance (km)	Observed during 2023 Surveys	Species Details and Habitat Requirements
Eastern Wood Pewee	*Contopus virens*	Special Concern	S3B	639 Records	4.5 km ± 7.0	Y	Eastern Wood Pewees use a variety of habitats but are mainly found near mixed or deciduous forests edges, intermediate-aged forests, and mature forests with little understory (Government of Canada, 2023g). In the Maritimes, they prefer riparian forests and avoid managed forests and young coniferous forests (Stewart et al., 2015).
Evening Grosbeak	*Coccothraustes vespertinus*	Special Concern	S3B S3 S4N SUM	291 Records	4.5 km ± 7.0	Y	Evening Grosbeaks are found in mature mixed wood forests with fir, spruce, and aspen being the dominant tree species (COSEWIC 2017). Due to their dependence on insect outbreaks, nesting habitat can be difficult to define (Stewart et al., 2015), however, there are mixed mature forests with conifers in the PDA.
Olive-sided Flycatcher	*Contopus cooperi*	Threatened	S3B	787 Records	4.5 km ± 7.0	Y	Olive-sided Flycatchers are associated mainly with coniferous or mixed coniferous forests or forest edges. Nests are usually built in coniferous trees (Government of Canada, 2023d). There is potential habitat within the PDA, including edges of spruce plantations and scattered wetlands. Several records have been documented within the RAA with possible breeding evidence. It is likely this bird occurs within the PDA. Within the LAA and RAA there are open forest cleanings as well as wetlands that may be available habitat.
Rusty Blackbird	*Euphagus carolinus*	Special Concern	S2 S3B S3M	280 Records	2.5 km ± 0.0	Y	Ideal breeding habitat for Rusty Blackbirds is generally in coniferous areas, sedge meadows, swamps, scrub thickets, beaver ponds (COSEWIC 2017). There are occurrences of coniferous stands near wetlands within the PDA. Suitable habitat may be present in the LAA and RAA as well.

Common Name	Scientific Name	SARA	S-Rank (NB)	# of Records	Distance (km)	Observed during 2023 Surveys	Species Details and Habitat Requirements
Wood Thrush	*Hylocichla mustelina*	Threatened	S1 S2B	198 Records	10.0 km ± 7.0	Y	Wood Thrushes are inconspicuous birds found in deciduous forests. They prefer large forest mosaics, but it has been found that they may nest in small forest fragments as well. Preferred nesting habitats are mature deciduous and mixed forests which require an understory of shrubs and saplings (Government of Canada, 2023i). Within the PDA there are areas that may be suitable for nesting.
Species of Conservation Concern (SOCC)							
American Three-toed Woodpecker	*Picoides dorsalis*	-	S2 S3	2 Records	16.1km ± 7.0	N	American Three-toed Woodpeckers breed in mature and old-growth coniferous forests with many snags (The Cornell Lab, 2023c). Although they are usually found further north than New Brunswick, two records were noted in 1986 of probable breeding in the RAA.
Black-backed Woodpecker	*Picoides arcticus*	-	S2S3	102 Records	4.5 km ± 7.0	Y	Black-backed Woodpeckers breed in coniferous forests. In the Maritimes, important trees include spruce, fir, hemlock, tamarack, cedar, and sometimes aspen (Stewart et al., 2015). The LAAs contain many of the preferred tree species; therefore, there is potential for nesting.
Black-billed Cuckoo	*Coccyzus erythropthalmus*	-	S3B	1 Record	4.5km ± 7.0	N	Black-billed Cuckoos breed in deciduous and shrub thickets on the edges of woodland, marshes, or shrubby edges of second growth in mixed forests (Audubon, 2023d). Habitat is available within the study area; therefore, there is potential for breeding activity.

Common Name	Scientific Name	SARA	S-Rank (NB)	# of Records	Distance (km)	Observed during 2023 Surveys	Species Details and Habitat Requirements
Baltimore Oriole	*Icterus galbula*	-	S2 S3B	2 Records	16.1km ± 7.0	N	Baltimore Orioles breed in deciduous or mixed woodland, open forest, edges, and riverside and shade trees (The Cornell Lab, 2023e). Two historic records noted birds in suitable habitat, one being a territorial male. The study area contains suitable habitat for breeding; therefore, their habitat should be avoided during the breeding season.
Boreal Chickadee	*Poecile hudsonicus*	-	S2B	437 Records	10.0 km ± 7.0	Y	Boreal Chickadees nest in mature conifer forests near water (The Cornell Lab, 202k). The site contains mature coniferous forest that could be used as nesting habitat. Therefore, conifer forests should remain untouched during the breeding season.
Brown Thrasher	*Toxostoma rufum*	-	S2 S3B	2 Records	10.4km ± 7.0	N	Brown Thrashers nest in thickets, edges, and overgrown clearings in deciduous forests (The Cornell Lab, 2023d). In 1987, two records of thrashers were in suitable nesting habitat about 3km from the boundary in the southern portion study area. The study area contains potential nesting habitat for this species.
Brown-headed Cowbird	*Molothrus ater*	-	S3B	4 Records	14.2km ± 7.0	N	Brown-headed Cowbirds live in grasslands and along edges but avoid forests. They place their eggs in the nests of other species (The Cornell Lab, 2023f). Four records from 1986 and 2006 suggest probable or possible breeding 1-3 km from the LAA. The PDA/LAA is mainly forested; therefore, it is unlikely that cowbirds would inhabit the area.
Canada Jay	*Perisoreus canadensis*	-	S2B	332 Records	10.8 km ± 0.0	Y	Canada Jays breed in coniferous forests in the Maritimes, typically in forests with black or white spruce (Stewart et al., 2015). The LAAs contain this habitat; therefore, it is likely they breed in the area.

Common Name	Scientific Name	SARA	S-Rank (NB)	# of Records	Distance (km)	Observed during 2023 Surveys	Species Details and Habitat Requirements
Cliff Swallow	*Petrochelidon pyrrhonota*	-	S2B	13 Records	10.9km ± 0.0	N	Cliff Swallows breed in open to semi-open land, farms, cliffs, river bluffs, and lakes with sheltered vertical cliffs for nesting (Audubon, 2023). Thirteen records of possible, probable, or confirmed breeding were noted 1-4km from the study area boundary from 1986-2008. The study area likely contains nesting habitat.
Eastern Kingbird	*Tyrannus tyrannus*	-	S3 S4B	15 Records	10.6km ± 0.0	N	Eastern Kingbirds breed in fields or disturbed areas, and along edge habitats near water (The Cornell Lab, 2023g). Fifteen records were noted from 1986-2002 with probable or possible breeding about 1-4km from the study area. There is not much suitable nesting habitat within the LAA or PDA.
Great Crested Flycatcher	*Myiarchus crinitus*	-	S3	314 Records	16.1 km ± 7.0	Y	Great Crested Flycatchers nest in deciduous/mixed forests, and forest edges, and specifically nest in natural cavity or old woodpecker holes (The Cornell Lab, 2023j). The study site has deciduous/mixed forests and edge habitat that potentially can be used as nesting habitat.
Killdeer	*Charadrius vociferus*	-	S3B	469 Records	9.0 km ± 7.0	Y	Killdeer nest in various areas but prefer open habitat such as pastures, plowed fields, large lawns, mudflats, lake shores and coastal estuaries (Audubon, 2023c). Killdeer are not expected to be nesting in the LAA as ideal habitat is not available.
Lincoln's Sparrow	*Melospiza lincolnii*	-	S3B	279 Records	4.5 km ± 7.0	Y	Lincoln's Sparrow prefers mountainous regions during the summer months. They are most common in wet meadows with willows, alders, and sedges. In lower elevations they are found in aspens, willows, and shrubby areas near streams (The Cornell Lab, 2023m). The northern portion of the LAA is mountainous, and the southern portion of the LAA contains an abundance of wetland and wet habitats.

Common Name	Scientific Name	SARA	S-Rank (NB)	# of Records	Distance (km)	Observed during 2023 Surveys	Species Details and Habitat Requirements
Northern Mockingbird	*Mimus polyglottos*	-	S2B	5 Records	12.8km ± 0.0	N	Northern Mockingbirds nest in urban/suburban areas such as farms, roadsides, and shrub thickets. They also favor areas with dense low shrubs and open ground (Audubon, 2023a). They usually do not extend as far north as New Brunswick; however, from 2006-2008, there were five records of probable breeding 1-3km from the northern boundary of the LAA.
Pine Grosbeak	*Pinicola enucleator*	-	S3B	88 Records	9.0 km ± 7.0	Y	Pine Grosbeaks breed in open coniferous forests across Canada (The Cornell Lab, 2023n). It is possible there is ideal nesting habitat in the PDA, LAA and RAA.
Pine Siskin	*Spinus pinus*	-	S2 S3B	196 Records	9.0 km ± 7.0	Y	Pine Siskins nest in mature coniferous and mixed woods, often around edges or clearings; sometimes in deciduous woods, and isolated conifer stands (The Cornell Lab, 2023o). The PDA, LAA, and RAA have edges and coniferous forest; therefore, there is potential for nesting.
Ring-billed Gull	*Larus delawarensis*	-	S3B	135 Records	9.1 km ± 0.0	Y	Ring-billed Gulls nest on ground near freshwater, usually on low, sparsely vegetated terrain, sandbars, rocky beaches, driftwood, bare rock, concrete, or soil (The Cornell Lab, 2023p). According to the MBBA, (Stewart et al., 2015), they prefer to nest along the coast in the Maritimes. It is unlikely that they would nest in the PDA.
Sandhill Crane	*Antigone canadensis*	-	S1B	1 Record	15.4km ± 0.0	N	Sandhill Cranes breed in a variety of wetlands that are open but surrounded by trees/shrubs (The Cornell Lab, 2023a). The Sandhill Crane breeding range does not usually extend into New Brunswick. One possible breeding record of a Sandhill Crane in suitable nesting habitat and season was observed in 2010 less than 5km from the study area.

Common Name	Scientific Name	SARA	S-Rank (NB)	# of Records	Distance (km)	Observed during 2023 Surveys	Species Details and Habitat Requirements
Scarlet Tanager	*Piranga olivacea*	-	S2 S3B	328 Records	4.5 km ± 7.0	Y	Scarlet Tanager breed in mature deciduous forests and mixed wood forests in eastern North America, preferring large forests and trees. They nest in oak, pine-oak, oak-hickory, beech, hemlock-deciduous, and eastern hemlock forests (The Cornell Lab, 2023l). Nesting habitat is present within the PDA and LAA.
Solitary Sandpiper	*Tringa solitaria*	-	S3B	89 Records	18.2 km ± 7.0	Y	Solitary Sandpipers nest near lakes, ponds, and streams in areas of muskeg bogs and spruce trees (The Cornell Lab, 2023h). There are wetlands and coniferous forest in the LAA and PDA.
Spotted Sandpiper	*Actitis macularius*	-	S2B S4 S5N S4 S5M	504 Records	9.0 km ± 7.0	Y	Spotted Sandpiper nest on edges of fresh water in a wide variety of settings, including lakes, ponds, rivers, streams, in either open or wooded country (Audubon, 2023g). This large variety of habitat is present in the PDA, LAA, and RAA. More open water such as lakes would be found in the RAA than the PDA or LAA.
Vesper Sparrow	*Pooecetes gramineus*	-	S2B	4 Records	16.6km ± 7.0	N	Vesper Sparrows are grassland birds and are not expected within the PDA or LAA. The last record is from 2011, 4 km from the boundary of LAA.
Willow Flycatcher	*Empidonax traillii*	-	S1 S2B	2 Records	11.4km ± 0.0	N	Willow Flycatchers breed in habitats with willow species near water (The Cornell Lab, 2023b), which are prevalent in the LAA. Two possible breeding records in suitable nesting habitat were documented in 2000 less than 4 km from the southern portion of the study area.
Wilson's Snipe	*Gallinago delicata*	-	S2B S4 S5M	559 Records	9.0 km ± 7.0	Y	Snipes prefer wet areas, marshes, bogs, fens, alder and willow swamps, wet meadows, and along rivers and ponds. They avoid areas with tall, dense vegetation, but need patches of cover to hide (The Cornell Lab, 2023i). This nesting habitat may be present in the LAA.

5.2.4.4.1 Species at Risk and Species of Conservation Concern

During the course of all 2023 avian surveys, nine SAR and seventeen SOCC were observed. The majority of these species were observed during the breeding season, but the highest number of recorded birds were seen during fall transects. Pine Siskins (728) and Evening Grosbeaks (231) were the most abundant SOCC species observed across all survey types.

Relative Abundance of Avian SAR/SOCC from observations per respective field surveys in 2023, are as follows:

- Spring Watch Counts: 5.7% of recorded species were SAR/SOCC;
- Spring Transects: 2.9% of recorded species were SAR/SOCC;
- Breeding Bird Surveys: 2.17% of recorded species were SAR/SOCC. The most abundant: Scarlet Tanagers and Eastern Wood-Pewees;
- Nightjars: Night hawks (14 instances);
- Fall Watch Counts: Throughout the fall watch count surveys, 12.5% of recorded species were SAR/SOCC (10% Pine Siskin);
- Fall Migration Transects: 9% of recorded species were SAR/SOCC (6.16% Pine Siskin); and
- Acoustic SAR/SOCC Detections for Spring/Fall Migration (ARUs): Chimney Swift (Spring), Eastern Wood-Pewee (Fall) and Common Night hawk (Spring and Fall) detected.

Locations where SAR or SOCC were observed during the Breeding Bird Surveys, are presented in Figure 5-40.

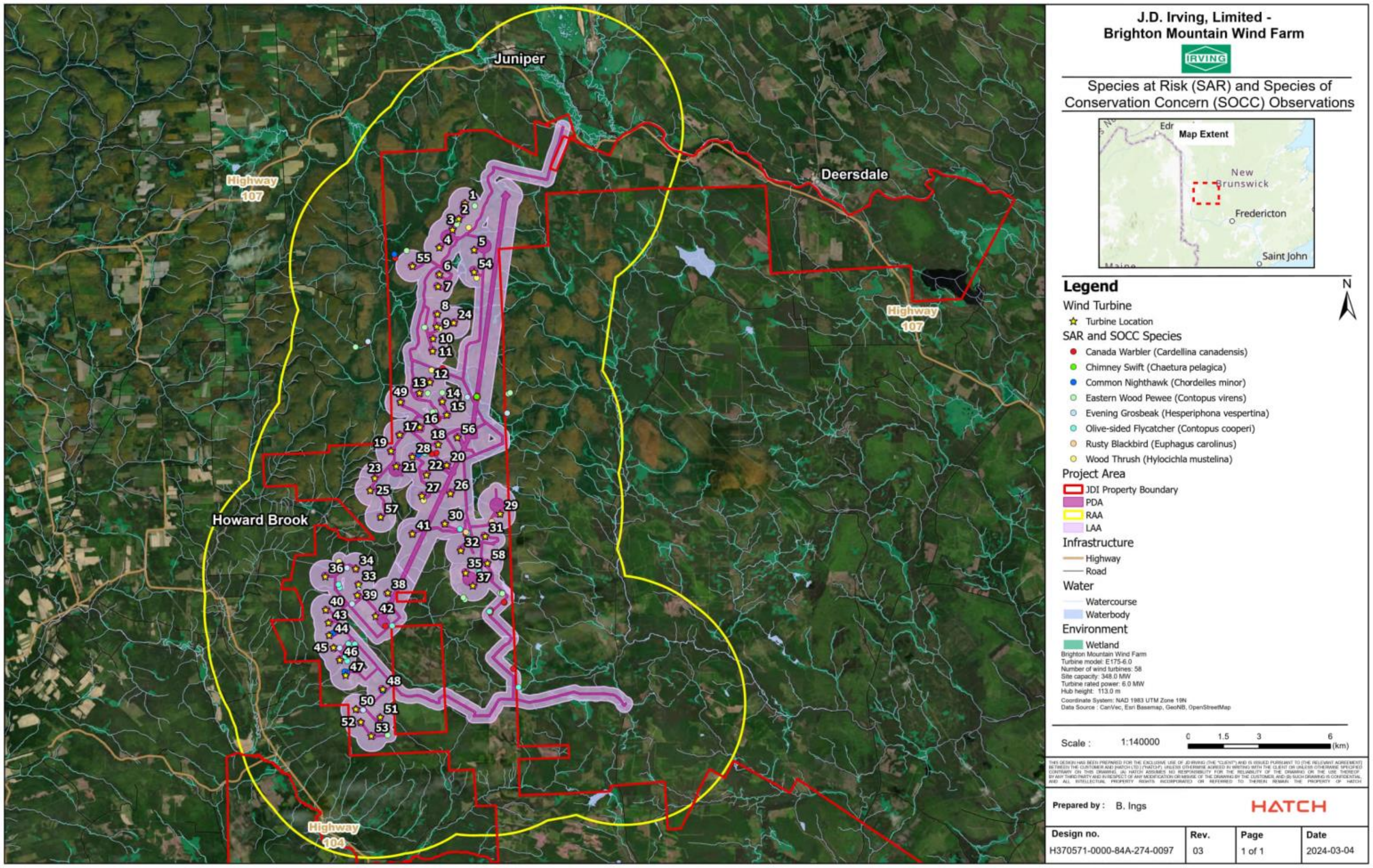

Figure 5-40: Avian SAR and SOCC Observations During 2023 Breeding Bird Surveys

5.2.4.5 Flight Patterns

Throughout 2023, extensive data on bird migration was collected. This section summarizes observed flight and behaviour patterns from migratory watch counts to identify potential groups or species who may be at risk of turbine collisions, and potential turbine locations where those risks may be the higher.

Some of these results will inform potential avian collision estimates. Avian collision estimates will be calculated using a collision risk model developed by 'Scottish Natural Heritage' (SNH, 2000). Avian mortality estimating methodology is further described in the "*Post Construction Bird and Bat Mortality Surveys Protocol*" (H370571-0000-844-056-0003), which is included as an Appendix to this EIA Registration in Appendix **I**. These estimates will be included in an addendum submission after the two-year survey period is concluded (late 2024) to provide completeness of results.

15.7% (2,880) of all birds recorded by field biologist during 2023 (n=18,375) were records from migratory watch counts, as shown in Table 5-28. There were 0.9% recorded birds flying over the LAA within the height range of the RSZ (**25.5 to 200.5 m above ground level**) during spring migration, and 4.8% during fall migration. This may suggest a higher number of birds flying through the height range of the RSZ during fall migration and therefore posing a higher risk of collisions with turbines during the fall season. In general, the percentage of watch count observations, were notably low in comparison to the number of all observations from all surveys combined. Suggestive that there are limited diurnal migrants traversing the site during migratory timeframes.

Combining this data with a second year of migratory watch counts in 2024 will provide more comprehensive understanding of migratory flight patterns.

Table 5-28: Birds Observed Within the LAA and RSZ Height Range During Migratory Watch Counts

Season	Number of Individual birds observed during migratory watch counts (LAA/RAA)	Watch Count Percentage of all Survey Observation (n=18,375)	Number of Individuals In flight in the LAA within RSZ during Watch Counts	Percentage of all survey observations documented within the RSZ range (n=18,375)	Number of Individuals in flight in LAA above and below RSZ during Watch Counts	Percentage of all survey observations above or below the RSZ range (n=18,375) Not at Risk
Spring 2023	855	4.6%	168	0.9%	531	2.88%
Fall 2023	2,025	11%	885	4.8%	1000	5.4%
Total	2,880	15.7%	1053	5.7%	1531	8.3%

5.2.4.5.1 Spring Migration Patterns

An avian and bat tracking radar system called the 'MERLIN™, developed by 'DeTect' Inc., was deployed during the Spring and Fall migration periods of 2023 to better understand and track the movement of biological targets, such as migrating birds and bats flying through or on the site. A stand-alone report, '*MERLIN™ Avian Radar Survey for the proposed Brighton Mountain Windfarm – Data Report for Fall & Spring, 2023'* was developed and incorporated into the broader survey results found with the 2023 *Avian Report*, Found in Appendix H.

The Horizontal Surveillance Radar (HSR) on the DeTect unit was used to determine directional movements of targets during biological periods (i.e., Dawn, Day, Dusk, and Night). The HSR utilized for Spring, was short-range with a 2 nautical mile (nm) radius. This equates to a radius of 3.704 km coverage from the unit's stationary location. The Vertical Surveillance Radar (VSR) has a vertical range of 0.75 nm and calculates the height in which targets traverse through the radar beam. This equates to a coverage of 1.38 km radius vertically from the unit's stationary location.

The MERLIN avian radar processing software is specifically developed for bird detection and tracking and uses automated clutter suppression in conjunction with biological target detection, tracking, and data recording to identify and track targets in the survey area.

Although the criteria for identifying bird targets has been developed by 'DeTect' to only track targets that are most likely birds, these are not separable from bats which are included within the targets tracks, and targets such as insects or clutter that will occasionally be falsely identified and tracked as bird targets. However, the inclusion of non-bird / bat targets is minimized through optimization of operational settings in the software and application of custom database queries.

It must also be noted that an individual track does not necessarily represent an individual bird or bat, as individuals moving in and out of the radar beam (e.g., circling, flying behind a large structure) would be "counted" by the radar system multiple times. Similarly, some flocks of birds may be recorded as a single target if individuals cannot be distinguished. Therefore, an individual track is referred to as a biological "target" in this study, and when counted together they represent an index of activity or exposure level for a given period of time, and not necessarily a count of individuals.

The locations and HSR/VSR range of where the MERLIN™ was deployed during the Spring and the Fall, is presented in Figure 5-41 below.

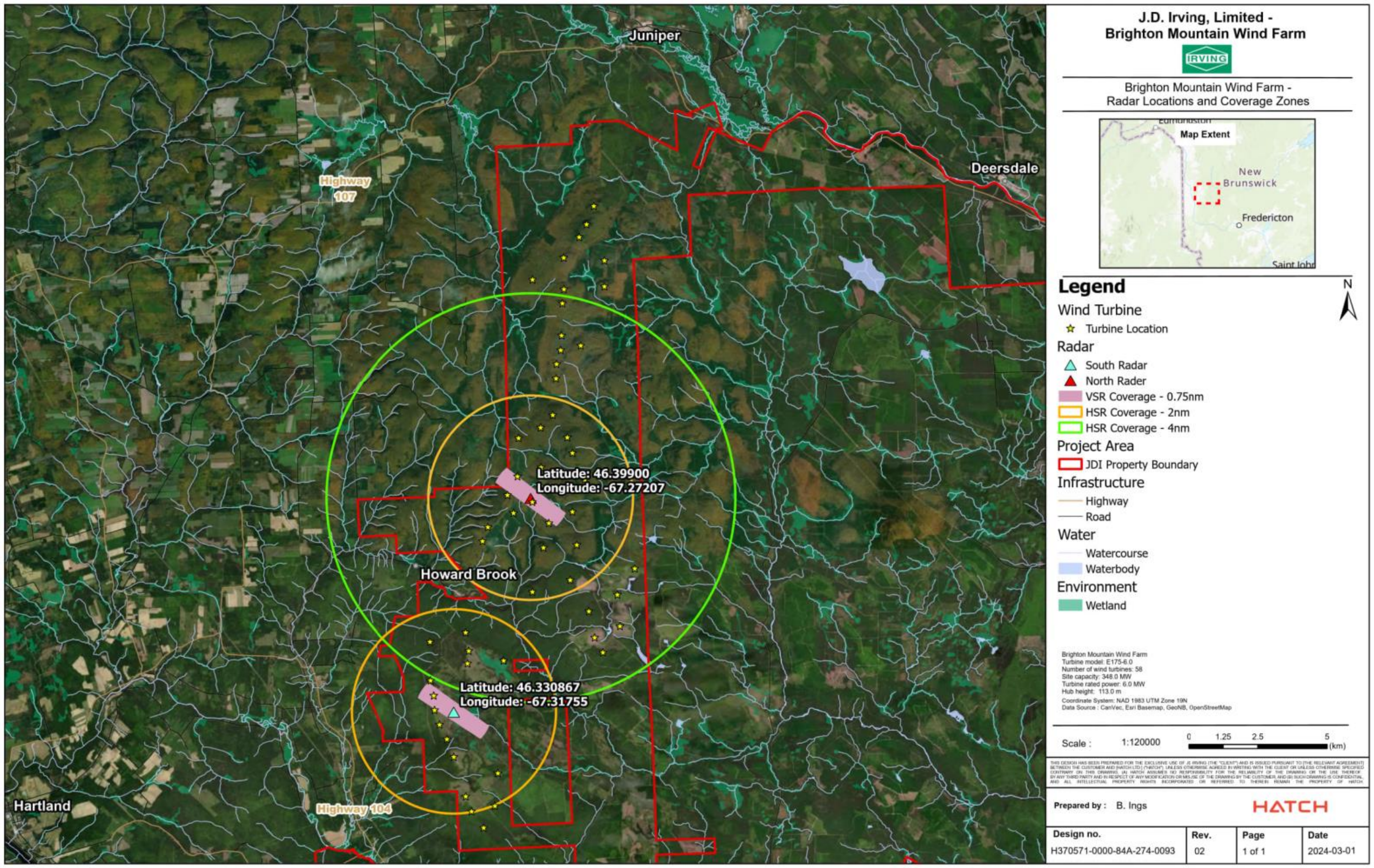

Figure 5-41: MERLIN Radar System Deployed Locations for Spring and Fall, with Zones of Vertical and Horizontal Coverage

The direction of travel of flying, biological targets were detected by the ‘Detect’ HSR avian radar system, as shown in Figure 5-42 below for the Spring period while deployed (May 17th – June 19th, 2023). Generally, when aggregated, targets were moving in a NE direction. This is aligned with expected direction of migrants during spring migration, as many birds are returning from their wintering grounds in southern areas. This suggests that there are flying migrants passing through, however, acoustic bat and bird recordings are utilized to help identify species composition of the flying ‘targets’ documented by the radar unit.

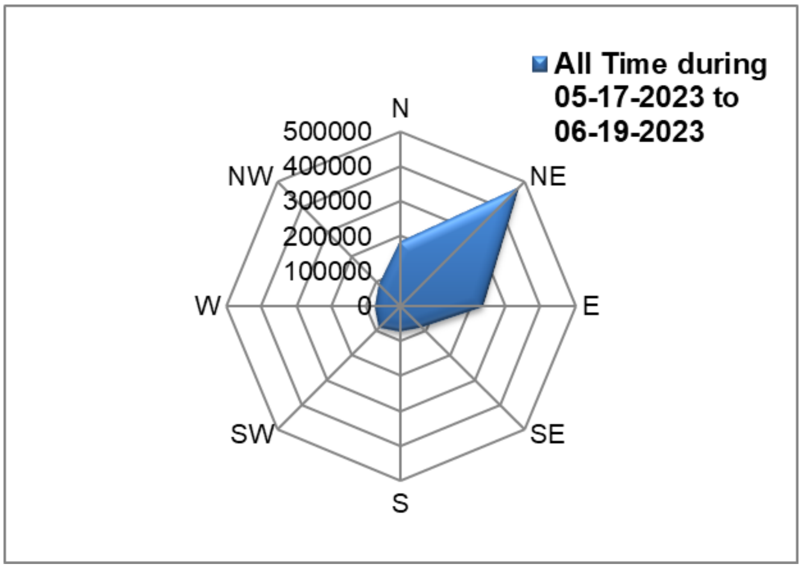

Figure 5-42: Comprehensive Distribution of Target Directions in Spring, 2023 (May 17 – June 19, 2023) (DeTect, 2023)

Data collected by the radar system, was supplemented by traditional watch counts, and migratory stop over transect surveys conducted by Field Biologist. Acoustic recordings were also collected at night and analyzed for Night flight calls (NFCs). The results of these traditional and acoustic surveys informed species composition during the day, as well as at night, and are presented in the Appendix H, and summarized above in Section 5.2.4.5.

During the Spring migration period while the DeTect System was operational, the flight elevations of targets were calculated by the Radar during biological periods (Dawn, Day, Dusk, and Nights), with reference to being above, within, and below the RSZ height range. The data set is presented with an RSZ height range of 30m - 200m (above ground level), as a general representation of the typical RSZ from the various WTG models that could be selected for the site, as shown in Figure 5-43.

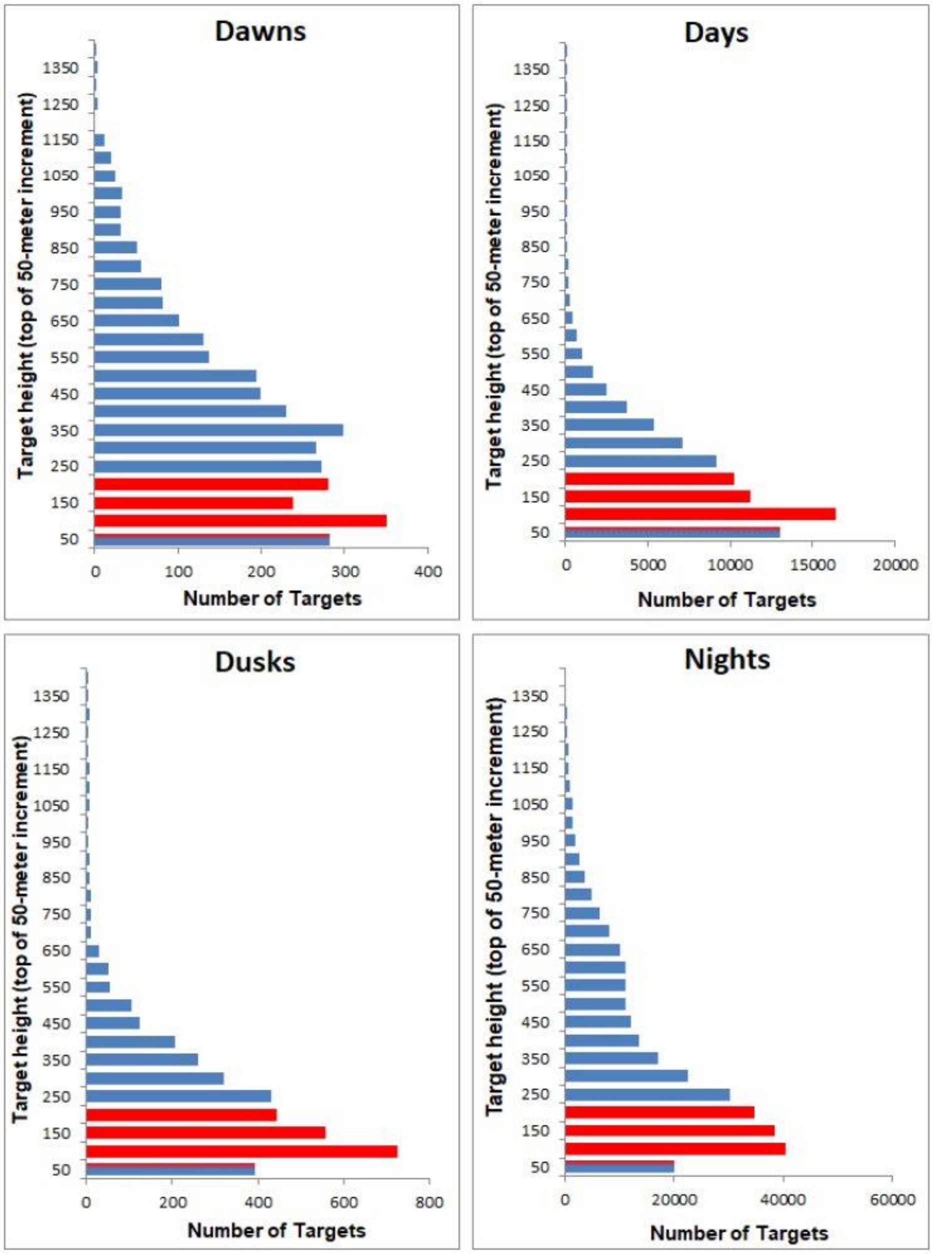

Figure 5-43: Flight Elevations of Targets During Biological Periods (Dawn, Day, Dusk, and Nights) in Spring.

Based on the comprehensive percentage of targets (CPT) above, within and below the RSZ height range were calculated by the system and are presented in Table 5-29, with 31.6% of the CPT moving through the RSZ during Dawn, 56% of the CPT during the Day, 52.7% of the CPT during the dusk, and 41.9% of the CPT at night during the Spring monitoring effort.

Table 5-29: Comprehensive Percentage of Targets Above, Within and Below the RSZ (30-20m AGL) at the Proposed Site, During Biological Periods of Spring, 2023

	Dawn	Day	Dusk	Night
Target data calculated for each biological period with >50% useable data				
Average TPR above RSZ	70.8	70.1	52.6	705.0
Average TPR within RSZ	33.7	98.9	62.5	526.8
Average TPR below RSZ	2.2	8.3	3.6	19.3
Average TPR , all Altitudes	106.8	177.3	118.6	1251.2
All targets for season combined				
Comprehensive % of Targets above RSZ	66.3%	39.4%	44.3%	56.6%
Comprehensive % of Targets within RSZ	31.6%	56.0%	52.7%	41.9%
Comprehensive % of Targets below RSZ	2.1%	4.7%	3.0%	1.5%

Based on the DeTect radar data, target passage rates averaged the greatest during nights during spring migration with peaks occurring during early night from 21:00 to 23:00 (Figure 5-44).

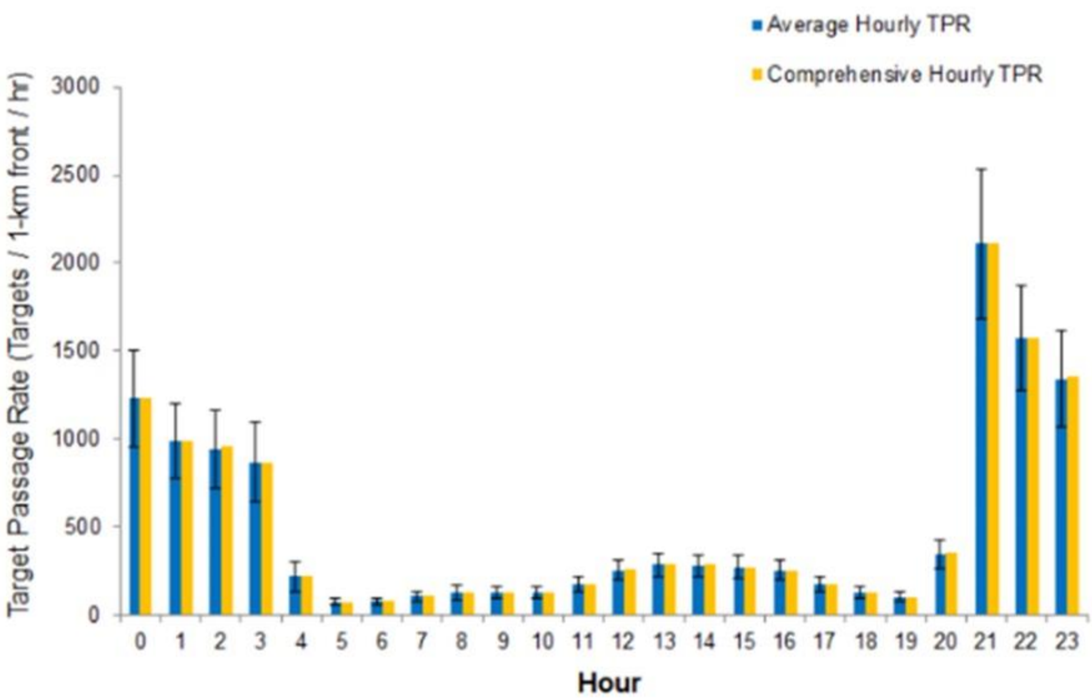

Figure 5-44: Average and Comprehensive Hourly Target Passage Rates During Spring, 2023. Error Bars Represent One Standard Error (Detect, 2023)

The peaks in target passage rates during night likely indicates avian nocturnal migration at the site (Figure 5-44 and Figure 5-45). The large variance in target passage rates observed during this study supports the current knowledge that migration of songbirds tends to occur in pulses, varying from date to date. These nightly pulses occurred through the end of May during spring (Figure 5-44). This may pose a risk to nocturnal migrants, who are known to be negatively impacted by collisions with wind turbines (Zimmerling et al., 2013, Mabee et al., 2010).

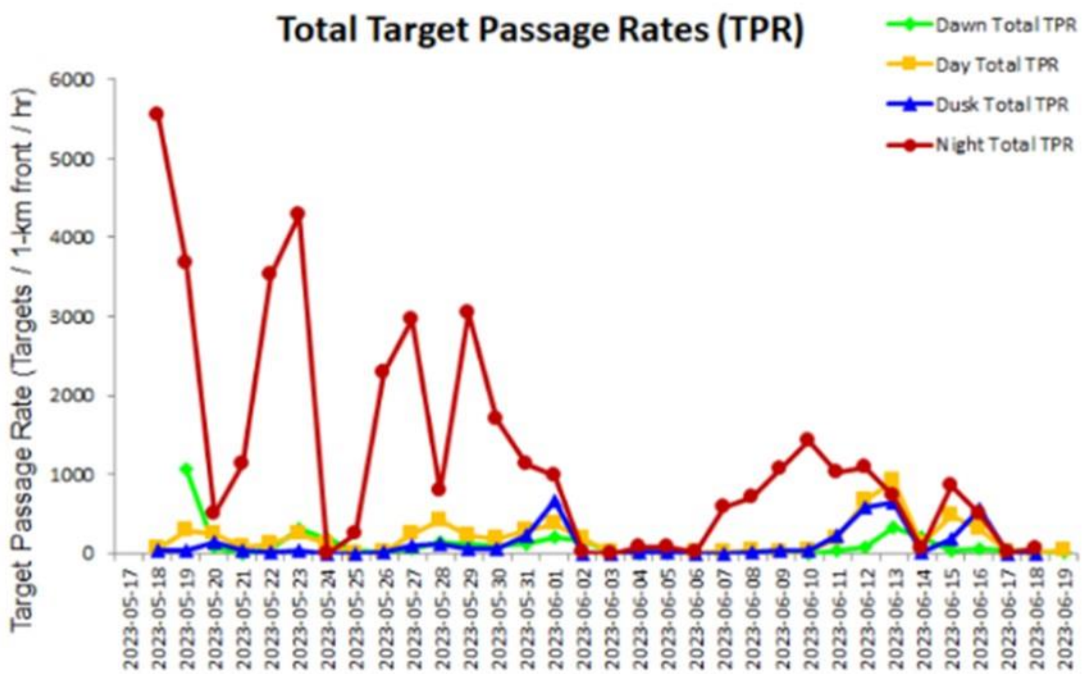

Figure 5-45: Target Passage Rates (TPR) During Biological Periods with >50% Useable Data During Spring, 2023 (Detect, 2023)

5.2.4.5.2 Fall Migration Patterns

The Horizontal Surveillance Radar (HSR) on the 'DeTect' unit was used to determine directional movements of targets during biological periods of fall as well. The VSR radar was operational from July 6th to October 31st, 2023, while the HSR radar had malfunctioned and was fully repaired and in operation from August 19th to October 31st, 2023, for the fall period.

Two HSR ranges were collected during this period: short-range (2 nm around radar) and long-range (4 nm around radar). Results from the short-range setting were similar to results from the long-range settings. (bottom), with target directions being predominantly south and southwest during all time periods, as shown in Figure 5-46 below.

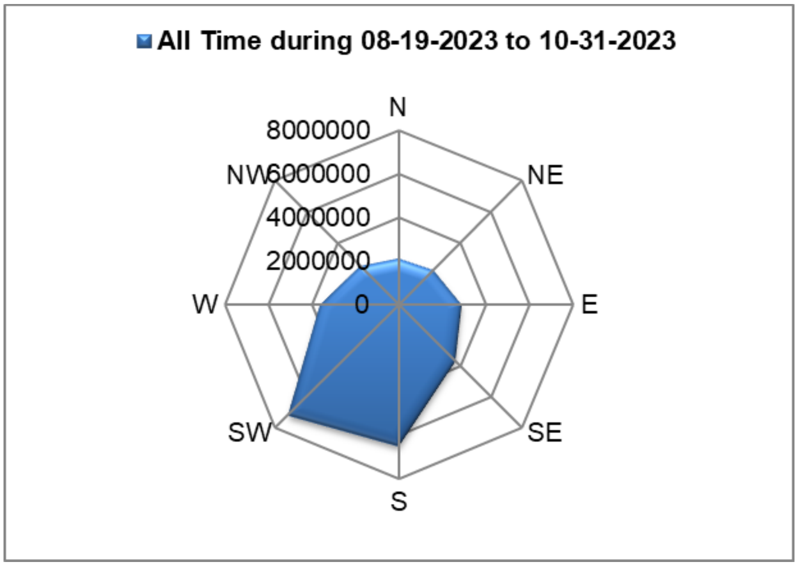

Figure 5-46: Comprehensive Distribution of Target Directions in Fall, 2023 (Aug 19 – Oct. 31, 2023) (DeTect, 2023)

Data collected by the radar system for the Fall, was supplemented once again by traditional watch counts, and migratory stop over transect surveys conducted by Field Biologist. Acoustic recordings were also collected at night and analyzed for Night flight calls (NFCs). The results of these traditional and acoustic surveys informed species composition during the day, as well as at night, and are presented in the Appendix G.

During the Fall migration period while the DeTect System's VSR was operational (July 6th-Oct. 31, 2023), the flight elevations of targets were calculated by the Radar during biological periods (Dawn, Day, Dusk, and Nights) for Fall, with reference to being above, within, and below the RSZ height range, as shown in Figure 5-47.

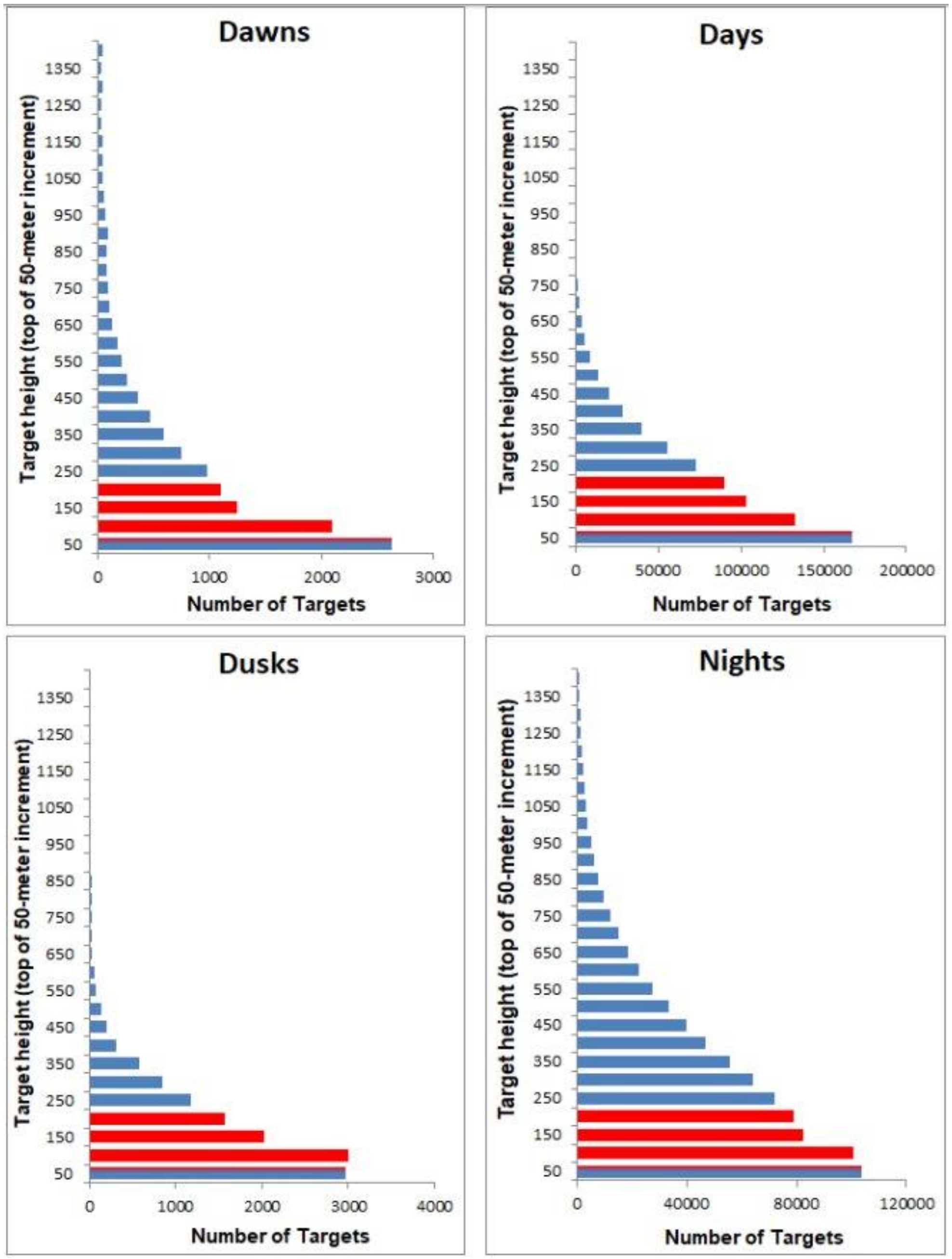

Figure 5-47: Flight elevations of targets During Biological Periods (Dawn, Day, Dusk, and Nights) in Fall 2023. DeTect (2023)

The CPT above, within and below the RSZ height range are also presented in Table 5-30, with 47% of CPT moving through the RSZ during Dawn, 52.4% CPT during the Day, 60.5% CPT during dusk, and 37.5% CPT at night. during the Fall monitoring effort.

Table 5-30: The CPT Above, Within and Below the RSZ (30-200m AGL) at the Proposed Site, During Biological Periods of Fall, 2023. DeTect (2023).

	Dawn	Day	Dusk	Night
Target data calculated for each biological period with >50% useable data				
Average TPR above RSZ	44.1	177.3	33.5	396.3
Average TPR within RSZ	50.4	270.2	73.2	279.1
Average TPR below RSZ	12.6	68.2	14.2	52.4
Average TPR, all Altitudes	107.1	515.7	120.9	727.8
All targets for season combined				
Comprehensive % of Targets above RSZ	41.2%	34.6%	27.8%	55.7%
Comprehensive % of Targets within RSZ	47.0%	52.4%	60.5%	37.5%
Comprehensive % of Targets below RSZ	11.8%	13.0%	11.7%	6.8%

Target passage rates were variable over time, during the four biological periods. Target passage rates averaged the greatest during nights, with a secondary increase in target rates during days of fall, as shown in Figure 5-48, below.

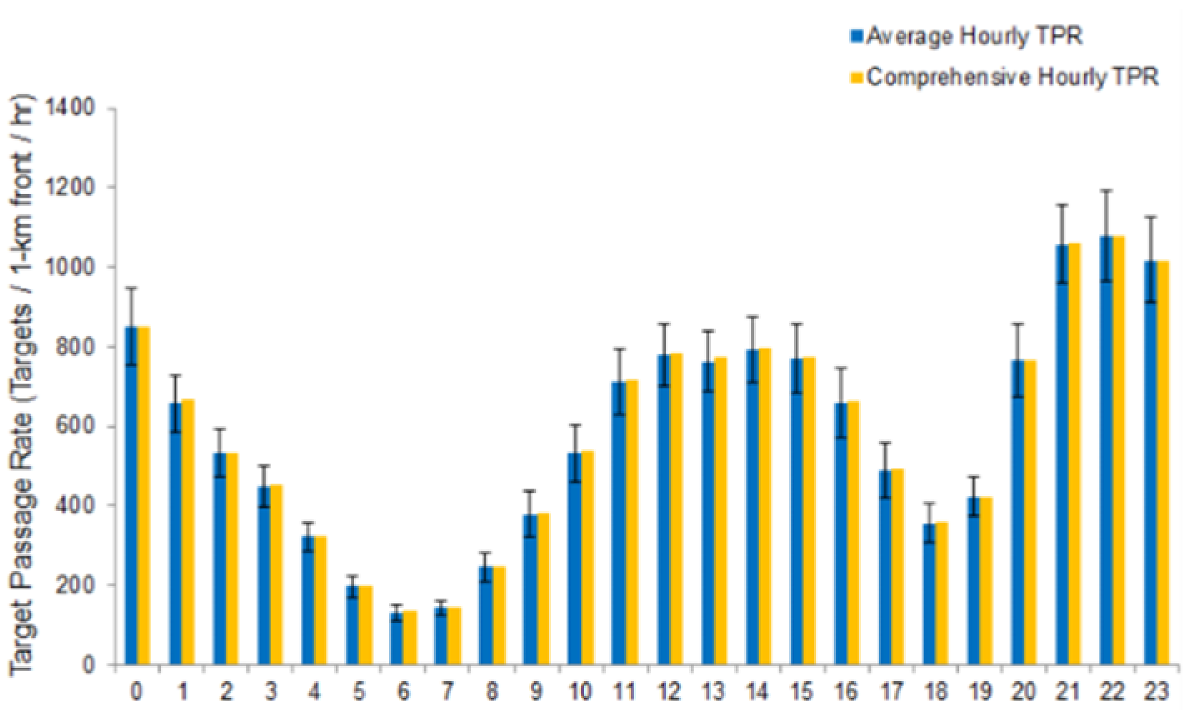

Figure 5-48: Average and Comprehensive Hourly Target Passage Rates During Fall, 2023. Error Bars Represent One Standard Error

This daytime peak was not observed during spring. When target activity was further broken down into hours, target passage rates peaked during early night (hours 21 – 23) as well as a secondary midday peak during hours 11 through 16 (Figure 5-48). The peaks during the day indicate a higher number of biological targets moving during the day in the fall than in the spring.

The total number of individuals recorded by biologist during fall watch counts (2,016) was also higher than the spring watch count total (855). This, along with the daytime peaks displayed by the radar data, may indicate a greater number of birds moving through the LAA during the fall.

5.2.5 Bats

The Project has completed an '*Bat and Bat Habitat Report'* (H370571-0000-483-066-0002), describing the baseline data collection methodologies, baseline conditions, methods for the assessment of this VC, and results. This Report is included in this EIA Registration as Appendix I.

A desktop analysis was carried out to determine bat species historically present within the RAA. A request was also submitted to the ACCDC to obtain information on Species at Risk (SAR) and critical habitat including whether any known bat hibernacula were located within 5 km of the JDI Property boundaries.

Bat Habitat was also classified, and acoustic monitoring locations selected, based on desktop results, aerial imagery, and open-source data vegetation layers from the Government of Canada's Natural Resource CanVec series (Natural Resources Canada, 2023) which provided preliminary information on expected habitat types throughout the Property boundaries. Additional Acoustic Monitoring Units (ARU's) were procured, and locations were also adjusted as per recommendations received from NB DELG and CWS on the Pre-Construction Bat Survey Protocols. Locations where Bat Monitoring ARUs were deployed, and the respective Habitat types, are provided in Figure 5-49.

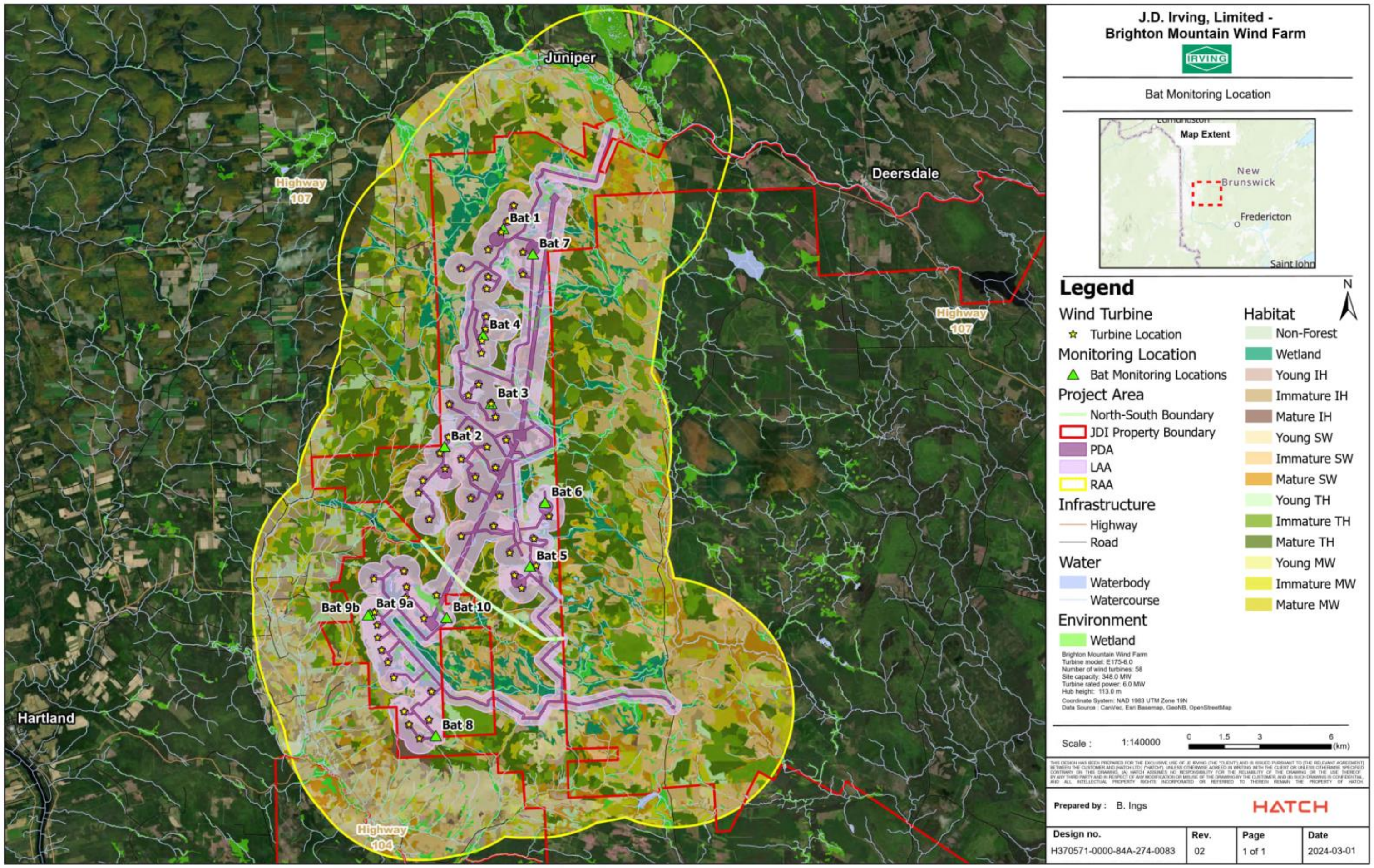

Figure 5-49: Locations of 2023 Bat Acoustic Monitoring Stations for the Proposed Brighton Mountain Windfarm

5.2.5.1 Bat Habitat Classification

During early 2023 winter and spring surveys, biologists confirmed or adjusted preliminary acoustic monitoring locations and determined suitable habitats expected to detect bat presence during activities such as migration, foraging, breeding, and roosting activities. Ridge and edge habitats within the JDI Property boundary were targeted in 2023 to detect potential occurrence of bat species. Forested areas such as deciduous stands with Oak, Beech, and Maple species were identified within the PDA and extend throughout the LAA. Wetlands and edge habitats were also identified and surveyed to assess for bat presence/absence for both breeding and migration activities of all potential bat species within the Property boundaries.

Within the northern section of the Project, habitats ranging from young, immature, and mature deciduous forests, spruce plantations of varying life stages, small fragments of clearcut areas, and mixed woods were observed. Habitats such as deciduous forests along edges of spruce plantations provide opportunities for roosting and foraging activities. Small pockets of wetlands are present within the northern Project boundaries which also provides foraging opportunities for bats.

Within the southern section of the Project, habitat types such as treed spruce wetlands, spruce plantations, and clearcuts dominate the majority of the landscape. Deciduous forests are less abundant within the southern Project boundaries. More detailed information regarding percentages and total habitat types within the Project boundaries can be found in the ‘Wetlands and Vegetated Environment Report’ Appendix D and Section 5.2.1.

5.2.5.2 Previously Recorded Bat Species (ACCDC Database and iNaturalist)

Seven bat species historically found in NB were identified within the ACCDC report. Three resident bat species (Little Brown Myotis, Northern Myotis and Tri-color Bat) are listed as Endangered under the SARA and NBSARA. Three migratory species (Hoary Bat, Silver Haired Bat, and Eastern Red Bat) are designated as Endangered according to COSEWIC and are currently under review by the SARA. As of January 2024, Big Brown Bats are the only species in New Brunswick without a federal or provincial listing under SARA or NBSARA. However, the current S-rank of Big Brown Bat is currently listed as ‘S3S4’, which means they are evaluated on a range rank between ‘Vulnerable’ (S3) and ‘Apparently Secure’ (S4). This ranking range system is used when there is some level of uncertainty regarding the status of the species or community which is determined by the ACCDC. The ACCDC Results are summarized in Table 5-31 below.

Based on the ACCDC report, there are no records of hibernacula or known records for these species within the PDA, LAA, or RAA.

Table 5-31: Desktop Review of Bat Species Occurrence in the RAA

Common Name	Scientific Name	SARA	NBSARA	COSEWIC	S-Rank (NB)	Resident (overwinter in NB)
SAR (Canada and New Brunswick)						
Little Brown Myotis	*Myotis lucifugus*	Endangered	Endangered	Endangered	S1[1]	Yes
Northern Long-eared Myotis / Northern Myotis	*Myotis septentrionalis*	Endangered	Endangered	Endangered	S1	Yes
Tri-coloured Bat	*Perimyotis subflavus*	Endangered	Endangered	Endangered	S1	Yes
Non-SAR Species of Conservation Concern (SOCC) from the ACCDC						
Big Brown Bat	*Eptesicus fuscus*	-	-	-	S3S4[2]	Yes
Hoary Bat	*Lasiurus cinereus*	Under consideration	-	Endangered	SUB,S2 ?M	No
Silver-haired Bat	*Lasionycteris noctivagans*	Under consideration	-	Endangered	SUB,S1 ?M	No
Eastern Red Bat	*Lasiurus borealis*	Under consideration	-	Endangered	SUB,S2 ?M	No

5.2.5.3 *Bat Populations of New Brunswick*

In New Brunswick, populations of bats are currently poorly understood due to a lack of available information and research. Seven species of bats occur within the province (Table 5-31). Four of the seven species overwinter locally (Little Brown Myotis, Northern Long-eared Myotis, Tri-coloured Bat, and Big Brown Bat) and three are considered to be migratory (Hoary Bat, Silver-haired Bat, and Eastern Red Bat). Resident species are also known to partake in migration activities, however, usually at much shorter distances than long-distance migrants. Migration occurs in spring between April and May and in the fall between August and October (Broders, 2011). Majority of fatalities occur in late summer and early fall for long distant migrants, whereas documented in smaller numbers in short-distant ("resident") migrant species (Broders, 2011).

Due to the introduction of White Nose Syndrome (WNS) that was first documented in bat populations in 2011, bat species such as Little Brown Myotis, Northern Long-eared Myotis, and Tri-coloured Bat local populations were severely affected. As a result, in 2014 these species were listed as Endangered under the federal Species at Risk Act (SARA) due to impacts caused by this infectious disease (Environment Canada, 2014). Migratory bats tend

[1] S1 = Critically Imperiled – Species or community is believed to be extirpated from the province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood it will be rediscovered.

[2] S#S# = A numeric range rank (e.g., S3S4) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).

not to be affected due to habitat niches and lack of exposure to infected caves as they do not overwinter in New Brunswick. Populations of Little Brown Myotis and Long-eared Myotis were reduced by nearly 99% due to the outbreak of WNS within local bat communities. Tri-coloured Bats were also designated with Endangered status and were potentially extirpated from the province of New Brunswick due to the WNS epidemic (McAlpine, 2021). Prior to the presence of WNS, Tri-coloured Bat populations were estimated to be quite low in comparison to other resident species (Broders, Findlay & Zheng 2004). Recovery of bat populations post-outbreak of resident bat species is still poorly known and undocumented within the province. Populations of species such as Big Brown Bat are thought to have increased in numbers and ranges via occupying niches formerly documented by Myotis species as they are less susceptible to WNS due to their wintering habitats which often include larger buildings and structures where conditions would not support adequate growing conditions of WNS (McAlpine et al, 2002).

5.2.5.3.1 Big Brown Bat (*Eptesicus fuscus*)

This species occurs across Canada in southern British Columbia, Manitoba, northwestern and southern Ontario, Quebec, New Brunswick, and most of Alberta and Saskatchewan. In New Brunswick, the range of this species stretches from the southern portion of the province in Saint John up to approximately Plaster Rock. The Project location is at the northern limit of the species' range in the province. Big Brown Bats are considered somewhat of a habitat generalist and have adapted to the presence of humans and manmade buildings and structures which present roosting opportunities for the species in comparison to other bat species that tend to be more sensitive human activities and interactions. Maternity roosting habitat for Big Brown bats commonly include anthropogenic structures such as buildings, houses, attics, barns, churches, sheds, bridges, and bat houses (Bat Conservation International, n.d.). Foraging habitat for Big Brown bats is not well documented and are thought to be generalists in regard to their foraging and habitat selections (National Park Service, 2017). Limited research exists to show strong preferences towards water versus land or forests versus open clearings. During the winter months, hibernation habitats are similar to roosting sites but may also include the undersides of bark, small cavities in both coniferous and deciduous trees, caves, and rock crevices. Although, it is more common for this species to be found in anthropogenic features (Nature Conservancy of Canada, n.d.).

5.2.5.3.2 Eastern Red Bat (*Lasiurus borealis*)

This species can be found in all Canadian provinces but appears to be less common British Columbia and Atlantic Canada. Distribution is relatively unknown in the territories (Jung et al 2014; Slough et al. 2022), as their distribution in the northern and southern limits of their distribution is poorly delineated and documented. Eastern Red bats are known to occur in New Brunswick but is less common than other bat species within the province (Klymko pers. comm 2020; McAlpine pers. comm 2020). This species is considered a habitat generalist, occupying a range of diverse habitats across its geographic extent (Fenton 1997; Gehrt and Chelsvig 2004). Roosting activities often occur among foliage of deciduous or coniferous trees, in open areas with overhead foliage and space for flight in between (Mager and Nelson, 2001). Less commonly, roosting will occur within shrubs. Individual bats roost solitarily or with their pups in both deciduous and coniferous forests of various age classes. Maternity roost tree selection often is characterized as the tallest tree in the surrounding forest canopy and typically a large DBH (diameter at breast height). This species is also known to switch roost trees throughout the area dependent on availability within the selected area. Foraging can occur in forested and non-forested habitats, open and semi-cluttered areas, within canopy cover and above, and in various forest age classes. Edges of forests are often used for foraging (COSEWIC, 2023). Hibernacula (overwintering habitat) of this species includes behind leaf clusters, however, current available data on overwintering requirements and habitats is still quite minimal and limited (COSEWIC, 2023). Detailed migration information and routes are currently poorly understood for this bat species, however, are known to overwinter in the southern portion of the United States (COSEWIC, 2023).

5.2.5.3.3 Hoary Bat (*Lasiurus cinereus*)

This species has been recorded in all provinces and territories, with very few occurrences in Nunavut, as well as Newfoundland and Labrador. The Hoary bat is considered a less common species in the Atlantic region of Canada; however, it is the most common migratory species often found dead at windfarms in the Maritimes (Bird Studies Canada et al. 2018). This species has also been reported on islands, oceanic vessels, and oil platforms off the east coast (Lucas and Hebda 2011; Humber pers. Comm. 2023), which might suggest their migration occurs over large stretches of open water along the east coast. Hoary Bats typically roost among tree foliage, utilizing both coniferous and deciduous forest habitats of any age class. Trees that present foliage within the crown and are sparser below are typically selected as suitable roost sites (Mager and Nelson, 2001), similarly to Eastern Red bats. Foraging activities tend to occur in open areas such as wetlands, grasslands, and open fields with patches of trees (Barclay 1985, 1989). Foraging activities may also occur in habitats such as clearcut areas, however, sizes of clearcuts and suitability of this habitat is not well understood. Edges of forests are often used for foraging, however, excessive fragmentation of forested habitats and the increase of vegetation clearing may reduce quality of habitat and foraging activities (Hutchinson and Lacki 1999; Amelon et al. 2014). Hoary bats tend to avoid urban areas, transportation corridors, mines, and areas that are heavily disturbed (Hutchinson and Lacki 2000; Walter et al 2007). Similar to Eastern Red bats, little documentation is available about the migration and overwintering ecology of Hoary bats, although their winter distribution also includes warmer climates within the southern portion of the United States (COSEWIC, 2023).

5.2.5.3.4 Little Brown Myotis (*Myotis lucifugus*)

Little Brown Myotis have been documented in all provinces and territories within Canada, apart from Nunavut where observations have not been confirmed (COSEWIC, 2013). Roosting habitat for Little Brown Myotis can include rock crevices, tree foliage, loose or raised bark, tree cavities, as well as anthropogenic features such as buildings, bridges, barns, and available bat boxes. Typically, roosting female bats select buildings and large diameter trees for summer maternity colonies. In New Brunswick, Little Brown Myotis males that occupy forested environments tend to favour coniferous or mixed wood stands with a large number of available snags nearby (Broders and Forbes 2004; Fabianek et al. 2015). Foraging habitat of Little Brown Myotis includes open habitats such as ponds, rivers, clearings, roads, trails, and gaps in forests, but can also be found foraging within forested areas and along lake and stream margins (Fenton and Barclay 1980b). Little Brown Myotis are considered to be short-distance migrants and can range from 35 to 554 km distance from their summer habitat (COSEWIC, 2013). This species overwinters in humid and cold locations, selecting hibernacula in mines and caves which support these conditions, which limits the number of suitable overwintering habitat available (COSEWIC, 2013).

5.2.5.3.5 Northern Long-eared Myotis (*Myotis septentrionalis*)

Northern Long-eared Myotis, also known as Northern Myotis, have been documented in all provinces and territories within Canada, apart from Nunavut where observations have not been confirmed (COSEWIC, 2013). Roosting habitats for Northern Long-eared Myotis in New Brunswick are strongly associated with tall, large mature deciduous trees that provide adequate shade cover, streams, and specific tree characteristics such as species, height, DBH, age, and decay class (Caceres and Barclay 2000, Broders and Forbes 2004, Broders et al. 2006). Preferred trees tend to be large in diameter (DBH) which present early-to-mid stages of decay (Sasse and Perkins 1996, Caceres and Barclay 2000, Silvis et al. 2015a). Northern Long-eared Myotis maternities tend to favour trees in the mid-stages of decay within mature shade-tolerant deciduous forest stands. This preference is attributed to the trees susceptibility to breakage and decay of limbs, long-lived characteristics, and upland habitats which increased solar radiation. All of these factors and characteristics result in the creation of available roosting opportunities (Broders and Forbes 2004, Henderson and Broders 2008). Foraging tends to occur within forests and along edge habitat of forested areas (Caceres and Barclay 2000). Migration activities of Northern Long-eared Myotis are not well understood but are thought to be short-distance migrants, similar to that of Little Brown Myotis' migratory movements (COSEWIC, 2013). Overwintering habitat for Northern Long-eared Myotis are similar to that of Little Brown Myotis, which typically select hibernacula in caves and abandoned mines where cold and humid conditions exist (COSEWIC, 2013).

5.2.5.3.6 Tri-coloured Bat (*Perimyotis subflavus*)

The Tri-coloured Bat have been documented in mainland Nova Scotia, southern New Brunswick, Quebec, and Ontario. However, they are considered rare in both New Brunswick and Quebec (Broders et al. 2001, 2003; van Zyll de Jong 1985). Tri-coloured Bats are thought to be potentially extirpated from the province of New Brunswick, based on the decimation of the population caused during the WNS epidemic (McAlpine, 2021). Limited information is available regarding the Tri-coloured bats roosting habitat. However, based on current information, roosting tends to occur in older forest stands which likely provides an increase of snag densities and presents roosting opportunities (Barclay and Brigham, 1996;

Crampton and Barclay, 1996). Roosting may also occur in clumps of dead foliage and lichens within forested habitats (COSEWIC, 2013). Foraging activity tends to occur over open water (ponds and rivers), along waterways, forested riparian areas, edges of forests, and within gaps in forested areas (COSEWIC, 2013). Tri-coloured bats are considered short-distant migrants and have been recorded migrating at distances between 53 km to a maximum of 780 km from their summer habitat, this depicts that migration distances can vary greatly. This species requires warm and humid conditions during overwintering, resulting in selection of the deepest parts of hibernaculum, particularly in caves or mines. Anthropogenic features are not utilized by this species. These specific physiological requirements limit the number of suitable overwintering sites available (COSEWIC, 2013).

5.2.5.3.7 Silver-haired Bat (*Lasionycteris noctivagans*)

Silver-haired Bats have been documented in all provinces and territories, with the exception of Nunavut and PEI. This species is considered a habitat generalist and can occupy a variety of habitats across their range (Fenton 1997). Although, roosting habitats for Silver-haired bats occur typically in forested environments. Roosting can occur in both deciduous and coniferous trees underneath loose bark and in cavities, primarily large diameter trees (Bohn 2017). However, when deciduous trees are selected, species such as Poplar trees within older forests often present ideal decay characteristics that tend to present better roost suitability and they may rely on these habitats where large decaying trees are more abundant (Campbell et al 1996; Crampton and Barclay 1998). Selection of species of roost tree and type differs dependent on the region, but height and size tend to play an important role in roost suitability (Kalcounis-Ruppell et al. 2005). Silver-haired bats can occasionally roost in anthropogenic features such as buildings and barns, which can also be utilized during migration periods when suitable trees may not be readily available (Schowalter et al 1978; McGuire et al 2012). Foraging activity of Silver-haired bats primarily occurs within habitats such as young and old forests, forest openings and gaps, and along edges of forests, as well as intact forests (Crampton and Barclay 1995; Jung et al. 1999). Silver-haired bats are long-distance migrants and have been documented utilizing stopover areas such as Long Point, Ontario which tends to be a popular stop-over site for many migrant species, including birds and Monarch butterflies (Birds Canada, 2023). Their distribution changes seasonally and are often found overwintering across contiguous areas in United States and Mexico as well as coastal regions in British Columbia, southeast Alaska, and around the Great Lakes region (Parker et al. 1997).

5.2.5.4 Observed Bat Species

Out of the seven species outlined in the desktop review, four were detected during the 2023 monitoring season. A total of 690 bat call events were recorded between all units. Myotis species (Little Brown Bat and Long-eared Myotis) were grouped together during the analysis. Based on available habitat, range of call frequency, slope/intensity of vocalization, and known species life process requirements, it is likely that all vocalizations within the Property boundaries identified as ‘Myotis’ were produced by Little Brown Myotis, however, to reduce uncertainty the two species have been combined and are reported together.

The same methodology was utilized and combined two other similar species, the Big Brown Bat and the Silver-haired Bat during the analysis due to similarities in calls. Although the analysis reflects the two species as one, it is more suggestive that Silver-haired Bats are the species present within the Property boundaries due to a lack of manmade structures and buildings which Big Brown Bats tend to favorite and occupy frequently. During analysis of echolocation calls, the slope and intensity of the calls were more consistent with Silver-haired Bats, although not definitive.

The breakdown of species composition present throughout the PDA, is broken down into northern ARU locations and southern ARU Locations. A summary of all recorded Bat Species, including average counts per detector night are provided in Table 5-32 below.

Table 5-32: Summary of Recorded Bat Species Events within the Project Property Boundaries (2023)

Group/Species Group	Resident (overwinter in NB)	Bat Detector Units											
		North								South			
		Bat 1	Bat 2	Bat 3	Bat 4	Bat 5	Bat 6	Bat 7	Total All North Units	Bat 8	Bat 9	Bat 10	Total All South Units
Big Brown Bat (EPTFUS)/ Silver-haired Bat (LASNOC)	Big Brown Bat: Yes Silver-haired Bat: No	12	10	7	15	52	13	11	**120**	75	167	17	**259**
Eastern Red Bat (LASBOR)	No	3	1	0	6	23	4	3	**40**	1	3	0	**4**
Hoary Bat (LASCIN)	No	6	4	0	24	12	3	2	**51**	21	43	24	**88**
Little Brown Myotis / Northern Long-eared Myotis (Myotis)	Yes	9	5	5	3	11	6	4	**43**	1	5	1	**7**
Unknown (NoID)	N/A	5	2	11	9	8	7	2	**44**	16	9	1	**26**
Total Counts (All Species)		35	22	23	57	106	33	22	**298**	114	227	43	**384**
Average counts per detector night		0.04	0.03	0.03	0.07	0.13	0.04	0.03	**0.37**	0.36	0.71	0.14	**1.21**

5.2.5.4.1 Seasonal Timing and Bat Activity

5.2.5.4.1.1 Northern ARU Sites Seasonal Timing and Activity

Both resident and migratory bat species were recorded during the monitoring period in 2023. A low number of Myotis species calls were recorded at all stations throughout the monitoring period. Most detector nights produced four or less detections. Most of the bat detections occurred during the fall migration period (late July to October). Within the northern Property boundaries, the majority of call events occurred within July and August, with noticeable increased activity within end of July and mid-August, which is when a peak of activity is observed, as shown in Figure 5-50 below. The majority of calls were produced from migratory bats within the area (Silver-haired Bats) and is likely attributed to migratory activities during the typical period which coincides with the results and level of activity during the 2023 field season. This could be the result of higher activity levels within the northern property boundaries as bats begin their migration to overwintering habitat further south.

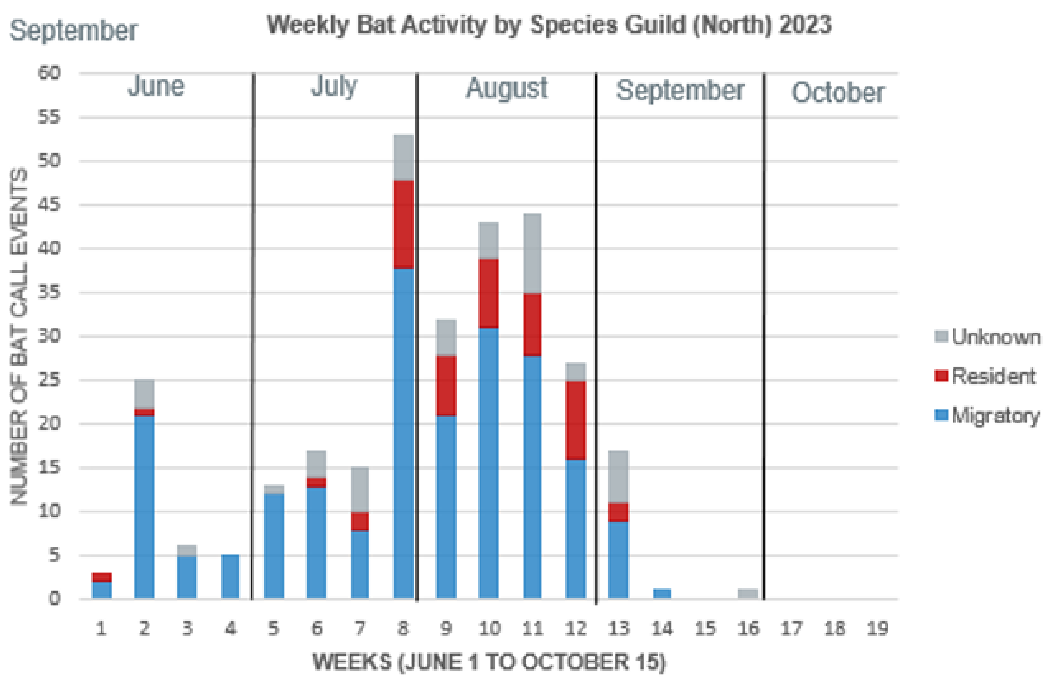

Figure 5-50: Weekly Bat Activity by Species Guild (Northern ARU Sites) 2023

5.2.5.4.1.2 Southern ARU Sites Seasonal Timing and Activity

Similarly to bat activity observed at the northern ARU sites, resident and migratory bat species were also recorded at southern ARU sites during the 2023 monitoring period.). A technical failure occurred during the month of August at all three southern bat units, whereby data was not available to be recovered for this period. August month aside, a noticeable decrease of Myotis activity was noted at the southern ARU sites which is likely attributed to the differences in habitat availability, as the south provides more wetland habitat and less presence of large deciduous forests which Myotis tend to favour.

In contrast to activity at the northern ARU sites, bat activity was higher during June and July and a peak of activity within the first week of September, potentially implying increased foraging and breeding activity at the southern ARU sites during June and July as shown in Figure 5-51, below. Mid-June was where the biggest peak of activity was observed. The majority of calls were produced from migratory bats within the area (Silver-haired and Hoary Bats) and is likely attributed to a combination of foraging, roosting, and migration related activities within the southern portion of the project during June, July, and September.

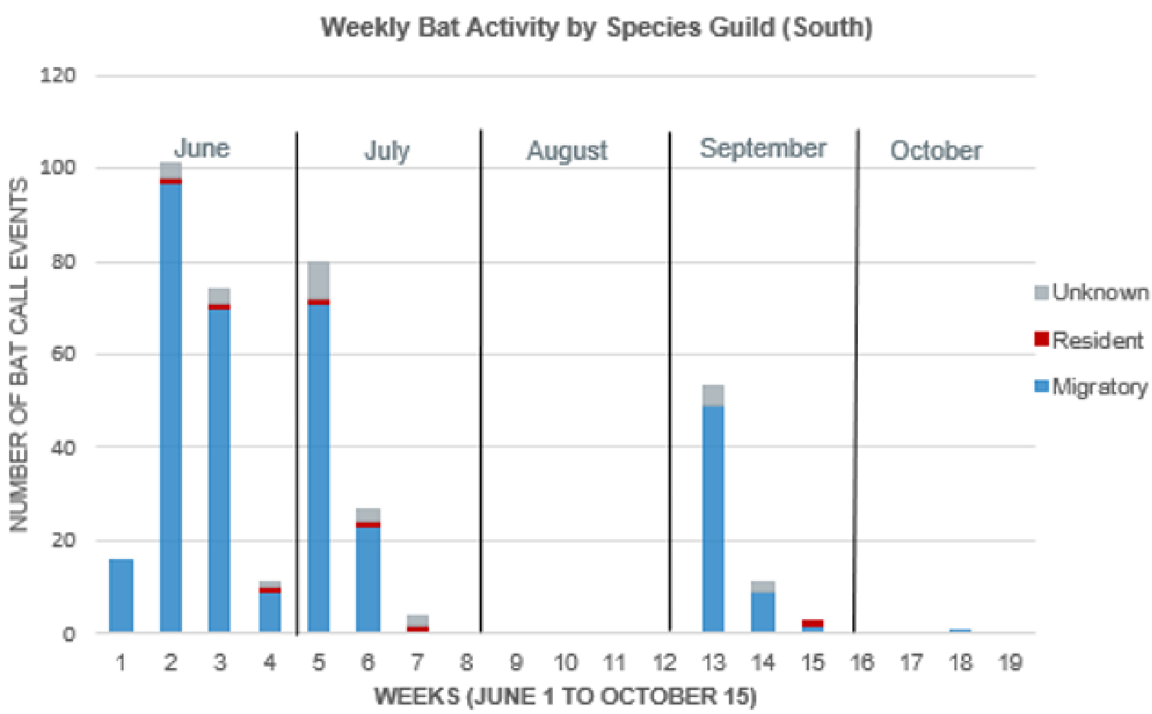

Figure 5-51: Weekly Bat Activity by Species Guild (Southern ARU Sites) 2023

The magnitude of bat activity across all monitoring period and all ARU recording units is presented in Figure 5-52 below.

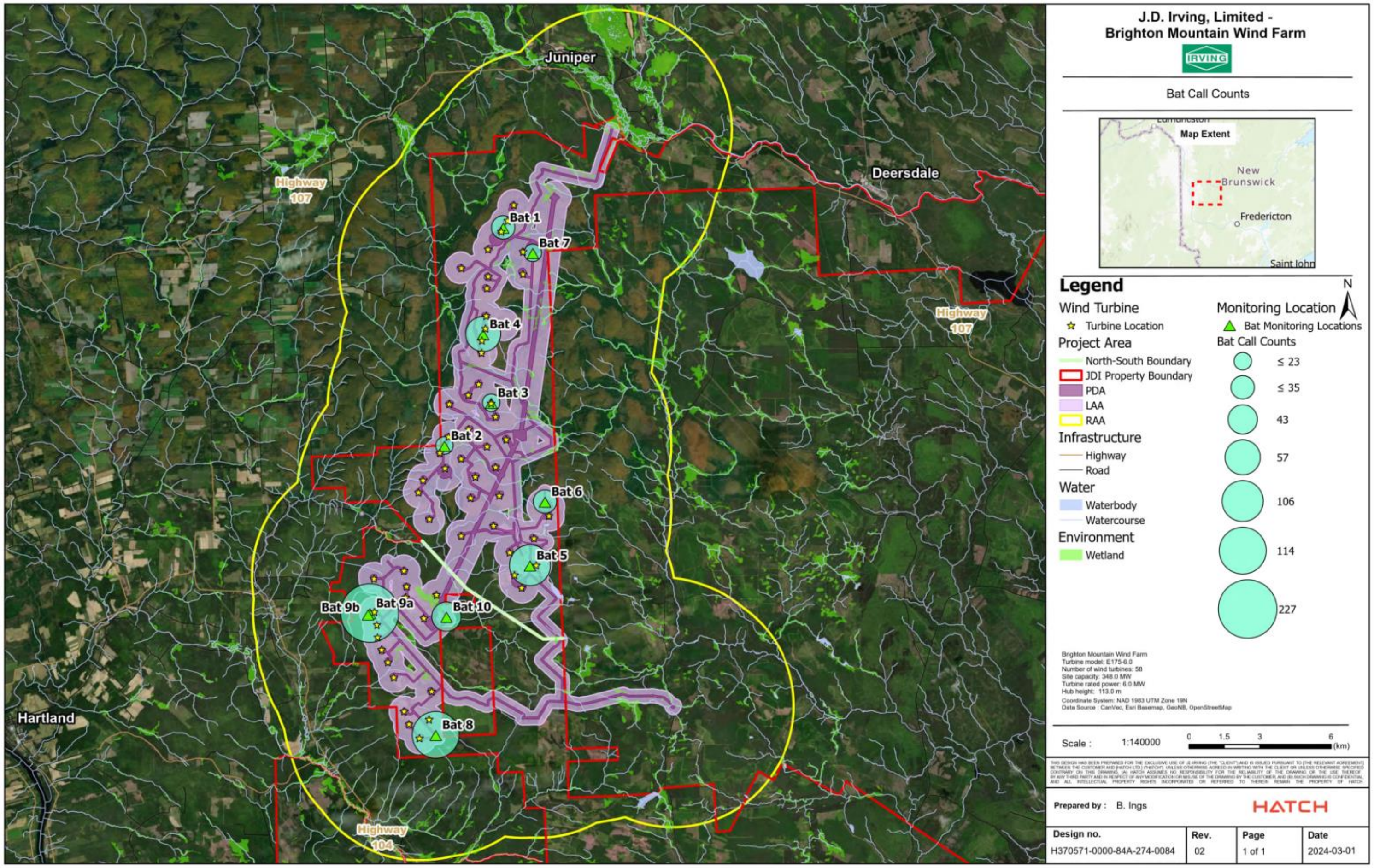

Figure 5-52: Magnitude of Bat Activity at Brighton Mountain Windfarm Recorded during 2023 Surveys

5.3 Socio-Economic Environment

5.3.1 Community and Local Economy

5.3.1.1 Community Demographics

The communities surrounding the Project site are mainly rural, with the closest major city being Fredericton. The distribution of population, illustrated in Figure 5-53, is determined at the smallest level – either a town or parish.

The population in majority is anglophone. The majority of the population is white/Caucasian, however there are growing populations of immigrants, including visible minorities. Only one Indigenous community, Wotstak (Woodstock) First Nation, is within the identified assessment boundary for the community and local economy VC. Overall, the communities assessed are determined to be an accurate representation of the region when compared to the provincial medians for categories such as income, highest rates of education, and workforce participants. Table 5-33 provides an overview of community demographics (Stats Canada, 2023).

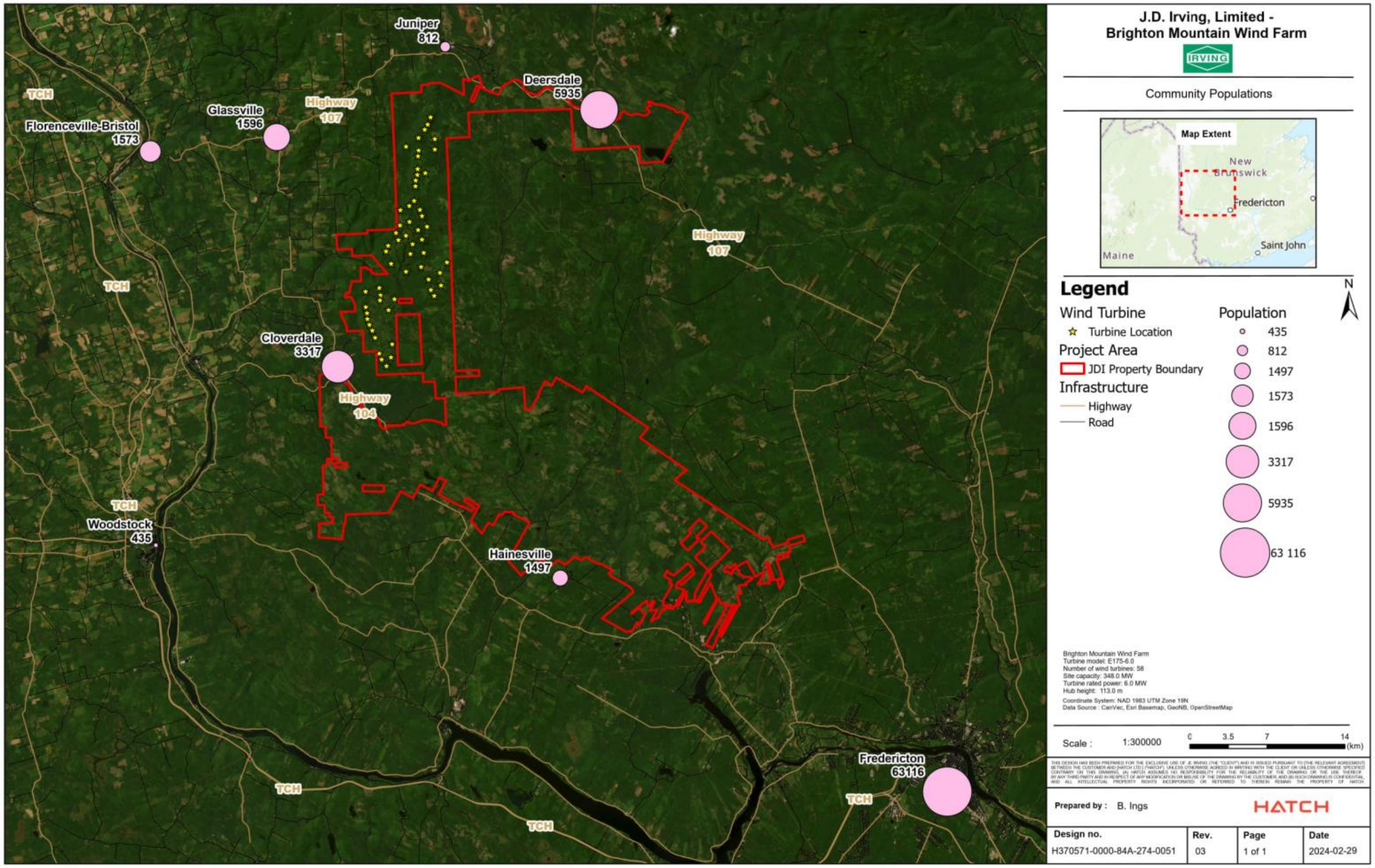

Figure 5-53: Community Population Distribution near the Project Area

Table 5-33: Community Demographics Overview (Statisitics Canada, 2023)

RSC	Entity	County	Parish	Town/ Community	Population[3]	Median Income	Employment Rates	Language	Identity Aspects		
12	76	Carleton	Aberdeen	Juniper	Population: 812 ↑ 4%[4] ↓ 17% from 2011	Median after-tax income: $29,800 ↑ 17%[5]	Employment: 47.8% ↑ 13%	English: 770 ↑ 4%	Visible minority: n/a	Indigenous: 30 ↑ 66%	Christian: 62%
					Working Population: 515 ↓ 2%	Median FTE income: $54,000 ↑ 15%	Unemployment: 9.6% ↓ 48%	French: 30 ↓ 25%	Immigrants: 35 ↑ 43%	Registered Indian Status: 20 ↑ 100%	
								Other: 5			
			Simonds	Florenceville -Bristol	Population: 1,573 ↓ 2%	Median after-tax income: $35,200 ↑ 17%	Employment: 58.7% ↑ 2%	English: 1,430 ↓ 1%	Visible minority: 135 ↑ 50%	Indigenous: 10[6]	Christian: 58%

[3] Population refers to the number of people who live in the census area; working population refers to the portion of the population who are between 15 and 64 years old.
[4] Trends in all categories — except median income — are calculated using data from the 2016 Statistics Canada census data.
[5] Income trends are calculated using 2015 data from the Statistics Canada census.
[6] Cells with no trend data reflect no change (<1%) from 2016 to 2021.

RSC	Entity	County	Parish	Town/ Communit	Population[3]	Median Income	Employment Rates	Language	Identity Aspects		
					Working Population: 985 ↓ 5%	Median FTE income: $62,400 ↑ 15%	Unemployment: 6.7% ↓ 21%	French: 35 ↓ 12.5%	Immigrants: 110 ↑ 14%	Registered Indian Status: 10	
								Other: 95			
	74		Brighton	Coldstream	Population: 1,596 ↓ 2%	Median after-tax income: $30,800 ↑ 31%	Employment: 56.1% ↑ 5%	English: 1,540 ↓ 8%	Visible minority: 45 ↑ 350%	Indigenous: 65 ↑ 63%	Christian: 65%
					Working Population: 1,005 ↓ 14%	Median FTE income: $48,000 ↑ 23%	Unemployment: 9.8%	French: 25	Immigrants: 55 ↑ 38%	Registered Indian Status: 20 ↑ 33%	
								Other: 40 ↑ 33%			

RSC	Entity	County	Parish	Town/ Communit	Population[3]	Median Income	Employment Rates	Language	Identity Aspects		
		York	Bright	Cloverdale	Population: 3,317 ↑ 1%	Median after-tax income: $34,400 ↑ 18%	Employment: 52.2% ↓ 9%	English: 3,125 ↑ 1%	Visible minority: 65 ↑ 63%	Indigenous: 65 ↑ 44%	Christian: 57%
					Working Population: 2,035 ↓ 5%	Median FTE income: $53,200 ↑ 16%	Unemployment: 10.7% ↓ 14%	French: 115 ↓ 12%	Immigrants: 95 ↓ 53%	Registered Indian Status: 25 ↑ 150%	
								Other: 45			
	73	Carleton	Woodstock		Population: 5,553 ↑ 6%	Median after-tax income: $31,600 ↑ 20%	Employment: 55% ↑ 3%	English: 4,665 ↑ 1%	Visible minority: 470 ↑ 161%	Indigenous: 200 ↑ 43%	Christian: 57.9%
					Working Population: 3,340 ↑ 2%	Median FTE income: $48,800 ↑ 12%	Unemployment: 9.2% ↑ 8%	French: 95 ↑ 6%	Immigrants: 415 ↑ 1%	Registered Indian Status: 50 ↓ 29%	

RSC	Entity	County	Parish	Town/ Communit	Population[3]	Median Income	Employment Rates	Language	Identity Aspects		
								Other: 530			
Wotstak First Nation					Population: 435 ↑ 33%	Median after-tax income: $32,400 ↑ 48%	Employment: 60.3% ↑ 1%	English: 400 ↑ 33%			
					Working Population: 300 ↑ 36%	Median FTE income: $36,400 ↑ 23%	Unemployment: 6.8% ↓ 59%	Wolastoqewi: 25			
Capital Region rural district		York	Douglas	Deersdale	Population: 5,935 ↑ 4%	Median after-tax income: $37,200 ↑ 19%	Employment: 60.2% ↓ 1%	English: 5,395 ↓ 4%	Visible minority: 160 ↑ 39%	Indigenous: 190 ↑ 19%	Christian: 56%
					Working Population: 3,785 ↓ 8%	Median FTE income: $40,000 ↓ 20%	Unemployment: 8.8% ↓ 4%	French: 345 ↑ 3%	Immigrants: 230 ↓ 4%	Registered Indian Status: 85	

RSC	Entity	County	Parish	Town/ Communit	Population[3]	Median Income	Employment Rates	Language	Identity Aspects		
								Other: 125 ↑ 9%			
11	70		Southampton	Hainesville	Population: 1,497 ↑ 1%	Median after-tax income: $31,000 ↑ 20%	Employment: 52.3% ↓ 2%	English: 1,430	Visible minority: 15	Indigenous: 50 ↑ 233%	Christian: 57%
					Working Population: 930 ↑ 2%	Median FTE income: $52,800 ↑ 7%	Unemployment: 10.6% ↓ 27%	French: 35 ↓ 13%	Immigrants: 30 ↓ 25%	Registered Indian Status: N/A ↓ 100%	
								Other: 10 ↓ 50%			
	69		Fredericton		Population: 63,116 ↑ 8%	Median after-tax income: $36,000 ↑ 19%	Employment: 56.7% ↓ 5%	English: 49,915 ↑ 6%	Visible minority: 8,660 ↑ 48%	Indigenous: 2,180 ↑ 19%	Christian: 52%

RSC	Entity	County	Parish	Town/ Communit	Population[3]	Median Income	Employment Rates	Language	Identity Aspects		
					Working Population: 41,455 ↑ 6%	Median FTE income: $58,400 ↑ 18%	Unemployment: 8.7%	French: 3,785 ↓ 3%	Immigrants: 7,790 ↑ 21%	Registered Indian Status: 1,110 ↑ 21%	
								Other: 6,655 ↑ 22%			

5.3.1.1.1 Highlights and Analysis

Table 5-33 illustrates a slight increase to population overall since 2016, after a decline the preceding years. This is in part due to cross-province migration during the 2020 pandemic. It is noteworthy that despite the general increases in population the number of working age individuals has mostly decreased: this is likely due to children being a significant portion of those coming into New Brunswick. Visible minorities and immigrants have increased quite significantly in several census areas. Community demographic indicators can give us information about social cohesion; social cohesion is "the ongoing process of developing a community of shared values, shared challenges and equal opportunity within Canada, based on a sense of trust, hope and reciprocity among all Canadians" (Jeanotte, 2003).

The baseline assessment highlights a few socioeconomic demographics which require closer analysis to understand how the Project might impact people and communities differently based on their various social and personal identities; this is in keeping with GBA+.

Median full-time employment income, chosen over average income to show a truer picture of the middle income-earners, is illustrated in Figure 5-54.

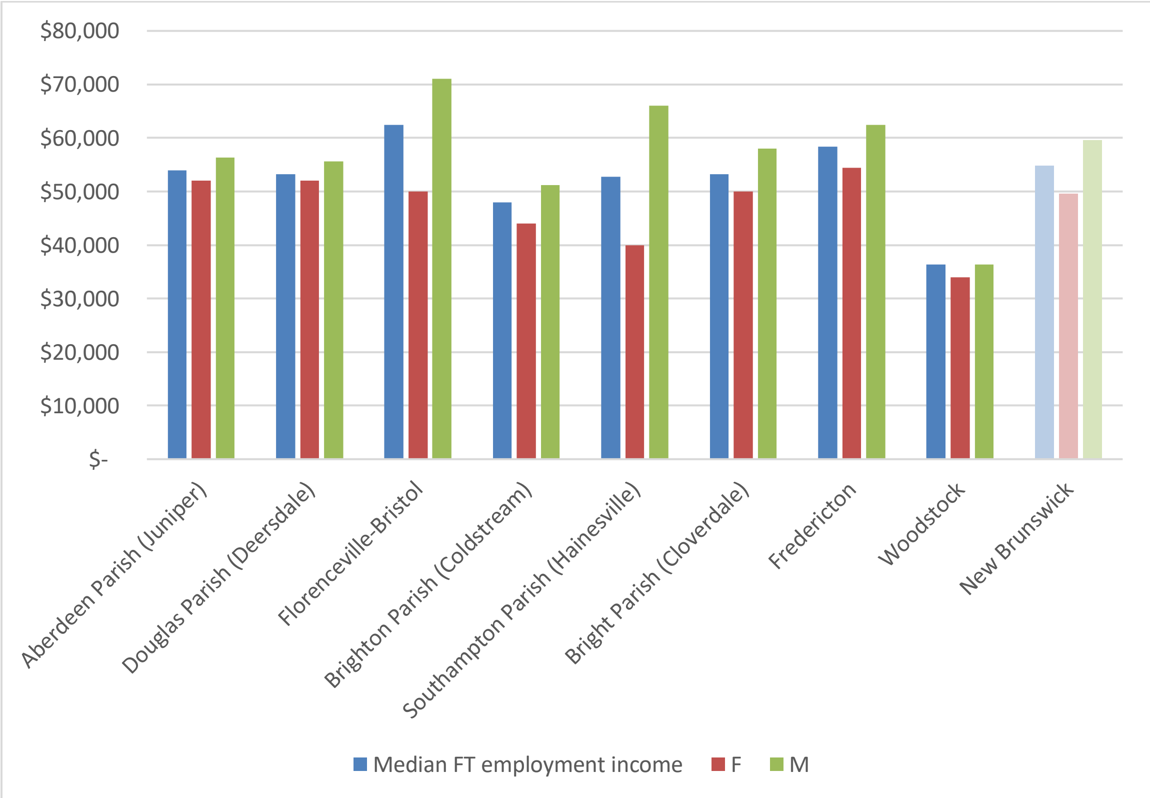

Figure 5-54: Median Full-Time Employment Income, Overall and Separated by Gender (2020)

There is a gender pay gap in every community: the most significant gaps are found in Florenceville-Bristol and around Hainesville, where the gap is near $20,000.

The highest proportion of the population between 25 and 64 in the regions surrounding the Project have a postsecondary certificate or diploma, as illustrated in Figure 5-55.

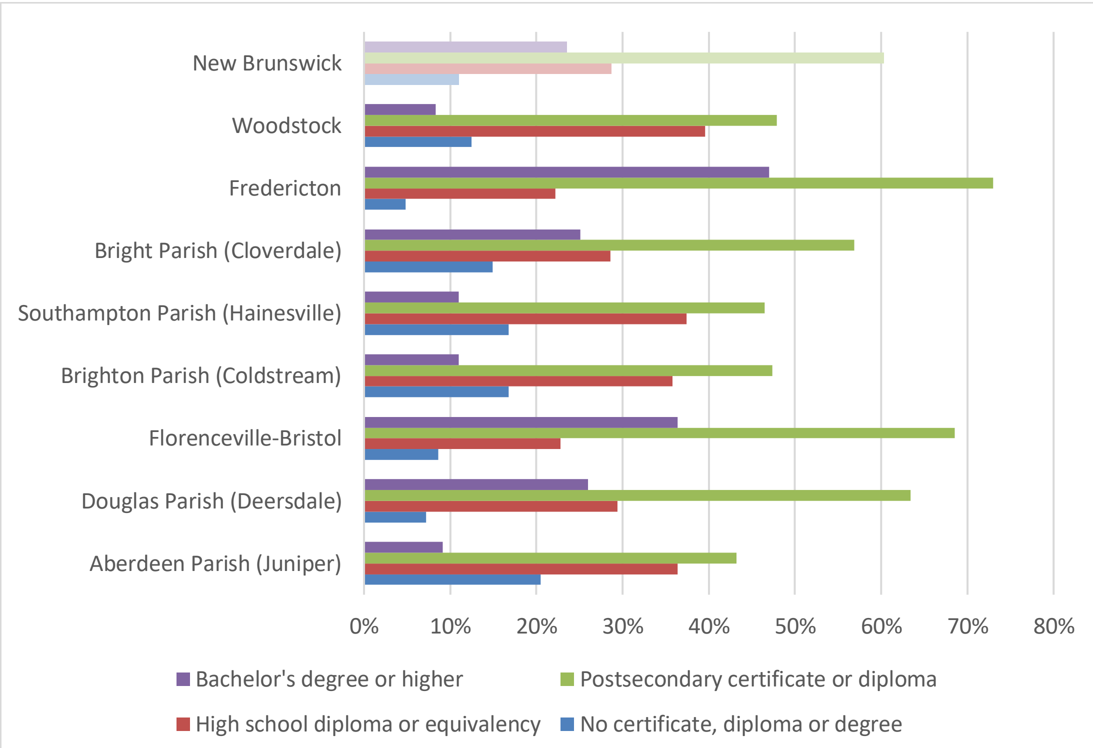

Figure 5-55: Rates of Highest Level of Education by Region (2021)

The regional workforce participants by industry are illustrated in Figure 5-56. Health care and social assistance, as well as retail trade, as leading industries in the country, which aligns with their presence in the assessed communities. Construction and manufacturing follow closely as well-populated industries. These industries are aligned with national workforce participants by region. According to location quotient analysis, New Brunswick has concentrations of workforce in mining, quarrying, and oil and gas extraction, management of companies and enterprises, and agriculture, forestry, fishing and hunting, which is discussed further down in subsequent sections.

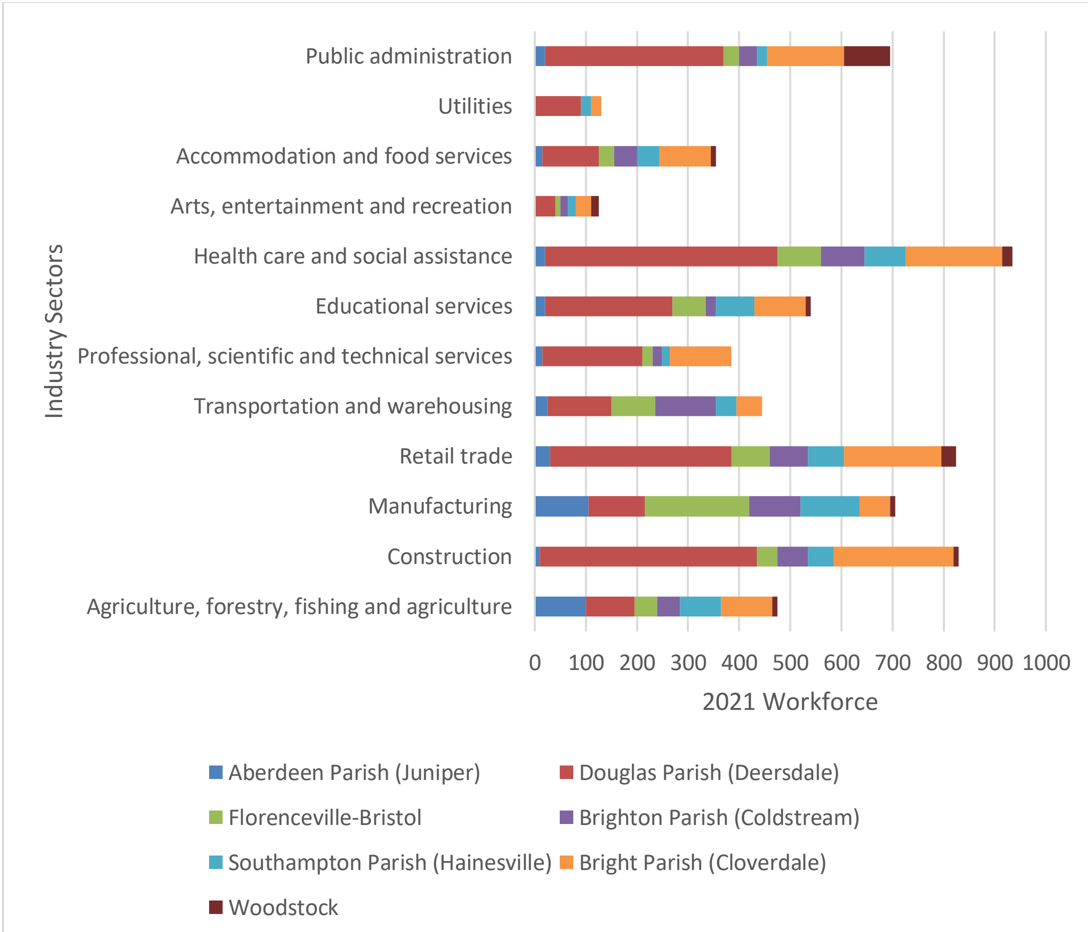

Figure 5-56: Workforce Participants by Largest Regional Industries (2021) (excluding Fredericton)

5.3.1.2 Employment

As with much of the country, New Brunswick is experiencing a labour shortage in the construction and skilled trades sector. Nearly 1/3 of the current construction workforce is expected to retire within the next 10 years. 'BuildForce Canada' expects that the industry will need "to recruit and train 8,500 new workers to keep up with construction demands" (BuildForce Canada, 2023). Residential construction is a major focus for investment due to the combined growth in population and tightening housing market. Non-residential construction is a more variable investment but is expected to increase substantially within the next 3 years as other major construction projects (such as the Mactaquac Dam refurbishment) enter core construction. In 2022 the employment in non-residential construction exceeded 10,000 workers. BuildForce Canada anticipates that although labour shortages are currently affecting most building trades, they will be able to meet local demand until 2026 when other major construction projects begin.

Overall, BuildForce Canada projects that the labour force will grow from 23,900 workers in 2023 to 25,900 in 2032, which will leave a 3,800-worker gap to meet labour demands. There will need to be a growing focus on recruiting women (who currently make up 3% or 650 individuals of the on-site workforce), Indigenous people (3.7% of the workforce), and newcomers (3% of the workforce).

5.3.1.3 Businesses

According to a location quotient analysis, New Brunswick has concentrations in mining, quarrying, and oil and gas extraction as well as management of companies and enterprises. New Brunswick also has a slight concentration in agriculture, forestry, fishing and hunting. The location quotient in company management show there is likely a large number of small businesses in the province. The concentration in mining and quarrying reflects the province's wealth of natural resources (ex. Iron and manganese, aggregate) and growing national sector share (Labour Market Analysis Directorate, Service Canada - Atlantic Region, 2023).

In 2022, New Brunswick contributed about 1.3% of the national gross domestic production (GDP). Major industries for the province were manufacturing, construction, and transportation and warehousing, as shown in Table 5-34.

Table 5-34: GDP Contributions by Most Relevant Industry

Industry	2022 NB GDP
Mining, Quarrying, and oil and gas extraction	0.68%
Utilities	3.51%
Construction	7.13%
Manufacturing	11.88%
Transportation and warehousing	4.93%
Professional, scientific and technical services	3.48%
Accommodation and food services	1.71%
Total contribution to national GDP %	1.3%
GDP market price	$44 Million

As mentioned above, New Brunswick has a high location quotient of management of companies and enterprises. In Table 5-35 the number of businesses in each relevant industry in New Brunswick are illustrated.

Table 5-35: Employment and Business Base Data for Most Relevant Sectors and Total of all Industries

Industry	Employment data (Statistics Canada, 2023)			Business base data (Statistics Canada, 2023)					
				Total employing businesses			Business size breakdown		
	No. of FTE jobs	% of total FTE jobs	FTE jobs LQ[7]	Number of employing businesses	% of total employing businesses	Business LQ	No. of businesses with 1-99 employees	No. of businesses with 100-499 employees	No. of businesses with 500+ employees
Construction	29,200	7.82%	0.99	2,963	11.3%	0.97	2,936	25	2
Professional, scientific and technical	22,000	5.89%	0.64	1,842	7%	0.59	1,821	21	n/a
Manufacturing	27,700	7.42%	0.82	901	3.4%	0.89	811	86	4
Transportation and warehousing	18,300	4.90%	0.98	1,389	5.3%	0.94	1,364	24	1
Utilities	4,100	1.10%	1.46	42	0.2%	1.5	38	3	1
Mining, quarrying, and oil and gas extraction	8,300	2.22%	1.65	64	0.2%	0.43	63	1	n/a
All industries	373,500	100%	n/a	**26,345**	**100%**	**n/a**	**25,793**	**497**	**55**

*Note various degrees of rounding are used.

[7] The Location Quotient (LQ) is a method of quantifying how concentrated a particular industry, cluster, occupation or demographic group is in a region as compared to the respective national average. The FTE jobs LQ measures the proportion of employment in each given sector relative to the Canadian average whereas the business LQ measures the proportion of businesses in a sector relative to the Canadian average.

5.3.1.4 Housing Availability

New Brunswick, like other Maritime provinces, is experiencing a shortage of housing. The average home price in New Brunswick is around $270,000 (Saillant, 2023), which is well below the national average; however, the rate by which home prices in New Brunswick have been growing in the past 3 years is about double the national growth rate. Rent has been climbing at a comparable rate near double the national average, and vacancy is around 2%. Fueling these dramatic increases in price is a record number of migration from Ontario: New Brunswick's supply of housing is, within the past 3 years, growing closer to not meeting the increase in demand. The Land Use and Property Value section considers impacts to property value; this section considers how the Project may impact community access to housing.

In the three census metropolitan areas (CMAs) of New Brunswick—Moncton, Saint John, and Fredericton—are experiencing high rates of housing starts (construction), but the rural areas and small towns are far behind. Most of the demand is also centered around the CMAs but for a Project such as the one proposed, it is anticipated that there will be increased demand on rural or small-town housing (Saillant, 2023).

From an initial search, there appear to be at least 80 homes and lots for sale within the spatial assessment boundary of the Project. The housing stock is quite old – it appears no new builds are currently available in the area, which reflects the reality of housing starts being concentrated on high-density housing in the CMAs. There are more single-family homes and condos available in Fredericton (over 100), but this still creates tight demand in a growing city.

5.3.1.5 Local Services

The communities around the Project site are rural; many people likely have to travel to the nearest town or population centre to access community, recreation, education, healthcare, and emergency services.

5.3.1.5.1 Community Services

Community services might include a variety of supports for culture, education, and recreation. Community services are vital for social cohesion, especially in rural communities (Desjardins, Halseth, Leblanc, & Ryser, 2002). Social cohesion is one aspect of community wellbeing (Cloutier, Ehlenz, & Afinowich, 2019).

5.3.1.5.1.1 Libraries

Public libraries around the Project site offer literature and media literacy resources, online learning resources, accessible resources, art galleries, language resources, technology, and historical resources. The Fredericton Public Library has additional musical instrument lending, room rentals, and more. Public libraries provide access to media and literacy for the whole population as an important social service. Table 5-36 provides a list of libraries in the RAA.

Table 5-36: Libraries Around the RAA

Library	Location
Andrew & Laura McCain Public Library	Florenceville-Bristol
Dr. Walter Chestnut Library	Hartland
L.P. Fisher Public Library	Woodstock
Nackawic Public Library	Nackawic
Fredericton Public Library	Fredericton (various locations)

5.3.1.5.1.2 Community Recreational Services

There are very active recreational organizations around the Project area. Recreation clubs create community connections between people living in the area who share common interests. The recreation, including outdoor recreation, is very important to those living near the Project, and in New Brunswick in general. Table 5-37 is a list of recreation services around the Project area which community members may access.

The Western Valley Recreation Association, for example, organizes recreation clubs and events for all ages which are held at school or college gymnasiums, or other nearby recreation facilities.

Table 5-37: Recreation Services around the Project Area

Name	Location	Services
Bristol Community Park	Florenceville-Bristol	Outdoor splash pad
North Carleton Civic Centre (NCCC)		NHL-sized rink, heated outdoor pool, meeting/event spaces, outdoor baseball diamond and field.
Beechwood Community Park		Docks, kayak rentals, pavilion, public washrooms.
Curling Club		Curling rink
Valley Outdoor Centre	Centreville	Outdoor recreation and groomed trails: cross country skiing, snowshoeing, mountain biking, walking/hiking, and trail running.

Name	Location	Services
Westen Valley Recreation Association		Organizes recreation clubs and events for community members of all ages.
Mount Pleasant Community Centre Co-op	Mount Pleasant	Seniors club, church groups, 4-H club, four-wheeler club, room rentals, artist workshops.
Triple C Rec Center	Rockland	Racetrack, outdoor cultural events
Hartland Recreation Department	Hartland	Pool, arena
Millville Youth Recreation Centre	Millville	Unknown
AYR Motor Centre	Woodstock	Arena, indoor pool, meeting rooms, field house (3 courts), fitness centre, walking track, outdoor rink,
Various locations		Baseball fields and batting cage.
Connell Park		Beach volleyball courts, tennis courts
Woodstock Golf and Curling Club		9-hole golf course, 4 sheet curling rink
Nackawic-Millville Recreation Department	Nackawic	Arena, ballfields, Lions Centre
Keswick Valley Recreation Council	Keswick	Arena, organizes recreation clubs and events for all ages.
Various	Fredericton	Indoor and outdoor arenas, field house, aquatic facilities, room rentals, various sport and activity clubs.

5.3.1.5.2 Education

New Brunswick offers public anglophone (some of these schools offer French Immersion) and francophone education to all residents. Table 5-38 shows which school subdistricts serve each community in the Project area.

Table 5-38: Anglophone and Francophone Schools Servicing the Project Area

School District	Subdistrict	Schools	Grades	Serviced Communities
Anglophone West	Subdistrict 2	Bath Community School	K, 1-8	Juniper, Florenceville-Bristol, Cold Stream, Glassville
		Bristol Elementary School	K, 1-5	
		Carleton North High School	9-12	
		Florenceville Middle School	6-8	
		Florenceville Elementary School	K, 1-5	
		Centreville Community School	K, 1-8	
	Subdistrict 3	Hartland Community School	K, 1-12	Hartland, Woodstock
		Woodstock High School	9-12	
		Townsview School	K, 1-8	
		Meduxnekeag Consolidated School	K, 1-8	
	Subdistrict 4	Keswick Valley Memorial School	K, 1-8	Millville, Hainesville
		Nackawick Senior High School	9-12	
		Nackawick Middle School	6-8	
		Nackawic Elementary School	K, 1-5	
		Canterbury High School	K, 1-12	
Francophone Nort-Ouest	Sous-district 8	Élémentaire Sacré-Coeur	K, 1-6	Juniper, Florenceville-Bristol, Cold

School District	Subdistrict	Schools	Grades	Serviced Communities
		Polyvalente Thomas-Albert	7-12	Stream, Glassville
Francophone Sud	Sous-district 10	École des Bâtisseurs	K, 1-5	Fredericton, Woodstock, Millville, Hainesville
		École Sainte-Anne	6-12	
		École Les Éclaireurs	K, 1-8	
		École Arc-en-ciel	K, 1-8	

New Brunswick's educator-student ratio is relatively low at 12.7 students per 1 educator. The average class size for kindergarten is 17.4 students and the average class size for grades 1-8 is 21.4 students. Enrolment in all grades has steadily declined since 2004, although 2022 presents the first major increase in past years, as shown below in Figure 5-57 (Policy and Planning Division, Department of Education and Early Childhood Development, 2023). This could be due in part to the increase in cross-province migration from Ontario since 2020.

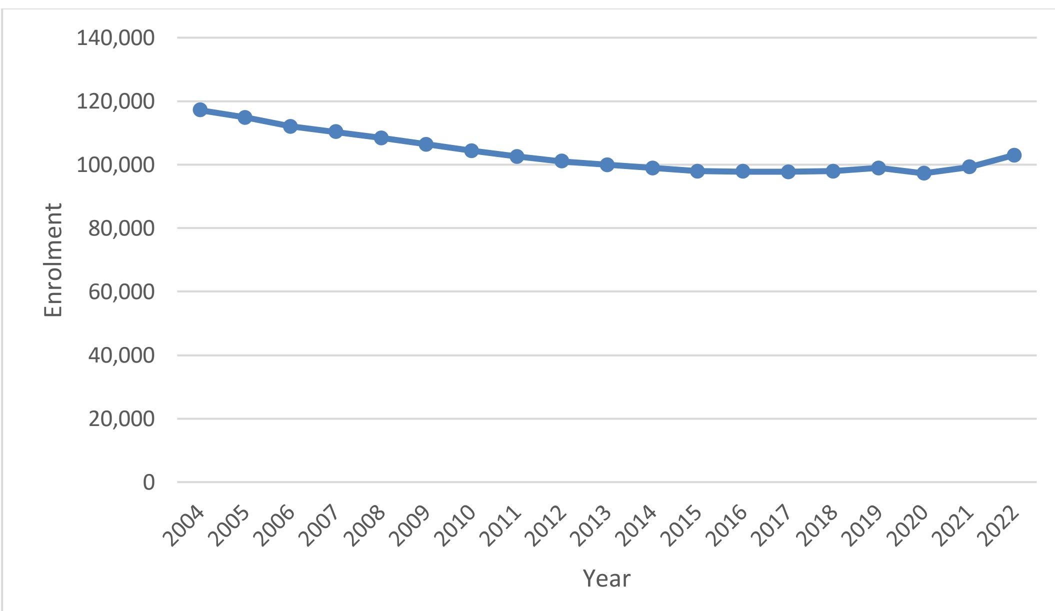

Figure 5-57: Overall Annual Student Enrolment (All Grades) in New Brunswick Public Schools

The Department of Education and Early Childhood Development in New Brunswick is also responsible for licensing and monitoring such facilities in the province. The province has its own Action Plan, as well as the Canada-New Brunswick Early Learning and Childcare Bilateral Agreement. As of March 2021, there were 508 early learning and childcare centres in the province, which means 14,517 licensed spaces split between anglophone and francophone. The provincial government also implemented a Market Fee Threshold which sets fees for small urban and rural families lower than large urban families. There is also a subsidy for low-and-middle-income families; roughly 3,360 children benefit from subsidized fees (Department of Education and Early Childhood Development, 2021). Table 5-39 shows a preliminary list of licensed childcare facilities near the Project area; it is not exhaustive and the number of spots, or length of waitlist, is unknown.

Table 5-39: Preliminary List of Licensed Childcare Around the Project Area

Daycare	Location
Crafty Corner Child Care Center	Florenceville-Bristol
Centreville Child Care Inc.	Centreville
Totally Kids Daycare	Hartland
Angies Little Peeps	Woodstock
Woodstock Child Care Inc.	Woodstock
Katie Bee’s Children Center	Kestwick
Various	Fredericton

5.3.1.5.3 Healthcare

New Brunswick, like the other Maritime provinces, is experiencing a shortage of physicians and strain on the healthcare system.

There are major provincial healthcare centres in Waterville (nearest hospital), Hartland, and Nackawic. Many of the other communities have family physician offices or independent health centers and nursing homes.

Table 5-40 shows the location and operator of each major health care centre near the Project area. Independent physician offices and homes are not listed.

Table 5-40: Major Health Care Centres around Project Area

Healthcare Service	Location	Operator
Upper River Valey Hospital	Waterville	Horizon Health Network (provincial provider)
Hartland Health Centre	Hartland	

Healthcare Service	Location	Operator
Bayshore HealthCare	Woodstock, Fredericton	Private
Family physicians (various offices)	Hartland, Florenceville-Bristol, Nackawic	Private
Nursing homes (various)	Hartland, Florenceville-Bristol	Private
Nackawic Health Centre	Nackawic	Horizon Health Network (provincial provider)
Fredericton Downtown Community Health Center	Fredericton	Horizon Health Network (provincial provider)
Veteran's Health Unit		
Various	Fredericton	Private

5.3.1.5.4 Emergency Services

5.3.1.5.4.1 Police

The Royal Canadian Mounted Police (RCMP) Western Vally Detachment is responsible for Carleton County, including the Project site. The Detachment is located in Woodstock, NB.

The nearest bilingual RCMP detachment is in Keswick, west of Fredericton.

The Municipality of Woodstock also has its own local Woodstock Police Force.

5.3.1.5.4.2 Fire

Local Volunteer Fire Departments in the near vicinity of the Project Site, include:

- Juniper Fire Department;
- Woodstock Fire Department;
- Hartland Fire Department;
- Florenceville-Bristol Fire Department;
- Nackawic Fire Department;
- North York Fire Department;
- Glassville Fire Department;
- Stanleyville Fire department; and
- Keswick Valley Fire Department.

5.3.2 Land Uses and Property Value

5.3.2.1 Traditional Land Use

Regional archaeological evidence indicates that the first peoples to inhabit New Brunswick likely arrived during the Pleistocene, approximately 11,000 years before present (B.P.). Given that glaciers still covered portion of the New Brunswick landscape until around 10,600 years B.P., habitation following the end of the Younger Dryas or interstadial warm period (from 9,000 years B.P.) is more likely (Bonnichsen et al. 1985; Cwynar et al.1994; Seaman 2006; Suttie et al. 2013). The area falls within the traditional Wolastoqey and Mi'kmaq territories (Zelazny, 2007). Rivers have played a large part in how people used the landscape in the CUE (Ganong, 1899; Zelazny, 2007). One of the largest Mi'kmaq and oldest continuous settlements in the Maritimes, Metepenagiag (Red Bank), is located near modern-day Miramichi, New Brunswick some 120-kilometers northeast along the Miramichi River. The Oxbow and Augustine Mound sites were excavations of these ancient Mi'kmaq settlements and revealed the long history from at least 3000 years ago (Allen, 1981).

Additionally, the Saint John/Wolastoq River is about 15-kilometers west of the PDA which is traditional Wolastoqey territory. The nearest Wolastoqey community is Wotstak (Woodstock approximately 40 km to the southwest) and Neqotkuk (Tobique, approximately 60 km to the northwest). Rivers have played a large part in how people used the landscape in the CUE (Zelazny, 2007). The name "Wolastoqey" means "people of the beautiful river" (Rayburn 1975). The precontact archaeological record within the Saint John/Wolastoq watershed is abundant, with documented habitation by Indigenous peoples for the region dating back more than 10,000 years.

The Community of Juniper lies within Carleton County, which was one of the eight original counties delineated in 1784 after the creation of the British Colony of New Brunswick . Juniper, named after the hydrophilic bog shrub, is largely forest services based. The community has had former sawmill operation close in the early 2000's, and now most industry and employment are centered around JDI Juniper Organics facility, the Juniper Tree Nursery, as well as Woodlands presence and operations in Deersdale. JDI has had a presence in nearby Deersdale since 1957 (Colwell-Pasch, 2023).

5.3.2.1.1 Archaeological Resources

An Archaeological Impact Assessment (AIA) has been initiated by the Project. A 'Predictive Model' was received from Archaeology and Heritage Branch (AHB) of the NB Department of Tourism, Heritage and Culture (NB-DTHC), in early 2023 showing areas of 'High-Potential Archaeological' Resources. This predictive model, informed field pedestrian surveys, undertaken throughout 2023 by a licensed professional archaeologist in the Province of NB. The predictive model also informed turbine sitting options, with all WTG locations having been designed to be located in areas with low potential (i.e., outside of 'high potential area's identified by Predictive model).

Pedestrian Surveys were conducted at 236 locations throughout the PDA in 2023, and sub-surface testing will commence in 2024 in selected areas.

The full AIA Report, detailing 2023 and 2024 archeological activities, will be submitted to the TRC as a Technical Addendum once completed.

There are four (4) registered archaeological sites within 5 km radius of the Project Site, but the Project will not impact on these sites:

- CdDs-1: a precontact projectile point cache site and camp found by George Frederick Clarke in 1945.
- CdDs-2: a precontact Maritime Woodland camp site also found by George Frederick Clarke in 1945 (Clarke 1950 as cited by Colwell-Pasch, 2023).
- CbDt-1: A Historic Plane Wreck (Skyway #600 CF-IMJ), and Memorial Site commemorating the 1958, crash of a WW2 era Avenger, where pilot Tommy Marsten, lost his life.
- CcDs-1: A historic 19th century log and stone dam on the Nashwaak River, partially removed in 2012 to restore fish movement in the river.

These registered archaeological sites, as well as areas of 'High potential' in relation to turbine locations, are presented in Figure 5-58.

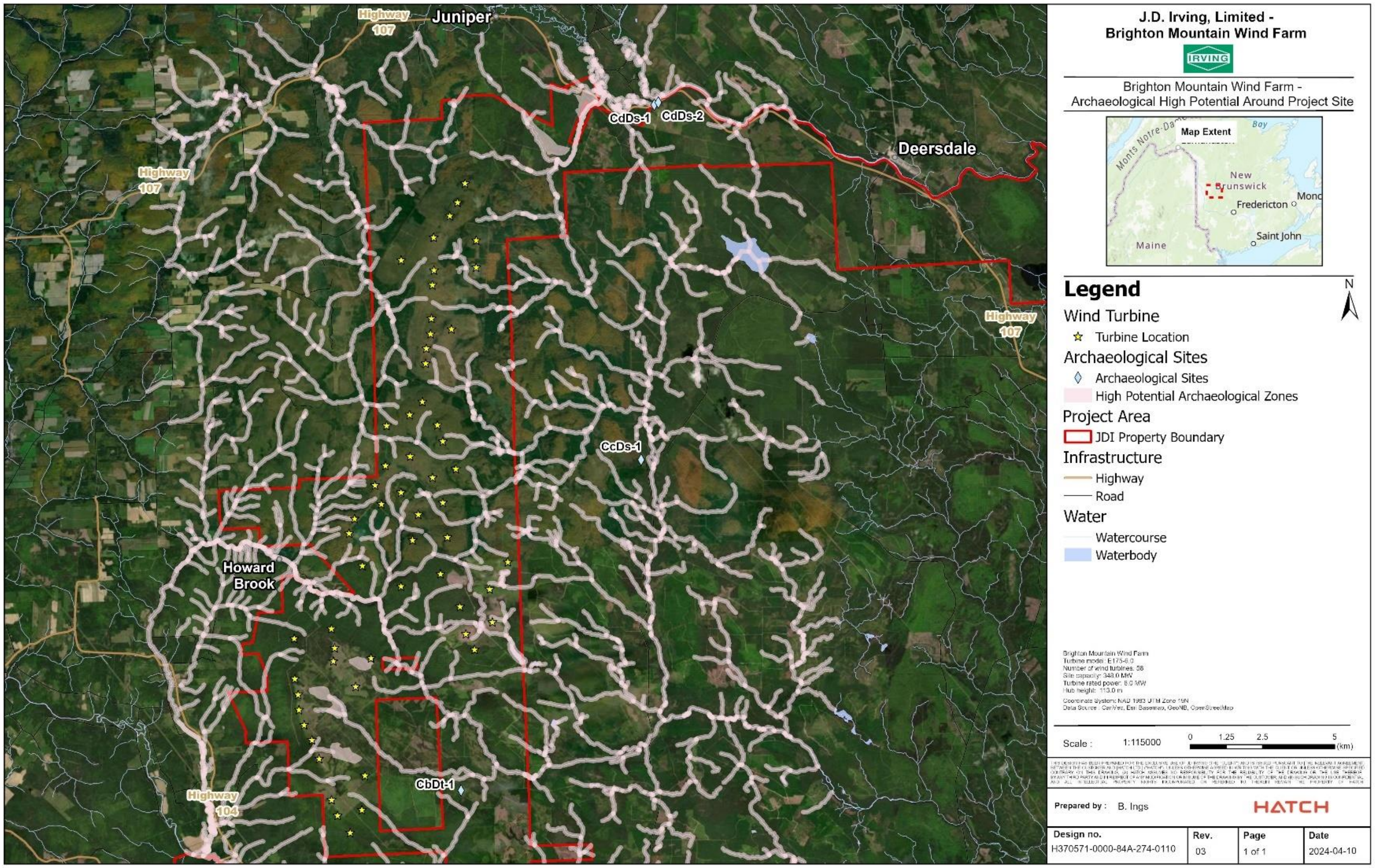

Figure 5-58: High Potential Archaeological Areas and Registered Archaeological Sites

5.3.2.2 Historical Land Use

The New Brunswick Railway (NBR) Company acquired timber holdings and harvesting rights in the Project Area during the mid-to-late 1800s. NBR was acquired by the Canadian Pacific Railway (CPR) in 1890, and the lands were administered by CPR for nearly half a Century. In an effort to reduce non-railway assets and properties, CPR sold NBR and all timber holdings as well as surface rights to the forest subsidiary of J.D. Irving Limited.

The area has been a managed working forest for several decades since the acquisition of NBR lands, The forest is managed under the oversight of JDI Woodlands operations, including forestry harvesting, as well as silviculture and replanting efforts as part of healthy forest management.

In 1956 a galvanized lookout tower with living quarter was constructed on top of Brighton Mountain, east of South Knowlesvile, Parish of Brighton. In 1956 improvements included very high frequency (VHF) radio transmitter and improved road access to the station. Only remnants of the structure's foundation can be seen today (New Brunswick Lookouts).

Access roads established for forestry operations, have opened the area to general public use, and improved opportunities for recreational activities, such as All-Terrain Vehicle (ATV) and snowmobile usage.

5.3.2.3 Existing Land Use

The existing land use on the Project Site has continued to support largely forest management operations and is utilized for timber harvesting. There are various recreational trails built off the network of logging resource roads, such as the ATV and groomed snowmobile trails. Recreational sites of interest as described in section are also found throughout the area.

The area continues to be managed by the JDI Woodlands Division.

5.3.2.3.1 Zoning

The site is currently zoned as ‘Freehold Timberland’ (according to SNB Property Assessment Online viewer, 2023), with the exception of lands along the northeastern section (PID: 10002392, PAN: 00374629 (153 – Carleton North, Route 107 Forks)), which list the zoning as Timberland and Camps.

5.3.2.3.2 Adjacent Properties

Adjacent properties to the JDI Property near the PDA, primarily include Crown Lands, inclusive of six (6) Class II PNAs (See Section 5.2.1.3.4), and two (2) ESAs (See Section 5.2.1.3.5). An additional ESA (Howard (Pokiok) Brook Hardwoods) is owned by JDI and located on the Property.

The PNAs include:

- Becaguimec Stream (Class II);
- East Cloverdale (Class II);
- Golden Ridge (Class II);
- Howard Brook (Class II);
- Otter Brook (Class II); and
- Welch Brook (Class II).

The ESAs include:

- Long Lake Mixed Wood Stand ESA; and
- Juniper String Bog Complex ESA.

Private Land holdings are primarily found along the western and southwestern portion of the JDI Property Boundary and are the basis for most of the ‘Sensitive receptors’ identified for noise, and shadow flicker impacts. Adjacent Crown lands properties and zoning are shown in Figure 5-59, Figure 5-60 shows Private Property Holdings, in Cloverdale and Howard Brook, While Figure 5-61 shows private property holdings In Juniper and Deersdale. These locations are the basis for property value assessments provided below.

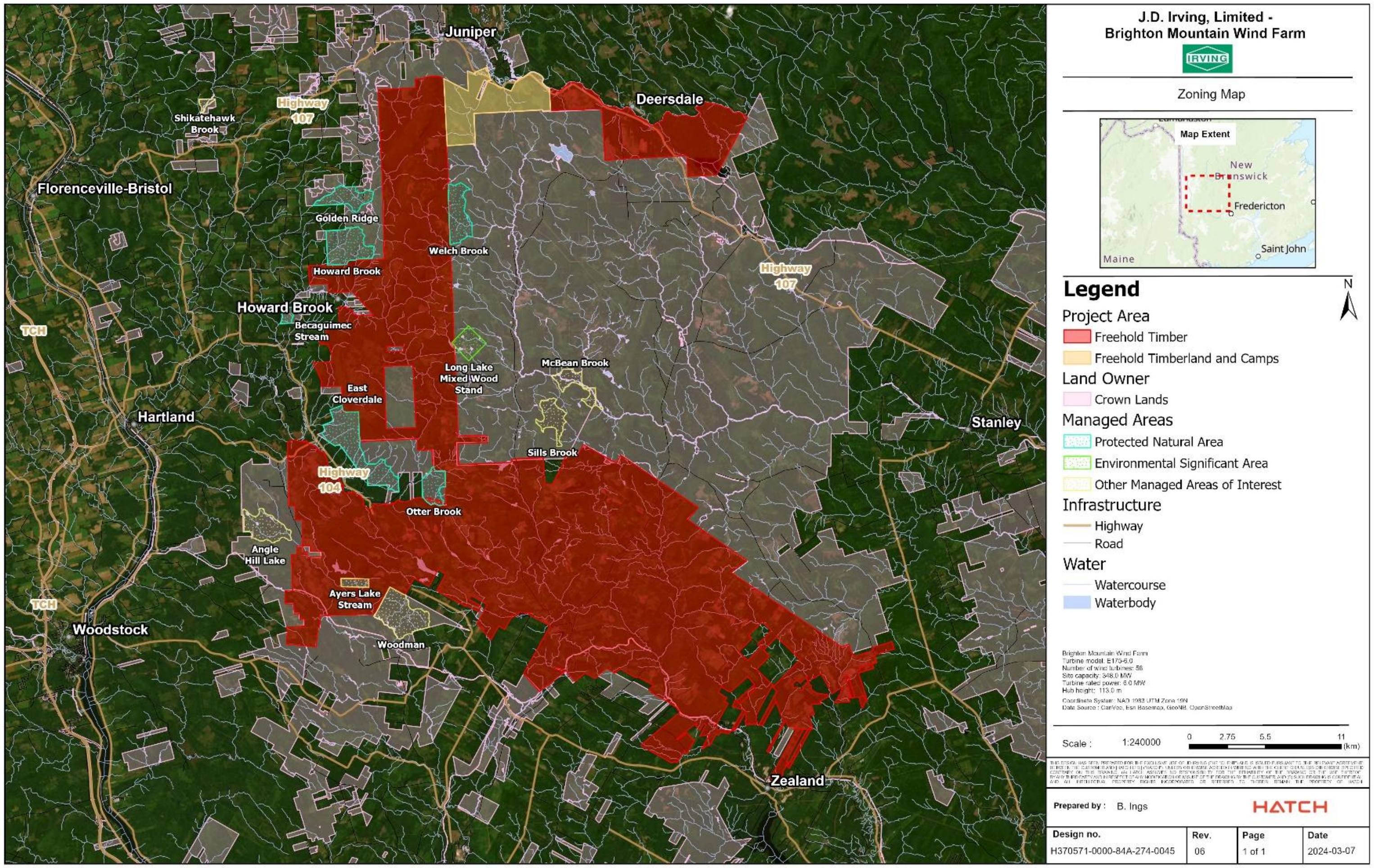

Figure 5-59: Adjacent Properties, Including Crown Lands

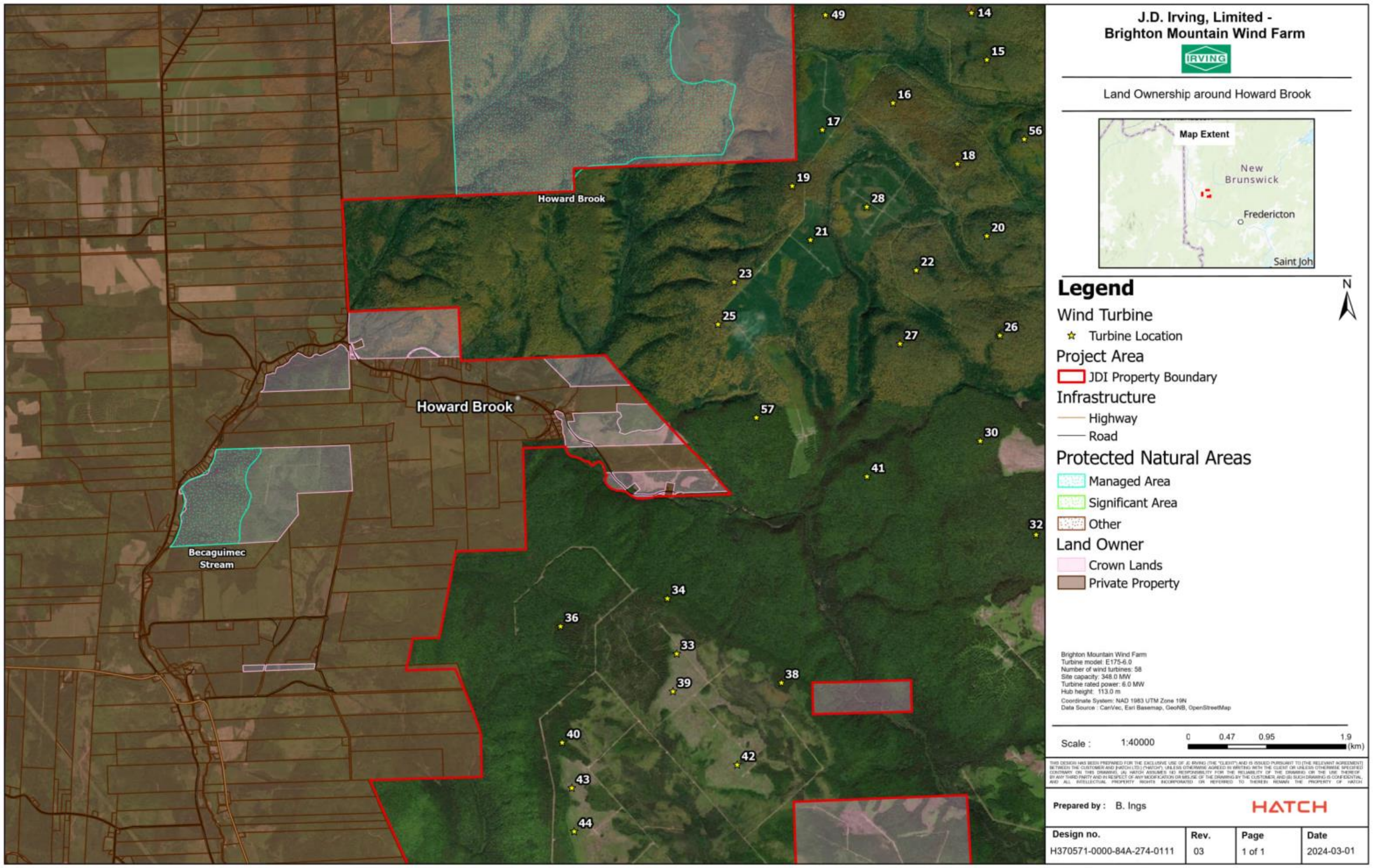

Figure 5-60: Private Land Ownership near Howard Brook and Cloverdale

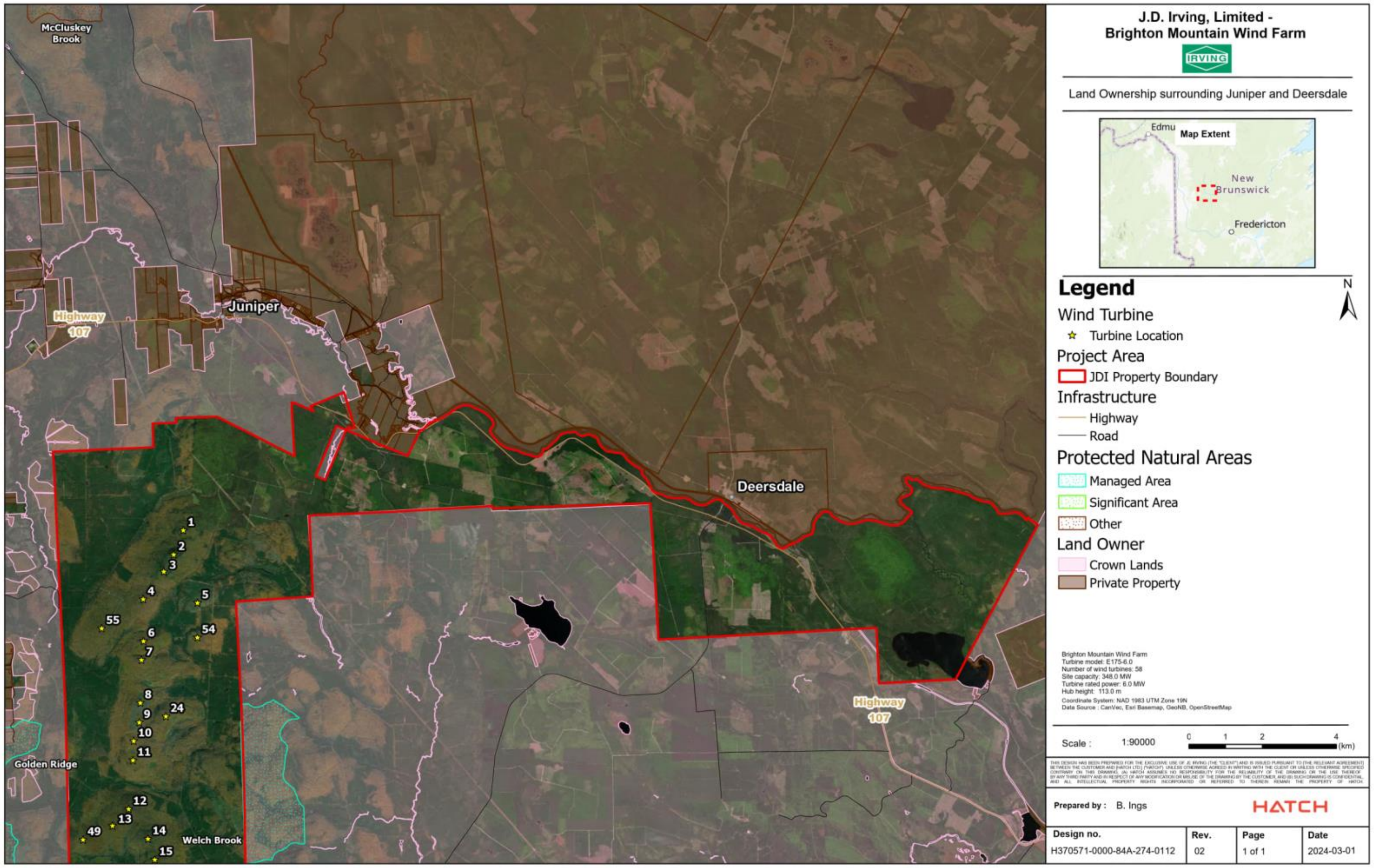

Figure 5-61: Private Land Ownership in Juniper and Deersdale

5.3.2.4 Property Values

According to Service New Brunswick's Real Property Information Registry (2023), excluding crown lands, the average value of a private property surrounding the JDI Freehold Lands in Cloverdale and Howard Brook is presented in Table 5-41 below.

Table 5-41: Average Private Property Value by Property Type in Howard Brook and Cloverdale (2024)

Property Descriptions	Number of Properties	Average Assessment Value	Year of Assessment
Camps (Camp and Land/ Camp & Lot)	50	$37,122	2024
Houses/homes/residences/cottages	61	$102,810	2024
Farmland/woodland (includes Farm and House)	14	$44,514	2024
Commercial	0	0	n/a
Vacant Lots	18	$8,572	2024
Total	143		

The average value of Private Property Adjacent to the JDI Freehold near Juniper and Deersdale are presented below in Table 5-42.

Table 5-42: Average Private Property Value by Property Type in Juniper and Deersdale (2024)

Property Descriptions	Number of Properties	Average Assessment Value	Year of Assessment
Camps (Camp and Land/ Camp & Lot)	54	$50,667	2024
Houses/homes/residences/cottages	155	$46,626	2024
Farmland/woodland (includes Farm and House)	0	0	n/a
Commercial	24	$81,438	2024
Vacant Lots	63	$8,911	2024
Total	296		

5.3.2.5 Recreation

5.3.2.5.1 All-terrain vehicles (ATVs) and Snowmobiling

Members from the Snowmobile Association of New Brunswick and QuadNB use the land for ATV and Snowmobile trails (see Figure 5-62). Both organizations have agreements in place with JDI, to safely access and use the onsite trial network. The local Chapter of the Snowmobile association maintains the groomed trails in the Project Site.

5.3.2.5.2 Hiking and Points of Interest

Within the Project area, hiking trails such as the Brighton Mountain, Pokiok Brook Falls and Long Falls exist. Several access roads also occur within the site footprint and give broader access to several important trails and sites of interest that are widely known and frequently visited in the area including the World War 2 era plane crash site and memorial (circa 1958, Marsten Avenger Site) as shown in Figure 5-62.

5.3.2.5.3 Hunting, Fishing and Trapping

Further to the above the property is also used for local hunting of moose, bear, and deer when in season.

The JDI Property Boundary falls within Wildlife Management Zone 16, which houses the Becaguimic Wildlife Management Area as shown in Figure 5-63 below.

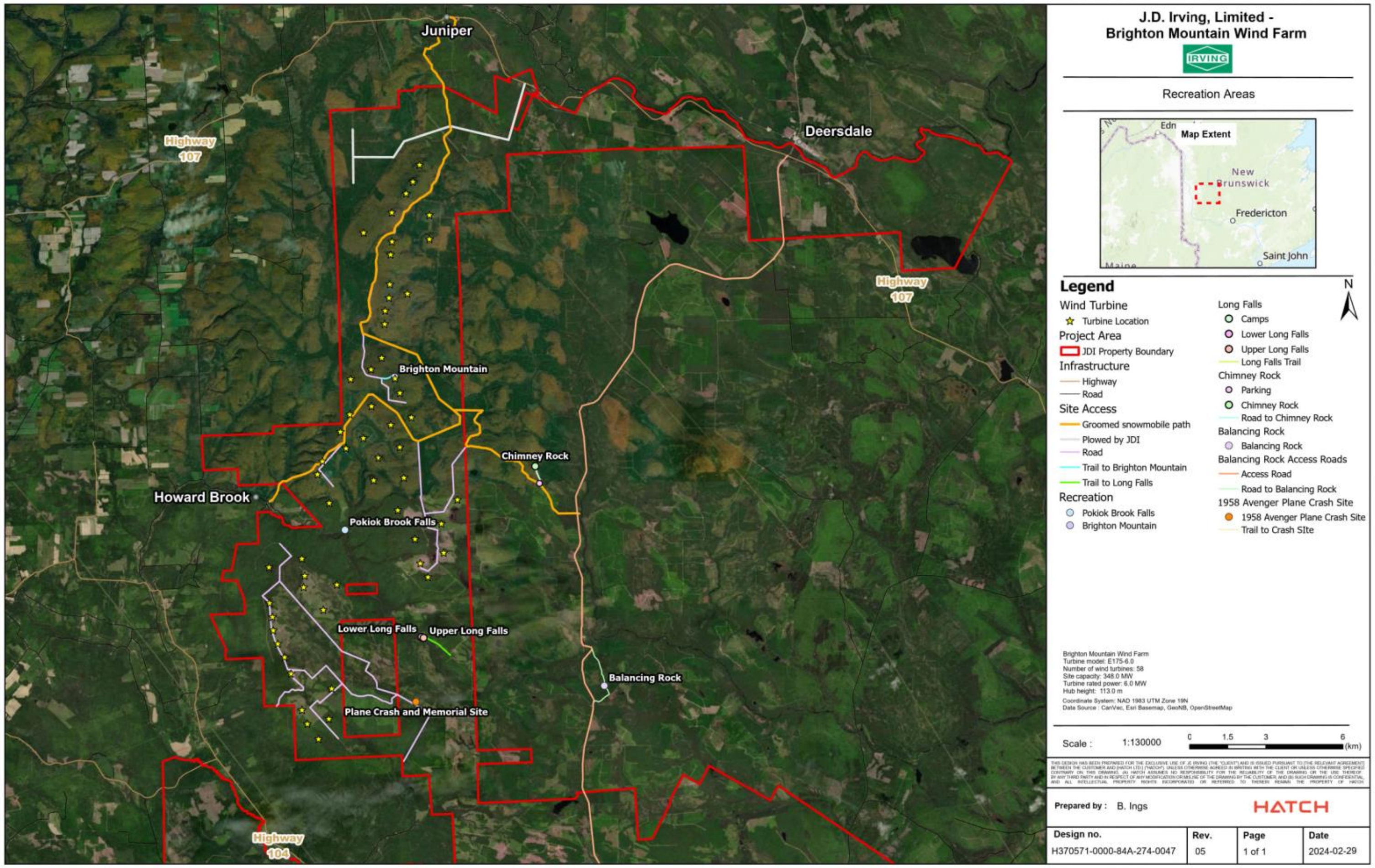

Figure 5-62: Recreational Access (ATV and Snowmobile) and Other Points of Interests

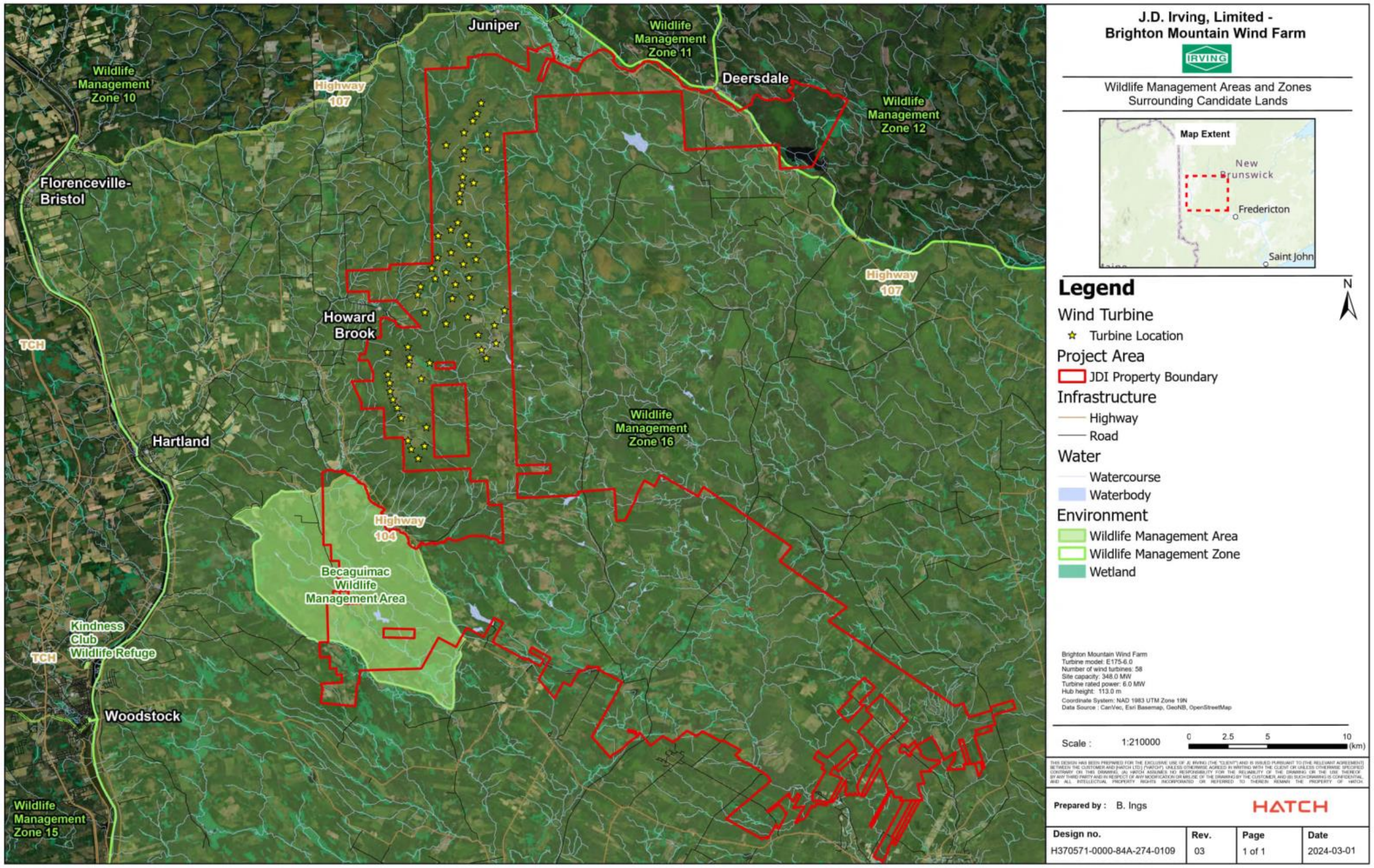

Figure 5-63: Wildlife Management Zone 16 and Becaguimic Wildlife Management Area

5.3.3 Vehicular Traffic

5.3.3.1 Port handling

A multicriteria analysis was used to determine the best available ports for entry to New Brunswick and ease of transportation from the ports to the project site. It was determined that both the Port of Bayside and the Port of Saint John may be used for this project. The main components of the WTGs (i.e., nacelle, hub, etc.) will be stored in the lay down areas at both ports, and used as staging points for all component deliveries.

5.3.3.1.1 Port of Bayside

The port of Bayside is a deep-water, ice-free port with a dock length of 242 m and a draft at low tide of 9.6 m, allowing the docking of multipurpose vessels the project intends to use. The port handles multiple types of dry bulk cargo as well as breakbulk cargo like wind turbine components, as shown in Figure 5-64. The port possesses different laydown yards that shall be available for the project with adequate prior notice.

Figure 5-64: Port of Bayside Unloading Wind Turbines

5.3.3.1.2 Port of Saint John

The port of Saint John is the largest port in Atlantic Canada by volume, handling containers, dry and liquid bulk, and breakbulk cargo of any kind. The port offers multiple terminals with heavy load-bearing capacities and significant open area for complex laydown requirements, including the Long Wharf Terminal, which is 285 m long, 10.7 m deep, and has 16.8 acres of open area, and the Lower Cove Terminal which is 225 m long, 10.7 m deep, and has an open area of 16.8 acres. The port has a history of handling wind turbine components as shown in Figure 5-65.

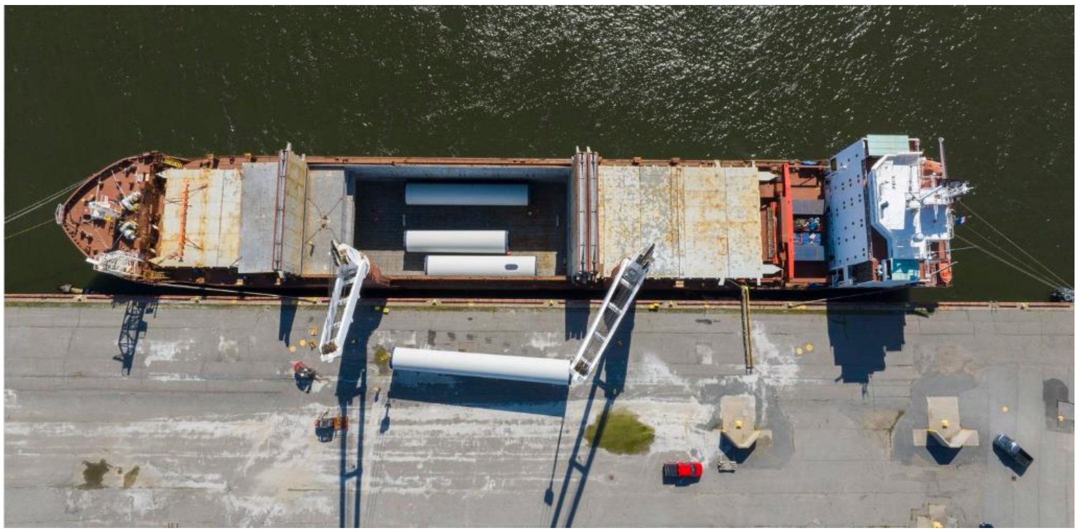

Figure 5-65: Port of Saint John Unloading Wind Turbines

5.3.3.2 Overland Transportation

There will be two routes being used for transportation between each of the selected ports of entry and the project site. A Route Survey Report was completed, to identify the best available routes along with any potential hazards or concerns (e.g., low hanging wires, low infrastructure). A summary of the proposed transportation routes is identified below and can be seen in Figure 5-66.

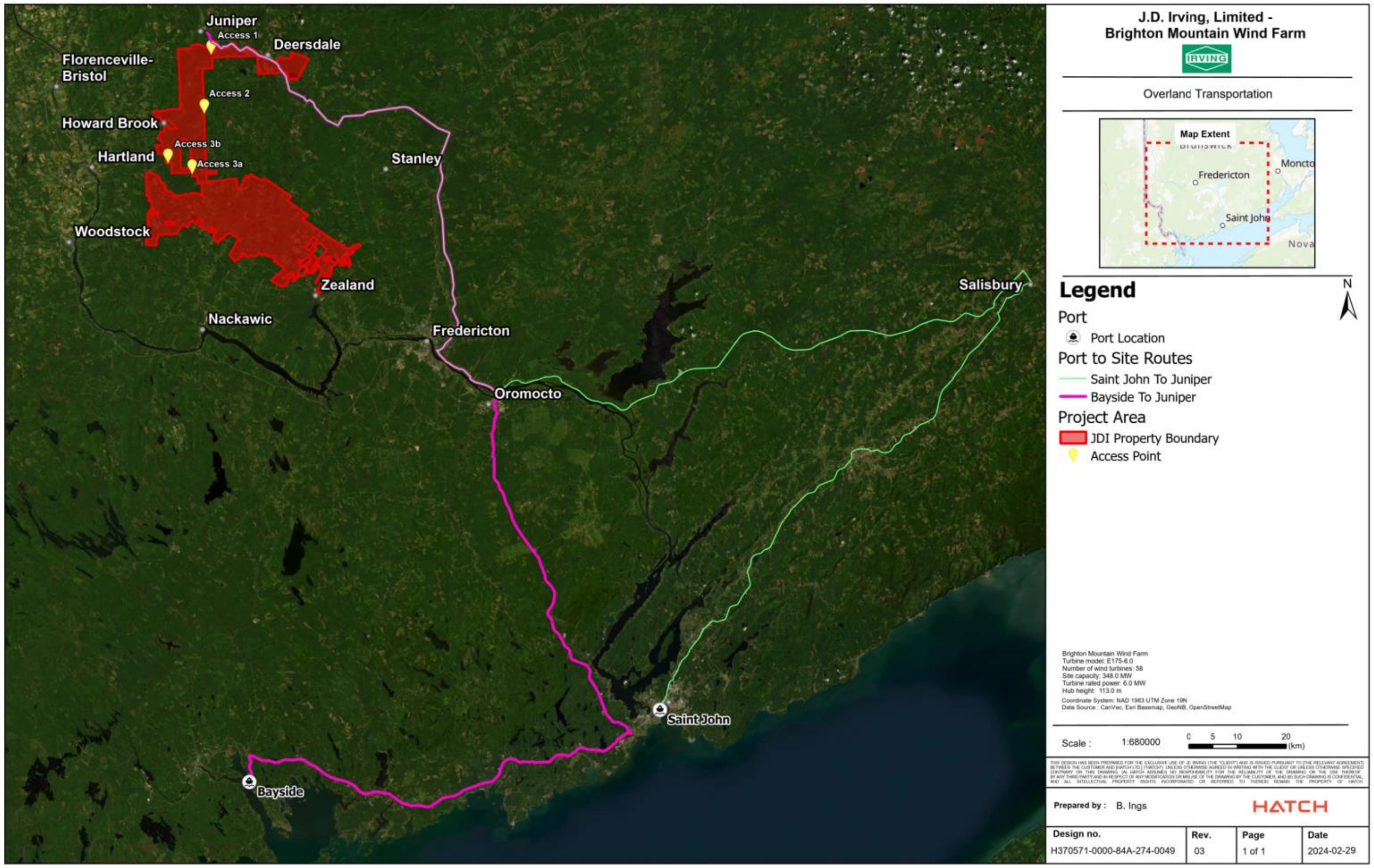

Figure 5-66: Overland Transportation from the Ports of Bayside and Saint John to the Project Site

Spring weight restrictions are enforced annually between March through until May by the DTINB (GONB, 2023). This is done during the thaw period to accommodate for the road network's lower bearing capacity. Deliveries to site are planned to begin after the thaw period in late May of 2026.

- **Port of Bayside to Project Site**
    1. Leave Bayside using Champlain Drive or Connors Lane to Route 127 (1.0 km)
    2. Route 127 – travel to the junction of route 1 (6.3 km)
    3. Route 1 – travel east to Exit 114 (87.8 km)
    4. Route 7 – Exit from 114 and Travel north towards Route 2 (76.9 km)
    5. Route 2 – Take southbound exit for Route 2 towards Exit 333 (28.0 km)
    6. Route 105 – Head north on Route 105 towards route 8 (41.0 km)
    7. Route 8 – Head east on Route 8 to Irving Bypass Road (48.0 km)
    8. Route 107 – Take Irving Bypass Road to Route 107 (26.0 km)
    9. Head north on Route 107 to Deersdale/Juniper (22.0 km)
    10. From Deersdale either the northern or southern Access Points will be used.
- **Port of Saint John to Project Site**
    1. Head east from Long Wharf Terminal to Route 100 (0.2 km)
    2. Route 100 – Continue on Route 100 in east bound lanes towards Clyde Street after passing the Irving Gas station (1.10 km)
    3. Route 100 – Continue on to 125 Rothesay Avenue (Still Route 100) past Canada Post and veer back to east bound lanes (0.70 km)
    4. Route 100 – Continue towards Route 1 (5.00 km)
    5. Route 1 – Head east on Route 1 towards Route 2 (112.00 km)
    6. Route 2 – Head north on Route 2 towards Exit 333 (91.2 km)
    7. Route 105 – Head north on Route 105 towards Route 8 (40.0 km)
    8. Route 8 – Head east on Route 8 to Irving Bypass Road (48.0 km)
    9. Route 107 – Take Irving Bypass Road to Route 107 (26.0 km)
    10. Head north on Route 107 to Deersdale/Juniper (22.0 km)
    11. From Deersdale either the northern or southern site access points will be used.

5.3.3.3 *Access Roads and On-site mobilization*

The access to site from the two proposed routes will be from either the northern, central or southern access points. Both routes will go to the town of Deersdale and then proceed to the approved access point.

The project site does have an existing resource road network. However, the roads require upgrades to accommodate the transportation of the wide and heavy loads associated with the wind turbine construction. Figure 5-67 displays the site layout with existing access roads and proposed new access roads.

5.3.4 Communications Facilities

As required by the NB DELG (2019) *EIA Sector Guideline: Additional Information Requirements for Wind Turbines*, the location of the site and its WTGs must be discussed with respect to television, microwave, and cellphone transmission facilities; and assessed of the potential for moving turbine blades to block or deflect such signals in line with "Technical Information and Coordination Process Between Wind Turbines and Radiocommunication and Radar Systems" from RABC and CanWEA (2020). As such, the Project has completed a '*Communications and Facility Interference Report'* (H370571-0000-483-066-0001), describing the methods for the assessment of this VC. This Report is included in this EIA Registration as Appendix K.

Radio, Communications and Transmission facilities, as well as their respective consultation zones include the following:

5.3.4.1 *Point-To-Point Systems Above 890 MHz*

Point-to-point systems are a configuration of radiocommunication equipment that connect a receiver and transmitter with directional antennas. According to RABC and CanWEA (2020), point-to-point systems above 890 megahertz (MHz) require a 1 kilometer (km) consultation zone around transmitters and receivers, along with a cylinder connecting the two with a diameter.

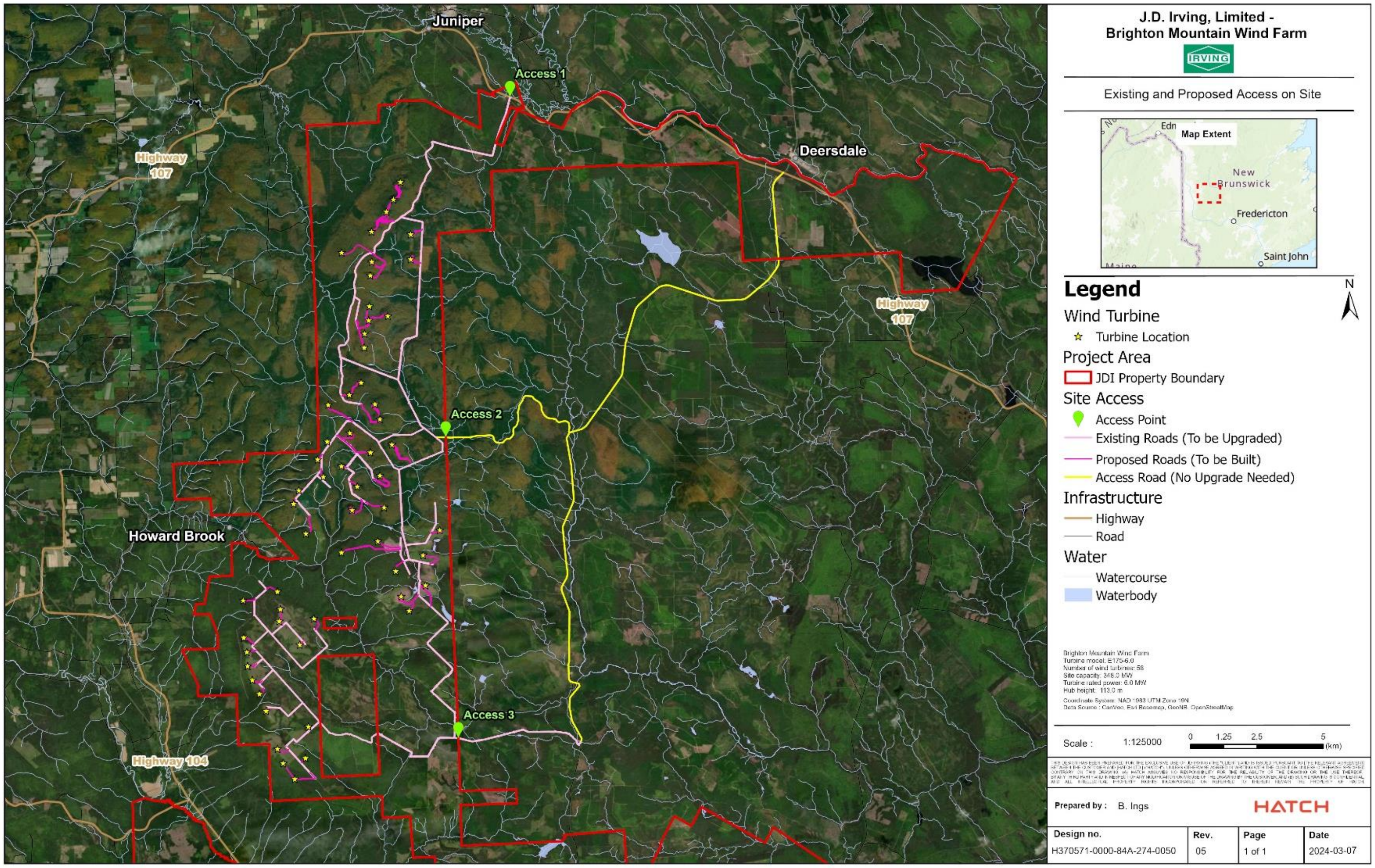

Figure 5-67: Existing and Proposed Access Roads

5.3.4.2 *Broadcast Transmitters*

Broadcast transmitters are radio devices that transmit a radio signal to the public. According to RABC and CanWEA (2020), broadcast transmitters have varying consultation zones depending on what is being broadcast:

- AM stations (omnidirectional): 5 km consultation zone.
- AM stations (directional): 15 km consultation zone.
- FM stations: 2 km consultation zone.
- TV stations: 2 km consultation zone.

Over-the-air reception refers to public broadcasting of digital or analog television. According to RABC and CanWEA (2020), over-the-air reception in reference to analog and digital television broadcasts require consultation when:

- Analog TV service contour overlaps with a 15 km buffer from the closest wind turbine.
- Digital TV service contour overlaps with a 10 km buffer from the closest wind turbine.

5.3.4.3 *Cellular Networks*

Cellular networks are systems of land areas broken into “cells” which are serviced by one or more transceiver, commonly used for mobile phones and other mobile equipment. According to RABC and CanWEA (2020), cellular type networks, land mobile radio networks, and point-to-point systems below 890 MHz have a consultation zone of 1 km around each transmitter/receiver.

5.3.4.4 *Satellite Systems*

Satellite systems are ground stations which receive or transmit signals to/from satellites in space. According RABC and CanWEA (2020), satellite systems require a 500m consultation zone around receivers/transmitters, along with a cone around the signal.

5.3.4.5 *Radars*

Radars (radio detection and ranging) are devices that time the echo of directional radio waves to calculate an objects position. According to RABC and CanWEA (2020), radars have varying consultation zones depending on the type:

- Department of Defence Air Defence Radar: 100 km.
- Department of Defence or Nav Canada Air Traffic Control Primary Surveillance Radar (PSR): 80 km.
- Department of Defence or Nav Canada Air Traffic Control Secondary Surveillance Radar (SSR): 10 km.
- Department of Defence Precision Approach Radar (PAR): 40 km.

- Canadian Coast Guard (CCG) Vessel Traffic Radar System: 60 km.
- Military or civilian airfield: 10 km.
- Environment and Climate Change Canada (ECCC) Weather Radar: 50 km.

5.3.4.6 VOR Beacons

Very High Frequency (VHF) OmniRange (VOR) beacons are radio beacons which are used in aviation to assist navigation. According to RABC and CanWEA (2020), VOR beacons require a consultation zone of 15 km around beacons.

6. Predicted Environmental Impacts and Mitigation

6.1 Assessment of Physical Valued Components Impacts

6.1.1 Groundwater - VC

6.1.1.1 Construction, Operation and Decommissioning Phases – Potential Impact - Groundwater Quality and Quantity

Potential impacts to groundwater quantity, quality or groundwater flow regime, which could potentially impact wells and surface water features, during construction include clearing and grubbing; blasting to obtain aggregate for site construction activities; construction of new or upgrading existing site access roads; construction of laydown areas; turbine foundations and other structures (e.g., tower etc.); and accidental spills of contaminants (e.g., fuels, lubricants etc.) from on-site equipment.

Negligible effects on groundwater resources are anticipated if quarrying operations are above the water table. If quarrying operations are below the water table, groundwater flow could be impacted through vibrational stress and forces in the rock mass, which can create new fractures and increase fracture size for existing fractures. These impacts, if they occur, are typically focused near the blast. Based on the distance from all proposed aggregate quarries to the nearest potable well (4994 m), adverse effects to potable groundwater quantity and quality (e.g., increase water turbidity) are not anticipated.

During the operation phase of the Project, accidental spills of contaminants from on-site maintenance equipment could potentially impact groundwater quality through migration into the groundwater resource (i.e., aquifer), or surface water features via overland flow.

During the decommissioning phase of the project potential impacts to groundwater quality, quantity and groundwater flow regime could result from infrastructure removal, site restoration activities, and accidental spills of contaminants from on-site equipment.

6.1.1.2 Mitigation Measures – Groundwater VC

Mitigation measures to reduce the potential for negative impacts during the construction phase of the project are presented in Table 6-1.

Table 6-1: Potential Impacts and Mitigations - Groundwater

Groundwater Resources						
Impact Number	**Phase**	**Relevant Activity/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
1.1	Construction	12	Blasting for aggregate required for construction of site access roads and/or foundations for wind turbines and associated changes to groundwater distribution and flow, and groundwater quality (e.g. increased turbidity in nearby wells) and aggregate stockpiles	1.1.1	Explosives will be transported in accordance with the *Transportation of Dangerous Goods Act*, and Regulation. Blasting operations will be completed by a certified contractor in accordance with an Approval to Operate to be issued by the NBDELG, as well as in accordance with the federal *Explosives Act* and any Permit issued through Natural Resources Canada (NRCan) under the Act.	Not required
				1.1.2	Blasting will be conducted in accordance with provincial and federal requirements, where applicable, including: •Maintaining a setback of 30 m from a right-of-way boundary of a public highway. •Maintaining a 10 m setback from an existing road or trail on crown land. •Maintaining a setback of 60 m of the ordinary high water mark of any watercourse or wetland, 30 m of any adjacent property, 100 m of a foundation of a building structure, and 600 m of any drinking water well •Maintaining a setback of 100 m of any public highway structure.	
				1.1.3	The number of blasting events will be kept to a minimum, where practicable	
				1.1.4	Erosion and sediment control structures will be installed around the excavation/blasting site, and detailed in a site-specific Environmental Protection Plan	
1.2	Construction	12, 14	Dewatering, if required, during blasting, and/or turbine foundation construction and associated changes to groundwater distribution and flow	1.2.1	Water removed from excavations will not be discharged directly to wetlands or watercourses on the Site. Water removed from excavations will be discharged to vegetated areas greater than 30 m from a watercourse or wetland. Water may be filtered to removed suspended solids before discharging to the environment.	Not required
				1.2.2	Water coming into contact with uncured cement or cementitious waste will not be deposited into or near waterways. Concrete wash water will be handled in accordance with the project EPP.	
				1.2.3	Erosion and sediment control structures will be installed and detailed in a site-specific Environmental Protection Plan	
1.3	Planning Construction Operation and Maintenance Decommissioning	7, 23, 31	Accidental spills of contaminants (e.g., fuel and lubricants) from on-site mechanical equipment infiltration into groundwater resources	1.3.1	Fuel (petroleum products) and lubricants (and any other chemicals) will not be stored within 100 m of a private groundwater well or within 30 m of a sensitive environmental feature (e.g., wetland, watercourse etc.)	Not required
				1.3.2	Mechanical equipment will be kept in good working condition and will be inspected daily for leaks and prior to being brought to site.	
				1.3.3	Spill kits will be kept in strategic locations on the Project site. Stationary and mobile equipment that require fuel will also have dedicated spill kits. Any leaks or accidental	

Groundwater Resources						
Impact Number	**Phase**	**Relevant Activity/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
					spills will be immediately contained, cleaned up and reported in accordance with regulation.	
				1.3.4	Portable washroom facilities for workers will be self contained, inspected and serviced regularly to prevent release of sewage into the environment.	
				1.3.5	Sewage/sludge removed from portable washrooms and from the facilities will be transported offsite for appropriate treatment and disposal.	
				1.3.6	Spill reporting and response procedures will be included in the site-specific Environmental Protection Plan	
				1.3.7	Refueling will be conducted in accordance with the Projects Refueling Procedure to be included in the Environmental Protection Plan.	
				1.3.8	Secondary containment will be required for hazardous material storage, including fuels. Secondary containment capacity is considered to be ≥110% by volume, of the holding tank, or largest container housed in containment. Tanks and onsite storage will comply with applicable Fire Code, as well as the Petroleum Product Storage and Handling Regulation, NB Reg 87-97. For tanks >2000L, this includes the requirement for an Environmental Approval. Tank will also be in compliance with the Canadian Council of Ministers of the Environment (CCME) Environmental Code of Practices for Aboveground and Underground Storage Tank Systems Containing Petroleum Products (CCME 2003). Containers will be maintained in good condition – with no evidence of rust, damage or leaks. Containers also require to be adequately sealed with proper fitting lids, caps, bungs or valves to prevent spills and leaks. Hoses and nozzles used for dispensing fuel should be maintained in good repair, free of leaks, and equipped with automatic shut-offs. All equipment with box-mounted fuel tanks will be accompanied with spill prevention and containment, and clean-up materials that are suitable for the volume of fuel or oils carried.	
1.4	Decommissioning	34, 35	Removal of infrastructure and site restoration	1.4.1	Erosion and sediment control structures will be installed and detailed in the site-specific Environmental Protection Plan	Not required
				1.4.2	Site will be restored to pre-construction conditions as much as practicable	

6.1.1.3 *Significance Determination – Groundwater VC*

An assessment of the significance of the Project on groundwater resources is outlined in Table 6-2. With the proposed mitigation measures employed, the significance of residual effects on groundwater resources is considered to be insignificant.

Table 6-2: Significance Determination of Residual Impacts - Groundwater

Factor	Rating	Rationale
Magnitude	Negligible	Potential impacts to groundwater quantity, quality and flow regime are anticipated to be negligible (no detectable change from baseline conditions) once mitigation measures are implemented
Duration	Short Term	Potential impacts are expected to be short term
Frequency	Sporadic	Potential impacts to groundwater resources from accidental spills, and blasting events are anticipated to be sporadic. Potential impacts to the groundwater flow regime due to construction are anticipated to be a one-time event
Geographic Extent	PF/PDA	Potential impacts to groundwater resources are anticipated to be local
Reversibility	Reversible	Impacts to groundwater resources are reversible with the implementation of the mitigation measures
Ecological Resilience	High	The receiving environment has a high natural resilience to imposed stresses and can respond and adapt to the impact (assimilative capacity is good)
Likelihood	Unlikely	Impacts to groundwater quantity, quality and groundwater flow regime, while possible, are unlikely to occur
Certainty	High	There is good understanding of the cause-effect relationship, and all necessary data are available for the Project. The effectiveness of the mitigation measures is well known. There is a low degree of uncertainty and variation from the predicted impact across a wide range of conditions is expected to be low
Significance	**Not significant**	Residual impacts have low magnitude; local geographic extent; are short-term duration; are either one-time or sporadic and are reversible. Potential impacts are anticipated to be indistinguishable from background conditions

6.1.1.4 Follow-up Monitoring – Groundwater VC

As the potential impacts to groundwater resources are considered to be insignificant for the Project, follow-up monitoring is not required.

6.1.2 Atmospheric Conditions - VC

6.1.2.1 Construction, Operation and Decommissioning Phases - Potential Impact - Air Quality

During construction and decommissioning, there is potential for localized impacts to ambient air quality due to releases from combustion of diesel fuel in heavy equipment and fugitive dust associated with construction activities.

No substantive sources of air contaminants are expected during operation. Potential for releases of fugitive dust and combustion gases are expected from vehicles and equipment associated with maintenance activities during operation, however, these releases are expected to be short-term and very localized (confined to the PDA). Therefore, no significant impacts to air quality in the LAA/CAA are expected during operation.

6.1.2.1.1 Air Quality Dispersion Modelling

Plume dispersion modelling of air contaminant releases from construction activities was conducted to assess potential changes to air quality in the LAA/CAA.

6.1.2.1.1.1 Emissions Estimates

Air contaminants expected to be released in substantive quantities from construction activities that were considered in the assessment include the following:

- Total Suspended Particulate Matter (TSP);
- Particulate Matter with Aerodynamic Diameters ≤ 10 Microns (PM_{10});
- Particulate Matter with Aerodynamic Diameters ≤ 2.5 Microns ($PM_{2.5}$);
- Nitrogen Oxides (NO_X); and
- Carbon monoxide (CO).

Since construction equipment will be fueled using Ultra-Low Sulphur Diesel (ULSD) (<15 ppm sulphur content), releases of sulphur dioxide (SO_2) are expected to be negligible and therefore, not considered further in the assessment.

The equipment that are expected to be used during construction activities are listed in Table 6-3.

Table 6-3: Expected Construction Equipment

Equipment/Activity	Expected Operation Total[(d)] (hours)	Expected Operation Daily (hours)	Total Diesel Consumption (L)	Engine Rating[(a)] (kW)	Maximum Fuel Consumption[(b)] (L/h)	Emission Standard [(c)]
Transportation and Delivery of Turbine Components						
Semi-Trailer Truck	NA	NA	187,175	NA	NA	Tier 3
Cranes (Miscellaneous)	NA	NA	1,170,240	NA	NA	Tier 3
Sub-total	**-**	**-**	***1,357,415***	**-**	**-**	**-**
Civil Earthworks						
Civil and Site Development Typical Crew	2,200	NA	44,000	NA	NA	Tier 3
Concrete Typical Crew	700	NA	7,000	NA	NA	Tier 3
Ford F450 - Service Truck	99,100	6	173,623	354	49.2	Tier 3
Bobcat S66	500	8	1,900	55.4	2.7	Tier 4
Cat 315 Excavator	27,700	12	249,300	82.0	11.4	Tier 4
Cat 336 Excavator	17,000	12	408,000	228	31.7	Tier 4
Cat 950 Loaders	12,000	12	144,000	189	26.2	Tier 4
Cat 966 Loaders	8,100	12	121,500	242	33.7	Tier 4
Cat D4 Dozer	13,100	12	144,100	96.9	13.5	Tier 4
Cat D6 Dozer	12,000	12	216,000	160	22.3	Tier 4
Cat D8 Dozer	5,000	12	165,000	264	36.7	Tier 4
Cat 140 Grader	6,100	12	97,600	186	25.9	Tier 4
Cat CS563 Roller	12,800	12	166,400	108	15.0	Tier 4
Tandem Dump Truck	31,400	12	549,500	149	20.7	Tier 3
40 tonne Offroad Rock Truck	15,000	12	270,000	264	36.7	Tier 4
Flatbed Truck	1,600	6	28,000	149	20.7	Tier 3
Semi-Trailer Truck 2	12,300	6	206,640	149	20.7	Tier 3
Water Truck	1,800	6	31,500	149	20.7	Tier 3
350T Mobile Crane [(e)]	8,100	8	486,000	180	18.2	Tier 3
90T Mobile Crane [(e)]	300	8	10,500	100	18.2	Tier 3
Other Miscellaneous Equipment (2%)	NA	NA	103,080	NA	NA	Tier 3
Sub-total	**-**	**-**	***3,899,643***	**-**	***424***	**-**
Power Generation						
Concrete Batch Plant Generator	13,140	12	1,807,959	1,136	268	Tier 3
Tower Crane K-1650-L - 400 kVA Generator	4,600	12	276,000	409	96.4	Tier 3

Equipment/Activity	Expected Operation		Total Diesel Consumption (L)	Engine Rating[a] (kW)	Maximum Fuel Consumption[b] (L/h)	Emission Standard [c]
	Total[d] (hours)	Daily (hours)				
Sub-total	-	-	***2,083,959***	-	***364***	-
TOTAL	-	-	**7,341,016**	-	**789**	-

[a] Engine shaft power
[b] Estimated maximum fuel consumption based on rated power
[c] U.S. EPA NONROAD Emission Standard Assumed
[d] Total over construction period
[e] Crane lift engine rating, does not consider drive train engine
NA Equipment breakdown not available

The areas used to estimate fugitive emissions from earthworks activities during construction are shown in Table 6-4.

Table 6-4: Assumed Earthworks Construction Areas Used for Emission Estimates

Activity	Area (ha)
Access Roads (new)	73.5
Turbine/crane pads/foundations	60.5
Substations	28.7
Batch plant and quarry	141
TOTAL	**304**

Air contaminant emissions from combustion of diesel fuel in heavy equipment and diesel generators were estimated using anticipated fuel consumption rates and US EPA *Nonroad Emission Standards for Compression Ignition Engines* (US EPA 2016). GHG emissions from the mobile construction equipment and diesel generators were estimated using emission factors for engines from the Canadian National Inventory Report - 2023 Edition Part 2 (ECCC, 2023e). The list of equipment used in the emissions estimates is provided in Table 6-3.

Fugitive emissions of particulate matter were also estimated for construction activities involving earthworks. The emissions were estimated using the WRAP Fugitive Dust Handbook Level 01 PM_{10} emission factor for Construction Operations (i.e., 0.11 tons/acre/month), where only the area and duration of activities are known (Countess Environmental 2006). The area used for the estimate where earthworks are expected was assumed based on the project components listed in the Project Description and are presented in Table 6-4. Based on the construction schedule presented in the Project Description, a total of 36 months was assumed for earthworks activities, which was used for the estimate of fugitive PM_{10} emissions. The air contaminant and GHG release estimates for construction over the complete construction period of approximately 3 years are provided in Table 6-5.

Table 6-5: Air Contaminant and GHG Emission Estimates for the Construction Period

Activity	Equipment	Emissions (t)								
		TSP	PM_{10}	$PM_{2.5}$	NO_x	CO	CO_2	CH_4	N_2O	CO_2eq
General Construction activities in the PDA - Fugitive Dust	Equipment movements and earthworks	29,417	2,702	562	-	-	-	-	-	-
Transportation and Delivery of Turbine Components	Mobile equipment[(a)]	1.16	1.16	1.16	21.7	20.1	3,639	0.0991	0.0299	3,649
Civil Earthworks	Mobile equipment[(a)]	1.74	1.74	1.74	32.3	60.8	9,713	0.2645	0.0797	9,742
Power Generation	Crane and Concrete batch plant/diesel generators[(a)]	3.24	3.24	3.24	97.2	56.2	10,169	0.277	0.0835	10,198
TOTAL	**-**	26,423	2,708	568	151	137	23,520	0.641	0.193	23,589

(a) Estimated based on rated shaft power and U.S. EPA NONROAD CI Equipment Load Factors (US EPA 2010)

t metric tonnes, total released over the construction period (3 years)

6.1.2.1.1.2 Screening Modelling Approach

Plume dispersion modelling was conducted using the most recent version of the U.S. EPA model AERSCREEN (i.e., v2112), which is the screening level version of the American Meteorological Society (AMS) and U.S. EPA developed regulatory model, AERMOD. The maximum potential emissions during construction were modelled to establish the resulting worst-case ground level concentrations off-site.

The civil earthworks construction activities are expected to result in the highest short-term emission rates, as it is expected that more heavy equipment would be operating in close proximity to one another during these activities. The turbine foundation areas are the closest areas of the PDA to the property boundary. Thus, activities in these areas (turbine pad sites) are likely to lead to the highest potential ground-level concentrations off-site. The closest turbine foundation area to the property boundary is Turbine 49, which is located approximately 150 m from the property boundary (based on the current PDA). This distance was used in the model to establish potential maximum off-site concentrations.

It is assumed that there would be sufficient distance between activities that may be occurring concurrently at other turbine pad locations and areas with land clearing activities, such that exhaust, and fugitive dust plumes would not overlap where air contaminant concentrations off-site would be impacted substantively.

Emissions estimated from civil earthworks, including fugitive dust, heavy equipment engine exhaust and batch plant diesel generators as indicated in Table 6-3.

, were combined and modelled as a volume source in AERSCREEN. Air contaminant releases from transportation and delivery of wind turbine components were not included with the modelled emission rates. Additionally, emissions from the tower crane generator were not modelled since it is assumed that turbine erection would occur once the most intensive earthworks activities are mostly complete at the individual turbine pad sites. The model input source parameters are shown in Table 6-6.

Releases of NO_x from fuel combustion primarily consist of Nitrogen Oxide (NO) and Nitrogen Dioxide (NO_2). For most combustion processes, NO makes up most of the NO_x emission at the point of release, which is oxidized to NO_2 as the exhaust plume travels downwind through reactions with ambient oxygen and ozone. Since NO_2 is the regulated compound, a method for estimating conversion of NO_x to NO_2 is required. For this assessment, complete conversion of NO_x to NO_2 was conservatively assumed for the modelling.

The maximum AERSCREEN predicted concentrations were combined with measured background concentrations, based on data measured at the Fredericton AAQM station, as described in Section 3.2.2. Background concentrations were added to maximum model predictions to assess cumulative effects. The background concentrations used in the modelling are provided in Table 6-7.

Table 6-6: Model input Source Parameters - Construction

Parameter		Value
Source Dimensions (m)		
Initial Horizontal Plume Dimension, σ_y		23.3
Initial Vertical Plume Dimension, σ_z		0.698
Release Height		3.00
Distance to Property Boundary		150
Air Contaminant Emissions (g/s)		
TSP	Hourly	1.17
	Daily	1.09
PM_{10}	Hourly	0.227
	Daily	0.149
$PM_{2.5}$	Hourly	0.151
	Daily	0.0734
NO_x	Hourly	3.19
	Daily	1.38
CO	Hourly	3.33
	Daily	1.45

Table 6-7: Background Concentrations Applied to the Model Results

Air Contaminant	Averaging Period	Background Concentration ($\mu g/m^3$)	NBDELG Objective ($\mu g/m^3$)	CAAQS (2020/2025) ($\mu g/m^3$)	Percentage of Applicable Limit (%)
$PM_{2.5}$	24-hour[(a)]	14.8	-	27	55%
	Annual[(b)]	6.01	-	8.8	68%
NO_2	1-hour[(c)]	50.0	400	113 / 79	12%
	24-hour[(d)]	9.41	200	-	5%
	Annual[(b)]	5.19	100	32 / 23	5%

(a) Three-year rolling average of 98th percentile of 24-hour average concentrations
(b) Annual maximum from 2020 to 2023
(c) Three-year rolling average of 98th percentile of Daily 1-Hour maximum concentrations
(d) Maximum 24-hour average calculated with hourly values >90th percentile excluded.

6.1.2.1.1.3 Screen Modelling Results

The dispersion modelling results for construction are presented in Table 6-8. The maximum predicted concentrations, combined with measured background, are compared with the applicable objectives and standards. The maximum predicted concentrations, including background, were within the applicable objectives and standards at downwind locations outside the PDA. The predicted 24-hour $PM_{2.5}$ and 1-hour NO_2 concentrations, including background, are plotted against the downwind distance from the source in Figure 6-1. The 1-hour objective for NO_2 and 24-hour CAAQS for $PM_{2.5}$ are also shown for comparison. As indicated in Figure 6-1, the maximum predicted concentration occurs approximately 250 m downwind of the source location, which is ~100 m downwind of the PDA boundary.

Construction activities are expected to result in increased air contaminant concentrations offsite (outside the PDA) on occasion. However, given the transient nature of the releases during construction, periods with elevated concentrations are expected to be short duration and based on the results of the modelling conducted, exceedances of ambient air quality objectives and standards are not likely to occur.

Table 6-8: Screening Air Quality Dispersion Modelling Results - Construction

Air Contaminant	Averaging Period	Background Concentration (µg/m³)	Maximum Predicted Concentration (µg/m³)	Background + Predicted Maximum (µg/m³)	NB MPGLCs (µg/m³)	CAAQS (µg/m³)	Percent of Objective/ Standard
TSP	24-hour	NA	62.1	62.1	120	-	52%
	Annual	NA	10.4	10.4	70	-	15%
PM_{10}	24-hour	NA	8.48	8.48	-	-	-
	Annual	NA	1.41	1.41	-	-	-
$PM_{2.5}$	24-hour	14.8	4.18	19.0	-	27	70%
	Annual	6.01	0.697	6.71	-	8.8	76%
NO_2	1-hour	50.0	303	353	400	79	88%
	24-hour	9.41	78.4	87.8	200	-	44%
	Annual	5.19	13.1	18.2	100	23	18%
CO	1-hour	NA	316	316	35,000	-	<1%
	8-hour	NA	284	284	15,000	-	2%

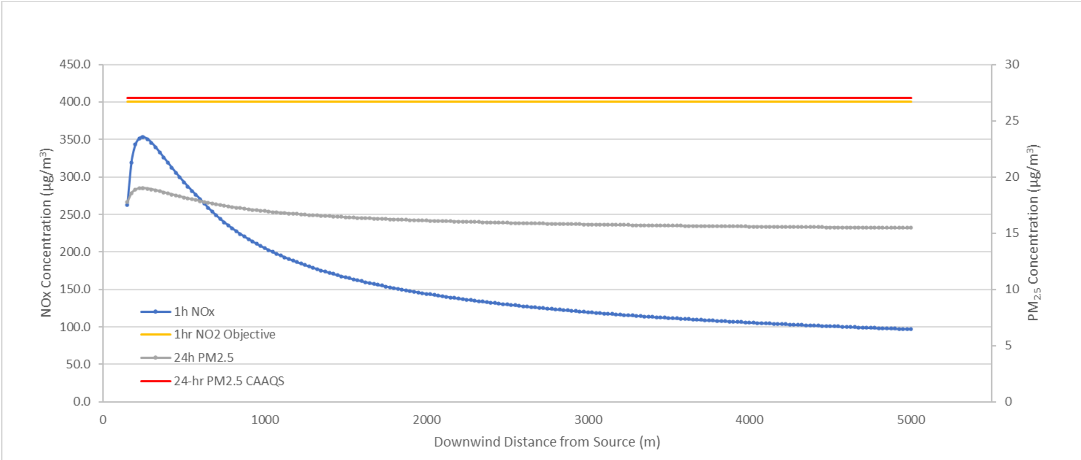

Figure 6-1: AERSCREEN Predicted NO_2 and $PM_{2.5}$ Concentrations

6.1.2.2 Construction, Operation and Decommissioning Phases - Potential Impact - GHG

6.1.2.2.1 Releases from Vehicles

During construction and decommissioning, there is potential for increases in GHG releases from combustion of diesel fuel in heavy equipment and vehicles used during construction activities. Estimated releases of GHG during construction are provided above in Table 5-3. A total of 23,589 tonnes CO_2eq is estimated to be released over the 3-year construction period, based on expected fuel consumption in heavy equipment, large vehicles and diesel generators.

No substantive sources of GHG releases are expected during operation and the Project is expected to reduce NB provincial GHG emissions from offsetting fossil usage for electricity generation, as described below. Therefore, no significant adverse impacts to GHG are expected during operation.

6.1.2.2.2 Offsets Associated with Project

According to the *National Inventory Report 1990-2021: Greenhouse Gas Sources and Sinks in Canada* (NIR), in 2021, GHG emissions from NB were estimated at 11.9 Mt/a CO_2eq. Of the 11.9 Mt CO_2eq/a, 3.39 Mt CO_2eq/a were released directly from electricity generated through the combustion of fossil fuels. In consideration of the total electricity generated (i.e., power generation with no direct GHG emissions combined with power generation from fossil fuel combustion), the grid had a GHG emisison intensity of 290 g CO_2eq/kWh in 2021 (ECCC, 2023e).

When fully implemented, the Project's 350 MW of wind energy has the potential to reduce GHG emissions by approximately 1.1 Mt/a of CO_2eq (based on information from the 2023 NIR for the 2021 calendar year). This will result in a potential reduction of total GHG emissions year over year by approximately 9% in NB. Furthermore, GHGs released as a result of electricity generation in NB could be reduced by 33%, leading to a decrease of approximately 100 g CO_2eq/kWh in grid GHG intensity (from approximately 290 to 190 g CO_2eq/kWh). The potential GHG reductions are based on the assumption that the Project will only offset power generated from combustion of fossil fuels and that other generation with no direct GHG emissions will be constant using the most recently available data from 2021.

Although the project will result in a potential reduction in GHG emissions by reducing reliance on fossil fuels for electricity generation, additional land clearing associated with the project will result in the loss of vegetation and associated carbon sinks. However, it is anticipated that the project will have a net positive effect on GHG emissions and climate. Therefore, no adverse impacts to GHG are expected during operation. A summary of the GHG Offset calculations and assumptions are presented in Table 6-9.

Table 6-9: Summary of GHG Offset Emissions

Electricity Generation Type	Direct GHG Emissions (kt CO_2 e)	Electricity Generation (GWh)	Combustion Emission Intensity (g CO_2 e/kWh)	Grid Generation Fraction (%)
Current - 2021 NIR report				
2021 NB Provincial total	11,900	-	-	-
2021 NB GHG total from electricity generation	3,390	11,800	**290**	100%
Combustion total - Current	3,390	3,950	858	**33%**
Electricity from zero direct GHG generating sources - Current	0	7,810	0	**66%**
Nuclear	-	4,420	-	-
Hydro	-	2,630	-	-
Other renewables	-	760	-	-
Future – Project Case - 350 MW				
Future NB GHG total from electricity generation	2,746	11,800	**190**	100%
Combustion total - Future	2,270	2,720	835	**23%**
Electricity from zero direct GHG generating sources – Future	0	9,050	0	**77%**
Project	-	1,240	-	-
Nuclear	-	4,420	-	-
Hydro	-	2,630	-	-
Other renewables + Project	-	2,000	-	-
Assumptions: - the electricity generated from the project will only offset electricity generated from fossil fuel combustion, assumed to be an even split between the three fuel type classifications in the NIR (coal, natural gas, other). - the total provincial electricity generation will not change from the 2021 levels for both phase 1 and phase 2 of the project (11.8k GWh/yr). - electricity generated from sources with no direct GHG emissions (nuclear, hydro and other renewables) are assumed to be constant in the future (i.e., consistent with 2021 levels). - future emission intensities for fossil fuels will be constant, i.e., NB future GHG emission intensities for coal, natural gas and other fossil fuel will be consistent with 2021 levels. Data Source: National Inventory Report (NIR) 1990-2021: Greenhouse Gas Sources and Sinks in Canada (2023 Edition), Part 3, Table A13-5 (ECCC 2023				

6.1.2.3 Mitigation Measures – Atmospheric Conditions VC

A list of the possible impacts of this project and the associated mitigation measures for these impacts are summarized in Table 6-10.

Table 6-10: Potential Impacts and Mitigation Measures – Atmospheric Conditions

Atmospheric Conditions						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
2.1	Planning Construction Operation Decommissioning	8, 9, 10, 11, 12, 13, 14, 15, 18, 26, 27, 28, 29, 32, 33, 34, 35	Local air quality may be affected through fugitive dust from the access roads and equipment movements during construction and decommissioning as well as minimal dust associated with blasting activities	2.1.1	An Air Quality and Dust Management Plan will be prepared as a component of the EPP and implemented for the construction phase.	Not required
				2.1.2	Fugitive dust, especially during dry and windy weather conditions, will be controlled with the application of water twice a day or as required in unpaved areas frequented by heavy machinery. Other dust suppressants (e.g., calcium chloride) may be used, where permitted.	
				2.1.3	When hauling material that is prone to creating dust loads will be covered.	
				2.1.4	Limit general site traffic to established routes.	
				2.1.5	Loading and unloading of material will be performed in such a way to limit dust generation.	
				2.1.6	Vehicles on unpaved roads will be limited to a speed limit of 40 kph or less.	
				2.1.7	The burning of waste brush material will not be undertaken unless permitted.	
2.2	Planning Construction Operation Decommissioning	8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 26, 27, 28, 29, 32, 33, 34, 35	Local air quality may be affected by emissions from generators, construction vehicles and machinery as well as minimal blasting activities, concrete batch plant and quarry. Equipment used for construction will generally consist of trucks, bulldozers, graders, backhoes, cranes, and other heavy equipment.	2.2.1	All vehicles and machinery will comply with current emission standards and will be used efficiently, minimizing distances travelled whenever possible.	Not required
				2.2.2	Vehicles used will be inspected regularly.	
				2.2.3	Idling of vehicle engines, equipment and machinery will be avoided (unless queuing for a job or an operation).	
				2.2.4	Maintain vehicle emission control systems in accordance with manufacturers' specifications.	
2.3	Planning Construction Operation Decommissioning	8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 26, 27, 28, 29, 32, 33, 34, 35	GHGs such as Carbon Dioxide (CO_2), Methane (CH_4) and Nitrous Oxide (N_2O) will be emitted from generators, vehicles and construction equipment.	2.3.1	All vehicles and machinery will comply with current emission standards and will be used efficiently, minimizing distances travelled whenever possible.	Not required
				2.3.2	Vehicles used will be inspected regularly	
				2.3.3	Use of electric vehicles will be considered for site operations.	
				2.3.4	Removal of vegetation and topsoil shall be minimized as far as practical. Vegetation shall be reinstated as soon as possible to minimize loss of carbon sinks.	
				2.3.5	Idling of vehicle engines, equipment and machinery will be avoided (unless queuing for a job or an operation).	
2.4	Planning Construction Operations Decommissioning	2, 7, 23, 31	Accidents or spills of volatile compounds will decrease the air quality in the area.	2.4.1	Spill reporting and response procedures will be included in the site-specific Environmental Protection Plan	Not required

6.1.2.4 *Significance Determination – Atmospheric Conditions VC*

The Significance Determination of Residual impacts is provided in Table 6-11. The Project will help global long-term efforts to slow climate change and local efforts to achieve net-zero emissions. As such, the significance of residual effects on atmospheric conditions is to be considered not significant, and rather beneficial. Also, the Project will use the wind resource in the local area over the lifetime of the Project. Because the Project will use a renewable resource (i.e., wind) to produce electricity, the significance of residual effects on the wind resource is considered, not significant.

6.1.2.4.1 Air Quality

Potential impacts to air quality are anticipated to be minor to moderate as during construction local ambient air quality could be reduced on occasion where ambient limits may be met or exceeded. The duration is expected to be long term as the Project life will be more than 30 years (for construction, operation and decommissioning phases). The frequency of impacts will be regular during construction as air contaminant emissions generating activities will occur regularly and sporadic during operation and decommissioning as impacts may only occur during maintenance activities, which are not regularly scheduled. The Geographic extent for impacts will be localized to the PF as air contaminant releases are expected to be localized in the area that activities occur. Impacts will be reversible as air quality will return to background after decommissioning of the Project. There is a high resilience to imposed stresses as the receiving environment has a high natural resilience to imposed stresses and can respond and adapt to the impact, i.e., assimilative capacity is good. The likelihood of impacts to air quality is low to medium as releases are expected, however with mitigation impact is likely to be minimal. Residual impacts have minor to moderate magnitude; local extent; and are regular and reversible. Potential residual impacts on air quality are anticipated to be ‘Not significant’.

6.1.2.4.2 Wind Resource

Potential impacts to winds are anticipated to be minor as wake effects are expected during operation where local winds may be influenced on occasion. However, it is anticipated that the effects would be localized. The duration is expected to be long term as the Project life will be more than 30 years (for construction, operation and decommissioning phases). The frequency of impacts will be regular during operation. The Geographic extent for impacts will be localized to the LAA. Impacts will be reversible as conditions will return to the baseline after decommissioning of the Project. There is a high resilience to imposed stresses as the receiving environment has a high natural resilience to imposed stresses and can respond and adapt to the impact, i.e., assimilative capacity is good since there are no other wind farms in the area that would be impacted by wake effects of the Project. The likelihood of impacts to winds is high as wake effects could influence local winds on occasion. Residual impacts have minor magnitude; local extent; and are regular and reversible. Potential residual impacts on winds are anticipated to be ‘Not significant’.

6.1.2.4.3 GHG and Climate

Potential impacts to GHG and Climate are anticipated to be minor to moderate as construction activities will result in a marginal increase in GHG emissions. During operation and decommissioning there are no substantive sources of GHG. The duration is expected to be long term as the Project life will be more than 30 years (for construction, operation and decommissioning phases). The frequency of impacts will be regular during construction as GHG generating activities will occur regularly and sporadic during operation and decommissioning as impacts may only occur during maintenance activities, which are not regularly scheduled. The Geographic extent for impacts will be beyond the LAA as climate change is a global concern. Impacts will be reversible as GHG releases will cease after decommissioning of the Project and the operation of the Project will result in a reduction in provincial GHG emissions from offsetting fossil combustion for power generation. There is a low resilience to imposed stresses as the receiving environment will not easily adapt to the impact, as climate change is already occurring due to anthropogenic GHG emissions, thus, the assimilative capacity is low and any increase in GHG emissions (during construction) is expected to have a negative impact. The likelihood of impacts to GHG and climate is low to medium as GHG releases are expected during construction, however, operation of the project will result in a reduction in GHG emissions. Residual impacts have minor to moderate magnitude; regional extent; and are regular and reversible. Potential residual impacts on HG and climate are anticipated to be 'Not significant'.

A summary Table for all Residual Impacts is provided in Table 6-11.

Table 6-11: Significance Determination of Residual Impacts – Atmospheric Conditions

Impact	Project Phase	Magnitude	Duration	Frequency	Geographic Extent	Reversibility	Ecol. Resilience	Certainty	Likelihood	Significance
Air Quality	C/D, O	Moderate	Short term	Regular	PDA	Reversible	High	High	Medium	**Not Significant**
Winds	C/D, O	Minor	Long term	Regular	LAA	Reversible	High	High	High	**Not Significant**
GHG and Climate	C/D, O	Minor	Long term	Regular	Beyond LAA	Reversible	Low	High	Medium	**Not Significant**

* P refers to the Planning Phase, C/D refers to the Construction and Decommissioning Phases, and O refers to the Operational Phase

6.1.2.5 Follow-up Monitoring – Atmospheric VC

Follow-up monitoring is not required; however, wind monitoring campaign will continue for a minimum period of two (2) years from all MET Mast towers and the Lidar unit to inform engineering.

6.1.3 Noise - VC

A ‘Construction and Operational Noise Assessment’ Report was completed by Hatch in and is included in Appendix B. The following sections provide an overview of the results.

6.1.3.1 Construction, and Decommissioning Phases - Potential Impact – Construction Noise

6.1.3.1.1 Construction Noise Assessment Methodology

There are no regulations in New Brunswick regarding construction noise. Therefore, suitable guidelines have been adopted from the U.S. Department of Transportation, Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment Manual (2018). The combined noise level from two of the noisiest equipment for each construction activity was used to determine the noise impact of each construction stage. If construction noise levels were to exceed the levels outlined in Table 6-12, there may be adverse, short-term reaction from nearby receptors (i.e., remote cabins owners), wildlife or local land users in the direct vicinity.

Table 6-12: General Assessment - Construction Noise Criteria

Land Use	Leq- 1hr [dB(A)]	
	Day (7:00 a.m. to 10:00 p.m.)	Night (10:00 p.m. to 7:00 a.m.)
Residential	90	80
Commercial	100	100
Industrial	100	100

6.1.3.1.2 Construction Sources of Noise

To inform if the construction noise criteria would be exceeded, a construction equipment inventory list has been provided by the Civil Contractor. The anticipated loudest equipment from this fleet to be utilized onsite, with typical sound pressure levels (SPL) at 50 feet or 15.24 m are shown in Table 6-13. Noise levels from equipment were taken from the FTA Transit Noise and Vibration Impact Assessment Manual (2018) and the BSI British Standards Code of practice for noise and vibration control on construction and open sites.

Table 6-13: Construction Equipment and Noise Levels

Equipment	SPL at 15.24 m from equipment (dBA)
Tracked Excavator	81
Excavator	76
Dozer	85
Dump Truck	82
Backhoe	80

Equipment	SPL at 15.24 m from equipment (dBA)
Loader	85
Grader	85
Drill Rig	81
Heavy Truck	88
Crawler Crane (Liebherr 1700)	76
Tower Crane (Kroll K1650L)	88

From the list of equipment, it was determined that the two noisiest equipment were the heavy trucks and the tower cranes. The noise from the Kroll K1650L crane is estimated from the FTA manual tower crane sound pressure level and includes the machinery, motors, and generator during operation.

6.1.3.1.3 Construction Noise Assessment Results

The combined noise level from the two noisiest equipment identified were used to calculate the daytime and nighttime Construction Noise Zone of Influence (ZOI) as shown in Table 6-14. The construction noise ZOI is the distance away from the equipment where the noise limits from Table 6-12 are reached. All receptor locations are more than 54 m away from the construction footprint, so no receptors fall within the ZOI.

Table 6-14: Construction Noise ZOI

Receptor	Land Use	Receptor Distance from Construction Footprint (m)	Noise ZOI [m]		Within ZOI
			Day	Night	Yes/No
Receptor 1	Residential	890	17	54	No
Receptor 2	Residential	170			No
Receptor 3	Residential	930			No
Receptor 4	Residential	2000			No
Receptor 5	Residential	130			No
Receptor 6	Residential	1200			No
Receptor 7	Residential	1700			No
Receptor 8	Residential	1690			No
Receptor 9	Residential	1250			No
Receptor 10	Residential	550			No

There are no receptors that fall within the construction noise ZOI. Thus, noise mitigation is not required. Although construction noise is temporary in nature, construction best practices will still be applied to the extent possible to minimize any potential disturbances to the surrounding environment and are provided Table 6-20 (Mitigation Measures).

6.1.3.2 Construction, Operation and Decommissioning Phases - Potential Impact – Operational Noise

6.1.3.2.1 Operational Noise Assessment Methodology

The NB DELG (2019), *Additional Information Requirements for Wind Turbines*, provides adequate guidelines for the assessment and limits for allowable community noise emissions from industrial windfarms. In summary, a noise impact assessment is required for all noise sensitive locations within 1 km of the nearest turbine and must demonstrate compliance with the noise criteria predicted at the building exterior, as set out in Table 6-15.

Table 6-15: New Brunswick Sector Guidelines for Wind Turbine Noise

Wind Speed m/s	Noise Criteria[8] dBA
4	40
5	40
6	40
7	43
8	45
9	49
10	51
11	53
12	53
13	53
14	53
15	53

The operational noise assessment was completed using the CadnaA software application developed by DataKustik. CadnaA models atmospheric sound propagation following the ISO 9613-2 standard. ISO 9613, '*Acoustics-Attenuation of sound during propagation outdoors'* is an internationally recognized standard, and an acceptable methodology as per the NB DELG EIA *Sector Guidance Document* (2019). The model considers geometrical dispersion, atmospheric decay, ground absorption and ground topography. The ISO 9613-2 model has been used across Canada, and the world to predict the cumulative noise impact of wind turbines.

Two scenarios were modelled, with and without a Noise Reduction (NR) Mode applied to WTGs. NR Mode is an available feature on selected WTGs, such as the Enercon E-175. For the worst-case scenario (i.e., 'without NR' mode), is presented.

The noise spectrum for the Enercon E-175 Wind Turbine (directly at the source) operating with a wind speed ranging from the cut-in wind speed of 4 m/s to the cut-out wind speed of 20 m/s can be found in Table 6-16.

Table 6-16: Sound Power Spectrum for Enercon E-175 Wind Turbine Up to Cut-Out Wind Speed

Wind Turbine Type	Wind Speed	Capacity	Octave Band Center Frequencies, Sound Power, dB								Overall dBA
	m/s	MW	63	125	250	500	1000	2000	4000	8000	
Enercon E-175	Cut-out (20 m/s)	6.0	113.2	110.0	105.2	101.6	102.3	99.2	92.8	84.6	106.5
	15		113.2	110.0	105.2	101.6	102.3	99.2	92.8	84.6	106.5
	14		113.2	110.0	105.2	101.6	102.3	99.2	92.8	84.6	106.5
	13		113.2	110.0	105.2	101.6	102.3	99.2	92.8	84.6	106.5
	12		113.2	110.0	105.2	101.6	102.3	99.2	92.8	84.6	106.5
	11		113.2	110.0	105.2	101.6	102.3	99.2	92.8	84.6	106.5
	10		112.7	109.5	104.7	101.1	101.8	98.7	92.3	84.1	106.0
	9		112.4	109.2	104.4	100.8	101.5	98.4	92	83.8	105.7
	8		112.0	108.8	104.0	100.4	101.1	98.0	91.6	83.4	105.3
	7		109.0	105.8	101.0	97.4	98.1	95.0	88.6	80.4	102.3
	6		105.7	102.5	97.7	94.1	94.8	91.7	85.3	77.1	99.0
	5		103.1	99.9	95.1	91.5	92.2	89.1	82.7	74.5	96.4
	4		103.1	99.9	95.1	91.5	92.2	89.1	82.7	74.5	96.4

Transformer Nosie emissions originating from the two planned substation, were also included in the assessment.

The sound power spectrum directly at the source for the three (3) transformers for both turbine substations can be found in Table 6-17.

Table 6-17: Transformer Noise Emissions

Capacity	Octave Band Center Frequencies, Sound Power, dB									Overall dBA
MW	31.5	63	125	250	500	1000	2000	4000	8000	
80 MVA 345 kV, North Substation	98.2	104.2	106.2	101.2	101.2	95.2	90.2	85.2	78.2	101.5
106 MVA 345 kV, North Substation	99.7	105.7	107.7	102.7	102.7	96.7	91.7	86.7	79.7	103.0
133 MVA 345 kV, South Substation	100.9	106.9	108.9	103.9	103.9	97.9	92.9	87.9	80.9	104.3

6.1.3.2.2 Operational Noise Impact Results

The six (6) Noise Monitoring (NM) locations used in the baseline noise report, have been referenced in the noise model. The modelled noise levels at these locations are strictly used to quantify the change in the noise environment.

The NM locations were modelled at a height of 1.5 m for direct comparison to the measured levels. The sound power of the wind turbines was modelled as 106.5 dBA which represents the worst-case change in the noise environment as the wind turbine is the loudest when operating between 11 m/s to the cut-out wind speed of 20 m/s.

As shown in Table 6-16, the turbine sound power remains as 106.5 dBA when operating in a wind speed from 11 m/s to 20 m/s.

Table 6-18 below, summarizes the measured noise level at the noise monitoring (NM) locations selected in the baseline noise assessment (Appendix A) versus the modelled noise at the same location once the wind turbines are operational. The change in the noise environment is generally louder and is dependent on the proximity to the wind turbines. For example, NM 5 is within 0.3 km of a wind turbine and experiences a change in the noise environment of up to 26 dB during the nighttime.

Table 6-18: Modelled Operational Noise versus Measured Baseline (No NR mode)

Location	Wind Speed m/s	Measured from Baseline Report $L_{eq,1hr}$, (dBA)			Modelled, $L_{eq,1hr}$, (dBA)		
		Daytime (06:00-18:00)	Evening (18:00-23:00)	Nighttime (23:00-6:00)	Daytime (06:00-18:00)	Evening (18:00-23:00)	Nighttime (23:00-6:00)
NM 1	11 m/s – 20 m/s	27	23	19	29	29	29
NM 2		29	42	31	43	43	43
NM 3		29	25	39	30	30	30
NM 4		22	24	24	40	40	40
NM 5		22	21	19	41	41	41
NM 6		25	21	19	43	43	43

Table 6-19 below summarizes the predicted receptor levels during nighttime noise, compared to the noise criteria prescribed by the NB-DELG sector guideline (2019). All receptors are within the noise criteria, as the turbine layout has been designed and validated to ensure noise generated from turbines will remain below acceptable levels at sensitive receptors, therefore Mitigation for operational noise will not be required.

Table 6-19: Receptor Noise Levels (No NR Mode)

Wind Speed m/s	Noise Criteria dBA	Modelled, $L_{eq,1hr}$, (dBA)									
		Receptor 1	Receptor 2	Receptor 3	Receptor 4	Receptor 5	Receptor 6	Receptor 7	Receptor 8	Receptor 9	Receptor 10
4	40	21	21	23	16	31	25	20	22	24	25
5	40	21	21	23	16	31	25	20	22	24	25
6	40	23	24	26	19	33	27	23	24	26	27
7	43	27	27	29	22	36	30	26	28	29	31
8	45	30	30	32	25	39	32	29	31	31	34
9	49	30	31	32	25	40	33	29	31	32	34
10	51	30	31	32	25	40	33	30	31	32	34
11	53	31	32	33	26	40	34	30	32	32	35
12	53	31	32	33	26	40	34	30	32	32	35
13	53	31	32	33	26	40	34	30	32	32	35
14	53	31	32	33	26	40	34	30	32	32	35
15	53	31	32	33	26	40	34	30	32	32	35
Exceedance of noise criteria											

6.1.3.2.3 Conclusion

The operational noise impact of the proposed Brighton Mountain Wind Farm on the surrounding environment has been assessed based on a 58 Enercon E-175 wind turbine layout and two substations. The predicted noise emission of the farm (operating with average winds of 8 m/s) is anticipated to result with an audible noise environment increase between 1 dB to 24 dB above existing baseline noise levels at the noise monitoring locations.

Despite the audible change in the noise environment, all identified nearest receptors to the JDI Property or turbine locations, meet the NB DELG EIA, sector guidelines for wind farm noise.

Receptor 5 will be the closest to approaching the noise limit prescribed in the EIA Sector document (at 6-7 dB from the noise threshold ranging between 33 dBA to 39 dBA when the wind speed is between 6 m/s to 8 m/s).

Figure 6-2 shows the limiting nighttime noise level contour plot calculated at a height of 4.5 m and the worst-case wind speed (up to the cut-out wind speed of 20 m/s). Baseline NM locations, as well as receptors 1 through 10 are also georeferenced.

6.1.3.3 Mitigation Measures – Noise VC

A list of the possible impacts of this project and the associated mitigation measures for these impacts are summarized in Table 6-20.

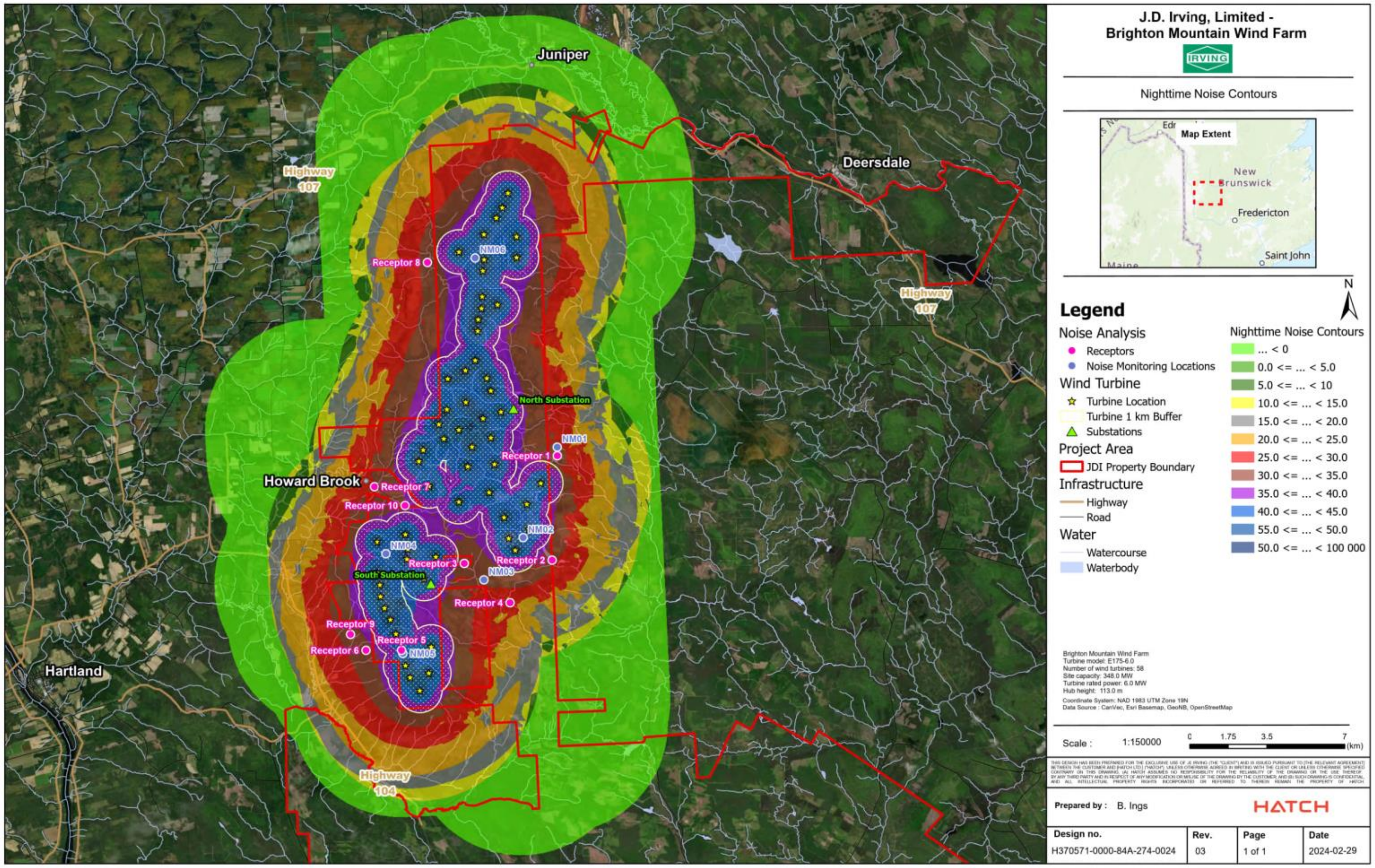

Figure 6-2: Nighttime Noise Contours Modelled without NR Mode

Table 6-20: Potential Impacts and Mitigation Measures - Noise

Noise						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
3.1	Planning Construction Operations Decommissioning	1,3,6,8,9,10,11,12,13,14, 15,16,17,18,19,20,21,30, 32,33,34,35	Noise from construction equipment	3.1.1	Work will be scheduled during the daytime where practical.	Not required
				3.1.2	Locate site access roads, laydown areas and stationary equipment (e.g., generators) as far away as possible from sensitive receptors	
				3.1.3	Whenever possible, plan haul routes to avoid residential areas / receptors	
				3.1.4	Maintain access roads. Design access roads and laydown areas to minimize reversing of trucks/equipment	
				3.1.6	Do not use engine brakes unless necessary	
				3.1.7	Maintain equipment as per manufacturer's instructions	
				3.1.8	Keep engine covers closed	
				3.1.9	Dampen tailgates to avoid banging near sensitive receptors	
				3.1.10	Avoid dropping loads into dump trucks from unnecessary heights	
				3.1.11	Site activities should be planned prior to execution to ensure efficient implementation and prevent unnecessary excess noise. The duration and frequency of noise should be minimized wherever possible. Heavy machinery should be maintained in accordance with the manufacturer's specifications, including appropriate mufflers and other noise-control equipment. Project personnel should ensure idling of construction vehicles is limited	
3.2	Operations	22,24,28,29	Noise from turbine operation	3.2.1	The turbine layout has been designed and validated to ensure noise generated from turbines will remain below acceptable levels at sensitive receptors.	Not required

6.1.3.4 *Significance Determination – Noise VC*

Considering noise during construction is short term, and spatially limited to the PDA, as well that Operational noise will be below Regulatory Threshold within 1 km of WTGs, and reversable once the operational phase of the Project comes to completion, the significance of residual environmental effects is deemed to be 'Not significant, as shown below in Table 6-21.

Table 6-21: Significance Determination if Residual Impacts - Noise

Factor	Rating	Rationale
Magnitude	Minor	Construction noise will be limited to the PDA. Operational noise will stay below guideline levels at all identified receptors.
Duration	Long Term	Impacts will last for the full operational phase of the project.
Frequency	Regular	Operational noise will occur while WTGs are in operation. .
Geographic Extent	LAA	Impacts will be limited to within the local assessment area, and generally confined to within 1 km of WTGs.
Reversibility	Reversible	Impacts will be eliminated upon removal of the turbines.
Ecological Resilience	High	Noise generated will be below threshold for identified receptors, and limited in geographic extent, therefore social and ecological resilience and assimilative capacity is good.
Likelihood	High	Noise will be generated when WTGs are operational, as per manufacturer supplied information. Therefore, the likelihood is high.
Certainty	High	Noise will be generated when WTGs are operational.
Significance	**Not Significant**	Due to the impacts being limited to receptors or the environment, the impact being reversible, and the exposure keeping within guideline amounted, the significance determination is deemed to be 'Not Significant'.

6.1.3.5 Follow-up Monitoring – Noise VC

As the turbine layout has been optimized to ensure Noise related impacts do not exceed regulatory threshold, there is no follow-up monitoring recommended at this time.

6.1.4 Visual – VC

A '*Visual Impact and Shadow Flicker Assessment Report'* (H370571-0000-240-066-0002) was completed by Hatch and is included in Appendix C of this Registration.

6.1.4.1 Construction, Operation and Decommissioning Phases – Potential Impact – Visual Aesthetics

6.1.4.1.1 Visual Aesthetics – Methodology

The *EIA Sector Guidance Document* prescribes the requirements for the visual impact analysis. The analysis includes a computer-generated 'worst-case' area of influence mapping that shows all locations from which the proposed wind turbines will be visible, as well as visual photomontage simulations computer-generated from selected sensitive locations in the impact area.

A worst-case zone of influence (ZOI) was identified to highlight all locations from which the proposed wind turbines will be visible given existing topography and ignoring intervening vegetation or buildings. The extent of this modelling was out to 50 km from the WTG locations, as shown in Figure 6-3.

A subtended vertical angle (SVA) analysis was also undertaken to complement the worst-case visual ZOI. The SVA analysis shows the prominence of the turbines on the landscape by calculating the vertical angle of the turbine from the perspective of a viewer at any given location. The SVA analysis is depicted in Figure 6-4.

QGIS version 3.32.1 was used to generate a raster image to depict the number of wind turbines visible from any given location. QGIS version 3.32.1 was also used to generate the SVA analysis raster. These raster images were then imported into ArcGIS for creation of a worst-case visual ZOI map.

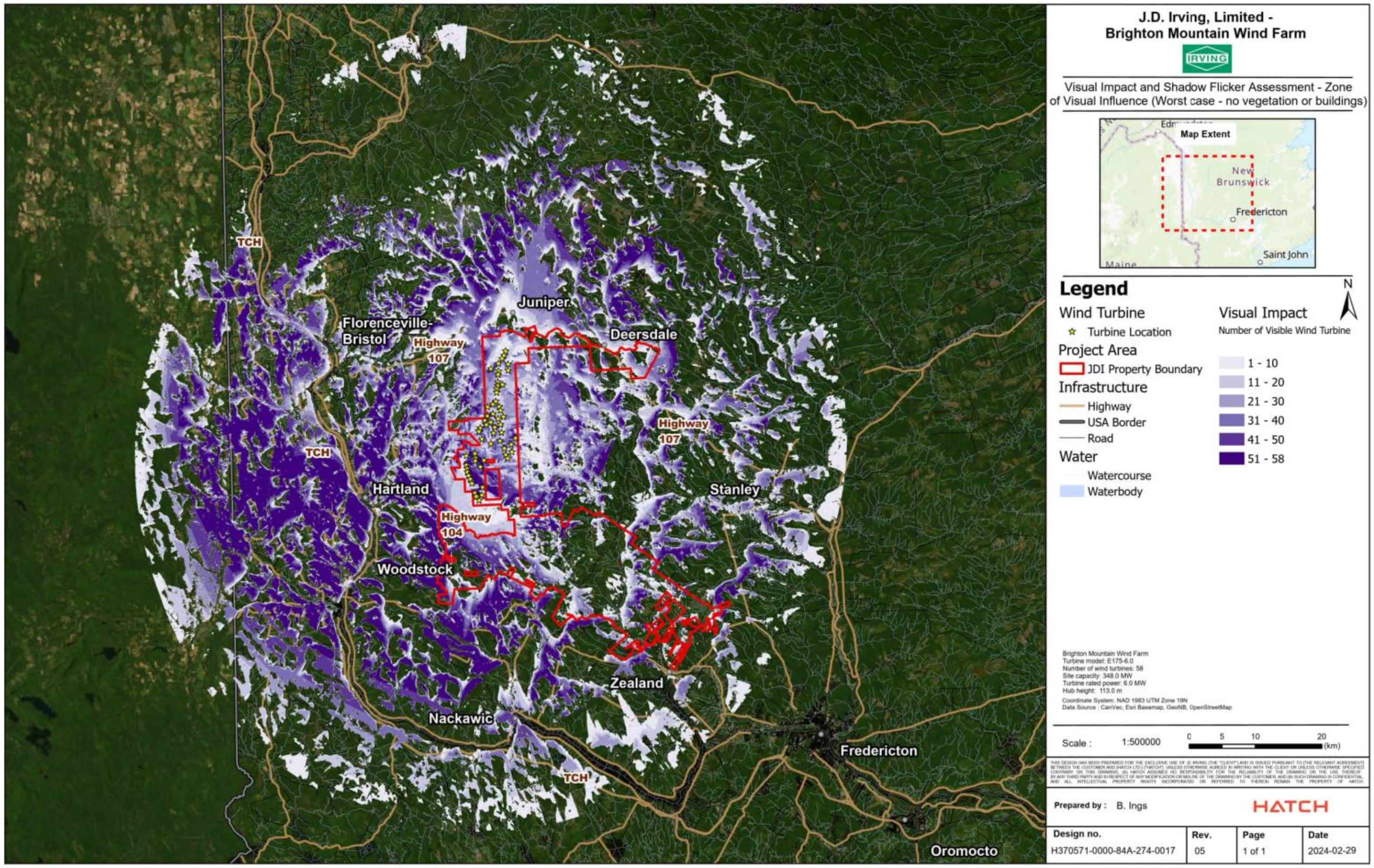

Figure 6-3: Worst Case - Visual Zone of Influence

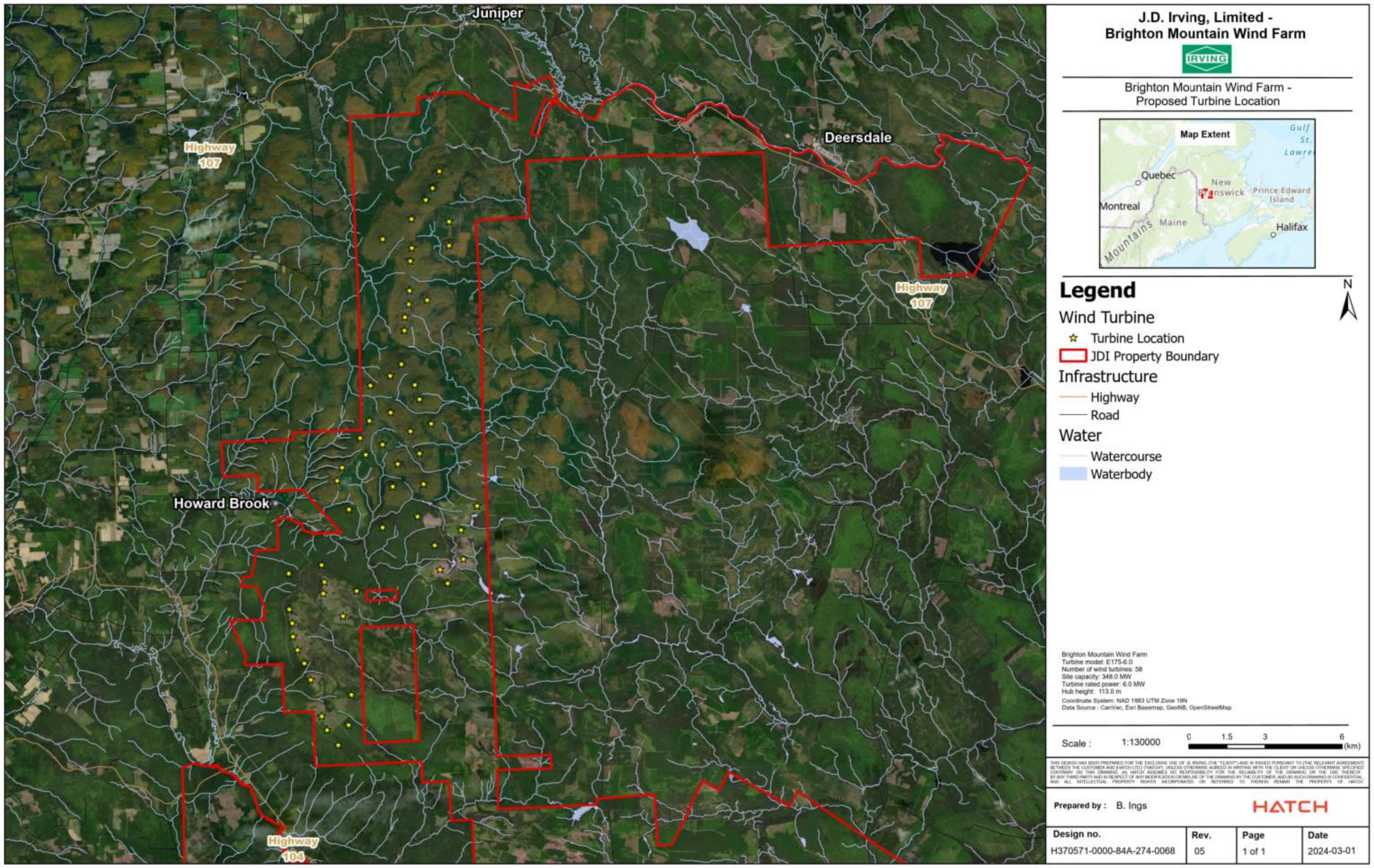

Figure 6-4: Visual Prominence of WTGs in Relation to the Sub-intended Vertical Angle

‘WindFarmer’™ software was used to generate photomontage simulations, based on photos collected at strategic areas where an unimpeded viewshed was observed. Viewshed locations were ground-truthed and confirmed during site visits. These locations were also selected as they correspond to publicly accessible areas, highways, and recreational spaces.

The photomontage results from each of the four (4) viewpoints are depicted below in Figure 6-5 through to Figure 6-9, with reference to the SVA degree shown in Figure 6-4.

Figure 6-5: Photomontage from Viewpoint 1

The photo montage from ‘Viewpoint #1’, taken offsite along Highway 104 at a roadside clearing, looking NE, corresponds to an SVA of 3°-5° for visual prominence on the landscape as shown in Figure 6-5.

Figure 6-6: Photomontage from Viewpoint 2

The photo montage from ‘Viewpoint #2’, taken offsite from Mountain View Rd, in Cloverdale (entrance to Private Residence), looking NE, corresponds to an SVA of 5°-10° for visual prominence on the landscape as shown above in Figure 6-6.

Figure 6-7: Photomontage from Viewpoint 3

The photo montage from ‘Viewpoint #3’, Taken offsite, from Howard Brook Rd, in Howard Brook, looking SE, corresponds to an SVA of 5°-10° for visual prominence on the landscape as shown above in Figure 6-7.

Figure 6-8: Photomontage from Viewpoint 4

The photo montage from 'Viewpoint #4', Taken onsite, along the existing ATV trails, looking SE, corresponds to an SVA of >10° for visual prominence on the landscape as shown above in Figure 6-8.

While the worst-case visual ZOI shows a large area visually impacted, the SVA analysis shows a very low prominence (vertical angle below 1°) beyond 12 km from the turbines. The area is also generally quite heavily vegetated preventing photomontage from being generated and is limited in the real-world visual impact of the Project.

6.1.4.2 Operational Phase – Potential Impact – Shadow flicker

The *EIA Sector Guidance Document* prescribes the requirements for the shadow flicker assessment. The assessment was undertaken with a moving shadow analysis of a computer-generated worst-case scenario (i.e., maximum shadow flicker between sunrise and sunset on a cloudless day, ignoring intervening vegetation or buildings) showing receptors affected by shadow flicker. Where mitigations are not feasible, the number of shadow flicker hours at a receptor must be limited to 30 hours per year for a maximum of 30 minutes per day based on a "worst case" calculation.

6.1.4.2.1 Shadow Flicker Assessment Methodology

WindFarmer was used to map and evaluate the shadow flicker effect. WindFarmer is a widely used software developed for wind farm design. It includes several modules and one specifically for shadow flicker assessment.

The shadow flicker model used in WindFarmer provides a conservative estimate as it simulates the worst-case scenario, or astronomical maximum, in terms of the yearly number of hours when receptors are exposed to shadow flicker.

The main assumptions of the model are:

- The sky is always clear. Therefore, cloud cover or fog is not considered.
- The wind turbine is facing the sun 100% of the time. Changes in the wind direction are not considered.
- The wind turbine is continuously rotating, so that stopping due to low or high wind speed is not considered. Periods of maintenance when the wind turbine is stopped are also not considered.
- The shielding effects of close obstacles like trees are not considered.

Inputs to the model included:

- Digital topographic map (DTM) of the site;
- Turbine location (coordinates), turbine rotor diameter and turbine tower height, taken from the Project Descritpon;
- Receptor locations (coordinates);
- Receptor Height (building or dwelling);
- Window orientations;
- Minimum sun angle elevation above horizon (the 3º default is used as suggested by WindFarmer);
- Time zone of the site; and
- Distance limit of shadow flicker effect propagation (2000m).

6.1.4.2.2 Results - Worst Case Shadow Flicker

The WTG layout was optimized to ensure that shadow flicker was reduced within acceptable levels at receptors, once modelling confirmed the worst-case results. Table 6-22 presents the shadow flicker results for each receptor for the worst-case scenario.

Among the ten (10) receptors identified, six (6) were affected by shadow flicker to some degree from one or more wind turbines. The "annual shadow flicker" affecting each receptor is the astronomical maximum shadow flicker effect.

The results show that, under the maximum worst-case scenario, one (1) onsite receptor, (receptor 5) will be affected by more than 30 hours of shadow flicker per year, and more than 30 minutes on the worst day. However, this receptor is a remote cabin located on the JDI property, with an existing relationship as a 'Tenant' to the Proponent. An agreeable arrangement will be made between both parties, regarding the amount of shadow flicker.

Table 6-22: Worst Case Shadow Flicker Results at Receptors

Receptor ID	Easting (m)	Northing (m)	Annual shadow flicker [hh:mm]	Number of days with flicker	Number of days for which the limit is exceeded	Worst day	Minutes on worst day	Turbines causing flicker
Receptor 1	637259	5138578	no flicker					
Receptor 2	637025	5133857	14:50	43	0	28/04/2026	30	37
Receptor 3	633059	5133708	29:30	72	0	29/04/2026	30	38, 42
Receptor 4	635126	5131930	no flicker					
Receptor 5	630227	5129779	61:10	112	53	09/01/2026	50	48, 50, 51
Receptor 6	628598	5129780	22:00	67	0	25/02/2026	30	47, 50
Receptor 7	628983	5137178	no flicker					
Receptor 8	631395	5147318	22:50	57	0	04/05/2026	30	55
Receptor 9	627897	5130478	15:10	48	0	07/05/2026	20	46
Receptor 10	630387	5136327	no flicker					

Figure 6-9 represents the worst-case shadow flicker map, with reference to the ten (10) receptors identified both on and offsite (See Section 5.15). The spatial extent to which shadow flicker may occur around a wind turbine is mainly a function of the sun path throughout the year:

- In the northern hemisphere, the sun has a trajectory mainly oriented south; this is why receptors located from south-west to south-east of a wind turbine are not affected by shadow flicker.
- As the sun rises east and goes down west, most of the shadow flicker is observed east and west of the wind turbine.
- The maximal spatial reach of shadows is generally defined by winter and summer solstices, due to the relative maximum and minimum "heights" of the sun in the sky.

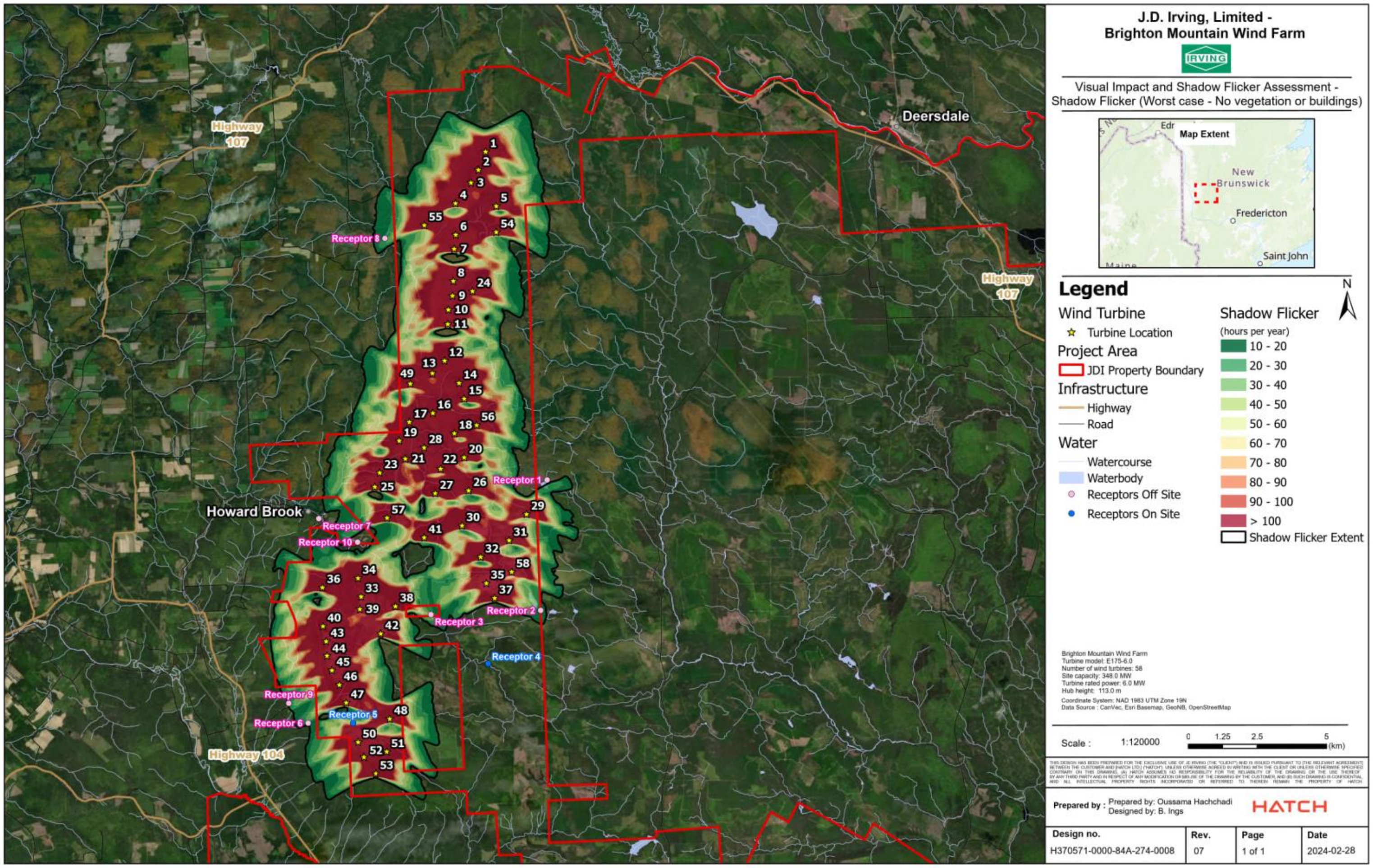

Figure 6-9: Shadow Flicker Map (worst-case)

For the Project, dwellings are generally situated far from the wind turbines (i.e., more than 1 km, except receptor 5 which is approximately 700 m from the nearest wind turbine), and only small periods of the year present potential shadow flicker conditions (alignment of house, wind turbine and sun) based on worst-case scenario.

Realistic modelling was also undertaken, with results presented in the '*Visual Impact and Shadow Flicker Assessment Report'* (H370571-0000-240-066-0002), found in Appendix C. Realistic modelling indicates reduction of shadow flicker hours at all receptors, including 'Receptor 5' which is reduced from the worst-case prediction of 61 hours and 10 minutes per year, down to 21 hours and 10 minutes per year.

Further to this assessment, visual and noise impacts were also analyzed for their influence on Adjacent PNAs. The Results of that Analysis are included in Appendix I and further discussed in Section 6.3.2 (Land Use and Property Value). Visual Impacts to adjacent PNAs are minimal.

6.1.4.3 Mitigation measures – Visual VC

In the pre-construction phase, shadow flicker was reduced by increasing the distance between the receptors and the wind turbines through design. The reduction (based on worst case scenario) ensured below threshold levels were attained at offsite receptors. It is also important to note, that all receptors identified, have an abundance of pre-existing vegetation surrounding structures, which will further reduce affects through acting as a natural screen.

Mitigations measures are summarized below in Table 6-23.

Table 6-23: Potential Impacts and Mitigation Measures - Visual Impact

Shadow Flicker & Visual Aesthetics						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
4.1	Operation	25	Shadow Flicker	4.1.1	The turbine layout has been optimized to ensure that 'Worst-Case' shadow flicker exposure at sensitive receptors remains below acceptable levels.	N/A
				4.1.2	There is abundant vegetation located around structures at each receptor, that will act as natural screens to reduce flicker effect.	

6.1.4.4 *Significance determination – Visual Impact VC*

Considering the turbine layout has been optimized to ensure that 'Worst-Case' shadow flicker exposure at sensitive receptors located offsite, remains below acceptable levels, as well that abundant vegetation exists surrounding the various receptors, the Visual Impacts of the Project are deemed to be not significant. The determination was made and is described below in Table 6-24.

Table 6-24: Significance Determination of Residual Impacts– Visual

Factor	Rating	Rationale
Magnitude	Minor	Shadow flicker will stay below guideline levels except for Receptor 5 which is a lease on the proponent's property and will be consulted regarding shadow flicker.
Duration	Long Term	Impacts will last for the full operational phase of the project.
Frequency	Regular	Shadow flicker will exist whenever the sun can cast a shadow on the turbine while the turbine is in operation.
Geographic Extent	LAA	Impacts will be limited to within the local assessment area
Reversibility	Reversible	Impacts will be eliminated upon removal of the turbines.
Ecological Resilience	High	There is a very limited population that will be exposed to shadow flicker, and even less exposed to above recommended amounts of shadow flicker.
Likelihood	High	Shadow flicker is well documented to occur around all wind projects.
Certainty	High	Shadow flicker is well documented to occur around all wind projects.
Significance	**Not Significant**	Due to the impact being limited to a very small population of people, the impact being reversible, and the exposure keeping within guideline amounted (apart from Receptor 5), the impact has been determined to be Not Significant.

6.1.4.5 *Follow-up Monitoring – Visual Impact VC*

As the turbine layout has been optimized to ensure visual impacts do not exceed regulatory threshold, there is no follow-up monitoring recommended at this time.

6.2 Assessment of Biophysical Valued Components Impacts

6.2.1 Wetlands and Vegetated Habitat – VC

A '*Wetland and Vegetated Environment Report'* (H370571-0000-840-066-0008) was completed by BOREAL Environmental and Hatch and is included in Appendix D of this Registration.

6.2.1.1 *Construction, Operation and Decommissioning Phases – Potential Impact – Wetlands and Vegetated Habitat*

Any project that involves construction of roads and other facilities has the potential to negatively impact wetlands and vegetation.

The clearing, grubbing, and grading associated with the construction and installation of Project Facilities will be the primary mechanism of project effects on the Wetlands and Vegetated Environment. There may be some areas that are grubbed and/or graded that may return to natural states of wetland or forest in the longer term but these areas are considered permanent impact, and the precise area of this impact will be determined based on final Project design and may include a form of as-built survey. Some areas may be cleared as a part of construction but not grubbed or graded. These areas include most of the HGVL line corridor and the portion of the PDA that is a 100 m buffer around the turbine pad footprints where the extent of ground disturbance is less certain, and the most severe form of disturbance will be largely clearing of trees.

The PDA also includes a 30 m buffer along all existing access roads that is assumed for the purposes of this EIA registration are assumes to constitute the maximum area of permanent impact but most of these areas of the PDA will not be altered. The true impacts will be determined based on final Project design and potential follow-up as built checks.

Minor effects may also occur as a result of increase of traffic activity, noise, dust, and other human disturbances which may indirectly affect plants and wetlands and potentially introduce invasive species.

6.2.1.2 *Construction Phase – Potential Impact – Wetlands and Vegetated Habitat*

Clearing, grubbing, and grading has the potential to result direct and permanent loss of wetlands, plant SAR and SOCC and habitat. Clearing during the construction phase will be more invasive than during the planning phase, as roads will be altered for turbine transportation, new roads will be built, and turbine pads will be cleared. Some of the proposed turbine pads exist within intact forest stands, which may result in degradation of the integrity of the residual habitat.

It is likely that the black ash saplings and Nodding Ladies' Tresses found within the PDA will be displaced as a result of the project as they both lie along areas that have been identified for either road construction or road upgrades. Additional plant SOCC may be found during 2024 surveys, but it is unlikely that plant SAR will be encountered. There are only a small number of plant SAR in New Brunswick, and most are associated with specific habitat conditions in specific areas of the province and their range and distribution is generally well understood with the possible exception of Pine Drops (*Pterospora andromedea*), there is a very low chance that plant SAR will occur within the PDA or will be affected by the project.

For wetlands, up to 83 ha falls within the current PDA which may be permanently lost as a result of the project. However, because the PDA includes various buffers on project components that spans between 30m and 100m, this area of potential impact is an overestimation, and the actual impact will likely be significantly less. Especially where the majority of the PDA outside the HVGL line corridor is along existing roads for which the required upgrades will not result in substantial additional footprint. There are 78 ha of wetland within the clearing-only portion of the HGVL line and this area includes a 30 m buffer on either side which will not be disturbed.

Associated with areas of direct effects on wetlands, there is a smaller potential for indirect effects (e.g., sedimentation and introduction of invasive species) during construction and decommissioning phases. Direct effects to wetland through clearing, grubbing, infilling and excavation have the potential to alter wetland hydrology, nutrient regimes, pH, and could introduce sediments and other contaminants. While some wetlands may be permanently affected by upgrades or construction of roads, turbine pads, and substations or other facilities, others will experience temporary impacts through clearing such as those that fall within transmission lines and cleared areas around turbines that will not be regraded.

6.2.1.3 Construction and Operational Phase – Potential Impact – Wetlands and Vegetated Habitat

Additional impacts on Wetlands and Vegetation during the Operations Phase are expected to be minimal but may arise through maintenance activities and vehicle movement to and from the various facility components.

Maintenance activities where ground disturbance is required have the activity for erosion and sedimentation that may impact wetland and vegetation. Construction equipment and vehicles have the potential to introduce and spread invasive plant species that can degrade the quality and integrity of the vegetation communities and displace native diversity.

Emissions and Wastes arising from Construction activities may include air contaminants; sound emissions; vibration; wastewater storage, treatment, and release; and solid waste removal for disposal at an approved site. Air contaminants (e.g., dust), wastewater, and solid waste will be within regulated limits and as such are unlikely to affect the health of the Wetlands and Vegetated Environment.

Additionally, some vegetation management may be required during operation that has the potential for indirect effects on habitats within the PDA and beyond.

Linear Facilities Presence, Operation, and Maintenance will include vegetation maintenance, (e.g., removing trees and shrubs that may impede reliable operation of HVGL line, or to a lesser extent, removing vegetation that may encroach upon or interfere with lines of sight on site access roads). Vegetation maintenance will interact with the Vegetated Environment, but in a minor way, as the maintenance will occur in areas that have been previously cleared and accounted for elsewhere in the assessment of the VC. The most common wetland type within the HGVL line corridor is Freshwater Marsh where the vegetation cover tends to be herbaceous or shrubby and sparse and these wetland areas will not require extensive vegetation management during Maintenance and Operation of the line.

In addition, JDI will follow an established vegetation management plan and EPP for vegetation maintenance along electrical transmission lines. Measures to avoid the spread of invasive species will be applied as appropriate and pre-disturbance surveys for these will identify areas for avoidance.

6.2.1.4 Mitigation measures –Wetlands and Vegetated Environment VC

A list of the possible impacts of this project and the associated mitigation measures for these impacts are summarized in Table 6-25.

6.2.1.5 Significance determination –Wetlands and Vegetated Environment VC

It is known that any projects that involving grading, road construction, clearing and ground disturbance can potentially have negative effects on the Wetland and Vegetated Environment. This section summarizes the predicted magnitude of the residual effects of the project of Wetland and the Vegetated Environment once the prescribed mitigations have been implemented. The significance determination of residual Impacts is further summarized in Table 6-26.

6.2.1.5.1 Loss of Wetland Area/Function

With mitigation measures in place, this impact should have a low likelihood and not be significant. There are no PSWs within the PDA or LAA. Half of the wetland area within the PDA will not be lost but only temporarily impacted during construction with some longer-term alterations to vegetation. When any unavoidable loss of wetland is compensated for, there will be no significant effect.

6.2.1.5.2 Loss of Plant SOCC and SAR

No Plant SAR were found in 2023 with exception of black ash. It's unlikely that any will be found in 2024 (exception of butternut trees or more black ash). Black ash will be avoided or offered to First Nations for harvesting. The loss of some individual Nodding Ladies' Tresses plants does not constitute a significant effect. Any plant SAR or SOCC encountered in 2024 surveys will be included in a follow-up Technical Addendum, with more mitigations prescribed, if warranted.

Table 6-25: Potential Impacts and Mitigation Measures – Wetlands and Vegetated Environment

Wetlands & Vegetated Environment						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
5.1	Planning Construction Decommissioning	4, 7, 8, 9, 10, 15, 18, 23, 24, 26, 27, 31, 32, 35	Loss or Disturbance of Wetlands	5.1.1	Wetlands will be delineated, and Functional Assessments (WESPACs) completed in areas of the PDA that have not yet been field surveyed.	Not required
				5.1.2	Wetlands will be avoided in the selection of locations for temporary ancillary facilities unless required for site specific purposes.	
				5.1.3	Re-routes of linear features and layout deviations will be considered to avoid disturbance of any wetlands with exceptionally high functions (as determined by the WESPACs).	
				5.1.4	Approvals and permits be sought for all regulated wetlands that are expected to be altered or lost as a result of Project construction.	
				5.1.5	Watercourse and Wetland Alteration (WAWA) permit for any alterations to wetlands (and their 30 m buffers) will be obtained. Where a net loss of wetland function occurs as a result of the Project, applicable wetland compensation will be determined as per the New Brunswick Clean Water Act and New Brunswick Wetlands Conservation Policy (NBDNRE-NBDELG 2002).	
				5.1.6	Clearing activities are to be restricted to necessary portions of the PDA, to minimize the amount of vegetation and wetlands altered through direct disturbance, or adjacent edge effects.	
				5.1.7	Soil and vegetation disturbance be only allowed where required for construction.	
				5.1.8	Appropriate erosion and runoff control techniques will be installed and maintained on all approaches to wetlands for erosion prevention, runoff, and sedimentation control during construction and until re-vegetation.	
				5.1.9	Pre-disturbance water sources of a wetland will be maintained, to the extent possible, when grading near wetlands.	
				5.1.10	Grading in wetlands to be restricted to essential areas, only.	

Wetlands & Vegetated Environment						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
				5.1.11	Natural re-vegetation will be used for wetlands in areas surrounded by native vegetation, and which have no invasive and non-native plant species.	
				5.1.12	Trees shall be felled in such a manner that they do not fall outside of the clear and grubbing limits.	
				5.1.13	Trees shall be felled away from wetlands and watercourses.	
5.2	Construction Decommissioning	4, 7, 8, 9, 10, 15, 18, 23, 24, 26, 27, 32, 33, 34, 35	Introduction of Invasive or Non-Native Plant Species	5.2.1	All construction equipment will be inspected upon arrival on-site to confirm it is clean and free of any plant or soil material. Any equipment with soil or vegetation debris will be pressure washed prior to entering site.	Not required
				5.2.2	Only Canada Certified No. 1 or better seed mixes be used for reclamation to limit the introduction of listed weed species and other invasive species in the PDA. Certificates of seed analysis be kept on file.	
5.3	Planning, Construction, Operation, and Decommissioning	7, 8, 9, 10, 12, 15, 18, 23, 24, 26, 27	Changes in native plant species distribution/abundance (including SOCC and SAR)	5.3.1	Unsurveyed areas of the PDA will be surveyed in 2024 at the time of year that would be appropriate to identify plant SOMC and SAR that may be present (e.g., late May for early ephemerals, to September for other plants). A supplemental report will summarize the findings of these additional surveys and will be submitted to the Technical Review Committee.	Not required
				5.3.2	Direct loss of or effects on plant SAR and SOCC be avoided or minimized through the appropriate siting of linear facilities and turbine locations and footprints minimized where deviations are not possible.	
				5.3.3	Direct effects to plant SAR be avoided by adhering to federal and provincial guidelines, unless otherwise approved by the appropriate regulatory agency.	
				5.3.4	All known occurrences of SOCC be marked on construction plans and identified SAR/SOCC plant locations are clearly flagged before the start of site preparation and construction. Black ash identified during Vegetative Surveys, will be avoided, or offered to local First Nations for harvesting.	

Wetlands & Vegetated Environment						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
				5.3.5	Mitigation plans be developed for unavoidable effects on plant SAR, if any are identified, in consultation with regulators, which may include collecting and propagating seeds or live plants for transplant prior to construction.	
				5.3.6	Vegetation management along transmission lines will be undertaken to limit the impact of trees and plants around high voltage lines. vegetation management will be undertaken in accordance with best management practices. This includes: Manually pruning tree branches adjacent to right-of-ways Manually cutting or mechanically mowing trees in the right-of-ways Where necessary, mechanically or manually applying herbicides selectively on shorter trees and stumps to manage growth.	
				5.3.7	Construction traffic be limited near locations of known plant SAR to equipment essential to construction; all other equipment will use alternative approved access around these areas.	
				5.3.8	Standard erosion prevention and sedimentation control measures be employed to minimize erosion of soils that could affect vegetation recovery.	
				5.3.9	Existing roads will be used for access, to the greatest extent possible.	

Table 6-26: Significance Determination of Residual Impacts – Wetlands and Vegetated Environment

Impact	Project Phase*	Magnitude	Duration	Frequency	Geographic Extent	Reversibility	Ecol. Resilience	Certainty	Likelihood	Significance
Wetlands										
Permanent Direct Loss of Wetland	C/D, O	Minor	Long term	Sporadic	PDA	Permanent	High	High	High	**Not Significant**
Temporary and Indirect Impacts on Wetland	P, C/D, O	Moderate	Long term (HVGL), Short Term (siltation)	Continuous, Sporadic	PDA	Reversible	High	High	High	**Not Significant**
Vegetated Environment										
Introduction of Invasive Plant Species	P, C/D, O	Minor	Long term	Continuous	LAA	Partially Reversible	Low	Moderate	Moderate	**Not Significant**
Changes in SAR/ SOCC Plant distribution/ abundance	P, C/D, O	Low	Long Term	Sporadic	PDA	Partially Reversible	High	Moderate	Low	**Not Significant**
Loss of Unique, Rare Communities or Critical Habitat	C/D, O	Low	Long term	Continuous	PDA/ LAA	Partially Reversible	Low	High	Low	**Not Significant**
Disturbance (harassment)	P, C/D, O	Negligible	Short term	Sporadic	PDA	Partially Reversible	Neutral	Low	Low	**Not Significant**

* P refers to the Planning Phase, C/D refers to the Construction and Decommissioning Phases, and O refers to the Operational Phase

6.2.1.5.3 Changes in Habitat Availability or Important Habitat Features

There are no unique or important vegetated habitat features that will be lost as a result of the project. The changed to the vegetation communities are not significant in the context of the extensive forestry infrastructure already in place in the PDA and LAA and the intensive management of the forest in this area for timber production values which involves frequent and ongoing conversion of natural stands into plantations and active management of forest stand composition and structure. The majority of the PDA area includes existing roads with only small areas of additional development required in natural forest stands. This effect is not anticipated to be significant.

6.2.1.5.4 Habitat Degradation

The spreading of invasive species can have major impacts on an ecosystem. While no invasive species have been noted within the PDA so far, in other nearby areas of New Brunswick, invasive species such as Alder Buckthorn (*Frangula alnus*) and Garlic Mustard can be seen infiltrating forested habitats similar to those habitats found within the RAA.

With mitigation measures in place, the potential of introducing an invasive species to the Project site will be lowered. Controlling and eradicating invasive species can be extremely difficult and costly; and not always succeeding at eradication (CFS & NRC, 2002), therefore, potential effects may have a major magnitude and long-term effects. Due to the inconsistencies of invasive plant species potential effects on habitat quality, this is not considered a significant impact.

6.2.1.6 Follow-up Monitoring – Wetlands and Vegetated Habitat VC

Baseline wetland and vegetation surveys will be conducted throughout 2024 to meet the regulatory requirements and will provide a more complete understanding on how Vegetation and Wetlands may interact with the development of the Project, with results submitted in addendum. The results will include any anticipated impacts to peatlands and/or fens.

Once all areas have been assessed on the ground for wetlands/watercourses, a site plan showing only the ground-delineated features (i.e., wetlands, watercourses, 30-metre buffers) overlain with all proposed project components (i.e., wind turbines, electrical substations, high-voltage lines, terminal stations, access road upgrades, etc.) will be provided to NB-DELG and the TRC.

On the revised site plan, all permanent wetland impact areas (in m^2) will be identified. According to the Wetlands Conservation Policy, a three-step mitigation approach is taken when reviewing proposed projects in or within 30m of a wetland. The three steps include: avoidance of the wetland and its buffer to the extent possible (completed during design), minimization of impacts, and mitigating the effects of the project. If avoidance of the wetland is not possible, all permanent loss of wetland would require compensation at a 2:1 ratio.

Where impacts to wetland size and/or function will occur, a Wetland Monitoring Plan will be required. The plan will monitor wetland size and function at 1-, 3-, and 5-year intervals from the date of the onset of initial construction. Additional compensation and/or mitigation may be required depending on the results of the final monitoring report, and in consultation with NB-DELG.

Areas disturbed by construction of the Project will be periodically inspected following completion to assess the success of any reclamation efforts completed during the Project and to assess effectiveness of applied mitigation measures (e.g., erosion control). This will determine the necessity for any immediate remedial or follow-up work (e.g., additional erosion control in unstable areas). If any additional work is required, additional inspection may be required.

6.2.2 Fish and Fish Habitat – VC

6.2.2.1 Planning Phase – Potential Impacts to Fish and Fish Habitat

During the planning phase, there are potential impacts to fish and fish habitat, such as increased vehicular travel through the PDA and LAA, transportation of equipment and materials, vegetation clearing and grubbing, geotechnical works, and environmental surveys (fish community sampling and watercourse assessments). The types of impacts include changes to fish habitat, change in mortality of fish, and introduction of deleterious substances, accidental introduction of invasive species, decreased riparian habitat quality, fish mortalities (from environmental surveys or salvages), potential water contamination, as well as an increase of erosion and sediment within aquatic habitats. Project works with potential to impact fish or fish habitat during the planning phase will be subject to mitigation measures listed in Table 6-27 below, which may include those measures mentioned in the applicable DFO Standards and Codes of Practices (DFO 2023a, 2023b, 2023c, 2023d).

6.2.2.1.1 Restricted Activity Periods

In New Brunswick, DFO has prescribed a restricted activity period (RAP). Works should occur between June 1st to September 30th (summer low flow period) for work within 30 m of a watercourse or wetland (DFO 2014, NBDELG 2012). These works would include vegetation removal, soil excavation, construction, etc., within 30 m of a watercourse or wetland, as well as works within the watercourse or wetlands. During this timeframe, work is to be postponed until after May 30th in any given year. This RAP also corresponds with the recommendation made by NB in the *Watercourse and Wetland Alteration Technical Guidelines* document. The restricted activity period should be followed throughout all phases of the project unless given specific permission or exemption under permit.

6.2.2.2 Construction, and Decommissioning Phases – Potential Impacts to Fish and Fish Habitat

During the construction phase, project activities such as site clearing and grubbing near riparian areas, road upgrades, culvert installation and upgrades, excavation and earthworks near watercourses, spills, and civil works all have the potential to impact fish and fish habitat within the PDA. Potential impacts include changes such as degradation or destruction of fish habitat by a decrease in water quality, flow or substrate, change in fish movement, migration, and/or fish passage, introduction of deleterious substances that result in water contamination (i.e., hazardous substances, sedimentation), introduction of invasive species, and riparian zone damage. Fish may also be impacted by direct mortality during the construction phase by fish stranding or entrapment, or from the effects of blasting. Project works will comply with applicable regulations and guidelines to protect fish and fish habitat such as the *Fisheries Act*. DFO Interim Guidelines for the Design of Watercourse Crossings in New Brunswick and Prince Edward Island (DFO, 2023h), will inform the design basis for culvert installations and upgrades along fish bearing watercourses. The *Standard code of practice: culvert maintenance and Interim Standard: in-water site isolation* (DFOe, 2023) and Winter access road installation to follow *DFO Standard Code of Practice: ice bridges and snow fills (*DFOc, 2023) will also be implemented during culvert installation and maintenance and winter access road installation. All required watercourse crossings will also comply with existing regulatory requirements including specifically the *New Brunswick Watercourse and Wetland Alterations Technical Guidelines* and a permit will be obtained, as well as all conditions will be adhered to. Turbine pads will be constructed “High and Dry’, away from watercourses and wetlands, with appropriate erosion and sedimentation control installed around each pad.

Reduction of negative impacts will be implemented during the construction and decommissioning phases utilizing mitigation measures outlined in Table 6-27 below.

Table 6-27: Potential Impacts and Mitigation Measures – Fish and Fish Habitat

Fish and Fish Habitat						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
6.1	Planning Construction Operation Decommissioning	2, 3, 4, 5, 7, 8, 9, 10, 12, 13, 14, 15, 23, 24, 26, 27, 31, 32, 34, 35	Changes to substrate, flow, and/ or water quality	6.1.1	Geotechnical works to be a minimum of 30 m from a watercourse or wetland unless authorized through an applicable WAWA permit	Not required
				6.1.2	Avoid changes to flow or water levels, and/ or restore streambeds	
				6.1.3	Refueling and equipment maintenance activities will be completed a minimum of 30 m from watercourses, drainage features, and wetlands.	
				6.1.4	Travel through site and to specific survey locations to be accessed via existing resource and ATV/snowmobile trails when possible to complete surveys	
				6.1.5	Field survey crews conducting fish sampling and watercourse assessments to minimize amount of time spent in streams and watercourses to avoid disturbing sediment and streambed characteristics	
				6.1.6	Follow Erosion and Sedimentation Control Plan; Utilize erosion and sediment fencing where appropriate, unless warranted by an environmental emergency or event, complete repairs and/or maintenance, when possible, outside of sensitive timing such as spawning and migration	
				6.1.7	Follow DFO's code of practice: beaver dam breaching and removal, if a dam must be breached or removed. Survey the footprint and backwater area to mitigate downstream flooding.	
6.2	Planning Construction Operation Decommissioning	2, 3, 4, 5, 7, 8, 9, 10, 11, 14, 15, 16, 17, 18, 21, 23, 24, 26, 27, 29, 31, 32, 34, 35	Introduction of invasive species	6.2.1	Equipment will not enter waterways unless under permit. In-water works, if required, will be undertaken with equipment that is free of grease oil, leaks, and debris.	Not required
				6.2.2	Follow Clean Equipment Protocol for Industry guidelines	
				6.2.3	Inspections should be completed prior to moving vehicles out of a local area of operation, between properties or sites, along roadsides in ditches and along watercourses, unformed dirt roads and access roads, trails, transporting of materials such as soil and quarry materials, and visiting remote areas where access is limited.	

Fish and Fish Habitat						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
				6.2.4	Inspections should occur after: Operating in areas known to have terrestrial or aquatic invasive species or high-risk areas (i.e., recently disturbed areas near known invaded areas) Transporting of materials (i.e., soil or aggregates) known to contain or has potential to contain invasive species or parts of invasive species Operating in an area or transporting materials that may contain invasive species (undetermined prior to beginning work in that area)	
				6.2.5	Vehicle marshalling yards and parking locations to be 30 m or greater from watercourses and crossings to avoid potential spread of invasive species onto site.	
				6.2.6	Field crews undertaking biological surveys, will clean equipment and gear to avoid spreading invasive species by pressure washing equipment.	
6.3	Planning	2, 3, 5	Decreased quality of the riparian area, reduced shade cover	6.3.1	Avoid and minimize work and disturbance within the riparian zone and watercourse	Not required
				6.3.2	Have the riparian area clearly delineated.	
				6.3.3	Limit clearing and grubbing in riparian areas, unless approved by permit.	
				6.3.4	Revegetate affected area with native seed and plant species to restore shade cover.	
6.4	Planning Construction	2, 3, 4, 7, 21	Fish mortality from environmental survey or salvage	6.4.1	Field studies on fish and fish habitat including the handling of fish for project purposes will only occur under authorization from DFO (Section 52 permit).	Not required
				6.4.2	Ensure staff are qualified and trained properly to conduct electrofishing and other fisheries sampling.	
				6.4.3	Follow recommended electrofishing settings and methods during sampling	
				6.4.4	Follow BMPs for safe handling and care of fish, (i.e., release fish in appropriate location in a timely manner).	
6.5	Construction	12	Fish Mortality from Blasting Activities	6.5.1	Blasting operations will be completed by a certified contractor in accordance with an Approval to Operate to be issued by the NBDELG. Explosives will be transported in accordance with the *Transportation of Dangerous Goods Act*, and Regulation.	Not Required

Fish and Fish Habitat						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
					Storage, handling and use of explosives will be undertaken in accordance with the federal *Explosives Act* and any Permit issued through Natural Resources Canada (NRCan) under the Act Blasting will also be undertaken in accordance with the federal *Fisheries Act*.	
				6.5.2	All blasting activities will be completed in accordance with the project EPP.	
				6.5.3	No in-water blasting will be undertaken on the Project.	
				6.5.4	Quarry blasting operations will not occur within 60 meters of a watercourse or wetland. Set-back requirements shall also be based on the maximum weight of charge to be detonated at one instant in time, the substrate, and the type of fish or fish habitat in the area of the blast. These set back distances are outlined in the Guidelines for Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopky, 1998).	
				6.5.5	Blasting mats will be used when deemed appropriate (i.e., if a wetland or watercourse is near the vicinity of the blast), to prevent fly rock from entering a watercourse or wetland.	
				6.5.6	The number of blasting events will be kept to the minimum necessary, and each blast will only use the minimum amount of explosives required to complete each blast.	
				6.5.7	Erosion and sediment control structures will be installed around the excavation/blasting site, and detailed in the site-specific EPP	
6.6	Planning Construction Operations Decommissioning	2, 3, 4, 5, 7, 8, 9, 10, 12, 13, 14, 18, 21, 23, 24, 27, 31, 32, 34	Water contamination	6.6.1	Ammonia Nitrate Fuel Oil (ANFO) or bulk explosives used for quarry rock extraction, will not be used within 60 meters of a wetland or watercourse, or below the water table, in wet weather, or adjacent to wet soils. This will prevent leaching of nitrites and ammonia in the form of nitrogen into the ground and receiving waters, near quarry's.	Not required
				6.6.2	Routine maintenance, refueling and inspection of machinery and vehicles will be performed offsite whenever possible; if refueling onsite is necessary it will be done at least 30 m from watercourses.	
				6.6.3	An accidental release/ spill prevention and response plan and emergency response plan will be included within the EMP and submitted as an addendum.	
				6.6.4	Vehicle marshalling yards and parking locations to be 30 m or greater from watercourses and crossings to avoid potential contamination of fish habitat by potential vehicle leaks or failures.	
				6.6.5	Use spill/ drip trays when refueling.	

Fish and Fish Habitat						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
				6.6.6	Ensure spill kits are in place prior to operation and routine maintenance of all heavy machinery/ equipment.	
				6.6.7	Equipment shall be in good working order and maintained, to reduce risk of spill/ leaks and avoid water contamination.	
				6.6.8	Limit and minimize heavy machinery and vehicles crossing through sensitive habitat and areas where water extends over and drains across road (when possible).	
6.7	Planning Construction Decommissioning	2, 3, 5, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 21, 23, 24, 26, 27, 31, 32, 34	Erosion and Sedimentation decrease water quality	6.7.1	Surface water quality will be managed in accordance with the project EPP. Unless authorized by Project Environmental Permits or Approvals, surface water quality and environmental monitoring of Construction operations will take into account 'CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life (total particulate matter)' for any in-water works, if required.	Not required
				6.7.2	Follow DFO standards for working near water.	
				6.7.3	For water withdrawal from fish habitat, pumps must be screened in accordance with the Interim code of practice: End-of-pipe fish protection screens for small water intakes in freshwater	
				6.7.4	Develop and implement an Erosion and Sediment Control (ESC) plan as a part of the EMP, to minimize introduction of sedimentation or contaminants to fish habitat.	
				6.7.5	Installing erosion and sediment controls (ESC) to prevent entry of debris and sediment into the watercourse, such as silt fencing, riprap and straw wattles.	
				6.7.6	Regular monitoring of ESC measures and structures during all phases of the works and watercourse for any signs of sedimentation or contamination.	
				6.7.7	Minimize use of equipment along unstable bank or earth surfaces	
				6.7.8	Avoid earth works during greater than 25 mm/24h (high flow volumes from heavy rain events)	
				6.7.9	Unstable earth surfaces to be treated with temporary erosion or sediment control measures (i.e., silt fencing)	
				6.7.10	Filter sediment laden water before release of pump into vegetated area.	
6.8	Construction Operation Decommissioning	8, 9, 10, 12, 13, 14, 15, 18, 21, 23, 24, 26, 27, 31, 32, 34, 35	Damage to spawning habitat (change in substrate, flow rate, water quality, increase of turbidity)	6.8.1	Culvert installation, upgrades, and road construction to follow DFO Standard code of practice: culvert maintenance and Interim Standard: in-water site isolation.	
				6.8.2	Avoidance of work during known seasonal and sensitive timing windows (spawning, migration) by following DFO standard fish timing windows (in New Brunswick: work should occur June 1 to Sept 30 during the summer low flow period).	

Fish and Fish Habitat						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
				6.8.3	Winter access road installation to follow DFO Standard Code of Practice: ice bridges and snow fills, including: Use of clean materials (i.e., ice, water, snow) to construct ice bridge if applicable.	
				6.8.4	Operate machinery on land in stable and dry areas when feasible.	
				6.8.5	Install erosion and sediment control measures prior to beginning works, undertakings and activities.	
				6.8.6	All required watercourse crossings will comply with existing regulatory requirements including the New Brunswick Watercourse and Wetland Alteration Technical Guidelines, if alterations are required, a WAWA permit will be obtained, and all conditions will be adhered to.	
				6.8.7	Follow the Erosion and Sediment Control (ESC) plans, detailed in the Introduction of deleterious substances section.	
6.9	Construction Decommissioning	7, 8, 9, 10, 12, 14, 15, 16, 17, 18, 21, 31, 32, 35	Effects on Riparian Zone and vegetation	6.9.1	Protection of the riparian zones including limiting vegetation removal, installing barriers around the riparian zone (30m from watercourse), limit activity in the riparian zone, use methods to reduce soil compaction (i.e., mats)	Not required
				6.9.2	All required watercourse crossings will comply with existing regulatory requirements including the New Brunswick Watercourse and Wetland Alteration Technical Guidelines, if alterations are required, a WAWA permit will be obtained, and all conditions will be adhered to	
				6.9.3	Restore the banks and riparian vegetation affected by the works using native species to revegetate banks	
6.10	Construction Decommissioning	7, 8, 10, 14, 16, 17, 18, 21, 31, 32, 34, 35	Fish stranding & entrapment	6.10.1	Culvert installation to follow DFO Interim Guidelines for the Design of Watercourse Crossings in New Brunswick and Prince Edward Island (DFO, 2023). Culvert upgrades to follow DFO Standard code of practice: culvert maintenance and Interim Standard: in-water site isolation	Not required
				6.10.2	Follow standard DFO fish protection timing windows (in New Brunswick: during summer low flow period from June 1 to September 30) and limit duration of in-water works (DFO, 2022).	
				6.10.3	Follow DFO's Code of Practice: Ice bridges and snow fills	
				6.10.4	Follow DFO standard for in-water site isolation	

Fish and Fish Habitat						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
				6.10.5	Conduct fish rescues where required (under DFO permit section 52)	
6.11	Construction, Operations	23, 24, 26, 27	Impacts to fish passage (e.g., blocked / perched culvert)	6.11.1	DFO Interim Guidelines for the Design of Watercourse Crossings in New Brunswick and Prince Edward Island (DFO, 2023h), and any other updated guidance from the DFO in the Maritimes will inform the design basis for culvert installations and upgrades along fish bearing watercourses.	Not required
				6.11.2	Culvert installation will follow the DFO Interim Standard: in-water site isolation	
				6.11.3	Regularly inspect culverts and following BMP of DFO's code of practice regarding culvert maintenance	
				6.11.4	Limit amount of in-water Works where possible	
				6.11.5	Limitation of Works during sensitive timing windows	

6.2.2.3 Operational Phase – Potential Impacts to Fish and Fish Habitat

During the operational phase, activities such as routine operations and maintenance along existing, newly constructed roads and/or access routes may adversely impact fish and fish habitat. Specifically, maintenance may require the use of temporary water crossings or fording of watercourses. Degradation and disturbances to fish habitat as an impact of routine operations would be expected in two forms: impacts to fish passage and changes to water quality. Migratory fish species are susceptible to passage issues and water quality changes and potential contamination which are a result of spills and delirious substances from machinery operation as well as culvert and road maintenance. Erosion and sedimentation may also directly impact fish and fish habitat as well as changes, disturbance, or destruction of riparian banks and vegetation. Erosion and sedimentation, impacts to riparian vegetation, and water contamination as a result of usage of pesticides or herbicides are potential impacts during this phase of the Project. The introduction of invasive species is also a potential impact during the operations phase via vehicles travelling throughout the site and possibly from other areas throughout the RAA and beyond which may contain invasive species which can be transported via various means (e.g., tires, tracks, filters, footwear, etc.). Reduction of negative impacts will be implemented during the operational phase utilizing mitigation measures.

6.2.2.4 Mitigation measures – Fish and Fish Habitat VC

A list of the possible impacts of this project and the associated mitigation measures for these impacts are summarized in Table 6-27.

6.2.2.5 Significance determination –Fish and Fish Habitat VC

A significant adverse residual environmental effect on fish and fish habitat is defined as: serious harm to fish that have commercial, recreational, or aboriginal importance and if the effect cannot be avoided, mitigated, or offset to address the potential impacts. Significant adverse effects may include:

- Effects that displace fish;
- Effects can prevent fish from carrying out one of their life processes;
- Effects that cause the habitat to be unstable or marginalized; and
- Effects on fish or fish habitat of high importance such as SOMC or SAR, spawning, or critical habitat.

6.2.2.5.1 Residual Impacts of Direct Mortality on Fish

During the planning phase of the project, direct fish mortality could result from fish community sampling. Certain species are more likely to be missed during electrofishing efforts including those that do not have swim bladders, as they sink to the bottom and are harder to rescue. Methods to minimize this impact are described in Table 6-27. This residual effect of direct fish mortality is expected to be minor in magnitude, short term in duration, a one-time frequency, extend only with the PDA, is reversible, and would occur within a community of high ecological resilience. The effect is considered not significant.

During the construction phase of the project, there is low potential for direct mortality of fish during work activities. Fish stranding and entrapment has the potential to occur during road construction, culvert installation and repair, and installation of temporary access roads.

Fish mortality can also potentially be resultant of quarry blasting operations, if conducted within or near fish bearing waters. Quarry blasting will not occur directly in water, and quarry blasting setbacks will be maintained at 60 m minimum, and as per the DFO Guidelines for Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopky,1998).

Higher risk activities during installation of infrastructure at watercourse crossings, will be permitted through the WAWA process. Methods to minimize potential impacts are described in Table 6-27. The magnitude of the impact is expected to be minor, short term in duration, of sporadic frequency, confined to the PDA, and reversible in a highly resilient community. The determination is that this impact is not significant with the adequate implementation of mitigative measures throughout the construction and decommissioning phases of the project.

Project operations including road and culvert maintenance could result in fish strandings or entrapment causing direct mortality to fish. However, the likelihood of this effect is considered low so long as the mitigation measures are implemented. The impact would be expected to be minor in magnitude, short term in duration, potentially one time to sporadic in frequency, and reversible in a highly ecological resistant fish community. The effect is considered not significant.

6.2.2.5.2 *Residual Impacts of Fish Habitat Loss*

During the construction phase it is likely that degradation of fish habitat could occur as a result road construction and culvert installation and repair. These activities have potential to result impact the riparian zone and vegetation, change substrate, water flow rate, water quality, and turbidity. If mitigation measures are followed as suggested, the residual impact is expected to be not significant. Construction near watercourses and within the riparian zone will be avoided and minimized where possible throughout the Project. Where new watercourse crossings and in-water works are required, stringent standards and guidelines by DFO will be followed, including DFO Interim Guidelines for the Design of Watercourse Crossings in New Brunswick and Prince Edward Island (DFO, 2023h), and DFO Standard code of practice: culvert maintenance and Interim Standard: in-water site isolation. The potential impact on habitat loss would be minor in magnitude, impact lasting long term throughout the lifespan of the windfarm, sporadic in frequency, confined to the PDA, partially reversible in a highly ecologically resistant community. The clearing and grubbing in riparian zones and installation of new watercourse crossings will occur sporadically throughout the construction phase and the habitat loss associated will last the entirety of the windfarm's lifespan. The habitat loss is expected to be mostly reversible after decommissioning by remediating any areas affected during the Project.

During Operations phase of the Project, there will be a low likelihood of new habitat loss. If any habitat loss occurs it is expected to be negligible in magnitude, confined within the PDA, and sporadic in frequency. Potential habitat loss during operations could include construction of additional access roads or project related infrastructure, trails, vegetation maintenance, incidental, etc. Potential impacts to fish habitat will be mitigated by following the measures identified, such as clearly delineating the riparian area to avoid sensitive habitat areas and clearly delineating areas to be cleared and grubbed prior to works initiating. The potential impacts are expected to last the lifespan of the project and be partially reversable after decommissioning and remediation.

6.2.2.5.3 Residual effects of Fish Habitat Degradation

Fish habitat degradation has a low potential to occur during the planning phase of the Project. If habitat degradation occurs it is expected to be the result of a change in flow, substrate, or water quality, an introduction of invasive species, decrease in riparian vegetation, or an accidental release of deleterious substances into the aquatic environment during movement or installation of vehicles or equipment, geotechnical drilling, or environmental surveys prior to construction. Impacts will be mitigated by implementing measures provided in Table 6-26. Impacts are expected to be negligible in magnitude, regular frequency throughout the planning phase and short term in duration. The impacts are expected to be not significant.

Fish habitat degradation may occur to a moderate degree during the construction/ decommissioning phase of the Project. Construction activities that may result in fish habitat degradation include road construction and installation of culverts, including clearing and grubbing activities. Potential impacts are damage to potential spawning habitat by changing substrate, water quality and flow, introduction of invasive species, degradation of riparian vegetation, and introduction of deleterious materials. Mitigation measures will be implemented to address potential degradation to fish habitat. The potential impacts are expected to be regular in frequency, lasting the duration of the construction phase, confined within the PDA, and reversible in a highly resilient community. The determination is the potential impacts will not be significant if mitigation measures are successfully implemented.

Fish habitat degradation is unlikely to occur during the operations phase of the Project. If impacts occur, they are expected to be negligible in magnitude, sporadic in frequency, and confined within the LAA. If degradation occurred, mitigation measures would be reassessed for efficacy. Activities that may result in habitat degradation could include road maintenance, additional watercourse crossing (i.e., roads and culverts) upgrades and maintenance. Impacts are expected to include change in water quality, flow and substrate, introduction of invasives, damage to riparian and aquatic vegetation, and introduction of deleterious materials. The potential impacts of fish habitat degradation are expected to be insignificant, if the prescribed mitigation measures are successfully implemented throughout the windfarm operations.

A summary of all Significance Determinations of Residual Impacts to Fish and Fish Habitat are presented in Table 6-28.

Table 6-28: Significance Determination of Residual Impacts – Fish and Fish Habitat

Impact	Project Phase*	Magnitude	Duration	Frequency	Geographic Extent	Reversibility	Ecol. Resilience	Certainty	Likelihood	Significance
Fish										
Direct Mortality	P, C/D,O	Minor	Short term	One time - Sporadic	PDA	Reversible	High	High	Low	**Not Significant**
Fish Habitat										
Habitat Loss	C/D	Minor	Long term	Regular	PDA	Partially reversible	High	High	High	**Not Significant**
	O	Negligible	Long term	Sporadic	PDA	Partially reversible	High	High	Low	**Not Significant**
Habitat Degradation	P	Negligible	Short term	Sporadic	PDA	Reversible	High	High	Low	**Not Significant**
	C/D	Moderate	Short term	Regular	PDA	Reversible	High	High	Medium	**Not Significant**
	O	Negligible	Long term	Sporadic	LAA	Reversible	High	High	Low	**Not Significant**

* P refers to the Planning Phase, C/D refers to the Construction and Decommissioning Phases, and O refers to the Operational Phase

6.2.2.6 Follow-up Monitoring – Fish and Fish Habitat VC

Post-construction reclamation monitoring will be undertaken by JDI or its subsidiaries, to ensure native vegetation and land use is re-established following construction, during operations, as well, after the decommissioning phase to ensure that the site has successfully been restored to pre-construction conditions.

6.2.3 Terrestrial Wildlife and Wildlife Habitat – VC

6.2.3.1 Planning Phases – Potential Impact – Terrestrial Wildlife and Wildlife Habitat VC

Throughout the EIA process, it is acknowledged that surveyors have potential to harm the wildlife and the environment. Some loss of habitat is expected due to the installation of small-scale infrastructure and digging essential for surveying (e.g., MET Towers, Geotechnical works). Habitat degradation may occur through the accidental introduction of invasive species or hazardous spills. Direct mortality of wildlife may also occur due to increased traffic. A summary of potential impacts on terrestrial wildlife during the planning phase, and appropriate mitigation to avoid or minimize those impacts is provided in Table 7.

Mitigation to reduce or avoid these potential impacts will include avoiding the storing of hazardous materials (e.g., fuel, coolant, engine oil) on site. Spill kits will be stored in all Project vehicles and if spills occur, cleanup will occur immediately to prevent harm to wildlife. All vehicle/equipment maintenance and refueling will occur at least 30 m from aquatic features to avoid mortality to sensitive terrestrial wildlife groups such as amphibians.

When travelling through the site in vehicles and all-terrain vehicles (ATVs), posted speed limits will be respected to avoid collisions with species sensitive to road mortality such as Wood Turtle and Snapping Turtle. Should turtles be found on roadways, surveyors will move the individuals out of harm’s way, in the direction they were travelling.

When displacing sediment for geotechnical works, sediment deposition areas will prevent the infilling of small temporary pools that are essential for amphibian life processes and avoid creating areas that are attractive for amphibian egg or egg mass deposition. Mitigation measures could include placing fill in predetermined deposition/storage areas that are outside any sensitive habitat, or immediate removal of fill off-site.

Nest searches and searches for nesting turtles will be conducted by a qualified individual prior to vegetation clearing. If nests are identified or a turtle is found to be nesting in a construction area they will be clearly marked. As turtles show side fidelity to nesting areas, impacts that cannot be avoided should consider alternative sites where possible.

Sweeps for Canada Lynx and dens will also be conducted prior to any activity on site. If an occupied Canada Lynx den is found nearby, work should be delayed until the kittens have had time to wean and disperse from the den site. Under no circumstance will dens be knowingly destroyed as per NBSARA regulations. Observations of small, non-mobile kittens are most likely to occur near the Canada Lynx birthing season (May - June). Kittens are expected to stay near their dens for 6-8 weeks until they have weaned and begin to travel with their mothers (O'Donoghue, 2010).

Finally, surveyors throughout the EIA process will make sure to diligently clean and or sanitize clothing and equipment as applicable prior to arrival on site. The accidental introduction or spreading of invasive species, especially vegetation, to sensitive habitat features could greatly impact wildlife. Example species that could affect all wildlife groups include Buckthorns (*Frangula alnus and Rhamnus Cathartica)* which have potential to restrict wetland boundaries, outcompeting understories in productive Snowshoe Hare habitat, colonize open features require by SAR like the Bog Lemming, and release metabolites that threaten amphibian reproductive success (Frappier et al., 2003, Sacerdote & King, 2014 and Lewis et al., 2004).

6.2.3.2 Construction and Decommissioning Phases – Potential Impact – Terrestrial Wildlife and Wildlife Habitat VC

Turtles, especially semi-aquatic species, travel long distances on land to nest, with road mortality being a leading cause of mortality throughout their global range (Beaudry et al., 2008). However, recent literature in Canada suggests some turtle species, including the Spotted Turtle and Midland Painted Turtles, tend to avoid crossing service roads in Wind Farms unless a culvert is present (Trowbridge, C., 2020 & Delay, 2022, Delay et al., 2023 Delay et al., 2023). This does suggest there is an increased importance in maintaining connectivity between fragmented landscapes, as access roads have potential to decrease the existing home ranges of local turtles (Latham et al., 2022).

Limiting the number of constructed access roads as much as possible will significantly reduce potential impacts. Construction of permanent eco-passages on existing and new access roads where turtle presence is most likely (e.g., in proximity to wetlands intersections) could aid in encouraging turtles to continue utilize the broader landscape (Delay, 2022 and Delay, 2023). Eco-passages can also be of significant benefit to snakes, small mammals, and amphibians. Areas considered to be critical habitat or high traffic areas for wildlife, and therefore suitable for eco-passages, will need to be determined. Eco-passages will be designed in conjunction with the use of wildlife exclusion fencing, to promote usage in accordance with best management practices. Where existing roads occur and no eco-passages are present, connectivity is expected to increase from baseline conditions when implementing this mitigation strategy.

Aquatic overwintering habitat as well as nesting habitat for the Wood Turtle and Snapping Turtle in or adjacent to streams are highly susceptible to both sedimentation and erosion. In-water works, especially where flow is to be diverted temporarily, have a high potential for sediment displacement. Appropriate Erosion and Sediment Control (ESC) measures during both construction and decommissioning will be of critical importance and implemented on a case-by-case basis. Where banks are destabilized and sediment in run-off pathways is loose, ESC measures must remain in place until stabilization has occurred. Post construction planting with root stabilizing species can aid in accelerating the process, further minimizing overall risk.

Timing restrictions will be implemented where impacts to flow regime in any wetlands, tributaries or other aquatic features are expected. For the Wood Turtle and Snapping Turtle, in-water works should not take place during sensitive overwintering periods (Table 6-4) where changes in water level may result in mortality (GoC, 2018), unless areas have been adequately isolated and trapping efforts undertaken to remove any potential individuals present, prior to overwintering, and unless pre-construction surveys for nests and travelling turtles are completed.

Searches will be undertaken by a qualified individual ahead of works taking place in suitable habitat. If turtle, Rock Vole or Bog Lemming nests are identified, or if a turtle is found to be nesting in a construction area, these features will be clearly marked, and an appropriate buffer zone erected. If Wood Turtle nests are found, a 60 m riparian management zone on bodies of water 150 m up and downstream from documented nesting areas will be created (J.D Irving, 2019). If this is impractical, then handling or trapping may be required to relocate a nest, or individuals. Handling of wildlife will be only undertaken in exceptional circumstances (e.g., human health concerns), and in close consultation with relevant regulating authorities.

Next, the Canada Lynx's dependency on Snowshoe Hare encourages them to select as foraging grounds core natural areas with high productivity of Snowshoe Hare. These foraging grounds tend to be described as mid-age to young dense regenerating forest stands in Maritimes provinces (Parker, 2001 & NBDNRED, 2022). While complete avoidance of all foraging grounds is not possible given the large home range of the Canada Lynx, the identification and protection of core habitat areas and the maintenance of natural heritage corridors between these features will allow for continued right-of-passage by large mammals and maintain high Snowshoe Hare productivity, increasing residence time by the Canada Lynx as a result.

Sweeps for Canada Lynx dens must occur prior to any clearing activities on site. If an occupied Canada Lynx den is found, work will be delayed until the kittens have had time to mature and disperse from the den site. Under no circumstance will identified Canada Lynx dens be knowingly destroyed as per the NBSARA.

Finally, as outlined in the planning phase, when displacing soil and sediment for essential features like concrete foundations, deposition should not result in the infilling of small temporary pools that are essential for amphibian life processes. Mitigation measures could include predetermined deposition/storage areas that are known to minimize any impacts.

6.2.3.3 *Operational Phase – Potential Impact – Terrestrial Wildlife and Wildlife Habitat VC*

Operational phase impacts are frequently considered for volant species, such as bats and birds, but there also species-specific impacts to be considered for non-volant species (Łopucki at al., 2017). The presence of wind turbine operation on herpetofaunal behavior and distribution in Canada is still poorly understood. Literature seems to have mixed suggestions on if area avoidance will occur in turtles (Trowbridge, C., 2020, Delay, 2022 & Delay et al., 2023) and frogs (Trowbridge, C., 2020) due to turbine operation. However, access road impacts (direct mortality) are well documented (Lovich & Ennen, 2013).

While access road mitigation strategies highlighted in the Construction Phase such as limiting the Project footprint and construction of eco-passages will greatly reduce the number of interactions wildlife have with roads, it is important to consider that these interactions still have potential to occur throughout the lifespan of the Project. The most effective way to limit mortality to turtles on roadways is to limit traffic and reduce speeds during sensitive timing windows or life cycle events. This could be done in the form of limiting or preventing access to site roadways, erecting signage in sensitive habitat or locations with known presence, imposing lower speed limits on privately owned roadways, and conducting routine activities like maintenance outside of the active nesting season where possible. Education leading to changes in behaviours of people (e.g., keeping an eye out for wildlife while travelling) who frequent the site is a realistic and easily implementable goal to protect resident turtles. Guides will be made available for employees to help them identify species at risk that may occur in the area and advising what to do when one is encountered. A wildlife reporting system will also be implemented. Repeat observations from an active reporting strategy will double as a tool to identify priority areas for further mitigations, like eco-passages and/or wildlife crossing signs, that were missed in the EIA process or became priority areas as species landscape use adjusts post construction.

Next, large mammals like the Canada Lynx are easily visible and fast, so road mortality within the PDA and LAA is not expected to be significant as traffic is infrequent, and vehicles are moving slowly. However, it should be noted that Canada Lynx road mortality does occur within New Brunswick with some frequency (NBDNRED, 2022).

Responses by herbivores and carnivores to wind turbines appears to be species dependent, with some ungulate species suggesting rapid adaptation to landscape altered by a wind farm is possible (Walter et al., 2006). The Canada Lynx is known to avoid settled areas in New Brunswick (NBDNRED, 2022). Their main prey source, the Snowshoe Hare, may have lowered dispersal success facing similar levels of human disturbance (Hodges, K.E, 2000). While there is a lack of evidence to suggest Canada Lynx, furbearers or ungulates will avoid the Project Area because of turbines themselves, it is reasonable to expect that increased human presence in the PDA may deter these animals from the area while broad-scale utilization of the RAA is still expected.

The management of American Beaver activities may need to occur to protect infrastructure and maintain safe working conditions. When a dam with potential to cause harm to infrastructure/people is identified, removal will be done in accordance with the Department of Fisheries and Oceans Code of Practice: Beaver dam breaching and removal (GoC, 2023). Timing windows to be respected will include overwintering periods for the Wood Turtle and Snapping Turtle. The installation of further mitigations (Bafflers, Deceivers, etc.) should be considered where appropriate if repeat removals are required in an area. Beaver dams that do not pose harm to infrastructure or people will not be removed.

6.2.3.4 Mitigation measures – Terrestrial Wildlife and Wildlife Habitat VC

A list of the possible impacts of this project and the associated mitigation measures for these impacts are summarized in Table 6-29.

Table 6-29: Potential Impacts and Mitigation Measures – Terrestrial Wildlife and Wildlife Habitat

Terrestrial Wildlife and Wildlife Habitat						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
7.1	Planning Construction Decommissioning	5, 8, 9, 10, 12, 14, 15, 16, 17, 18, 32, 34	Turtle, snake, amphibian, or mammal habitat destruction.	7.1.1	Nest sweeps, searches for nesting females and searches for potential snake hibernacula will occur prior installation or commencement of geotechnical works.	Disturbed areas will be inspected to assess success of reclamation and mitigation measures.
				7.1.2	Should use of site as nesting or overwintering habitat be confirmed, alternative sites will be considered where possible.	
				7.1.3	Establish pre-determined deposition areas to avoid the infilling of features essential to amphibian life processes (e.g., vernal pools).	
				7.1.4	If Canada Lynx or other mammal nests, dens or young are found nearby, the area will be georeferenced, and surveyors made aware.	
				7.1.5	Den sweeps will be completed prior to site clearing activities	
				7.1.6	If Lynx den are found a 100m no touch buffer will be established until young have had time to wean and disperse from the site.	
				7.1.7	Known Canada Lynx dens will not be destroyed under any circumstance.	
7.2	Planning Construction Operation Decommissioning	3, 4, 5, 9, 21, 26, 27, 34, 35	Introduction of invasive species to turtle, snake, amphibian, or mammal habitat	7.2.1	Vehicles and equipment will be in good operating condition, free of leaks, mud, dirt, or debris before being mobilized to site, to ensure no exotic or invasive species are introduced.	Not required
7.3	Planning Construction Operation Decommissioning	2, 7, 23, 31	Hazardous materials spills into turtle, snake, amphibian, or mammal habitat.	7.3.1	Spills originating from equipment accidents and malfunctions will be cleaned up immediately to prevent impacts to wildlife	Not required
7.4	Planning Construction Operation Decommissioning	4, 5, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 24, 26, 27, 28, 29, 32, 33, 34	Project vehicle/machinery collisions with turtles, snake, amphibians, or mammals	7.4.1	Minimize project footprint.	Not required
				7.4.2	Driving vehicles at the posted speed limit to avoid collisions with turtles, snake, amphibians, or mammals.	
				7.4.3	Amphibians and turtles found on roadways will be moved out of harms way in the direction they were travelling.	
				7.4.4	Consider construction of eco-passages in areas where interaction with amphibians is most likely.	
				7.4.5	Pads and laydowns to be built in such a way to prevent pooling of water that could be attractive for amphibians laying eggs or egg mass.	
				7.4.6	Workers to complete pre-use inspection of equipment and work area walk down to ensure wildlife are not present.	

Terrestrial Wildlife and Wildlife Habitat						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
				7.4.7	An active reporting system for observed SAR to aid in identifying priority locations for further mitigations.	
				7.4.8	Limit traffic where possible.	
				7.4.9	Wildlife crossing signage in areas of high wildlife occurrence.	
7.5	Construction Operation Decommissioning	9, 10, 12, 15, 26	Turtle, snake, amphibian, or mammal habitat fragmentation	7.5.1	Minimize project footprint.	Disturbed areas will be inspected to assess success of reclamation and mitigation measures.
				7.5.2	Construct eco-passages/culverts in areas where access routes may fragment features essential to turtle life processes.	
				7.5.3	Consider construction of eco-passages in areas where interaction with amphibians is most likely.	
				7.5.4	Avoid fragmenting continuous features described as productive Snowshoe hair habitat to maintain Canada Lynx and other carnivore foraging habitat. This will also benefit other mammals with large home ranges like White-Tailed Deer and Moose.	
				7.5.5	Keep wildlife corridors free of human presence as much as possible to prevent the promotion of avoidance behaviours.	
				7.5.6	Where clearing is required, or forestry practices planned, downed, woody debris and slash will be retained on site for Canada Lynx denning and resting areas as per J.D Irving Woodlands standard practice.	
7.6	Construction Decommissioning	10, 12, 13, 14, 34	Impacting water quality via sedimentation	7.6.1	Utilize appropriate ESC measures around wetland features, especially where flowing water is present, and sediment/discharge can be carried downstream.	Disturbed areas will be inspected to assess success of reclamation and mitigation measures.
				7.6.2	Water coming into contact with uncured cement or cementitious waste will not be deposited into or near waterways. Concrete wash water will be handled in accordance with the project EPP.	

Terrestrial Wildlife and Wildlife Habitat						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
7.7	Construction Decommissioning	4, 5, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 20, 24, 26, 27, 32, 34	Mortality to turtle nests or nesting individuals	7.7.1	Nest sweeps will be completed by a qualified individual with nests being marked when found. If nests are found, a 60m riparian management zone on bodies of water 150m up and downstream from documented nesting areas will be created.	Not required
				7.7.2	Eco-passages and exclusion fencing will be included in design where appropriate.	
				7.7.3	If wildlife handling is required under exceptional circumstances, it will only be done under appropriates permits/guidance from relevant authorities.	
7.8	Construction Decommissioning	10, 34	Mortality of overwintering turtles	7.8.1	Avoid aquatic works during sensitive overwintering periods (October – April) where changes in water levels may result in turtle mortality.	Not required
				7.8.2	If wildlife handling is required under exceptional circumstances, it will only be done under appropriates permits/guidance from relevant authorities.	
7.9	Construction Decommissioning	10, 11, 12, 14, 16, 18, 34	Infilling of ditches and seasonal pools used by amphibians	7.9.1	Plan deposition sites to benefit vernal breeders that are known to occur within the Local Assessment Area such as the Spring Peeper, American Toad, Spotted Salamander and Wood Frog	Not required
7.10	Operation	27	Culvert maintenance and beaver management altering water flow regime or disturbing overwintering turtles.	7.10.1	Ensure drain aquatic works are complete in a timely manner and that flow returns to baseline conditions.	Disturbed areas will be inspected to assess success of reclamation and mitigation measures.
				7.10.2	If dredging or dam removal is required as routine maintenance drainage systems, it shall be done outside of turtle overwintering periods (October – April) (GoC, 2018), unless isolated and trapped prior to overwintering.	

6.2.3.5 Significance determination – Terrestrial Wildlife and Wildlife Habitat VC

6.2.3.5.1 Herpetofauna and Related Habitat

6.2.3.5.1.1 Direct Mortality

Direct mortality because of vehicle collisions may occur sporadically throughout all phases of this Project and is expected to diminish post-decommissioning. However, this project has been purposefully planned to avoid lowland areas (High and Dry Approach). In consideration of this design feature together with the proposed mitigation such as use of eco-passages along roadways and the tendency for some turtle species to avoid access roads, the magnitude of this impact (in terms of the number of turtles being killed by vehicles) is considered to be minor, with the impact being entirely reversible if vehicles were to stop using roadways. Road mortality can only occur within the PDA, where roads are present. It is also important to note that most roadways to be used during all Project phases have already been in place for decades, meaning baseline conditions are not expected to change much post-construction. Ecological resilience is therefore rated much higher than if this Project was going to include an entirely new network of roadways.

Where non-roadway related construction is expected to occur (turbines, transmission lines, substations. etc.), mitigation including avoiding wetlands, conducting site sweeps ahead of construction, and respecting timing windows for overwintering periods would be expected to substantially lower the likelihood and frequency of direct mortality from these activities.

In low lying areas where the “High and Dry Approach” could not be followed (e.g., a road already existed in a low-lying area), or in areas where high turtle density is expected to occur, effective mitigations like eco-passages with guiding exclusion fencing will be put in place. Likelihood of interaction of reptiles and amphibians with roadways in these areas is considered high. Given the above rational, direct mortality to reptiles and amphibians is expected to be insignificant. Given the depth of literature surrounding reptiles and amphibians with road mortality and use of eco-passages, certainty of the overall assessment is high.

6.2.3.5.1.2 Habitat Loss

Habitat loss for reptiles and amphibians will primarily occur as large, one-time impacts during the construction and decommissioning phases within the PDA. Any habitat loss that may occur during the operational phase would likely be more minor, and easily eliminated by following the mitigations identified in the Operational Phase. Habitat loss will not necessarily always occur in the form of physical removal of features, rather in promoting the avoidance of suitable areas that are divided by roadways. As most roadways to be used in the turbine network already exist on site, ecological resilience should be considered high with local turtles having already established home ranges facing these impacts.

Impacts are partially reversible where connectivity can be re-established and maintained. Where mitigations promoting connectivity are implemented in areas which have already been fragmented by existing roads, ecological resilience should be expected to improve.

Given the above rational alongside the Projects "High and Dry" approach which avoids impacts to wetland features as much as possible in its design, magnitude of impact is minor following installation of mitigation measures, despite the high likelihood of occurrence. This results in the impact being rendered insignificant. Certainty in the assessment is Moderate given that mitigations are known to be effective as use of eco-passages by turtles is well documented in literature, but interactions between several turtle species known to occur within the PDA and wind-farm infrastructure are still poorly understood.

6.2.3.5.1.3 Habitat Degradation

The number of wetlands (possible reptile and amphibian habitat) that would need to be crossed by new access roads during the construction phase is low, as access will rely as primarily on existing infrastructure. This suggests that the number of works near water that have the potential to impacts active and/or overwintering habitats will also remain low. Where work does occur in proximity to wetlands (e.g., installing a culvert), implementing appropriate ESC measures at each site is expected to result in negligible changes from baseline conditions. Limited incidences of impacts to hydrology within the PDA, avoidance of sensitive areas in the projects "High and Dry design" as well as appropriate site specific being put in place should all be considered when assessing impact.

Given the project is largely building off existing roads, and many wetlands are available within the RAA, ecological resilience is considered high with impacts being reversible if works in any given location were to be removed with proper site remediation occurring afterwards. Most impacts are expected to be one-time during the construction/decommissioning phases but may be sporadic in nature where maintenance is required during the operational phase. Given appropriate mitigations are being followed during construction and incidences of occurrence will be small scale only, likelihood of impact is low, and impacts are expected to be of low magnitude. Overall, habitat degradation is not expected to be significant.

A summary of the Significance Determination of Residual Impacts to Herpetofauna and related habitat is presented in Table 6-30.

6.2.3.5.2 Canada Lynx, Other Mammal and Related Habitat

6.2.3.5.2.1 Direct Mortality

Direct mortality due to vehicle collisions may occur sporadically within the PDA throughout all phases of this Project and is expected to diminish post-decommissioning. While potential will always be present, given the size of many mammals known to occur on site, low traffic rates, proposed promotion of driver education, and reduced speed limits on roadways, likelihood of impact is low. Impacts are entirely reversible if vehicles stop using roadways. The maintenance of wildlife corridors and the resulting broader connected landscape will also further permit species to utilize features essential to life processes without needing to cross access roads. While small mammals are likely to use eco-passages intended for reptiles and amphibians, large mammals will not be able to given size limitations. Canada Lynx have shown to be a species resilient to commonly occurring disturbances within the province, having been downgraded from Endangered to Special Concern within the NBSARA as of May 2022. Magnitude of impact is expected to be minor, and the overall effect is assessed as not significant. Despite mammalian road mortality being known to occur frequently across New Brunswick (Christie, J.S. and Nason S., 2004 & NBDNRED, 2022), mitigation strategies being implemented in this Project, such as wildlife corridors and use of pre-existing infrastructure, are known to be effective and some SAR mammals, such as the Canada Lynx, are proven to have some resilience to anthropogenic disturbance. Given the rationale presented above, certainty in the assessment is ranked as High.

6.2.3.5.2.2 Habitat Loss

Habitat use by the Canada Lynx in natural systems is very poorly understood, with habitat use in urban landscapes having potential to be even more complex. While the Canada Lynx is known to select core natural areas with dense understory to forage (Parker, 2001 & NBDNRED, 2022), the Canada Lynx does traverse fragmented landscapes routinely given their large home ranges. Habitat availability within the RAA, alongside mitigation strategies listed in the Construction and Operational Phases, suggest the impact will be insignificant.

Loss of forest cover is a one-time impact to occur in the PDA during the construction phase but maintenance of lands to limit encroachment by vegetation (e.g., mowing) will occur sporadically through the operational phase. This disturbance type is similar to what is already experienced as a result of surrounding land use, where forestry, logging and silviculture take place, so ecological resilience is high given Canada Lynx are known to frequent the area despite the disturbances. While the magnitude of impact is moderate considering several turbines will require clearing of forest, maintenance of connectivity and habitat availability within the RAA suggest plenty of suitable habitat for essential life processes will remain post construction. Impacts are partially reversible given most forest being cleared is plantation that can be re-vegetated post-decommissioning. Likelihood of impact is high given forest cover loss will need to take place to make room for infrastructure. Certainty of impact is moderate given Lynx are still known to frequent areas within the RAA that experience similar disturbances, despite they’re use of natural systems being poorly understood.

6.2.3.5.2.3 Habitat Degradation

Responses by herbivores and carnivores to wind turbines appears to be species dependent and further studies would be required to know how they respond to infrastructure (Łopucki, 2017). The Canada Lynx in particular is known to avoid settled areas in New Brunswick (NBDNRED, 2022). Their main prey source, the Showshoe Hare, may have lowered dispersal success facing similar levels of human disturbance (Hodges, K.E, 2000). While there is a lack of evidence to suggest Canada Lynx, furbearers or ungulates will avoid the PDA because of turbines themselves, it is reasonable to expect that increased human presence in the PDA may continuously deter these animals from the area during all phases of the Project.

Wildlife corridors that will typically be free of human presence as a mitigation strategy is expected to promote dispersal throughout the LAA. Given most listed mammals are known to persist in areas with higher human density then the LAA, mammal ecological resilience facing an increase in infrastructure and human presence is expected to be high. Impacts would be reversible if people stopped frequenting the site enough to where human presence returns to baseline conditions. Likelihood of impact is high as human presence will certainly be increasing from baseline conditions so turbines can be routinely maintained. Given the rationale above, the impact is expected to be insignificant. Certainty of the assessment is moderate given the uncertainty surrounding some of the listed species' behaviours in anthropogenically disturbed landscapes.

A summary of the Significance Determination of Residual Impacts to Mammals and mammalian habitat is presented in Table 6-30.

6.2.3.6 Follow-up Monitoring – Terrestrial Wildlife and Wildlife Habitat VC

Areas disturbed by construction of the Project will be periodically inspected following completion to assess success of any reclamation efforts completed during the Project and to assess effectiveness of applied mitigation measures (e.g., erosion control). This will determine the necessity for any immediate remedial or follow-up work (e.g., additional erosion control in unstable areas). If any additional work is required, additional inspections may be required.

Table 6-30: Significance Determination of Residual Impacts - Terrestrial Wildlife and Wildlife Habitat

Impact	Project Phase*	Magnitude	Duration	Frequency	Geographic Extent	Reversibility	Ecol. Resilience	Certainty	Likelihood	Significance
Reptile										
Direct Mortality	P, C/D, O	Minor	Far Future	Sporadic	PDA	Reversible	Neutral	High	High	**Not Significant**
Reptile Habitat										
Habitat Loss	P, C/D, O	Minor	Far Future	Continuous	PDA	Partially Reversible	High	Moderate	Moderate	**Not Significant**
Habitat Degradation	P, C/D, O	Minor	Short Term	One Time	PDA	Partially Reversible	High	High	Low	**Not Significant**
Mammal										
Direct Mortality	P, C/D, O	Minor	Far Future	Sporadic	PDA	Reversible	High	High	Low	**Not Significant**
Mammal Habitat										
Habitat Loss	C/D, O	Moderate	Far Future	One Time & Sporadic	PDA	Partially Reversible	High	Low	High	**Not Significant**
Habitat Degradation	P, C/D, O	Minor	Far Future	Continuous	LAA	Reversible	High	Moderate	High	**Not Significant**

* Prefers to the Planning Phase, C/D refers to the Construction and Decommissioning Phases, O refers to the Operational Phase

6.2.4 Birds – VC

6.2.4.1 Planning Phase – Potential Impact – Birds

It is expected that the main impacts on birds during the planning phase of the project will relate to land-use changes (loss of habitat) required for installation of MET tower pads and radar locations, as well as an increase of traffic activity, noise, dust, and other human disturbances.

During this phase, an increase in traffic along access roads may cause environmental disturbances such as increased noise and dust levels, which may result in changes in natural behaviors related to breeding, nesting, or foraging. These changes may have the potential to affect the survival of individuals or bird populations. Direct mortality due to vehicle collisions is also possible.

Increasing human traffic within the PDA poses a risk to nests with viable eggs, nestlings, and fledglings, as birds may abandon nests and/or young when subjected to major disturbance (ECCC 2023c).

Any clearing and grubbing required for the installation of the MET towers, radar stations or geotechnical works, should only take place within the designated zones within the PDA. If clearing is required between April 10 - August 31 (e.g., the Breeding Bird Season), a qualified professional shall conduct a nest survey to assess the area for use by breeding birds. Nest surveys will occur 48 hours or less before clearing activities. If a nest is identified, appropriate buffer zones will be erected as guided by a qualified professional, and no work should occur within this buffer zone, unless under permit from CWS. The MBCA (1994) protects migratory bird nests that are being used for nesting or contain a viable egg or live bird. Mitigation for this impact, therefore, aligns with the regulatory requirements. There is confirmation that Canada Jays, a species of conservation concern, are breeding within the PDA. As this species is an early breeder and may be nesting prior to April 10th, this poses a risk of disturbance or destruction of nest locations when clearing coniferous areas. Any signs or evidence of Canada Jay nesting should be documented, and a qualified biologist should conduct a nest sweep and erect appropriate buffer zones if a nest is present.

6.2.4.2 Construction and Decommissioning Phases – Potential Impact – Birds

It is known that wind energy projects have potential to negatively impact birds due to habitat loss (ECCC-CWS 2007a).

It is expected that the main impacts on birds during the construction and decommissioning phases of the project will relate to land-use changes such as clearing and excavation, as well as an increase of traffic activity, noise, dust, and other human disturbances.

It is known that wind projects pose a risk to birds due to collisions with turbines and other associated structures such as MET towers, guy wires, and transmission lines (Zimmerling et al. 2013). High voltage lines may pose other risks such as electrocution of raptors and other large birds. This can be avoided by designing lines with enough space between conductors so birds cannot simultaneously touch two phases (ECCC CWS 2007a). As many birds are more active at dawn and dusk (Transport Canada, 2004), where practical, it is recommended that erecting and deconstructing structures takes place outside of these periods, to reduce the potential of collisions.

The presence of hazardous materials (e.g., fuel, coolant, engine oil) on site poses a risk of spills and contamination. This may result in changes to the quality of bird habitat, or indirect mortality of birds due to consumption of hazardous materials. If a spill occurs, cleanup should occur immediately to prevent harm to birds and their environment. In addition, care should be taken to ensure waste materials brought on site by Project personnel are properly disposed of and removed from the site.

As discussed in previous sections, clearing, grubbing, and excavation may result in habitat alteration or loss. If significant amounts of nesting habitat are altered and/or lost, it is possible the carrying capacity or productivity of the area may be reduced (Zimmerling et al., 2013). Clearing during the construction phase will be more invasive than during the planning phase, as roads will be altered for turbine transportation, new roads will be built, and turbine pads will be cleared. Some of the proposed turbine pads exist within intact forest stands, which may result in displacement of birds and loss of forest-interior species' habitat.

Cleared areas may resemble suitable habitat for ground-nesting birds, such as Common Nighthawk, attracting these species to the work site (ECCC, 2023c). To deter ground-nesters from occupying cleared spaces, there should be limited time between clearing and implementing Project activities within the area during nesting season, and open piles of gravel or construction materials should be covered when not in use. During nesting season, care should be taken while travelling through site on foot. Project personnel should be mindful of where they step in areas with dense ground vegetation and shrubs, so as not to disturb ground-nests. Human noise should be limited where possible. In addition, piles of gravel or soil from excavation should not be left uncovered for extended periods of time.

6.2.4.3 Operational Phase – Potential Impact – Birds

During the operations phase, the main impacts are expected to be direct mortality from collision with turbines, transmission lines, and other structures erected during the construction phase. In addition, certain impacts from the planning/construction phases are likely to remain during the operational phase such as disruptions due to traffic activity on roads and human activity within the PDA.

An adaptive Avian Management Plan will be developed for the project and will be integrated with the post-construction biological survey results. This Plan will ensure the Project implements additional mitigation measures, if required, to prevent avian mortality resultant from turbine operation.

Lighting on Project structures may also attract birds and increase the risk of mortality or injury. Mitigation measures may include using lights with the ability to emit no light during the pause of the flash, or “off phase”. Also recommended is the use of lights with short durations and the minimum number of flashes per minute. If possible, steady-burning lights or spotlights should not be used, as they hold the potential of attracting birds (ECCC-CWS, 2007a).

6.2.4.4 Mitigation measures – Bird VC

A list of the possible impacts of this project and the associated mitigation measures for these impacts are summarized in Table 6-31.

6.2.4.5 Significance Determination – Bird VC

It is known that wind turbine projects can potentially have negative effects on birds due to direct mortality, disturbance, and loss of habitat(s) (ECCC-CWS, 2007a). The following sub-sections discuss residual impacts informing significance determinations of those impacts.

6.2.4.5.1 Direct Mortality

Throughout all phases of the Project, direct mortality from vehicle collisions has a potential to occur sporadically. There is considerable data on the negative impacts of vehicle collisions on birds and bird populations, however, specific factors that affect the probability or number of collisions are not yet well understood (Morelli et al., 2014; Husby, 2016). There may be a higher risk for scavenging birds such as corvids, vultures, and bald eagles, as they may be attracted to roads due to any present roadkill (Husby, 2016). It is reasonable to estimate that the frequency of these collisions may decrease over time as access roads will be widened during the construction phase, removing shrubs and vegetation from road edges deterring birds from utilizing areas such as road edges for foraging and nesting. Some research has shown that mortality from vehicle collisions increases in the summer, which may be due to inexperienced fledglings using areas with roads (Husby, 2016).

Table 6-31: Potential Impacts and Mitigation Measures - Birds

Avian						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
8.1	Planning Construction Operation Decommissioning	3,9,12,14,15,26,27,35	Loss of nesting and foraging habitat.	8.1.1	Tree harvesting and clearing will be scheduled outside of the breeding bird season to the greatest extent possible. If clearing is required between April 10 - August 31 (i.e., the Breeding Bird Season), a qualified professional shall conduct a nest survey to assess the area for use by breeding birds. Nest surveys will occur 48 hours or less before clearing activities. If a nest is identified, appropriate buffer zones will be erected as guided by a qualified professional, and no work will occur within this buffer zone. Work will only occur within the buffer zone with a permit from CWS, or until the nest has been deemed evacuated. Removal of large trees and snags (15 cm or greater) should only occur where absolutely necessary. Clearing activities will be completed in accordance with the project EPP	N/A
				8.1.2	Clearing and excavating shall be minimized to necessary areas only.	
				8.1.3	Every effort should be taken to leave natural grassed areas intact.	
8.2	Planning Construction Operation Decommissioning	9,10,11,24,29,32	Vehicle Collisions	8.2.1	Speed limits shall be followed on all roads within the site, and care should be taken when driving at dawn or dusk.	Two year Post-Construction Bird Mortality Survey
8.3	Planning Construction Operation Decommissioning	3,25	Collisions with MET Towers and Turbines	8.3.1	An Adaptive Bird and Bat Protection Plan will be developed for the project and will be integrated with the post-construction biological survey results. This Plan will ensure the Project implements additional mitigation measures, if required, to prevent avian mortality resultant from turbine operation.	Two year Post-Construction Bird Mortality Survey
				8.3.2	Post-construction biological surveys, including mortality surveys, carcass removal trials, and searcher efficiency trials will be conducted by qualified biologists.	
				8.3.3	CWS (2007) recommends using lights with the ability to emit no light during the pause of the flash, or “off phase” of the flash. Also recommended is the use of lights with short durations and the minimum number of flashes per minute. No steady-burning lights or spotlights should be used, unless required by Transport Canada for aviation safety.	
8.4	Planning Construction Operation Decommissioning	4,5,9,10,12,14,15,16,26,27,35	Natural breeding and nesting processes disturbed or interrupted resulting in abandonment of nest, eggs, nestlings, or fledglings.	8.4.1	Tree harvesting and clearing will be scheduled outside of the breeding bird season to the greatest extent possible. If clearing is required between April 10 - August 31 (i.e., the Breeding Bird Season), a qualified professional shall conduct a nest survey to assess the area for use by breeding birds. Nest surveys will occur 48 hours or less before clearing activities. If a nest is identified, appropriate buffer zones will be erected as guided by a qualified professional, and no work will occur within this buffer zone. Work would only occur within the	N/A

Avian						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
					buffer zone with a permit from CWS, or until the nest has been deemed evacuated. Removal of large trees and snags (15 cm or greater) should only occur where absolutely necessary. Clearing activities will be completed in accordance with the project EPP.	
				8.4.2	During nesting season, care will be taken while travelling through site on foot. Through appropriate communication on environmental awareness, Project personnel will be mindful of where they step in areas with dense ground vegetation and shrubs, so as not to disturb ground-nests. Human noise should be limited where possible.	
				8.4.3	Ground nesting birds should be deterred from breeding in areas of clearing by keeping piles of gravel or soil covered during periods where they are not in use. In addition, the time between clearing and commencing project activities within the area will be limited.	
8.5	Planning Construction Operation Decommissioning	2,7,23,31	Illness or death caused by consuming hazardous materials or waste.	8.5.1	Hazardous materials (fuel, coolant, etc.) will be stored appropriately. All waste will be stored in proper receptacles, covered, and removed regularly from site.	Two year Post-Construction Bird Mortality Survey
				8.5.2	Mechanical equipment will be kept in good working condition and will be inspected daily for leaks and prior to being brought to site.	
				8.5.3	Spill kits will be kept in strategic locations on the Project site. Stationary and mobile equipment that require fuel will also have dedicated spill kits. Any leaks or accidental spills will be immediately contained, cleaned up and reported in accordance with regulation.	
8.6	Planning Construction Operation Decommissioning	3,4,5,8,9,10,11,12,13,14,15,16,17,18,19,20,26,32,34,35	Natural breeding, nesting, or foraging processes disrupted or interrupted due to dust or noise. Inhalation of dust causing injury	8.6.1	Speed limits shall be followed on all roads within site, and care should be taken during dry seasons to mitigate disturbance and dust dispersal in the air.	N/A
				8.6.2	Site activities will be planned prior to execution to ensure efficient implementation and prevent unnecessary excess noise. The duration and frequency of noise should be minimized wherever possible. Heavy machinery will be maintained in accordance with the manufacturer's specifications, including appropriate mufflers and other noise-control equipment. Project personnel will ensure idling of construction vehicles is limited	
				8.6.3	Project personnel will not feed or harass wildlife	
8.7	Planning Construction Operation Decommissioning	4,5,9,26,35	Natural lifecycle and behaviour interrupted resulting in high stress levels or unnatural injury.	8.7.1	Project personnel will not feed or harass wildlife.	N/A

Avian						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
8.8	Planning Construction Operation Decommissioning	8,24,32	Changes to ecosystem's flora or fauna from introduction of exotic species	8.8.1	Vehicles and equipment will be in good operating condition, free of leaks, mud, dirt, or debris before being mobilized to site, to ensure no exotic or invasive species are introduced onsite.	N/A
8.9	Construction Operation Decommissioning	15,17,25,34	Collisions/electrocution from transmission lines	8.9.1	Where practical, efforts will be made to schedule the erection and deconstruction of towers or other structures outside of dawn/dusk periods.	Two year Post-Construction Bird Mortality Survey
				8.9.2	Line visibility can be increased by using bird "flappers" or other diverters, and by increasing the size of the wire to larger than 230kV, where possible. The location of transmission routes has been selected to avoid area's most likely to have increased bird activity (e.g. near or over water, and wetlands) to the greatest extent possible. If lines cross over wetlands, small lightening shield wires can be removed, if safe to do so without jeopardizing the integrity of the infrastructure	
				8.9.3	Lines should be situated below the level of treetops where practical. Lines should be designed with enough space between conductors so birds cannot simultaneously touch two phases (ECCC-CWS 2007a).	

As construction actions such as clearing, and grubbing will primarily take place outside of the nesting period (i.e., April 10 to August 31, unless guided by a qualified professional biologist), then there will be less traffic moving through the site during the period where juvenile birds are fledging, which is the point where potential of collision is considered highest (Husby & Husby, 2014). Available literature on how vehicle speed relates to probability of collisions is still inconclusive Considering the above, certainty of assessment is low. Speed limits being followed alongside limited traffic at sensitive times of year will better allow birds to assess the movement of the vehicle and move out of the way, resulting in high ecological resilience and lowering the magnitude of impact. Overall, this impact is considered likely to occur infrequently but not significant to the overall population.

Other types of direct mortality include collisions with turbines, which is a concern to birds who may migrate or perform other flight behaviours such as foraging or displaying within the PDA and RSZ area.

From the initial data analysis of diurnal migratory watch counts and Year 1 surveys, it is not expected that the LAA is a major migration corridor for diurnal migrants such as raptors. Migratory stopover transects in both spring and fall also did not detect large numbers of raptor and/or passerine species, suggesting the Project site may not support significant migratory pathways. This suggests that likelihood of impact to populations of these species is low, and magnitude of impact will be low given the lack of birds migrating neat turbines. However, further migration data collected in 2024 will contribute to a better understanding of the Project’s potential impact on diurnal migrants.

It is however known that turbines pose a risk to nocturnal migrants (Zimmerling et al., 2013). The radar report by DeTect (2023), outlines the results from the first year of preliminary radar data collection. This data did show that target passage rates averaged greatest during the nights, specifically between the hours of 21:00 to 23:00, for both spring and fall, suggesting migrating birds or bats (amongst other targets, such as large insects) were passing through the area detected by the radar. Direction of travel for targets also pointed towards migration, as target movements in the spring averaged strongly northeast during the nights in the spring, and south and southwest during the nights in the fall. This suggests that likelihood of impact is expected to increase between these hours, and timing specific mitigations could be implemented to reduce magnitude of impact once the certainty of the assessment is increasing following collection of Year 2 data. Data from Year 2 is expected to help determine level of certainty of migratory pathway significance and overall avian activity within the Project site, particularly nocturnal activity. This impact would be sporadic, with mortality peaking annually in the spring and fall, but through adaptive management, and implementing mitigations, is deemed not significant.

6.2.4.5.2 Indirect Mortality

Waste such as oil drums, packing materials, and coolant have the potential to cause harm to birds and their environment within the PDA if disposed of improperly or unmaintained, resulting in leaks or spills in the surrounding environment (ECCC-CWS, 2007a). Care will be taken during all phases of the Project, notably during the construction and decommissioning phases, as there will be more vehicles, equipment, and substances on site in comparison to the operations and planning phases. Pesticides pose a risk to all forms of wildlife, including birds and are known to cause adverse effects to birds and bird populations (EC, 2002; Sala et al., 2010). It is recommended that pesticide usage is avoided, where possible, during all phases of the Project. With mitigation measures in place, this impact is anticipated to have a low likelihood of occurrence and would not be significant. Given the localized impacts a spill would have within the PDA, any spills that do occur are expected to be of low magnitude with impacted species having high ecological resilience given their large home ranges and high availability of suitable habitat.

The Migratory Bird Regulations (2022) protect nests of migratory birds when a viable egg or live bird is present, prohibiting damage, disturbance, and removal of these nests. There are Schedule 1 species whose nests are protected year-round, but only two of these species have been observed during avian surveys: Pileated Woodpecker and Great Blue Heron. No nesting cavities or nests for these two species were observed within the PDA during the 2023 survey season. To ensure no nests containing eggs or live birds are disturbed or destroyed during all phases of the Project, clearing and grubbing will be scheduled for completion outside of the nesting season (mid-April to late August) to the greatest extent possible. If clearing/grubbing is necessary during the nesting season, a qualified biologist will be required to conduct a nest survey (“sweep”) to assess the area for usage by any breeding birds. If a nest containing a live bird or egg is identified, appropriate buffer zones will be erected as guided by a biologist, and no work will occur within this protected buffer zone. The efficacy of nests sweeps, is a function of habitat type as well as species specific nesting preferences, whether nests are known to be easy to locate (e.g., previously cleared area, simple habitats, low vegetation, etc.) and carried out by experienced observers using appropriate scientific methodology. Should any nests or unfledged chicks be discovered, protection with an appropriate-sized buffer is expected. The nest location should not be marked using flagging tape or other similar material as this may increase the risk of nest predation. ECCC CWS can be contacted for further advice on bird monitoring and/or mitigation if a nest is found. In the case that it is necessary for a nest to be removed or relocated, appropriate permits would be required from CWS prior to removal. Disturbance of nests is considered as an insignificant potential impact.

Given the extent of area to be cleared, magnitude of impact would be high in a worst-case scenario, with impacts occurring one time and being limited to the PDA. Ecological resilience would be low as chicks/eggs would not be able to evade incoming harm if present along roadsides during clearing activities. Given mitigations put in place for the Project and timing windows to be respected will drastically reduce the likelihood of encountering active birds nest, likelihood of impact is low. Overall, the impact is considered insignificant with mitigation in place, certainty in the assessment is high given timing window avoidance alongside nest sweeps by a qualified biologist.

Therefore, the magnitude of impact is considered moderate, with highest potential for impacts being one-time during the construction phase. Sporadic impacts may occur during vegetation maintenance of the operational phase but are expected to be unlikely to occur given the small scope of work that will be completed under MBCA regulations.

6.2.4.5.3 Disturbance

Other impacts from the increase in number and use of access roads include an increase in unnatural light and dust within the PDA and LAA. Research shows that occurrence and abundance of birds is typically reduced near to active roads, with these reductions being larger in high-traffic areas than low-traffic areas (Summers et al., 2011). The specific causes for this are still inconclusive, however, given most species that are known to occur on-site frequent urbanized areas, ecological resilience to an increase in minor infrastructure components is expected to be high. Increased and/or high levels of noise from traffic may disturb behaviours such as territorial singing during breeding season (Rao & Koli, 2017). During the construction and decommissioning phases of the Project, it is expected that the rate of traffic will be relatively high, resulting in a regular disturbance of increased magnitude that occurs over a short period of time. The operations and planning phases will have a lower rate of traffic moving through the site, which is expected to reduce magnitude of disturbance. With mitigation measures in place, the disturbance level is expected to remain close enough to baseline conditions to where birds will adjust to disturbance and displacement, resulting in a low magnitude of impact. Therefore, although the duration of these potential impacts may be long-term and have regular frequency, the impact is not expected to be significant.

It is expected that during the construction and decommissioning phases, disturbance and noise from construction areas will deter birds from nesting in the area. Certainty of this assessment is high as studies have shown nesting in suboptimal habitat may have decreased reproductive success (Rao & Koli, 2017). During the operations phase, human traffic and disturbance is expected to be lowered, increasing the probability that birds may nest in areas of low human traffic such as near to high voltage lead lines or substations or portions less disturbed within the LAA. There is limited literature on the impacts of human harassment on birds, except for waterbirds that interact with human activity such as sport fishing (Dorr et al., 2010) Nonetheless, it is known that birds are susceptible to disturbance and may abandon a nest during the breeding season if flushed or disturbed (ECCC, 2023c). As the highest risk of this impact will occur during the construction phase, where most bird habitat will be encroached upon, it is being considered a short term, sporadic impact. All site personnel will be adequately trained on how to handle wildlife situations and best management practices, thus will not be intentionally harassing or feeding birds, and construction that would be responsible for disturbance is occurring outside of the nesting season, the impact is expected to be insignificant. Ecological resilience is considered high for work taking place outside of the nesting season, as individuals can simply displace themselves from actively disturbed areas.

6.2.4.5.4 Habitat Loss

The total amount of habitat lost in the PDA as a worst-case scenario, including wetland and upland features, is 1873 hectares. In actuality, the number of lost habitats is expected to be significantly lower (~75% reduction) when considering activities taking place in many portions of the PDA. Areas designated for development for infrastructure such as existing road upgrades, transmission line right of ways and more will be subject to activities that would fall more in line with habitat alteration (e.g. reverting forested features to a younger age class) as opposed to a complete loss of habitat function. It is also important to note that given generous buffers were applied to all proposed infrastructure to account for worst case scenarios, areas planned to undergo complete habitat loss are greatly exaggerated in size and scope. With this understanding, the one-time impact of habitat loss is expected to be moderate in magnitude as opposed to the major impacts that could occur in a worst-case scenario. Given current land-use and species ongoing success in a fragmented landscape, ecological resilience is expected to be high for interior forest species. Wetland and forest edge species are also expected to remain resilient given the “High and Dry” approach of the project design avoids these features to any extent possible, so less loss is expected then what will be experiences by forested features. For loss that does occur, as areas can be replanted but would require an extended period to mature and establish the same function as established forest. A summary of expected loss under expected conditions for the project will be produced in Year 2 and present data in the form on % of area lost compared to % of area altered to represent expected impact on local biodiversity more accurately.

As there are SAR and SOCC present within the LAA and PDA, critical habitat must be avoided and protected. Only one record was documented during 2023 of three Chimney Swifts foraging over wetland. It is not expected that this species is nesting within the area, however, as they may nest in large (>50 dbh) hollow trees and have been, albeit rarely, recorded using old nest cavities by Pileated woodpeckers (COSEWIC, 2007), trees flagged by biologists within the PDA that have potential nesting cavities should be avoided during clearing activities in order to preserve potential nesting cavities and quality habitat for SOCC and SAR species.

The proposed high-voltage generator lines (HVGL) will traverse through deciduous habitat that is more intact than much of the coniferous areas designated for harvesting, therefore affecting the availability of contiguous tracts of forest that some species require or prefer, such as the Wood Thrush (SAR) and Scarlet Tanager (SOCC). The location of the HVGL proposed to be built in the southern portion of the PDA has not been extensively surveyed by biologists and therefore, the relative abundance of these forest-interior species within this tract is still inconclusive. During 2024 surveys, biologists will include this area as transects to collect more data on how birds may be using this habitat via various seasonal avian surveys.

A significance determination will be provided for this impact post data collection where potential impacts on species that frequent the area will be better understood.

6.2.4.5.5 Habitat Degradation

The spreading of invasive plant species can have major impacts on an ecosystem (Grzędzicka & Jiří Reif, 2020). These impacts can be ecological, altering habitat and food webs, genetic, affecting gene pools, or pathological, infecting native species (CFS & NRC, 2002). Regarding plant species specifically, studies have shown nonuniform consequences from invasive plants on resource availability or habitat preferences of birds (Nelson et al., 2017). Although there is potential for invasive plants to change habitat architecture and heterogeneity, this does not necessarily cause negative effects on birds, and can in some cases create positive outcomes for birds and bird populations (Gleditsh & Carlo, 2010; McCusker et al., 2010).

With mitigation measures in place, the potential of introducing an invasive species to the Project site may be lowered. Controlling and eradicating invasive species can be extremely difficult and costly; and not always succeeding at eradication (CFS & NRC, 2002), therefore, potential impacts may be major in magnitude with long-term effects. Due to the inconsistencies of invasive plant species potential effects on bird habitat, this is not considered an impact of high magnitude, with certainty of impact being high given the impacts of invasive vegetation on bird populations are well documented (Nelson et al., 2017 & Drummond, 2005). Given the information presented above, the impact is considered insignificant.

Previously cleared areas may attract ground-nesting birds due to the resemblance of their natural nesting habitat. Therefore, throughout all phases of the Project, personnel travelling on foot through cleared areas or areas with dense vegetation should exert extra caution while in these areas, so as not to disturb ground-nesting birds or destroy nests via travelling through potential nesting habitat. Cleared areas may present additional habitat for species such as Common Nighthawks (SAR), which are ground-nesting birds who require open areas to nest. Although cleared areas from construction may present ideal nesting habitat, there is much habitat available for this species within the LAA and RAA in the form of clear-cuts. With the mitigation measures in place, and with the availability of suitable habitat within the LAA and RAA, this impact is not expected to be significant for ground-nesting birds.

A summary table of the Significance Determination of all Residual Impacts is Provided in Table 6-32 below.

6.2.4.6 Follow-up Monitoring – Bird VC

Baseline avian surveys will be conducted throughout 2024 to meet the Sector Guidance requirement and will provide more data and understanding of how birds may interact with the development of the Project.

A Post-Construction Bird and Bat Mortality Surveys Protocol has been created and can be found in Appendix H. This document will be adapted to any recommendations received by the Technical Review Committee (TRC), and with consultation with CWS and NBDELG. The protocol was developed based on the guidelines for Post-Construction Bat and Bird Mortality Survey Guidelines for Wind Farm Development in New Brunswick and the Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds (ECCC-CWS, 2007b).

The bird and bat post-construction monitoring plan will gather information on the impacts to the species and habitats for two years following the time the turbines are operational.

Post-construction monitoring for birds will include, but not limited to, mortality surveys, carcass removal trials, and searcher efficiency trials and will be combined with the required post-construction bird mortality studies. An annual Post-Construction Monitoring Report that will include all raw data, results, and analysis of the monitoring program will be submitted to the New Brunswick Fish and Wildlife Branch at Department of Environment and Local Government. If the Project is found to be causing significant bird and bat mortality or causing barrier or exclusion effects during postconstruction monitoring, additional mitigation may be required for the Project and the monitoring program may be extended based on requirements determined from consultation with the NBDELG and CWS.

Areas disturbed by construction of the Project will be periodically inspected following completion to assess success of any reclamation efforts completed during the Project and to assess effectiveness of applied mitigation measures (e.g., erosion control). This will determine the necessity for any immediate remedial or follow-up work (e.g., additional erosion control in unstable areas). If any additional work is required, additional inspection may be required.

Table 6-32: Significance Determination of Residual Impacts – Birds and Bird Habitat

Impact	Project Phase*	Magnitude	Duration	Frequency	Geographic Extent	Reversibility	Ecol. Resilience	Certainty	Likelihood	Significance
Birds										
Direct mortality (vehicle)	P, C/D, O	Minor	Long term	Sporadic	PDA	Permanent	High	Medium	Medium	**Not Significant**
Direct mortality (collisions, electrocutions)	C/D, O	Major	Long term	Regular	PDA	Permanent	Low	Moderate	High	**Not Significant**
Indirect mortality (hazardous waste, eggs/nest)	P, C/D, O	Moderate	Long term	Sporadic	PDA	Partially Reversible	Low	Medium	Low	**Not Significant**
Disturbance (dust/ noise, harassment)	P, C/D, O	Low	Short term	Regular	PDA/ LAA	Partially Reversible	Neutral	Medium	High	**Not Significant**
Bird Habitat										
Habitat loss	P, C/D, O	Major	Far Future	Continuous	LAA	Partially Reversible	Neutral	Medium	High	**Not Significant**
Habitat degradation	P, C/D, O	Major	Long term	One time	PDA / LAA / RAA	Reversible	Low	High	Low	**Not Significant**

* P refers to the Planning Phase, C/D refers to the Construction and Decommissioning Phases, O refers to the Operational Phase.

6.2.5 Bats – VC

Timing windows in Table 6-33 below reflect periods of essential life processes of all bat species. These timing windows reflect when activities will be restricted or limited to mitigate the potential for direct mortality.

Table 6-33: Restricted Activity and Sensitive Timing Windows for Bats

Essential Life Process	Timing Window	Source
Maternity Roosting	June – July	Van Zyll De Jong, 1985
Fall Migration and Mating	Late July – October	True et al., 2023

6.2.5.1 Planning Phase – Potential Impacts – Bats

Potential habitat degradation is possible should clearing activities be required during the planning phase, for example in order to complete geotechnical works and surveys, or erect additional MET mast towers. Prior to any clearing activities occurring, bat snag sweeps should be conducted to determine any potential high roosting potential and will be avoided where possible, with buffer zones protecting suitable features should avoidance not be feasible. Additional bat snag surveys will be required should clearing activities be necessary during the maternity roosting window, bat snag sweeps will be conducted by a qualified biologist to determine any potential snags within defined work areas. All clearing activities will be completed in accordance with the project Environmental Protection Plan (EPP). Unnecessary clearing of vegetation and habitat will be avoided. Activities during the planning phase are expected to be minimal to no impacts. Reduction of negative impacts will be implemented during the planning phase utilizing mitigation measures that are outlined in Table 6-34.

6.2.5.2 Construction, and Decommissioning Phases – Potential Impacts - Bats

Impacts to bat habitat during the construction and decommissioning phase present themselves in the form of vegetation clearing and grubbing, noise pollution, and light pollution. Impacts related to habitat loss and degradation can typically be mitigated through appropriate buffers, fencing, site assessments, and other site-specific measures as highlighted in the planning phase. Any features identified as potential maternity roosts will be preserved where possible.

Habitat degradation is possible in areas adjacent to where clearing is expected to take place. This could take place in the form of accidental clearing beyond surveyed boundaries, felled trees disturbing suitable features on the perimeter of cleared areas and exposing features on the perimeter of cleared areas to impacts bats were once shielded from (e.g., higher predation rates, microclimate changes). To mitigate this impact, utilization of snow fencing, survey tape or other means to clearly delineate work area boundaries as well as a pre-determined buffer zone from suitable features and wetlands should be implemented. Ensuring buffers leave some stand density/tree cover around features should be adequate in allowing those features to maintain necessary thermal gradients and protection from predation. As a general BMP, unnecessary clearing of vegetation will be avoided. Other site-specific mitigations to combat habitat degradation may include potential design layout changes, and avoidance of wetland alterations.

Potential direct mortality due to destruction of roosting features during vegetation clearing is easily avoidable through conducting snag sweeps to choose appropriate places to clear, and respecting timing windows to avoid accidental mortality where potential features are present. Any features identified as potential maternity roosts will be preserved where possible and will not be cleared during maternity roosting periods (Van Zyll De Jong, 1985).

If any features that have potential to act as bat hibernacula are found within 5 km of proposed infrastructure, additional survey periods may be required as per the *Pre-Construction Bat Survey Guidelines for Wind Farm Development in NB* (NBNRED, 2009). If an occurrence is determined, J.D Irving will provide a 200 m, year-round, no harvest zone at known active hibernacula (J.D Irving, 2019). Additional mitigation strategies will be made to protect a feature, if found, as hibernacula are known to be particularly sensitive to disturbance.

Lighting limitations will be implemented to control direction, timing, intensity, and flare of light fixtures into potential bat habitat while meeting operational health and safety requirements in accordance with the project Environmental Protection Plan (EPP). As Construction Phase lighting is temporary, long-term impacts are not expected to be significant and simple avoidance measures in combination with timing considerations (e.g., having workdays end at sunset) will be sufficient to protect bats and associated habitat features. Where possible, vertical light trespass should not exceed 0.1 lux within corridors for extended periods of time (Azam et al., 2018).

Noise impacts must be considered as bats are heavily reliant on echolocation to forage and drink, where anthropogenic noise can impact signal reception and processing, impacting foraging success and promoting area avoidance (Bunkley et al., 2015). Noise mitigations include potential buffer zones from sensitive features (e.g., Hibernacula), noise reduction measures. Mitigations such as buffer zones and noise reduction measures will be specified in the Project EPP. Reduction of negative impacts will be implemented during the construction and decommissioning phase utilizing mitigation measures that are outlined in Table 6-34.

6.2.5.3 Operational Phase – Potential Impacts – Bats

Artificial lighting is well documented to both reduce the effectiveness of wildlife corridors and deter light-sensitive species, like bats (Bardwhaj, 2020, Seewagen et al., 2023 & Rowse et al., 2016). Given this knowledge, avoiding the illumination of areas where high bat density is expected serves as a BMP promoting broad-scale landscape use by bats. Despite species specific limitations, lighting mitigation can also take place in the form of hedgerows, daily timing considerations and/or dimmed lights, all of which are thought to mitigate impact and can mitigate cumulatively (Voigt & Kingston, 2016). To meet requirements for light sensitive species, like *Myotis sp*. Light sources should be within no more than 50m of a corridor, with vertical light trespass not exceeding 0.1 lux within corridors (Azam et al., 2018).

Direct mortality as an impact of Turbine Operation is most significant in two forms: Collision with Turbines or Barotrauma. Migratory bats are particularly susceptible to direct mortality during periods of migration, with resident bats accounting for a much smaller portion of total mortality rates (Zimmerling & Francis, 2016). Keeping this in mind, targeting mitigations towards fall migratory periods or during meteorological conditions that correspond with 'high' bat activity, can significantly reduce bat mortalities (Baerwald et al., 2008 & True et. Al, 2023).

An Adaptive Bird and Bat Protection Plan will be developed and informed by the results of Post Construction Bat Mortality Surveys. WTG operations may be modified in accordance with the Plan, to prevent and/or reduce bat mortality during meteorological conditions that correspond with 'high' bat activity (i.e., low wind, no precipitation), or during fall migratory periods.

As an overarching BMP to protect all bat species, avoidance of maternity roost habitat when planning turbine locations will reduce the frequency of which bats will potentially interact with turbines. Reduction of negative impacts will be implemented during the operational phase utilizing mitigation measures outlined in Table 6-33.

6.2.5.4 Mitigation measures – Bat VC

A list of the possible impacts of this project and the associated mitigation measures for these impacts are summarized in Table 6-34.

6.2.5.5 Significance determination – Bats VC

6.2.5.5.1 Direct Mortality

Direct mortality during the Planning Phase could occur as a one-time impact if vegetation clearing were to occur within occupied roosting habitat and destroy or alter these features. Mitigation measures such as implementing buffers around known roost features where possible, and respecting timing windows will greatly reduce likelihood of mortality. If the impact was to occur, the magnitude would be minor considering the small scope of works set to take place during this phase of the Project. Ecological resilience is low given roosting bats cannot easily displace themselves if an impact that can result in mortality were to unexpectedly occur. Certainty of this assessment is high given the small scope of work and implementation of mitigation measures and guidance provided by the Project environmental protection plan (EPP).

Table 6-34: Potential Impacts and Mitigation Measures - Bats

Bats						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
9.1	Planning Construction Operation Decommissioning	3, 9, 15, 26, 35	Mortality to roosting bats from and/or destruction of habitat during vegetation clearing and grubbing	9.1.1	Prior to clearing, bat snag sweeps shall be conducted to determine potential within defined work areas. Sites with high roosting potential will be entirely avoided where possible, with buffer zones being implemented around suitable features if avoidance is impractical.	N/A
				9.1.2	If clearing is required during the bat maternity roosting period (June-July), a qualified professional will survey woodland areas to determine if high potential 'Bat Maternal Roosting Habitat' is present. If high potential bat habitat is identified, appropriate buffer zones will be erected, and clearing activities will be avoided within identified areas, until after the roosting period. All clearing activities will be completed in accordance with the project EPP.	
				9.1.3	Avoid unnecessary clearing.	
				9.1.4	Utilization of construction barriers to create buffer zones to avoid disturbances to bats. Pre-determined deposition /laydown areas.	
				9.1.5	Ensure buffer zones are adequate as to not expose potential features to inclement weather/increased predations rates	
9.2	Construction Operations Decommissioning	8, 10, 12, 13, 14, 15, 16, 17, 18, 20, 24, 26, 27, 32, 34	Area avoidance due to construction noise and lighting	9.2.1	During Construction, measures to control the direction, timing, intensity, and glare of light fixtures into potential bat habitat, while meeting operational health and safety requirements will be undertaken, in accordance with the project EPP.	N/A
				9.2.2	Buffer zones and noise reduction measures will be used as specified in the project EPP.	
				9.2.3	During Operations, measures to control the direction, timing, intensity, and glare of light fixtures into potential bat habitat, while meeting operational health and safety requirements will be undertaken, in accordance with the project EPP.	
				9.2.4	If a bat hibernaculum is discovered onsite, a 200m, year-round, 'no harvest zone' will be established. Currently, there are no known hibernacula within 5 km of any proposed turbine location	
9.3	Operations	25	Collision with turbines	9.3.1	An Adaptive Bird and Bat Protection Plan will be developed and informed by the results of Post Construction Bat Mortality Surveys.	Two year Post-Construction Bat Mortality Survey
9.4	Operations	25	Barotrauma	9.4.1	An Adaptive Bird and Bat Protection Plan will be developed and informed by the results of Post Construction Bat Mortality Surveys.	Two year Post-Construction Bat Mortality Survey
				9.4.2	If feasible, turbine layout may be adjusted during design phase to limit number of turbines within bat habitat shown to have high bat activity.	

Direct mortality during the Construction Phase could occur if vegetation clearing were to impact occupied roosting features. This would be a one-time impact as clearing takes place to make room for installation of infrastructure. Respecting timing windows significantly reduces the likelihood and potential magnitude of roosting mortality with the PDA. If mortality were to occur, ecological resilience would be low as the bats would not be able to easily escape incoming impacts. Given the knowledge surrounding maternity roost features as well as the occurrence of sensitive timing windows, certainty of impact is high. Considering the rationale above, the impact has been assessed as insignificant.

Direct mortality due to collision or barotrauma from turbines is well documented in literature with migratory bats being particularly susceptible during fall migratory periods (Baerwald et al., 2008 and True et al., 2023). Therefore, the likelihood of this impact and confidence in this assessment is high. Even with mitigation measures in place, the impact is expected to be high in magnitude. Long term mortality is expected to occur regularly throughout the active bat season, for the entirety of the Operational Phase. Despite several species being SAR, the wind farm is not expected to be of detriment to the overall population, based on Year 1 field survey data, bat activity is low. A second year of data collection in 2024, will confirm or refute this. Based on the rationale above, the overall assessment of the impact is presumed to be insignificant. The impact should be considered entirely reversible if turbines were to cease operating.

6.2.5.5.2 Habitat Loss

Habitat Loss could occur in the form of destruction and significant alterations to maternity roosting features to make room for planning phase works, such as undertaking geotechnical works and surveys. Implementing buffers around known roost features where possible and respecting timing windows will greatly reduce the potential magnitude of impact, rendering it minor. Like direct mortality during the planning phase, likelihood of impact is low given the small scale of works and easily implementable mitigation strategies. Ecological resilience is high given the abundance of maternity roost features present in the LAA. Given the rationale above, this impact has been assessed as insignificant.

Habitat loss is expected to be moderate in magnitude in the construction phase, where substations, turbine access roads, existing road upgrades, turbine pads and more will require altering and/or clearing of vegetation. While high quality habitat areas and roosting features will be avoided where possible, some level of loss is expected to occur. The effect would be long-term, until after decommissioning where cleared areas are allowed to re-naturalize and mature without maintenance or disturbances. Given the extent of treed areas (and thus likely maternity roost habitat) within the RAA, ecological resilience is high. Certainty in the impact is high as bat maternity roosting features are well described in literature, so loss is quantifiable. Given the high resilience of the RAA to this impact, it has been assessed as insignificant as no population or community level detriments are expected to occur because of clearing or grubbing activities.

Operational phase habitat loss could occur in the form of roosting features being impacted or destroyed during routine maintenance activities. Given no additional areas are expected to be cleared post-construction, and BMPs outlined in the EPP will be followed while any future vegetation clearing occurs such as following sensitive timing windows, impacts to roosting features during the operational phase are not likely and would be one time or sporadic occurrences limited to the PDA. In terms of potential hibernacula, any overwintering features will be buffered to eliminate risk of impact in accordance with *Pre-Construction Bat Survey Guidelines for Wind Farm Development in NB* (NBNRED, 2009). A 200 m, year-round, no harvest zone at known active hibernacula will also be applied (J.D Irving, 2019). This suggests the likelihood of impact to hibernacula is low, however the impact would be moderate if it occurred given a lack of known suitable features within the RAA. An inverse rationale can be attributed to the magnitude for the loss of roosting features, where given the abundance within the RAA, magnitude of impact would be minor. Given the low likelihood of impact to hibernacula, as well as the abundance of trees within the broader landscape (PDA, LAA and RAA), the effects of habitat loss during the operational phase is considered not significant.

6.2.5.5.3 Habitat Degradation

Habitat Degradation could occur on the perimeters of work areas, such as potential for felled trees damaging features outside of the work area. Similarly, to the above one-time impacts taking place during the planning phase, the implementation of buffers around known roost features will be enough to significantly reduce potential magnitude of impact given scope of works. Given the rational above, the likelihood of impact is low and ecological resilience is high given the abundance of maternity roost features within the LAA. Overall, the impact has been assessed as insignificant.

Habitat degradation because of light pollution and turbine operation is still poorly understood. While some species, like *Myotis spp*., are known to have low tolerance for disturbance, other tolerant species seem to carry out life processes in disturbed areas (Avila-Flores & Fenton, 2005). These disturbances would be continuous throughout the life of the project but would be limited to the PDA. Given mitigation strategies, impacts are not expected to be of high magnitude and ecological resilience is expected to remain high. However, it must be acknowledged that the lack of literature surrounding the impacts results in a low certainty level for this impact. Given the rationale above, the impact has been assessed as insignificant.

Habitat degradation has a high likelihood to occur in the form of light and noise pollution promoting area avoidance during construction. With mitigation measures discussed in in place, the magnitude of the effect is expected to be minor. While the effect may be continuous in nature, it will be limited to a short period of time within the Property boundaries given the rapid nature of construction. Ecological resilience is considered high as this degradation is only expected to impact non-critical habitat (ex: foraging) for limited periods of time. While there are some gaps in knowledge regarding bats and their tolerances for light and noise pollution, the short nature of activities still results in a high certainty of impact. There is also plenty of available foraging habitat available within the Property boundaries to be used during periods of impact, so ecological resilience is considered high. Given the rationale above, the impact has been assessed as insignificant.

A summary of the Significance determinations for Residual Impacts to Bats, is provided in Table 6-35.

6.2.5.6 Follow-up Monitoring – Bats VC

A post-construction monitoring plan has been developed and included as Appendix H to this EIA Registration. The Post-Construction Monitoring Plan has been developed upon the "*Post-Construction Bat and Bird Mortality Survey Guidelines for Wind Farm Development in New Brunswick*" (NBNRED, 2011) and the "*Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds*" (CWS, 2007).

The post-bat monitoring plan has been designed to gather information regarding the impacts to the species and habitats for two years following construction. A report with the monitoring results will be submitted to the Fish and Wildlife Branch at the Department of Environment and Local Government annually.

The bat post-construction monitoring plan includes several types of mortality surveys: standardized carcass searches, scavenger efficiency trials, and searcher efficiency trials. If the Project is found to be causing significant bat mortality or causing barrier or exclusion effects, additional mitigation may be required for the Project and the monitoring program may be extended based on requirements derived from consultation with the NDELG and CWS.

An Adaptive Bird and Bat Protection Plan will be developed and informed by the results of the Post-construction Bat Mortality surveys and may result in WTG operation modifications in accordance with the plan to prevent and/or reduce bat mortality during the fall migration period (late July to October).

Table 6-35: Significance Determination of Residual Impacts – Bats and Bat Habitat

Impact	Project Phase*	Magnitude	Duration	Frequency	Geographic Extent	Reversibility	Ecol. Resilience	Certainty	Likelihood	Significance
Bats										
Direct mortality (Collisions, clearing during roosting, etc.)	P, C/D	Minor	Short term	One Time	PDA	Reversible	Low	High	Low	**Not significant**
	O	Major	Long term	Continuous	PDA	Reversible	Low	Moderate	Moderate	**Not significant**
Bat Habitat										
Habitat loss	P	Minor	Short term	One Time	PDA	Reversible	High	High	Low	**Not significant**
	C/D	Moderate	Long Term	One Time	PDA	Partially Reversible	High	High	Moderate	**Not significant**
	O	Negligible	Long Term	Continuous	PDA	Reversible	High	Moderate	Low	**Not significant**
Habitat Degradation (disturbance by noise/light pollution)	P	Minor	Short Term	One Time	PDA	Reversible	High	High	Low	**Not significant**
	C/D	Minor	Short Term	One Time	PDA	Reversible	High	High	High	**Not significant**
	O	Minor	Long Term	Continuous	PDA	Reversible	Neutral	Low	High	**Not significant**

*P refers to the Planning Phase, C/D refers to the Construction and Decommissioning Phases, and O refers to the Operational Phase

6.3 Assessment of Socio-Economic Valued Components Impacts

6.3.1 Community and Local Economy VC

6.3.1.1 Planning Phase – Potential Impact – Community and Local Economy

The planning phase will likely have the least impact on community and local economy: impacts will mainly be to social cohesion and community wellbeing due to increased activity on the Site and communication between JDI and the community.

Planning phase activities include surveys and engagement with communities and First Nations. These planning phase activities will bring small numbers of field workers and JDI staff to the Project site and communities around the site. Local procurement in this phase has been focused on accommodation, meals, survey equipment, and transportation. The following potential impacts to community and local economy have been identified during planning phase:

The Project could cause impacts to community wellbeing (psychological) due to the frequency and transparency of communication from Proponent about the Project. The public will expect the Proponent to follow EIA requirements for public information-sharing about the Project.

The Project could cause impacts to social cohesion due to public disagreement over the wind farm. These impacts have been observed in similar approved projects in Atlantic Canada. Some concerns may include how “green” the supply chain for turbines is, the impacts a wind farm may have on wildlife (e.g., bird strikes), and impacts to recreational use and beauty of an area.

Activities with the potential to impact the Community and Local Community during the planning phase will be subject to mitigation measures as listed in Table 6-38.

6.3.1.2 Construction and Decommissioning Phases – Potential Impact - Community and Local Economy

The construction and decommissioning phases are likely to have the most impact on Community and Local Economy due to the associated construction activities in this phase, including the influx of people and activities in the area.

6.3.1.2.1 Community Demographics

Wind projects can create community demographic changes due to their social and economic impact. Some changes may include:

- Social cohesion: wind energy projects can be divisive in communities due to NIMBYism (not-in-my-backyard) and other community priorities (Bessette, et al., 2024).
- Influx of workers: large wind energy projects can bring large numbers of non-local workers to a region, which can impact the communities (Ryser, Halseth, Markey, & Morris, 2016.

  - Safety – most temporary workers are men, which can create unsafe conditions (ex. violence against women, substance use, disorderly conduct) without proper mitigation measures.
  - Demand on services – large projects can bring a number of new workers and their families to the area permanently, which can increase demand on education, healthcare, and other community services.
- Foreign workers: large projects may rely on foreign workers or newcomers to fill labour shortages (Cedillo, Lippel, & Nakache, 2019). These workers may bring new diversity to the community which may be noticeable in the following aspects:
  - Race/ ethnicity;
  - Religion;
  - Language(s) spoken; and
  - Culture.

Demographic changes occur within communities naturally, but a large project can hasten and magnify those changes. Social cohesion, globally, is on the decline which can impact a community's ability to adapt to demographic changes. However, JDI has a long positive relationship with the surrounding communities and the communities show evidence of having strong social cohesion currently (in the form of services and organizations) which will be natural mitigations.

Gender pay gaps may be exasperated by the Project because major industries employed during construction and decommissioning (transportation, construction, manufacturing) are generally male-dominated careers.

6.3.1.2.2 Local Employment

To understand the potential impacts of the Project we can compare the list of potential job roles with pre-existing conditions. The Planning Phase will require skills for design, planners, procurement, and professional services. Many of these skills will continue to be required throughout the lifetime of the Project. Manufacturing will be sourced globally. The Construction and Decommissioning Phases will create demand for jobs mainly for onsite construction labour requirement, primarily in the construction sector. A common approach developers take for large infrastructure projects is to bring in non-local construction workers if there is not the capacity to provide this workforce in the local labour market. Construction sector workers include onsite construction labourers and project managers, as well as structural metal fabricators and fitters, engineers (electrical, mechanical etc.), crane and tower operators, heavy machinery operators, health and safety specialists and logisticians, trades persons (pipefitters, carpenters, etc.). The Operational Phase job roles are divided into two categories: direct roles and indirect. Direct job roles include the technical and administrative personnel who perform their roles to support the operation of the facility. Indirect job roles support and/or develop direct job roles. A list of some examples of roles under consideration (from Hatch's experience on wind projects) are presented in Table 6-36. Job titles indicated with an asterisk are either currently experiencing labour shortages or are expected to experience shortages in the next 10 years.

Table 6-36: Preliminary List of Direct and Indirect Job Roles throughout the Project

Planning Phase	Direct	Administrative	Legal Finance
		Technicians	Surveys Scientists
		Engineering	Electrical engineers/technologists Mechanical engineers/technologists Software engineers/technologists Industrial engineers/technologists
		Communications	Engagement coordinators Engagement facilitators
Construction and Decommissioning Phases	Direct	Administrative	General managers Industrial production managers Payroll administrator Accountant Receptionist IT system specialist
		Technicians	Wind turbine technicians* Power system operators Plant controls operator
		Engineering	Electrical engineers/technologists Mechanical engineers/technologists Software engineers/technologists Industrial engineers/technologists
		Logistics	Shipping and receiving specialist Truck drivers* Heavy equipment and crane operators*
		Health	Occupational health and safety specialist
		Trades	Construction managers* Pipe and gas fitters* Ironworkers and structural metal fabricators* Construction millwrights* General contracting HVAC specialists Machinists Welders* Electricians*
		Utilities	Electrical utility service technician
Operational Phase	Direct	Administrative	General managers Industrial production managers Payroll administrator Accountant Receptionist IT system specialist
		Technicians	Wind turbine technicians and operators* Power system operators Plant controls operator
		Engineering	Electrical engineers/technologists Mechanical engineers/technologists Software engineers/technologists Industrial engineers/technologists
		Logistics	Shipping and receiving specialist. Heavy equipment and crane operators*
		Health	Occupational health and safety specialist
		Trades	Pipe and gas fitters* Ironworkers & structural metal fabricators* Millwrights* General contracting HVAC specialists Machinists Welders* Electricians*
		Utilities	Electrical utility service technician
	Indirect	Education and Training Personnel	Engineering professors Specialized training facilitators
		Municipal Services	Firefighters
		Other Services	Cleaning and janitorial services Security services Food and beverage services Vegetation maintenance

We can further anticipate how many job opportunities the Project might require from the categories above. Table 6-37 shows the modelled estimate, based on Statistics Canada data and Project CAPEX and OPEX, of direct full-time equivalent (FTE) on the Project, broken down across phases. The FTE opportunities for the 350 MW Project are shown with example Project activities and jobs to provide greater detail to the economic and social impact the Project may have. Much of the work, will be completed by existing staff and skilled trades currently employed by JDI.

Table 6-37: Estimated Direct and Indirect Employment Impacts

Phase	Assumed period length (years)	Average annual FTE employment impact		
		Direct	Indirect	Total
Development	2.5	5	<5	**<10**
Construction	2.5	200+	70	**270+**
Operation	25	14	<5	**<19**
Decommissioning	Due to the level of detail available at this stage, employment impacts of the decommissioning phase have not been assessed.			

6.3.1.2.3 Local Businesses

There will likely be increased demand on local businesses during construction and decommissioning as hundreds of workers work on site. These may be businesses directly implicated in the procurement chain (transportation and equipment) or indirectly (food, hospitality).

As discussed in the Communications and Facility Interference Report, J.D. Irving Woodlands Division, DeTect Field Services, and Acadian Timber Corporation all have licenses radiocommunications on or near the site. These local businesses may be impacted and therefore consultation is being undertaken with each.

6.3.1.2.4 Housing Availability

There will likely be increased demand for local housing during construction and decommissioning as hundreds of workers work on site. Based on estimates for the number of construction workers needed, a work camp will likely be established.

6.3.1.2.5 Local Services

There may be increased demand on local services during construction and decommissioning as hundreds of workers on site may access local services, including recreation, health and emergency services. Should workers bring their families and children with them, there may also be impacts on childcare and education.

There will also be increases in traffic on local roads during construction, especially with oversize loads transporting the turbine components. The local roads are already used for logging trucks so the community is familiar with heavy equipment, but there will be increased traffic during construction.

6.3.1.3 Operational Phase – Potential Impact – Community and Local Economy

6.3.1.3.1 Community Demographics

Many areas around the Project site already have significant gendered employment and wage gaps; with an increase in permanent full-time employment opportunities on the Project these gaps may be exacerbated.

6.3.1.3.2 Local Employment

As shown in the construction and decommissioning phases impacts, the Project will generate demand for hundreds of jobs. In the operational phase, the Project will also need permanent full-time workers. As a result, local job resources may be in higher demand than they can meet. The jobs required are technical and institutions in New Brunswick do not currently offer training programs to prepare workers for these roles, which may create a gap in the ability of the local workforce to supply.

6.3.1.3.3 Local Businesses

There are no significant anticipated impacts to local businesses in the operational phase. Business activities will likely return to regular levels.

6.3.1.3.4 Housing Availability

In the operational phase, the Project will need 20 permanent full-time workers per year. As a result, the local housing market may feel a slight increased demand from new workers moving to the area.

6.3.1.3.5 Local Services

Recreation services, education services (including child care), community services, healthcare and emergency services may all be impacted by the estimated 20 new full-time workers moving to the Project area.

One aspect of community wellbeing is access to public amenities; around and in the Project area the public currently enjoy access for recreational land use. The new wind turbines and access roads may change access to existing recreation trails and public access.

6.3.1.4 Mitigation measures – Community and Local Economy VC

A list of the possible impacts of this project and the associated mitigation measures for these impacts are summarized in Table 6-38.

Table 6-38: Potential Impacts and Mitigation Measures – Community and Local Economy

Community and Local Economy						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
10.1	Planning Operations	1, 2, 3, 4, 5	Impacts to community wellbeing (psychological) due to frequency/ transparency of communication from the Project.	10.1.1	The Project will establish a website to inform and communicate information on the Project.	Not required
				10.1.2	the Project will regularly engage with the Public to share information about the Project as it develops.	
				10.1.3	The Project will hold specific meetings with Indigenous communities to share information about the Project as it develops.	
10.2	Planning Operations	1, 2, 3, 4, 5	Impacts to social cohesion due to public disagreement over the wind farm.	10.2.1	The Project will facilitate discussion with various community members and interest groups to ensure everyone receives the same information about the Project and its purpose.	Not required
10.3	Construction Decommissioning	6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 30, 31, 32, 33, 34, 35	Impacts to community wellbeing due to temporary closure of recreational site/ parts of site to ensure public safety.	10.3.1	The Project will provide ample warning time to land users; signage at access points.	Not required
10.4	Construction Decommissioning	6, 7, 8, 10, 11, 32, 33, 34	Impacts to community wellbeing (psychological stress) due to increased truck traffic/ oversized loads on local highways and roads.	10.4.1	The Project will keep communities informed through letters of notification, community meetings etc., if required.	Not required
				10.4.2	Further mitigations outlined in transportation section, including enforced speed limits, limitations on nighttime traffic, and proper signage.	
10.5	Construction Decommissioning	6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 30, 32, 33, 34, 35	Impacts to local hospitality (accommodation, food) services due to increased demand from temporary workers.	10.5.1	The Project will engage proactively with local business and service providers to include in planning for the influx of workers.	Not required
				10.5.2	The Project will plan to accommodate temporary workers, which may include a work camp, catering service, sanitation, etc.	
10.6	Construction Decommissioning	6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 30, 32, 33, 34, 35	Impacts to local job resources due to increased demand for workers.	10.6.1	The Project will create recruitment strategies for targeting certain worker pools (including location of recruitment office, types of advertisement).	Not required
				10.6.2	The Project will engage proactively with local industry associations about labour needs in the area, reskilling opportunities, and labour shortages.	
				10.6.3	The Project will implement a human resources and recruitment strategy for local labour and outsider labour so as not to create divisions in the community.	
10.7	Construction Operation Decommissioning	6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 30, 32, 33, 34, 35	Impacts to gendered employment gaps and gender pay gaps due to male-dominated trades.	10.7.1	The Project will promote recruitment of women and pay equality in equivalent positions.	Not required
				10.7.2	The Project will plan for the safety and inclusion of all genders on work site, including camp. These might include gender neutral washrooms, gender appropriate PPE, proper lighting, security, accommodation and transportation measures.	
				10.7.3	The Project will plan for the safety and inclusion of all genders on the work site.	
10.8	Construction Decommissioning	6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 30, 32, 33, 34, 35	Impacts to community cohesion due to changing demographics from temporary workers (differences in religion, ethnicity/race, culture, language, etc.)	10.8.1	The Project may implement a cross-cultural training for onboarding.	Not required
				10.8.2	The Project will maintain relationships with local communities and interest groups through public events.	

Community and Local Economy						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
10.9	Construction Decommissioning	6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 30, 32, 33, 34, 35	Impacts to access of emergency services (including emergency room wait times) due to increase in workers living near the Project site.	10.9.1	The Project will engage proactively with local emergency services to understand their capacity, emergency routes, and allow for transparent communication about emergency preparedness and response.	Not required
				10.9.2	The Project will develop a Emergency Preparedness and Response Plan in coordination with local emergency service providers.	
				10.9.3	The Project will ensure proper workplace health and safety onsite to mitigate any emergencies.	
				10.9.4	The Project will retain security and/or private health personnel as needed.	
10.10	Construction Decommissioning	6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 30, 32, 33, 34, 35	Impacts on access to family physicians due to increase in workers living near the Project site.	10.10.1	The Project will retain a telehealth provider for temporary workers, if required.	Not required
10.11	Construction Operation Decommissioning	6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 30, 32, 33, 34, 35	Impacts to access to education (including class sizes) due to increase in workers' families near the Project site.	10.11.1	The Project will record the number (if any) of children of workers and their families relocating near Project site to anticipate impacts to education services.	Not required
10.12	ConstructionDecommissioning	6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 30, 32, 33, 34, 35	Impacts to public health (ex. violence, including gendered violence, public disturbances) due to the influx of workers to the area.	10.12.1	The Project will establish a Worker Code of Conduct that outlines prohibited behaviours outside of the Project site and work hours, and enforcement actions.	Not required
10.13	Construction Decommissioning	6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 30, 32, 33, 34, 35	Impacts to local housing market due to temporary workers moving to the area.	10.13.1	The Project will consider establishing a work camp for construction phase to mitigate increased demand on local housing.	Not required
10.14	Operations	22, 23, 24, 25, 26, 27, 28, 29	Impacts to community wellbeing related to recreational land use due to new wind turbines and access roads.	10.14.1	The Project will engage proactively with local trail user groups to co-create long-term trail infrastructure during operations.	Not required
				10.14.2	The Project will work with community members to maintain access to existing trails where it is safe from ice throwing events and other hazards.	
				10.14.3	The Project may create new trails to maintain public access to the land.	
10.15	Operations	22, 24, 26, 27, 28, 29	Impacts to local job resources due to demands for full-time workers.	10.15.1	The Project will balance using local labour, other Canadian labour, and foreign labour so as not to create divisions in the community.	Not required
10.16	Operations	22, 24, 26, 27, 28, 29	Impacts to local housing market due to new, specialized full-time workers moving to the area.	10.16.1	The Project will understand how many individuals/ families will be moving nearby and may aid them to find housing.	Not required
				10.16.2	The Project may consider using the temporary work camp for permanent employees while new, permanent housing is built.	
10.17	Operations	22, 24, 26, 27, 28, 29	Impacts to recreation services due to increased demand from new workers and families.	10.17.1	The Project will consider assisting with trail development to offset increased demand.	Not required

Community and Local Economy						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
10.18	Operations	22, 24, 26, 27, 28, 29	Impacts to community services (libraries, etc.) due to increased demand from new workers and families.	10.18.1	As part of ongoing relations with the surrounding communities, the Proponent will consult with stakeholders as needed, regarding any increased demands on existing services.	Not required

6.3.1.5 Significance Determination – Community and Local Economy VC

6.3.1.5.1 Community Demographics

Potential impacts to community demographics are anticipated to be moderate (no detectable change from baseline conditions) once mitigation measures are implemented. The duration is expected to be short term as the construction phase will be the major timeframe for the influx of workers and increased traffic in the area. The frequency of impacts will be short term and experienced only during the construction phase. The Geographic extent for impacts will be localized to the LAA. Certain impacts to community demographics may be reversible with the implementation of mitigation measures; there will likely be some permanent impacts to the community some of which will be beneficial. There is high to neutral ecological resilience to imposed stresses due to pre-existing strains on some community services. Community demographics can likely respond and adapt to the impact with appropriate mitigation measures (assimilative capacity is good). Residual impacts have moderate magnitude; rural geographic extent; are regular and partially reversible. Impacts to community demographics are likely to occur and could be positive or negative, with a medium certainty. With the implementation of mitigation measures, residual impacts to community demographics are anticipated to be ‘Not Significant’.

6.3.1.5.2 Local Employment

Potential impacts to local employment are anticipated to be moderate. The duration is expected to be long term as the construction, operation and decommissioning phases will most likely require local human resources. The frequency of impacts will be regular as the Project continues to employ people and exist in the community. The Geographic extent for impacts will be localized to the LAA. Certain impacts to local employment will be partially reversible with the implementation of the mitigation measures, for instance the Project will create recruitment strategies for targeting certain worker pools (including location of recruitment office, types of advertisement), and will implement a human resources and recruitment strategy for local labour and outsider labour so as not to create divisions in the community. There is a neutral resilience to imposed stresses due to pre-existing strains on some local job resources, especially in construction. Local employment can likely respond and adapt to the impact with appropriate mitigation measures (assimilative capacity is fair). The likelihood of impacts to local employment is high, and the certainty medium. Residual impacts have moderate magnitude; rural geographic extent; and are regular and partially reversible. Potential residual impacts on local employment are anticipated to be ‘Not significant’.

6.3.1.5.3 Local Businesses

Potential impacts to local business are anticipated to be minor. Potential duration of impacts are expected to be short term, and only for the construction phase, with sporadic frequency. The Geographic extent for impacts will be localized to the LAA. Certain impacts to local business will be partially reversible with the implementation of the mitigation measures. There is a high resilience to imposed stresses Local businesses can likely respond and adapt to the impact with appropriate mitigation measures. The likelihood of impacts to local business is medium, and the certainty medium. Residual impacts have minor magnitude; rural geographic extent; are sporadic and reversible. Potential impacts on local businesses are anticipated to be ‘Not significant’.

6.3.1.5.4 Housing Availability

Potential impacts to housing availability are anticipated to be minor. Potential duration of impacts are expected to be short term, and only for the construction and decommissioning phases, with a one-time frequency. The Geographic extent for impacts will be localized to the LAA. Certain impacts to housing availability will be partially reversible with the implementation of the mitigation measures, such as sourcing of a work camp to house temporary workers, if required. There is a neutral resilience to imposed stresses and local housing can likely respond and adapt to the impact with appropriate mitigation measures. The likelihood of impacts to housing availability is low with mitigation implemented, and the certainty medium. Residual impacts have minor magnitude; rural geographic extent; are sporadic and reversible. Potential impacts on housing availability are anticipated to be ‘Not significant’

6.3.1.5.5 Local Services

Potential impacts to Local Services are anticipated to be minor. Potential duration of impacts are expected to be medium term as new workers and families may move into the surrounding area and stay throughout the Project lifetime, with sporadic frequency. The geographic extent for impacts will be localized to the LAA. Certain impacts to Local Services will be partially reversible with the implementation of the mitigation measures. There is a neutral resilience to imposed stresses and Local Services can likely respond and adapt to the impact with appropriate mitigation measures, for instance, the Project will engage proactively with local emergency services to understand their capacity, emergency routes, and allow for transparent communication about emergency preparedness and response. The Project will also develop an Emergency Preparedness and Response Plan in coordination with local emergency service providers. The likelihood of impacts to Local Services is medium with mitigation implemented, and the certainty medium. Residual impacts have minor magnitude; rural geographic extent; are sporadic and partially reversible. Potential impacts on Local Services is anticipated to be ‘Not significant’.

A summary of the Significance determinations for Residual Impacts to Community and Local Economy, is provided in Table 6-39.

Table 6-39: Significance Determination of Residual Impacts – Community and Local Economy

Impact	Project Phase	Magnitude	Duration	Frequency	Geographic Extent	Reversibility	Ecol. Resilience	Certainty	Likelihood	Significance
Community Demographics	C/D, O	Moderate	Medium term	Sporadic	LAA	Partially reversible	High	Medium	Medium	**Not Significant**
Local Employment	C/D, O	Moderate	Long term	Regular	LAA	Partially reversible	Neutral	Medium	High	**Not Significant**
Local Business	P, C/D, O	Minor	Short term	Sporadic	LAA	Reversible	High	Medium	Medium	**Not Significant**
Housing Availability	C/D, O	Minor	Medium term	Sporadic	LAA	Partially Reversible	Neutral	Medium	Low	**Not Significant**
Local Services	C/D, O	Minor	Medium term	Sporadic	LAA	Partially Reversible	Neutral	Medium	Medium	**Not Significant**

*P refers to the Planning Phase, C/D refers to the Construction and Decommissioning Phases, and O refers to the Operational Phase.

6.3.1.6 Follow-up Monitoring – Community and Local Economy VC

There is no follow up monitoring required.

6.3.2 Land Uses and Property Value VC

6.3.2.1 Planning, Construction, Operation and Decommissioning Phase – Potential Impact – Land Uses and Property Value

The layout for Turbine locations has been optimized to ensure that 'High potential' archaeological areas, as identified by the AHB 'Predictive Model', are avoided. The use of existing access roads also reduces the likelihood of encountering archaeological or heritage resources, however some existing and new roads traverse through high potential areas (e.g. watercourse crossings). As such, road upgrades have the potential to impact archaeological resources, and specific areas will require additional investigation.

An archaeological impact assessment (AIA) was initiated in 2023, with pedestrian surveys completed at 236 locations. Additional sub-surface testing is planned to occur throughout 2024, and as required to protect archaeological resources. There are two (2) registered archaeological sites within 5 km radius of the Project Site, but the Project will not impact on these sites, as they do not fall within the PDA. An '*Accidental Discovery of Archaeological Resources Protocol'* (ADARP), co-developed by Wolastoqey Nation in New Brunswick (WNNB) and the AHB in 2020 has been adopted by the Project. All staff and contractors will be trained on and will follow the ADARP, as it has also been incorporated into the Projects EPP. Artifacts, and heritage resources of cultural significance will be protected if found onsite.

Recreational land users, such as ATVers and snowmobile enthusiasts may be impacted during the construction, operation and decommission phases. Temporary resource road (i.e., trail) closures may be enacted to protect the public during construction and de-commissioning activities. Closures will be communicated through signage or other means. Alternate routes may be explored, through consultation and communication with local ATV clubs (Quad NB) and Snowmobile Clubs (Snowmobile – Motoneige NB). Existing community relations and communication with these entities will occur throughout the project lifecycle to reduce impacts. During Operations, some snowmobile routes currently utilized as part of the groomed trail system, may no longer be accessible or adequate for recreational use (e.g., if they are plowed during the winter). Alternate routes will be explored during consultation if required. Any consultations that occur with stakeholder groups, will be provided to the TRC as part of the 'Public Consultation Summary Report' (Appendix L).

Similarly, land users who access the area for hunting, fishing and trapping may be impacted, specifically during the construction and decommissioning phases. Restrictions on firearm use in proximity to workers or work operations may be required but will be communicated appropriately. This may be through increased signage, or other means as part of on-going community dialogue and relations.

Property values, adjacent to the wind farm are not anticipated to be impacted. There is currently no evidence of an effect on home pricing in proximity to WTGs. Given the remote nature of the site, limited visual or audio impacts will be experienced as the turbine layout has been optimized to ensure visual and noise impacts are below regulatory thresholds. Limited to no impact on property values is further corroborated by a study conducted by the Lawrence Berkeley National Laboratory (2013), which examined data collected from 50,000 home sales near wind farms, throughout 9 different states in the U.S. The homes were all located within 10 miles (16 km) of a wind farm, and property values were not affected by the wind energy development in close proximity to these properties. The results of the 2013 Lawrence Berkeley National Laboratory study were further affirmed by similar studies completed by the University of Rhode Island (Lang & Opaluch, 2013) and the University of Connecticut (Hoen et. al, 2013).

6.3.2.2 Operation Phase – Potential Impact - Land Uses and Property Value

Operational impacts to adjacent protected natural areas have also been further evaluated for noise, and visual impacts. A stand-alone Report was produced '*Visual and Noise Impacts to Adjacent Protected Natural Area*s' (H370571-0000-840-066-0009) and is included in Appendix J. In summary, after review of the noise, shadow flicker, and SVA models for the Wind Farm, it is not expected that there will be any significant noise or visual impacts to the six surrounding Protected Natural Areas. Worst-case scenarios indicate that there should be minimal portions of the PNA's that have the potential to have moderate to high visual impacts however PNA's are particularly resilient to visual impacts due to their inherent vegetative characteristics (i.e. Forested and protected from timber harvesting).

6.3.2.3 Mitigation Measures – Land Uses and Property Value VC

A list of the possible impacts of this project and the associated mitigation measures for these impacts are summarized in Table 6-40.

Table 6-40: Potential Impacts and Mitigation Measures – Land Use and Property Value

<table>
<tr><th colspan="7">Land Use and Property Value</th></tr>
<tr><th>Impact Number</th><th>Phase</th><th>Relevant Activities/Physical Works Number (Table 3-5)</th><th>Impact</th><th>Mitigation Number</th><th>Mitigation Description</th><th>Follow-up Monitoring</th></tr>
<tr><td rowspan="2">11.1</td><td rowspan="2">Administration</td><td rowspan="2">1, 6, 22, 30</td><td rowspan="2">Overlapping land uses may pose some conflict between land users and the Project</td><td>11.1.1</td><td>Focus on early consultation process with interested and affected people.</td><td rowspan="11">N/A</td></tr>
<tr><td>11.1.2</td><td>Use key messages to communicate the same message to all.</td></tr>
<tr><td>11.2</td><td>Administration</td><td>1, 6, 22, 30</td><td>Public concern that property value will be affected by the Wind Farm Development</td><td>11.2.1</td><td>During the Public Consultation process provide updated literature and information regarding property value.</td></tr>
<tr><td rowspan="3">11.3</td><td rowspan="3">Construction
Decommissioning</td><td rowspan="3">9, 10, 12, 14, 16, 18, 34</td><td rowspan="3">Discovery of Archaeological Resources</td><td>11.3.1</td><td>All Project employees and contractors will follow the Accidental Discovery of Archaeological Resources Protocol (ADARP) (WNNB & AHB, 2020)</td></tr>
<tr><td>11.3.2</td><td>All Project employees and contractors are responsible for reporting any unusual materials unearthed during any phase of development, in accordance with the ADARP.</td></tr>
<tr><td>11.3.3</td><td>If a suspected archaeological resource is encountered, the following actions will be taken:

Work will be stopped Immediately.

• Immediately stop work in the vicinity (i.e. 30 m) of the find and notify your supervisor.
• Leave all known and suspected archaeological resources in place.

The Proponent will Contact Archaeology and Heritage Branch and WNNB (where appropriate)

• In the event that human remains are discovered also contact the local police or RCMP detachment.
• If the archaeological resources are suspected to be Indigenous in origin, the proponent may also contact WNNB.

AHB and WNNB will work collaboratively with the Project to develop an appropriate mitigation strategy for archaeological resources of Indigenous origin and will provide guidance to the proponent on next steps.</td></tr>
<tr><td rowspan="4">11.4</td><td rowspan="4">Administration</td><td rowspan="4">1, 6, 22, 30</td><td rowspan="4">Recreational land-use may be impacted during the construction and operation of the Wind Farm (closing of access areas for public safety)</td><td>11.4.1</td><td>As part of ongoing relations with the community, the Project will consult with ATV and Snowmobile associations to maintain public access to established trail systems if possible.</td></tr>
<tr><td>11.4.2</td><td>The Project will continue consultation with hikers/organizations in the area to discuss the Project.</td></tr>
<tr><td>11.4.3</td><td>Determine if re-zoning will be required for the new development.</td></tr>
<tr><td>11.4.4</td><td>When construction, operation, and decommissioning activities are occurring onsite, extra caution will be taken on resource roads including increased signage and flag persons to alert recreational users of ongoing project related activities or hazards.</td></tr>
</table>

Land Use and Property Value						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
11.5	Administration	1,4, 5, 6, 10, 22, 24, 27, 30	Impacts to hunters and firearms use on the land.	11.5.1	Hunting restrictions may need to be in place or communicated to hunters during hunting season such as prohibitions of discharging firearms around turbines or other infrastructure. Notices will be communicated via signage and other forms of communication.	
11.6	Operations	22, 23, 24, 25, 26, 27, 28, 29	In the interest of public safety, access to turbine locations may need to be restricted during the winter	11.6.1	Early engagement with rightsholders, stakeholders and landholders through letters, public meetings, and creation of a Project website.	
				11.6.2	Consultation with the ATV and Snowmobile associations will occur, to discuss the potential of realignment of snowmobile and ATV trails if required.	

6.3.2.4 *Significance Determination –Land Uses and Property Value VC*

The residual impacts on Land-use, archaeological resources and property values will not be significant, as impacts are expected to be negligible once mitigations are implemented, as presented in Table 6-41.

Table 6-41: Significance Determination of Residual Impacts – Land-use and Property Value

Factor	Rating	Rationale
Magnitude	Negligible	Potential impacts to Land Use, Archaeological Resources and Property Value are anticipated to be negligible (no detectable change from baseline conditions) once mitigation measures are implemented
Duration	Short Term	Potential impacts are expected to be short term
Frequency	One time	Potential impacts to Land Use and Property Value will be a once off occurrence.
Geographic Extent	PDA/LAA	Potential impacts to Land Use and Property Value will be on the project footprint, but may extend into the PDA Property Value impacts extend to the LAA
Reversibility	Reversible	Impacts to Land Use and Property Value are reversible with the implementation of mitigation measures
Ecological Resilience	High	The receiving environment has a high natural resilience to imposed stresses and can respond and adapt to the impact (assimilative capacity is good)
Likelihood	High	Impacts to Land Use and Property Value, will occur, however with mitigation the impact will be low. Impacts to archaeological resources will be avoided through mitigation.
Certainty	High	There is good understanding of the cause-effect relationship, and all necessary data are available for the Project. The effectiveness of the mitigation measures is well known. There is a low degree of uncertainty and variation from the predicted impact across a wide range of conditions is expected to be low
Significance	**Not significant**	Residual impacts have low magnitude; local geographic extent; are short-term duration; are either one-time or sporadic and are reversible. Potential impacts are

Factor	Rating	Rationale
		anticipated to be indistinguishable from background conditions. With mitigation, they will ne 'Not significant'.

6.3.2.5 Follow-up Monitoring – Land Uses and Property Value VC

There is no follow up monitoring proposed or required for this VC.

6.3.3 Public Health and Safety (Including EMF) VC

6.3.3.1 Construction, Operation and Decommissioning Phases – Potential Impact – Public Health and Safety

During the construction, operation and decommissioning phases, the protection of the public's health and safety is legislated under the provincial *Occupational Health and Safety Act* (OHS). A such, the Proponent will adhere to OHS during all phases of the Project, to ensure public safety.

Given the remote nature of the site, WTGS will be constructed away from public access roads and infrastructure.

During construction and decommissioning the traffic volumes in the area will increase due to an influx of workers and the import of equipment to site. Increased vehicular traffic may lead to impacts such as increased noise, increased probability off collision, accidental spillage, and damage to infrastructure. As well, temporary road closures, or minor localized traffic interruption (such as slowdowns) can be expected when travelling with oversized loads. This is assessed more in the 'Vehicular Traffic' VC.

6.3.3.2 Operational Phase – Potential Impact – Public Health and Safety

Public Health and Safety impacts associated with the wind farm during the operational phase include noise levels, shadow flickering, ice throw, increased risk of fire due and the potential electromagnetic fields (EMF). Noise and Shadow flicker are addressed in other sections of this EIA, and have impacts found to be insignificant to sensitive receptors. The following section address ice throw, fire risk and EMF.

6.3.3.2.1 Ice Throw

Extreme weather conditions with high air humidity and outside temperatures around freezing or colder often cause ice to accumulate on wind turbine blades during the winter months. Two types of risks are associated with the buildup of ice on the wind turbine blades, these are:

- Ice throw from an operating wind turbine blade; and
- Ice fall from a wind turbine blade that is not in operation.

Ice fragments thrown away or even large ice pieces falling from the wind turbine can harm people, wildlife, or damage infrastructure (Seifert. et al. 2003).

Technological considerations including a built-in heating system to detect and melt ice from the blades to reduce ice throw will be implemented. Cold Climate Packages are also offered by various WTG suppliers (e.g. >-20°) will be sourced. Aftermarket technologies for ice detection and removal also exist to reduce this potential.

Ice buildup detection technology is a standard feature of many WTG models, whereby the WTG will stop and activate a blade heater that will melt the ice. Reactivation of the wind turbine can be an automated feature, or a manual feature based on visual inspection.

Turbines can also be shut down during large storm events, including ice storms, to prevent damage to the WTG and prevent 'ice throw'. In the event that meteorological conditions are conductive to ice accretion and ice throw, communication with the public will be undertaken. This may include signage posted near WTG access points, or exclusion (if required) through fencing or other means. Re-start procedures will be undertaken to ensure ice throw is minimized to reduce the risk of damaging infrastructure, personnel or the public.

6.3.3.2.2 Increased Risk of Fire

Increased risk of fire can be associated with lightning strikes, as well as the operation of electrical and mechanical equipment in remote forested areas.

During construction, fire prevention measures will be included in the EPP and implemented. These include, but are not limited to the following:

- Fire extinguishers will be readily available;
- Fire watch will be required during 'hot work' and/or during times of elevated fire risk; and
- Work shutdowns will be implemented if the wildfire risk rating is too high.

To guard against fire from lightning strikes wind turbines will be grounded. As well, all associated sub-stations and electrical infrastructure will be grounded and built to code as per legislative requirements and industry best practice.

Additional Mitigations and descriptions on fire prevention and reduction of fire risk are covered in the "Effects of the Environment on the Project' in Sections 7.4 and 7.5.

6.3.3.2.3 EMF

Since the 1990's, there has been concern over public safety in relation to possible exposure to EMFs. Public misconceptions of elevated EMF risk originating from wind turbines and associated high voltage infrastructure has increased in recent years, with the increase in wind energy development. However, the science around EMFs and possible health concerns has been extensively researched, with numerous studies published without finding causal links to between low frequency EMF and any chronic health effects (Canadian Electricity Association, 2015).

Some specific positions statements on EMF from various organizations are as follows:

> "*In Canada, there are no guidelines or standards pertaining to acceptable levels of …extremely low frequency (ELF) electric and magnetic fields (EMF), due in large part to the fact that there is no established correlation between low frequency EMF and chronic health effects*". (Canadian Electricity Association, 2016).

Health Canada's (2012) 'It's Your Health" fact sheet on EMFs from Power Lines and Electrical Appliances, specifically states:

> "*Health Canada does not consider that any precautionary measures are needed regarding daily exposures to EMFs at ELF's."*

Government and medical agencies including Health Canada (2012), the World Health Organization (WHO) (2012), the International Commission on Non-Ionizing Radiation Protection (2010), the International Agency for Research on Cancer (2002), the US National Institute of Health and US National Institute of Environmental Health Sciences (2002) have all thoroughly reviewed available information on EMF and support that there is no causal link between EMF and chronic health conditions.

While individual opinions on the issue may vary, the weight of scientific evidence does not support a causal link between EMFs and health issues at levels typically encountered by people.

Israel *et al*. (2011) conducted EMF, sound, and vibration measurements surrounding one of the largest wind energy parks in Bulgaria. In this study, the EMF levels measured within 2–3 m of the wind turbines were comparable to or lower than magnetic field measurements that have been reported in the proximity of typical household electrical devices. This is further reinforced by a study conducted in Canada by McCallum et al. (2014) were by the magnetic field levels in the direct vicinity of wind turbines were lower than levels that people are exposed to daily in their homes.

Low frequency EMFs generated by wind turbines do not pose any causal link to human health and are not considered a potential impact to public health and safety.

6.3.3.3 Mitigation Measures – Public Health and Safety VC

A list of the possible impacts of this project and the associated mitigation measures for these impacts are summarized in Table 6-42.

Table 6-42: Potential Impacts and Mitigation Measures - Public Health and Safety

Public Health and Safety						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
12.1	Construction Decommissioning	8, 9, 10, 12, 13, 14,15, 16, 17, 18, 19, 20, 21, 27, 28, 29, 32, 33, 35	Public health risks due to the influx of workers to the area	12.1.1	The selected contractor shall develop and roll out a Safety Induction training program which includes topic on public health and safety associated with the project.	Not required
				12.1.2	The Contractor shall keep record of any complaint raised during the construction period relating to the Contractor's activities.	
12.2	Construction Operation Decommissioning	7, 23, 31	During extreme weather events, there is the potential for high winds to damage infrastructure and cause failure, as well as potential for electrical fires through lightning strike	12.2.1	WTGs will be constructed away from public access roads and infrastructure.	Not required
				12.2.2	During periods of high winds, WTGs can be shut down to prevent damage to infrastructure or equipment.	
				12.2.3	WTGs will be grounded to dissipate lightning surge safely to the ground.	
12.3	Operation	23	During extreme cold weather events there is the potential for ice to build up and throw ice from the wind turbine generator blades.	12.3.1	Depending on the turbine vendor selected, wind turbine generator models, if available, can be equipped with ice-detection systems on each blade.	Not required
				12.3.2	Depending on the turbine vendor selected, wind turbine generator models, if available, can be equipped with de-icing systems to prevent and remove ice buildup.	
				12.3.3	Turbines may be shut down during periods of high ice accretion, or other storm events in line with the safe operating conditions, as specified by the WTG manufacturer.	
				12.3.4	Public exclusion near turbine sites may be considered during certain times of the year or operations, if hazardous conditions are present.	
				12.3.5	Public notices can be issued should ice accretion be anticipated, or if the potential for ice throw becomes apparent	

6.3.3.4 *Significance Determination – Public Health and Safety VC*

One of the top risks to the Project is Public Health and Safety. Every reasonably possible effort will be made to eliminate any negative potential impacts or to minimize these impacts that the Project may have on the Public's Health and Safety. By following the JDI Safety requirements, implementing the proposed mitigative measures and following the regulatory guidelines pertaining to Health and Safety, the significance of residual effects on health and safety is expected to be 'not significant', and rationale presented in Table 6-43.

Table 6-43: Significance Determination of Residual Impacts – Public Health and Safety

Factor	Rating	Rationale
Magnitude	Moderate	The impact on Public Health and Safety could cause a substantial impact as it will occur and impact beyond just the Project and Site boundaries.
Duration	Long term	Depending on the impact, it could have long term effects on an individual or family.
Frequency	One time	Should an impact occur, an investigation, including impactful corrective actions, will be completed to eliminate the impact from reoccurring.
Geographic Extent	LAA	Public Health and Safety impacts will occur beyond the project footprint.
Reversibility	Partially reversible	Depending on the impact, it might not be completely reversible.
Ecological Resilience	High	The receiving environment has a high natural resilience to imposed stresses and can respond and adapt to the impact with mitigation measures.
Likelihood	Medium	Impact is likely but may not occur.
Certainty	High	Knowledge from other wind farms used to build on further and the EIA process is robust
Significance	**Not Significant**	Residual impacts have low magnitude; local geographic extent; short-term duration; and are reversible in the short term.

6.3.3.5 *Follow-up Monitoring – Public Health and Safety VC*

No required or proposed.

6.3.4 Vehicular Traffic VC

6.3.4.1 Construction, Operation and Decommissioning Phases – Potential Impact – Vehicular Traffic

The construction and decommissioning phases are likely to have the most impact due to an increase in the volume of transportation during this time, with large Project related components (e.g. blades, towers, etc.) on provincial highways and roads. Increased vehicular traffic may lead to impacts such as: increased emissions, increased noise, increased probability of collision, accidental spillage, and damage to infrastructure can be considered. However, many of these concerns (e.g., noise and emissions) are captured under other VCs of the EIA. Transportation focused impacts such as temporary road closures, minor localized traffic interruption (such as slowdowns), and temporary or permanent changes to infrastructure are anticipated to occur.

It should be noted that a temporary camp is likely to be set-up to accommodate workers during the construction phase. This will reduce the need for workers to be on provincial roads and consequently reduce vehicular traffic and personal vehicle use associated with the Project. Alternatively, busses can be arranged for workers to mitigate this similar issue. The assessment below is prepared with the assumption that either one of these mitigation measures is being put in place to reduce worker vehicle use to and from site.

Delivery of the required materials and equipment will be scheduled in phases throughout the construction period. Examples of vehicles likely to be involved include:

- Marine vessels to deliver WTG components to ports in New Brunswick;
- Large trucks with trailers for delivery of materials;
- Earth-moving equipment such as graders, backhoes and snow plows;
- Dump trucks to deliver, move and/or remove materials from site;
- Concrete trucks for constructing WTG foundation;
- Cranes for the assembler of WTG and other associated construction activities; and
- Miscellaneous light vehicles including cars and pickup trucks.

Of these predicted vehicle movements, many will be oversized loads associated with the delivery of WTG component parts (towers, blades, and nacelles) and the cranes required for erection. Delivery of WTG components from international providers to New Brunswick will most like occur using ocean vessel transport, with the preliminary transportation routes between the selected offloading ports to the project site.

A preliminary route survey was completed by the Project. This survey was used to determine the best available routes between the selected ports to the project site as well as potential concerns.

It is recommended that anticipated times of transportation for oversized or large components of the WTGs be communicated with the city of Saint John and City of Fredericton. Additionally, radio announcements can be made during days of heavy transport. If deemed necessary, the City of Saint John and Fredericton may provide escorting for the transportation of certain components.

The route survey also identified a potential traffic circle could be implemented at the intersection between Route 105 and Route 8. This request should be communicated to the DTI-NB for consideration and the transportation routes and logistics study may be updated.

It should be noted that certain specifications (i.e., number of vessels, schedule, and number of vehicles) may change and are conditional upon the WTG model chosen for the project. All information included in this assessment is therefore preliminary and subject to change upon finalization of the WTG model.

Once finalized, a Special Permit for hauling large loads, will require a detailed Traffic Management Plan, that will be submitted and reviewed by DTI's Traffic Engineers, for approval.

There is low potential for impact during the operational phase. The anticipated transportation will be associated with periodic maintenance activities. The impacts associated with transportation for maintenance are considered to be minor, as long as mitigations are applied, and large components traversing public roadways, are under Permit from DTI-NB.

6.3.4.2 Mitigation Measures – Vehicular Traffic VC

A list of the possible impacts of this project and the associated mitigation measures for these impacts are summarized in Table 6-44.

Table 6-44: Potential Impacts and Mitigation Measures – Vehicular Traffic

Vehicular Traffic						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
13.1	Construction Operation Decommissioning	1, 6, 7, 8, 11, 21, 22, 23, 24, 29, 30, 31, 32, 34	Increased Vehicular traffic during construction activities due to transportation of WTG components and mobilization to construction site.	13.1.1	Ensure that all special permits are issued for any oversized or overweight vehicles (will be communicated with the DTINB)	Not required
				13.1.2	A Transportation Management Plan will be developed for review and approval by DTINB.	
				13.1.3	All vehicles will need to have the correct inspection approvals and permitting required by the DTINB.	
				13.1.4	If required by the DTINB a police escort may be arranged during transportation of certain oversized loads.	
				13.1.5	All transportation vehicles will abide by the enforced speed limits during transportation.	
				13.1.6	Oversized loads or components moving through cities or municipalities will be coordinated with local authorities to minimize the impacts to regular traffic. Consideration will be given to start and stop times of schools.	
				13.1.7	All vehicles will be kept in working order and regular housekeeping and maintenance will be completed to reduce inefficiencies.	
				13.1.8	During transport, loads will be checked regularly to ensure no opportunity for spills.	
				13.1.9	Vehicles should only be parked within designated parking areas as demarcated on the site layout plan.	
				13.1.10	Oversized loads or components moving through cities or municipalities will be coordinated with local authorities to minimize the impacts to regular traffic. Consideration will be given to start and stop times of schools.	
13.2	Construction Operation Decommissioning	7, 8, 23, 24, 31, 32	Vehicular traffic and use of transportation equipment has potential for accidental spillage of hazardous materials (e.g., fuel, oils, hydraulic fluids).	13.2.1	Ensure regular load checks are being carried out during transportation.	Not required
				13.2.2	Regular vehicle maintenance should be conducted to reduce chance of leakage due to equipment failure. Pre-use inspections will be completed prior to site entry. Pre-use inspections will be completed prior to site entry.	
13.3	Construction Operation Decommissioning	7, 8, 11, 19, 21, 23, 24, 28, 29, 34	Increased volume of vehicular traffic in residential and urban areas may increase the potential for vehicle collisions (e.g., vehicle on vehicle collisions, vehicle-pedestrian incidents).	13.3.1	Ensure all speed limits are being followed on and off-site to avoid any collisions due to speed exceedance.	Not required
				13.3.2	Drivers operating for long periods of time should ensure breaks are being taken to avoid collisions caused by fatigue.	
				13.3.3	Ensure all appropriate vehicle signage (e.g., oversized vehicle), taillights, and other visible indicators are in working condition.	
				13.3.4	The contractor must co-ordinate the loading and offloading of material during the construction phase to avoid congestion of vehicles on-site.	
13.4	Construction Operation Decommissioning	18, 11, 24, 27, 29, 32	Oversize loads may cause damage or require alterations to traffic Infrastructure during transportation	13.4.1	Transportation of oversized and heavy loads will be planned to avoid the thawing season on public roads unless permitted to do so.	Not required
				13.4.2	For transportation using Marsh Creek bridge a special permit should be requested from DTINB.	
				13.4.3	Oversized loads or components moving through cities or municipalities will be coordinated with local authorities to minimize the impacts to regular traffic. Consideration will be given to start and stop times of schools.	

6.3.4.3 *Significance Determination –Vehicular Traffic VC*

The Project will ensure that highway usage permits are obtained prior to transport and will coordinate with DTINB if any changes are required with delivery schedules to ensure the least impactful transportation of Project component over Provincial highways.

The impact to the environment is expected to be minor. Increased transportation and disruption to vehicular traffic will only occur during construction and decommissioning.

Table 6-45: Significance Determination of Residual Impacts - Vehicular Traffic

Factor	Rating	Rationale
Magnitude	Minor	The impact of Transportation is only considered during construction/decommissioning. It will only occur within the described spatial boundary on recognized highways and access roads on site.
Duration	Short term	The impact will be short term as the construction phase is planned to occur within a 5-year period.
Frequency	Sporadic	Impact will only occur during the construction phase, sporadically during deliveries.
Geographic Extent	PDA/LAA	Impacts on vehicular traffic, will be within the LAA,
Reversibility	Reversible	Increased vehicle use will only occur during construction. Modifications required to infrastructure along transportation routes, will likely enhance or improve infrastructure, but can be reversed if necessary.
Ecological Resilience	High	The receiving environment has a high natural resilience to imposed stresses and can respond and adapt to the impact with mitigation measures.
Likelihood	High	The project will be developed as described.
Certainty	High	Knowledge from other wind farms used to build on further and the EIA process is robust
Significance	**Not Significant**	Residual impacts have low magnitude; local geographic extent; short-term duration; and are reversible in the short term.

6.3.4.4 *Follow-up Monitoring – Vehicular Traffic VC*

No required or proposed.

6.3.5 Interference With Radio Communications VC

A '*Communications and Facility Interference Report'* (H370571-0000-483-066-0001) was completed by the Project and is included as Appendix K to this EIA Registration. As per industry guidance, the assessment methodology for the study varied by the type of radiocommunication technology and included certain organizations that required mandatory consultations regardless of proximity to the project. Methods were taken directly from the "*Technical Information and Coordination Process Between Wind Turbines and Radiocommunication and Radar Systems*" document (Radio Advisory Board of Canada and Canadian Wind Energy Association, 2020).

A summary table of all consultation buffer zones, per radio or communication technology, is provided in Table 6-46.

Table 6-46: Consultation Buffer Zones, Per Radio or Communication Technology

Section	Technology	Consultation Zone
Point-To-Point Systems Above 890 MHz	Point-To-Point Systems Above 890 MHz	1km + variable buffer around signal path
Broadcast Transmitters	AM (Omnidirectional)	5 km
Broadcast Transmitters	AM (Directional	15 km
Broadcast Transmitters	FM	2 km
Broadcast Transmitters	TV	2 km
Over-The-Air Reception	Analog TV	15 km to service contour
Over-The-Air Reception	Digital TV	10 km to service contour
Cellular Networks	Cellular Networks	1 km
Satellite Systems	Satellite Systems	500m + variable cone around signal path
Radars	Air Defence Radar	100 km
Radars	PSR	80 km
Radars	SSR	10 km
Radars	PAR	40 km
Radars	CCG Vessel Traffic Systems	60 km

Section	Technology	Consultation Zone
Radars	Airfields	10 km
Radars	ECCC Weather Radar	50 km

6.3.5.1 Planning and Operational Phase – Potential Impact – Interference with Radio Communications

Upon analysis of the various buffer consultation zones, two turbines (turbines 1 and 2) were found to be within the 10 km consultation zone (Radar -SSR) around a civilian airfield.

The airfield is the Juniper Airport, located just north of the project area. The Juniper Airport is owned and operated by J.D. Irving Woodlands division; a subsidiary of J. D. Irving Ltd. Internal discussion will be held with representatives charged with operation of the Airfield.

Additionally, review of Cellular Networks, Land Mobile Radio Networks and Point to Pont Systems, revealed upon analysis, that 19 receivers/transmitters had turbines within consultation zones across two sites within the project area. All 19 receivers and transmitters are related to current onsite activities or infrastructure, as outlined below:

A communications tower is located on the proponent's land and is physically atop of Brighton Mountain itself. The two Licensees owning 15 of the 19 identified transmitters and receivers are:

- Acadian Timber Corporation Woodlands Office; and
- J. D. IRVING, LIMITED (Woodlands Division).

Consultation with each Licensee will be undertaken. The communication towers' need for continued use will also be verified, with possible relocation, and/or possible interference tolerable if it remains in place. JDI will come to an agreeable arrangement with the Licensee.

An additional licensee was also found operating within the property boundaries, and is related to the 'MERLIN' Avian Radar System, which will not be affected by Project Construction Activities, as it will be demobilized following the required monitoring period:

- DeTect Field Services Inc.

Mandatory Consultations are also required as specified by Industry Canada, some of which, the Project has already consulted through means of 'Land Use Approvals' (NAV Canada) and 'Aeronautical Obstruction' (DND, Transport Canada) reviews. The full list of Mandatory Consultations is provided below in Table 6-47.

Table 6-47: Mandatory Radiocommunication and Radar Systems Contact List for Wind Turbine Coordination

Agency	Contact	Consultation Status	Responded
Industry Canada	ic.spectrumnbd-spectrednb.ic@canada.ca	Ongoing	
Department of National Defence	windturbines@forces.gc.ca	**Consulted**	Y
Royal Canadian Mounted Police	windfarm_coordinator@rcmp-grc.gc.ca	Ongoing	
Canadian Coast Guard	windfarm.coordinator@dfo-mpo.gc.ca	Ongoing	
Environment Canada	weatherradars@ec.gc.ca	Ongoing	
NAV Canada	landuse@navcanada.ca	**Consulted**	Y
Woodstock Police	wpfadmin@nbpolice.ca	Ongoing	
Juniper Fire Department	juniperfd@nb.aibn.com	Ongoing	
Woodstock Fire Department	firechief@town.woodstock.nb.ca	Ongoing	
Hartland Fire Department	fdh@nb.aibn.com	Ongoing	
Florenceville-Bristol Fire Department	zcougle@hotmail.com	Ongoing	
Nackawic Fire Department	william.hopkins@nackawic.com	Ongoing	
North York Fire Department	millvillefd.carter@gmail.com	Ongoing	
Glassville Fire Department	GlassvilleFD@outlook.com	Ongoing	
Stanley Fire Department	kennycolford@hotmail.com	Ongoing	
Kewick Valley Fire Department	ken.kvfd@gmail.com	Ongoing	
Ambulance New Brunswick	rti@ambulancenb.ca	Ongoing	
Transport Canada*	aviation.atl@tc.gc.ca	**Consulted**	Y

*While Transport Canada was not listed as a mandatory consultation but has been.

6.3.5.2 Mitigation Measures – Interference with Radio Communications VC

A list of the possible impacts of this project and the associated mitigation measures for these impacts are summarized in Table 6-48.

Table 6-48: Potential Impacts and Mitigation Measures – Interference with Radio and Communications

Communication Interference Mitigations						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
14.1	Construction Operation Decommissioning	1, 22, 25	Possible interference with Acadian Timber Corp equipment on Brighton Mountain (JDI Land)	14.1.1	Upon analysis following CanWEA and RABC's guidelines, it is possible that there will be interference. Consultations are ongoing to come to an agreement with the tenant.	Not Required
14.2	Construction Operation Decommissioning	1, 22, 25	Possible interference with JDI Woodlands equipment on Brighton Mountain and Juniper Airport.	14.2.1	Upon analysis following CanWEA and RABC's guidelines, it is possible that there will be interference. Consultations within JDI are occurring to ensure that any impacts to JDI Woodlands operations will be avoided.	Not Required
14.3	Construction Operation Decommissioning	1, 22, 25	Possible interference with licensees on mandatory consultation list	14.3.1	Upon analysis following CanWEA and RABC's guidelines, it is not expected that there will be any interference. Consultations are ongoing regarding confirmation of findings.	Not Required
14.4	Construction Operation Decommissioning	1, 22, 25	Possible interference with aeronautical or defence functions	14.4.1	Project has received approvals from Transport Canada, Nav Canada, and the Department of Defence. The project will continue to adhere to any requirements identified in these approvals.	Not Required

6.3.5.3 Significance Determination –Interference with Radio Communications VC

With mitigations applied, and consultation processes undertaken, impacts to radiocommunications are anticipated to be 'Not Significant', as illustrated in Table 6-49.

Table 6-49: Significance Determination of Residual Impacts - Interference with Radio Communications

Factor	Rating	Rationale
Magnitude	Minor	The project resides outside nearly all consultation zones of radiocommunication equipment in the area, and therefor only possibly will interfere with one site that is not controlled by the proponent.
Duration	Long term	The duration of any radio interference will persist until decommissioning of the project.
Frequency	Continuous	Any interference will persist continually while turbines are erected.
Geographic Extent	Beyond LAA	Interference is possible outside the LAA by blocking/reflecting signals that traverse the area.
Reversibility	Reversable	Any interference will be reversible when turbines are decommissioned.
Social Resilience	High	Resilience is high because there are alternatives to any signals that may be interfered with (such as DTV broadcast vs cable television).
Likelihood	Low	It is unlikely that the project will interfere with even those signals that the project is within the consultation zone.
Certainty	Medium	Certainty is medium, mainly due to the lack of information regarding television service contours.
Significance	**Not Significant**	Rated as not significant because there are very few signals that may be affected, and there are alternative communications that can be used if they are interfered with.

6.3.5.4 Follow-up Monitoring – Interference with Radio Communications VC

There is no follow-up monitoring proposed or required.

7. Effects of Environment on the Project

7.1 Extreme Weather Events

In New Brunswick, river valleys and flood plains can pose a risk because of ice jams, harsh weather and the floods of annual spring thaw. All of these can cause a threat of flooding. Forest fires are also a risk in all regions of New Brunswick (Government of Canada (GoC) 2018). Extreme weather events recognized as regional hazards in New Brunswick include earthquakes, floods, hurricanes, landslides, severe storms, storm surges, tornados and wildfires (GoC 2018). The potential impact of these events, the risk of these events at the Project location and proposed mitigation measures are discussed in the following sections.

7.2 Climate Change

Climate change is defined by the IPCC as a change in the state of climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be as a result of natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use (IPCC 2018).

To forecast how climate will evolve over time, different Greenhouse Gas (GHG) concentration scenarios known as Representative Concentration Pathways (RCPs) were developed by the IPCC. The RCPs range from a best-case/low GHG concentration scenario (i.e., RCP 2.6) to a worst-case/high GHG concentration scenario (i.e., RCP 8.5) where emissions continue to increase until they stabilize in 2100. Research suggests that long-term predictions are best based on RCP 4.5 and RCP 8.5 scenarios (Taylor et al, 2012), noting that RCP 4.5 is the intermediate scenario.

Future climate change in New Brunswick is expected to include, but not be limited to, changes (increases) in temperature, increased precipitation in the form of more rainfall days and fewer snowfall days, more frequent winter thaws, increased risk of ice jams, more significant flooding events, and more extreme and variable weather patterns and storms (Government of New Brunswick (GNB) 2022).

7.2.1 Rainfall

7.2.1.1 Impact

As larger WTG blades are used more frequently in wind farms, erosion of the leading edge resultant of increased rain impact has become a serious issue. Leading-edge erosion causes a significant loss in aerodynamics efficiency of turbine blades leading to a considerable reduction in annual energy production (Ibrahim and Medraj, 2019).

Additional impact of increased rainfall is soil erosion, which typically happens gradually over time. Water erosion occurs when rainfall breaks soil aggregates causing detachment and displacement of soil, either directly by means of raindrop impact or indirectly through large bodies of water (Spray Grass Australia 2017). Soil erosion can also cause significant environmental impacts through runoff transported by agricultural drains, ditches and waterways. This can lead to water quality issues such as increased water cloudiness (turbidity), sedimentation, and accumulation of nutrients, pesticides, pathogens and other substances (GoC 2023).

7.2.1.2 Risk at Location

Future annual precipitation for New Brunswick was predicted using climate scenarios from the Coupled Model Intercomparison Project Phase 5 (CMIP5; Taylor et al., 2012) climate models, and the results are provided for comparison in Figure 7-1 (Aubé et al. 2018 from Roy and Huard, 2016) for the intermediate and worst-case RCPs. As indicated in Figure 7-1, there is significant predicted increase in the number of annual episodes of extreme rainfall associated with climate change driven by GHG emissions. In addition to these predictions, Intensity Duration Frequency (IDF) climate change curves for the Project site were researched using the IDF tool developed by the University of Western Ontario to reflect future trends for extreme rainfall patterns. Historical and future precipitation IDF associated with climate change at the Project site was extracted using the IDF Tool, noting that data for IDF curves at the Project site are extrapolated using measured data from nearby weather stations (Simonovic et al., 2015). Total precipitation and intensity estimates are confirmed to increase over all timeframes, noting that this increase in precipitation is within the IPCC Sixth Assessment Report predictions, which indicate that precipitation is likely to increase in high latitudes (IPCC 2021).

7.2.2 Floods

Mild spring weather and heavy precipitation have the potential to result in rapid spring freshet flows and ice jams, which can lead to flooding along the Saint John River and its tributaries (GNB 2022).

7.2.2.1 Impact

Floodwaters make it difficult to access WTGs for repairs or maintenance if bridges and roads are compromised. Furthermore, floods can affect not only the energy generation but also the distribution infrastructure. Substations, power lines, and transformers can be damaged, leading to power outages and instability in the electrical grid. However, debris brought by floods are not expected to damage infrastructure since WTGs will be constructed at elevated locations, and as such, damage to WTGs and related reduced generating capacity is not anticipated unless the foundation is compromised.

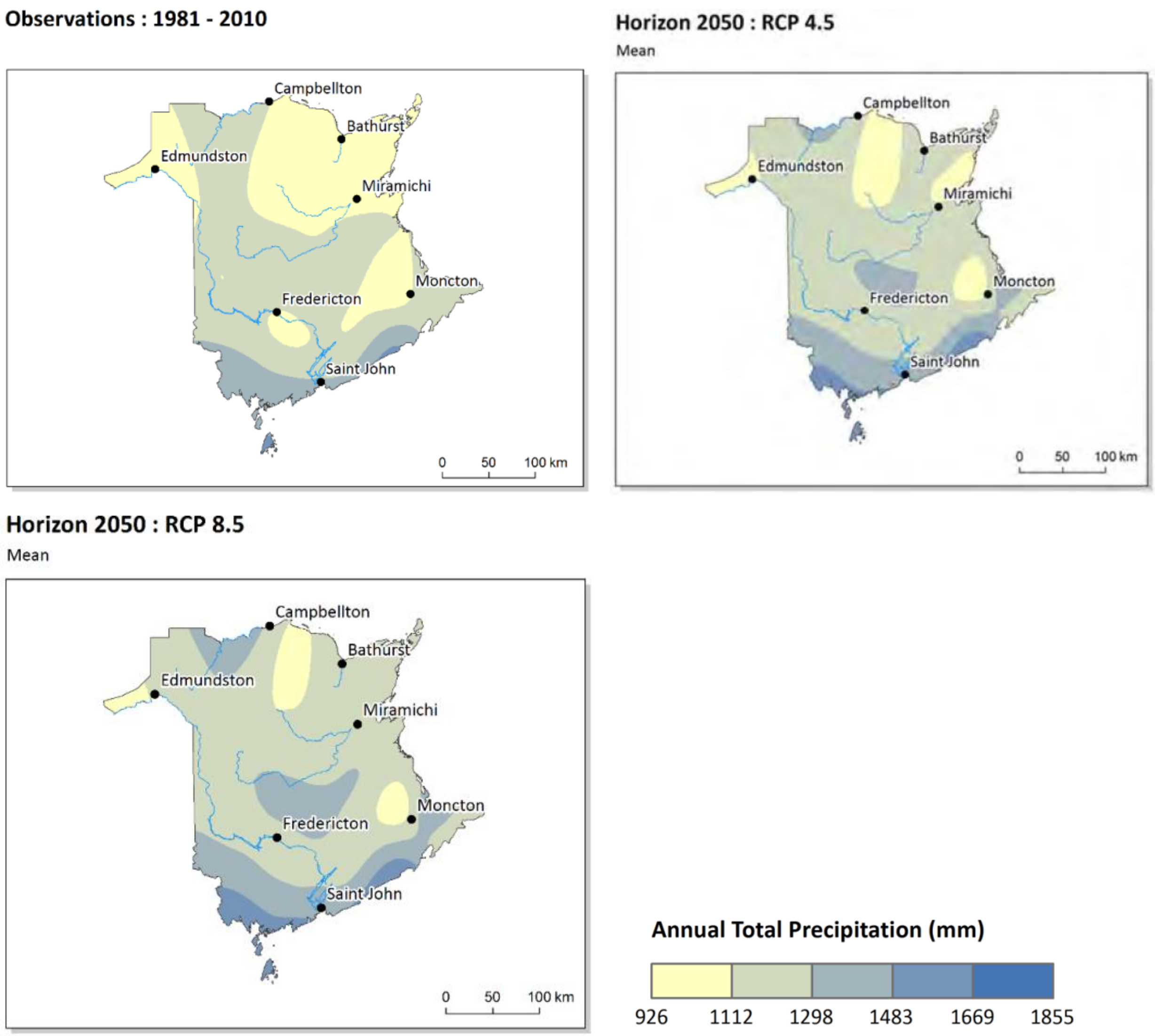

Figure 7-1: Annual Total Precipitation for NB Showing Historical Data and Predicted 2050 Data for the Intermediate and Worst-Case Rcps.

7.2.2.2 Risk at Location

Historically, flooding has occurred in a small area outside the northeast section of the PDA. However, increased flooding is possible as a result of climate change. The New Brunswick Flood Hazard Maps were used to estimate flooding events that will have a 5% chance or 1% chance of being reached in any given year, when adjusting for climate change impacts to the year 2100 (NBDELG 2023). These projected maps are provided in Figure 7-2 and Figure 7-3. The project will include minimal infrastructure that is located in regions at risk of flooding as a result of climate change (i.e., local roads, etc.).

Figure 7-2: 1 in 20-year Return Period Flood Event (i.e., 5%)

Figure 7-3: 1 in 100-year Return Period Flood Event (i.e., 1%)

7.2.3 Temperature

7.2.3.1 Impact

External temperature that is not within the operational range of the WTG can impact the function of the WTG.

7.2.3.2 Risk at Location

Future temperatures for New Brunswick were also predicted using climate scenarios from CMIP5 and the results are provided for comparison in Figure 7-4 (Aubé at al. 2018 from Roy and Huard, 2016) for the intermediate and worst-case RCPs. As indicated in Figure 7-4, there is predicted increase in the temperature associated with climate change driven by GHG emissions. This increase in temperature is within the IPCC Sixth Assessment Report predictions, which indicate that global temperature is expected to reach or exceed 1.5°C of warming (IPCC 2021). WTGs used onsite will be designed with incorporated technology to prevent damage from rising temperatures, The predicted increase in temperature associated with climate change is well within the WTG operating specifications and as such, the predicted increase in temperature is not expected to impact WTG function.

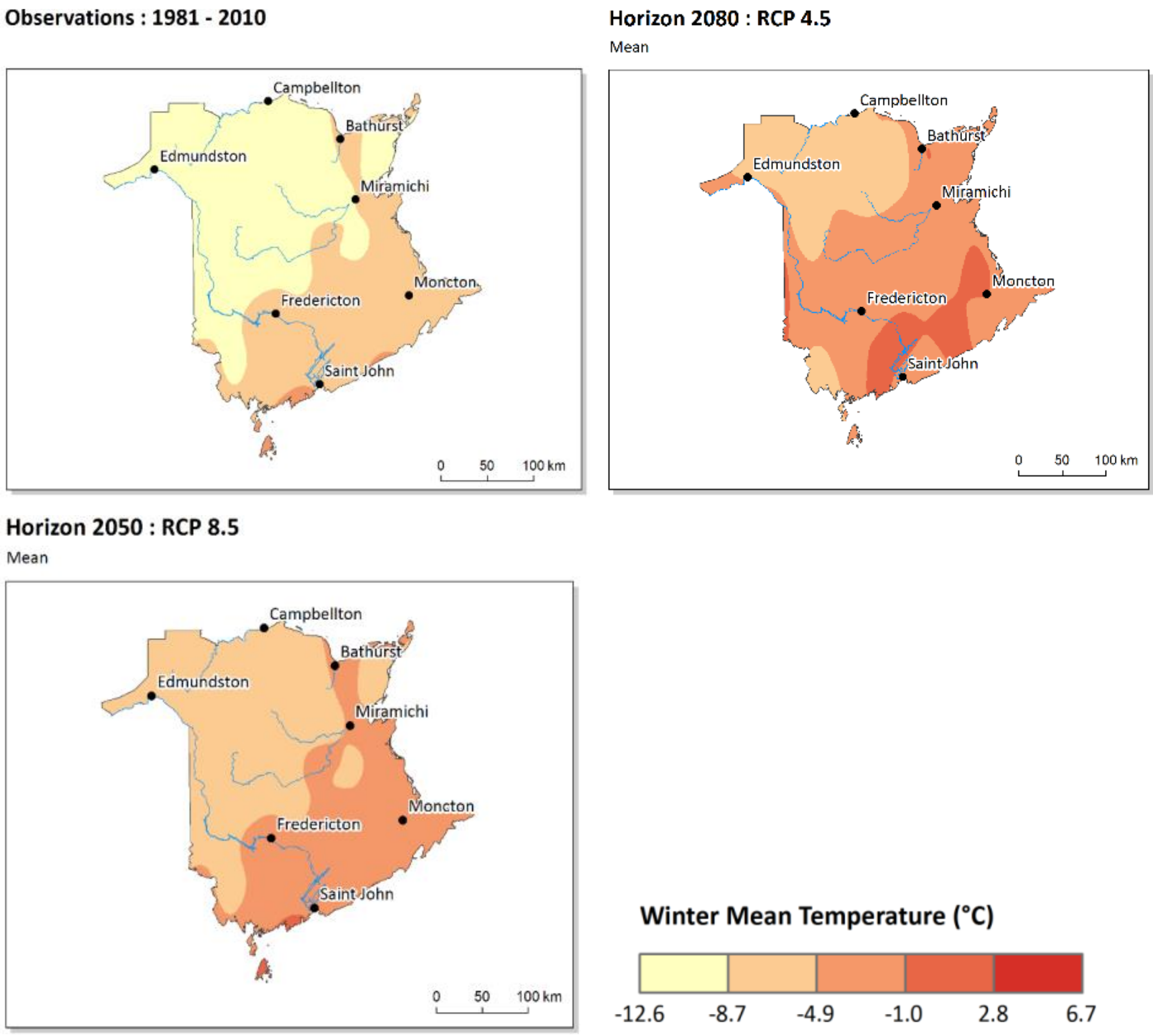

Figure 7-4: Predicted Winter Temperature for NB Showing Historical Data and Predicted 2050 Data for the Intermediate and Worst-Case Rcps

7.3 Earthquakes/Seismic Activity

When rocks break apart and slip along a fault under the earth's surface (e.g., the movement of tectonic plates), seismic waves are released. The seismic waves radiate and cause vibration of the ground, known as earthquakes. With the present state of scientific knowledge, it is not possible to predict earthquakes and certainly not possible to specify in advance their exact date, time and location, although scientists have carried out research on a wide variety of attempted prediction methods. However, the rates of earthquakes in particular regions, expressed in terms of probabilities, can be estimated (GoC 2021b).

7.3.1 Impact

During an earthquake, the WTG foundation experiences dynamic loads that vary in magnitude and direction. These loads induce vibrations and forces that can potentially compromise the structural integrity of the foundation and the WTGs, the high voltage generator lead line and structural towers.

7.3.2 Risk at Location

The Project takes place in the Northern Appalachians seismic zone, which includes most of New Brunswick and parts of New England. Seismic activity in this area has generally been low over the years with only one earthquake of Magnitude 4 and six earthquakes of Magnitude 3 occurring within 50 km of the Project (NRCan 2021a). According to NRCan, a Magnitude 3 earthquake is strong enough to be felt in the immediate area, whereas an earthquake with a magnitude of 5 is the threshold for damage to infrastructure (NRCan 2021a). The most severe earthquake in New Brunswick occurred in 1982 near Miramichi and had a magnitude of 5.7 on the Richter Scale. A simplified seismic hazard map for New Brunswick is provided in Figure 7-5, noting that this map is applicable for damage to one and two-storey buildings.

The damage potential of an earthquake is determined by how the ground moves and how the buildings within the affected region are constructed. Expected ground motion can be calculated on the basis of probability, and the expected ground motions are referred to as seismic hazard (NRCan 2021c). The parameters used to represent seismic hazard for specific geographical locations are the 5%-damped horizontal Spectral Acceleration (S_a) for periods of 0.2 s, 0.5 s, 1.0 s, 2.0 s, 5.0 s and 10.0 s, the horizontal Peak Ground Acceleration (PGA) and the horizontal Peak Ground Velocity (PGV) corresponding to a 2% probability of being exceeded in 50 years (Canadian Commission on Building and Fire Codes 2022).

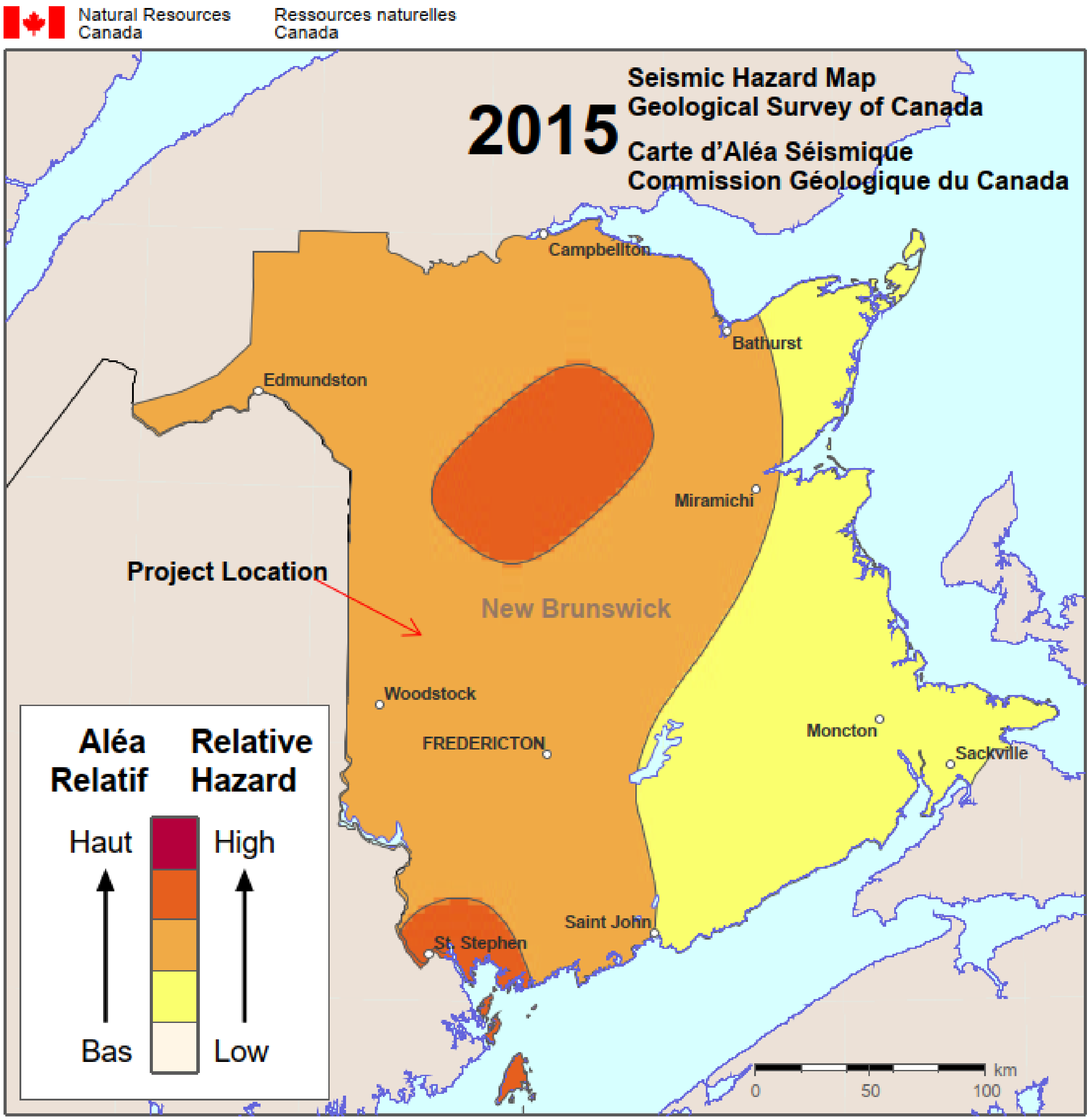

Figure 7-5: Simplified Seismic Hazard Map for New Brunswick

The seismic hazard for the area in the vicinity of the Project were obtained for the municipalities of Woodstock and Fredericton (Canadian Commission on Building and Fire Codes, 2023), which are located approximately 30 km southwest and 60 km southeast of the

Project center, respectively. These values are provided in Table 7-1 and Table 7-2 for Site Class D (i.e., stiff soil), which is more common in the Project area as indicated in the Geotechnical Report (2023) prepared by Hatch. Seismic hazard values were also estimated at borehole locations within the PDA and these values are provided in Table 7-2 to determine seismic hazards in the vicinity of the various WTG locations within the Project site, noting that in the case of multiple soil samples, the worst-case soil properties case was used to estimate these values.

Table 7-1: Seismic Hazard for Woodstock and Fredericton Obtained from NBC 2020

Location	$S_a(0.2)$ (g)[a]	$S_a(0.5)$ (g)	$S_a(1.0)$ (g)	$S_a(2.0)$ (g)	$S_a(5.0)$ (g)	$S_a(10.0)$ (g)	PGA (g)	PGV (m/s)
Woodstock	0.439[b]	0.428	0.261	0.127	0.0352	0.011	0.251	0.288
Fredericton	0.423	0.403	0.245	0.119	0.033	0.010	0.247	0.271

[a] g = Acceleration due to gravity.
[b] The 5%-damped horizontal spectral acceleration that has a 2% probability of being exceeded in 50 years has a value of 0.439 g.

Table 7-2: Seismic Hazard at Borehole Locations Drilled in 2023 in the Project Area

Borehole No.	$S_a(0.2)$ (g)[a]	$S_a(0.5)$ (g)	$S_a(1.0)$ (g)	$S_a(2.0)$ (g)	$S_a(5.0)$ (g)	$S_a(10.0)$ (g)	PGA (g)	PGV (m/s)
BH23-01	0.428[b]	0.275	0.153	0.728	0.020	0.007	0.213	0.185
BH23-02	0.467	0.439	0.265	0.128	0.035	0.011	0.277	0.297
BH23-03	0.463	0.437	0.264	0.128	0.035	0.011	0.273	0.296
BH23-04	0.500	0.508	0.315	0.153	0.043	0.013	0.298	0.343
BH23-05	0.455	0.433	0.263	0.127	0.035	0.011	0.267	0.293
BH23-06	0.454	0.432	0.263	0.127	0.035	0.011	0.266	0.293
BH23-07	0.491	0.503	0.313	0.153	0.042	0.013	0.290	0.339
BH23-08	0.453	0.431	0.262	0.126	0.035	0.011	0.266	0.292
BH23-09	0.485	0.499	0.311	0.151	0.042	0.013	0.287	0.336
BH23-10	0.486	0.501	0.312	0.152	0.042	0.013	0.286	0.337
BH23-11	0.485	0.501	0.312	0.152	0.042	0.013	0.286	0.337
BH23-12	0.485	0.500	0.312	0.152	0.042	0.013	0.285	0.337
BH23-13	0.484	0.499	0.311	0.152	0.042	0.013	0.285	0.336
BH23-14	0.484	0.499	0.311	0.152	0.042	0.013	0.284	0.336
BH23-15	0.482	0.498	0.310	0.151	0.042	0.013	0.284	0.335
BH23-16	0.482	0.498	0.310	0.151	0.042	0.013	0.283	0.335

[a] g = Acceleration due to gravity.
[b] The 5%-damped horizontal spectral acceleration that has a 2% probability of being exceeded in 50 years has a value of 0.428 g.

7.4 Wildfires

7.4.1 Impact

Wildfires can damage WTGs and surrounding areas.

7.4.2 Risk at Location

The average incidence of forest fires in New Brunswick is amongst the lowest in Canada as indicated in the National Forestry Database (NFD) (Canadian Council of Forest Ministers, 2023) and is largely related to the New Brunswick climate and relative lack of buildup of combustible materials on the forest floor. The Fire Weather Index for August, which is the month with the highest probability of wildfires is provided in Figure 7-6, using Fire Normals Data from 1981 to 2010 (NRCan 2023). As indicted in Figure 7-6, the Fire Weather Index for the Project area is a maximum of 5-10, which is a lower risk of forest fire. Therefore, the likelihood of a major forest fire event occurring in the vicinity of the Project that would cause substantive damage to the Project or interruption to any Project-related activities or phases is low.

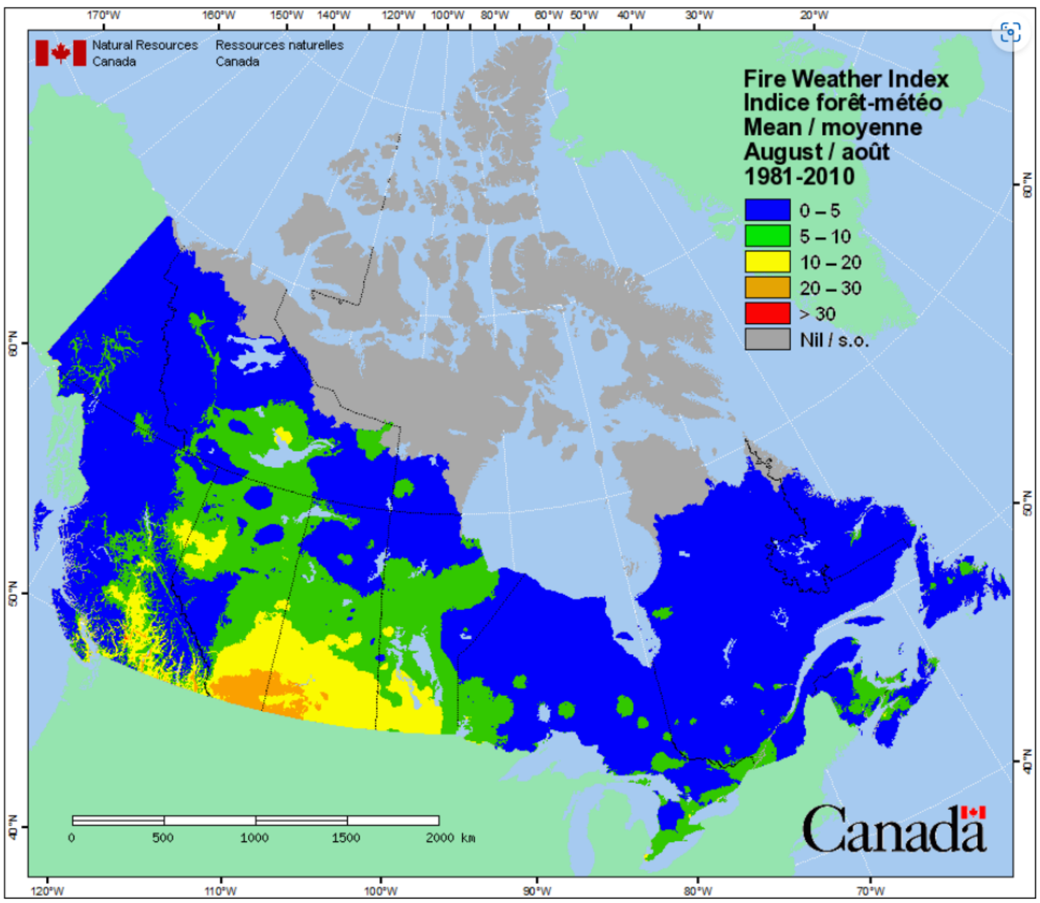

Figure 7-6: Fire Weather Index Mean for August using Fire Normals Data from 1981 to 2010

7.5 Accidents

The leading causes of accidents in WTGs are because of blade failure, fire and structural failure (Chou et al., 2015) as a result of the following (Rehman et al. 2018, Shohag et al., 2017):

- Weather, including precipitation and debris, uneven ice acceleration, water ingress;
- Insect contamination;
- Seismic effects;
- Extreme weather events, especially extreme winds, lightening and fire; and
- Manufacturing-induced defects, or fatigue/failure of WTG components.

7.5.1 Impacts

Accidents can cause severe damage to the WTG and the area in the vicinity of the WTG. During a blade damage event, where the blade or a piece of the blade separates from the turbine, because of the centrifugal and Coriolis forces this piece can travel up to 1.6 km, depending on the rotor size and speed (Rehman et al. 2018).

7.5.2 Risk at Location

Extreme weather and seismic effects expected in the PDA are discussed in previous sections.

7.6 Mitigations Measures – Effects of the Environment on the Project

A brief summary of the potential impacts of the environment on the Project and the proposed mitigation measures are provided in Table 7-3.

Table 7-3: Potential Impacts and Mitigation Measures – Effects of the Environment on the Project

Effects of the Environment on the Project						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
15.1	Planning Operations	3, 25	Blade damage and decreased efficiency from rainfall	15.1.1	Climatic conditions, including historic and future rainfall levels will be provided to WTG suppliers to determine adequate model or accessories for the Project. This may include stronger coatings for WTG blades (e.g. protective paints, polymers, or multiple layers). Precipitation totals will also be considered for WTG operational speeds, maintenance planning and repairs.	N/A
15.2	Planning Construction Operation	3, 9, 15, 24, 25, 26, 35	Infrastructure damage and decreased energy output due to floods	15.2.1	The Project will consider flood information during Project siting.	N/A
				15.2.2	New access roads and upgrades to existing roads will be designed to minimize potential flood damage. This includes required upgrades and installation of culverts, which will be adequately sized for future increases high precipitation events.	
				15.2.3	Emergency Response and Preparedness Plans will be developed for the Project and include storm water management and flood response.	
15.3	Planning	3, 25	Decreased energy output due to temperature	15.3.1	The WTGs will be equipped with a control system consisting of various monitoring sensors and mechanisms (e.g. sensors for temperature, vibrations, etc.). If the WTG control system recognizes that the conditions at the site are outside the acceptable range, the system will automatically take the appropriate protective measures (e.g. transition to a reduced power operating mode or stopping operation).	N/A
15.4	Planning	3, 10, 12, 13, 14, 16, 17, 18, 25	Infrastructure and WTG damage and due to earthquakes	15.4.1	Design equipment to withstand earthquakes based on seismic hazard values for the Project area	N/A
15.5	Planning Construction Operation Decommissioning	1, 3, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 24, 25, 27, 28, 33, 34	Delays, Infrastructure damage, or WTG damage and due to severe storms	15.5.1	WTGs will be designed and constructed in compliance with the Canadian Electrical Code.	N/A
				15.5.2	The WTGs will be equipped with a control system consisting of various monitoring sensors and mechanisms (e.g. sensors for temperature, vibrations, etc.). If the WTG control system recognizes that the conditions at the site are outside the acceptable range, the system will automatically take the appropriate protective measures	
				15.5.3	When wind speeds surpass a WTG rated wind speed, the blades begin to feather, or point into the wind to reduce their surface area. The blades can even be locked down to ride out severe gusts	
				15.5.4	The selected WTGs model will be equipped with Ice Detection and Blade Heating Systems. The Project will also explore means of communicating any increased risk to the public (e.g. through signage, etc.), if ice accumulation is anticipated.	
				15.5.5	The selected WTGs will come equipped with Lightning Protection Systems, including adequate grounding.	
				15.5.6	The Project will routinely inspect, service, repair and upgrade WTG components, as required and as per manufacturer recommendations.	
				15.5.7	Schedule and modify construction activities, as well as operations as required to operate safely during extreme weather events.	
15.6				15.6.1	Fire protection measures will be considered in the design.	N/A

Effects of the Environment on the Project						
Impact Number	**Phase**	**Relevant Activities/Physical Works Number (Table 3-5)**	**Impact**	**Mitigation Number**	**Mitigation Description**	**Follow-up Monitoring**
	Planning Construction Operation Decommissioning	3, 8, 9, 10, 12, 13, 14, 15, 16, 17, 19, 18, 24, 25, 26, 27, 28, 32, 33, 34, 35	Infrastructure damage due to wildfires	15.6.2	Fire Prevention will be undertaken onsite in accordance with good industry practice and detailed in the EPP. This includes adaptive management during the forest fire season, to modify operations per fire risk ratings and during dry conditions, including work shutdowns. Other fire prevention efforts will include, but not be limited to: -No open burning onsite, unless under permit. -Fire extinguishers will be mandatory on all equipment. -Fire suppression equipment caches will be available on site, including water tanks, and pumps, as required. -Smoking will be prohibited while moving from one place to another in forest land. -Cars, trucks and machinery will have proper exhaust systems when operated in or near forest land. -Proper spark arresting devices will be required on all mechanical equipment. -Power saws will have a proper muffler and be accompanied by a round point shovel or fire extinguisher	N/A
15.7	Planning Operations	2, 7, 23, 31	Fire from accidents and malfunctions	15.7.1	Fire Detection Systems for WTGs will be installed, and inclusive of extinguishing systems. In the event of a fire WTGs will be shut-down and extinguishing systems activated	Not required
				15.7.2	Comprehensive training will be provided for all maintenance staff, on-site staff and other groups that assist with fire suppression, as applicable	
15.8	Operation	20, 25, 27, 31, 32, 34	Accidents and Malfunctions- Blade and Structural Failure	15.8.1	The Project will routinely inspect, service, repair and upgrade WTG components, as required and as per manufacturer recommendations.	Not required
	Planning		Infrastructure damage from accidents	15.8.2	Selected WTG locations have been designed with appropriate setbacks, to prevent issues with public or private infrastructure, should catastrophic failure occur.	Not required

8. Summary of Residual Impacts and Significance Determinations

A summary table of all Residual Impacts, and Significance Determinations is provided in Table 8-1, below.

Table 8-1: Summary Table of Residual Impacts and Significance Determinations

VC	Residual Impact	Project Phase	Magnitude	Duration	Frequency	Geographic Extent	Reversibility	Ecological Resilience	Certainty	Likelihood	Significance
Groundwater	Quality and Quantity	C,O, D	Negligible	Short Term	Sporadic	PDA	Reversable	High	High	Unlikely	**Not Significant**
Atmospheric Conditions	Air Quality	C/D, O	Moderate	Short term	Regular	PDA	Reversible	High	High	Medium	**Not Significant**
Atmospheric Conditions	Winds	C/D, O	Minor	Long term	Regular	LAA	Reversible	High	High	High	**Not Significant**
Atmospheric Conditions	GHG and Climate	C/D, O	Minor	Long term	Regular	Beyond LAA	Reversible	Low	High	Medium	**Not Significant**
Noise	Noise	C,O, D	Minor	Long Term	Regular	LAA	Reversible	High	High	High	**Not Significant**
Visual	Visual	O	Minor	Long term	Regular	LAA	Reversible	High	High	High	**Not Significant**
Wetlands	Permanent Direct Loss of Wetland	C/D, O	Minor	Long term	Sporadic	PDA	Permanent	High	High	High	**Not Significant**
Wetlands	Temporary and Indirect Impacts on Wetland	P, C/D, O	Moderate	Long term (HVGL), Short Term (siltation)	Continuous, Sporadic	PDA	Reversible	High	High	High	**Not Significant**
Vegetated Environment	Introduction of Invasive Plant Species	P, C/D, O	Minor	Long term	Continuous	LAA	Partially Reversible	Low	Moderate	Moderate	**Not Significant**
Vegetated Environment	Changes in SAR/ SOCC Plant distribution/ abundance	P, C/D, O	Low	Long Term	Sporadic	PDA	Partially Reversible	High	Moderate	Low	**Not Significant**
Vegetated Environment	Loss of Unique, Rare Communities or Critical Habitat	C/D, O	Low	Long term	Continuous	PDA/ LAA	Partially Reversible	Low	High	Low	**Not Significant**
Vegetated Environment	Disturbance (harassment)	P, C/D, O	Negligible	Short term	Sporadic	PDA	Partially Reversible	Neutral	Low	Low	**Not Significant**
Fish and Fish Habitat	Direct Mortality	P, C/D, O	Minor	Short term	One time - Sporadic	PDA	Reversible	High	High	Low	**Not Significant**
Fish and Fish Habitat	Habitat Loss	C/D	Minor	Long term	Regular	PDA	Partially reversible	High	High	High	**Not Significant**
Fish and Fish Habitat	Habitat Loss	O	Negligible	Long term	Sporadic	PDA	Partially reversible	High	High	Low	**Not Significant**
Fish and Fish Habitat	Habitat Degradation	P	Negligible	Short term	Sporadic	PDA	Reversible	High	High	Low	**Not Significant**
Fish and Fish Habitat	Habitat Degradation	C/D	Moderate	Short term	Regular	PDA	Reversible	High	High	Medium	**Not Significant**
Fish and Fish Habitat	Habitat Degradation	O	Negligible	Long term	Sporadic	LAA	Reversible	High	High	Low	**Not Significant**
Terrestrial Wildlife and Wildlife Habitat	Direct Mortality (Reptile)	P, C/D, O	Minor	Far Future	Sporadic	PDA	Reversible	Neutral	High	High	**Not Significant**
Terrestrial Wildlife and Wildlife Habitat	Habitat Loss (Reptile)	P, C/D, O	Minor	Far Future	Continuous	PDA	Partially Reversible	High	Moderate	Moderate	**Not Significant**

VC	Residual Impact	Project Phase	Magnitude	Duration	Frequency	Geographic Extent	Reversibility	Ecological Resilience	Certainty	Likelihood	Significance
Terrestrial Wildlife and Wildlife Habitat	Habitat Degradation (Reptile)	P, C/D, O	Minor	Short Term	One Time	PDA	Partially Reversible	High	High	Low	**Not Significant**
Terrestrial Wildlife and Wildlife Habitat	Direct Mortality (Mammals)	P, C/D, O	Minor	Far Future	Sporadic	PDA	Reversible	High	High	Low	**Not Significant**
Terrestrial Wildlife and Wildlife Habitat	Habitat Loss (Mammals)	C/D, O	Moderate	Far Future	One Time & Sporadic	PDA	Partially Reversible	High	Low	High	**Not Significant**
Terrestrial Wildlife and Wildlife Habitat	Habitat Degradation (Mammals)	P, C/D, O	Minor	Far Future	Continuous	LAA	Reversible	High	Moderate	High	**Not Significant**
Birds	Direct mortality (vehicle)	P, C/D, O	Minor	Long term	Sporadic	PDA	Permanent	High	Medium	Medium	**Not Significant**
Birds	Direct mortality (collisions, electrocutions)	C/D, O	Major	Long term	Regular	PDA	Permanent	Low	Moderate	High	**Not Significant**
Birds	Indirect mortality (hazardous waste, eggs/nest)	P, C/D, O	Moderate	Long term	Sporadic	PDA	Partially Reversible	Low	Medium	Low	**Not Significant**
Birds	Disturbance (dust/ noise, harassment)	P, C/D, O	Low	Short term	Regular	PDA/ LAA	Partially Reversible	Neutral	Medium	High	**Not Significant**
Birds	Habitat loss	P, C/D, O	Major	Far Future	Continuous	LAA	Partially Reversible	Neutral	Medium	High	**Not Significant**
Birds	Habitat degradation	P, C/D, O	Major	Long term	One time	PDA / LAA / RAA	Reversible	Low	High	Low	**Not Significant**
Bats	Direct mortality (Collisions, clearing during roosting, etc.)	P, C/D	Minor	Short term	One Time	PDA	Reversible	Low	High	Low	**Not Significant**
Bats	Direct mortality (Collisions, clearing during roosting, etc.)	O	Major	Long term	Continuous	PDA	Reversible	Low	Moderate	Moderate	**Not Significant**
Bats	Habitat loss	P	Minor	Short term	One Time	PDA	Reversible	High	High	Low	**Not Significant**
Bats	Habitat loss	C/D	Moderate	Long Term	One Time	PDA	Partially Reversible	High	High	Moderate	**Not Significant**
Bats	Habitat loss	O	Negligible	Long Term	Continuous	PDA	Reversible	High	Moderate	Low	**Not Significant**
Bats	Habitat Degradation (disturbance by noise/light pollution)	P	Minor	Short term	One-time	PDA	Reversible	High	High	Low	**Not Significant**
Bats	Habitat Degradation (disturbance by noise/light pollution)	C/D	Minor	Short Term	One Time	PDA	Reversible	High	High	High	**Not Significant**
Bats	Habitat Degradation (disturbance by noise/light pollution)	O	Minor	Long Term	Continuous	PDA	Reversible	Neutral	Low	High	**Not Significant**
Community and Local Economy	Community Demographics	C/D, O	Moderate	Medium term	Sporadic	LAA	Partially reversible	High	Medium	Medium	**Not Significant**

VC	Residual Impact	Project Phase	Magnitude	Duration	Frequency	Geographic Extent	Reversibility	Ecological Resilience	Certainty	Likelihood	Significance
Community and Local Economy	Local Employment	C/D, O	Moderate	Long term	Regular	LAA	Partially reversible	Neutral	Medium	High	**Not Significant**
Community and Local Economy	Local Business	P, C/D, O	Minor	Short term	Sporadic	LAA	Reversible	High	Medium	Medium	**Not Significant**
Community and Local Economy	Housing Availability	C/D, O	Minor	Medium term	Sporadic	LAA	Partially Reversible	Neutral	Medium	Low	**Not Significant**
Community and Local Economy	Local Services	C/D, O	Minor	Medium term	Sporadic	LAA	Partially Reversible	Neutral	Medium	Medium	**Not Significant**
Land-Use and Property Value	Traditional Land Use and Recreational Access	C/D, O	Negligible	Short term	One-time	PDA/LAA	Reversible	High	High	High	**Not Significant**
Public Health and Safety	Ice Throw, and Fire Risk	C/D, O	Moderate	Long Term	One-time	LAA	Partially Reversible	High	High	Medium	**Not Significant**
Vehicular Traffic	Increased Traffic	C/D	Minor	Short term	Sporadic	PDA/LAA	Reversible	High	High	High	**Not Significant**
Interference with Radio Communications	Interference with communications	O	Minor	Long term	Continuous	Beyond LAA	Reversable	High	Medium	Low	**Not Significant**

9. Stakeholder Engagement and Indigenous Consultation

9.1 Public and Stake Holder Engagement

Public and Stakeholder engagement will commence upon Registration of the Project with the EIA Branch of NB-DELG. The Public Consultation Summary Report, will be submitted as an Addenda to the TRC, as Appendix L.

9.2 Indigenous Consultation

Indigenous early engagement has been initiated on this Project, consistent with the JDI commitment to engage early with all sixteen Indigenous communities in New Brunswick and their representative organizations. An Indigenous Consultation Report will be provided to the NB Department of Indigenous Affairs, upon request.

10. Approval of the Project

10.1 Regulatory Permits, Approvals and Authorizations

Several federal and provincial permits are required to progress the Project throughout various phases of development. A list of anticipated federal and provincial Permits, Approvals and Authorizations for the Project, are provided in Table 10-1, below.

Table 10-1: Anticipated Federal Permits, Approvals and Authorizations for the Project

Applicability	Regulatory Framework	Authority
Installation of an apparatus > 12 m in height	Aeronautics Act Canadian Aviation Regulations Aeronautical Obstruction Clearance Permit	Transport Canada
Development likely to impact air navigation	Civil Air Navigation Services Commercialization Act Land Use Permit	Nav Canada
Harmful alteration, disruption, or destruction of fish habitat Activity other than fishing that results in death of fish	Fisheries Act Authorizations Concerning Fish and Fish Habitat Protection Regulations Fisheries Act Authorization	DFO
Undertaking husbandry, release, scaring, capture, killing, or disposal of migratory birds	Migratory Birds Convention Act Migratory Birds Regulations, 2022 Migratory bird permit	CWS
Activities affecting wildlife species at risk	Species at Risk Act Permits Authorizing an Activity Affecting Listed Wildlife Species Regulations Permit authorizing activities affecting listed wildlife species	ECCC
Use of explosives onsite (Blasting in Quarry)	Explosives Act Explosives Regulations Magazine License, explosives license	NR Canada
Activity classified as an Undertaking under EIA Regulations	Clean Environment Act 87-83 - Environmental Impact Assessment Regulations Certificate of Determination or EIA Approval	NB DELG

Applicability	Regulatory Framework	Authority
Work within 30 m of a wetland or waterbody	Clean Water Act 90-80 - Watercourse and Wetland Alteration Regulations Watercourse and Wetland Alteration (WAWA) Permit	NB DELG
Water withdrawal	Clean Water Act 90-80 - Watercourse and Wetland Alteration Regulations Watercourse and Wetland Alteration (WAWA) Permit	NB DELG
Blasting Activities	Blasting Permit	NB DELG
Easement across crown land	Crown Lands and Forests Act Crown Lands - Easements	NB DNRED
Occupying crown land	Crown Lands and Forests Act 2009-62 - Lands Administration Regulations Crown Lands - Licence of Occupation	NB DNRED
Need to control nuisance wildlife	Fish and Wildlife Act 97-141 - Nuisance Wildlife Control Regulations Nuisance Wildlife Control Operator Licence	NB DNRED
Disturbance to a high potential archaeological site	Heritage Conservation Act 2010-132 - General Regulations Archaeological Field Research Permit	NB DTHC - AHB
Installation or modification of a culvert	Highway Act Culvert Installation	NB DTI
Oversized road transport	Motor Vehicle Act 2001-67 - Vehicle Dimensions and Mass Regulations Trucking Services - Special Permits	NB DTI
Geotechnical drilling	Oil and Natural Gas Act 86-191 - Geophysical Exploration Regulations Geophysical Exploration Permit	NB DTI
Removal of topsoil	Topsoil Preservation Act 95-66 - General Regulations Topsoil Removal Permit	NB DELG

11. Follow Up Monitoring

11.1 Post-Construction Monitoring

11.1.1 Birds and Bats

Baseline avian surveys will be conducted throughout 2024 to meet the Sector Guidance requirement and will provide more data and understanding of how birds may interact with the development of the Project.

A Post-Construction Bird and Bat Mortality Surveys Protocol has been created and can be found in Appendix H. This document will be adapted to any recommendations received by the Technical Review Committee (TRC), and with consultation with CWS and NBDELG. The protocol was developed based on the guidelines for Post-Construction Bat and Bird Mortality Survey Guidelines for Wind Farm Development in New Brunswick and the Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds (ECCC-CWS, 2007b).

The bird and bat post-construction monitoring plan will gather information on the impacts to the species and habitats for two years following the time the turbines are operational.

Post-construction monitoring for birds will include, but not limited to, mortality surveys, carcass removal trials, and searcher efficiency trials and will be combined with the required post-construction bird mortality studies. An annual Post-Construction Monitoring Report that will include all raw data, results, and analysis of the monitoring program will be submitted to the New Brunswick Fish and Wildlife Branch at Department of Environment and Local Government. If the Project is found to be causing significant bird and bat mortality or causing barrier or exclusion effects during postconstruction monitoring, additional mitigation may be required for the Project and the monitoring program may be extended based on requirements determined from consultation with the NBDELG and CWS.

An Adaptive Bird and Bat Protection Plan will be developed and informed by the results of the Post-construction Bat Mortality surveys. The plan will describe measures to prevent and/or reduce bird and bat mortality during migration periods, or during times when increased bird and bat activity are anticipated to occur. The 'Adaptive Bird and Bat Protection Plan' will be submitted as ab Addendum to this EIA Registration (Appendix N).

12. Funding

The Project is fully funded by J.D. Irving, Limited.

13. Summary of Commitments and Mitigations

A summary of all the commitments and mitigation measures is provided in Table 13-1. Mitigation Measures identified through this assessment, will form the basis for inclusion into the Projects Environmental Protection Plan (EPP). The EPP will be submitted as an Addendum to the TRC, as Appendix M.

Table 13-1: Summary of Commitments and Mitigation Measures

VC	Impact Number	Impact	Mitigation Number	Mitigation Description
Groundwater (1)	1.1	Blasting for aggregate required for construction of site access roads and/or foundations for wind turbines and associated changes to groundwater distribution and flow, and groundwater quality (e.g. increased turbidity in nearby wells) and aggregate stockpiles	1.1.1	Explosives will be transported in accordance with the *Transportation of Dangerous Goods Act*, and Regulation. Blasting operations will be completed by a certified contractor in accordance with an Approval to Operate to be issued by the NBDELG, as well as in accordance with the federal *Explosives Act* and any Permit issued through Natural Resources Canada (NRCan) under the Act.
			1.1.2	Blasting will be conducted in accordance with provincial requirements, where applicable, including: •Maintaining a setback of 30 m from a right-of-way boundary of a public highway. •Maintaining a 10 m setback from an existing road or trail on crown land. •Maintaining a setback of 60 m of the ordinary high water mark of any watercourse or wetland, 30 m of any adjacent property, 100 m of a foundation of a building structure, and 600 m of any drinking water well •Maintaining a setback of 100 m of any public highway structure.
			1.1.3	The number of blasting events will be kept to a minimum, where practicable
			1.1.4	Erosion and sediment control structures will be installed around the excavation/blasting site, and detailed in a site-specific Environmental Protection Plan
	1.2	Dewatering, if required, during blasting, and/or turbine foundation construction and associated changes to groundwater distribution and flow	1.2.1	Water removed from excavations will not be discharged directly to wetlands or watercourses on the Site. Water removed from excavations will be discharged to vegetated areas greater than 30 m from a watercourse or wetland. Water may be filtered to removed suspended solids before discharging to the environment.
			1.2.2	Water coming into contact with uncured cement or cementitious waste will not be deposited into or near waterways. Concrete wash water will be handled in accordance with the project EPP.
			1.2.3	Erosion and sediment control structures will be installed and detailed in a site-specific Environmental Protection Plan
	1.3	Accidental spills of contaminants (e.g., fuel and lubricants) from on-site mechanical equipment infiltration into groundwater resources	1.3.1	Fuel (petroleum products) and lubricants (and any other chemicals) will not be stored within 100 m of a private groundwater well or within 30 m of a sensitive environmental feature (e.g., wetland, watercourse etc.)
			1.3.2	Mechanical equipment will be kept in good working condition and will be inspected daily for leaks, and prior to being brought to site.
			1.3.3	Spill kits will be kept in strategic locations on the Project site. Stationary and mobile equipment that require fuel will also have dedicated spill kits. Any leaks or accidental spills will be immediately contained, cleaned up and reported in accordance with regulation.
			1.3.4	Portable washroom facilities for workers will be self-contained, inspected and serviced regularly to prevent release of sewage into the environment.
			1.3.5	Sewage/sludge removed from portable washrooms and from the facilities will be transported offsite for appropriate treatment and disposal.
			1.3.6	Spill reporting and response procedures will be included in the site-specific Environmental Protection Plan
			1.3.7	Refueling will be conducted in accordance with the Projects Refueling Procedure to be included in the Environmental Protection Plan.
			1.3.8	Secondary containment will be required for hazardous material storage, including fuels. Secondary containment capacity is considered to be ≥110%.by volume of the tank, or largest container housed in containment. Tanks and onsite storage will comply with applicable Fire Code, as well as the Petroleum Product Storage and Handling Regulation, NB

VC	Impact Number	Impact	Mitigation Number	Mitigation Description
				Reg 87-97. For tanks >2000L, this includes the requirement for an Environmental Approval. Tanks will also be in compliance with the Canadian Council of Ministers of the Environment (CCME) Environmental Code of Practices for Aboveground and Underground Storage Tank Systems Containing Petroleum Products (CCME 2003). Containers will be maintained in good condition – with no evidence of rust, damage or leaks. Containers also require to be adequately sealed with proper fitting lids, caps, bungs or valves to prevent spills and leaks. Hoses and nozzles used for dispensing fuel should be maintained in good repair, free of leaks, and equipped with automatic shutoffs. All equipment with box-mounted fuel tanks will be accompanied with spill prevention and containment, and clean-up materials that are suitable for the volume of fuel or oils carried.
	1.4	Removal of infrastructure and site restoration	1.4.1	Erosion and sediment control structures will be installed and detailed in the site-specific Environmental Protection Plan
			1.4.2	Site will be restored to pre-construction conditions as much as practicable
Atmospheric Conditions (2)	2.1	Local air quality may be affected through fugitive dust from the access roads and equipment movements during construction and decommissioning as well as minimal dust associated with blasting activities	2.1.1	An Air Quality and Dust Management Plan will be prepared as a component of the EPP and implemented for the construction phase.
			2.1.2	Fugitive dust, especially during dry and windy weather conditions, will be controlled with the application of water twice a day or as required in unpaved areas frequented by heavy machinery. Other dust suppressants (e.g., calcium chloride) may be used, where permitted.
			2.1.3	When hauling material that is prone to creating dust loads will be covered.
			2.1.4	Limit general site traffic to established routes.
			2.1.5	Loading and unloading of material will be performed in such a way to limit dust generation.
			2.1.6	Vehicles on unpaved roads will be limited to a speed limit of 40 kph or less.
			2.1.7	The burning of waste brush material will not be undertaken unless permitted.
	2.2	Local air quality may be affected by emissions from generators, construction vehicles and machinery as well as minimal blasting activities, concrete batch plant and quarry. Equipment used for construction will generally consist of trucks, bulldozers, graders, backhoes, cranes, and other heavy equipment.	2.2.1	All vehicles and machinery will comply with current emission standards and will be used efficiently, minimizing distances travelled whenever possible.
			2.2.2	Vehicles used will be inspected regularly.
			2.2.3	Idling of vehicle engines, equipment and machinery will be avoided (unless queuing for a job or an operation).
			2.2.4	Maintain vehicle emission control systems in accordance with manufacturers' specifications.
	2.3	GHGs such as Carbon Dioxide (CO_2), Methane (CH_4) and Nitrous Oxide (N_2O) will be emitted from generators, vehicles and construction equipment.	2.3.1	All vehicles and machinery will comply with current emission standards and will be used efficiently, minimizing distances travelled whenever possible.
			2.3.2	Vehicles used will be inspected regularly
			2.3.3	Use of electric vehicles will be considered for site operations.
			2.3.4	Removal of vegetation and topsoil shall be minimized as far as practical. Vegetation shall be reinstated as soon as possible to minimize loss of carbon sinks.
			2.3.5	Idling of vehicle engines, equipment and machinery will be avoided (unless queuing for a job or an operation).

VC	Impact Number	Impact	Mitigation Number	Mitigation Description
	2.4	Accidents or spills of volatile compounds will decrease the air quality in the area.	2.4.1	Spill reporting and response procedures will be included in the site-specific Environmental Protection Plan
Noise (3)	3.1	Noise from construction equipment	3.1.1	Work will be scheduled during the daytime where practical.
			3.1.2	Locate site access roads, laydown areas and stationary equipment (e.g., generators) as far away as possible from sensitive receptors
			3.1.3	Whenever possible, plan haul routes to avoid residential areas / receptors
			3.1.4	Maintain access roads. Design access roads and laydown areas to minimize reversing of trucks/equipment
			3.1.6	Do not use engine brakes unless necessary
			3.1.7	Maintain equipment as per manufacturer's instructions
			3.1.8	Keep engine covers closed
			3.1.9	Dampen tailgates to avoid banging near sensitive receptors
			3.1.10	Avoid dropping loads into dump trucks from unnecessary heights
			3.1.11	Site activities should be planned prior to execution to ensure efficient implementation and prevent unnecessary excess noise. The duration and frequency of noise should be minimized wherever possible. Heavy machinery should be maintained in accordance with the manufacturer's specifications, including appropriate mufflers and other noise-control equipment. Project personnel should ensure idling of construction vehicles is limited
	3.2	Noise from turbine operation	3.2.1	The turbine layout has been designed and validated to ensure noise generated from turbines will remain below acceptable levels at sensitive receptors.
Visual (4)	4.1	Shadow Flicker	4.1.1	The turbine layout has been optimized to ensure that 'Worst-Case' shadow flicker exposure at sensitive receptors remains below acceptable levels.
			4.1.2	There is abundant vegetation located around structures at each receptor, that will act as natural screens to reduce flicker effect.
Wetlands & Vegetated Habitat (5)	5.1	Loss or Disturbance of Wetlands	5.1.1	Wetlands will be delineated, and Functional Assessments (WESPACs) completed in areas of the PDA that have not yet been field surveyed.
			5.1.2	Wetlands will be avoided in the selection of locations for temporary ancillary facilities unless required for site specific purposes.
			5.1.3	Re-routes of linear features and layout deviations will be considered to avoid disturbance of any wetlands with exceptionally high functions (as determined by the WESPACs).
			5.1.4	Approvals and permits be sought for all regulated wetlands that are expected to be altered or lost as a result of Project construction.
			5.1.5	Watercourse and Wetland Alteration (WAWA) permit for any alterations to wetlands (and their 30 m buffers) will be obtained. Where a net loss of wetland function occurs as a result of the Project, applicable wetland compensation will be determined as per the New Brunswick Clean Water Act and New Brunswick Wetlands Conservation Policy (NBDNRE-NBDELG 2002).
			5.1.6	Clearing activities are to be restricted to necessary portions of the PDA, to minimize the amount of vegetation and wetlands altered through direct disturbance, or adjacent edge effects.
			5.1.7	Soil and vegetation disturbance be only allowed where required for construction.
			5.1.8	Appropriate erosion and runoff control techniques will be installed and maintained on all approaches to wetlands for erosion prevention, runoff, and sedimentation control during construction and until re-vegetation.
			5.1.9	Pre-disturbance water sources of a wetland will be maintained, to the extent possible, when grading near wetlands.
			5.1.10	Grading in wetlands to be restricted to essential areas, only.

VC	Impact Number	Impact	Mitigation Number	Mitigation Description
			5.1.11	Natural re-vegetation will be used for wetlands in areas surrounded by native vegetation, and which have no invasive and non-native plant species.
			5.1.12	Trees shall be felled in such a manner that they do not fall outside of the clear and grubbing limits.
			5.1.13	Trees shall be felled away from wetlands and watercourses.
	5.2	Introduction of Invasive or Non-Native Plant Species	5.2.1	All construction equipment will be inspected upon arrival on-site to confirm it is clean and free of any plant or soil material. Any equipment with soil or vegetation debris will be pressure washed prior to entering site.
			5.2.2	Only Canada Certified No. 1 or better seed mixes be used for reclamation to limit the introduction of listed weed species and other invasive species in the PDA. Certificates of seed analysis be kept on file.
	5.3	Changes in native plant species distribution/abundance (including SOCC and SAR)	5.3.1	Unsurveyed areas of the PDA will be surveyed in 2024 at the time of year that would be appropriate to identify plant SOMC and SAR that may be present (e.g., late May for early ephemerals, to September for other plants). A supplemental report will summarize the findings of these additional surveys and will be submitted to the Technical Review Committee.
			5.3.2	Direct loss of or effects on plant SAR and SOCC be avoided or minimized through the appropriate siting of linear facilities and turbine locations and footprints minimized where deviations are not possible.
			5.3.3	Direct effects to plant SAR be avoided by adhering to federal and provincial guidelines, unless otherwise approved by the appropriate regulatory agency.
			5.3.4	All known occurrences of SOCC be marked on construction plans and identified SAR/SOCC plant locations are clearly flagged before the start of site preparation and construction. Black ash identified during Vegetative Surveys, will be avoided, or offered to local First Nations for harvesting.
			5.3.5	Mitigation plans be developed for unavoidable effects on plant SAR, if any are identified, in consultation with regulators, which may include collecting and propagating seeds or live plants for transplant prior to construction.
			5.3.6	Vegetation management along transmission lines will be undertaken to limit the impact of trees and plants around high voltage lines. vegetation management will be undertaken in accordance with best management practices. This includes: Manually pruning tree branches adjacent to right-of-ways. Manually cutting or mechanically mowing trees in the right-of-ways. Where necessary, mechanically or manually applying herbicides selectively on shorter trees and stumps to manage growth.
			5.3.7	Construction traffic be limited near locations of known plant SAR to equipment essential to construction; all other equipment will use alternative approved access around these areas.
			5.3.8	Standard erosion prevention and sedimentation control measures be employed to minimize erosion of soils that could affect vegetation recovery.
			5.3.9	Existing roads will be used for access, to the greatest extent possible.
Fish and Fish Habitat (6)	6.1	Changes to substrate, flow, and/ or water quality	6.1.1	Geotechnical works to be a minimum of 30 m from a watercourse or wetland unless authorized through an applicable WAWA permit
			6.1.2	Avoid changes to flow or water levels, and/ or restore streambeds
			6.1.3	Refueling and equipment maintenance activities will be completed a minimum of 30 m from watercourses, drainage features, and wetlands.

VC	Impact Number	Impact	Mitigation Number	Mitigation Description
			6.1.4	Travel through site and to specific survey locations to be accessed via existing resource and ATV/snowmobile trails when possible, to complete surveys
			6.1.5	Field survey crews conducting fish sampling and watercourse assessments to minimize amount of time spent in streams and watercourses to avoid disturbing sediment and streambed characteristics
			6.1.6	Follow Erosion and Sedimentation Control Plan; Utilize erosion and sediment fencing where appropriate, unless warranted by an environmental emergency or event, complete repairs and/or maintenance, outside of sensitive timing such as spawning and migration
			6.1.7	Follow DFO's code of practice: beaver dam breaching and removal, if a dam must be breached or removed. Survey the footprint and backwater area to mitigate downstream flooding.
	6.2	Introduction of invasive species	6.2.1	Equipment will not enter waterways unless under permit. In-water works, if required, will be undertaken with equipment that is free of grease oil, leaks, and debris.
			6.2.2	Follow Clean Equipment Protocol for Industry guidelines
			6.2.3	Inspections should be completed prior to moving vehicles out of a local area of operation, between properties or sites, along roadsides in ditches and along watercourses, unformed dirt roads and access roads, trails, transporting of materials such as soil and quarry materials, and visiting remote areas where access is limited.
			6.2.4	Inspections should occur after: Operating in areas known to have terrestrial or aquatic invasive species or high-risk areas (i.e., recently disturbed areas near known invaded areas). Transporting of materials (i.e., soil or aggregates) known to contain or has potential to contain invasive species or parts of invasive species. Operating in an area or transporting materials that may contain invasive species (undetermined prior to beginning work in that area).
			6.2.5	Vehicle marshalling yards and parking locations to be 30 m or greater from watercourses and crossings to avoid potential spread of invasive species onto site.
			6.2.6	Field crews undertaking biological surveys, will clean equipment and gear to avoid spreading invasive species by pressure washing equipment.
	6.3	Decreased quality of the riparian area, reduced shade cover	6.3.1	Avoid and minimize work and disturbance within the riparian zone and watercourse.
			6.3.2	Have the riparian area clearly delineated.
			6.3.3	Limit clearing and grubbing in riparian areas, unless approved by permit.
			6.3.4	Revegetate affected area with native seed and plant species to restore shade cover.
	6.4	Fish mortality from environmental survey or salvage	6.4.1	Field studies on fish and fish habitat including the handling of fish for project purposes will only occur under authorization from DFO (Section 52 permit).
			6.4.2	Only qualified and trained professionals will conduct electrofishing and other fisheries sampling.
			6.4.3	Follow recommended electrofishing settings and methods during sampling
			6.4.4	Follow BMPs for safe handling and care of fish, (i.e., release fish in appropriate location in a timely manner).
	6.5		6.5.1	Blasting operations will be completed by a certified contractor in accordance with an Approval to Operate to be issued by the NBDELG.

VC	Impact Number	Impact	Mitigation Number	Mitigation Description
		Fish Mortality from Quarry Blasting Activities		Explosives will be transported in accordance with the *Transportation of Dangerous Goods Act*, and Regulation. Storage, handling and use of explosives will be undertaken in accordance with the federal *Explosives Act* and any Permit issued through Natural Resources Canada (NRCan) under the Act Blasting will also be undertaken in accordance with the federal *Fisheries Act*.
			6.5.2	All blasting activities will be completed in accordance with the project EPP
			6.5.3	NO in-water blasting will be undertaken on the Project.
			6.5.4	No blasting will occur within 60 meters of a watercourse or wetland. The set-back distance from the blast site to the waterbody may need to be increased beyond 60 m depending on the size of the blast. Additional setback requirements shall be based on the maximum weight of charge to be detonated at one instant in time, the substrate, and the type of fish or fish habitat in the area of the blast. These set back distances are outlined in the Guidelines for Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopky, 1998).
			6.5.5	Blasting mats will be used when deemed appropriate (i.e., if a wetland or watercourse is near the vicinity of the blast), to prevent fly rock from entering a watercourse or wetland.
			6.5.6	The number of blasting events will be kept to the minimum necessary, and each blast will only use the minimum amount of explosives required to complete each blast.
			6.5.7	Erosion and sediment control structures will be installed around the excavation/blasting site, and detailed in a site-specific Environmental Protection Plan
	6.6	Water contamination	6.6.1	ANFO or bulk explosives will not be used within 60 meters of a wetland or watercourse, or below the water table, in wet weather, or adjacent to wet soils. This will prevent leaching of nitrites and ammonia in the form of nitrogen into the ground and receiving waters.
			6.6.2	Routine maintenance, refueling and inspection of machinery and vehicles will be performed offsite whenever possible; if refueling onsite is necessary it will be done at least 30 m from watercourses.
			6.6.3	An accidental release/ spill prevention and response plan and emergency response plan will be included within the EMP and submitted as an addendum.
			6.6.4	Vehicle marshalling yards and parking locations to be 30 m or greater from watercourses and crossings to avoid potential contamination of fish habitat by potential vehicle leaks or failures.
			6.6.5	Use spill/ drip trays when refueling.
			6.6.6	Ensure spill kits are in place prior to operation and routine maintenance of all heavy machinery/ equipment.
			6.6.7	Equipment shall be in good working order and maintained, to reduce risk of spill/ leaks and avoid water contamination.
			6.6.8	Limit and minimize heavy machinery and vehicles crossing through sensitive habitat and areas where water extends over and drains across road (when possible).
	6.7	Erosion and Sedimentation decrease water quality	6.7.1	Surface water quality will be managed in accordance with the project EPP. Unless authorized by Project Environmental Permits or Approvals, surface water quality and environmental monitoring of Construction

VC	Impact Number	Impact	Mitigation Number	Mitigation Description
				operations will take into account 'CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life (total particulate matter)' for any in-water works, if required.
			6.7.2	Follow DFO standards for working near water.
			6.7.3	For water withdrawal from fish habitat, pumps must be screened in accordance with the Interim code of practice: End-of-pipe fish protection screens for small water intakes in freshwater
			6.7.4	Develop and implement an Erosion and Sediment Control (ESC) plan as a part of the EMP, to minimize introduction of sedimentation or contaminants to fish habitat.
			6.7.5	Installing erosion and sediment controls (ESC) to prevent entry of debris and sediment into the watercourse, such as silt fencing, riprap and straw wattles.
			6.7.6	Regular monitoring of ESC measures and structures during all phases of the works and watercourse for any signs of sedimentation or contamination.
			6.7.7	Minimize use of equipment along unstable bank or earth surfaces
			6.7.8	Avoid earth works during greater than 25 mm/24h (high flow volumes from heavy rain events)
			6.7.9	Unstable earth surfaces to be treated with temporary erosion or sediment control measures (i.e., silt fencing)
			6.7.10	Filter sediment laden water before release of pump into vegetated area.
	6.8	Damage to spawning habitat (change in substrate, flow rate, water quality, increase of turbidity)	6.8.1	Culvert installation, upgrades, and road construction to follow DFO Standard code of practice: culvert maintenance and Interim Standard: in-water site isolation.
			6.8.2	Avoidance of work during known seasonal and sensitive timing windows (spawning, migration) by following DFO standard fish timing windows (in New Brunswick: work should occur June 1 to Sept 30 (summer low flow period).
			6.8.3	Winter access road installation to follow DFO Standard Code of Practice: ice bridges and snow fills, including: Use of clean materials (i.e., ice, water, snow) to construct ice bridge if applicable.
			6.8.4	Operate machinery on land in stable and dry areas when feasible.
			6.8.5	Install erosion and sediment control measures prior to beginning works, undertakings and activities.
			6.8.6	All required watercourse crossings will comply with existing regulatory requirements including the New Brunswick Watercourse and Wetland Alteration Technical Guidelines, if alterations are required, a WAWA permit will be obtained, and all conditions will be adhered to.
			6.8.7	Follow the Erosion and Sediment Control (ESC) plans, detailed in the Introduction of deleterious substances section.
	6.9	Effects on Riparian Zone and vegetation	6.9.1	Protection of the riparian zones including limiting vegetation removal, installing barriers around the riparian zone (30m from watercourse), limit activity in the riparian zone, use methods to reduce soil compaction (i.e., mats)
			6.9.2	All required watercourse crossings will comply with existing regulatory requirements including the New Brunswick Watercourse and Wetland Alteration Technical Guidelines, if alterations are required, a WAWA permit will be obtained, and all conditions will be adhered to
			6.9.3	Restore the banks and riparian vegetation affected by the works using native species to revegetate banks
	6.10	Fish stranding & entrapment	6.10.1	Culvert installation to follow DFO Interim Guidelines for the Design of Watercourse Crossings in New Brunswick and Prince Edward Island (DFO, 2023h). Culvert upgrades to follow DFO Standard code of practice: culvert maintenance and Interim Standard: in-water site isolation
			6.10.2	Follow standard DFO fish protection timing windows (in New Brunswick: during summer low flow period from June 1 to September 30) and limit duration of in-water works (DFO, 2022).

VC	Impact Number	Impact	Mitigation Number	Mitigation Description
			6.10.3	Follow DFO's Code of Practice: Ice bridges and snow fills
			6.10.4	Follow DFO standard for in-water site isolation
			6.10.5	Conduct fish rescues where required (under DFO permit 'Section 52')
	6.11	Impacts to fish passage (e.g., blocked / perched culvert)	6.11.1	DFO Interim Guidelines for the Design of Watercourse Crossings in New Brunswick and Prince Edward Island (DFO, 2023), and any other updated guidance from the DFO in the Maritimes will inform the design basis for culvert installations and upgrades along fish bearing watercourses.
			6.11.2	Culvert installation will follow the DFO Interim Standard: in-water site isolation
			6.11.3	Regularly inspect culverts and following BMP of DFO's code of practice regarding culvert maintenance
			6.11.4	Limit amount of in-water Works where possible
			6.11.5	Limitation of Works during sensitive timing windows
Terrestrial Wildlife and Wildlife Habitat (7)	7.1	Turtle, snake, amphibian, or mammal habitat destruction.	7.1.1	Nest sweeps, searches for nesting females and searches for potential snake hibernacula will occur prior installation or commencement of geotechnical works.
			7.1.2	Should use of site as nesting or overwintering habitat be confirmed, alternative sites will be considered where possible.
			7.1.3	Establish pre-determined deposition areas to avoid the infilling of features essential to amphibian life processes (e.g., vernal pools).
			7.1.4	If Canada Lynx or other mammal nests, dens or young are found nearby, the area will be georeferenced, and surveyors made aware.
			7.1.5	Den sweeps will be completed prior to site clearing activities
			7.1.6	If Lynx den are found a 100m no touch buffer will be established until young have had time to wean and disperse from the site.
			7.1.7	Known Canada Lynx dens will not be destroyed under any circumstance.
	7.2	Introduction of invasive species to turtle, snake, amphibian, or mammal habitat	7.2.1	Vehicles and equipment will be in good operating condition, free of leaks, mud, dirt, or debris before being mobilized to site, to ensure no exotic or invasive species are introduced.
	7.3	Hazardous materials spills into turtle, snake, amphibian, or mammal habitat.	7.3.1	Spills originating from equipment accidents and malfunctions will be cleaned up immediately to prevent impacts to wildlife
	7.4	Project vehicle/machinery collisions with turtles, snake, amphibians, or mammals	7.4.1	Minimize project footprint.
			7.4.2	Driving vehicles at the posted speed limit to avoid collisions with turtles, snake, amphibians, or mammals.
			7.4.3	Amphibians and turtles found on roadways will be moved out of harms way in the direction they were travelling.
			7.4.4	Construct eco-passages in areas where interaction with amphibians is most likely.
			7.4.5	Pads and laydowns to be built in such a way to prevent pooling of water that could be attractive for amphibians laying eggs or egg mass.
			7.4.6	Workers to complete pre-use inspection of equipment and work area walk down to ensure wildlife are not present.
			7.4.7	An active reporting system for observed SAR to aid in identifying priority locations for further mitigations.
			7.4.8	Limit traffic where possible.
			7.4.9	Wildlife crossing signage in areas of high wildlife occurrence.
	7.5	Turtle, snake, amphibian, or mammal habitat fragmentation	7.5.1	Minimize project footprint.
			7.5.2	Consider the construction of eco-passages/culverts in areas where access routes may fragment features essential to turtle life processes.
			7.5.3	Consider the construction of eco-passages in areas where interaction with amphibians is most likely.

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			7.5.4	Avoid fragmenting continuous features described as productive Snowshoe hair habitat to maintain Canada Lynx and other carnivore foraging habitat. This will also benefit other mammals with large home ranges like White-Tailed Deer and Moose.
			7.5.5	Keep wildlife corridors free of human presence as much as possible to prevent the promotion of avoidance behaviours.
			7.5.6	Where clearing is required, or forestry practices planned, downed, woody debris and slash will be retained on site for Canada Lynx denning and resting areas as per J.D Irving Woodlands standard practice.
	7.6	Impacting water quality via sedimentation	7.6.1	Utilize appropriate ESC measures around wetland features, especially where flowing water is present, and sediment/discharge can be carried downstream.
			7.6.2	Water coming into contact with uncured cement or cementitious waste will not be deposited into or near waterways. Concrete wash water will be handled in accordance with the project EPP.
	7.7	Mortality to turtle nests or nesting individuals	7.7.1	Nest sweeps will be completed by a qualified individual with nests being marked when found. If nests are found, a 60m riparian management zone on bodies of water 150m up and downstream from documented nesting areas will be created.
			7.7.2	Eco-passages and exclusion fencing will be included in design where appropriate.
			7.7.3	If wildlife handling is required under exceptional circumstances, it will only be done under appropriates permits/guidance from relevant authorities.
	7.8	Mortality of overwintering turtles	7.8.1	Avoid aquatic works during sensitive overwintering periods (October – April) where changes in water levels may result in turtle mortality.
			7.8.2	If wildlife handling is required under exceptional circumstances, it will only be done under appropriates permits/guidance from relevant authorities.
	7.9	Infilling of ditches and seasonal pools used by amphibians	7.7.1	Plan deposition sites to benefit vernal breeders that are known to occur within the Local Assessment Area such as the Spring Peeper, American Toad, Spotted Salamander and Wood Frog
	7.10	Culvert maintenance and beaver management altering water flow regime or disturbing overwintering turtles.	7.10.1	Ensure drain aquatic works are complete in a timely manner and that flow returns to baseline conditions.
			7.10.2	If dredging or dam removal is required as routine maintenance drainage systems, it shall be done outside of turtle overwintering periods (October – April) (GoC, 2018), unless isolated and trapped prior to overwintering.
Birds (8)	8.1	Loss of nesting and foraging habitat.	8.1.1	Tree harvesting and clearing will be scheduled outside of the breeding bird season to the greatest extent possible. If clearing is required between April 10 - August 31 (i.e., the Breeding Bird Season), a qualified professional shall conduct a nest survey to assess the area for use by breeding birds. Nest surveys will occur 48 hours or less before clearing activities. If a nest is identified, appropriate buffer zones will be erected as guided by a qualified professional, and no work will occur within this buffer zone. Work would only occur within the buffer zone with a permit from CWS, or until the nest has been deemed evacuated. Removal of large trees and snags (15 cm or greater) should only occur where absolutely necessary. Clearing activities will be completed in accordance with the project EPP.
			8.1.2	Clearing and excavating shall be minimized to necessary areas only.
			8.1.3	Every effort should be taken to leave natural grassed areas intact.
	8.2	Vehicle Collisions	8.2.1	Speed limits shall be followed on all roads within the site, and care should be taken when driving at dawn or dusk.
	8.3	Collisions with MET Towers and Turbines	8.3.1	An Adaptive Bird and Bat Protection Plan will be developed for the project and will be integrated with the post-construction biological survey results. This Plan will ensure the Project implements additional mitigation measures, if required, to prevent avian mortality resultant from turbine operation.

VC	Impact Number	Impact	Mitigation Number	Mitigation Description
			8.3.2	Post-construction biological surveys, including mortality surveys, carcass removal trials, and searcher efficiency trials will be conducted by qualified biologists.
			8.3.3	CWS (2007) recommends using lights with the ability to emit no light during the pause of the flash, or "off phase" of the flash. Also recommended is the use of lights with short durations and the minimum number of flashes per minute. No steady-burning lights or spotlights should be used, unless required by Transport Canada for aviation safety.
	8.4	Natural breeding and nesting processes disturbed or interrupted resulting in abandonment of nest, eggs, nestlings, or fledglings.	8.4.1	Tree harvesting and clearing will be scheduled outside of the breeding bird season to the greatest extent possible. If clearing is required between April 10 - August 31 (i.e., the Breeding Bird Season), a qualified professional shall conduct a nest survey to assess the area for use by breeding birds. Nest surveys will occur 48 hours or less before clearing activities. If a nest is identified, appropriate buffer zones will be erected as guided by a qualified professional, and no work will occur within this buffer zone. Work would only occur within the buffer zone with a permit from CWS, or until the nest has been deemed evacuated. Removal of large trees and snags (15 cm or greater) should only occur where absolutely necessary. Clearing activities will be completed in accordance with the project EPP.
			8.4.2	During nesting season, care will be taken while travelling through site on foot. Through appropriate communication on environmental awareness, Project personnel will be mindful of where they step in areas with dense ground vegetation and shrubs, so as not to disturb ground-nests. Human noise should be limited where possible.
			8.4.3	Ground nesting birds will be deterred from breeding in areas of clearing by keeping piles of gravel or soil covered during periods where they are not in use. In addition, the time between clearing and commencing project activities within the area will be limited.
	8.5	Illness or death caused by consuming hazardous materials or waste.	8.5.1	Hazardous materials (fuel, coolant, etc.) will be stored appropriately. All waste will be stored in proper receptacles, covered, and removed regularly from site.
			8.5.2	Mechanical equipment will be kept in good working condition and will be inspected daily for leaks and prior to being brought to site.
			8.5.3	Spill kits will be kept in strategic locations on the Project site. Stationary and mobile equipment that require fuel will also have dedicated spill kits. Any leaks or accidental spills will be immediately contained, cleaned up and reported in accordance with regulation.
	8.6	Natural breeding, nesting, or foraging processes disrupted or interrupted due to dust or noise. Inhalation of dust causing injury	8.6.1	Speed limits shall be followed on all roads within site, and care should be taken during dry seasons to mitigate disturbance and dust dispersal in the air.
			8.6.2	Site activities will be planned prior to execution to ensure efficient implementation and prevent unnecessary excess noise. The duration and frequency of noise should be minimized wherever possible. Heavy machinery will be maintained in accordance with the manufacturer's specifications, including appropriate mufflers and other noise-control equipment. Project personnel will ensure idling of construction vehicles is limited.
			8.6.3	Project personnel will not feed or harass wildlife
	8.7	Natural lifecycle and behaviour interrupted resulting in high stress levels or unnatural injury.	8.7.1	Project personnel will not feed or harass wildlife.
	8.8	Changes to ecosystem's flora or fauna from introduction of exotic species	8.8.1	Vehicles and equipment will be in good operating condition, free of leaks, mud, dirt, or debris before being mobilized to site, to ensure no exotic or invasive species are introduced.

VC	Impact Number	Impact	Mitigation Number	Mitigation Description
	8.9	Collisions/electrocution from transmission lines	8.9.1	Where practical, efforts will be made to schedule the erection and deconstruction of towers or other structures outside of dawn/dusk periods.
			8.9.2	Line visibility can be increased by using bird “flappers” or other diverters, and by increasing the size of the wire to larger than 230kV, where possible. The location of transmission routes has been selected to avoid area’s most likely to have increased bird activity (e.g. near or over water, and wetlands) to the greatest extent possible. If lines cross over wetlands, small lightening shield wires can be removed, if safe to do so without jeopardizing the integrity of the infrastructure.
			8.9.3	Lines should be situated below the level of treetops where practical. Lines should be designed with enough space between conductors so birds cannot simultaneously touch two phases (ECCC-CWS 2007a).
Bats (9)	9.1	Mortality to roosting bats from and/or destruction of habitat during vegetation clearing and grubbing	9.1.1	Prior to clearing, bat snag sweeps shall be conducted to determine potential within defined work areas. Sites with high roosting potential will be entirely avoided where possible, with buffer zones being implemented around suitable features if avoidance is impractical.
			9.1.2	If clearing is required during the bat maternity roosting period (June-July), a qualified professional will survey woodland areas to determine if high potential 'Bat Maternal Roosting Habitat' is present. If high potential bat habitat is identified, appropriate buffer zones will be erected, and clearing activities will be avoided within identified areas, until after the roosting period. All clearing activities will be completed in accordance with the project EPP.
			9.1.3	Avoid unnecessary clearing.
			9.1.4	Utilization of construction barriers to create buffer zones to avoid disturbances to bats. Pre-determined deposition /laydown areas.
			9.1.5	Ensure buffer zones are adequate as to not expose potential features to inclement weather/increased predations rates
	9.2	Area avoidance due to construction noise and lighting	9.2.1	During Construction, measures to control the direction, timing, intensity, and glare of light fixtures into potential bat habitat, while meeting operational health and safety requirements will be undertaken, in accordance with the project EPP.
			9.2.2	Buffer zones and noise reduction measures will be used as specified in the project EPP.
			9.2.3	During Operations, measures to control the direction, timing, intensity, and glare of light fixtures into potential bat habitat, while meeting operational health and safety requirements will be undertaken, in accordance with the project EPP.
			9.2.4	If a bat hibernaculum is discovered onsite, a 200m, year-round, 'no harvest zone' will be established. Currently, there are no known hibernacula within 5 km of any proposed turbine location
	9.3	Collision with turbines	9.3.1	An Adaptive Bird and Bat Protection Plan will be developed and informed by the results of Post Construction Bat Mortality Surveys.
	9.4	Barotrauma	9.4.1	An Adaptive Bird and Bat Protection Plan will be developed and informed by the results of Post Construction Bat Mortality Surveys.
			9.4.2	If feasible, turbine layout may be adjusted during design phase to limit number of turbines within bat habitat shown to have high bat activity.
Community and Local Economy (10)	10.1	Impacts to community wellbeing (psychological) due to frequency/ transparency of communication from the Project.	10.1.1	The Project will establish a website to inform and communicate information on the Project.
			10.1.2	The Project will regularly engage with the public to share information about the Project as it develops.
			10.1.3	The Project will hold specific meetings with Indigenous communities to share information about the Project as it develops.
	10.2	Impacts to social cohesion due to public disagreement over the wind farm.	10.2.1	The Project will facilitate discussion with various community members and interest groups to ensure everyone receives the same information about the Project and its purpose.
	10.3	Impacts to community wellbeing due to temporary closure of recreational	10.3.1	The Project will provide ample warning time to land users; signage at access points.

VC	Impact Number	Impact	Mitigation Number	Mitigation Description
		site/ parts of site to ensure public safety.		
	10.4	Impacts to community wellbeing (psychological stress) due to increased truck traffic/ oversized loads on local highways and roads.	10.4.1	The Project will keep communities informed through letters of notification, community meetings etc., if required.
			10.4.2	Further mitigations outlined in transportation section, including enforced speed limits, limitations on nighttime traffic, and proper signage.
	10.5	Impacts to local hospitality (accommodation, food) services due to increased demand from temporary workers.	10.5.1	The Project will engage proactively with local business and service providers to include in planning for the influx of workers.
			10.5.2	The Project will plan to accommodate temporary workers, which may include a work camp, catering service, sanitation, etc.
	10.6	Impacts to local job resources due to increased demand for workers.	10.6.1	The Project will create recruitment strategies for targeting certain worker pools (including location of recruitment office, types of advertisement).
			10.6.2	The Project will engage proactively with local industry associations about labour needs in the area, reskilling opportunities, and labour shortages.
			10.6.3	The Project will implement a human resources and recruitment strategy for local labour and outsider labour so as not to create divisions in the community.
	10.7	Impacts to gendered employment gaps and gender pay gaps due to male-dominated trades.	10.7.1	The Project will promote recruitment of women and pay equality in equivalent positions.
			10.7.2	The Project will plan for the safety and inclusion of all genders on work site, including camp. These might include gender neutral washrooms, gender appropriate PPE, proper lighting, security, accommodation and transportation measures.
			10.7.3	The Project will plan for the safety and inclusion of all genders on the work site.
	10.8	Impacts to community cohesion due to changing demographics from temporary workers (differences in religion, ethnicity/race, culture, language, etc.)	10.8.1	The Project may implement a cross-cultural training for onboarding.
			10.8.2	The Project will maintain relationships with local communities and interest groups through public events.
	10.9	Impacts to access of emergency services (including emergency room wait times) due to increase in workers living near the Project site.	10.9.1	The Project will engage proactively with local emergency services to understand their capacity, emergency routes, and allow for transparent communication about emergency preparedness and response.
			10.9.2	The Project will develop an Emergency Preparedness and Response Plan in coordination with local emergency service providers.
			10.9.3	The Project will ensure proper workplace health and safety onsite to mitigate any emergencies.
			10.9.4	The Project will retain security and/or private health personnel as needed.
	10.10	Impacts on access to family physicians due to increase in workers living near the Project site.	10.10.1	The Project will retain a telehealth provider for temporary workers, if required.
	10.11	Impacts to access to education (including class sizes) due to increase in workers’ families near the Project site.	10.11.1	The Project will record the number (if any) of children of workers and their families relocating near Project site to anticipate impacts to education services.

VC	Impact Number	Impact	Mitigation Number	Mitigation Description
	10.12	Impacts to public health (ex. violence, including gendered violence, public disturbances) due to the influx of workers to the area.	10.12.1	The Project will establish a Worker Code of Conduct that outlines prohibited behaviours outside of the Project site and work hours, and enforcement actions.
	10.13	Impacts to local housing market due to temporary workers moving to the area.	10.13.1	The Project will consider establishing a work camp for construction phase to mitigate increased demand on local housing.
	10.14	Impacts to community wellbeing related to recreational land use due to new wind turbines and access roads.	10.14.1	The Project will engage proactively with local trail user groups to co-create long-term trail infrastructure during operations.
			10.14.2	The Project will work with community members to maintain access to existing trails where it is safe from ice throwing events and other hazards.
			10.14.3	The Project may create new trails to maintain public access to the land.
	10.15	Impacts to local job resources due to demands for full-time workers.	10.15.1	The Project will balance using local labour, other Canadian labour, and foreign labour so as not to create divisions in the community.
	10.16	Impacts to local housing market due to new, specialized full-time workers moving to the area.	10.10.1	The Project will understand how many individuals/ families will be moving nearby and may aid them to find housing.
			10.10.2	The Project may consider using the temporary work camp for permanent employees while new, permanent housing is built.
	10.17	Impacts to recreation services due to increased demand from new workers and families.	10.17.1	The Project will consider assisting with trail development to offset increased demand.
	10.18	Impacts to community services (libraries, etc.) due to increased demand from new workers and families.	10.18.1	As part of ongoing relations with the surrounding communities, the Proponent will consult with stakeholders as needed, regarding any increased demands on existing services.
Land Uses and Property Value (11)	11.1	Overlapping land uses may pose some conflict between land users and the Project	11.1.1	Focus on early consultation process with interested and affected people.
			11.1.2	Use key messages to communicate the same message to all.
	11.2	Public concern that property value will be affected by the Wind Farm Development	11.2.1	During the Public Consultation process provide updated literature and information regarding property value.
	11.3	Discovery of Intact or Disturbed Archaeological Deposits/Artifacts	11.3.1	All Project employees and contractors will follow the Accidental Discovery of Archaeological Resources Protocol (ADARP) (WNNB & AHB, 2020)
			11.3.2	All Project employees and contractors are responsible for reporting any unusual materials unearthed during any phase of development, in accordance with the ADARP.

VC	Impact Number	Impact	Mitigation Number	Mitigation Description
			11.3.3	If a suspected archaeological resource is encountered, the following actions will be taken: Work will be stopped Immediately. • Immediately stop work in the vicinity (i.e. 30 m) of the find and notify your supervisor. • Leave all known and suspected archaeological resources in place. The Proponent will Contact Archaeology and Heritage Branch and WNNB (where appropriate) • In the event that human remains are discovered also contact the local police or RCMP detachment. • If the archaeological resources are suspected to be Indigenous in origin, the proponent may also contact WNNB. AHB and WNNB will work collaboratively with the Project to develop an appropriate mitigation strategy for archaeological resources of Indigenous origin and will provide guidance to the proponent on next steps.
	11.4	Recreational land-use may be impacted during the construction and operation of the Wind Farm (closing of access areas for public safety)	11.4.1	As part of ongoing relations with the community, the Project will consult with ATV and Snowmobile associations to maintain public access to established trail systems if possible.
			11.4.2	The Project will continue consultation with hikers/organisations in the area to discuss the Project.
			11.4.3	Determine if re-zoning will be required for the new development.
			11.4.4	When construction, operation, and decommissioning activities are occurring onsite, extra caution will be taken on resource roads including increased signage and flagpersons to alert recreational users of ongoing project related activities or hazards.
	11.5	Impacts to hunters and firearms use on the land.	11.5.1	Hunting restrictions may need to be in place or communicated to hunters during hunting season such as prohibitions of discharging firearms around turbines or other infrastructure. Notices will be communicated via signage and other forms of communication.
	11.6	In the interest of public safety, access to turbine locations may need to be restricted during the winter	11.6.1	Early engagement with rightsholders, stakeholders and landholders through letters, public meetings, and creation of a Project website.
			11.6.2	Consultation with the ATV and Snowmobile associations will occur, to discuss the potential of realignment of snowmobile and ATV trails if required.
Public Health and Safety (12)	12.1	Public health risks due to the influx of workers to the area	12.1.1	The selected contractor shall develop and roll out a Safety Induction training program which includes topic on public health and safety associated with the project.
			12.1.2	The Contractor shall keep record of any complaint raised during the construction period relating to the Contractor's activities.
	12.2	During extreme weather events, there is the potential for high winds to damage infrastructure and cause failure, as well as potential for electrical fires through lightning strike	12.2.1	WTGs will be constructed away from public access roads and infrastructure.
			12.2.2	During periods of high winds, WTGs can be shut down to prevent damage to infrastructure or equipment.
			12.2.3	WTGs will be grounded to dissipate lightning surge safely to the ground.
	12.3	During extreme cold weather events there is the potential for ice to build up and throw ice from the wind turbine generator blades.	12.3.1	Depending on the turbine vendor selected, wind turbine generator models, if available, can be equipped with ice-detection systems on each blade.
			12.3.2	Depending on the turbine vendor selected, wind turbine generator models, if available, can be equipped with de-icing systems to prevent and remove ice buildup.

VC	Impact Number	Impact	Mitigation Number	Mitigation Description
			12.3.3	Turbines may be shut down during periods of high ice accretion, or other storm events in line with the safe operating conditions, as specified by the WTG manufacturer.
			12.3.4	Public exclusion near turbine sites may be considered during certain times of the year or operations if hazardous conditions are present.
			12.3.5	Public notices can be issued should ice accretion be anticipated, or if the potential for ice throw becomes apparent
Vehicular Traffic (13)	13.1	Increased Vehicular traffic during construction activities due to transportation of WTG components and mobilization to construction site.	13.1.1	Ensure that all special permits are issued for any oversized or overweight vehicles (will be communicated with the DTINB)
			13.1.2	A Transportation Management Plan will be developed for review and approval by DTINB.
			13.1.3	All vehicles will need to have the correct inspection approvals and permitting required by the DTINB.
			13.1.4	If required by the DTINB a police escort may be arranged during transportation of certain oversized loads.
			13.1.5	All transportation vehicles will abide by the enforced speed limits during transportation.
			13.1.6	Oversized loads or components moving through cities or municipalities will be coordinated with local authorities to minimize the impacts to regular traffic. Consideration will be given to start and stop times of schools.
			13.1.7	All vehicles will be kept in working order and regular housekeeping and maintenance will be completed to reduce inefficiencies.
			13.1.8	During transport, loads will be checked regularly to ensure no opportunity for spills.
			13.1.9	Vehicles should only be parked within designated parking areas as demarcated on the site layout plan.
			13.1.10	Oversized loads or components moving through cities or municipalities will be coordinated with local authorities to minimize the impacts to regular traffic. Consideration will be given to start and stop times of schools.
	13.2	Vehicular traffic and use of transportation equipment has potential for accidental spillage of hazardous materials (e.g., fuel, oils, hydraulic fluids).	13.2.1	Ensure regular load checks are being carried out during transportation.
			13.2.2	Regular vehicle maintenance should be conducted to reduce chance of leakage due to equipment failure. Pre-use inspections will be completed prior to site entry. Pre-use inspections will be completed prior to site entry.
	13.3	Increased volume of vehicular traffic in residential and urban areas may increase the potential for vehicle collisions (e.g., vehicle on vehicle collisions, vehicle-pedestrian incidents).	13.3.1	Ensure all speed limits are being followed on and off-site to avoid any collisions due to speed exceedance.
			13.3.2	Drivers operating for long periods of time should ensure breaks are being taken to avoid collisions caused by fatigue.
			13.3.3	Ensure all appropriate vehicle signage (e.g., oversized vehicle), taillights, and other visible indicators are in working condition.
			13.3.4	The contractor must co-ordinate the loading and offloading of material during the construction phase to avoid congestion of vehicles on-site.
	13.4	Oversize loads may cause damage or require alterations to traffic Infrastructure during transportation	13.4.1	Transportation of oversized and heavy loads will be planned to avoid the thawing season on public roads unless permitted to do so.
			13.4.2	For transportation using Marsh Creek bridge a special permit should be requested from DTINB.
			13.4.3	Oversized loads or components moving through cities or municipalities will be coordinated with local authorities to minimize the impacts to regular traffic. Consideration will be given to start and stop times of schools.
Interference With Radio Communications (14)	14.1	Possible interference with Acadian Timber Corp equipment on Brighton Mountain (JDI Land)	14.1.1	Upon analysis following CanWEA and RABC's guidelines, it is possible that there will be interference. Consultations are ongoing to come to an agreement with the tenant.
	14.2	Possible interference with JDI Woodlands equipment on Brighton Mountain and Juniper Airport.	14.2.1	Upon analysis following CanWEA and RABC's guidelines, it is possible that there will be interference. Consultations within JDI are occurring to ensure that any impacts to JDI Woodlands operations will be avoided.

VC	Impact Number	Impact	Mitigation Number	Mitigation Description
	14.3	Possible interference with licensees on mandatory consultation list	14.3.1	Upon analysis following CanWEA and RABC's guidelines, it is not expected that there will be any interference. Consultations are ongoing regarding confirmation of findings.
	14.4	Possible interference with aeronautical or defence functions	14.4.1	Project has received approvals from Transport Canada, Nav Canada, and the Department of Defence. The project will continue to adhere to any requirements identified in these approvals.
Effects of the Environment on the Project (15)	15.1	Blade damage and decreased efficiency from rainfall	15.1.1	Climatic conditions, including historic and future rainfall levels will be provided to WTG suppliers to determine adequate model or accessories for the Project. This may include stronger coatings for WTG blades (e.g. protective paints, polymers, or multiple layers). Precipitation totals will also be considered for WTG operational speeds, maintenance planning and repairs.
	15.2	Infrastructure damage and decreased energy output due to floods	15.2.1	The Project will consider flood information during Project siting.
			15.2.2	New access roads and upgrades to existing roads will be designed to minimize potential flood damage. This includes required upgrades and installation of culverts, which will be adequately sized for future increases high precipitation events.
			15.2.3	Emergency Response and Preparedness Plans will be developed for the Project and include storm water management and flood response.
	15.3	Decreased energy output due to temperature	15.3.1	The WTGs will be equipped with a control system consisting of various monitoring sensors and mechanisms (e.g. sensors for temperature, vibrations, etc.). If the WTG control system recognizes that the conditions at the site are outside the acceptable range, the system will automatically take the appropriate protective measures (e.g. transition to a reduced-power operating mode or stopping operation).
	15.4	Infrastructure and WTG damage and due to earthquakes	15.4.1	Design equipment to withstand earthquakes based on seismic hazard values for the Project area
	15.5	Delays, Infrastructure damage, or WTG damage and due to severe storms	15.5.1	WTGs will be designed and constructed in compliance with the Canadian Electrical Code.
			15.5.2	The WTGs will be equipped with a control system consisting of various monitoring sensors and mechanisms (e.g. sensors for temperature, vibrations, etc.). If the WTG control system recognizes that the conditions at the site are outside the acceptable range, the system will automatically take the appropriate protective measures
			15.5.3	When wind speeds surpass a WTG rated wind speed, the blades begin to feather, or point into the wind to reduce their surface area. The blades can even be locked down to ride out severe gusts
			15.5.4	The selected WTGs model will be equipped with Ice Detection and Blade Heating Systems. The Project will also explore means of communicating any increased risk to the public (e.g. through signage, etc.), if ice accumulation is anticipated.
			15.5.5	The selected WTGs will come equipped with Lightning Protection Systems, including adequate grounding.
			15.5.6	The Project will routinely inspect, service, repair and upgrade WTG components, as required and as per manufacturer recommendations.
			15.5.7	Schedule and modify construction activities, as well as operations as required to operate safely during extreme weather events.
	15.6	Infrastructure damage due to wildfires	15.6.1	Fire protection measures will be considered in the design.
			15.6.2	Fire Prevention will be undertaken onsite in accordance with good industry practice and detailed in the EPP. This includes adaptive management during the forest fire season, to modify operations per fire risk ratings and during dry conditions, including work shut downs. Other fire prevention efforts will include, but not be limited to: -No open burning onsite, unless under Permit. -Fire extinguishers will be mandatory on all equipment. -Fire suppression equipment caches will be available on site, including water tanks, and pumps, as required. -Smoking will be prohibited while moving from one place to another in forest land.

VC	Impact Number	Impact	Mitigation Number	Mitigation Description
				-Cars, trucks and machinery will have proper exhaust systems when operated in or near forest land. -Proper spark arresting devices will be required on all mechanical equipment. -Power saws will have a proper muffler and be accompanied by a round point shovel or fire extinguisher
	15.7	Fire from accidents and malfunctions	15.7.1	Fire Detection Systems for WTGs will be installed, and inclusive of extinguishing systems. In the event of a fire WTGs will be shut-down and extinguishing systems activated
			15.7.2	Comprehensive training will be provided for all maintenance staff, on-site staff and other groups that assist with fire suppression, as applicable
	15.8	Accidents and Malfunctions- Blade and Structural Failure	15.8.1	The Project will routinely inspect, service, repair and upgrade WTG components, as required and as per manufacturer recommendations.
		Infrastructure damage from accidents	15.8.2	Selected WTG locations have been designed with appropriate setbacks, to prevent issues with public or private infrastructure, should catastrophic failure occur.

14. Project-Related Documents

Project Related Documents are as follows and have been included as an Appendix to this EIA. Any Project Related Documents which are currently under development, will be submitted via Addendum to the TRC.

Project related documents are:

- Appendix A: Baseline Noise Assessment Report (H370571-0000-240-066-0001).
- Appendix B: Operational and Construction Noise Assessment Report (H370571-0000-245-066-0001).
- Appendix C: Visual Impact & Shadow Flicker Assessment Report ((H370571-0000-240-066-0002).
- Appendix D: Wetlands and Vegetated Environment Report (H370571-0000-840-066-0008).
- Appendix E: Fish and Fish Habitat Report (H370571-0000-844-066-0001).
- Appendix F: Terrestrial Wildlife and Wildlife Habitat Report (H370571-0000-483-066-0003).
- Appendix G: Avian Report (H370571-0000-483-066-0004).
- Appendix H: Post Construction Bird and Bat Mortality Surveys Protocol (H370571-0000-844-056-0003).
- Appendix I: Bat and Bat Habitat Report (H370571-0000-483-066-0002).
- Appendix J: Visual and Noise Impacts to Adjacent Protected Natural Areas (H370571-0000-840-066-0009).
- Appendix K: Communications and Facility Interference Report (H370571-0000-483-066-0001).

To be Submitted as an Addendum:

- Appendix L: Public Consultation Summary Report.
- Appendix M: Environmental Protection Plan.
- Appendix N: Adaptive Bird & Bat Management Plan.
- 2024 Avian Survey Addendum Report.
- 2024 Bat Survey Addendum Report.
- 2024 Wetlands, Vegetated Environmental and Watercourse Addendum Report.
- 2023-2024 Archaeological Impact Assessment – Addendum Report.

15. Summary and Conclusion

Once commissioned, the Project's 350 MW of wind energy will reduce GHG emissions within NB, by approximately 1.1 million metric tonnes of CO_2eq, annually. These reductions, align with provincial, regional, and federal targets towards the phase-out of coal-fired electricity generation by 2030, achieving net-zero electricity by 2035, and a net-zero economy by 2050.

The Brighton Mountain Wind Farm, will become an important step for JDI, in meeting long-term renewable energy goals, reducing GHG emissions, as well as creating long-term, sustainable and secure jobs within NB. The Project will also be an important step for the Province of NB, and the Country as a whole, in actualizing goals toward a sustainable, decarbonized future.

JDI, is fully committed to the implementation of mitigation measures, and post construction monitoring efforts, to ensure that environmental impacts from the Project are minimized for all phases of development. From the assessment of available data on the VCs presented within this EIA, and through the application of identified mitigation measures, no significant residual effects to VCs are predicted.

16. Signature

April 15, 2024

Date

Signature of Main
Proponent Contact

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Appendix A
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