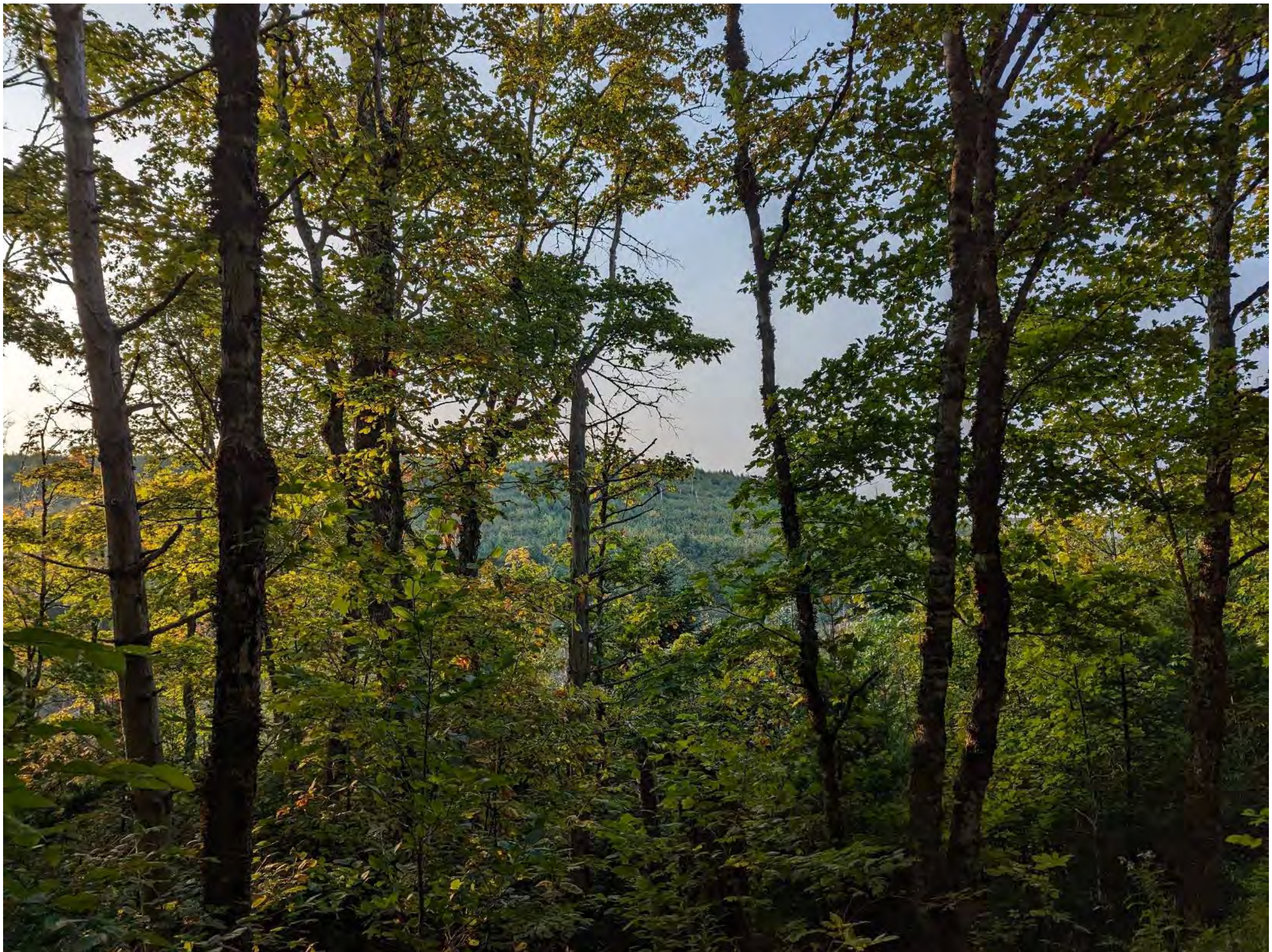

CLYDESDALE RIDGE WIND PROJECT

Environmental Assessment Registration Document

Prepared for: Clydesdale Holdings Ltd.

strum CONSULTING

July 31, 2024

1701 HOLLIS ST. SUITE 1200 HALIFAX, NS B3J 3M8 | (902) 422-9663 | NATURALFORCES.CA

Allison Fitzpatrick
Environmental Assessment Officer
Environmental Assessment Branch
Nova Scotia Environment and Climate Change
Suite 2085, 1903 Barrington St
Halifax, NS
B3J 2P8

Re: Environmental Assessment Registration Document Submission for the Clydesdale Ridge Wind Project

July 31, 2024

To Allison Fitzpatrick,

Clydesdale Holdings Ltd (the Proponent) is pleased to submit the enclosed Environmental Assessment Registration Document and associated appendices for the proposed Clydesdale Ridge Wind Project (the Project). The Proponent, representing a partnership between Natural Forces Developments LP and Dalhousie Mountain Wind Energy Inc, will own and operate the Project in partnership with Mi'kmaw bands in Nova Scotia.

This submission has been prepared in accordance with the *Guide to Preparing an EA Registration Document for Wind Power Projects in Nova Scotia* guidance document dated October 2021. As such, this submission is being provided in hard copy and electronically. The electronic version is divided into separate documents to ensure clarity while satisfying the requirement that each document be no larger than 10 MB.

To facilitate review, below is a table of concordance to guide the reviewer in evaluating the minimum requirements as listed in Section 9(1A)(b) of the Environmental Assessment Regulations made under Section 49 of the *Environment Act* for this submission. A cheque in the amount of the fee of $11,146.40 as prescribed under the *Environment Act* has been provided with this submission.

Minimum Requirement	Reference Section
(i) The name of the proposed undertaking	3.0 Project Summary
(ii) The location of the proposed undertaking	3.0 Project Summary
(iii) The name, address and identification of the proponent	2.0 Proponent Profile 3.0 Project Summary
(iv) A list of contact persons for the proposed undertaking and their contact information	3.0 Project Summary
(v) The name and signature of the Chief Executive Officer of a person with signing authority, if the proponent is a corporation	3.0 Project Summary

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Minimum Requirement	Reference Section
(vi) Details of the nature and sensitivity of the area surrounding the proposed undertaking	6.2 Project Proximity to Other Areas
(vii) The purpose and need for the proposed undertaking	5.2 Need for the Project
(viii) The proposed construction and operation schedules for the undertaking	3.1 Anticipated Project Schedule
(ix) A description of the proposed undertaking	6.0 Description of the Undertaking
(x) Environmental baseline information	12.0 Baseline Survey Results
(xi) A list of licences, certificates, permits, approvals and other forms of authorization that will be required for the proposed undertaking	15.0 Other Approvals Required
(xii) All sources of any public funding for the proposed undertaking	16.0 Funding
(xiii) All steps taken by the proponent to identify the concerns of the public and aboriginal people about the adverse effects of the environmental effects of the proposed undertaking	7.0 Mi'kmaq of Nova Scotia 8.0 Public Engagement
(xiv) A list of all concerns expressed by the public and aboriginal people about the adverse effects or the environmental effects of the proposed undertaking	7.2 Summary of Issues 8.2 Summary of Issues
(xv) All steps taken or proposed to be taken by the proponent to address concerns of the public and aboriginal people identified under subclause (xiv)	7.6 and 8.3 Ongoing Engagement

Please do not hesitate to contact me if there are any questions. We would appreciate any opportunity to discuss and expand upon this application and the Project prior to the determination.

We would like to thank you, the Environmental Assessment Branch and the rest of the Technical Review Committee for your time in reviewing this submission.

Sincerely,

Reuben Burge
President
Clydesdale Holdings Ltd

EXECUTIVE SUMMARY

Clydesdale Holdings Ltd., (the Proponent) represents a partnership between Natural Forces Developments (Natural Forces) and Dalhousie Mountain Wind Energy Inc., represented by Rotor Mechanical Services (RMS). The Proponent is proposing to construct and operate the Clydesdale Ridge Wind Project (the Project) in Mount Thom, Colchester and Pictou Counties, Nova Scotia. The Project is an onshore wind project with up to 18 wind turbines, along with associated infrastructure, including access roads, and power collection systems connecting to an existing substation. The Project turbines will have a nominal nameplate capacity of up to 7 MW, which represents the upper range of turbine models being considered for the Project. The development of this Project will provide renewable energy to Nova Scotia; leading and supporting the province in becoming a national and international leader in the clean renewable energy sector.

The Project is considered a Class I Undertaking under Schedule A of the Nova Scotia Environmental Assessment Regulations, N.S. Reg. 26/95, and therefore, requires the registration of an Environmental Assessment Registration document. The Environmental Assessment Registration document has been completed according to methodologies and requirements outlined in A Proponent's Guide to Environmental Assessment and has incorporated guidance from the Guide to Preparing an EA Registration Document for Wind Power Projects in Nova Scotia.

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

- Atmospheric Environment
- Geophysical Environment
- Terrestrial Environment
- Avifauna
- Aquatic Environment
- Socioeconomic Environment
- Technical Components

The results of the assessment indicated that the Project, with the implementation of mitigation and monitoring measures, will not result in significant adverse residual effects. The Project will also have a positive residual effect associated with the reduction of greenhouse gas emissions (i.e., production of renewable energy) and economic prosperity within Nova Scotia.

Clydesdale Holdings Ltd. is further partnering with Mi'kmaq bands in Nova Scotia to ultimately develop, construct, own, and operate the Project. Clydesdale Holdings Ltd. has, and will continue, to engage and collaborate with local communities, the Mi'kmaq of Nova Scotia, and government representatives to ensure that any potential concerns identified in association with the Project are addressed and mitigated.

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LIST OF ACRONYMS

AA	Assessment Area
ACCDC	Atlantic Canada Conservation Data Centre
ACPF	Atlantic Coastal Plain Flora
AEP	Alberta Environment and Parks
AI	Artificial intelligence
AMO	Abandoned Mine Openings
AMP	Adaptive Management Plan
AQHI	Air Quality Health Index
ARD	Acid rock drainage
ARIA	Archaeological Resource Impact Assessment
ATV	All-terrain vehicle
ATVANS	All-terrain Vehicle Association
°C	Degrees Celsius
CanWEA	Canadian Wind Energy Association
CCME	Canadian Council of Ministers of the Environment
CGC	Canadian Coast Guard
cm	Centimetre
CMM	Confederacy of Mainland Mi'kmaq
cm/sec	Centimetres per second
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPUE	Catch Per Unit Effort
dBA	A-weighted decibels
DFO	Fisheries and Oceans Canada
DND	Department of National Defence
DO	Dissolved oxygen
DWC	Diurnal watch count
EA	Environmental Assessment
EARD	Environmental Assessment Registration Document
ECCC	Environment and Climate Change Canada
ECCC-CWS	Environment and Climate Change Canada – Canadian Wildlife Service
ELC	Ecological Land Classification
EMI	Electromagnetic interference
EMPP	Environmental Management and Protection Plan
EPC	Engineering Procurement and Construction
EPP	Environmental Protection Plan
ESA	*Endangered Species Act*
ESCP	Erosion and Sediment Control Plan
FBP	Functional Benefit Product
FWAL	Freshwater Aquatic Life
GDWPP	Glen Dhu Wind Power Project
GHG	Greenhouse gas
GIS	Geographic Information System

GPS	Global Positioning System
ha	Hectare
HP	Habitat point
HPA	High potential area
HRP	Heritage Research Permit
IBA	Important Bird Area
ISO	International Organization for Standardization
kHZ	Kilohertz
km	Kilometres
KMKNO	Kwilmu'kw Maw-klusuaqn Negotiation Office
KMKNO-ARD	Kwilmu'kw Maw-klusuaqn Negotiation Office Archaeological Research Division
km/h	Kilometres per hour
kV	Kilovolts
LED	Light-emitting diode
LPM	Litres per minute
m^2	Square metres
m^3	Cubic metres
m	Metres
m/day	Metres per day
m/s	Metres per second
MAC	Maximum allowable concentration
masl	Metres above sea level
MBBA	Maritimes Breeding Bird Atlas
MBS	Migratory Bird Sanctuary
MEL	McCallum Environmental Ltd.
MEKS	Mi'kmaq Ecological Knowledge Study
MET	Meteorological
mg/L	Milligrams per litre
mm	Millimetre
MTRI	Mersey Tobeatic Research Institute
MW	Megawatt
MWh	Megawatt hours
NRS	National Radio Services
NCNS	Native Council of Nova Scotia
NFC	Nocturnal flight calls.
NLM	Natural Landscapes of Maine
NO_2	Nitrogen dioxide
NS	Nova Scotia
NSCCTH	Nova Scotia Communities, Culture, Tourism and Heritage
NSE	Nova Scotia Environment
NSECC	Nova Scotia Environment and Climate Change
NSFA	Nova Scotia Fisheries and Aquaculture
NSNRR	Nova Scotia Natural Resources and Renewables
NSORRA	Nova Scotia Offroad Riders Association

NS Power	Nova Scotia Power
NSPW	Nova Scotia Public Works
NSTDB	Nova Scotia Topographic Database
O_3	Ozone
OF	Old Field
OLA	Office of L'nu Affairs
OMNR	Ontario Ministry of Natural Resources
PDF	Portable Document Format
PGI	Pellet Group Inventory
pH	Potential hydrogen
PID	Premises Identification
PM	Particulate matter
PPA	Power purchase agreement
ppb	Parts per billion
PPE	Personal protective equipment
PWA	Protected Water Area
QGIS	Quantum Geographic Information System
RABC	Radio Advisory Board of Canada
RCMP	Royal Canadian Mounted Police
RMS	Rotor Mechanical Services
ROW	Right of way
RSA	Rotor swept area
SAR	Species at risk
SARA	*Species at Risk Act*
SCADA	Supervisory control and data acquisition
SH	Spruce Hemlock
SNH	Scottish Natural Heritage
SO_2	Sulfur dioxide
SOCI	Species of conservation interest
SOP	Standard Operating Procedure
SMP	Special Management Practices
SM4BAT	Wildlife Acoustic SM4BAT Full Spectrum Bioacoustic data sensor
SU	Southern Uplands
SWMP	Surface Water Management Plan
T	Turbine
tCO_2e	Tonnes of carbon dioxide equivalent
TDS	Total dissolved solids
TH	Tolerant Hardwood
TSS	Total suspended solids
µm	Micrometres
µS/cm	Microsiemens per centimetre
UTM	Universal Transverse Mercator
VEC	Valued Environmental Component
WAM	Wet Areas Mapping

WC#	Watercourse (in context of a watercourse, this acronym is used with a number)
WC	Wet Coniferous
WESP-AC	Wetland Ecosystem Services Protocol – Atlantic Canada
WL	Wetland
WM	Wet Mixedwood
WMP	Wildlife Management Plan
WSS	Wetlands of Special Significance
WTG	Wind turbine generator
ZVI	Zone of Visual Influence

LIST OF DRAWINGS

LIST OF APPENDICES

1.0 PROJECT OVERVIEW

Clydesdale Holdings Ltd., (the Proponent) represents a partnership between Natural Forces Developments (Natural Forces) and Dalhousie Mountain Wind Energy Inc., represented by Rotor Mechanical Services (RMS). The Proponent is proposing to construct and operate the Clydesdale Ridge Wind Project (the Project) in Mount Thom, Colchester and Pictou Counties, Nova Scotia. The proposed Project is an energy generating facility with a production rating of at least 2 megawatts (MW) derived from wind, therefore, the Project requires a provincial Environmental Assessment (EA) registration (Class I undertaking) with Nova Scotia Environment and Climate Change (NSECC).

2.0 PROPONENT PROFILE

Clydesdale Holdings Ltd. (the Proponent) represents a partnership between Natural Forces and Dalhousie Mountain Wind Energy Inc., represented by RMS. The Proponent is further partnering with Mi'kmaq bands in Nova Scotia to ultimately develop, construct, own, and operate the Project.

2.1 Natural Forces

Established in 2001, Natural Forces is a private independent power producer based in Halifax, Nova Scotia that delivers renewable energy projects in partnership with local communities. Natural Forces develops, constructs, owns, and operates wind, solar, hydro, and storage projects with Indigenous communities, universities, municipalities, and local community funds. Partnering with local communities for these projects not only generates clean and renewable electricity but delivers local economic prosperity and raises awareness of the challenges of climate change.

2.2 Dalhousie Mountain Wind Energy Inc. (per Rotor Mechanical Services)

Established in 2005, RMS oversees several different aspects of wind energy: development, construction, management, and operations including maintenance of large scale and community-based projects. These activities are represented by RMS, which built and now maintains the Dalhousie Mountain Wind Farm and the community-based Affinity Wind.

3.0 PROJECT SUMMARY

A summary of the Project is provided in Table 3.1.

Table 3.1: Project Summary

Project Name	Clydesdale Ridge Wind Project
Proponent Name	Clydesdale Holdings Ltd.
Proponent Information	The Proponent represents a partnership between Natural Forces and RMS. The Proponent will own and operate this Project in Partnership with Mi'kmaq bands in Nova Scotia
Proponent Address	1701 Hollis St., Halifax, Nova Scotia B3J 3M8
Proponent Contact Information	Kellan Duke Environmental Permitting Specialist Email: kduke@naturalforces.ca Phone: 902.422.9663 Fax: 902.422.9780 www.naturalforces.ca Secondary Contact: Jim Roycroft Project Manager Email: jim@rmsenergy.ca Phone: 902.925.9463 www.rmsenergy.ca
Proponent Signatory	Reuben Burge President Clydesdale Holdings Ltd.
Project Type	Wind Energy
Number of Wind Turbine Generators (WTGs)	Up to 18
Capacity per WTG	Up to 7 MW
Project Location	The Project is in Mount Thom, within the counties of Colchester and Pictou, Nova Scotia. The approximate center of the Project is: 20T 496,832 m E 5,045,535 m N
Landowner(s)	The Study Area is located on private land with easements on Crown land.
Provincial Authorities Issuing Approvals under this Application	NSECC
Municipal Authorities	Municipality of the County of Colchester Municipality of the County of Pictou
Environmental Assessment Registration Document Completed By	Strum Consulting 211 Horseshoe Lake Drive, Suite 210 Halifax, Nova Scotia B3S 0B9 Primary Contact: Melanie Juurlink Senior Environmental Scientist mjuurlink@strum.com

3.1 Anticipated Project Schedule

The anticipated Project schedule is provided in Table 3.2.

Table 3.2: Project Schedule

Project Task	Estimated Start Date	Estimated Completion Date
EA registration	Q3 2024	TBD
Regulatory permitting for wetland and watercourse crossings	Q1 2025	Q3 2025
Geotechnical investigations and site survey	Q1 2025	Q2 2025
Construction	Q3 2025	Q4 2027
Pre-commissioning, commissioning, and acceptance tests	Q3 2027	Q4 2027
Commercial operation date	Q4 2027	Q4 2027
Interim site reclamation	Q4 2027	Q1 2028

4.0 REGULATORY CONTEXT

Wind energy projects that can produce at least 2 MW of energy require a Class I EA, as per Schedule A - Designated Class I and Class II Undertakings of the Environmental Assessment Regulations, N.S. Reg. 26/95 made under Section 49 of the *Environment Act*, S.N.S. 1994-95, c.1.

No federal EA is required under the *Impact Assessment Act* as a Project of this size and location is not listed in the Physical Activities Regulations, S.O.R./2019-285.

5.0 PROJECT INFORMATION

The following sections outline the Project overview and the EA team.

5.1 Project History

In May 2012, Clydesdale Ridge Wind LP (Firelight Infrastructure Partners Inc. and Dalhousie Mountain Wind Farm Inc.) registered a previous version of the Clydesdale Ridge Wind Project for EA (hereafter referred to as the 2012 Project), in accordance with Part IV of the *Environment Act*, S.N.S. 1994-95, c.1. The purpose of the 2012 Project was to construct and operate a wind energy facility providing up to 47 MW of renewable energy to the provincial grid.

On July 24, 2012, the Minister of Environment released a decision approving the 2012 Project in accordance with Section 40 of the *Environment Act*, S.N.S. 1994-95, c.1. In 2017, the existing Approval was granted an extension for another opportunity to build. This extension was not renewed for the current Project iteration as it had become out-of-date.

Instead, an entirely new EA process commenced in 2022. The Proponent is now completing the necessary steps for the successful permitting, construction, and operation of the Project.

The 2012 Project layout generally overlaps the currently proposed Project layout (Drawing 5.2). While some of the studies completed in the 2012 Environmental Assessment Registration Document (EARD) are regional in scale and broadly applicable to the current Project, this EARD relies on the current Project layout and studies completed since the recommencement of the Project in 2022.

5.2 Need for the Project

The Renewable Electricity Regulations, N.S. Reg. 155/2010 under Section 5 of the *Electricity Act*, S.N.S. 2004. c. 25 require the provincial grid to provide 80% renewable energy generation and reduce greenhouse gas (GHG) emissions by 53% by 2030 and net zero by 2050. This Project serves to support the province in meeting this objective through providing local, clean, renewable energy to the grid and decreasing reliance on imported energy.

5.3 Construction of Alternatives

5.3.1 Alternatives to Wind Energy

Non-renewable energy would be incongruent with the province's renewable energy goals and the Proponent's mission to provide sustainable solutions to the climate change emergency. Solar energy is an alternative renewable energy that may be suitable at this Project location; however, the technology would require a much larger footprint of disturbance to generate an equivalent amount of energy.

5.3.2 Alternative Project Location

Alternative locations across Nova Scotia were investigated; however, the chosen location was favored due to the reasons outlined in Section 5.4. The alternative locations are not provided in this document to maintain confidentiality.

5.4 Determination of Project Location

The Proponent selected this location due to the following factors:

- The Project location has a wind resource with sufficient energy and consistency suitable for a wind energy project.
  - RMS currently owns and operates the Dalhousie Mountain Wind Farm, situated immediately east of the Project, which confirms the strong wind resource.
  - The location of this Project allows it to make use of an existing electrical substation built for the Dalhousie Mountain Wind Farm. This provides a connection to the transmission system without the need to build new infrastructure on an entirely new footprint.
- Residents of Mount Thom appear generally supportive of wind energy projects. Local private landowners are long-time supporters of a wind project on Clydesdale Ridge

and have consistently supported efforts to build a Project at this location. Through the construction and operation of the existing Dalhousie Mountain Wind Farm, no complaints have been received to date. Additionally, eight open houses were conducted for the Project, and feedback was received from attendees and addressed to their satisfaction.

5.5 Site Optimization and Constraints

Site optimization and a constraints analysis were used to identify the Project lands and buildable area.

- Site Optimization: Determination of the most appropriate location to maximize power yields and minimize the overall impact on the landscape.
- Constraints Analysis: Analysis used to determine lands available and suitable for the Project. This includes an assessment of the buildable area through a review of Project setbacks and separation distances.

Spatial boundaries for the Project are fully outlined in Section 10.2. Briefly, the Project Area includes 7358 hectares; comprising all PIDs which intersect the Study Area. The Study Area is 588 hectares, comprised of a 50 m buffer on all proposed roads and a 200m buffer on all proposed WTG sites. The Project Area and Study Area are shown on Drawings 5.1 and 5.2.

5.5.1 Site Optimization

Site optimization includes an evaluation of technical (i.e., wind resource), landowners, biophysical, financial, construction, and socio-economic factors, as well as community and stakeholder feedback.

Detailed planning and analysis were completed to determine available lands and to ensure that the wind turbine generators (WTGs) can be located within a buildable area. Minimization and optimization of the Project footprint allow the Project to reduce the impact on the environment and reduce construction and development costs.

The Project lands were chosen for the following reasons:

- Appropriate wind regime to maximize energy generation.
- Presence of adequate land base for the WTGs and Balance of Plant (BOP).
- Ability to locate WTGs responsibly from homes, cottages, and other receptors.
- Proximity to the transmission system to connect the Project to the Nova Scotia electrical grid.
- Suitable available land area to allow for adequate setbacks between WTGs to minimize wind turbulence. Furthermore, WTG manufacturers will not allow WTGs to be erected if the threshold for turbulence intensity is exceeded.

5.5.2 Constraints Analysis and Project Setbacks

Once the more general process of site optimization was completed and a Project Area (defined in Section 6.1) was confirmed, a more detailed and site-specific constraints analysis was completed.

Detailed planning and analysis were completed to ensure that WTGs and roads can be located within the smallest possible footprint. Minimization of the footprint remains a very important factor while planning the Project.

Site specific constraints that were used for the Project are as follows:

- Species at risk (SAR): SAR locations were taken from known datasets, government databases/sources, or other relevant studies specific to the Project Area, and setbacks were imposed.
- Existing infrastructure: Existing roads, transmission lines, or other infrastructure were used to reduce impacts and construction costs.
- Setbacks between WTGs: To minimize wake loss and turbulence from blades while they are in operation, setbacks were applied between the Project's WTGs of approximately six times the rotor diameter in the predominant wind direction, and approximately four times the rotor diameter in the non-dominant wind direction. Setbacks between WTGs include setbacks to the existing WTGs associated with the Dalhousie Mountain Wind Farm.
- Geographic Information System (GIS) mapping of the Project lands was completed using data collected (above), public datasets, and the Nova Scotia Provincial Landscape Viewer (NSNNR, 2017) including:
    - Topography
    - Land use
    - Existing infrastructure
    - Residences
    - Existing roads
    - Existing transmission lines
    - Atlantic Canada Conservation Data Centre (ACCDC) observations
    - Critical and core habitat
    - Wood Turtle Special Management Practices (SMP) Buffers (NSNRR, 2012)
    - Nova Scotia Old Forestry Policy polygons
    - Atlantic Coastal Plain Flora (ACPF) buffers
    - Boreal felt lichen predictive habitat polygons
    - Parks and Protected Areas
    - Known heritage sites
    - Mapped watercourses and waterbodies
    - Mapped wetlands and Wetlands of Special Significance (WSS)
    - Property boundaries

Table 5.1 outlines the provincial and municipal setback considerations applied when determining the extent and location of Project infrastructure.

Table 5.1: Project Infrastructure and Setbacks

Jurisdiction	Category	Setback	Source
Provincial	WTG	Noise – 40 dBA from receptors	NSECC
		Shadow flicker – maximum 30 minutes per day or 30 hours per year	NSECC
		200 m from Gully Lake Wilderness Area	NSECC Protected Areas
Colchester	Habitable Buildings	2 km from residences located on other properties (for WTGs over 100 m in height)	Wind Turbine Development By-law Chapter 56, S. 5.2.2
		An additional 7.5 m setback for every 1 m of additional WTG height over 200 m	Wind Turbine Development By-law Chapter 56, S. 5.3
	Habitable Buildings - Variance	Minimum setback of 1 km for WTGs over 200 m with written permission from all landowners who share a property boundary with the Project (Development Officer must approve)	Wind Turbine Development By-law Chapter 56, S. 5.6
	Property Lines	1 x WTG height from all external property lines	Wind Turbine Development By-law Chapter 56, S. 5.1
	Roads	1 x WTG height from public roads	Wind Turbine Development By-law Chapter 56, S. 5.1
	Noise	Cannot exceed 36 dBA as measured at existing dwellings	Wind Turbine Development By-law Chapter 56, S. 5.5
	Noise - Variance	Ambient Degradation Noise Standard can be waived to a maximum of 40 dBA, if written permission is given from all landowners whose property shares a boundary with the Project lands.	Wind Turbine Development By-law Chapter 56, S. 5.7
Pictou	Habitable Buildings	1 km from residences located on other properties	Wind Energy By-law, S. 4.2.1
		No setback requirement from residences located on the same lot	Wind Energy By-law, S. 4.2.2
	Property Lines	2 x WTG height from all external property lines	Wind Energy By-law, S. 4.2.3 & S 4.4
	Roads	300 m from the boundary of a public road	Wind Energy By-law, S. 4.2.4
	Noise	Cannot exceed 40 dBA as measured 15 m from a dwelling	Wind Energy By-law, S. 4.5, S 4.8
	WTGs	1 x WTG height from WTGs in the same development	Land Use By-law, S. 26.1.3
		4 x WTG height from external developments, measured from property lines	Land Use By-law, S. 26.4.2

5.6 Benefits of the Project

The Project will benefit all Nova Scotian's by providing clean, renewable, and affordable energy that reduces provincial GHG emissions while bringing significant economic and social benefits to the province.

GHG Reductions*:* The Project is expected to offset approximately 242,230 tonnes of carbon dioxide equivalent (tCO_2e) of non-renewable generation in Nova Scotia over the Project's 25-year operational life. To match the amount of power equivalent to the Project's production, the current Nova Scotia grid would produce 38,636.01 tCO_2e per year in emissions. GHG reductions are further described in Section 13.1.1.

Employment: The Project is expected to create up to 100 jobs throughout its life. Contracting opportunities will be available for civil, electrical, mechanical, transportation, and environmental work.

Tax Revenues*:* The Project will provide a substantial tax revenue of approximately $9,200 per MW per year.

Local Stimulus*:* Local businesses (e.g., restaurants and hotels) will benefit from increased spending on goods and services during the construction and operations phases.

First Nations Partnership Benefits: The Proponent is actively seeking a partnership with one or more First Nations communities.

Section 11.7 provides more information on the economic and social impacts and benefits of the Project.

5.7 Environmental Assessment Project Team

The EA Project Team and responsibilities are detailed in Table 5.2. CVs are provided in Appendix A.

Table 5.2: Environmental Assessment Project Team

Company	Name	Responsibility
Strum Consulting	Melanie Juurlink, MREM	Project management, senior review, reporting, regulatory consultation
	Melanie Smith, MES	Senior review
	Jeff Bonazza, MES	Project management, reporting, regulatory consultation
	Mark MacDonald, MScF	Biophysical reporting, botany surveys and reporting, avian survey design
	Ryan Gardiner, BSc	Bat data analysis and reporting
	Nicholas Doane, BSc	Bird surveys and bat acoustic monitoring
	Jessica Lohnes, BSc	Bird surveys and reporting
	Cole Vail, BSc, MREM	Lichen surveys and reporting
	Kerry Wallace, B.Sc	Geomatics Technician

Company	Name	Responsibility
	Emma Halupka, MSc	Biophysical surveys and reporting
	Christina Daffre, BSc	Biophysical surveys and reporting
	Emily MacLean, BASc	Biophysical surveys and reporting
	Lyndsay Eichinger, MREM	Biophysical surveys and reporting
	Katrina Ferrari, BSc	Biophysical surveys and reporting
	Reilly Cameron, BSc	Biophysical surveys and reporting
	Brayden Thomas, BSc	Biophysical surveys and reporting
	Lucas Bonner, BSc	Biophysical surveys and reporting
	Cuun Niesink, BSc, MREM	Biophysical surveys and reporting
	Darcy Kavanaugh, BSc, MREM	Biophysical surveys and reporting
	Dafna Shultz, BSC, MREM	Biophysical surveys and reporting
	Alex Scott, BSc, EPt	Biophysical surveys and reporting
	Jody Hamper	Moose Surveys
Natural Forces	Meg Morris, BSc, MPL, LPP	Project management, regulatory consultation, stakeholder and rightsholder engagement
	Kellan Duke, BSc,	Project management, regulatory consultation, stakeholder and rightsholder engagement
	Jessica Pitman, BSc, MREM	Regulatory consultation, stakeholder and rightsholder engagement
	Gracyn McLaughlin, BSc,	GIS, stakeholder and rightsholder engagement
	Megan MacIsaac, BSc	Regulatory consultation, stakeholder and rightsholder engagement
RMS	Jim Roycroft	Project management, regulatory consultation, stakeholder and rightsholder engagement
Cultural Resource Management Group Ltd.	Kyle Cigolotti, BA	Archaeological Resource Impact Assessment. Team lead by Kyle Cigolotti included Sarah Ingram, Shawn MacSween, Stewart MacPherson, Mike Sanders, and Shannon Stevenson
Membertou Geomatics Solutions	Jason Googoo	Mi'kmaq Ecological Knowledge Study Team lead by Jason Googoo included Colin Poushay, Jing Lian, Kerry Prosper, Sara Swiminar and Norma Brown
	Dave Moore	
	Devin Abbass	
	Colin Poushay	
Ausenco	Florian Reurink	Acoustic bird data analysis, interpretation, and reporting
	Patrick Burke	

6.0 DESCRIPTION OF THE UNDERTAKING

6.1 Project Area

The Project Area is in Mount Thom, Nova Scotia, and exists within both Pictou and Colchester Counties. The Project Area is bounded by the communities of East Earltown to the north, Upper Kemptown to the west, Dalhousie Settlement to the east, and Watervale to the south (Drawing 5.1). The Project Area is situated north of Highway 104 and its central south boundary is delineated by the Gully Lake Wilderness Area (Drawing 5.1). The Project Area is 7,358 hectares (ha) in size and has an approximate center located at 20T 49,6832 m E 5,045,535 m N.

The Project Area was designed to include the maximum extent of expected terrestrial impacts (and in consideration of property ownership) and is defined by the boundaries of Premises Identification (PID) numbers listed in Table 6.1 (Drawing 5.3). The Project Area is defined based on all PIDs which intersect the Study Area (defined in Section 10.2.1.2), 67% of which are located on private land. The Proponent has obtained option agreements to lease the private land.

The Proponent initiated consultation in 2022 with the Land Services Branch of Nova Scotia Natural Resources and Renewables (NSNRR) on the Crown land easement process.

Table 6.1: Project Area PIDs

PID	Ownership	Project Footprint	PID	Ownership	Project Footprint
00827832	Private	Y	20381372	Road	Y
00830992	Private	Y	20381380	Road	N
00831016	Private	N	20381398	Road	N
00831040	Private	Y	20381406	Road	N
00831263	Private	Y	20381430	Road	N
00831511	Crown	Y	20381869	Road	N
00831537	Private	Y	20411500	Private	N
00851824	Private	Y	20417648	Private	N
00852103	Private	N	20428215	Private	Y
00852111	Private	Y	20442927	Private	Y
00852319	Private	Y	20451159	Private	Y
00852509	Private	N	20451167	Private	N
00852533	Private	N	20451175	Private	Y
00853903	Private	Y	20451183	Private	Y
00853911	Private	N	20451209	Private	Y
00853929	Private	Y	20451217	Private	Y
00853960	Crown	N	20451225	Private	N
00866459	Private	N	20451605	Private	Y
00901991	Private	N	65009136	Private	Y
00963751	Private	Y	65047979	Private	Y
01032259	Private	N	65053480	Private	Y
01037373	Crown	N	65057663	Private	N
01037407	Crown	Y	65086258	Private	N
20013322	Crown	N	65103434	Road	N

PID	Ownership	Project Footprint	PID	Ownership	Project Footprint
20015590	Private	N	65103442	Road	N
20015707	Private	Y	65103459	Road	N
20015798	Private	Y	65103467	Road	Y
20015814	Private	Y	65103475	Road	Y
20015822	Private	Y	65105371	Road	N
20015830	Private	N	65105389	Road	Y
20016218	Private	Y	65105405	Road	N
20016226	Private	Y	65107294	Water	N
20016259	Private	Y	65136038	Road	Y
20016267	Private	N	65136087	Road	Y
20016341	Private	N	65136103	Road	Y
20097457	Private	Y	65136111	Road	N
20290615	Private	Y	65136129	Road	N
20334611	Private	Y	65136137	Road	N
20341012	Private	Y	65141947	Private	Y
20341020	Private	Y	65170490	Private	N
20356812	Private	Y	65176901	Private	Y
20381240	Road	Y	65187783	Private	N
20381257	Road	Y	65187791	Private	N
20381364	Road	Y	65188914	Private	N

*PIDs current as of January 2024.

6.2 Project Proximity to Other Areas

The Project's location in relation to towns or cities, Mi'kmaq communities, other developments, parks and protected areas, water supplies, and Important Bird Areas (IBAs) is outlined in the following subsections.

6.2.1 Towns or Cities

The Project is situated approximately 26 kilometres (km) west of New Glasgow, 27 km northeast of Truro, and 107 km northeast of Halifax (Drawing 5.1).

6.2.2 Mi'kmaq Communities

The nearest Mi'kmaq communities are Pictou Landing First Nation Reserve No. 37 (Boat Harbour) which is 27 km northeast of the Project, and Millbrook First Nation Reserve No. 27 (Truro) which is 30 km southwest of the Project (Drawing 5.1). Refer to Section 7 for additional details on the Mi'kmaq of Nova Scotia.

6.2.3 Other Known Developments

Other developments within proximity to the Project include the existing Dalhousie Mountain Wind Farm (Drawing 5.2). The Dalhousie Mountain Wind Farm is a 52 MW project that includes 35 WTGs, the nearest of which is sited 2.7 km west of one of the Project's proposed WTG locations.

6.2.4 Water Supplies

The New Glasgow – Forbes Lake Watershed Protected Water Area (PWA) is the nearest PWA to the Project. It is located 24 km southeast of the Project.

6.2.5 Parks and Protected Areas

The Gully Lake Wilderness Area is situated within the Project Area boundary (Drawing 5.1). This Wilderness Area totals 3,991 ha and contains large patches of older forest and quality habitat to support Mainland Moose (NSECC, n.d.). This Wilderness Area was included in the Project Area as part of the Study Area (buffered infrastructure) falls within the Wilderness Area boundary. No infrastructure will be built within the Wilderness Area.

Cape Breton Highlands National Park, the nearest national park to the Project, is located 197 km to the northeast.

6.2.6 Important Bird Areas

The nearest IBA, Cobequid Bay (NS019), is located 30 km southwest of the Project in the Bay of Fundy, near Truro, Nova Scotia.

6.3 Physical Components

The primary components associated with the Project include the following (Drawing 6.1):

- WTGs
- Access roads to WTGs
- Electrical collector lines to move electrical energy from WTGs to the existing Dalhousie Mountain substation
- Temporary laydown yards
- Construction pads
- Concrete batch plant
- Meteorological towers
- Operations and maintenance building

6.3.1 Wind Turbine Generators

The Project will consist of the construction of up to 18 WTGs (model N-163). At this time, the WTG model is not confirmed; however, the N-163 (Table 6.2) has been used to support modelling and all effects assessment predictions. This represents the largest potential WTG model and is therefore a conservative assessment of potential effects. Each WTG will have an individual generating capacity of 7 MW. The installed capacity will ultimately depend on the final permitted Project design and the available WTG technology that is most suitable for this site.

Table 6.2 WTG Characteristics

WTG Output	7 MW
Hub Height	118 m
Blade Length	81.5 m
Rotor Diameter	163 m
Rotor Swept Area	20867 m^2
Total Height	200 m

The WTGs and supporting structures consist of nine key components:

- Tower foundations
- Tower sections, stacked
- Nacelle
- Three rotor blades
- Hub
- Generator
- Transformer
- Electrical and grounding system
- Locking doorway to access the interior of the tower at the base with staircase

Tower foundations will be approximately 3 metres (m) in depth depending upon site-specific soil conditions. Refer to Section 6.4.3 for additional details on WTG foundation construction.

The nacelle includes the gearbox and electric generator, as well as the blade and WTG control equipment, sensors, and cooling/heating equipment. These components are located at the top of the tower and are connected to the blades via a main shaft through the hub.

All transformers and switchgear are expected to be located inside of the WTG and are required for each WTG to step-up the generator voltage to the 34.5 kilovolts (kV) medium voltage of the collection system.

Lighting on WTGs will meet the design requirements and quality assurance for lights required under Part VI - General Operating and Flight Rules, Standard 621, Chapter 12 – Marking and Lighting of Wind turbines and Wind farms of the Canadian Aviation Regulations, S.O.R./96-433 (Transport Canada, 2021). WTGs with an overall height greater than 150 m must use CL-864 medium intensity, flashing red beacon lights to delineate the perimeter of a wind farm. The highest WTG (based on topographic elevation) must also be lighted (along with any other WTGs deemed to need lighting). Once WTGs reach a height of 60 m or greater during construction, they must be lit with temporary lighting (Transport Canada, 2021).

WTG locations are provided in Table 6.3 and Drawing 6.1.

Table 6.3: Wind Turbine Generator Locations

WTG Generator ID	Location (UTM NAD83 Zone 20)		PID	Private or Crown land
	Easting	Northing		
WTG1	492498	5050554	20016218	Private
WTG2	493781	5050473	20428215	Private
WTG3	493114	5050101	20016226	Private
WTG4	492652	5049556	20451183	Private
WTG5	494865	5049717	20428215	Private
WTG6	492040	5049125	20451159	Private
WTG7	493738	5049527	20015798	Private
WTG8	493204	5048896	20015707	Private
WTG9	494740	5049015	65053480	Private
WTG10	492894	5048279	20451175	Private
WTG11	493690	5048525	20015707	Private
WTG12	494622	5048436	00830992	Private
WTG13	495344	5046297	00963751	Private
WTG14	498171	5042769	65205635	Private
WTG15	499026	5042891	65205635	Private
WTG16	498463	5042356	65205635	Private
WTG17	491661	5050797	20341020	Private
WTG18	492009	5051338	20356812	Private

6.3.2 Access Roads

Access roads to support all Project phases total 28.94 km and include both existing and new access. Access roads to the site will be north from Highway 4, with a secondary option to use Biorachan No 1 Road from the west. Two options for road layouts (i.e., A and B) were assessed during baseline surveys for the EA, with Option A being ultimately selected as the preferred option. As such, the effects assessment presented herein is based on Option A only. The layout provided herein comprises roads that are constructable and optimized to reduce effects wherever possible. Through the completion of the civil design process, minor adjustments will be made to reduce impacts to sensitive habitats such as wetlands and watercourses, or to consider the turning radius of trucks. No major deviations from the proposed layout are expected, and all revisions will remain within the existing Study Area.

6.3.2.1 Existing Access Roads

To the greatest extent practicable, the Project was laid out to take advantage of existing roads. Approximately 13 km of existing roads will be used to support Project development, which includes primarily upgrades to existing roads (Glen Road, Vanderveens Road and Gunshot Road).

6.3.2.2 New Access Roads

The remaining access roads will be new (16 km; 57%) construction. The cleared corridor required is approximately 20 m in width. Access roads will have a 6 to 12 m wide road surface. Detailed civil design will incorporate the full width, including ditches and grading. Wider roads (12 m road surface) are required for the crane to crawl from WTG to WTG, and narrower roads (6 m road surface) will be used if the crane is mobilized via a float truck.

Access roads will be constructed as all-weather, all-season roads. Access roads will be built to accommodate the oversize loads and large weights of the WTG and substation components.

Refer to Section 6.4.2 for specifications related to access road construction.

6.3.3 Electrical Collector Lines

Approximately 32 km of new 34.5 kV electrical collector network will be installed, using a mix of above (i.e., overhead) and below ground methods.

From the foundation of each WTG, approximately 70 to 150 m of underground cable will be run to a riser pole adjacent to the access road and crane pads. The underground cables can be direct buried or contained in conduits that are buried in sand trenches and marked with warning tape according to specification.

The remainder of the collector system (i.e., from the riser poles to the substation) will predominantly remain above ground. The above ground sections will consist of standard wood utility poles with appropriate guying as required. Pole mounted disconnect switches and additional safety and regulating equipment will be installed as required. A fibre optic communication system will also be installed throughout the system to monitor and control the Project remotely.

The overhead collector lines will be installed adjacent to the access roads, except for a section approximately 1.8 km long between the substation north to the intersection with an unnamed quarry road.

6.3.4 Substation, Transmission Line, and Interconnection to Grid

Electricity generated by the Project will be transmitted through the electrical collection system to the existing Dalhousie Mountain 91N substation located within PIDs 65201220 and 65187783, along Cove Road just north of Highway 104. The substation is required to step up the power generated by the WTGs from a voltage of 34.5 kV to 230 kV which is then supplied to Nova Scotia Power (NS Power).

Each WTG has a small transformer located inside that initially steps up the voltage to 34.5 kV. An earthing (grounding) system will be installed in and around the WTG foundations for lightning protection; grounding will also be installed at other areas as determined by the electrical design. The electrical, communications, and grounding cables will leave the WTG foundations below grade. These cables will be installed according to the design engineer's specification. Typical design will require the cables to be installed inside conduit or by the direct buried method consisting of the excavation of a trench with a minimum depth of 1.2 m, the placement of a layer of sand, collection system cables, earthing, and fibre optic cable, which are then covered by another layer of sand. Clean aggregate, as specified by the design engineer, will then be placed on top of the sand and compacted as the trench is filled back in.

Caution tape, stating "Danger Underground Electrical Cable" will be placed along the full length of the trench at approximately 0.15 m below the finish grade. The buried electrical cable will be marked with permanent safety signs to warn of potential hazards from excavation. The size, type, and location of the marker signs will be determined in consultation with the Lands Division and be in accordance with applicable safety standards.

The Proponent is planning to connect the Project to the existing NS Power grid through a newly constructed bay at the existing Dalhousie Mountain substation and connecting to the nearby existing 230 kV transmission line.

6.3.5 Temporary Laydown Yards

Two temporary laydown yards (approximately 100 m x 250 m) are proposed within the Project Area. Laydown area locations will be determined during the civil design process, and will be located entirely within the Study Area, respecting environmental constraints such as wetlands, watercourses, and rare species.

6.3.6 Construction Pads

The erection of a WTG requires a large level work area for storage of WTG components, cranes, and safe operation. These pads will remain in place until decommissioning and may be used throughout Project operations to accommodate the cranes required to complete repairs or replacement of various WTG components (Table 6.4).

Table 6.4: Infrastructure Dimensions and Workspace

Infrastructure	Approximate Dimensions of Workspace Required
WTG base with underground power cables	15 m diameter
Blades laydown pad	30 m x 100 m
Crane pad	30 m x 50 m
Remaining WTG equipment laydown pad	25 m x 60 m

6.3.7 Mobile Concrete Batch Plant

On average, a WTG base requires approximately 600 cubic metres (m^3) of concrete. The volume of a concrete truck is approximately 10 m^3. Therefore, 40 trucks may be required for pouring a single WTG foundation.

A mobile concrete batch plant allows consistent high output and quality concrete to be produced at the Project Area and reduces trucking costs and traffic to surrounding communities. The batch plant is fully mobile making it ideal for projects in remote areas. Short mixing times allows for increased production, up to 120 m^3 of concrete per hour.

6.3.8 Meteorological Towers

Two meteorological towers have been installed for the Project, located at 493754 m E, 5049686 m N, and 498280 m E, 5042660 m N.

6.3.9 Operations and Maintenance Building

One operations and maintenance building may be required during operations. This building may be situated at a laydown area.

6.4 Site Preparation and Construction[1]

The following sections outline the activities associated with the Construction and Operational phases of the Project. Table 6.5 outlines the general order of activities associated with the development of a wind power project.

Table 6.5: Construction Phases

Phase	Details	Approximate Timing
Preconstruction	• Notification to residents/landowners of construction commencement • Geotechnical testing for WTG site locations in field • Survey access roads and WTG locations • Install temporary washroom facilities • Clearing of vegetation commences	Q1 2025 – Q2 2025
Construction – General	• Delivery and set up of temporary facilities (construction offices, workers trailers, etc.) • Construction of laydown yards • Construction equipment delivery	Q3 2025
Construction – Civil	• Stripping, storage, and stabilization of surface soils along access roads, at WTG locations, at substation, and at other required work areas • Construction of access roads, ditches, and water crossings, including water management • Construction of temporary workspace(s) • Construction of WTG locations and crane pads • Installation of erosion and sediment control structures • Site grading • Compaction testing of roads • Creation of crane pads using crushed rock • Excavation of foundations • Pouring of concrete ‘mud slab’ working surface • Installation of rebar and form work for WTG foundations if required • Pouring of concrete for foundations • Dilling and grouting of foundation rock anchors if applicable • Installation of site drainage at base of WTG foundations	Q3 2025 – Q3 2026

[1]Please note that at this time these methods are expected but cannot be confirmed until the Project is approved, and an Engineering Procurement and Construction (EPC) contractor has been selected. The EPC will create final detailed requirements for all construction activities, which will generally align with those provided here.

Phase	Details	Approximate Timing
	• Backfilling of foundations with previously excavated materials • Reclamation of surplus materials • Grading of site	
Construction – WTGs	• WTG component delivery • Crane delivery and assembly • Tower/WTG erection • Install WTG electrical systems and pad mount transformers (if necessary)	Q3 2026 – Q4 2027
Construction – Collection System	• Soil stripping and excavation of trenches for underground electrical system • Installation of utility poles • Installation of wires and associated infrastructure • Installation and connection of underground collector system • Terminations in WTG switchgear • Testing & commissioning	Q3 2026 – Q4 2027
Operations & Maintenance	• Reclamation of subsoils and disturbed surface soils • Weed control • Re-seeding of disturbed soils • Grading of roads • Road maintenance • Culvert maintenance • WTG maintenance • Substation maintenance • Equipment testing	Q4 2027
Decommissioning & Reclamation	• De-energize facility • Removal of above ground infrastructure and infrastructure to a depth of 1 m below ground. This includes WTG blades, nacelles, tower components, and other support structures. • Recontouring of crane pads and access road grades • Reclamation of surface soils • Re-seeding or re-planting	25+ years after commissioning

Equipment for construction includes:

- Feller buncher
- Tree skidder
- Log truck
- Cable trencher
- Cable reel tractor
- Fuel truck
- Concrete trucks
- Borehole drilling machine

- Back hoes
- Bulldozers
- Dump trucks
- Compaction rollers
- Excavators
- Grader
- Forklift or telehandlers
- Welding trucks
- Delivery vehicles
- Pickup trucks
- Erection and support cranes
- Generators
- Site/office trailers
- Storage containers

Access to the Project Area during the construction period and WTG component delivery will be via Highway 4 and Highway 311 (Drawing 6.1). All construction equipment and vehicles can access Highway 4 and Highway 311 from Highway 104. During WTG component delivery, signage and traffic control will be implemented as required. Biorachan No 1 Road from Highway 311 at Earltown may be used as a secondary or alternate access route, likely only for light vehicles.

6.4.1 Clearing and Grubbing

Clearing of vegetation and grubbing of overburden will take place in advance of scheduled work at the site and will include harvesting trees and grubbing of overburden from areas proposed to support Project infrastructure. When possible, overburden will be strategically stockpiled on the site to reduce double handling of material and allow for future use in reclamation. Clearing and grubbing will occur outside of the breeding bird window where possible (April 15 to August 31).

6.4.2 Access Road Construction

The following construction activities will take place for new roads:

- Road areas will be clearcut and grubbed. Salvageable lumber will be stockpiled for the landowners at their request. If landowners do not want salvageable timber, it will be sold or provided for use by local commercial sawmills.
- Excess organic material will be stockpiled temporarily and used for reclamation/revegetation as needed.
- A cut and fill technique will be used where suitable road building materials exist. The road surface will be graded and levelled to the engineering specification.
- It is unknown at this time whether blasting will be required.
- A suitable compacted subgrade will be verified by a geotechnical engineer.
- Geotextile fabrics may be used as specified by the engineer.
- Culverts will be installed to maintain natural drainage according to the erosion and

drainage controls specified by the civil engineering drawings.
- Borrow pit areas may also be proposed in areas where there is insufficient material to construct a suitable access road.
- All final access road construction and design will be completed in accordance with both landowner and WTG manufacturer requirements.
- A total of 24 watercourse crossings are associated with the Project's access roads (combination of new crossings and upgrades to existing crossings).

Existing access roads may require different levels of upgrades depending on their condition. The following construction activities may be required to upgrade existing access roads:

- Road widening
- Brush clearing
- Grading and/or compacting
- Caping the road surface
- Re-ditching
- Culvert replacement

6.4.3 Turbine Pads and Foundations

The following describes the proposed methods for the installation of WTG pads and foundation:

- Remove all timber and grubbings.
- Strip surface and subsoils in areas to be constructed. Separate and stockpile organic soils for later use with reclamation and revegetation.
- Contour and level working areas.
- Excavate WTG bases to appropriate dimensions (determined by engineering requirements).
- Stockpile excavated materials nearby for use in backfill of the tower base or for eventual removal.
- It is assumed that each WTG base will require installation of a support structure made of concrete and rebar. As a result, subsoil will require excavation and possibly relocation for use in other locations throughout the site.
- Maximize the use of excavated material to backfill the WTG foundations and level the crane pad area, any excess will be used to achieve required grades in other locations on the site.
- It is unknown at this time whether blasting will be required, however, it is being considered as an option if/as necessary.
- Pour the concrete slab.
- Install formwork.
- Install rebar, conduits, grounding, and other required infrastructure.
- Transport concrete (the supplier location is to be determined).
- Place concrete.
- Cure and test concrete (tests taken throughout pouring process).

- Backfill area.
- Recontour area.
- Interim reclamation of surface soils and revegetation of disturbance areas is not needed to support operations and maintenance activities.

6.4.4 Temporary Components

During the construction phases, the following temporary components will be required:

- Laydown yards will be required to store construction equipment, WTGs, cranes, shacks, offices, parking and other necessary components. During the construction period, trailers or other temporary structures will be brought in for construction support and management.
- Temporary workspaces may be required along access roads and at crane pad sites. These areas will be reclaimed/restored following WTG erection if not required to support operational activities.
- Borrow pits may be required to provide necessary fill for access road or crane pad construction. All borrow pits will be permitted as required.

6.4.5 Turbine Pad Assembly and Erection

WTG components will be delivered to site and the erection of WTGs will be based upon specific site conditions found at each WTG pad. The base tower section will be positioned onto the foundation and the remaining tower sections will be installed on top via a crane. The hub will be installed on the nacelle prior to being set in place on the tower. Lastly, the three blades will be attached individually to the hub.

Crane lifts require detailed engineering and safety protocols, and those details are currently unknown but considered outside of the scope of this EARD.

6.4.6 Electrical Collector Line Construction

Underground electrical system collector lines will be constructed by:

- Stripping surface soils along the route.
- Excavating a trench to approximately 1.5 m to 2 m deep.
- Installing and compacting of a sand or gravel bed along the base of the trench.
- Laying and interconnection of below ground cables and conduits.
- Backfilling of trench with sand followed by excavated material (parent materials). Excess soils that will result in a ridge along the trench will be removed and used elsewhere on site or disposed of at an approved location.
- Replacement of subsoils.
- Replacement of topsoil.
- Re-seeding as per sediment and erosion control requirements.
- Marking any buried electrical cable with permanent safety signs to warn of potential hazards from excavation.

Overhead electrical system collector lines will be constructed by:

- Surveying of pole locations.
- Drilling or excavating to a specified depth.
- Installing timber poles.
- Guying.
- Installing cross-arm supports and pole mounted infrastructure.
- Unspooling and stringing of power lines and fibre optic cable.
- Interconnection with substation and underground sections.
- Testing and commissioning.

6.5 Operations and Maintenance

Routine maintenance activities will continue throughout the operations phase and will include maintenance visits by technicians on a daily, weekly, or monthly basis.

6.5.1 Site Access and Traffic

Once the Project is operational, minimal vehicle activity will be required. Internal site roads will be used for periodic maintenance and safety checks. Grading of access roads will be required to maintain travel and for snow removal.

A supervisory control and data acquisition (SCADA) system will be installed within the WTGs for remote monitoring and control of the WTGs, which will minimize the need for on-site personnel. The SCADA system ensures the safe and efficient operation of the WTGs and of the overall Project Area.

6.5.2 Project Safety Signs

Project signage will be located at the entrance to the Project Area and throughout the Study Area, as required. These signs will provide essential safety information such as emergency contacts and telephone numbers. Signs will also provide information about the Project and the companies involved. These signs will be maintained throughout the operational life of the Project.

6.5.3 Inspection and Maintenance of Project Infrastructure

Scheduled maintenance work will be carried out several times each year in addition to routine site visits. Unscheduled maintenance is anticipated to be minimal, as the SCADA system allows 24/7 monitoring of the WTGs by the manufacturer and the Project's operations team. Maintenance procedures may require the use of small or large cranes for brief periods of time for the replacement of blades or other WTG components. Maintenance may also periodically require bucket trucks to service the collector lines.

6.5.4 Waste Management

There are limited waste by-products created from the wind energy generation process. Some waste will be produced from ongoing maintenance for the WTG facilities (e.g., lubrication and hydraulic fluids) and these waste materials will not be generated in large quantities and will be disposed of through disposal methods as regulated by the province.

A spill kit with appropriate spill response gear (e.g., spill pads, absorbent, booms, etc.) will be available within specified locations (such as the office or site vehicles).

Non-hazardous waste (i.e., domestic waste) will be disposed of through conventional local waste handling facilities operated by local municipalities.

Materials suitable for recycling will be reused and/or recycled.

6.5.5 Vegetation Management

Minor vegetation management will be required for Project operations. This will be limited to vegetation that threatens the safe operation of the Project, such as any trees close to the overhead collector lines or within the WTG footing/crane pad area.

Herbicides will not be used for Project maintenance.

6.6 Decommissioning and Reclamation

The Project is expected to be in operation for approximately 25+ years, depending on the length of the power purchase agreement (PPA) with NS Power. There is the potential to extend the operational period if an extension to the PPA is granted or a new PPA is negotiated and extended land agreements are secured. If an extension to the PPA is not obtained, the Project will be decommissioned by removing the infrastructure and reclaiming the land. The exact timeframe for decommissioning cannot be determined; however, for the purpose of this EARD, it has been assumed to occur at year ~25 and will take approximately one to two years to complete.

The Proponent acknowledges its statutory obligation to decommission and reclaim the Project in accordance with any provincial regulatory requirements and any development permit issued. The Proponent commits to ensuring sufficient funds will be available to do so and expects that the costs or majority of the costs to reclaim the Project will be recovered from the salvage value associated with the Project components. Salvage values for steel, copper, and other metals in a WTG can be significant and since WTG installations are mainly above ground, practically all the valuable components are salvageable. Publicly available studies indicate that salvage value contributes greatly towards the decommissioning of a facility (Anderson et al., 2014; McCarthy, 2015).

Decommissioning will commence within a year after the PPA is terminated. The decommissioning phase will require considerably lower vehicular support than during the construction phase. The following four steps are anticipated in the decommissioning phase:

1. The WTGs will be dismantled and removed for scrap or resale. Based on landowner agreements, the foundation will be buried below plough depth, leveled, and mulched/seeded to return the land to its former use.
2. The internal site roads and site entrance may be removed if required. After removal, the land will be returned to its former use.

3. The underground cables will be below plough depth and contain no harmful substances. They may be recovered or left in the ground in consultation with the landowner. Terminal connections will be cut back below plough depth.
4. All other equipment, including the overhead collector network and substation equipment, will be dismantled and removed. Substation foundations will be buried below plough depth and the land will be returned to its former use.

After the WTGs have been decommissioned, all worksite infrastructure will be removed, and the land re-graded for site reclamation in consultation with the landowners. The end land use objectives are based on pre-development site conditions, to the extent possible, and the reclaimed site will plan to support the land uses that were present prior to Project development occurring (i.e., undeveloped, forested land). In consultation with the landowners, any revegetation of a reclaimed site will be naturally occurring, of species present prior to construction to minimize the potential spread of invasive species and increase the availability of habitat for wildlife. Ultimate site restoration will be based upon regulatory requirements in place at the time.

7.0 MI’KMAQ OF NOVA SCOTIA

The Mi’kmaq are the founding people of Nova Scotia and currently live throughout the province including 13 Mi’kmaq communities (OLA, 2015). The Proponent consulted with the Native Council of Nova Scotia to ensure engagement with Mi’kmaw people living off-reserve. The Project Area is located within the Mi’kmaq territory called Sipekne’katik, which means ‘wild potato area’ (CMM, 2015).

The Mi’kmaq in the provinces of Nova Scotia, New Brunswick, and Prince Edward Island, and the Gaspé Peninsula in Quebec, are founded on land historically occupied by the ancestors of the Mi’kmaq. The earliest evidence of the Mi’kmaq of Nova Scotia in the Maritimes Region indicates that the ancestors of the Mi’kmaq have existed on the land for more than 11,000 years (Mi’kmawey Debert Cultural Centre, 2024).

The Mi’kmaq of Nova Scotia have established Aboriginal and Treaty rights, including the right to fish for a “moderate livelihood” which flows from the Peace and Friendship Treaties, and Aboriginal rights to hunt, fish and gather for food, social, and ceremonial purposes, more broadly referred to as “traditional” purposes. Mi’kmaq rights are communal rights and therefore shared amongst all members of the Mi’kmaq Nation in Nova Scotia.

The Crown has a duty to consult with the Mi’kmaq of Nova Scotia, which is achieved in accordance with the Mi’kmaq-Canada-Nova Scotia Consultation Terms of Reference. As per Supreme Court of Canada instruction and subsequent guidance from governments, such as the Updated Guidelines for Federal Officials to Fulfill the Duty to Consult (Government of Canada, 2011) and the Proponents' Guide: The Role of Proponents in Crown Consultation With the Mi'kmaq of Nova Scotia (Office of Aboriginal Affairs, 2012), the Crown may delegate procedural aspects of consultation to proponents. However, the duty to consult, and ultimate decision-making authority, remains with the Crown. The results of the Proponent's Mi'kmaq of Nova Scotia engagement program and EA development is expected to be considered by the provincial government in the EA decision-making process.

For the purposes of consultation, 10 of the 13 Mi'kmaq communities are represented in consultation by Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO), which reports to the Assembly of Nova Scotia Mi'kmaq Chiefs. At this time, Membertou First Nation, Millbrook First Nation, and Sipekne'katik First Nation represent their own communities in consultation through their elected Chiefs and Councils.

The nearest Mi'kmaq communities to the Project are Pictou Landing First Nation and Millbrook First Nation. Pictou Landing First Nation includes five reserves: Boat Harbour (No. 37), Fisher's Grant (No. 24), Fisher's Grant (No. 24G), Franklin Manor (No. 22), and Merigomish Harbour (No. 31) and has a registered population of 695 individuals (Government of Canada, 2024a). Boat Harbour is the most proximate reserve to the Project and is 27 km to the northeast (Drawing 5.1).

Millbrook First Nation is a Mi'kmaq community within the Town of Truro with additional reserve land in Beaver Dam (No. 17), Sheet Harbour (No. 36), and Cole Harbour (No. 30). Millbrook has a band membership of 2,312 (981 on reserve and 1,331 off reserve; MFN, n.d.). Reserve No. 27 (Truro) is located 30 km southwest of the Project (Drawing 5.1).

The nearest known Mi'kmaq placename to the Project Area is Kmtnuk which means "at the chain of the mountains". The contemporary name for this area is Mount Thom (CRM Group, 2024).

7.1 Mi'kmaq Engagement

First Nations engagement is an important aspect of any project development. It is fundamental that the Mi'kmaq of Nova Scotia have a full understanding of a proposed project to meaningfully engage in the development process and assess potential impacts to Aboriginal and Treaty Rights. This requires strong, active, communication that considers the varied needs of individual communities. The Proponent values the contributions Indigenous Peoples make to improve upon their renewable resource projects across Canada. As such, the Proponent has engaged with the Mi'kmaq in Nova Scotia regarding the Project.

The first step was the identification of the Mi'kmaq communities that could be impacted by the Project. This process provides a better understanding of the communities that currently and historically have lived and use these lands, and ensures they have access to information and opportunities to discuss and voice any questions or concerns that may arise.

The Proponent initiated consultation with the Office of L'nu Affairs (OLA). The OLA identified three Mi'kmaq bands whose Aboriginal and Treaty rights may be impacted by the Project. These bands were Millbrook First Nation, Paqntkek Mi'kmaq Nation, and Pictou Landing First Nation. Therefore, early engagement efforts focused on contact with these three bands, as well as KMKNO and the Native Council of Nova Scotia (NCNS). As development has progressed, the Proponent has broadened the engagement efforts to include all 13 Mi'kmaq bands in Nova Scotia, which are:

- Acadia First Nation
- Annapolis Valley First Nation
- Bear River First Nation
- Eskasoni First Nation
- Glooscap First Nation
- Membertou First Nation
- Millbrook First Nation
- Paqtnkek First Nation
- Pictou Landing First Nation
- Potlotek First Nation
- Sipekne'katik First Nation
- Wagmatcook First Nation
- We'koqma'q First Nation

While most of the bands are represented by KMKNO for many aspects of consultation and engagement, Sipekne'katik First Nation, Millbrook First Nation, and Membertou First Nation are not, and have been engaged with more directly. The Proponent has additionally committed effort to engaging with the Confederacy of Mainland Mi'kmaq (CMM).

Clydesdale Ridge Wind began engaging with KMKNO for the Project in 2011. This included in person meetings, phone calls, and sharing Project information and data virtually. In late summer 2021, the Proponent began providing updates to CMM, the Maritime Aboriginal Peoples Council, and NCNS.

The Proponent began providing email updates to the nearest bands to the Project between October 2020 and September 2021. This included Millbrook First Nation, Pictou Landing First Nation, and Paqtnkek Mi'kmaq Nation. Additionally, presentations were provided to Pictou Landing First Nation and Paq'ntkek Mi'kmaq Nation.

The Proponent is also offering indirect engagement activities as follows:

Webpage, Email, and Social Media

Project webpages are a great tool to share information and receive comments from community members. The advantages of a website are that it can be updated frequently, and it is continuously available to stakeholders and rightsholders. The webpage is primarily used to inform the general public, stakeholders, and First Nations about various aspects of the proposed development, including:

- Current project information
- Notices for open information sessions

- Maps of the Project location
- Site specific WTG information
- Posting of technical reports such as the EARD
- Project activity schedules
- Construction activity notices
- Educational and media related material

Additionally, the 'Frequently Asked Questions' section on the website allows the Proponent to address questions and concerns brought forward through all engagement activities.

A Project-specific webpage was created in March 2021 and can be viewed at: https://www.clydesdaleridgewindproject.ca. This webpage is updated on an ongoing basis.

The webpage has both a comment form, as well as a newsletter sign-up sheet. This way, individuals can have their questions answered quickly, sign-up to receive regular correspondence, or both.

Email has and will be used to contact First Nation members, answer questions, plan engagement activities, distribute newsletters, and send Project updates.

Signage

At the entry points to wind energy projects, signage is often posted to identify the project, the primary contact, and the presence of hazards, such as ice throw during certain weather conditions. The Proponent will use signage as an opportunity to provide additional information about the Project, including facts about the construction schedule, electricity generation, and wind energy statistics. At a minimum, signage will include contact information for Natural Forces staff.

Other Engagement Tools

There are many other engagement tools that the Proponent may implement in discussion with community members. These include, but are not limited to:

Participation in community events: BBQs, sporting events, and other gatherings can allow an opportunity for the Proponent to have informal discussions about the Project with community members.

Workshops: Workshops can be facilitated in many different formats and for different objectives, which include education by using theoretical design exercises; empowerment by using a World Café format; and joint fact finding on specific issues of interest or concern.

Expert visits: If a key area of concern is identified, an expert can be integrated into the engagement process as opposed to working solely with the Proponent. Experts may attend a meeting, presentation, or community workshop as most appropriate to the level of interest and the issue of concern.

These additional engagement tools will be used when a specific need exists, or is identified that would be of benefit to the concerned Nation.

Refer to Appendix B for the Mi'kmaq of Nova Scotia Engagement Communication Log.

7.2 Summary of Issues

A summary of Project-related issues raised during Mi'kmaq of Nova Scotia engagement is provided in Table 7.1. For each key issue identified, a summary of the Project team's response is provided along with references to sections within the EARD which more fully address the issue.

Table 7.1: Summary of Issues Raised during Mi'kmaq Engagement

Key Issue	Summary of Proponent Response	Primary EA Reference
There are reported sources of black ash on the north slopes of the Cobequid Hills which are a valuable resource to early peoples and Mi'kmaq today, for tool handles and basket making. Based upon the frequency of activities reported by the interviewees, trout, salmon, and bass fishing, along with berry harvesting are considered the favoured activities for Mi'kmaq in this area.	Facilitate opportunities for the Mi'kmaq of Nova Scotia to harvest traditional plants prior to clearing the Project footprint.	2023 MEKS (Section 7.4.2)

7.3 Ongoing Engagement

The Proponent is committed to maintaining open lines of communication with interested Mi'kmaq communities throughout the EA process and the construction, operational, and decommissioning phases of the Project.

The Proponent will support adjustments in proposed mitigation measures and monitoring plans relating to Project impacts based on ongoing feedback and input received from communities.

The results of Mi'kmaq engagement have been considered and incorporated in the environmental effects assessment and are reflected in the Proponent's commitments to involve the Mi'kmaq in the development and implementation of monitoring programs.

7.4 Mi'kmaq Ecological Knowledge Study

As part of the 2012 EARD, a Mi'kmaq Ecological Knowledge Study (MEKS) was completed by CMM Environmental Services in 2008. In 2023, Membertou Geomatics Solutions completed a second MEKS for the Project. The 2023 MEKS was completed to update the results of the 2008 MEKS and to confirm if the conclusions presented in 2008 remain valid or if they have changed.

As directed by NSECC (EA Branch), the MEKS is not appended to this EARD. The 2023 MEKS document is provided directly to the EA Branch on submission of the EARD.

7.4.1 2008 MEKS

The 2008 MEKS completed by CMM Environmental Services was completed for the 2012 Project, which has a different layout than the current Project but was proposed to occur within the same general lands (Drawing 5.2). Its purpose was to assess the 2012 Project site and a 5 km area surrounding the 2012 Project (i.e., the “Study Area”) for Mi’kmaq ecological knowledge.

The 2008 MEKS included a study of historic and current Mi’kmaq land and resource use, an evaluation of the potential impacts of the Project on Mi’kmaq use, an evaluation of the significance of the potential impacts of the Project on Mi’kmaq use and occupation, and recommendations to proponents and regulators.

The 2008 MEKS indicated that it is likely that the Mi’kmaq settled in the Study Area pre-contact due to the availability of water routes. The 2008 MEKS described current use activities as fishing for trout, hunting deer, and gathering food plants, wild berries, wild fruit, and logs. Species of significance to the Mi’kmaq identified on the site include species used for medical (25 species present in the spring and 49 in the fall), food/beverage (16 species present in the spring and 20 in the fall), and craft/art (6 species present in the spring and 6 in the fall).

Potential impacts on Mi’kmaq land and resource use documented in the 2008 MEKS include potential disturbance to archaeological resources and the permanent loss of some species of significance used by the Mi’kmaq. Based on these potential impacts, an evaluation of significance concluded that any disturbance of a Mi’kmaq archaeological resource would be deemed significant, and the permanent loss of some plant species is not evaluated as significant.

7.4.2 2023 MEKS

In 2023, a MEKS was completed by Membertou Geomatics Solutions to support the Project and update the results of the 2008 MEKS. Spatial boundaries used in the 2023 MEKS included the MEKS Project Site (50 m buffer on Project infrastructure) and a MEKS Study Area (5 km buffer surrounding the MEKS Project Site). The 2023 MEKS included:

- Interviews
- Literature and archival research
- Field sampling

Interviews were completed with 18 informants who provided information on past and present traditional use activities. A site visit was completed in October 2022 with a knowledge holder from Paq’tnkek. The site visit was used to collect information on significant Mi’kmaq flora and fauna identified on the site.

Within the MEKS Project Site, traditional use consists of berry harvesting, trout fishing, and deer, rabbit, and partridge hunting. These activities occur currently (~1%), in the recent past (~54%), and in the historic past (~45%)[2].

Mi'kmaq significant species findings identified land/water use areas within the MEKS Project Site and MEKS Study Area that continue to be used by the Mi'kmaq of Nova Scotia, to varying degrees. Species used for food/sustenance (n=57), medicinal/ceremonial (n=3), and tools/art (n=1) were identified in the MEKS Study Area.

7.5 Effects of the Undertaking on the Mi'kmaq of Nova Scotia

Archaeological Resource Impact Assessments (ARIA) were completed in 2012 and updated in 2024 (CRM Group, 2024). The 2024 ARIA study is described in more detail in Section 12.6.5; NSECC (EA Branch) has requested that the ARIA report is provided directly to the department, rather than appended to the EARD. The 2012 and 2024 ARIA both concluded that there is low potential for First Nations archaeological resources on site. The current Project layout generally overlaps the 2012 Project layout (Drawing 5.2).

The Project Area consists of predominantly private land and some Crown land. Recreational use of the land [e.g., hunting, all-terrain vehicle (ATV) use, etc.] has been documented. For the portions of the Crown land that are being used for the Project (i.e., access roads), the Proponent will work with the province to determine appropriate access to Crown land, as well as safety measures to protect the Mi'kmaq of Nova Scotia and members of the public. Following the operations period, the Project will be decommissioned, and the land will be reclaimed which will aim to revert land back to existing conditions (Section 6.6).

The Proponent is committed to the continued engagement with Mi'kmaq communities and organizations throughout the life of the Project and will ensure Mi'kmaq interests are considered during all phases of the Project.

7.6 Ongoing Engagement

Mitigation measures and monitoring associated with related Valued Environmental Components (VECs) (Section **Error! Reference source not found.**) are key to avoiding e ffects on the Mi'kmaq of Nova Scotia, as detailed in each VEC section (Section 13). The Project has been planned to minimize footprint disturbance and impacts to the Mi'kmaq of Nova Scotia. There are limited expected indirect effects on the Mi'kmaq of Nova Scotia based on the assessment of effects for related VECs. Mitigation and monitoring measures are not repeated in detail in this section but generally include:

- Obtaining wetland/watercourse alteration approvals
- Implementing erosion and sedimentation controls
- Controlling dust

[2]Current use = within the last 10 years
Recent past use = 11 to 25 years ago
Historic past use = >25 years ago

- Maintaining regulatory setbacks
- Meeting regulatory guidelines (e.g., noise and shadow flicker)
- Completing post construction bird and bat mortality monitoring

The Proponent also offers the following actions to continue to engage with the Mi'kmaq of Nova Scotia and provide opportunities for involvement with the Project:

- Support the Mi'kmaq review of the EARD by making the Project team available to provide additional information about the Project, answer questions, or facilitate discussion with interested Mi'kmaq Nations, organizations, or individuals.
- Continue engagement with the Mi'kmaq of Nova Scotia to understand traditional use of the Project Area and receive feedback on EA conclusion and impacts.
- Provide the Mi'kmaq of Nova Scotia an opportunity to walk the Project Area with the Proponent to identify and document sensitive sites prior to construction.
- Facilitate opportunities for the Mi'kmaq of Nova Scotia to harvest traditional plants prior to clearing the Project footprint.
- Halt work immediately if archaeological deposits or human remains are encountered during construction activities associated with the Project and immediately contact the Nova Scotia Special Places Program and the KMKNO Archaeological Division.
- Develop a Mi'kmaq Communication Plan that outlines an ongoing two-way communication process throughout the life of the Project.
- Provide the opportunity for a tour of the Project to the Mi'kmaq of Nova Scotia, once in operations.
- Provide opportunities for Mi'kmaq participation in the Project (e.g., opportunities to participate in environmental monitoring).

Mitigation measures and conclusions relating to impacts to traditional practices will continue to be evaluated directly with Mi'kmaq communities throughout the EA process and throughout the life of the Project.

8.0 PUBLIC ENGAGEMENT

The Proponent has a flexible, place-based approach to engagement that ensures the consideration of a wide range of interests and allows the maximization of community participation. Maintaining flexibility with engagement is vital to address current and future concerns in an appropriate manner that best suits the needs of the community.

The Proponent has carried out extensive community engagement to provide a breadth of opportunities for local community members to ask questions, share concerns, and provide feedback throughout Project development. This began in 2011 and has continued with growing outreach. Methods of engagement have been adaptive based on the needs of the community and have consisted of:

- Meeting with elected officials prior to broad public outreach.
- Creating a Project website that is frequently updated.
- Meeting with community groups, land users, and local businesses, among others, individually to ensure their questions are addressed.
- Hosting public information meetings and open houses with prior invitations sent out via email, mail, social media, and in the regional/local newspapers.
- Continually communicating Project updates to the surrounding communities via email, social media, electronic and mail-out newsletters, media interviews, and individual meetings and phone calls.

Refer to Appendix C for the Public Engagement Communication Log (within the Public Consultation Plan).

8.1 Public Information Sessions

The Proponent hosted several public information sessions for the Project. These meetings provided an opportunity for community members and stakeholders to meet the Proponent, learn about the Project, ask questions directly to Proponent staff, and provide feedback on the Project proposal. The Proponent structured the public information sessions in an open house style meeting with lots of display boards, maps, and handout materials to allow attendees to digest the information at their own pace. Multiple staff knowledgeable about the Project were present at each session to ensure attendees could ask their questions and provide their feedback directly to the people with the information and influence over Project planning.

To date, eight public information sessions have been hosted in nearby communities:

- December 15, 2011: 1383 Mount Thom Road
- December 2, 2021: Kemptown Community Hall
- December 9, 2021: Dalhousie Mountain Snowmobile Club Hall
- December 15, 2021: Kemptown Community Hall
- December 20, 2021: West River Fire Hall
- January 7, 2022: Dalhousie Mountain Snowmobile Club Hall
- January 12, 2022: Kemptown Community Hall
- March 21, 2024: Kemptown Community Hall

The first public information session was hosted on December 15, 2011, at the existing RMS operations building near the substation for the Project. The meeting was advertised in the Truro Daily News and in the New Glasgow News on three different days prior to the event. Notices of the meeting were emailed to the Mi’kmaq Rights Initiative and CMM. Notices were displayed at the band office in Pictou Landing First Nation and at the two closest stores to the Project: Scott’s Bakery in Earltown and Johnny’s Country Canteen in Salt Springs. Over 150 flyers were distributed by hand to all residents within 3 km of the Project.

Staff from RMS and from Stantec, the consultant who completed the initial EA for the Project, were present at the information session to speak with attendees, answer questions, and receive feedback. Project information was presented as large posters, pamphlets, and handout sheets for attendees, who were encouraged to sign in and leave comments. The large posters included general Project information, Proponent information, maps of the proposed Project infrastructure, and maps of the visual and noise level assessments. Fourteen guests attended the four-hour information session. Attendees included members of the local community, neighbours of the proposed Project, landowners, and local businesses. All comments received were positive, with support in the form of verbal and written comments.

In December 2021 and January 2022, six open houses were hosted at various locations in the area surrounding the Project. Each session was advertised in the local Nova Scotia Advocate for two weeks prior to the event. These meetings were drop-in style, with COVID protocols in place at that time. Project information handouts were provided to attendees along with one-on-one discussions with Proponent staff.

In March 2024, the most recent information session was hosted at the Kemptown Community Centre. The meeting was advertised in the Casket Newspaper one and two weeks before the event. Newsletter invitations were mailed out to over 7,400 homes near the Project Area, and invitations were emailed to the stakeholder mailing list.

The Proponent was present at the information session to speak with attendees, answer questions, and receive feedback. Materials were displayed as large poster boards and included:

- Project overview and benefits
- Timeline
- Project layout map
- Environmental studies
- Sound level map
- Project owners

All display materials were offered as a printed package that attendees could take home. This package was emailed as a Portable Document Format (PDF) to the mailing list after the information session.

Over 25 people attended the information session and the feedback received was supportive of the Project.

Supporting materials are provided in Appendix C.

8.2 Summary of Issues

Two feedback forms were received from the public information session (Appendix C). Table 8.1 summarizes the feedback and provides a response.

Table 8.1: Summary of Issues Raised During Public Engagement

Key Issue	Summary of Proponent Response
Would like to see updates about wildlife and habitat studies in the update emails.	Updates will be sent out to the mailing list when the provincial EA is submitted.
Signs about construction should be posted on snowmobile trails so users have advanced notice of the plans in the area.	The Proponent is engaging with the snowmobile club to explore how to deploy signage.

8.3 Ongoing Engagement

The Proponent is committed to maintaining open lines of communication with interested members of the public through the EA process and all Project phases. The Proponent will develop and implement a Complaints Resolution Plan and create a Community Liaison Committee, if there is community interest.

9.0 REGULATORY CONSULTATION

To support the EARD, the Project team consulted with the following regulatory agencies:

1. NSECC
2. NSNRR
3. Environment and Climate Change Canada – Canadian Wildlife Service (ECCC-CWS)
4. Fisheries and Oceans Canada (DFO)
5. Transport Canada
6. Nav Canada
7. Department of National Defence (DND)
8. Municipality of Pictou County
9. Municipality of Colchester

A Project introduction meeting was held on June 28, 2023 with NSECC to inform the regulator on the history of the Project, the Project location, scope of the proposed Project, site sensitivities, selection of VECs, proposed biophysical survey program, proposed archaeology survey program, proposed MEKS, and a review of the approach to Mi'kmaq and Community Engagement. This presentation was attended by Bridget Tutty (NSECC EA Branch) and Paula Francis (NSECC). All consultation conducted prior to April 2024 was completed by McCallum Environmental Ltd. (MEL), now referred to as Strum.

The Proponent and Strum met with Kermit deGooyer of the NSECC Protected Areas and Ecosystems Branch on October 6, 2023, as recommended by the NSECC EA Branch as the Project is situated within 500 m of a Protected Area. During this meeting, the Proponent committed to maintaining a 200 m setback distance from WTGs to the boundary of the Gully Lake Wilderness Area, using existing access to the extent possible, and siting the WTGs that are adjacent the Wilderness Area in disturbed habitats to the extent possible. The Proponent met with NSECC again on July 18, 2024, to discuss the EARD submission.

A Project introduction meeting was held on September 7, 2023, with NSNRR. The Proponent and Strum provided NSNRR with the Project's history, a Project description, Project location, Study Area sensitivities, and an overview of the biophysical survey methods. Strum continued to consult with NSNRR related to eastern waterfan (*Peltigera hydrothyria*), black ash (*Fraxinus nigra*), and Mainland Moose (*Alces alces americana*).

Additionally, avian and bat survey methods were provided to NSNRR and ECCC-CWS on September 15, 2023. Responses were received by NSNRR and ECCC-CWS on September 29 and November 23, 2023. The recommendations from the regulator pertaining to the avian and bat survey program are discussed in more detail in Section 11.4.

Strum met with Laura Watkinson from DFO on June 23, 2022, to discuss the Proponent's approach related to fish and fish habitat surveys for wind project EAs in Nova Scotia.

Discussions about the Project with Municipal staff have been taking place since July 2023. These discussions have taken place via email, phone, and in-person meetings with the development officers from Pictou County and Colchester County. Topics include Project lands, layout, distance from residences, development permit requirements, building permit requirements in Pictou, and public meeting requirements. These conversations with both municipalities are ongoing.

Appendix C provides a complete log of all regulatory communications.

10.0 ENVIRONMENTAL ASSESSMENT METHODS

The EA methods for the Project followed general guidance provided in the Guide to Preparing an EA Registration Document for Wind Power Projects in Nova Scotia (NSECC, 2021) and CWS protocols (CWS, 2007a, 2007b, 2018, 2022). Assessments were also completed in accordance with acceptable practices in EA, and specific methods by Project tasks are outlined below.

The EA focusses on specific environmental components called VECs. VECs are specific components of the atmospheric, geophysical, biophysical, and socioeconomic environments that the Project has the potential to interact with. VECs are not only important to the local environment and human population but can have a national or even international profile.

10.1 Scope

The scope of the assessment included the selection and assessment of potential VECs, the evaluation of the potential Project activities' interactions with VECs (both positive and negative), the identification of environmental effects from Project activities (if any) for each VEC, and the identification of VEC thresholds to determine the significance of residual environmental effects (if any).

The EA process then allows for the prediction of environmental effects of the proposed Project. The Proponent, Strum, and other technical experts then identify measures to mitigate, and subsequently minimize, potential adverse environmental effects. The EA then attempts to predict if significant residual adverse environmental effects will occur once mitigation measures are implemented.

10.2 Boundaries of the Assessment

Spatial and temporal boundaries were established for the EA to evaluate potential Project interactions with VECs.

10.2.1 Spatial Boundaries

Spatial boundaries of the EA are defined by the Project Area, Study Area, Fish Study Area, and the Project footprint (Table 10.1; Drawing 6.1; Drawing 11.4).

10.2.1.1 Project Area

The Project Area is in Dalhousie Settlement, bounded by Upper and Lower Mount Thom to the south, Earltown, East Earltown and West Branch River John to the north, and Gully Lake Wilderness Area to the east. The Dalhousie Mountain Wind Farm is located directly to the east of the Project Area (Drawing 6.1). The Project Area is approximately 7,358 ha in size and has an approximate centre located at 20T 498079 m E, 5046027 m N.

The Project Area was designed to include the maximum extent of expected terrestrial impacts (and in consideration of property ownership) and is defined by the boundaries of private land PIDs outlined in Table 6.1.

10.2.1.2 Study Area

The Study Area is located within the Project Area and includes the entirety of the Project footprint, plus a buffer to understand baseline conditions surrounding proposed infrastructure. The Study Area (Drawing 6.1) is based on a minimum 50 m buffer around proposed roads, and a minimum 200 m buffer on proposed WTGs. This Study Area captures all direct impacts from the Project. The Study Area is 588 ha in size.

Fish Study Area

Evaluation of fish and fish habitat was completed within the Fish Study Area, which serves as an extension of the Study Area for the purposes of fish collection. The Fish Study Area (640 ha) includes the entirety of the Study Area and three additional aquatic features – West Branch River John, Mackay Mills Brook, and Steele Run, located north, west, and south of the Project Area, respectively (Drawing 11.4). The Fish Study Area was defined to consider fish and fish habitat representation with the Study Area and the maximum extent of potential impacts to fish and fish habitat.

Project Footprint

The Project footprint includes the maximum extent of the road footprint and WTG pads where physical alteration (not just clearing) is expected (Drawing 6.1). The Project footprint totals 143.8 ha and includes PIDs listed in Table 6.1. The specific Project footprint is expected to adjust during the civil design process but remain within the Study Area.

Additional Spatial Boundaries

Expanded spatial boundaries were considered for discrete aspects of the EA. Colchester County, Pictou County, and Nova Scotia were used for the purpose of data collection relating to existing conditions and evaluation of certain conditions that naturally extend beyond the Project Area (Drawing 5.1).

Assessments per Spatial Boundary

All assessments used the Project Area, Study Area, Fish Study Area, or Additional Spatial Boundaries for assessment, as outlined in Table 10.1.

Table 10.1: Assessments Completed per Spatial Boundary

Spatial Boundary		Assessment
Project Area		Noise
		Geology
		Groundwater
		Habitat classification
		Fauna
		Avifauna[1]
		Bats
Study Area		Wetlands
		Surface water
		Vascular plants and lichens
Fish Study Area		Fish and fish habitat
Additional Spatial Boundaries	Colchester/Pictou County	Socioeconomic
		Visual aesthetics
		Shadow flicker
		Noise
	Nova Scotia	Climate change
		Air quality
		Electromagnetic interference

[1]Note: Several avian surveys (Owl, Common Nighthawk, waterfowl, and spring migration surveys) occurred within and beyond the Project Area but are not carried into the Additional Spatial Boundaries.

10.2.2 Temporal Boundaries

The temporal boundaries of the EA include the following Project phases: construction (two years), operations and maintenance (25+ years), decommissioning and reclamation (two years).

10.3 Valued Environmental Component Selection

The selection of VECs were based on the following:

- Technical aspects of the Project and known interactions based upon similar projects.

- Regulatory policies and guidelines[3], including regulatory consultation recommendations.
- Information received during engagement with the Mi'kmaq of Nova Scotia and/or the public.
- Scientific knowledge of the area from existing public data sources.
- Professional judgement based upon expertise in EA completion across Canada.

Refer to Table 10.2 for the VECs selected for evaluation. All VECs were selected based on the potential to interact with the Project.

Table 10.2: VECs Selected for Evaluation

Group	VEC
Atmospheric	Climate change
	Air quality
	Noise
Geophysical	Surficial and bedrock geology
	Groundwater
Terrestrial	Habitat, flora, and lichens
	Fauna
	Bats
	Avifauna
Aquatic	Wetlands
	Surface water, fish, and fish habitat
Technical	Visual aesthetics
	Shadow flicker
	Electromagnetic interference
Socioeconomic	Local Economy
	Land use and value
	Transportation
	Recreation and tourism
	Human health
	Cultural and heritage resources
	Other undertakings in the area

10.4 Characterization of Environmental Effects

To determine the level of residual effects to each VEC that remains after mitigations are implemented, the Project team considered the magnitude, likelihood, duration, and frequency of the Project's impact. As the Project is proposed for a finite time and will be fully reclaimed, all VECs have been considered reversible (partially to fully). Table 10.3 provides a description of each characterization criteria and the degrees in which they can contribute to an effect. These criteria were defined in relation to assessing the significance of the residual adverse effects for the VECs.

[3]As part of VEC selection, Strum also reviewed the NSECC Guide to Preparing an Environmental Assessment Registration Document for Wind Power Projects in Nova Scotia, revised October 2021.

Table 10.3: Characterization Criteria for Environmental Effects

Characterization	Description	Category Definitions
Magnitude	Refers to the expected size or degree of the effects compared against baseline conditions. If no average values or threshold values are identified, the magnitude determination is subjective based on literature and/or reasonable inference.	**Negligible (N)** – Differing from known average values for the existing environment/baseline conditions to a small degree, but within the range of natural variation and below a threshold value **Low (L)** – Differing from the average value for the existing environment/baseline conditions, outside the range of natural variation, and less than or equal to appropriate guideline or threshold value **Moderate (M)** – Differing from the existing environment/ baseline conditions and natural variation, and marginally exceeding a guideline or threshold value **High (H)** – Differing from the existing environment/ baseline conditions and natural variation, and exceeding a guideline or threshold value
Likelihood	Refers to the probability of the impact occurring.	**Unlikely (UL)** – Expected to occur with a low degree of certainty **Possible (P)** – Expected to occur with a low to medium degree of certainty **Likely (L)** – Expected to occur with a medium to high degree of certainty **Almost Certain (AC)** – Expected to occur with a high degree of certainty
Duration	Refers to the time period over which the effects are likely to persist.	**Short Term (ST)** – Construction, decommissioning and reclamation (effects are limited to occur from as little as 1 day to 2 years) **Long Term (LT)** – Operations (25+ years) **Permanent (P)** – VEC unlikely to recover to baseline conditions
Frequency	Refers to the rate of recurrence of the effects (or conditions causing the effect).	**Once (O)** – Effects occur once **Sporadic (S)** – Effects occur at irregular intervals throughout the Project **Regular (R)** – Effects occur at regular intervals throughout the Project **Continuous (C)** – Effects occur continuously throughout the Project

10.5 Determination of Significance of Effects

Table 10.4 outlines the approach to determine the significance of effects from the Project on VECs. Significance is based on the category (e.g., high, moderate, low, or negligible) for each characterization (e.g., magnitude) per VEC. Certain combinations of categories will result in a determination of a significant adverse effect, while other combinations will not.

Table 10.4: Evaluation of Significance for Adverse Effects

<table>
<tr><th>Magnitude</th><th>Likelihood</th><th>Duration</th><th>Frequency</th><th>Significance</th></tr>
<tr><td>Negligible</td><td>All</td><td>All</td><td>All</td><td>Not significant</td></tr>
<tr><td>Low</td><td>All</td><td>All</td><td>All</td><td>Not significant</td></tr>
<tr><td rowspan="4">Moderate</td><td>Unlikely
Possible
Likely</td><td>Short term
Long term</td><td>Once
Sporadic</td><td>Not significant</td></tr>
<tr><td>Unlikely
Possible
Likely</td><td>Long term</td><td>Regular
Continuous</td><td>Significant</td></tr>
<tr><td>Almost certain</td><td>All</td><td>All</td><td>Significant</td></tr>
<tr><td>Unlikely
Possible
Likely
Almost certain</td><td>Permanent</td><td>All</td><td>Significant</td></tr>
<tr><td rowspan="4">High</td><td>Unlikely</td><td>Short term</td><td>Once
Sporadic</td><td>Not significant</td></tr>
<tr><td>Unlikely</td><td>Short term</td><td>Regular
Continuous</td><td>Significant</td></tr>
<tr><td>Unlikely</td><td>Long term
Permanent</td><td>All</td><td>Significant</td></tr>
<tr><td>Possible
Likely
Almost certain</td><td>All</td><td>All</td><td>Significant</td></tr>
</table>

11.0 BASELINE SURVEY METHODS

11.1 Atmospheric

The following subsections describe the baseline survey methods for weather conditions, air quality, and noise.

11.1.1 Weather Conditions

Weather conditions in Nova Scotia are monitored by weather stations under the operation of Environment and Climate Change Canada (ECCC), Nav Canada, and various other stakeholders. Data collected from these stations includes temperature, precipitation, relative humidity, pressure, wind direction, and wind speed. Recent data from the three weather stations within 50 km of the Project (that have up to date data) was obtained to summarize weather conditions in proximity to the Project Area. These weather stations include Upper Stewiacke (Climate ID 8206200; 33 km south), Caribou Point (Climate ID 8200774; 36 km northeast), and Debert (Climate ID 8201390; 37 km southwest).

Since none of the weather stations exist within the Project's ecoregion (Nova Scotia Uplands; 300), a literature review of climate conditions within the ecoregion and ecodistrict was completed. The Upper Stewiacke and Debert climate stations are within the Valley and Central Lowlands Ecoregion (600) and the Caribou Point climate station is within the Northumberland/ Bras d'Or Ecoregion (500) (Neily et al., 2017).

11.1.2 Air Quality

The Air Quality Health Index (AQHI) was assessed in Pictou, Nova Scotia, 27 km northeast of the Project Area. AQHI is calculated based on values for ground-level ozone (O_3), fine particulate matter (PM) [≤2.5 micrometres (μm) ($PM_{2.5}$) or ≤10 μm (PM_{10}) in size], and nitrogen dioxide (NO_2). The AQHI is a scale from 1 to 10+, representing the following health risk categories: Low (1 to 3), Moderate (4 to 6), High (7 to 10), and Very High (10+) (ECCC, 2023).

As recommended by Health Canada (2017a), available data from air quality monitoring stations provided by the National Air Pollution Surveillance Program was reviewed to describe the existing environment.

Based on the type of project and limited related particulate or air quality concerns, no baseline particulate monitoring or air quality modelling was completed.

11.1.3 Noise

Health Canada (2017b) defines noise as any unwanted sound and provides qualitative descriptions of community types and estimated baseline sound levels per community type. The community type in the vicinity of the Project Area was determined and based on the Health Canada guidance document, and estimated baseline sound levels were determined.

For the purposes of the current Project, no on-site baseline noise monitoring was completed. Predictive modelling for operational noise (Appendix D) was completed to ensure that the maximum allowable sound level from WTGs at an existing residential receptor does not exceed 40 A-weighted decibels (dBA) as per NSECC's Guide to Preparing an EA Registration Document for Wind Power Projects in Nova Scotia (2021). Additionally, the Municipality of the County of Colchester's Wind Turbine Development By-Law has a regulatory threshold of 36 dBA, which can be waived with written consent of the landowners. Predictive estimates of construction noise were also calculated and compared with relevant policies and guidelines.

11.2 Geophysical

The following subsections describe the baseline survey methods for topography, geology, and groundwater.

11.2.1 Topography

Topography within the Project Area was assessed via a review of the Nova Scotia Topographic Database (NSTDB) contour lines (5 m), LiDAR, and from the completion of elevation profiles (north to south and east to west) using Quantum Geographic Information System (QGIS) (2024).

11.2.2 Geology

The assessment of site geology was divided into surficial geology and bedrock geology.

11.2.2.1 Surficial Geology

A review of geologic units provided by NSNRR (Stea et al., 1992), information available in the 2012 EARD (Stantec, 2012), and site observations were used to determine characteristics of surficial geology within the Projcet Area.

11.2.2.2 Bedrock Geology

To determine the bedrock geology within the Study Area, a review of the Geological Map of the Province of Nova Scotia (Keppie, 2000) and information provided in the 2012 EARD (Stantec, 2012) was completed.

Acid rock drainage (ARD) potential was evaluated for the Project Area, based on a review of the NSNRR ARD Risk Map (NSNRR, 2021b). In Nova Scotia, bedrock groups such as the Goldenville Formation and Halifax Formation of the Cambro-Ordovician Meguma Group are more likely to comprise acid-producing rock. Exposing and physically disturbing sulphide-bearing rocks can cause ARD to develop which can negatively impact the environment and human health. Acidic runoff with potential hydrogen (pH) levels as low as 3 can be harmful for aquatic habitats, possibly causing fish kills. ARD can also contaminate drinking water supplies through increased concentrations of toxic and carcinogenic heavy metals (NSNRR, 2021a).

A review of the Uranium Potential Map of Nova Scotia (O'Reilly et al., 2009) was also completed. According to Kennedy and Drage (2020) and Health Canada Maximum Allowable Concentrations (MAC), long term ingestion of well water from bedrock aquifers with high levels [>0.02 milligrams per litre (mg/L)] of uranium can cause kidney disease.

11.2.3 Groundwater

While depth to groundwater is challenging to determine without drilling groundwater wells, several information sources can be considered to predict groundwater levels, including:

- Adjacent surface water feature elevations at presumed groundwater discharge locations.
- Underlying rock type (igneous intrusive and sedimentary).
- Hydrologic characterization (Kennedy et al., 2008).
- Information sourced from the Nova Scotia Groundwater Observation Well Network.
    - The Nova Scotia Groundwater Observation Well Network was established in 1965 and includes 40 active well observations across the province. The closest observation site to the Project Area is in Durham (045[4]), approximately 28 km northeast of the Study Area.
- Information sourced from the Nova Scotia Well Logs Database
    - The Nova Scotia Well Logs Database provides information on more than 100,000 water wells in the province, including information on well locations, geology and well construction, well depth, and yield. General conclusions

[4] Note: This well is situated far away from the Project Area, and information reliability is limited.

relating to the groundwater resource in the Project Area were derived from this information.

- To determine a more precise location for adjacent residential wells, NSTDB and aerial imagery were reviewed to identify buildings within 1 km of the Study Area.

11.3 Terrestrial Environment

Biophysical field components of the EA were initiated in July 2023 and continued until June 2024. Field studies focused on highlighting the ecological linkages within the Project Area. The field components, survey timing, and surveyors that completed the assessments are outlined in Table 11.1.

Table 11.1: Biophysical Assessment Components, Timing, and Surveyors

Survey		Date	Surveyor(s)
Vegetation Community and Classification (i.e., habitat)		September 28 and 29, 2023	Jessica Lohnes
Vascular Plant Surveys	Early botany	June 17 to 21, 2024	Christina Daffre
	Late botany	September 12,13 and 15, 2023	Mark MacDonald Christina Daffre
Lichen Survey		August 2023 and June 2024	Cole Vail
Wildlife Surveys	Incidental observations	Opportunistically throughout all biophysical surveys	All surveyors
	Bat acoustic monitoring	May 10 to October 31, 2022, and April 4 to June 17, 2024.	Nicholas Doane
	Winter Moose surveys	January 31, February 16, and March 14, 2024.	Jessica Lohnes Emma Halupka Emily MacLean
	Spring PGI Surveys	April 30, 2024	Reilly Cameron Jody Hamper
Avian Surveys	Spring migration (5)	April 4 to May 31, 2024	Jessica Lohnes Mark MacDonald Nicholas Doane
	Breeding bird (2)	June 13 to 30, 2023	
	Nightjar (2)	June 13 and 26, 2024	
	Fall migration (5)	August 15 to October 20, 2023	
	Acoustic & Radar Monitoring	April 15 to June 8, and July 15 to November 30, 2022 April 7 to June 8, and July 15 to November 22, 2023	Ausenco
Wetland and watercourse evaluations		August to October 2023	Brayden Thomas, Emma Halupka, Lucas Bonner, Hannah Machat, Cole Vail, Reilly Cameron, Emily MacLean, Manminder Singh
Fish and fish habitat assessment		August 2023, June 2024	
Species at Risk	Incidental	All seasons	All surveyors

The following subsections describe the baseline survey methods for priority species, habitat, flora, lichens, and fauna.

11.3.1 Priority Species

Assessment of wildlife and habitat was completed based on the requirements outlined in the Guide to Addressing Wildlife Species and Habitat in an Environmental Assessment Registration Document (NSE, 2009). The priority species list was created in accordance with this guide as outlined below; and it is used for the following purposes:

- To identify which targeted surveys were recommended based on species and habitats available within the Project Area.
- To identify key detection times for targeted surveys.
- To inform field staff of priority species which may be encountered during biophysical surveys.

11.3.1.1 Development of a Priority Species List

Priority species include:

- Species of Conservation Interest (SOCI): rare species lacking formal designation under provincial or federal endangered species legislation:
  - Species listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).
  - Species ranked by ACCDC as S1, S2 and S3 or any combination thereof (i.e., S3S4 is considered a SOCI).
- SAR: species listed as protected under provincial or federal endangered species legislation:
  - *ESA*: All species listed as Endangered, Threatened, or Vulnerable under the *Endangered Species* Act, S.N.S. 1998, c. 11 (*ESA*).
  - *SARA*: All species listed as Endangered, Threatened or Special Concern under the *Species at Risk Act* (*SARA*).

The priority list of species was first narrowed by broad geographic area and then further narrowed by identifying specific habitat requirements for each species. For example, if a listed species on the *ESA* required karst topography and no karst topography is present inside the Project Area, this species was not carried forward to the priority species list.

The compilation of a priority species list is habitat driven, rather than observation driven [e.g., ACCDC report of Maritime Breeding Bird Atlas (MBBA)]. This is based on the recognition that observation-based datasets are not comprehensive lists of species identified in any given area. As such, the information provided by observation-driven sources are supplementary to the priority species list, rather than forming the basis of the priority species list.

A single desktop priority species list is developed for all seasons for the Project using the methodology provided above. The seasonality of mobile species is not used to screen species into, or out of, the desktop priority species list. All field staff reviewed the desktop evaluation for priority species prior to commencing field work to ensure they were familiar with priority species identification and their status ranks. See Table 11.2 for status rank definitions.

Table 11.2: Status Ranks Definitions

Protection	Status	Definition
COSEWIC	Extinct	A wildlife species that no longer exists.
COSEWIC	Extirpated	A wildlife species that no longer exists in the wild in Canada but exists elsewhere.
COSEWIC	Endangered	A wildlife species facing imminent extirpation or extinction.
COSEWIC	Threatened	A wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
COSEWIC	Special Concern	A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.
COSEWIC	Data Deficient	A category that applies when the available information is insufficient (a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction.
COSEWIC	Not at Risk	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
SARA	Extirpated	Species which no longer exist in the wild in Canada but exist elsewhere in the wild.
SARA	Endangered	Species facing imminent extirpation of extinction.
SARA	Threatened	Species which are likely to become endangered if nothing is done to reverse the factors leading to their extirpation or extinction.
SARA	Special Concern	Species which may become threatened or endangered because of a combination of biological characteristics and identified threats.
ESA	Endangered	A species facing imminent extirpation or extinction.
ESA	Threatened	A species likely to become endangered if limiting factors are not reversed.
ESA	Vulnerable	A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.
ESA	Extirpated	A species that no longer exists in the wild in the province but exists in the wild outside of the province.
ESA	Extinct	A species that no longer exists.
ACCDC	SX	Presumed Extirpated - Species or community is believed to be extirpated from the province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
ACCDC	S1	Critically Imperiled - Critically imperiled in the province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.
ACCDC	S2	Imperiled - Imperiled in the province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.

Protection	Status	Definition
ACCDC	S3	Vulnerable - Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
ACCDC	S4	Apparently Secure - Uncommon but not rare; some cause for long term concern due to declines or other factors.
ACCDC	S5	Secure - Common, widespread, and abundant in the province.
ACCDC	SNR	Unranked - Nation or state/province conservation status not yet assessed.
ACCDC	SU	Unrankable - Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
ACCDC	SNA	Not Applicable - A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
ACCDC	S#S#	Range Rank - A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).
ACCDC	Not Provided	Species is not known to occur in the province.
Breeding Status Qualifiers		
ACCDC	**Qualifier**	**Definition**
ACCDC	B	Breeding - Conservation status refers to the breeding population of the species in the province.
ACCDC	N	Nonbreeding - Conservation status refers to the non-breeding population of the species in the province.
ACCDC	M	Migrant - Migrant species occurring regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. Conservation status refers to the aggregating transient population of the species in the province.

11.3.1.2 Additional Desktop Priority Species Review

Several sources were used to supplement the desktop priority species list. These sources are described herein and include observations-based datasets (i.e., ACCDC data) and proximal datasets [e.g., abandoned mine openings (AMO) database]. Proximal datasets are those that provide information that may support the understanding of priority species in proximity to an area. For example, AMOs may support bat hibernacula, but this dataset does not represent known bat hibernacula or observations of the species.

ACCDC houses the most comprehensive biodiversity database available in Atlantic Canada. ACCDC compiles and distributes georeferenced data on species occurrences to governments, private industry, and academia. ACCDC reports provide important supplementary, observation-driven data sources including sightings of priority species recorded within 5 km and 100 km of the Project Area. An ACCDC report (Appendix E) was prepared for the Project Area on August 14, 2023.

When ACCDC prepares a rare species report, they provide the user with georeferenced shapefile points of rare species records within 5 km of the centre of the Project Area. However, NSNRR has classified several species as ‘location sensitive’, meaning that ACCDC is not permitted to provide specific location data for these species in their reports.

Concern about the exploitation of location-sensitive species precludes inclusion of coordinates in the rare species reports. Location sensitive species in Nova Scotia include black ash, Blanding's turtle (*Emydoidea blandingii*), Wood turtle (*Glyptemys insculpta*), Peregrine Falcon populations (*Falco peregrinus*, pop.1), and any bat hibernaculum or bat species occurrence. If any of these species are present within 5 km of the centre of the Project Area, the ACCDC report will simply identify that they are present but will not provide specific location data. Location sensitive species were noted in the ACCDC report, therefore, Strum consulted with NSNRR to obtain additional information on the observation.

NSNRR was consulted regarding location sensitive species recorded within the ACCDC report and the location of core habitat. A summary of regulatory correspondence regarding location sensitive species is included in Section 12.3.

Additional datasets reviewed during the desktop review for priority species include:

- Lichen databases, including those provided by the Mersey Tobeatic Research Institute (MTRI) that were assessed to identify potential for priority lichen species including graceful felt lichen (*Erioderma mollissimum*) and boreal felt lichen (*Erioderma pedicellatum*)
- Provincial government records of AMOs were reviewed as AMOs that are uncapped and unflooded may provide bat hibernacula
- The NSNRR Significant Species and Habitats Database
- MBBA
- CWS Migratory Bird Sanctuary (MBS)
- Canadian IBAs
- *SARA* critical habitat layers
- *SARA* recovery strategies
- DFO critical habitat mapping
- Atlantic salmon atlas
- Freshwater fish species distribution records
- Provincial Landscape Viewer (NSNRR, 2020) – ACPF Buffer, Lynx Buffer, Marten Range Patches 2019, Marten Habitat Management Zones, Mainland Moose Concentration Areas, Mainland Moose Core Habitat, Black Ash Core Habitat
- Provincial SMP layers – Wood Turtle, graceful felt lichen, Mainland Moose, etc.

The priority species list is referenced across the various biophysical assessments and is provided in Appendix F.

11.3.2 Habitat

The following are the desktop and field survey methods used during the habitat survey program. Defining the vegetation communities within the Project Area aided in determining different vegetation communities, and what type of species can be supported. Further, it guides biophysical surveys to determine if unique or rare habitats are found.

11.3.2.1 Desktop Review

Prior to completing field assessments, several geospatial datasets were reviewed to inform the surveyors of the landscape within the Project Area:

- Project and Study Area Spatial Boundary
- Nova Scotia Forest Inventory
- NSECC Wetland and Watercourse Inventory
- NSTDB
- NSNRR Ecological Land Classification (ELC)
- Nova Scotia Old Forestry Policy Polygons
- 2012 EARD (Stantec, 2012)
- Aerial Imagery

The above listed spatial file layers were used to create a habitat model using QGIS. First, three proxy layers were created: the Nova Scotia Forest Inventory layer was re-classified into ten categories based on the “FORNON” attribute, four height classes from the Canopy Height Model were defined as proxies for tree age (0 to 1 m, 1 to 6 m, 6 to 11 m, and >11 m), and the Depth to Water model was used to predict wet areas with <0.5 m considered wet, and >0.5m considered dry. Those three layers were rasterized and combined, then turned into polygons using the “Majority Filter” tool on QGIS. Results were adjusted based on aerial imagery to best reflect current conditions.

11.3.2.2 Field Surveys

Vegetation community assessments were completed within the Project Area in September 2023 during avifauna fall migration point count surveys. Additional vegetation community assessments were completed during early botany surveys in June 2024 to account for gaps due to layout changes. A total of 39 habitat points (HP) were placed across the Project Area in various vegetation communities. At HPs, Strum biologists surveyed the surrounding landscape and used vegetation characteristics to determine the habitat type. Drawing 11.1 outlines vegetation types within the Study Area and targeted habitats as part of the vegetation community surveys.

Several resources were referenced to identify vegetation communities found within the Study Area (Table 11.3). While Nova Scotia has several resources for classified forested and barren communities (Neily et al., 2022), literature is lacking for many of the non-forested communities (e.g., shrub bogs, marshes, fens, etc.). By using several different classification systems, communities that were not well defined in the Nova Scotia guides were able to be classified and described. If Nova Scotia guides were only used, then there would be a bias towards forested and barren communities and many non-forested wetlands communities and their abundance and frequency within the Project Area would not be accurately documented. Table 11.3 summarizes the classification systems used.

Table 11.3: Classification System Guides Used in the Surveys Classification System

Classification	Authors	Vegetation Community Types Defined
Forest Ecosystem Classification	Neily et al., 2022	Forested uplands, forested wetlands, and woodlands
Natural Landscapes of Maine	Gawler & Cutko, 2018	Defines forested and non-forested communities. This was used to define non-forested wetland communities within the Project Area
Classification of Heathlands and Related Plant Communities on Barrens Ecosystem in Nova Scotia	Porter et al., 2020	Described barrens, heathlands, and shrublands

The Natural Landscapes of Maine (NLM) classification was referenced and used as a guideline for non-forested wetland classification systems. Due to the geographical location of Maine and its proximity to Nova Scotia, many parallels exist between the two locations. Nova Scotia and Maine are both within the Acadian Forest region which is characterized by temperate broadleaf and mixedwood forests which are subject to coastal influences. Many of the community types described in the NLM are found in Nova Scotia and attributed to the climatic and geographic similarities between these two provinces/states. Therefore, the use of NLM to describe communities in Nova Scotia is a suitable classification system to use for these surveys.

All vegetation community types encountered within the Project Area were georeferenced using a handheld Global Positioning System (GPS) and the following information was collected:

- Dominant tree, shrub and herbaceous species
- Presence of disturbance:
  - Anthropogenic (e.g., cutover)
  - Natural (e.g., windthrow)
  - None
- Approximate stand age:
  - Regenerative
  - Mature
- Representative photographs
- Vegetation community and classification

Both wetland and upland vegetation communities were assessed, acknowledging that additional wetland information will be recorded during detailed wetland evaluations.

11.3.3 Flora

Desktop and field survey methodologies were implemented during the flora survey program. Flora includes both vascular and nonvascular plants.

11.3.3.1 Desktop Review

Prior to undertaking the field assessment, a detailed desktop review of known flora observations and potential habitat for rare vascular plants within the Study Area was conducted. The desktop review involved four components: a review of the August 2023 ACCDC database results (Appendix E), the 2012 EARD (Stantec 2012), mapped wetland habitat, the vegetation communities and classification, and the Strum-generated Priority Species List (Appendix F). The following databases were also reviewed:

- ACPF buffer database
- MTRI graceful felt lichen and boreal felt lichen database
- NSNRR Signifiant Habitats
- NSNRR Signifiant Habitat layers
- *SARA* Critical Habitat layers
- *SARA* Recovery strategies
- SMP layers

NSNRR was consulted regarding the location of black ash core habitat within the Study Area.

This background research helped inform field surveys by notifying surveyors if there is an increased likelihood of priority flora species. The ELCs helped inform surveyors of landscape characteristics that may shape the prevalence of priority vascular plant species. All suitable habitats, as identified within the field, were surveyed in September 2023 and June 2024 to ensure the greatest range of flowering times were encompassed during the surveys.

11.3.3.2 Field Surveys

Dedicated vascular plant surveys were completed within the Study Area both early and late in the growing season to capture plant species with different phenological characteristics. Botany surveys were completed September 12 to 15, 2023 and June 17 to 21, 2024 by Strum biologists Mark MacDonald and Christina Daffre.

Meandering transects were completed on foot and all major habitat types, including wetlands, trails, upland forests, and forestry trails, were assessed to create a species list of the general vascular species and vegetation communities present within the Study Area. Incidental observations were also recorded throughout other targeted biophysical surveys in 2023 and 2024.

If a species could not be identified in the field, detailed photographs were taken to capture diagnostic features, and, if possible (i.e., unless there was a high chance of the species being a SAR/SOCI), specimens were collected and preserved for future identification. All priority species observed were georeferenced, counted (when possible), photographed, and their habitat was recorded. When specimens were present in tufts or in large numbers and counting the individuals became a challenge, the areas of these clumps were measured (e.g., 10 m x 10 m). The following primary references were used during the field surveys and identification process:

- Roland's Flora of Nova Scotia (Zinck, 1998)
- Nova Scotia Plants (Munro et al., 2014)
- Flora of New Brunswick (Hinds, 2000)
- Go Botany (Native Plant Trust, 2024)
- Field Manual of Michigan Flora (Voss & Reznicek, 2012)
- Sedges of Maine (Arsenault et al., 2013)
- Grasses and Rushes of Maine (Mittelhauser et al., 2019)

Based on the vascular plant survey, a list of observed species was developed, and locations of priority vascular flora species were mapped. All plant species were reviewed to determine if they are native or invasive, and if they belong to the ACPF Group.

In addition to vascular plants, a list of nonvascular plants (i.e., bryophytes) was also collected during the survey. The following resources were the primary references to help with identification in the field:

- Mosses of Eastern North America Vol. 1 & 2 (Crum & Anderson, 1981)
- Mosses and Liverworts of Britain and Ireland – a Field Guide (British Bryological Society, 2010)
- Common Mosses of the Northeast and Appalachians (McKnight et al., 2013)

11.3.4 Lichens

The following sections outline the desktop and field survey methodologies implemented during the lichen survey program.

11.3.4.1 Desktop Review

Prior to the lichen field assessments, a detailed desktop review of known observations and detailed predictive habitat was reviewed. The following databases/resources were reviewed:

- ACCDC report database results (Appendix E)
- NSNRR predictive habitat mapping for boreal felt lichen
- NSNRR Forest Inventory GIS database (NSNRR, 2021c)
- NSECC Wetland Inventory
- MTRI graceful felt lichen and boreal felt lichen database
- NSECC Wet Areas Mapping (WAM) and Flow Accumulation
- Aerial imagery (provided by Google Earth)
- The Priority Species List (Appendix F)

This background research informs field surveys by notifying surveyors if there is an increased likelihood of priority lichen species present. During the desktop lichen survey design, surveyors screened for mature forested stands, wetlands, and forests adjacent to lakes and watercourses as these habitats have an elevated potential for rare epiphytic lichens. The forest inventory GIS database helped inform surveyors of forest characteristics, including age. Following a categorization of these habitats into groups, specific habitats were chosen for targeted lichen surveys:

- Mature forested softwood stands
- Mature forested mixedwood stands
- Mature forested softwood stands
- Wetlands (i.e., swamps, fens, bogs)
- Anthropogenic (e.g., roads, quarries etc.)
- Open waterbodies
- Areas with edge habitat

11.3.4.2 Field Surveys

Surveys throughout all suitable habitat in the Project Area were completed by Cole Vail, BSc., MREM, in August 2023 and June 2024. In addition, lichens were opportunistically searched for during the vascular plant surveys. Predictive habitat polygons for boreal felt lichen, mature forested swamps, or mature stands adjacent to watercourses or lakes and areas subject to high humidity were targeted. In general, mature forested stands, either in poorly drained or well drained soils, provide a higher likelihood to support rare epiphytic lichen species. Meandering transects were completed on foot and targeted mature trees appropriate for hosting priority lichen species. These trees were visually inspected, focusing on tree trunks, branches, and twigs.

The following information was collected for any priority lichen species identified during field surveys, along with a photograph and any other relevant comments:

- Surveyor name
- Site location
- Weather
- Date
- Scientific name
- Count
- Size
- Habitat (substrate, general habitat)
- Location [waypoint in Universal Transverse Mercator (UTM) NAD83]

In the event lichen specimens could not be readily identified in the field, samples were collected (when in abundance on site) in paper bags and stored for future identification. Chemical spot tests were used when necessary for identification and were completed as per methods described in Lichens of North America (Brodo et al., 2001). The following primary references were used during the field surveys and identification process:

- The Macrolichens of New England (Hinds & Hinds, 2007)
- Lichens of Great Britain and Ireland (Smith et al., 2009)
- Keys to Lichens of North America – Revised and Expanded (Brodo, 2016)
- Lichens of North America (Brodo et al., 2001)
- Microlichens of the Pacific Northwest – Volume 1 – Key to The Genera (McCune, 2017a)

- Microlichens of the Pacific Northwest – Volume 2 – Key to the Species (McCune, 2017b)
- Common Lichens of Northeastern North America (McMullin & Anderson, 2014)

11.3.5 Fauna

The following sections outline the desktop and field survey methodologies implemented during the fauna survey program.

11.3.5.1 Desktop Review

Prior to undertaking the terrestrial field assessment, a detailed desktop review of known fauna observations and potential habitat for fauna was completed to support the survey design. The following databases were reviewed:

- ACCDC report (Appendix E)
- NSNRR Significant Habitat layers
- NSNRR Mainland Moose shelter patches and moose concentration areas
- *SARA* Critical Habitat layers
- Government records of AMOs (NSNRR, 2021g)
- *SARA* Recovery strategies
- SMP layers
- Priority species list (Appendix F)
- 2012 EARD (Stantec, 2012)

These databases were reviewed to determine what wildlife or habitat is potentially within the Project Area and to support wildlife survey design.

Additionally, NSNRR was consulted regarding additional details on the location sensitive species recorded within the ACCDC report and the core habitat in relation to the Project Area.

11.3.5.2 Field Surveys

Data collected on various terrestrial fauna species (e.g., mammals, reptiles, amphibians, and invertebrates) occurred through incidental observations. The aim of these observations was to understand which species are present within the Project Area and how they could potentially interact with the Project. Particular attention was paid to priority species.

Direct observations of terrestrial fauna, or their signs, within the Study Area were recorded and photographed, when feasible, during all biophysical field surveys (Table 11.1). Incidental observations were chosen as the most appropriate method as they provide the broadest coverage of the Study Area, both spatially and temporally. Rather than limiting surveys to transects, incidental observations provide a holistic and overarching understanding of wildlife on the landscape. Signs observed included features such as dens, nests, scat, tracks, and evidence of foraging. The following literature was referenced during the surveys and identification process:

- Mammal Tracks & Signs: A Guide to North American Species (Elbroch & McFarland, 2019)
- A Field Guide to Animal Tracks (Murie, 1974)
- Dragonflies and Damselflies of the East (Paulson, 2012)
- Tracking & the Art of Seeing (Rezendes, 1999)

In addition to incidental observations, surveyors searched for and assessed for potential habitat (e.g., nesting or overwintering) of Snapping turtle (*Chelydra serpentina*; COSEWIC & *SARA* Special Concern; *ESA* Vulnerable; ACCDC S3) and Eastern painted turtle (*Chrysemys picta picta*; COSEWIC & *SARA* Special Concern; ACCDC S4) during wetland and watercourse assessments. If a turtle was observed, the Nova Scotia turtle observation card would be completed, which includes the species, number of notches, turtle sex, date and time, noteworthy observations, habitat description, location, and weather. The known distribution for Wood turtle (COSEWIC, *SARA* & *ESA* Threatened; ACCDC S2) and Blanding's turtle (COSEWIC, *SARA* & *ESA* Endangered; ACCDC S1) is not in proximity to the Project Area (ECCC 2020; ECCC 2019).

11.3.5.3 Mainland Moose Monitoring

The desktop review showed that the Project Area is within core habitat and concentration areas for Mainland Moose. Mainland Moose is ranked as Endangered by the *ESA* and is considered critically imperiled (S1) by ACCDC. The closest reported observation of Mainland Moose is 3 km from the Project Area. Communication with NSNRR biologist Sarah Spencer, confirmed the Project Area falls within core habitat for Mainland Moose (Sarah Spencer, NSNRR SAR Biologist, personal communication, August 20, 2023).

Core habitat for Mainland Moose is identified as areas that currently contain and will continue to contain over the next 30 years, the biophysical attributes necessary for the moose life cycle (NSNRR, 2021f). Mainland Moose forage in habitats that are dominated by regenerative forests and cutovers. Mature forested stands can provide areas for winter and summer cover, and areas of open water features provide calving and aquatic feeding areas in the summer months (NSNRR, 2021f). Mainland Moose prefer boreal and temperate coniferous and mixedwood forest habitats with plenty of mature trees that they use for protection and thermal cover (NSNRR, 2021f). Core habitat is present throughout Cumberland/Colchester, Pictou/Antigonish/Guysborough, and Tobeatic regions.

Strum adopted survey methods outlined in NSNRR's Mainland Moose Recovery Plan (NSNRR, 2021f). Winter transect surveys and spring Pellet Group Inventory (PGI) surveys were completed to understand the distribution of Mainland Moose and how they may be using the Project Area. Survey timing and transect locations were selected in consultation with NSNRR's Mark McGarrigle (Mark McGarrigle, NSNRR Biologist, February 22, 2024).

To guide all survey methods, Strum completed a habitat modelling exercise, using modelling parameters for various habitat components described in the 2021 Recovery Plan (NSNRR, 2021f). Transect placement was driven by Winter Forage Area (S1B) and Winter Cover (S2) habitat components. These components are based on habitat parameters outlined in the Recovery Plan (p. 62), which include analysis of forest stand cover and stand age. Modelled suitable habitat for Mainland Moose (S1B and S2 habitat components) are shown on Drawing 11.2.

Strum biologists, experienced in recognition of Mainland Moose, White-tailed deer (*Odocoileus virginianus*) and other wildlife tracks, scat and browse, followed 12 transects looking for signs of Mainland Moose within the Project Area. Transect selection was occasionally adjusted in the field, based on safety, accessibility, habitat, and conditions. Winter track surveys were completed within three to seven days following a 10-centimetre (cm) snowfall if there were no additional precipitation events in the intervening days. Surveys were not conducted during periods of rain, snowfall, or blowing snow. Strum used local weather forecasts, highway cameras, and direct observations of tracking conditions from on-site personnel prior to mobilizing, to ensure appropriate tracking conditions were present. Strum documented weather conditions prior to, and during each survey; and surveys were cancelled if tracking conditions degraded partway through a survey.

The PGI survey was completed in spring before “green up”, on April 30, 2024. PGI surveys follow the same standardized transects used in winter track surveys (Drawing 11.2. The number of deer/moose pellets observed along the transects were recorded. These numbers are used to detect the presence of Mainland Moose within the Project Area.

During all surveys, locations of Mainland Moose tracks, browse, and scat were recorded using a handheld GPS unit, pre-loaded with the transects to complete the surveys. If signs of Mainland Moose were observed, UTM coordinates and photographs were recorded. If signs of Mainland Moose were observed within the Project Area throughout the 2023/2024 survey season, observations were recorded as incidental.

11.3.5.4 Bat Acoustic Monitoring
Bat acoustic monitoring was completed within the Project Area to confirm species presence and abundance. Acoustic bat detector locations stationed within and surrounding the Project Area are provided in Drawing 11.2.

Acoustic monitoring for bats was completed between June 20 and October 31, 2023, and April 4 to June 17, 2024, through the installation of six Wildlife Acoustic SM4BAT Full Spectrum Bioacoustic data sensors (SM4BAT). SM4BAT detectors record ultrasonic bat calls through a transducer (microphone) and record them on a compact flash card for later download and analysis. Acoustic bat monitoring was conducted to evaluate relative activity patterns by species or species groups over the monitoring period within and adjacent to the Project Area.

Two specialized software systems (Kaleidoscope Pro and Analook) were used by a qualified biologist to identify recorded bat files to species or species group. Each variable was then compared with a library of reference calls collected from individual bats that had been identified to species. Subsequently, the data was reviewed by a qualified biologist to define the species producing the bat call.

Once identified, bat passes were analyzed for peak seasonal and temporal activity periods in the Project Area. Further analysis was completed to determine the abundance of migratory species (i.e., those at higher risk for mortality).

Refer to the Bat Acoustic Monitoring Baseline Report for additional details (Appendix G).

All bat species found within Nova Scotia have a provincial SRank of S1 or SUB, S1M, including Little brown bat (M*yotis lucifugus*), Northern myotis (*Myotis septentrionalis*) and Tricolored bat (*Perimyotis subflavus*) who are all listed as Endangered under *SARA*.

11.4 Avifauna

The following subsections summarize the desktop review, field survey, acoustic monitoring, radar monitoring, and mortality modelling methodologies implemented during the avifauna survey program. Full details, including all relevant drawings are provided in Appendices H, I, and J (Radar and Acoustic Report, Avifauna Baseline Report, and Avian Mortality Estimate Report, respectively).

11.4.1 Desktop Review

To support avian survey design, the following sources were reviewed to understand potential for the Project Area to contain avian SAR, their habitats, or features upon which they rely:

- Canadian IBAs
- ACCDC report
- Provincial Landscape Viewer
- NSNRR Significant Habitats
- MBBA
- CWS MBS
- *SARA* Critical Habitat layers
- *SARA* Recovery Strategies
- 2012 EARD (Stantec, 2012)

Based on the desktop analysis, the nearest protected area is the Gully Lake Wilderness Area, directly to the west of the Project. There are no other nearby sanctuaries or protected areas within 10 km of the Project. The nearest IBA is approximately 30 km southwest: the Cobequid Bay IBA (NS019). The Project falls primarily within MBBA square 20MR94 in the Cobequid region. The landscape is characterized by well-drained hardwood-dominated forests and a variety of landscape uses, including forestry and silviculture.

11.4.2 Field Surveys

The objective of the avifauna surveys is to identify species and habitat usage within the Project Area with a focus on SAR and SOCI, and to determine trends in species composition and bird group usage through different seasons, where possible. Avian surveys are then supplemented by radar and acoustic monitoring to determine the potential effects of the Project on avifauna.

Prior to conducting field surveys, a preliminary desktop survey design was developed to target suitable habitat for avifauna species or groups of interest (e.g., breeding birds, nightjar, owls, etc.). Survey methods were consistent with the guidelines stated in CWS (2007a, 2007b, 2018)[5]. These documents provided instructions in the following areas: survey site selection, survey location spacing, number of point counts (PCs), survey duration, and season selection.

Based on the CWS guidelines (CWS 2007a, 2007b, 2018), the Guide to Addressing Wildlife Species and Habitat in an Environmental Assessment Registration Document (NSE, 2009), regulatory consultation, and the desktop review described above, the following avifauna survey types were selected:

- Fall migration point count and diurnal watch count (DWC) surveys (2023)
- Breeding bird point count surveys and non-standardized area searches (2023)
- Nightjar surveys (2023)
- Spring migration point count and DWC surveys (2024)

Strum consulted with CWS and NSNRR on the proposed methods in May/June 2022. All guidance discussed with NSNRR and CWS was considered in developing the avian survey field program. Avian surveys completed within the Project Area are outlined in Table 11.4.

Table 11.4: Avian Surveys Completed within the Project Area

Survey Type	Survey Rounds	Dates	Rationale	Reference for Survey Dates and Methods
Spring migration (with DWC surveys)	1	April 4, 2024	Bird species begin to migrate back to Canada to breed this time of year. Resident species may begin to breed on March 30. Surveying during this time period will detect any early nesters and the beginning of spring migration.	ECCC, 2024b
	2	April 17, 2024 April 18, 2024 April 19, 2024		
	3	April 29, 2024 April 30, 2024 May 1, 2024		
	4	May 13, 2024 May 15, 2024 May 17, 2024		
	5	May 29, 2024 May 30, 2024 May 31, 2024		

[5]Note that during initial survey design the Environment and Climate Change Canada's Canadian Wildlife Service (Atlantic Region) - Wind Energy & Birds Environmental Assessment Guidance Update (April 2022) was not yet released.

Survey Type	Survey Rounds	Dates	Rationale	Reference for Survey Dates and Methods
Breeding bird	1	June 13, 2023 June 14, 2023 June 15, 2023 June 16, 2023	June is peak breeding season in Nova Scotia. Different species breed on different schedules, therefore, spreading surveys out within June allowed for greater chances to detect species.	MBBA, 2023
	2	June 26, 2023 June 27, 2023 June 28, 2023 June 29, 2023 June 30, 2023		
Nightjar	2	June 13 and 26, 2023	To understand the use of the land within and surrounding the Project Area by Common Nighthawk and Eastern Whip-Poor-Will. ACCDC reported a Common Nighthawk sighting within 16.7 ± 0 km and an Eastern Whip-Poor-Will sighting within 5.4 ± 7.0 km of the Project Area.	ACCDC report in Appendix E
Fall migration (with DWC surveys)	1	Aug. 15, 2023 Aug. 16, 2023	Bird species begin to migrate south for the winter months from late August to September. Survey rounds began in mid-August and extended into late October to accommodate five survey rounds and potential early/late migrants.	MBBA, 2023
	2	Aug. 29, 2023 Aug. 31, 2023 Sept. 1, 2023		
	3	Sept. 7, 2023 Sept. 8, 2023		
	4	Sept. 28, 2023 Sept. 29, 2023		
	5	Oct. 19, 2023 Oct. 20, 2023		

11.4.3 Radar and Acoustic Monitoring

Radar monitoring aimed to quantify the volume (i.e. passage rate) and flight heights of nocturnal migrating birds within the Project Area using electromagnetic energy technology. This method enabled biologists to detect and record bird presence and altitude during nighttime hours, complemented by acoustic data to determine species composition and assess potential bird interactions with the Project.

Automated radar monitoring was conducted during the spring and fall migration seasons of 2022 and 2023. Radar operations began 30 minutes before sunset and concluded 30 minutes after sunrise, with data collected in 10-minute intervals three times per hour. Radar locations were strategically chosen for optimal visibility and minimal interference, oriented perpendicular to flight paths to maximize detection.

The Furuno 1962 BB marine radar system, operating in the microwave X-band, used a 1.8-metre open-array antenna with precise beam control and high resolution. Radar data were stored locally and periodically transferred to external drives for archival and processing purposes.

Data processing involved two stages: autonomous hourly processing in the field and subsequent cleaning post-upload. Initial processing converted radar sweeps into “blipmovies”, capturing rotations of the antenna. These “blipmovies” were later refined to eliminate clutter and non-avian targets using specialized software, ensuring data accuracy and relevance.

Filters removed radar clutter, rain interference, and non-bird targets below 70 m altitude, aligning with the operational parameters of the proposed WTGs. Validated radar datasets, including seasonal visuals, were compiled for detailed analysis and reporting. Appendices A-D of the Radar and Acoustic Monitoring Report (Appendix H) provide visual representations of migration patterns observed across the study periods, highlighting significant radar and acoustic detections.

Ausenco deployed automated acoustic sensors to identify bird species migrating through the Project Area by recording nocturnal flight calls (NFC). The AudioMoth™ recorders, positioned at 11 locations, operated nightly during the spring and fall migrations of 2022 and 2023, recording in 10-minute intervals at 32 kilohertz (kHz). These recordings started 30 minutes before sunset and ended 30 minutes after sunrise to capture nocturnal migrants and prevent interference from daytime calls. Acoustic data was collected, stored on micro-SD cards, and processed monthly. Once processed, recordings were compressed into Free Lossless Audio Codec format and renamed for organization.

An artificial intelligence (AI) model trained on ~12,000 classified NFC clips identified bird species from the recordings. Precision-recall thresholds were determined for each species, ensuring high accuracy. The model was further validated using stratified random samples, refining thresholds based on recall rates. Key species categories identified include warblers, thrushes, sparrows, and other birds such as the Common Nighthawk (*Chordeiles minor*) and American Woodcock (*Scolopax minor*). Some species were poorly detected or classified, including the Red-breasted Nuthatch (*Sitta canadensis*) and Golden-crowned Kinglet (*Regulus satrapa*).

Refer to Appendix H for the Radar and Acoustic Monitoring Report.

11.5 Aquatic

The following subsections describe the baseline survey methods for wetlands, surface water, fish, and fish habitat.

11.5.1 Wetlands

In Nova Scotia, wetlands are protected under the Activities Designation Regulations, N.S. Reg. 47/95 of the *Environment Act*, S.N.S. 1994-95, c.1 and the Nova Scotia Wetland Conservation Policy (NSE, 2019). The *Environment Act*, S.N.S. 1994-95, c.1 defines a wetland as “Land referred to as a marsh, swamp, fen, or bog that either periodically or permanently has a water table at, near, or above the land surface, or that is saturated with water, and sustains aquatic processes as indicated by the presence of poorly drained soils, hydrophytic vegetation, and biological activities adapted to wet conditions”.

Nova Scotia's Wetland Conservation Policy (NSE, 2019) applies to all freshwater and certain tidal wetlands with the objectives to prevent the net loss of wetland area or function, promote wetland protection and net gain, and enhance impact mitigation efforts. Under this policy and the *Environment Act*, S.N.S. 1994-95, c.1, approvals are required to alter wetlands, with certain exceptions [e.g., area <100 square metres (m^2), specific linear developments].

The policy also provides a mechanism for the province to designate WSS, which are described in Section 11.5.1.4.

Wetland functions are the natural processes associated with wetlands and include, but are not limited to, water storage, pollutant removal, sediment retention, and provision of nesting/breeding habitat. Functions may also include values and benefits associated with these natural processes such as aesthetics/recreation, cultural values, and subsistence production (NBDELG, 2018). The discussions of wetlands presented herein primarily uses terminology associated with the Canadian Wetlands Classification System (NWWG, 1997) or terminology that is in line with the methodologies adapted by Nova Scotia for wetland delineation and functional assessment.

11.5.1.1 Desktop Review

A desktop review of available topographic and provincial databases, and aerial photography was completed to aid in the identification of wetland habitat in the Project Area and support the field assessment process within the Study Area. The NSECC Wetland Inventory Database was used to identify predicted wetland areas. The Nova Scotia WAM database, the provincial flow accumulation data set, and LiDAR data were reviewed to identify potential unmapped wetlands within the Study Area. A predictive WSS layer, provided by NSECC, was consulted for the presence of expected and potential WSS within the Study Area (Drawing 11.3).

Stantec conducted wetland assessments (via a combination of field and desktop methods) for much of the Project's current Study Area in 2012. Strum used these findings to support field planning and assessments.

11.5.1.2 Field Surveys

Following the initial desktop review, wetland field surveys were completed by Strum within the Study Area from August 2023 to October 2023. An additional assessment was completed in June 2024 to account for layout changes to the Project. The initial wetland assessments conducted by Stantec in 2012 were opportunistically verified by Strum during subsequent field surveys.

Wetland delineation and assessment took place within the growing season (i.e., June 1 to September 30), and continued into the month of October, as growing conditions were still favourable for assessments. Wetland characteristics and functional assessments can be completed sufficiently during any time of the growing season; however, seasonal factors were considered for the identification of priority species and their habitat. As necessary, targeted species surveys were completed within identified wetland habitat to further support functional and effects assessments. Targeted priority species surveys were completed during appropriate timing windows (i.e. early and late botany, winter and spring Mainland Moose surveys, multi-season avian surveys, etc.). Species assemblages found within wetlands are described in the respective baseline section (Section 12.5.1).

Targeted wetland surveys were completed within the Study Area where previously mapped systems (i.e., NSECC Wetland Inventory Database and Stantec 2012 wetlands) were present to confirm and delineate known wetland habitat. Meandering transects were also completed across the Study Area to support efforts to delineate additional wetlands, beyond those identified in the available desktop resources. All field surveys were completed by trained wetland delineators and evaluators. Delineated wetlands that extended outside of the Study Area were only delineated to the Study Area boundary (as per the predicted extent of potential indirect impacts).

Wetland delineation was conducted in accordance with the Corps of Engineers Wetland Delineation Manual (Environmental Laboratory, 1987) and the Regional Supplement to the United States Army Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (U.S. Army Corps of Engineers, 2012). In each wetland, vegetation, hydrology, and soil data were recorded at both wetland and upland data points on either side of the wetland boundary in accordance with the Corps of Engineers Wetland Delineation Manual (Environmental Laboratory, 1987). At least one pair of data points (upland and wetland) was completed in each wetland. Wetland classes were determined using the Canadian Wetland Classification System (NWWG, 1997).

According to guidance from Corps of Engineers Wetland Delineation Manual (Environmental Laboratory, 1987), at least 50% vegetation cover must be present to be classified as wetland; as such, habitats lacking vegetation cover in observed low flow periods were described as open water features. Open water features are discussed specifically relating to fish and fish habitat in Section 11.5.2.

Wetland boundaries were documented using a handheld Garmin GPS unit, with sub-5 m accuracy. Any inlet and outlet watercourses or other notable features were marked during the delineation process. All watercourses observed within the boundaries of the wetland were mapped and pink flagging tape was used to mark wetland boundaries in the field. Refer to Section 11.5.2 for more information on watercourse delineation and assessment.

In keeping with the Army Corps of Engineers (Environmental Laboratory, 1987) methodologies for wetland delineation, three criteria are required for a wetland determination to be made:

- Presence of hydrophytic (water loving) vegetation
- Presence of hydrologic conditions that result in periods of flooding, ponding, or saturation during the growing season
- Presence of hydric soils

Hydrophytic vegetation is defined as the sum total of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanent or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present (Environmental Laboratory, 1987). Hydrophytic vegetation should be the dominant plant type in a wetland habitat (Environmental Laboratory, 1987).

Dominant plant species observed at each data point were classified according to their indicator status (probability of occurrence in wetlands) in accordance with the Nova Scotia Wetland Indicator Plant List. Further relevant information was reviewed in Rolands Flora of Nova Scotia (Zinck, 1998) and Nova Scotia Plants (Munro et al., 2014).

A hydric soil is defined as a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in its upper strata (USDA, 2003). Indicators that a hydric soil is present include soil colour (gleyed soils and soils with bright mottles and/or low matrix chroma), aquic or preaquic moisture regime, reducing soil conditions, sulfidic material (odour), soils listed on the hydric soils list, iron and manganese concretions, organic soils (histosols), histic epipedon, high organic content in the surface layer of sandy soils, and organic streaking in sandy soils.

A soil pit was completed at each data point. These pits were excavated to a depth of 40 cm or refusal. The soil in each pit was then examined for hydric soil indicators. The matrix colour and mottle colour (if present) of the soil were determined using the Munsell Soil Colour Charts.

Wetland habitat, by definition, either periodically or permanently, has a water table at, near, or above the land surface or has persistent near-surface saturation. To be classified as a wetland, a site should have at least one primary indicator or two secondary indicators of wetland hydrology. Examples of primary indicators of wetland hydrology include surface saturation, watermarks, drift lines, and water-stained leaves. Examples of secondary indicators of wetland hydrology include oxidized root channels, dry season water table, and stunted or stressed plants.

Priority species (i.e., SAR and SOCI) surveys were completed in suitable habitat throughout the respective assessment areas (see Section 10.2.1), including wetland-specific priority species surveys and habitat potential, and according to species-specific methodologies (e.g., both early and late season botany surveys, avian migration and breeding surveys). Information on these baseline survey methods, including survey locations and timing, and species observed, can be found in the respective baseline sections (Section 11.3.3.2, and Section 11.4.2).

11.5.1.3 Functional Assessment

Wetland functional assessments were completed for any field delineated wetlands proposed to be directly impacted or within a conservative extent of reasonable potential for indirect impacts (e.g., within 30 m of planned Project infrastructure). Functional assessments were completed for 89 wetlands within the Study Area using the Wetland Ecosystem Services Protocol – Atlantic Canada (WESP-AC) evaluation technique. The WESP-AC process involves the completion of three forms: a desktop review portion (Office Form) that examines the landscape level aerial conditions in which the wetland is situated, and two field forms identifying biophysical characteristics of the wetland (Field Form) and stressors to the wetland (Stressors Form), if any. The process serves as a standardized method for assessing individual wetland functions and values. WESP-AC addresses 17 specific functions that wetlands may provide (Table 11.5).

The specific wetland functions are individually allocated into grouped wetland functions and measured for "functional" and "benefit" scores. The wetland function relates the wetland's natural ability (i.e., water storage), whereas wetland benefits are benefits of these functions, whether it is ecological, social, or economic. The highest functioning wetlands are those that have both high 'function' and 'benefit' scores for a given function. WESP-AC enables a comparison to be made between individual wetlands within a province to gain a sense of the importance each has in providing ecosystem services.

Table 11.5: WESP-AC Function Parameters

Grouped Wetland Function	Specific Wetland Functions
Hydrologic Function	Surface Water Storage
Aquatic Support	Aquatic Invertebrate Habitat
	Stream Flow Support
	Organic Nutrient Export
	Water Cooling
Water Quality	Sediment Retention & Stabilization
	Phosphorus Retention
	Nitrate Removal & Retention
	Carbon Sequestration
Aquatic Habitat	Anadromous Fish Habitat
	Resident Fish Habitat
	Waterbird Feeding Habitat
	Waterbird Nesting Habitat
	Amphibian and Turtle Habitat
Terrestrial Habitat	Songbird, Raptor, & Mammal Habitat
	Pollinator Habitat
	Native Plant Habitat

In addition to the grouped wetland functions above, WESP-AC also measures the following specific wetland functions; however, these are only evaluated by their benefit scores:

- Wetland Condition
- Wetland Risk (i.e., sensitivity to potential impacts)

The following individual functions are assessed to determine the benefit scores associated with each wetland:

- Public Use & Recognition
- Wetland Sensitivity
- Wetland Ecological Condition
- Wetland Stressors

For each wetland evaluated, the WESP-AC process calculates the overall score for the seven grouped wetland functions and the 17 specific wetland functions listed in Table 11.5. One score each is provided for function and benefit. Scores are ranked as 'Lower', 'Moderate', or 'Higher', allowing for the analysis of the wetland as compared to calibrated baseline wetland scores in Nova Scotia to date. A wetland with a 'Higher' WESP-AC score has a greater capacity to support those processes as compared to other wetlands in the province. A 'Higher' WESP-AC score in both the function and benefits category means the wetland supports the natural ecosystem functions and provides services with potentially societal importance.

The WESP-AC Functional WSS Interpretation Tool is discussed in Section 11.5.1.4. A summary of the WESP-AC results is provided in Appendix K. The raw WESP-AC Excel files can be provided to the NSECC Wetland Specialist(s) upon request and/or through the permitting process.

The WESP-AC functional evaluation technique recognizes that, in many cases, delineation of entire wetlands where they extend beyond a Study Area is not always feasible (e.g., property ownership) or required to complete an appropriate assessment using this tool (NBDELG, 2018). Instead, WESP-AC permits the delineation of an Assessment Area (AA), defined as the wetland or portion of wetland physically assessed in the field, while the Office Form considers the broader landscape characteristics and functions that extend beyond the AA and/or Study Area.

11.5.1.4 Wetlands of Special Significance

The Wetland Conservation Policy was developed by NSECC [previously known as Nova Scotia Environment (NSE)] in 2011. Its mandate is to provide a framework for the conservation of wetlands. Furthermore, it provides a framework for the identification of WSS. According to NSECC (NSE, 2019, p.11-12), the following criteria define WSS:

- All salt marshes.
- Wetlands, or portions thereof, within a designated RAMSAR site, Provincial Wildlife Management Area (Crown and Provincial lands only), Provincial Park, Nature Reserve, Wilderness Area, or lands owned or legally protected by non-government charitable conservation land trusts.
- Intact or restored wetlands that are project sites under the North American Waterfowl Management Plan and secured for conservation through the Nova Scotia Eastern Habitat Joint Venture.
- Wetlands known to support at-risk species (designated Threatened or Endangered) as designated under *SARA* or the *ESA.*
- Wetlands in designated PWAs as described within Section 106 of the *Environment Act*, S.N.S. 1994-95, c.1.
- Furthermore, the Wetland Conservation Policy states that NSECC is in the process of developing a system for classifying additional wetlands or wetland types as WSS (NSE, 2019). Among the wetland characteristics, functions, and services to be considered during the process are whether the area:
- Supports a significant species or species assemblages (e.g., coastal plain flora).
- Supports high wildlife biodiversity.
- Has significant hydrologic value.
- Has high social or cultural importance.

A province-wide framework for determination of WSS based on functional characteristics using WESP-AC has recently been developed (see Section 12.5.1.3 for results). The WSS Interpretation Tool automatically assesses the subject wetland based on the WESP-AC functional results. The grouped functions in Table 11.5 are used to calculate a “Functional Benefit Product” (FBP). The FBP is categorized into scores of “low”, “moderate” and “high”. The thresholds for these categories are calibrated by WESP-AC assessments across Nova Scotia. These categories are used to create WSS determination rules. The grouped functions are further combined into “supergroups” for habitat (Aquatic Habitat and Transition Habitat) and support (Hydrologic Support, Water Quality Support and Aquatic Support) functions. The wetland could be designated as a WSS if certain ‘high’ or a combination of ‘moderate and ‘high’ scores are satisfied within these supergroups.

NSECC has also developed a WSS predictive GIS layer (I. Bryson, NSECC Wetland Specialist, personal communication, September 2020) which overlays mapped wetlands with protected areas layers, and rare species observations from ACCDC, among other attributes. According to NSECC, this WSS GIS layer is intended to be used as a planning tool, and its contents should be interpreted as potential WSS. The actual determination of WSS status is based on field verification of the parameters or considerations listed above, through consultation with NSECC.

This predictive layer was consulted during the desktop evaluation for wetlands prior to field delineations by Strum. This predictive layer incorporates all ACCDC rare species observations which fall within NSECC mapped wetlands, regardless of the species’ ranking or status, positional accuracy of the data points, observation date, and mobility of species. As such, it is used as a predictive tool only to support WSS determination. The Project team will continue to engage with NSECC to discuss WSS designation on a site-specific basis.

11.5.2 Surface Water, Fish and Fish Habitat

The *Environment Act*, S.N.S. 1994-95, c.1 requires an approval from NSECC before any watercourses or water resource can be altered, including the flow of water. Therefore, it is necessary to understand what watercourses and water resources are present within the Study Area prior to development.

The *Environment Act*, S.N.S. 1994-95, c.1 defines a watercourse as:

> "Any creek, brook, stream, river, lake, pond, spring, lagoon, or any other natural body of water, and includes all the water in it, and also the bed and the shore (whether there is actually any water in it or not)".

Using this definition and the parameters listed in the Guide to Altering Watercourses (NSE, 2015), watercourses were identified and described throughout the Study Area to support the description of fish habitat, and effects to regulated watercourses which may require provincial approval.

Although the *Environment Act*, S.N.S. 1994-95, c.1 also defines a watercourse as "all groundwater", this section focuses on surface water features in the context of fish habitat provision.

The *Fisheries Act* defines fish as "(a) parts of fish, (b) shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals, and (c) the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals;", and fish habitat as "waters frequented by fish and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas".

Within the *Fisheries Act*, activities which result in the harmful alteration, disruption, or destruction of fish habitat are prohibited. Under Section 35(2) of the Act, authorization may be granted for a proposed work, undertaking or activity that may, respectively, result in the death of fish or the harmful alteration, disruption, or destruction of fish habitat.

11.5.2.1 Desktop Review

The goal of the surface water desktop evaluation was to identify where watercourses, waterbodies, and drainage features are located within or in proximity to the Fish Study Area based on mapped systems, topography, and satellite imagery, and watershed boundaries. The Fish Study Area is defined as the Study Area plus three downstream receiving environments (fish collection locations). Prior to completing the field evaluation, Strum reviewed all NSTDB mapped watercourses and waterbodies, provincial flow accumulation data, and depth to water table mapping to identify potential surface water features within the Fish Study Area.

A priority species list was used to identify priority fish species that may occur in the Fish Study Area (Appendix F) using the following sources:

- ACCDC Report (Appendix E)
- NSNRR Significant Species and Habitats database (NSNRR, 2018b)
- Aquatic Species at Risk Map (DFO, 2023)
- DFO Stock Status Reports
- Description of Selected Lake Characteristics and Occurrence of Fish Species in 781 Nova Scotia Lakes (Alexander et al., 1986)
- Nova Scotia Salmon Atlas (Salmon Atlas, 2022)
- Nova Scotia Freshwater Fish Species Distribution Records (NSFA, 2019)
- Nova Scotia Fisheries and Aquaculture (NSFA) Lake Inventory Maps

11.5.2.2 Field Surveys

This section summarizes the methods used during evaluation of fish and fish habitat at linear watercourses, waterbodies, and wetlands in 2023 and 2024. The evaluation of fish and fish habitat was performed within a distinct spatial boundary (Fish Study Area), which serves as an extension of the Study Area for the purposes of fish collection. The Fish Study Area includes the entirety of the Study Area and three additional aquatic features to the north, west, and south – West Branch River John, Mackay's Mill Brook, and Steele Run, respectively (Drawing 11.4). The Fish Study Area was defined to consider fish and fish habitat representation within the Study Area and the maximum extent of potential aquatic impacts. The following discussion of surveys completed will differentiate which spatial boundary they were completed within.

Prior to the commencement of the field program, Strum consulted with DFO on the proposed field survey methods (L. Watkinson, DFO, personal communication, June 23, 2023).

11.5.2.3 Watercourse Delineation

Watercourse delineation and site drainage characterizations were completed throughout the Study Area in conjunction with wetland delineation and evaluation.

During the field evaluations, Strum used NSECC guidance on watercourse determinations to identify watercourses (NSE, 2015):

- Presence of a mineral soil channel
- Presence of sand, gravel and/or cobbles evident in a continuous pattern over a continuous length with little to no vegetation
- Indication that water has flowed in a path or channel for a length of time and rate sufficient to erode a channel or pathway
- Presence of pools, riffles or rapids

- Presence of aquatic animals, insects or fish
- Presence of aquatic plants

According to guidance provided by NSECC, any surface feature that meets two of the criteria above meets the definition of a provincially regulated watercourse. General reconnaissance was conducted via meandering transects within the Study Area by qualified Strum biologists. Any identified watercourses were flagged in the field with blue flagging tape and mapped using a Garmin GPSMAP 64s unit or similar (capable of sub-5 m accuracy).

All delineated watercourses within the Study Area were characterized using a Strum Level 1 Baseline Delineation Form. The form includes general survey data such as Project name, crew members names, weather, watercourse identification, stream order, substrate, habitat, flow regime, representative width and depth. General notes on the watercourse were recorded on the form.

Furthermore, each watercourse was individually assessed for potential impacts from the Project (i.e., proposed road crossings). If the watercourse had expected impacts based on overlay with the Project footprint, an additional field form (i.e., Level 2 Fish Habitat Form) was completed to help identify the presence of fish habitat and its potential ability to support fish species. Additionally, this information will be used to support further permitting of the Project. Qualitative fish habitat assessments were carried out at each watercourse with predicted impacts using internal Strum protocols. At minimum three cross-sectional measurements (transects) were established to describe morphological (i.e., channel and wetted width bank heights) and flow characteristics (i.e., velocities and depths). These transects were typically recorded at the proposed or existing crossing and 25 m upstream and downstream. Flow regime (perennial, intermittent, ephemeral), estimates of gradient, a description of substrate composition, habitat types (i.e., riffle, run, pool) and cover types (i.e., emergent and submergent vegetation, overhead cover, woody debris, etc.) were described at each transect.

Fish habitat is described in the context of any aquatic feature which is contiguous with a fish bearing system, whether it is located within a watercourse, wetland, or waterbody. Where fish habitat is present in a watercourse which flows through a wetland in an entrenched channel, that habitat is described in the context of the watercourse. Where fish habitat is present in a wetland, but outside of an entrenched channel, it is described in the context of the wetland (accessible to fish, or open water feature if that feature is largely un-vegetated).

11.5.2.4 Water Quality

In-situ water quality measurements [pH, conductivity, total dissolved solids (TDS), temperature, and DO] were recorded at all electrofishing sites prior to each sampling event in 2023. In addition, water quality measurements were recorded opportunistically during wetland and watercourse delineation and during the completion of the Level 2 Fish Habitat Form. Measurements were collected using a calibrated YSI Multi-Probe water quality instrument or a combination of a Myron Ultrapen DO Pen Probe and Hannah Combo pH/Conductivity/TDS Probe at the time of the sampling event/survey.

11.5.2.5 Fish Collection: Electrofishing

Qualitative electrofishing surveys were performed in aquatic features with the goal of evaluating fish species presence and relative abundance under DFO Scientific License #SG-RHQ-23-001A.

Electrofishing was completed using internal Strum Standard Operating Procedures (SOP) for fish collection. The methods and data collection forms outlined in the SOP were developed using the following sources:

- A review of fish sampling methods commonly used in Canadian freshwater habitats (Portt et al., 2006)
- DFO Interim Electrofishing Policy (DFO, 2003)

DFOs Interim Policy for the Use of Backpack Electrofishing Units (2003) was reviewed and followed by all members of the electrofishing crew. This document provides a detailed list of standard equipment, safety, training, and emergency response procedure requirements for electrofishing. Each electrofishing crew consisted of two individuals, one of which (the crew lead) was a qualified person as defined under the DFO Interim Electrofishing Policy. The crew lead is responsible for operating the backpack electrofisher according to their training and the Policy, and for communicating safety policies and electrofishing procedures to the second crew member.

Fish were sampled using a Halltech Battery Backpack Electrofisher (HT-2000) with un-pulsed direct current. A crew member walked alongside the electrofisher operator to net any stunned fish using a D-frame landing net (1/8” mesh). All captured fish were held in a live well containing ambient stream water, which was kept out of the sun and fish were checked regularly for any signs of stress. At the conclusion of the pass, fish in the live well were identified (species confirmation), weighed, and measured for length. After recuperating, all fish were released back into the watercourse.

Qualitative electrofishing surveys were performed using an “open” site methodology with no barrier nets. One pass with a backpack electrofisher was performed, unless crew members noted a high number of fish that evaded capture. In that case, a second pass was performed to obtain greater species representation. The Salmonid Field Protocols Handbook: Techniques for Assessing Status and Trends in Salmon and Trout Populations (Johnson et al., 2007) describe the use of single-pass electrofishing without barrier nets and provide a summary of academic reports supporting this method. Though the technique does not support estimates of absolute abundance or population estimates, research has found that single-pass electrofishing works well to determine species richness (Simonson & Lyons, 1995), and relative abundance (Kruse et al., 1998). Qualitative species abundance estimates were calculated using electrofishing Catch Per Unit Effort (CPUE) indices, standardized to 300 seconds of effort (Scruton & Gibson, 1995).

The following three sampling reaches were selected for electrofishing surveys in linear watercourses within the Fish Study Area:

- West Branch River John
- MacKay's Mill Brook
- Steele Run

These three reaches were selected based on suitability of the habitat to conduct electrofishing surveys (i.e., deep enough to submerge the anode), fish habitat potential, and access considerations. All three reaches are third order (or higher) watercourses fed from first and second order watercourses located within the Project Area. Fish species caught within these watercourses are assumed to be present upstream to the first or second order watercourses within the Project Area.

Fish collection locations, corresponding secondary watersheds and connected watercourses are provided in Table 11.6. Electrofishing locations are shown in Drawing 11.4.

Table 11.6: Qualitative Electrofishing Locations and Details

Electrofishing Location	Secondary Watershed	Stream Order	Survey Dates	Upstream Coordinates (UTM)		Downstream Coordinates (UTM)		Reach Length (m)
				Easting	Northing	Easting	Northing	
West Branch River John	River John (1DO-4)	Fourth	August 28 and 29, 2023*	496502	5056609	496677	5056644	100
MacKay's Mill Brook	Waugh River (1DO-3)	Third	August 29, 2023	489157	5047263	489094	5047276	80
Steele Run	Salmon River (1DH-6)	Third	August 29, 2023	498900	5039738	498866	5039643	100

*West branch River John was fished over two days due to the electrofisher malfunctioning on the first day. Crews had to trouble shoot and fix the electrofisher overnight. The reach was re-fished the following day.

11.6 Technical Components

This section outlines the methods for determining the effects of the undertaking on the following technical VECs: visual aesthetics, shadow flicker, and electromagnetic interference (EMI).

11.6.1 Visual Aesthetics

The visual representation of the Project was completed to demonstrate to stakeholders and the public at large where and to what extent the Project will be visible in the surrounding area (Appendix L). The visual representation includes a Zone of Visual Influence (ZVI) and visual simulations.

11.6.1.1 Zone of Visual Influence

The software package WindPRO version 4.0 was used to complete the ZVI assessment. The ZVI assessment shows the broader extent of visual impacts from the Project on the surrounding landscape. The ZVI assessment does not consider factors such as weather conditions, vegetation cover, existing buildings, or other screening objects, but exclusively considers the location of WTGs with respect to topographical features. Therefore, this assessment represents a conservative approach.

11.6.1.2 Visual Simulations

Using the WindPRO 4.0 software package, the photomontage study demonstrates how the Project may be visible on the landscape from local viewpoints used by, or known to, community members. The resulting photos serve as an example of how the Project may appear following construction, subject to minor adjustments to the layout further into the design process.

Photos were taken from four locally known points where the Project may impact the viewscape:

- A point near the Earltown Community Centre along Highway 311
- A point along Loganville Road
- A point along Balmoral Road
- At the entrance to the south of the Project on Glen Road

In each photomontage, at least one proposed WTG is visible or partially visible from the selected location. The photomontages, with coordinates and a map of their locations are included in Appendix L.

11.6.2 Shadow Flicker

Shadow flicker is an intermittent shadow cast on a receptor due to incident light rays on moving objects, such as WTG rotor blades. For shadow flicker to occur, certain criteria must be met:

- The sun must be shining and unobscured
- The WTG must be between the sun and the receptor
- The line of sight between the WTG and receptor must be clear
- The receptor must be close enough to the WTG to be in the shadow of the WTG rotor.

The EA branch's guide for Wind Power Projects in Nova Scotia states that shadow flicker perceived by a receptor must not exceed 30 hours per year or 30 minutes per day. This aligns with industry standards and regulations in Maritime provinces. The shadow flicker assessment uses the Nordex N163, 7 MW WTG model, which represents the proposed WTG model with the highest possible impact. The assessment assumes that a WTG will be constructed at all 18 locations, further demonstrating the highest possible impact.

There are 26 receptors within the vicinity of the WTG locations (within ~2.5 km), consisting of year-round dwellings, seasonal dwellings, and local businesses. The geographical coordinates of these receptors and the proposed WTG locations are included in Appendix L.

The shadow flicker impact was calculated using the Shadow module of the WindPRO 4.0 software package. The actual-case model uses sunshine statistics and prediction data from the nearest station in the WindPRO database (Charlottetown, PEI) to calculate the predicted shadow flicker.To ensure a conservative approach, each receptor is treated as a greenhouse with 1.5 m high by 1.5 m wide windows for 360° of the building. No topographical or ground cover shielding from obstacles (such as trees, buildings, awnings, etc.) has been considered between the WTGs and receptors.

11.6.3 Electromagnetic Interference

A study was conducted following the Radio Advisory Board of Canada (RABC) and the Canadian Wind Energy Association (CanWEA) guidelines (2020) to investigate the potential interference of the Project on radiocommunication and radar systems. The methods used in the radiocommuncation system impact analysis include a combination of a mapping exercise using the WTG locations to identify consultation zones with various federal regulators (Navigation Canada, Transport Canada, Department of National Defence, ECCC, the Royal Canadian Mounted Police, and the Canadian Coast Guard). A Point-to-Point system analysis was completed following RABC/CanWEA guidelines to further refine consultation zones related to other Wind Projects and stationary towers (broadcast, cellular). Detailed methodology is available in Appendix M.

11.7 Socioeconomic

The socioeconomic environment was evaluated by reviewing background literature as well as communicating with local residents via an in-person information session which took place on March 21, 2024.

The following subsections describe the baseline survey methods for economy, land use and value, transportation, recreation and tourism, cultural and heritage resources, and other undertakings in the area.

11.7.1 Economy

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

- 2021 Census of Population – Statistics Canada
- Taxation legislation
- Public mapping resources
- Economic data from Proponent

11.7.2 Land Use and Value

The assessment of land use and value was completed through a review of desktop resources and in consideration of feedback from public engagement to evaluate how the Project may interact with this VEC. The following resources were reviewed:

- Nova Scotia property records
- Public mapping resources
- Literature review of property values and wind farms (i.e. Brinkley & Leach, 2019; Gardner, 2009; Gulden, 2011; and Hoen et al., 2009).

11.7.3 Transportation

A review of the Nova Scotia Public Works (NSPW) transportation data of provincial series highways in proximity to the Project was completed (NSPW, 2024).

The Proponent consulted with Nav Canada to discuss the potential impact of the Project on air navigation systems and airports in the vicinity of the Project and with DND.

The assessment of traffic and transportation was completed using information provided by the Proponent as RMS has personnel on site on a daily basis at the adjacent Dalhousie Mountain Wind Farm.

11.7.4 Recreation and Tourism

The assessment of recreation and tourism was completed through a review of desktop resources and in consideration of feedback from public engagement to evaluate how the Project may interact with this VEC. The following resources were reviewed:

- Nova Scotia Visitor Exit Survey (Tourism Nova Scotia, 2019)
- Literature review of wind farm impacts on tourism and recreation (i.e. Aitchison, 2004; Glasgow Caledonian University, 2008; and Silva & Delicado, 2017)
- Review of Municipality of Colchester website
- Review of Municipality of Pictou website

11.7.5 Cultural and Heritage Resource

Cultural Resource Management Group Limited (CRM Group) was retained to complete an ARIA for the Project, under Heritage Research Permit (HRP) A2023NS183. This assessment consisted of three components:

- Background study
- Mi'kmaq engagement
- Archeological reconnaissance

The final report was reviewed and accepted by the Special Places Program of Nova Scotia Communities, Culture, Tourism, and Heritage (NSCCTH) on March 29, 2024. Following guidance from the EA branch of NSECC, the ARIA report is provided directly to NSECC and NSCCTH, rather than submitted along with this EARD.

11.7.5.1 Background Study

As part of this assessment, a historic background study was conducted. Historical maps, manuscripts, and published literature were consulted. The Maritime Archaeological Resource inventory was searched. Topographic maps and aerial photographs were used in conjunction with LiDAR Digital Elevation Models to evaluate the Project footprint.

11.7.5.2 Mi'kmaw Engagement

As part of Mi'kmaq engagement, CRM Group contacted the Kwilmu'kw Maw-klusuaqn Negotiation Office's Archaeological Research Division (KMKNO-ARD) requesting information pertaining to historic or traditional Mi'kmaq use of the land. This information provided CRM Group with a better understanding of the cultural and archeological importance of the Project footprint.

11.7.5.3 Archeological Reconnaissance

CRM Group conducted a field reconnaissance of the Project footprint between September 21 and October 5, 2023, and June 26 to 28, 2024. GPS tracklogs of all reconnaissance areas were retained for records, and any sites determined to have potential for archaeological resources were recorded with photographs and GPS coordinates. The terrain and vegetation were noted to record any negative evidence for historic cultural activity.

In addition, two archaeological shovel tests were excavated by the field team to evaluate the surficial geology, and associated potential for archaeological resources, within the Study Area. The locations of the shovel tests were strategically selected where the ground surface was elevated, potentially levelled, dry, and in close proximity to visible archaeological features.

11.7.6 Other Undertakings in the Area

The type, size, and location of other relevant undertakings or developments in proximity to the Project was determined via a review of aerial imagery, and projects with registered EAs with NSECC (imagery dates: between December 1985 and September 2023).

12.0 EXISTING CONDITIONS

This section outlines the results of the baseline surveys.

12.1 Atmospheric

The following subsections describe the baseline survey results for weather conditions, air quality, and noise.

12.1.1 Weather Conditions

The Project Area is in the Nova Scotia Uplands Ecoregion (300) and the Cobequid Hills Ecodistrict (340). Climate in the Nova Scotia Uplands Ecoregion includes large temperature ranges with warm summers and mild to cold winters with high precipitation, including snowfall (Neily et al., 2017; Webb & Marshall, 1999).

Records from Upper Stewiacke, Caribou Point, and Debert were reviewed and available records from 2021 to 2023 are presented in Table 12.1. Note that these three weather stations are not in the same ecoregion or ecodistrict as the Project.

Table 12.1: 2021 to 2023 Weather Information

Weather Station	Data Date Range	Avg. Mean Temp. (°C)	Max. Temp. (°C)	Min. Temp. (°C)	Max. Daily Precip. (mm)	Avg. Daily Precip. (mm)	Total Precip. (mm)	Max. Wind Gust (km/h)	Avg. Daily Max. Gust (km/h)
Debert	Totals 2021 to 2023	7.3	32.7	-27.1	80	3.3	3,631.6	113	43.4
Caribou Point	Totals 2021 to 2023	8.7	34.1	-26.5	91.2	3.0	3,128.3	146	50.1
Upper Stewiacke	Totals 2021 to 2023	7.2	33.2	-26.4	94.8	3.6	3,686.3	125	43.7

As shown in Table 12.1, the lowest temperature from 2021 to 2023 was -27.1 degrees Celsius (°C) in Debert and the highest temperature was 34.1°C in Caribou Point. The average daily mean temperature ranged from 7.2 to 8.7°C across the three weather stations (Environment and Natural Resources, 2024).

The average annual precipitation ranged from 1042.8 millimetres (mm) in Caribou Point to 1228.8 mm in Upper Stewiacke and the average daily precipitation ranged from 3.0 mm to 3.6 mm with a maximum daily precipitation of 94.8 mm being recorded in Upper Stewiacke (Environment and Natural Resources, 2024).

The average daily maximum wind gusts were recorded as 43.4 kilometres per hour (km/h), 43.7 km/h, and 50.1 km/h in Debert, Upper Stewiacke, and Caribou Point, respectively. The maximum wind gust across all three weather stations was 146 km/h in Caribou Point (Environment and Natural Resources, 2024).

12.1.2 Air Quality

As recommended by Health Canada (2017a), available data from air quality monitoring stations were used to describe the existing environment. The Project Area is located approximately 27 km southwest of Pictou, Nova Scotia, where the nearest stations monitoring AQHI are located (Table 12.2). The AQHI in Pictou was considered low risk when assessed in January 2024 (Government of Canada, 2024b).

Table 12.2: 2021 Air Quality Data, Pictou, NS

Station	Mean Annual SO_2 (ppb)	Mean Annual NOX (ppb)	Mean Annual NO (ppb)	Mean Annual NO_2 (ppb)	Mean Annual PM2.5 (ug/m^3)	Mean Annual O3 (ppb)
Pictou	0.4	1.3	1.2	1.0	5.0	30.0

When comparing levels to the maximum permissible ground level concentrations cited within the Air Quality Regulations, N.S. Reg. 8/2020 made under Section 25 and 112 of the *Environment Act*, S.N.S. 1994-95, c.1, no exceedance of the annual NO_2 or sulfur dioxide (SO_2) maximum permissible ground level concentrations were observed.

12.1.3 Noise

The community type in the vicinity of the Project Area meets the Health Canada (2017b) qualitative description of a quiet rural area. A quiet rural area is based on dwellings being >500 m from heavily travelled roads and not subject to frequent aircraft flyovers. A quiet rural area has an estimated baseline sound level of ≤45 dBA (Health Canada, 2017b). Construction sound estimates for forested landscapes estimate that forest habitats have a dBA range between 25 dBA (low end) and 45 dBA (high end), averaging 34.5 dBA (California Department of Transportation, 2016).

Available information collected during the various baseline field assessments reported that ambient background noise levels encountered were typical of a rural setting but were not measured by a decibel meter. These included, but were not limited to, the sounds of birds, insects, small animals, windblown debris, trees, vegetation, and running water in select sites. An existing quarry (Mount Thom), owned and operated by S.W. Weeks Construction Ltd., exists adjacent to the southern portion of the Study Area. When active, quarry operations can be heard from the Study Area. Additionally, vehicular traffic can be heard in portions of the Project Area in proximity to Highway 104, Highway 4, and Highway 326. No specific setbacks or distances were measured, and this only provides a general description of the quiet rural area.

The nearest residential receptors to the Project Area, as identified via a review of aerial imagery, field confirmation, review of GIS datasets, and field surveys are shown on Drawing 5.3.

12.2 Geophysical

12.2.1 Topography

Based on a review of NSTDB contour lines, the Project Area records its lowest elevation at 224 metres above sea level (masl) along existing infrastructure adjacent to Bezanson's Lake. The highest elevation within the Project Area is at approximately 324 masl along a ridge in the northern portion of the Project Area (Drawing 5.3).

The elevation profile indicated in Figure 12.1 depicts topography sections of the northern and southern Study Area boundaries. The central portion of the site reaches a maximum elevation of approximately 300 masl. The range of elevations observed along this profile is from less than 250 masl to approximately 300 masl. The substantial change in topography across these 4 km profiles suggests that groundwater movement within the Study Area would likely vary depending on location and likely does not occur in one direction.

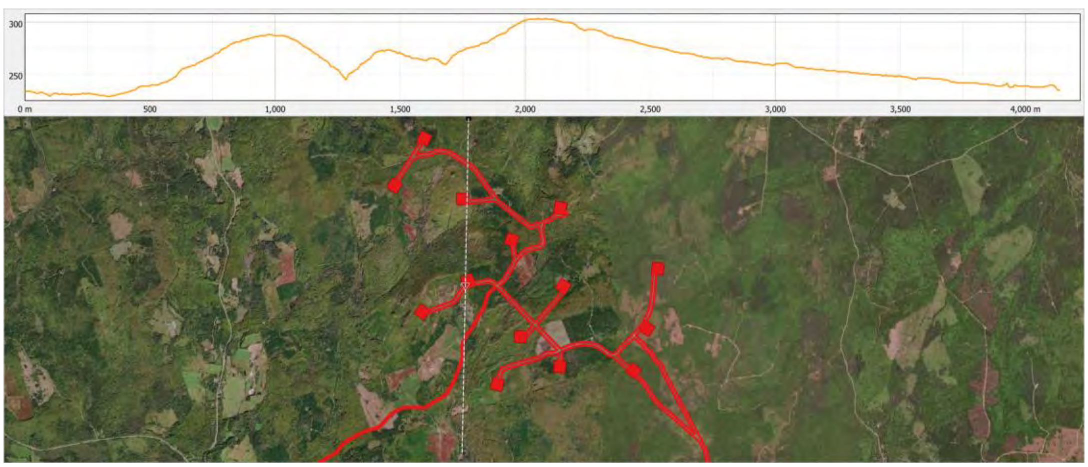

Figure 12.1: North-South Elevation Profile Through the Northern Section of the Project Area
*Please be aware of the scale, as the topography is not this pronounced in the field.
Source: Created in QGIS, 2024

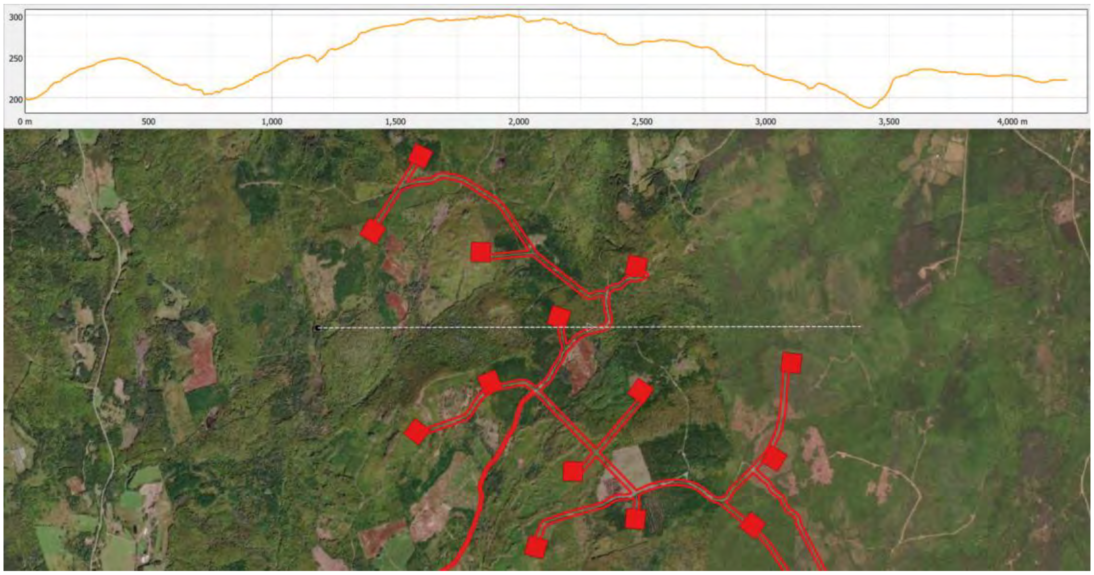

Figure 12.2: West-East Elevation Profile Through the Northern Section of the Project Area
*Please be aware of the scale, as the topography is not this pronounced in the field.
Source: Created in QGIS, 2024.

The elevation profile indicated in Figure 12.2 depicts a larger range in slope from west to east in the northern Project Area. Elevation ranges from less than 200 masl in the eastern portion of the profile boundary before rising in the approximate centre to 311 masl, undulating down to the western section of the Study Area boundary near 200 masl.

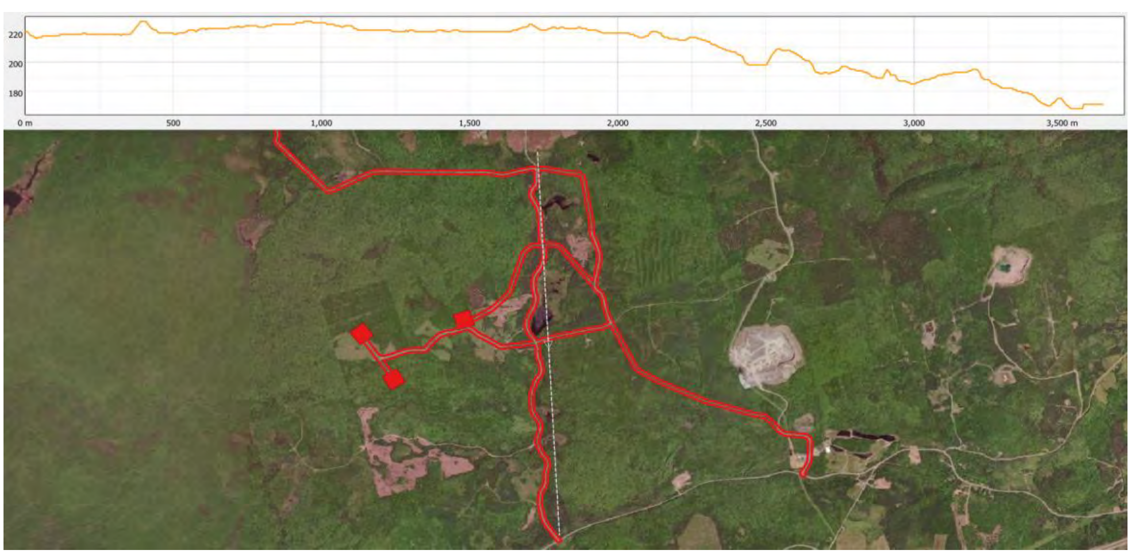

Figure 12.3. North-South Elevation Profile Through the Southern Portion of the Project Area
*Please be aware of the scale, as the topography is not this pronounced in the field.
Source: Created in QGIS, 2024

The elevation profile indicated in Figure 12.3 depicts another moderate change in slope from north to south in the southern Project Area. The elevation ranges from approximately 225 masl in the northern portion of the profile boundary before lowering to approximately 180 masl in the southern section of the boundary near Highway #4.

Figure 12.4: West-East Elevation Profile Through the Southern Portion of the Project Area
*Please be aware of the scale, as the topography is not this pronounced in the field.
Source: Created in QGIS, 2024

The elevation profile indicated in Figure 12.4 depicts the change in slope from within the Project Area in the southern section of the site. Elevation in this Profile ranges from 300 masl in the western portion of the profile to approximately 225 masl at the centre of the Profile (Bezanson's Lake) and back to nearly 300 masl at the eastern extent of the profile.

12.2.2 Geology

12.2.2.1 Surficial Geology

According to the Surficial Geology Map of the Province of Nova Scotia (Stea et al., 1992), soil classifications within the Nova Scotia Highlands Ecoregion include a diverse range of soil types. Glacial till is prevalent and glaciofluvial deposits are common throughout the ecoregion (Drawing 12.1). The Cobequid Hills Ecodistrict is itself primarily dominated by loam soils of various sorts, from gravelly sandy loam to loamy sand till high in granite. Glacial till is dominant in this ecodistrict, with frequent bedrock exposures. Coarse glaciofluvial deposits can be locally significant in this area, such as near Folly Lake. Generally, till in these areas range between 2 to 20 m in depth. The material in these regions is typically released from the base of an ice sheet by melting; these tills are deposited by ice sheets centred over Nova Scotia (Stea et al., 1992).

According to information available in the 2012 EARD (Stantec, 2012), the Project Area is overlain by deposits of sandy glacial till varied in thickness and reworked to post-glacial sediments and a combination of organic and alluvial deposits.

The soil in this area potentially has factors that may affect its use for construction. These include shallowness, stoniness, and a high water table, as well as a poor buffering capacity for acid rain (Stea et al., 1992).

Colluvial Deposits

The northern portion of the Project Area is located near surficial sediments referred to as colluvial (talus) deposits (Drawing 12.1). When present on sloped terrain, these deposits are susceptible to mass wasting events. If they give way, these features have the potential to harm people and property.

12.2.2.2 Bedrock Geology

According to the Geological Map of the Province of Nova Scotia, the bedrock geology of the Project Area (Drawing 12.2) is comprised of igneous intrusive granite, volcanic rocks, and sedimentary sandstones, siltstones and limestones. This localized granite type, formed during the Devonian and Carboniferous Periods, is abutted by both the Warwick and Dalhousie Mountain Formations (Keppie, 2000).

Acid Rock Drainage

ARD is a common issue found throughout Nova Scotia and mostly pertains to sulphide-bearing slates of the Halifax Formation. However, the Project Area is not located within the Halifax Formation, and according to the Nova Scotia Mineral Resource Land-Use Atlas (NSNNR, 2021d), the Project Area is not located within acid-bearing slates.

Karst Geology

Karst landscapes are derived from the dissolution of bedrock material, usually through groundwater erosion. This can result in subsidence in bedrock which can pose a hazard to people and infrastructure. The Project Area is in a medium karst risk area at the very southern tip of the road network along the Mt Thom and Cove Road areas (Drawing 12.3). Medium karst risk is also observed in the northern portion of the Project Area (Drage & McKinnon, 2019).

12.2.3 Groundwater

The Project Area records its lowest elevation at 209 masl along the southeastern boundary and its peak elevation of 310 masl along a ridge in the centre of the Project Area (Drawing 5.3).

The Project Area intersects with approximately 14 NSECC mapped watercourses (Drawing 12.4). Five mapped watercourses intersect with the northern section of the Project Area, two with the middle section where road infrastructures may be developed, and another seven intersect with the southern section of the Project Area. One watercourse acts as an inflow to

Bezanson's Lake, and the other acts as an outflow from Bezanson's Lake to Steele Run. Surface water features are further discussed in Section 12.5.2.

Flow accumulation lines and WAM were also reviewed. Predicted depth to water nearest the surface (i.e., 0 to 0.10 m) exists around the flow accumulation lines (described further in Section 11.5.2). These areas exist throughout the Project Area and generally flow south to north to the Northumberland Strait. Groundwater flow within the Project Area is anticipated to follow the general drainage trend from higher elevations along the central ridge of the Project Area to the north to the Northumberland Strait.

Hydrogeologic characterization of Nova Scotia's Groundwater Regions indicates that the Project Area is situated on igneous protrusions, metamorphosed calc-alkaline and tholeiitic lavas, and sedimentary rock (Kennedy et al., 2008). These igneous protrusions are the Neoproterozoic diorite and gabbro pluton, the Mount Thom Complex, and the Devonian to Carboniferous granite. The metamorphic lavas found on the site are the Warwick Mountain Formation. The sedimentary rocks found on site are of the Nuttby, Boss Point, Falls, and the Claremont and Millsville Formations.

Hydraulic conductivity across the Project Area varies depending on bedrock composition and the severity of fracturing. Throughout the igneous and metamorphic complexes, the bedrock hydraulic conductivity would likely fall within the range of 10 to 10^{-9} metres per day (m/day), which represents highly fractured to poorly fractured igneous and metamorphic bedrock. The sedimentary bedrock formations are likely characterized by hydraulic conductivity ranging from 103 to 10^{-5} m/day, which represents karst limestone to well-cemented sandstone (Driscoll, 1986).

The closest Nova Scotia Groundwater Observation Well Network observation site to the Project Area is in Durham (045). This well is located within a late carboniferous area and is not situated within the same sedimentary groundwater region as the Study Area. Therefore, it is not directly applicable to the Project.

The Nova Scotia Well Logs Database identifies 96 water (88 domestic wells) within 2 km of the Project Area (Drawing12.4). Any record with a geospatial reference accuracy greater than 1 km was not included in this analysis. According to the user manual of the Nova Scotia Well Logs Database, wells were based on the Nova Scotia Map Book, the Nova Scotia Property Records Database, the Atlas, the well UTM Well Log, and the National Topographic System Maps (NSNRR, 2021e).

A review of the 96 drilled wells of various uses within 2 km of the Project Area indicates yields of 0.5 to 272.4 litres per minute (LPM) (mean 41.98 LPM). The available recorded static water levels in the vicinity of the Project Area are shown to range between -0.03 (overflowing) and 26.19 m below the surface in dug wells. These wells are primarily located near the entrance to the Project Area, where residents reside. Therefore, these wells are situated much further away from where any blasting is likely to occur if required.

A review of aerial imagery did not identify any additional structures or potential well sites surrounding the perimeter or within the Study Area (Google Earth aerial imagery 29/2/2024).

The information obtained for wells identified within 2 km of the Project Area by the Nova Scotia Well Logs Database is presented in Table 12.3.

Table 12.3: Characteristics of Groundwater Wells Within 2 km of the Project Area

Measurement	Drilled Wells		
	Mean	Maximum	Minimum
Well Casing (m)	12.42	47.50	4.57
Well Depth (m)	44.56	152.86	7.31
Water level (m)	6.23	26.19	-0.03[1]
Till thickness (m)	6.55	30.75	1.22
Groundwater flow (LPM)	41.98	272.40	0.50

Source: (NSNRR, 2021e)
[1]Negative values represent overflowing wells or static water level at ground level.
*Wells with a geospatial reference accuracy greater than 1 km were not included in this assessment.

12.2.3.1 Arsenic in Bedrock Wells

Arsenic is a naturally occurring contaminant in bedrock groundwater throughout Nova Scotia. The Project Area is situated within low, medium, and high-risk areas of potential contamination to bedrock groundwater well users (Drawing 12.5). Low risk refers to less than 5% of bedrock wells exceeding Health Canada water quality guidelines. Medium risk refers to between 5% and 15% of bedrock groundwater wells exceeding Health Canada drinking water quality guidelines. High risk refers to over 15% of bedrock groundwater users exceeding these guidelines (Kennedy & Drage, 2017).

12.2.3.2 Uranium in Bedrock Wells

Uranium is a naturally occurring contaminant in bedrock groundwater wells throughout Nova Scotia. This element can cause disease and as such, MACs have been set by Health Canada. The Project Area is situated throughout low and medium-risk areas for uranium in bedrock wells (Drawing 12.6). Low risk refers to less than 5% of bedrock wells exceeding Health Canada water quality guidelines. Medium risk refers to between 5% and 15% of bedrock groundwater wells exceeding Health Canada drinking water quality guidelines (Kennedy & Drage, 2020).

12.3 Terrestrial

Habitat and vegetation community surveys for vascular plants and lichens were completed to determine potential impacts to species or their specific habitat which may be protected under legislation.

Vegetation community assessments were also completed to understand habitat as discussed in The Guide to Addressing Wildlife Species and Habitat in an Environmental Assessment Registration Document (NSE, 2009).

12.3.1 Habitat

12.3.1.1 Desktop Review

The Project Area is in the Cobequid Hills (340) Ecodistrict, which extends across three counties, Cumberland, Colchester, and Pictou (NSLF, 2019). This ecodistrict is located within the Nova Scotia Uplands Ecoregion and is 190,295 ha in size (NSLF, 2019). The Cobequid Hills is characterized by its hilly topography and abundance of snowfall, receiving 300 cm of snow and a low annual precipitation of 1,200 mm a year (NSLF, 2019). Dalhousie Mountain and Nuttby Mountain are the highest points on mainland Nova Scotia and are located within this ecodistrict.

This landscape is comprised of six landscape elements: (i) tolerant hardwood hills, (ii) tolerant mixedwood hummocks, (iii) red and black spruce hummocks, (iv) tolerant mixed slopes (v) wetlands, and (vi) valley corridors. Tolerant hardwoods hills are the matrix element, dominated by long-lived shade tolerant species such as sugar maple (*Acer saccharum*), yellow birch (*Betula alleghaniensis*), American beech (*Fagus grandifolia*), and red maple (*Acer rubrum*). This element represents 65% of the landscape in the ecodistrict. In the valley and lower slopes, these species blend with white spruce (*Picea glauca*), red spruce (*Picea rubens*) and balsam fir (*Abies balsamea*) to form the mixedwood hummock landscape element. White spruce stands are common where abandoned farmland of the early settlers has returned to forest (Neily et al., 2022). Some of the old fields have been converted for blueberry production.

Table 12.4 and Drawing 11.1 display the desktop identified land classifications (i.e., habitat) within the Project Area. These estimations are based on the forest inventory GIS database (NSNRR, 2021c), a Canopy Height Model from GeoNOVAs Elevation Explorer (GeoNOVA, 2019, 2020), and the WAM database (NSE, 2022).

Table 12.4: Desktop Calculations of Habitat Within the Project Area.

Habitat Type	Area (ha)	Approximate Percentage of Project Area (%)
Cutover	141	2
Cutover Wetland[1]	8	0
Hardwood Forest	2760	38
Hardwood Wet Forest	159	2
Mixedwood Forest	1152	16
Mixedwood Wet Forest	157	2
Open Areas	295	4
Open Wetland[1]	163	2
Shrub/Alders	16	0
Softwood Forest	2151	29
Softwood Wet Forest	291	4
Urban/Developed	46	1
Water	10	0
TOTAL PROJECT AREA	**7348**	**100**

[1]Includes wetlands from provincial forestry layer (NSNRR, 2021c) and does not include field delineated wetlands.

Habitat within the Project Area mainly consists of hardwood (2760 ha, 38% of the Project Area) and softwood forest (2151 ha, 29%), followed by mixedwood forest (1152 ha, 16%). The majority of the Project Area is forested (91%) and only 3% (187 ha) is classified as disturbed (urban/developed and cutover, respectively).

Hardwood stands are mainly concentrated in the western portion of the Project Area (Drawing 11.1). Softwood stands are found throughout most of the Project Area, situated mainly within the Study Area, and mixedwood stands are scattered throughout the Project Area, with a larger concentration near the Project centre. There is a small section or urban/developed habitat in the southern end of the Project Area as well as some open areas.

Mapped wetland habitat in the Project Area includes 171 ha (2%) and are mainly present in the southern portion. Refer to Section 12.5.1 for additional details on wetlands.

Cutover habitat within the Project Area accounts for 141 ha (2%). Cutover habitat including disturbed landscapes such as clearcuts, partial cuts, right of way (ROW) clearings, etc. were placed in the cutover group. Cutover habitat was identified throughout the Project Area.

Gully Lake Wilderness Area is located directly along the western boundary of the Project Area. Within Gully Lake Wilderness Area, old forest polygons are present (NSNRR, 2020). Dalhousie Mountain Nature Reserve is also located 2.5 km east of the Project Area. The closest AMO (AMO; ID# MEP-1-001) is located 78 m west of the Study Area (Drawing 11.2).

The ACCDC report identified eight priority vascular plants within 5 km of the Project Area (Drawing 12.7). All priority flora species within 5 km of the Project Area are listed in Table 12.5.

Table 12.5: Priority Flora Species Within 5 km of the Project Area as Listed by the ACCDC Report

Scientific Name	Common Name	COSEWIC	*SARA*	*ESA*	SRank	Distance
Hepatica americana	Round-lobed hepatica	-	-	-	S2	3.4 ± 0.0
Hieracium paniculatum	Panicled hawkweed	-	-	-	S3S4	2.2 ± 0.0
Hieracium robinsonii	Robinson's hawkweed	-	-	-	S3	4.6 ± 7.0
Viburnum edule	Squashberry	-	-	-	S3	3.1 ± 0.0
Polygala sanguinea	Blood milkwort	-	-	-	S3	2.3 ± 0.0
Platanthera grandiflora	Large purple fringed orchid	-	-	-	S3	2.2 ± 0.0

Scientific Name	Common Name	COSEWIC	*SARA*	*ESA*	SRank	Distance
Potamogeton richardsonii	Richardson's pondweed	-	-	-	S3	4.8 ± 7.0
Fagus grandifolia	American beech	-	-	-	S3S4	1.0 ± 0.0
Fraxinus nigra	Black ash	Threatened	Threatened	Threatened	S2S3	0.0 ± 0.0

The ACCDC report states that there are observations of black ash known to be within the Project Area. NSNRR considers black ash to be a “location sensitive” species; therefore, precise coordinates were not provided. Communication with NSNRR confirmed that there are observations of black ash within the Project Area (M. McGarrigle, NSNRR SAR Biologist, personal communication, September 7, 2023).

Five priority lichen species were documented within 5 km of the Project Area in the ACCDC report.

- Eastern waterfan (COSEWIC & *SARA*: Threatened, *ESA*: Threatened, ACCDC: S1)
- Blue felt lichen (*Pectenia plumbea*, COSEWIC & *SARA*: Special Concern, *ESA*: Special Concern, ACCDC: S3)
- Pompom-tipped shadow lichen (*Phaeophyscia pusilloides*, ACCDC: S3)
- Fringe lichen (*Heterodermia neglecta*, ACCDC: S3S4)
- Valley oakmoss lichen (*Evernia prunastri*, ACCDC: S3S4)

According to the MTRI databases, no extant boreal felt lichen populations are within the Project Area. The closest boreal felt lichen critical habitat is located 49 km southeast of the Project Area. The closest extant graceful felt lichen population is located over 50 km southeast of the Project Area. Critical habitat for eastern waterfan exists in two locations immediately adjacent the Project (ECCC, 2021). One existing observation of eastern waterfan is within the boundaries of the Study Area.

The 2012 EARD (Stantec, 2012) found that the most abundant vegetation types within the Study Area are the following: immature softwoods, immature hardwoods, mature softwoods, mature hardwoods, mature mixedwoods, clearcut, other agricultural lands, and wetlands. The report concludes that the Study Area was predominantly immature softwood forest, and mature hardwood forest based on their analysis with the NSNRR Forest Inventory mapping (Stantec, 2012). Strum confirmed this is accurate through the 2023 desktop review.

In the 2012 EARD (Stantec, 2012), 405 vascular plant species were observed within the Project Area. The 2012 EARD identified 12 priority vascular plant species:

- Round-lobed hepatica (*Hepatica americana*, S2)
- Heart-leaved foamflower (*Tiarella cordifolia*, S2S3)

- Climbing false buckwheat (*Fallopia scandens*, S3S4)
- Black ash (*Fraxinus nigra*, *SARA*/COSEWIC/*ESA* Threatened, S1S2)
- Squashberry (*Viburnum edule*, S3)
- Alpine rush (*Juncus alpinoarticulatus*, S2)
- Blood milkwort (*Polygala sanguinea*, S3)
- Long leaved stitchwort (*Stellaria longifolia*, S3)
- Wavy leaved aster (*Symphyotrichum undulatum*, S3)
- Large purple fringe orchid (*Platanthera grandiflora*, S3)
- Small round-leaved orchid (*Platanthera orbiculata*, S3S4)
- Rosy sedge (*Carex rosea*, S3)

The 2012 EARD (Stantec, 2012) did not include lichen surveys.

12.3.1.2 Field Surveys

Vegetation Community and Classification

The existing anthropogenic disturbance is limited to roads and cutover/clearcut areas, which are scattered across the Project Area. As was predicted in the QGIS habitat model (Section 11.3.2), field assessments confirmed the Project Area is comprised of a mosaic of softwood forests, mixedwood forests, and hardwood forests.

In September 2023 and in June 2024, Strum biologists identified 39 HPs across the Project Area during fall migration avifauna point count and spring and fall botany surveys. Avifauna point counts were distributed across the Project Area to account for all habitat types.

The Project Area includes the following vegetation types (Table 12.6; Drawing 11.1): Spruce Hemlock (SH) Forest, Tolerant Hardwoods (TH) Group, Old Field (OF) Forest Group, Wet Mixedwood (WM) Forest Group, Wet Coniferous (WC) Forest Group, and Anthropogenic habitats.

Table 12.6: Vegetation Groups and Vegetation Types Observed Within the Project Area

<table>
<tr><th>Community Type</th><th>Vegetation Group</th><th>Vegetation Type</th><th>HP</th><th>Classification System[1]</th></tr>
<tr><td rowspan="5">Upland Communities</td><td rowspan="3">Spruce Hemlock Forest Group</td><td>SH5 – Red spruce – Balsam Fir / Schreber's Moss</td><td>12, 14, 25</td><td>FEC</td></tr>
<tr><td>SH5b – Balsam Fir Variant</td><td>27</td><td>FEC</td></tr>
<tr><td>SH8 – Balsam Fir / Wood Fern / Schreber's Moss</td><td>17</td><td>FEC</td></tr>
<tr><td rowspan="2">Tolerant Hardwoods Group</td><td>TH1 – Sugar Maple / Wood Fern – Hay-scented Fern</td><td>21, 23, 31, 39</td><td>FEC</td></tr>
<tr><td>TH1a – Beech Variant</td><td>1, 4, 13, 15, 18, 22, 30</td><td>FEC</td></tr>
</table>

Community Type	Vegetation Group	Vegetation Type	HP	Classification System[1]
		TH1b – Yellow Birch Variant	7, 28, 36, 38	FEC
		TH2 – Sugar Maple / New York Fern – Northern Beech Fern	8, 40	FEC
	Old Field Forest Group	OF1 – White Spruce / Aster – Goldenrod / Shaggy Moss	3, 5, 6, 10, 11, 32, 33, 37	FEC
		OF4 – Balsam Fir – White Spruce / Evergreen Wood Fern – Wood Aster	16, 35	FEC
Wetland Communities	Wet Mixedwood Forest Group	WM1 – Red Maple – Balsam Fir / Wood Aster / Sphagnum	29	FEC
	Wet Coniferous Forest Group	WC1 – Black Spruce / Cinnamon Fern / Sphagnum	26	FEC
Anthropogenic	-	Plantations	19, 20	Strum determined
	-	Clearcut	9, 24, 31	Strum determined

The vegetation groups and vegetation types identified within the Project Area are described in detail within the following subsections.

- Upland Vegetation Type

  Spruce Hemlock Forest Group

  This vegetation group is widespread throughout Nova Scotia and consists of mid to late successional vegetation types. This canopy is dominated by shade tolerant softwoods such as balsam fir, red spruce, and eastern hemlock (*Tsuga canadensis*). The shrub layer often consists of regenerating conifers and soils are often derived from glacial till. The SH group provides habitat for a diverse community of birds and mammals (Neily et al., 2022). There are two vegetation types within the Project Area that belong to this group: SH5 and SH8.

  - SH5 – Red Spruce / Balsam Fir / Schreber's Moss

    The SH5 vegetation type is a mid-successional community group with red spruce and balsam fir dominant in the overstory and scattered red maple and white birch. The canopy in these stands is often dense, reducing light availability and abundance of common woodland flora (Neily et al., 2022). Groundcover comprises of schreber's moss (*Pleurozium schreberi*), bazzania (*Bazzania trilobata*), and stairstep moss (*Hylocomium splendens*). This forest is the preferred habitat for Snowshoe hare (*Lepus americanus*). The potential for rare vascular plants and lichens is low for this vegetation type. The SH5 vegetation type was observed at HP 12, 14, and 25 within the Project Area. The balsam fir variant was observed at HP 27.

- SH8 – Balsam Fir / Wood Fern / Schreber's Moss
  The SH8 vegetation type is an early to mid-successional vegetation type dominated by balsam fir and often indicative of disturbances such as harvesting, insect infestation, and windthrow (Neily et al., 2022). This vegetation type was observed in mature and regenerative stands. The herbaceous layer is often variable within this vegetation type and in some instances the canopy cover is so dense that very little herbaceous cover is present. As seen within the Project Area, the herbaceous layer consisted of bunchberry (*Cornus canadensis*) and starflower (*Lysimachia borealis*). The bryoid layer consisted of wavy-leaved moss (*Dicranum polysetum)*, hypnum mosses (*Hypnum spp.*) and *Bazzania spp*. The regenerative portion of this vegetation type provides suitable foraging habitat for Snowshoe hare, Mainland Moose and passerines. Rare vascular flora and lichen potential for this vegetation type is low. This vegetation type was observed at HP 17.

Tolerant Hardwood Forest Group

This vegetation group is classified as a mid to late successional hardwood vegetation group. The TH vegetation group is generally composed of a closed canopy dominated by sugar maple, beech, yellow birch, and red maple, with balsam fir as a significant understory species. The shrub layer in TH groups can be extensive and will show high diversity and abundance of ferns. Most TH sites contain soils ranging from fresh to moist. Due to the fertile soils of the TH group, rare plants are often associated with this group (Neily et al., 2022). Three vegetation types belonging to this group, TH1, TH1a, and TH2, were observed within the Project Area.

- TH1 – Sugar Maple / Wood Fern / Hay-scented Fern and TH1a – Sugar Maple / Wood Fern / Hay-scented Fern: Yellow Birch Variant
  TH1 has a canopy dominated by sugar maple and yellow birch in the overstory. The TH1a vegetation group is a yellow birch variant of TH1 which is dominated by yellow birch and originates after disturbance events such as harvesting. The understory contains mixtures of American beech, fly honeysuckle (*Lonicera canadensis*) and regenerative sugar maple and balsam fir (Neily et al., 2022). This vegetation type offers suitable conditions for a diverse herb cover; common species include evergreen wood fern (*Dryopteris intermedia*), Eastern hay-scented fern (*Dennstaedtia punctilobula*), whorled wood aster (*Oclemena acuminata*), dutchman's-breeches (*Dicentra cucullaria*) and dog tooth violet (*Erythronium dens-canis*). This vegetation group is commonly shown to develop old growth characteristics due to stand continuity and can provide valuable habitat for warblers, thrushes, and woodpeckers. TH1 was found at HP 21, 23, 31, and 39. The beech variant was found at HP 1, 4, 13, 15, 18, 22, and 30, and the yellow birch variant was found at HP 7, 28, 36, and 38.

- TH2 – Sugar Maple / New York Fern – Northern Beech Fern
  The TH2–Sugar maple / New York fern–northern beech fern vegetation type is a late successional forest, dominated by sugar maple in the overstory. The shrub layer is dominated by regenerating tree species and other species like striped maple (*Acer pensylvanicum*) and fly-honeysuckle. The herbaceous layer is quite diverse and is composed of species like New York fern (*Amauropelta noveboracensis*), evergreen wood fern and northern beech fern (*Phegopteris connectilis*). A well-developed bryophyte layer is not common. It is common for this vegetation type to develop old growth characteristics and it typical on upper slopes of drumlins (Neily et al., 2022). TH2 was found at HP 8 and 40.

Old Field Forest Group

The OF Forest Group consists of early successional forests originating from abandoned farmland where land was cleared to create pastures for farmstock. Past cultivation has removed most microtopography of these sites. These forests are typically dominated by even-aged softwood species and develop dense overstory canopies with little understory cover. Common species found throughout this group include white spruce, tamarack (*Larix laricina*), Eastern white pine (*Pinus strobus*), or balsam fir. Forests are short-lived and often succumb to insects and disease (Neily et al., 2022). The OF1 and OF4 vegetation types observed within the Project Area belong to this group.

- OF1 – White Spruce / Aster – Goldenrod / Shaggy Moss
  The OF1 vegetation type is an early successional vegetation type with softwood forests associated with abandoned agricultural lands in central and eastern Nova Scotia. White spruce is dominant in the overstory with balsam fir, red maple, and tamarack are common throughout. The shrub and herb layer of this group is usually poorly developed. Species include hawkweeds, goldenrods, asters, common speedwell (*Veronica officinalis*) and various grass species indicative of past agricultural land use (Neily et al., 2022). Later successional stages of OF1 may lead to components of tolerant hardwoods sites and include sugar maple, yellow birch, and beech species. This vegetation type was common throughout the Project Area, at HP 3, 5, 6, 10, 11, 32, 33, and 37.
- OF4 – Balsam Fir – White Spruce / Evergreen Wood Fern – Wood Aster
  The OF4 vegetation type is an even-aged, early to mid-successional vegetation type with balsam fir dominant in the overstory. This vegetation group is the second-growth forest that follows from previously harvested or disturbed OF1, OF2, and OF3 vegetation types. Red maple, tamarack and paper birch (*Betula papyrifera*) are common species found throughout the overstory. The herb layer consists of upland flora species such as wild sarsaparilla (*Aralia nudicaulis*), whorled wood aster, and evergreen wood fern (Neily et al., 2022). Moss cover is comprised of Schreber's moss, stairstep moss and haircap mosses. The OF4 vegetation type was observed at HP 16 and 35 within the Project Area.

- Wetland Vegetation Type
  Wetland vegetation communities observed within the Project Area are discussed below. For further details on wetland types, classification, landscape position and overall wetland functions, refer to Section 12.5.1.

  Wet Mixedwood and Wet Coniferous Forest Group
  The WM and the WC Forest Group are wet forested ecosystems which often have water at or near the surface of the soil for most of the year. These forested vegetation groups are typically found within swamps in Nova Scotia. The successional dynamics of this group are mainly edaphic mid-successional associations maintained by excessive moisture. The dominate tree species in this forest group include red maple, black spruce, balsam fir, white ash (*Fraxinus americana*), and red spruce. The shrub layer is well developed with regenerating tree species, winterberry (*Ilex verticillata*), and speckled alder (*Alnus incana*). The bryophyte coverage is extensive with common sphagnum species such as blunt-leaved peat moss (*Sphagnum palustre*), Northern peatmoss (*Sphagnum capillifolium*), and green peat moss (*Sphagnum girgensohnii*) (Neily et al., 2022). Fern species, such as cinnamon fern (*Osmundastrum cinnamomeum*) and sedges such as the three-seeded sedge (*Carex trisperma*) are often observed within this vegetation community group. This forest group offers suitable habitat for SAR like the Canada Warbler (*Cardellina canadensis*), Olive-sided Flycatcher (*Contopus cooperi*) and black ash.
  - WM1 – Red Maple – Balsam Fir / Wood Aster / Sphagnum
    The WM1 vegetation type is a relatively common wet mixedwood forest. This vegetation type is characterized by a dominant overstory of red maple and balsam fir, whereas the understory is less abundant. The woody and herbaceous layer supports vascular plants like false holly, cinnamon fern, creeping snowberry (*Gaultheria hispidula*) and three-seeded sedge. It is common to have a moderate level of sphagnum cover, and a more developed cover is dominant on poorly drained mineral soil (Neily et al., 2022). This vegetation type was found at HP 29.
  - WC1 – Black Spruce / Cinnamon Fern / Sphagnum
    WC1 is a nutrient poor wet forest, characterized by black spruce and high herbaceous cover. This vegetation type is an edaphic climax and is commonly found in shallow depressions or gentle slopes with little microtopography. Herbaceous cover consists of mountain holly (*Ilex mocronata*), cinnamon fern, goldthread (*Coptis trifolia*), and creeping snowberry (Neily et al., 2022). WC1 was observed at HP 26.

  Anthropogenic

  - Plantations
    There are various softwood plantations throughout the Project Area. Species observed include Norway spruce (*Picea abies*), red pine (*Pinus resinosa*),

balsam fir and tamarack. A Christmas tree plantation is located at HP 19 and 20.

- Clearcuts
  Several clearcuts were identified throughout the Project Area, namely at HP 9, 24, and 31.

- Vegetation Type Summary
  The Project Area is comprised of vegetation types within the SH Forest Group, TH Forest Group, OF Forest Group, WM Forest Group, WC Forest Group and softwood plantations (Drawing 11.1).

  Provincial rankings for vegetation communities currently do not exist within Nova Scotia, and not all communities found in Nova Scotia have been described and researched. The lack of data and rankings make it difficult to designate a community as rare. The vegetative communities identified within the Project Area are common in the surrounding landscape and the province. Vegetation type TH1, TH1b, TH2, and WM1 are known to support rare plants due to fertile soils and saturated conditions. All other vegetation types do not have an elevated potential for priority species. The vegetation types informed field surveys for rare vascular and nonvascular species.

12.3.2 Flora

A total of 174 vascular plant species and seven bryophyte species were identified within the Study Area. None of the five bryophytes identified are listed as a priority species.

Of the 174 vascular plant species identified, only two (or 1%), American beech and stoloniferous foamflower (*Tiarella stolonifera*, S2S3), are SOCI (Drawing 12.8). A complete species list is provided in Appendix N.

While black ash was identified in the 2012 EARD field surveys (Stantec, 2012), this location was visited during both field seasons by two experienced botanists and no evidence of the tree was found or any evidence of harvesting. However, it was noted that the wetland the species was found in underwent some hydrological alterations that may have made the wetland unfavourable to the black ash sometime between 2012 and 2023.

American Beech

American beech is a shade-tolerant deciduous tree native to eastern North America that is often associated with climax forest species such as sugar maple, yellow birch, and eastern hemlock (NRCan, 2015). American beech can live up to 400 years, and their nuts supply food for many birds and mammals such as ruffed grouse, blue jays and black bears (Sweeney et al., 2020). American beech prefers moist or well-drained slopes throughout mainland Nova Scotia and Cape Breton Island.

Since the late 1800’s, American beech trees have been documented suffering from beech bark disease, an infection of fungal pathogens that are able to enter cambium tissue with the help of an invasive scale insect. The invasive leaf-mining weevil (*Orchestes fagi*) is a European insect that has more recently been discovered to be infecting American beech in Nova Scotia, leading to defoliation of trees (Sweeney et al., 2020).

American beech trees were mostly observed within the northern portion of the Study Area (Drawing 12.8), which is dominated by immature tolerant hardwood stands that are mostly comprised of yellow birch. These nutrient rich stands provide suitable habitat for American beech regeneration in the understory (Neily et al., 2022). American beech was abundant throughout the Study Area, found mostly within tolerant hardwood forest stands. Most observations consisted of multiple individuals, some of which displayed signs of beech bark disease.

Heart-leaved Foamflower

The heart-leaved foamflower is a herbaceous flowering plant that is a part of the Saxifragaceae family. It is distinct for its finely haired heart-shaped basal leaves, that can be up to 20 cm long. It grows in rich forests across Ontario to Nova Scotia (Hinds, 2000). There were 27 observations of this species, largely dispersed throughout the northern portion of the Study Area. The majority of observations were found in hardwood forest stands.

12.3.3 Lichens

During the field surveys, 58 lichen species were observed within the Project Area (Table 12.7; Drawing 12.8). Two SAR and seven SOCI were identified.

Table 12.7: Lichen Species Identified Within the Project Area

Scientific Name	Common Name	COSEWIC, *SARA*, *ESA*	SRank
Sclerophora peronella	**Frosted glass-whiskers**	**SC**	**S3S4**
Peltigera hydothyria	**Eastern waterfan**	**T**	**S1**
Stereocaulon condensatum	**Granular soil foam lichen**	**-**	**S2S3**
Fuscopannaria sorediata	**A lichen**	**-**	**S2S3**
Heterodermia speciosa	**Powdered fringe lichen**	**-**	**S3S4**
Chaenotheca hispidula	**A lichen**	**-**	**S2S3**
Scytinium subtile	**Appressed jellyskin lichen**	**-**	**S3S4**
Anaptychia palmulata	**Shaggy fringed lichen**	**-**	**S3S4**
Phaeophyscia pusilloides	**Pompom-tipped shadow lichen**	**-**	**S3**
Bacidia schweinitzii	A lichen	-	S5
Cladonia boryi	Fishnet lichen	-	S5
Cladonia crispate	Orangepipe lichen	-	S5
Cladonia cristatella	British soldiers lichen	-	S5
Cladonia macilenta	Lipstick powderhorn lichen	-	S4S5
Cladonia ochrochlora	Smooth-footed powderhorn lichen	-	S5
Cladonia rangiferina	Gray reindeer lichen	-	S5
Cladonia rei	Wand lichen	-	S5

Scientific Name	Common Name	COSEWIC, *SARA, ESA*	SRank
Cladonia squamosa	Dragon lichen	-	S5
Cladonia uncialis	Thorn lichen	-	S5
Cladonia verticillate	Ladder lichen	-	S5
Collema furfuraceum	Blistered tarpaper lichen	-	S5
Dibaeis baeomyces	Pink earth lichen	-	S5
Dolichousnea longissima	Methuselah's beard	-	S4
Evernia mesomorpha	Boral oakmoss lichen	-	S5
Graphis scripta	A lichen	-	S5
Hypogymnia krogiae	Freckled tube lichen	-	S5
Hypogymnia tubulosa	Powder-headed tube lichen	-	S5
Hypogymnia vittate	Slender monk's hood lichen	-	S4
Lepra amara	A lichen	-	S5
Leptogium cyanescens	Blue jellyskin lichen	-	S5
Loxospora ochrophaea	A lichen	-	SU
Melanelixia glabratula	Polished camouflage lichen	-	S4S5
Mycoblastus sanguinarius	Bloody heart lichen	-	SU
Normandina pulchellum	Rimmed elf-ear lichen	-	S4
Ochrolechia androgyna	Crabseye lichen	-	S5
Parmeliella triptophylla	Black-bordered shingles lichen	-	S5
Parmotrema crinitum	Salted ruffle lichen	-	S5
Peltigera aphthosa	Common freckle pelt lichen	-	S5
Peltigera canina	Dog lichen	-	S5
Peltigera evansiana	Peppered pelt lichen	-	S4S5
Phaeophyscia orbicularis	Mealy shadow lichen	-	S4?
Phaeophyscia rubropulchra	Orange-cored shadow lichen	-	S5
Physconia detersa	Bottlebrush frost lichen	-	S4
Platismatia glauca	Varied rag lichen	-	S5
Pseudocyphellaria crocata	Yellow specklebelly Lichen	-	S5
Punctelia rudecta	Rough speckleback lichen	-	S5
Pyxine sorediata	Mustard lichen	-	S5
Ramalina americana	Sinewed ramalina lichen	-	S5
Ramalina dilacerate	Punctured ramalina lichen	-	S5
Ramalina roeseleri	Frayed ramalina lichen	-	S5
Stereocaulon dactylophyllum	Finger foam lichen	-	S5
Tuckermanopsis americana	Fringed wrinkle lichen	-	S5
Tuckermanopsis orbata	Variable wrinkle lichen	-	S5
Umbilicara muhlenbergii	Plated rock tripe	-	S5
Umbilicaria deusta	Peppered rocktripe lichen	-	S4?
Umbilicaria mammulata	Smooth rocktripe lichen	-	S5
Usnea dasopoga	Fishbone beard lichen	-	S5
Usnea strigose	Bushy beard lichen	-	S5

Frosted Glass-whiskers

Frosted glass-whiskers (*Sclerophora peronella – Atlantic pop.*) is listed as Special Concern under *SARA* and COSEWIC. Frosted glass-whiskers belongs to a group known as calicioids or "stubble" lichen, due to their tiny, stalked structures, which are imbedded in substrates. They generally occur on hardwoods, usually on exposed heartwood or living trunks, particularly red maple and yellow birch. It is most often found in mature and old growth coniferous and deciduous forests (COSEWIC, 2005). There were three observations of frosted glass-whiskers in the Lichen Study Area. One observation of abundant stalks was made near proposed WTG7 on the heartwood of a living red maple. An incidental observation was made on the southern side of the Study Area, near an existing road. This observation consisted of around 70 stalks on the lignum of a decorticated hardwood snag. Finally, an observation was made during lichen surveys in the southern end of the Project Area near an existing road, consisting of 50 to 70 stalks on the heartwood of a red maple. Frosted glass-whiskers is included in the At-Risk Lichens – Special Management Practices (NSNRR, 2018a); therefore, a 100 m buffer is recommended.

Eastern Waterfan

Eastern waterfan is listed as Threatened under *SARA*, COSEWIC, and the *ESA*. Eastern waterfan is one of the only foliose lichens in the northeast that always grows submerged in fresh water. It is a medium-sized (2 to 8 cm broad) species with fan-shaped lobes and a brownish to bluish-black upper surface that can range from smooth to warty. The most distinctive feature of this species is the presence of veins on the underside. It often prefers small streams with a steady flow and a rocky bed, and it tends to persist in calm pools adjacent the main flow of a watercourse. There were 25 observations of this species across the Project Area. Eastern waterfan is included in the At-Risk Lichens – Special Management Practices (NSNRR, 2018a); therefore, a 200 m buffer is recommended.

Granular Soil Foam Lichen

The primary thallus of granular soil foam lichen (*Stereocaulon condensatum*) is composed of a crust of granular and warty phylloclades intermixed with rough-surfaced cephalodia that are much darker by contrast. These cephalodia are abundant and rough due to the surface of tiny spines. Apothecia in this species are frequent, very often occurring on the primary thallus. One observation of granular soil foam lichen was found adjacent to an old overgrown resource road on soil along exposed bedrock. This observation is immediately adjacent to wetland (WL) 31. Granular soil foam lichen is not included in the At-Risk Lichens – Special Management Practices (NSNRR, 2018a); therefore, no buffer is required.

Fuscopannaria sorediata

Fuscopannaria sorediata is a grey-brown foliose shingle lichen. It is typically found on deciduous trees such as maple, birch, ash, and oak. It has a small thallus, with convex lobes and a rough upper surface (Jorgensen, 2000). Two observations of this species were made near each other outside of the Study Area, north of WL 73. One observation was made on a red maple, another on a sugar maple. Both hosts were near the top of a steep north-facing incline overlooking a well-entrenched brook. *Fuscopannaria sorediata* is not included in the

At-Risk Lichens – Special Management Practices (NSNRR, 2018a); therefore, no buffer is required.

Powdered Fringe Lichen

Powdered fringe lichen (*Heterodermia speciosa*) is a distinct looking sorediate foliose species whose pale rhizines extend from both marginal and laminal portions of the corticate underside. This species will occur on the bark of hardwoods but has also been found on rocks within its range. Two observations of powdered fringe lichen were found within the Lichen Study Area. One observation of two thalli was found on a red maple, about 130 m southeast of WL 50. Another observation of this species was found on a sugar maple in mature upland hardwood forest, more than 450 m away from the nearest wetland. Powdered fringe lichen is not included in the At-Risk Lichens – Special Management Practices (NSNRR, 2018a); therefore, no buffer is required.

Chaenotheca hispidula

This black stubble lichen has a distinctive yellow pruina around the upper portion of the stalk. The capitulum is orb-like, also holding on its lower side a very dense yellow pruina – which can at times be reddish-brown. One observation of this species was made 24 m south of WL 81 on the bark of an old red oak. *Chaenotheca hispidula* is not included in the At-Risk Lichens – Special Management Practices (NSNRR, 2018a); therefore, no buffer is required.

Appressed Jellyskin Lichen

Appressed jellyskin lichen (*Scytinium subtile*) forms very small, crustose-like cushions with flattened to cylindrical, often dissected, branches. Concave *apothecia* are orange-brown to almost black. It tends to prefer the gaps between bark sections in older hardwoods and has also been observed elsewhere on rotting bark and lignum. Two observations of the species were found in the Lichen Study Area. One observation was made on a red maple, approximately 50 m east of WL 29. The other observation was made on a mature red maple near WC8. Appressed jellyskin lichen is not included in the At-Risk Lichens – Special Management Practices (NSNRR, 2018a); therefore, no buffer is required.

Shaggy Fringed Lichen

The foliose shaggy fringed lichen (*Anaptychia palmulata*) has a green-grey to brownish roseate thallus. The lobe tips are flat to ascended and fan-shaped. Its apothecia are dark brown and epruinose. It can be found on the bark of hardwoods, particularly yellow birch and red maple, but also occurs on white cedar (Hinds & Hinds, 2007). One observation of this species was made on a sugar maple in an upland mixedwood forest more than 150 m northeast of the nearest wetland, WL 5. Shaggy fringed lichen is not included in the At-Risk Lichens – Special Management Practices (NSNRR, 2018a); therefore, no buffer is required.

Pompom-tipped Shadow Lichen

Pompom-tipped shadow lichen has a grey to grey-brown upper surface with elongated and discrete lobes and is typically found on the bark of trees (Nash et al., 2004). One observation of this species was made in the northern end of the Project Area, over 400 m northeast from the nearest wetland, WL 84, consisting of several thalli covering the trunk of an American beech. Pompom-tipped shadow lichen is not included in the At-Risk Lichens – Special Management Practices (NSNRR, 2018a); therefore, no buffer is required.

12.3.4 Fauna

The following sections outline the results from the desktop review and the field surveys completed within the Project Area.

12.3.4.1 Desktop Review

Significant habitats are those habitats that ensure the continued presence and survival of specific species throughout the landscape. Significant habitats can include deer wintering areas, or other areas that have been identified as habitat for rare species or potential habitat for rare species. There are no documented NSNRR significant habitats within the Project Area; the closest significant habitat is located approximately 3 km west of the Project Area (Drawing 12.7).

The Project Area falls within a Mainland Moose concentration area and core habitat[6]. The ACCDC report documents a moose observation 3 km from the Project Area. Bat hibernaculum or bat species occurrence were also documented 4 km east and 4.5 km northeast of the Project Area by the ACCDC report (Appendix E). NSNRR confirmed the occurrence of these site sensitivities within proximity to the Project Area (M. McGarrigle, SAR Biologist, NSNRR, September 7, 2023).

In the 2012 EARD, evidence of Mainland Moose was observed within the Project Area. During late vegetation surveys, scat believed to belong to moose was observed near the a previously proposed location. This is located at the northeast tip of the Gully Lake Wilderness Area, close to the currently proposed WTG-12 (Gunshot). No other evidence of Mainland Moose presence was found during the 2012 EARD field surveys (Stantec, 2012). The 2012 EARD (Stantec, 2012) identified 11 mammals and 10 herptiles within the Project Area through field observations (Table 12.8).

Table 12.8: Species Observed in Support of the 2012 EARD With Updated (January 2024) Conservation Rankings

Scientific Name	Common Name	COSEWIC	*SARA*	*ESA*	SRank
Alces alces americanus	**Mainland moose**	**-**	**-**	**Endangered**	**S1**
Ambystoma malculatum	Yellow spotted salamander	-	-	-	S5
Bufo americanus	American toad	-	-	-	S5
Canis latrans	Eastern coyote	-	-	-	S5
Castor canadensis	American beaver	-	-	-	S5

[6]Under the *ESA*, Core Habitat means specific areas of habitat essential for the long term survival and recovery of Endangered or Threatened species and that are designated as core habitat pursuant to Section 16 or identified in an order made pursuant to Section 18.

Scientific Name	Common Name	COSEWIC	*SARA*	*ESA*	SRank
Hyla crucifer	Spring peeper	-	-	-	S5
Lepus americana	Snowshoe hare	-	-	-	S5
Liochlorophis vernalis	Eastern smooth green snake	-	-	-	S4
Microtus pennsylvanius	Meadow vole	-	-	-	S5
Odocoileus virginianus	White-tailed deer	-	-	-	S5
Plethodon cinereus	Redback salamander	-	--	-	
Rana clamitans	Green frog	-	-	-	S5
Rana palustris	Pickerel frog	-	-	-	S5
Rana sylvatica	Wood frog	-	-	-	S5
Storeria occipitomaculata	Redbelly snake	-	-	-	S5
Thamnophis sirtalis pallidulus	Maritime garter snake	-	-	-	S5
Ursus americanus	American black bear	-	-	-	S5
Vulpes vulpes	Red fox	-	-	-	S5
Zapus hudsonius	Meadow jumping mouse	-	-	-	S5

*Bolded species are SAR/SOCI species observed within the Project Area.
Source: (Stantec, 2012)

12.3.4.2 Field Results

Terrestrial fauna species, including mammal, herpetofauna and insect species, were assessed through incidental wildlife observations and recorded within the Study Area during the biophysical surveys (Table 12.9).

Table 12.9: Confirmed Terrestrial Fauna Species Observed Within the Project Area

Taxon	Scientific Name	Common Name	COSEWIC	*SARA*	*ESA*	SRank
Mammal	*Canis latrans*	Eastern coyote	-	-	-	S5
	Lepus americanus	Snowshoe hare	-	-	-	S5
	Odocoileus virginianus	White-tailed deer	-	-	-	S5
	Tamiasciursus hudsonicus	American red squirrel	-	-	-	S5

None of these species are classified as priority species.

Turtles

No turtles were identified incidentally or during the wetland and watercourse delineation assessments.

Snapping turtles use a variety of habitats; however, their preferred habitat is slow-moving water with a soft mud bottom and dense aquatic vegetation. Hibernation sites are aquatic environments (e.g., lentic, lotic, and mud) where water will not freeze to the bottom, the substrate is a thick layer of mud, and other cover (e.g., large woody debris) is present. Typical nesting habitat includes sand or gravel banks in proximity to water with sparse vegetative cover (ECCC, 2020). None of the watercourses delineated within the Study Area offer suitable overwintering habitat.

The eastern painted turtle occupies slow-moving shallow wetlands and waterbodies with abundant aquatic vegetation and organic substrate. Overwintering habitat includes watercourses or wetlands with shallow water and deep sediment. Eastern painted turtles typically nest in habitats that are open with south-facing slopes that have a sandy loamy and/or gravel substrate (COSEWIC, 2018). Nesting habitat for the species was not identified within the Study Area.

The known distribution for wood turtle and Blanding's turtle is not found in proximity to the Project Area (ECCC, 2012).

Mainland Moose

The PGI survey was completed in snow-free conditions on April 30, 2024. During the survey, 12 transects were completed in overcast 70°C weather conditions (Drawing 11.2). No signs of moose were recorded on any of the transects. Other signs of wildlife observed include White-tailed deer scat along transect 1, 2, 5, 8, and 10. Snowshoe hare scat was observed along transect 5 and Coyote (*Canis latrans*) scat along transect 2 and 5.

Three rounds of winter track surveys were conducted on January 31, February 16, 2024, and March 14, 2024. Biologists followed twelve one-km standardized transects within the Project Area (Drawing 11.2). Table 12.10 outlines the weather conditions and survey results. No signs of Mainland Moose were identified during the winter surveys. Wildlife including Snowshoe hare, American red squirrel (*Tamiasciursus hudsonicus*), and Coyote were observed during surveys.

Table 12.10: Mainland Moose Winter Track Survey Conditions and Results

Survey Dates	Transects Surveyed	Weather Conditions	Moose Observations	Other Wildlife
January 31, 2024	10, 7, 8	Snow Depth: 25 to 30 cm of snow two days prior. Weather conditions: Clear, Sunny, -5^{0} C	No	Snowshoe hares and American red squirrels; Coyote tracks
February 16, 2024	1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12	Snow Depth: 70 to 100 cm of snow three days prior. Weather conditions: Cloudy, -2^{0} C	No	Snowshoe hare scat and tracks; Bobcat, American red squirrel, and Coyote tracks

Survey Dates	Transects Surveyed	Weather Conditions	Moose Observations	Other Wildlife
March 14, 2024	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12	Snow Depth: 5 to 10 cm of snow two days prior. Weather conditions: Clear, 4^0 C	No	Coyote tracks; Snowshoe hare; Grouse

Bats

All bat species found within Nova Scotia have a provincial SRank of S1 or SUB, S1M with Little brown bat, Northern myotis, and Tricolored bat all listed as Endangered under *SARA*.

Several little brown myotis, as well as non-specific bat observations were identified within 10 km while Northern myotis, Tricolored bat, and Hoary bat (*Lasiurus cinereus*) were identified within 100 km of the Project Area by ACCDC. As noted in the ACCDC report (Appendix E), bat species and/or hibernacula are known to occur within 5 km of the Study Area, though given their location sensitivity, further details are not available in the ACCDC report. No potential bat hibernacula were identified during biophysical surveys. Potential roosting habitat (i.e., snags and mature stands) for bats was observed in select sites within the Study Area. No confirmed roosting sites were observed.

The following is a summary of bat acoustic monitoring results. Please refer to the report provided in Appendix G and Drawing 11.2 for more details.

- There are low levels of bat activity across the Project Area. Peak bat activity occurred in early August 2023, with five bat passes recorded in a single night.
- 31 total bat passes were recorded.
- 13 migratory bat species passes were recorded (42%).
- The average total passes per detector night for the Project Area over the entire survey period for all species was 0.03. The average migratory passes per detector night for the Project Area over the entire survey period was 0.01.
- Migratory species or species group comprised 42% of the bat passes recorded. The most common species groups recorded were myotis species (52%), followed by the Hoary bat (35%). Little brown bat, and Silver-haired bat (*Lasionycteris noctivagans*) were also recorded comprising the remaining 13% of bat passes.

12.4 Avifauna

Complete details associated with avian field surveys, including drawings with survey methods and results are outlined in Appendix I and summarized herein.

12.4.1 Field Surveys

Breeding bird surveys in 2023 included 807 individuals being observed, representing 59 species. Canada Warbler, Eastern Wood-Pewee (*Contopus virens*), and Olive-sided Flycatcher were the SAR observed during the breeding season, though none displayed evidence of confirmed breeding. Passerines accounted for 96.1% of the species observed, with Ovenbird (*Seirus aurocapilla*) and White-throated Sparrow (*Zonotrichia albicollis*) as the most common and abundant species (n=74 and 73, respectively). The habitat present within the Project Area is expected to support the breeding of most, if not all, of the species observed throughout the breeding season.

Nightjar surveys in 2023 resulted in no observations of nightjar species. Although Common Nighthawk and Eastern Whip-Poor-Will (*Antrostromus vociferus*) were note observed, it is expected that either species may use the Project Area at certain times of year. Suitable habitat for Common Nighthawk breeding and nesting includes open bogs, grasslands and open areas with low shrub cover, as well as early regeneration clearcuts which were observed throughout the Project Area. Eastern Whip-Poor-Will are found in habitats with moderate tree, shrub, and herbaceous cover, including in some habitats that are found within the Project Area, suggesting it may be present at times, despite not being observed during targeted nightjar surveys.

Fall migration point count surveys in 2023 resulted in observation of 2,160 individuals, representing 86 species. Red Crossbill (*Loxia curvirostra*), Olive-sided Flycatcher, and Evening Grosbeak (*Coccothraustes vespertinus*) were the SAR observed during the fall migration period. Turkey Vulture (*Cathartes aura*) and American Kestrel (*Falco sparverius*) were also observed, though given the seasonality of the observations, they are not considered priority species. Passerines were once again the most common species group, totaling 91.3% of species observed. American Robin (*Turdus migratorius*) (n=199), American Goldfinch (*Spinus tristis*) (n=197), and Golden-crowned Kinglet (n=181) were the most common and abundant birds observed.

During 2023 fall migration DWC surveys, 378 individuals were observed, representing 42 species, none of which were SAR. Of the two locations where surveys were conducted, 39 species were observed at DWC 1, while only 15 were observed at DWC 2. This variation is expected to be in part due to the variety of habitats observed from DWC 1, including transitional habitats and open water. Passerines were again the most common species group, accounting for 84.5% of all species observed, with Blue Jay (*Cyanocitta cristatat*a) as the most common species (n=68).

Spring migration point count (2024) surveys resulted in observation of 3,762 individuals, representing 91 species. Evening Grosbeak, Rusty Blackbird (*Euphagus carolinus*), Olive-sided Flycatcher and Red Crossbill were the four SAR observed, though none displayed any confirmation of breeding. Passerines comprised 92.3% of all species observed, with American Robin (n = 669) as the most abundant species overall.

Spring migration DWC surveys completed in 2024 resulted in observation of 625 individuals, representing 50 species. Of those 50 species, none were SAR, and no breeding evidence for any species was observed. The largest flock observed was that of 10 American Robin. The only non-native species observed was the European Starling (*Sturnus vulgaris*). Passerines accounted for 83.7% of all species observed, with American Robin (n=98) and American Crow (*Corvus brachyrhynchos*) (n=57) as the two most abundant species.

Across all seasons and surveys, 7,683 individuals comprising 117 species were observed throughout the more than 100 hours of avian survey time within the Project Area and nearby habitats. Of those, passerines made up more than 80% of the individuals observed across 72 species. Most individuals were observed at a height of under 100 m.

Six avian SAR were observed during baseline surveys:

- Canada Warbler
- Eastern Wood-Pewee
- Evening Grosbeak
- Olive-sided Flycatcher
- Red Crossbill
- Rusty Blackbird

Each of the avian SAR were observed in low numbers (Canada Warbler was most common; n=8), with most individuals being observed during the breeding season. No common Nighthawk nor Eastern Whip-Poor-Will were observed during targeted nightjar surveys.

Eighteen SOCI were observed during all surveys, with Boreal Chickadee (*Poecile hudsonicus*) as the most abundant (n=53).

The location with the highest species diversity in the spring and fall surveys was PC 37, with 54 and 40 different species during each season respectively. This is generally attributed to the diversity of habitats observable from the point count location, as there is wetland, open water, mixedwood, and clearcut all nearby.

Refer to Appendix I for detailed results of avian field surveys.

12.4.2 Radar and Acoustic Monitoring

Radar monitoring during spring migration was completed over 54 nights in 2022 (April 15 to June 8) and 62 nights in 2023 (April 7 to June 8), totaling approximately 980 hours of recording. During fall migration, radar monitoring was conducted for 138 nights in 2022 (July 15 to November 30), and 131 nights in 2023 (July 15 to November 22), totaling approximately 2,880 hours of recording. There were some weather events that prevented data collection; however, uptime was observed to be very good at 98% in the spring and 97% in the fall.

More than 40,000 targets were detected below 200 m during the fall 2023 monitoring period: a significant increase of approximately 60% over the 2022 results (approximately 25,000 targets detected). While it is not clear why this difference in low-altitude target abundance occurred, it could be related to a variety of factors. In comparison, both the 2022 and 2023 spring migration monitoring periods detected approximately 15,000 targets below 200 m each period, respectively.

During each of the four monitoring periods, most radar targets detected were above the rotor-swept zone; however, the highest concentration of targets (for any 200 m band of airspace) was below 200 m altitude. While migratory flight height can be highly dependent on weather patterns, it was observed that target height (and therefore migratory flight height) was slightly higher in the 2022 fall migration period than it was in 2023, when there was more inclement weather. It was also observed that across all datasets, stronger headwinds (compared to the prevailing migratory direction) resulted in lower target heights.

Acoustic monitoring was conducted for the spring migration period between April 19 and June 8, 2022, and then again from April 3 to May 9, 2023. During fall migration, monitoring was conducted between July 14 and November 4, 2022, and again from July 7 to November 3, 2023. A varying number of units were deployed during each season monitored, contributing to variances in the total number of calls detected between the seasons (Table 12.11).

Table 12.11: Seasonality and Total Number of Nocturnal Flight Calls Detected by Year

Season	2022	2023
Spring Migration	2,715	1,283*
Fall Migration	28,407	29,501

*Only two monitors recorded successfully from April 3 to May 9, with 10 monitors recording successfully for the remainder of the season.

Throughout all seasons, most NFCs were from passerine species, with only a small percentage being shorebird species. Canada Warbler was the only SAR species observed during the acoustic monitoring, representing no more than 3% of all nocturnal calls during a given season.

Refer to Appendix H for detailed results of the radar and avian acoustic monitoring programs.

12.5 Aquatic

12.5.1 Wetlands

The following sections outline the wetland findings from the desktop review and field surveys within the Study Area.

12.5.1.1 Desktop Review

A review of the NSECC Wetlands Inventory Database identified six mapped wetlands within the Study Area (ID# 87397, 87634, 87628, 87604, 35073, and 13294, shown on Drawing 11.3).

The provincial WAM Database identifies areas within the Study Area that have modelled water table depth ranges varying from 0 to 10.0 m below ground surface. Wet areas with a depth to water table <2.0m from the surface are commonly associated with field mapped wetlands and watercourses. A modelled depth to water table of <2.0 m from the surface is present across the Study Area in low areas of land between the Cobequid Hills (Drawing

11.3). These areas are predominantly modelled along access roads and collector lines within the Study Area.

There are no NSECC WSS mapped within the Study Area. Gully Lakes Wilderness Area, which is located directly west of the Study Area, contains multiple WSS, none of which fall within the Study Area (Drawing 11.3). The Study Area does not include any RAMSAR sites, Provincial Wildlife Management Areas, Provincial Parks, Nature Reserves, and any known lands owned or legally protected by non-governmental charitable conservation land trusts, intact or restored wetlands under the North American Waterfowl Management Plan, or PWAs.

The 2012 EARD (Stantec, 2012) included 161 assessed wetlands within the Study Area. Wetlands in the 2012 EARD were either delineated in field assessments or using aerial imagery. No wetland functional assessments were completed. Wetland types included coniferous tree swamp, mixedwood tree swamp, tall shrub swamp, low shrub swamp, treed bog, shallow water wetland, fresh marsh, wet meadow, and deciduous treed swamp (Stantec, 2012). No wetlands were identified as possible WSS in the 2012 EARD.

12.5.1.2 Field Surveys

A total of 89 wetlands were delineated within the current Study Area (which varies from the 2012 EARD Study Area described above), consisting of 81 swamps, two marshes, one fen, and five wetland complexes made up of a combination of bog, swamp, fen, and marsh classes (Drawing 12.9). The total delineation wetland area is 30.68 ha, which represents approximately 5.2% of the Study Area. A summary of Project wetlands, including type, area, dominant flow path, landform, hydric soil indicators, hydrological conditions, and dominant vegetation, is provided in Table 12.12.

Table 12.12: Wetland Delineation Summary

Wetland ID	Wetland Type	Area (ha)	Water Flow Path	Landform	Soil	Hydrology	Dominant Vegetation
1*	Complex: Swamp/ Treed bog	0.516	Outlet	Basin	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3), Aquatic Fauna (B13) Hydrogen Sulfide Odor (C1)	Herbs: *Doellingeria umbellata, Typha angustifolia, Osmundastrum cinnamomeum* Shrubs: *Picea mariana, Acer rubrum.* Trees*: Abies balsamea, Acer rubrum, Picea mariana*
2	Treed Swamp	0.061	Outlet	Sloped	Histosol (A1)	High Water Table (A2), Saturation (A3), Iron Deposits (B5), Recent Iron Reduction in Tilled Soils (C6)	Herbs: *Onoclea sensibilis, Ranunculus repens, and Typha angustifolia.* Shrubs: *Abies balsamea, Acer rubrum, and Betula papyrifera.* Trees: *Abies balsamea, Acer rubrum, Betula papyrifera,*
3	Treed Swamp	0.123	Outlet	Sloped	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3), Hydrogen Sulfide Odor (C1)	Herbs: *Solidago uliginosa var. terrae-novae, Osmundastrum cinnamomeum, Onoclea sensibilis.* Shrubs: *Picea mariana, and Acer rubrum.* Trees: *Abies balsamea, Acer rubrum, Picea mariana*
4*	Fen	3.506	Continuous Throughflow	Sloped	Histosol (A1)	Surface Water (A1), High Water Table (A2), and Saturation (A3)	Herbs: *Solidago rugosa, Cornus canadensis, and Doellingeria umbellata.* Shrubs: *Alnus incana, Picea mariana, and Acer rubrum.* Trees: *Abies balsamea, Acer rubrum, and Picea mariana.*
5*	Complex-Fen/ Swamp	2.155	Continuous Throughflow	Hillslope	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3), Water marks (B1), Water-Stained Leaves (B9)	Herbs: *Maianthemum canadense, Carex trisperma, and Osmundastrum cinnamomeum.* Shrubs: *Acer rubrum, Picea mariana, and Tsuga canadensis.* Trees: *Acer rubrum, Tsuga canadensis, Betula alleghaniensis, and Picea mariana*
6*	Treed Swamp	0.217	Isolated	Hillslope	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3), Water marks (B1), Water-Stained Leaves (B9)	Herbs: *Maianthemum canadense, Carex trisperma, and Osmundastrum cinnamomeum.* Shrubs: *Acer rubrum, Picea mariana, and Tsuga canadensis.* Trees: *Acer rubrum, Tsuga canadensis, and Betula alleghaniensis*
7	Shrub Swamp	0.034	Inlet	Basin	Histosol (A1)	Surface Water (A1), Saturation (A3), Water-Stained Leaves (B9)	Herbs: *Impatiens capensis, and Onoclea sensibilis.* Shrubs: *Alnus incana, Acer rubrum.* Trees: *Alnus incana, and Acer rubrum*
8	Treed Swamp	0.029	Continuous Throughflow	Hillslope	Histosol (A1)	Surface Water (A1), Saturation (A3), Water-Stained Leaves (B9)	Herbs: *Osmundastrum cinnamomeum, Onoclea sensibilis, Carex trisperma.* Shrubs: *Betula alleghaniensis.* Trees: Betula alleghaniensis
9	Shrub Swamp	0.298	Discontinuous Throughflow	Basin	Depleted Matrix (F3)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Ranunculus Repens, Osmundastrum cinnamomeum, Glyceria striata* Shrubs: *Picea mariana, Betula alleghaniensis, Abies balsamea* Trees: *Picea mariana, Acer rubrum, Betula alleghaniensis, Abies Balsamea*
10*	Treed Swamp	0.021	Inlet	Basin	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Osmundastrum cinnamomeum, Onoclea sensibilis, Carex trisperma.* Shrubs: *Betula alleghaniensis.* Trees*: Betula alleghaniensis, Abies balsamea, and Acer rubrum,*
11	Shrub Swamp	0.048	Outlet	Basin	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Onoclea sensibilis.* Shrubs: *Alnus incana*
12*	Shrub Swamp	0.454	Discontinuous Throughflow	Basin	Histosol (A1)	High Water Table (A2), Saturation (A3) and Geomorphic Position (D2)	Herbs: *Ranunculus repens, Osmundastrum cinnamomeum,* and *Juncus effusus* Shrubs: *Betula alleghaniensis* and *Abies balsamea.* Trees: *Picea mariana, Acer rubrum,* and *Betula alleghaniensis.*
13*	Treed Swamp	0.612	Discontinuous Throughflow	Sloped	Histic Epipedon (A2)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs*: Juncus effusus, Scirpus cyperinus,* and *Glyceria striata.* Shrubs: *Betula alleghaniensis.* Trees: *Betula alleghaniensis, Acer rubrum,* and *Picea mariana.*
14	Treed Swamp	0.114	Isolated	Floodplain	Sandy Mucky Mineral (S1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Glyceria striata, Juncus effusus, and Doellingeria umbellata,* Shrubs: *Abies balsamea,* and *Acer rubrum* Trees: *Abies balsamea, Acer rubrum,* and *Betula alleghaniensis*

Wetland ID	Wetland Type	Area (ha)	Water Flow Path	Landform	Soil	Hydrology	Dominant Vegetation
15	Shrub Swamp	0.089	Isolated	Basin	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Osmundastrum cinnamomeum, Onoclea sensibilis,* and *Doellingeria umbellata,* Shrubs: *Picea mariana, Acer rubrum,* and *Betula alleghaniensis* Trees: *Picea mariana, Acer rubrum, Betula alleghaniensis*
16*	Treed Swamp	1.137	Isolated	Basin	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Osmundastrum cinnamomeum, Onoclea sensibilis, Rubus hispidus,* and *Solidago uliginosa* Shrubs: *Picea mariana, Acer rubrum,* and *Betula alleghaniensis* Trees: *Picea mariana, Acer rubrum, Betula alleghaniensis*
17	Shrub Swamp	0.049	Isolated	Sloped	Depleted Matrix (F3)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Scirpus cyperinus, Glyceria striata, Ranunculus Repens, Onoclea sensibilis.* Shrubs: *Picea mariana, Betula alleghaniensis, and Abies balsamea.* Trees: *Picea mariana, Acer rubrum, and Betula alleghaniensis.*
18	Treed Swamp	0.124	Isolated	Basin	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3), Hydrogen Sulfide Odor (C1)	Herbs: *Osmundastrum cinnamomeum, Onoclea sensibilis, Thelypteris noveboracensis, Rubus hispidus, Cornus canadensis.* Shrubs: *Abies balsamea.* Trees: *Abies balsamea, Acer rubrum, Betula papyrifera, and Betula alleghaniensis*
19	Treed Swamp	0.194	Isolated	Basin	Histic Epipedon (A2)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Glyceria canadensis, Osmunda cinnamomeum, Onoclea sensibilis, Rubus hispidus, Aster sp.* Shrubs: *Ilex verticillata, and Abies balsamea* Trees: *Betula alleghaniensis, Acer rubrum, and Picea mariana*
20*	Treed Swamp	0.038	Isolated	Basin	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Doellingeria umbellata, Onoclea sensibilis, Carex intumescens, Osmundastrum cinnamomeum.* Shrubs*: Viburnum nudum.* Trees: *Abies balsamea, Acer rubrum, and Picea mariana*
21	Treed Swamp	0.057	Isolated	Basin	Histosol (A1), Hydrogen Sulfide (A4)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Osmundastrum cinnamomeum, Onoclea sensibilis, Doellingeria umbellata, Ranunculus repens, Solidago canadensis.* Shrubs: *Viburnum nudum,* and *Abies balsamea.* Trees: *Betula alleghaniensis, Acer rubrum, and Abies balsamea.*
22	Treed Swamp	0.030	Isolated	Basin	Histosol (A1), Hydrogen Sulfide (A4)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Onoclea sensibilis, Osmundastrum cinnamomeum, Carex trisperma,* and *Cornus canadensis.* Shrubs: *Abies balsamea,* and *Acer rubrum* Trees: *Abies balsamea, Acer rubrum, Betula papyrifera*
23*	Treed Swamp	0.119	Continuous Throughflow	Basin	Histosol (A1), Hydrogen Sulfide (A4)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs*: Carex stricta, Juncus effusus,* and *Osmundastrum cinnamomeum.* Shrubs: *Abies balsamea, and Picea mariana*
24	Treed Swamp	0.066	Outlet	Basin	Histosol (A1), Hydrogen Sulfide (A4)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Glyceria canadensis, Rubus hispidus, Onoclea sensibilis.* Trees: *Abies balsamea,* and *Betula populifolia*
25	Treed Swamp	0.099	Isolated	Basin	Histosol (A1),	High Water Table (A2), Saturation (A3)	Herbs: *Ranunculus repens, Impatiens capensis, Osmundastrum cinnamomeum.* Shrubs*: Abies balsamea,* and *Betula papyrifera.* Trees: *Acer rubrum, Betula papyrifera, and Betula alleghaniensis*
26	Shrub swamp	0.151	Isolated	Basin	Histosol (A1), Hydrogen Sulfide (A4)	High Water Table (A2), Saturation (A3)	Herbs: *Ranunculus repens, Carex trisperma, Impatiens capensis, Onoclea sensibilis.* Shrubs: *Abies balsamea,* and *Picea rubens* Trees: *Acer rubrum, Betula papyrifera, Betula alleghaniensis, Abies balsamea, Picea mariana*

Wetland ID	Wetland Type	Area (ha)	Water Flow Path	Landform	Soil	Hydrology	Dominant Vegetation
27*	Shrub swamp	0.194	Isolated	Basin	Histosol (A1), Hydrogen Sulfide (A4)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Juncus effusus, Dryopteris cristata, Scirpus cyperinus, Doellingeria umbellata* Shrubs: *Abies balsamea*, and *Picea mariana* Trees: *Picea mariana*
28*	Shrub Swamp	0.093	Isolated	Basin	Histosol (A1), Hydrogen Sulfide (A4)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Juncus effusus, Doellingeria umbellata, and Solidago uliginosa.* Shrubs: *Abies balsamea*, and *Picea mariana.* Trees: *Picea mariana*
29*	Treed Swamp	0.747	Isolated	Sloped	Depleted Matrix (F3)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Glyceria striata, Viola cucullata, and Solidago rugosa* Shrubs: *Abies balsamea, and Acer spicatum* Trees: *Abies balsamea, and Betula alleghaniensis*
30*	Shrub Swamp	0.088	Isolated	Basin	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Scirpus cyperinus, and Fragaria virginiana.* Shrubs: *Populus tremuloides* Trees: *Populus tremuloides, and Abies balsamea*
31*	Shrub Swamp	0.181	Isolated	Flat	Histic Epipedon (A2)	High Water Table (A2), Saturation (A3)	Herbs: *Doellingeria umbellata, Carex crinita, Osmundastrum cinnamomeum.* Shrubs; *Acer spicatum, and Betula alleghaniensis* Trees: *Abies balsamea, and Acer rubrum*
32*	Treed Swamp	0.455	Isolated	Sloped	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Carex trisperma, and Osmundastrum cinnamomeum.* Shrubs: *Abies balsamea*
33*	Shrub Swamp	0.064	Continuous Throughflow	Floodplain	Red Parent Material (TF2)	Surface Water (A1), High Water Table (A2), Saturation (A3	Herbs: *Glyceria striata, Carex crinita, and Osmundastrum cinnamomeum* Shrubs: *Abies balsamea* Trees: *Acer saccharum*
34	Shrub Swamp	0.055	Isolated	Sloped	Redox Dark Surface (F6)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Juncus effusus, and Amauropelta noveboracensis* Shrubs: *Betula alleghaniensis, Acer saccharum, and Abies balsamea*
35*	Treed Swamp	0.164	Isolated	Sloped	Depleted Matrix (F3)	Surface Water (A1), High Water Table (A2), Saturation (A3	Herbs: *Onoclea sensibilis, Fragaria virginia, and Scirpus cyperinus.* Shrubs: *Acer saccharum.* Trees: *Betula alleghaniensis, and Acer saccharum.*
36	Treed Swamp	0.196	Isolated	Flat	Histic Epipedon (A2)	Surface Water (A1), High Water Table (A2), Saturation (A3	Herbs: *Thelypteris palustris, and Cornus canadensis.* Trees: *Betula alleghaniensis, and Abies balsamea*
37*	Treed Swamp	0.090	Isolated	Basin	Histic Epipedon (A2)	High Water Table (A2), Saturation (A3)	Herbs: *Glyceria striata, and Solidago canadensis.* Shrubs: *Abies balsamea, and Acer spicatum* Trees: *Betula alleghaniensis, and Abies balsamea*
38*	Open graminoid swamp	0.163	Isolated	Basin	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Glyceria striata, Glyceria canadensis, and Onoclea sensibilis* Shrubs: *Abies balsamea*
39*	Shrub Swamp	0.155	Discontinuous Throughflow	Floodplain	Histic Epipedon (A2)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Osmundastrum cinnamomeum, and Glyceria striata.* Shrubs: *Alnus incana* Trees: *Betula alleghaniensis, and Abies balsamea*
40	Open Graminoid Swamp	0.060	Isolated	Sloped	Histic Epipedon (A2)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: Glyceria canadensis, Scirpus cyperinus, and Viola cucullate Shrubs: *Betula alleghaniensis, and Abies balsamea* Trees: *Acer rubrum, and Picea mariana*
41	Open graminoid swamp	0.066	Isolated	Basin	Histic Epipedon (A2)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Glyceria canadensis, Scirpus cyperinus, viola cucullata* Trees: *Betula alleghaniensis, Abies balsamea, Fagus grandifolia*
42*	Open graminoid marsh	0.085	Discontinuous Throughflow	Basin	Depleted Matrix (F2)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Dryopteris cristata, Scirpus cyperinus* Shrubs: *Abies Balsamea*
43*	Open graminoid marsh	0.073	Isolated	Basin	Depleted Matrix (F2)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Doellingeria umbellata, Impatiens capensis*, and *Carex crinita*

Wetland ID	Wetland Type	Area (ha)	Water Flow Path	Landform	Soil	Hydrology	Dominant Vegetation
44	Open graminoid Swamp	0.207	Continuous Throughflow	Basin	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Euthamia graminifolia, Viola cucullata, and Persicaria sagittate.* Shrubs: *Abies balsamea.* Trees: *Picea mariana, and Abies balsamea*
45	Shrub Swamp	1.614	Continuous Throughflow	Basin	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Parathelypteris noveboracensis, Juncus effusus, Carex trisperma* Shrubs: *Betula alleghaniensis, Picea mariana, Abies balsamea, Alnus incana* Trees: *Betula alleghaniensis, Picea mariana*
46*	Shrub Swamp	0.264	Discontinuous Throughflow	Basin	Histic Epipedon (A2)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Carex crinita, Carex Stricta, Rubus pubescens* Shrubs: *Betula alleghaniensis, Abies balsamea, Alnus incana* *Trees: Betula alleghaniensis, Abies balsamea*
47	Treed Swamp	0.032	Isolated	Basin	Depleted Matrix (F3)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs*: Acer spicatum, Salix sp.* Trees: *Betula alleghaniensis, and Abies balsamea*
48*	Shrub Swamp	0.079	Isolated	Basin	Depleted Matrix (F3)	Surface Water (A1), High Water Table (A2), Saturation (A3), Moss trim Lines (B16), (Geomorphic Position (D2)	Herbs: *Osmundastrum cinnamomeum, Ranunculus repens, Glyceria striata, Doellingeria umbellata.* Shrubs: *Abies balsamea, and Alnus incana* Trees: *Acer rubrum, and Betula papyrifera*
49*	Shrub Swamp	0.028	Isolated	Sloped	Depleted Matrix (F3)	High Water Table (A2), Saturation (A3)	Herbs: *Osmundastrum cinnamomeum, Glyceria striata, and Ranunculus repens.* Shrubs: *Abies balsamea.* Trees: *Picea mariana, and Abies balsamea.*
50	Treed Swamp	0.022	Isolated	Flat	Histosol (A1)	High Water Table (A2), Saturation (A3)	Herbs*: Juncus effusus, Carex intumescens, Scirpus cyperinus, and Thelypteris palustris,* Shrubs*: Abies balsamea, Betula alleghaniensis, and Doellingeria umbellata* Trees: *Betula alleghaniensis, and Abies balsamea*
51	Treed Swamp	0.031	Isolated	Basin	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Osmundastrum cinnamomeum, and Amauropelta noveboracensis.* Shrubs: *Abies balsamea.* Trees: *Betula alleghaniensis, and Abies balsamea.*
52	Shrub Swamp	0.018	Isolated	Basin	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Cornus canadensis, Rubus pubescens, Aster sp.* Trees: *Abies balsamea, Ilex mucronata*
53*	Treed Swamp	0.068	Isolated	Basin	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Osmundastrum cinnamomeum, Aster sp. Cornus canadensis, and Onoclea sensibilis.* Shrubs: *Betula alleghaniensis.* Trees: *Betula alleghaniensis, Abies balsamea, and Acer saccharum.*
54*	Treed Swamp	0.032	Isolated	Basin	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3), Hydrogen Sulfide odor (C1)	Herbs: *Osmundastrum cinnamomeum, Geum macrophyllum, Aster sp. Dryopteris cristata.* Shrubs: *Betula alleghaniensis, and Abies balsamea.* Trees: *Betula alleghaniensis, Abies balsamea, and Acer saccharum.*
55*	Shrub Swamp	0.179	Continuous Throughflow	Sloped	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3), Geomorphic Position (D2)	Herbs: *Carex trisperma, Scirpus cyperinus, Glyceria striata.* Shrubs: *Betula alleghaniensis, and Salix bebbiana.* Trees: *Betula alleghaniensis, Abies balsamea, and Acer rubrum*
56*	Treed Swamp	0.449	Discontinuous Throughflow	Basin	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Dryopteris carthusiana, and Glyceria striata.* Shrubs: *Betula alleghaniensis, Alnus incana, and Viburnum nudum.* Trees: *Picea mariana, Abies balsamea, and Betula alleghaniensis*
57	Treed Swamp	0.030	Isolated	Basin	Histic Epipedon (A2)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Glyceria striata, Thelypteris palustris, Dryopteris carthusiana, and Thelypteris noveboracensis.* Shrubs: *Betula alleghaniensis, and Abies balsamea,* Trees: *Betula alleghaniensis, Abies balsamea, and Acer saccharum.*

Wetland ID	Wetland Type	Area (ha)	Water Flow Path	Landform	Soil	Hydrology	Dominant Vegetation
58*	Treed Swamp	1.167	Continuous Throughflow	Basin	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs*: Glyceria striata, Dryopteris carthusiana, and Osmundastrum cinnamomeum.* Shrubs: *Abies balsamea, Alnus incana, and Acer rubrum.* Trees: *Abies balsamea*
59*	Complex: Fen/ Tree Swamp	1.056	Continuous Throughflow	Basin	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Glyceria canadensis, and Juncus effusus.* Shrubs: *Acer saccharum, Alnus incana, and Picea mariana.* Trees: *Betula alleghaniensis, Acer saccharum, and Picea mariana*
60*	Treed Swamp	0.145	Isolated	Basin	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Juncus effusus, Glyceria striata, and Osmundastrum cinnamomeum.* Shrubs: *Betula alleghaniensis, Abies balsamea, and Alnus incana.* Trees: *Betula alleghaniensis, and Picea mariana*
61*	Treed Swamp	0.447	Isolated	Basin	Histic Epipedon (A2)	Surface Water (A1), High Water Table (A2)	Herbs: *Betula alleghaniensis, Abies balsamea, Kalmia angustifolia, Aster sp.* and *Osmundastrum cinnamomeum.* Shrubs: *Betula alleghaniensis*, and *Abies balsamea.* Trees: *Betula alleghaniensis, and Abies balsamea.*
62*	Shrub Swamp	0.045	Isolated	Basin	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Onoclea sensibilis, Cornus canadensis, Osmundastrum cinnamomeum, and Dryopteris carthusiana.* Shrubs: *Abies balsamea*, and *Alnus incana.* Trees: *Betula alleghaniensis*, and *Abies balsamea*
63*	Treed Swamp	0.177	Continuous Throughflow	Basin	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Cornus canadensis, Dryopteris carthusiana and Ranunculus repens.* Shrubs: *Acer rubrum*, and *Betula alleghaniensis.* Trees: *Betula alleghaniensis*, and *Abies balsamea*
64*	Treed Swamp	0.069	Isolated	Basin	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Dryopteris carthusiana, Ranunculus repens, Glyceria melicaria*, and *Rubus pubescens* Shrubs: *Abies balsamea.* Trees: *Betula alleghaniensis, and Abies balsamea*
65	Treed Swamp	0.020	Isolated	Sloped	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Osmundastrum cinnamomeum, Aster spp., Rubus pubescens*, and *Glyceria melicaria.* Shrubs: *Abies balsamea.* Trees: *Betula alleghaniensis, and Abies balsamea*
66	Shrub Swamp	0.290	Outlet	Sloped	Depleted Matrix (F3)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Dryopteris intermedia, Glyceria striata,* and *Osmundastrum cinnamomeum.* Shrubs: *Abies balsamea.* Trees: *Picea rubens, Acer rubrum, and Betula alleghaniensis*
67*	Treed Swamp	0.157	Isolated	Sloped	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Dryopteris carthusiana, and Osmundastrum cinnamomeum.* Shrubs: *Abies incana, and Abies balsamea.* Trees: *Betula alleghaniensis, and Abies balsamea*
68*	Shrub Swamp	0.366	Isolated	Basin	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Scirpus cyperinus, and Carex crinita.* Shrubs: *Chamaedaphne calyculaya.* Trees: *Picea rubens, and Betula alleghaniensis*
69*	Shrub Swamp	0.493	Outlet	Basin	Depleted Matrix (F3)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Osmundastrum cinnamomeum, Glyceria striata, and Chrysosplenium americanum.* Shrubs: *Alnus incana.* Trees: *Picea rubens, and Betula alleghaniensis*
70*	Complex: Marsh/Shrub Swamp	1.057	Isolated	Basin	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Scirpus cyperinus, and Glyceria striata.* Shrubs: *Alnus incana.* Trees: *Abies balsamea*
71	Treed Swamp	0.111	Isolated	Basin	Depleted Matrix (F3)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Scirpus cyperinus, Thelypteris noveboracensis, and Doellingeria umbellata.* Trees: *Acer rubrum, Betula alleghaniensis, and Picea mariana*

Wetland ID	Wetland Type	Area (ha)	Water Flow Path	Landform	Soil	Hydrology	Dominant Vegetation
72*	Treed Swamp	0.371	Outflow	Sloped	Histic Epipedon (A2)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Symphyotrichum lateriflorum, and Symphyotrichum puniceum.* Shrubs: *Acer rubrum.* Trees: *Picea rubens, and Acer rubrum*
73*	Complex: Fen/Shrub Swamp	0.938	Continuous Throughflow	Floodplain	Histosol (A1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Glyceria canadensis, Scirpus cyperinus, and Persicaria sagittata.* Shrubs: *Alnus incana* Trees: *Picea rubens*
74	Shrub Swamp	0.014	Isolated	Basin	Histosol (A1)	High Water Table (A2), Saturation (A3), Geomorphic Position (D2)	Herbs: *Scirpus cyperinus.* Shrubs: *Alnus incana, and Betula papyrifera.*
75*	Treed Swamp	0.232	Isolated	Basin	Histosol (A1)	High Water Table (A2), Saturation (A3), Geomorphic Position (D2)	Herbs: *Scirpus cyperinus, Osmundastrum cinnamomeum, Eriophorum sp.* Shrubs: *Ilex mucronata, Alnus incana* Trees: *Picea rubens, Acer rubrum, and Betula alleghaniensis*
76	Treed Swamp	0.077	Isolated	Basin	Histic Epipedon (A2)	High Water Table (A2), Saturation (A3), Geomorphic Position (D2) Stunted or Stressed Plants (D1)	Herbs: *Scirpus cyperinus, and Dryopteris intermedia.* Trees: *Picea rubens, Acer rubrum, and Abies balsamea*
77*	Treed Swamp	1.794	Isolated	Basin	Histic Epipedon (A2)	Surface Water (A1), High Water Table (A2), Saturation (A3), Geomorphic Position (D2)	Herbs: *Dryopteris intermedia, and Thelypteris noveboracensis.* Shrubs: *Abies balsamea.* Trees: *Picea rubens, Acer rubrum, and Betula alleghaniensis*
78	Treed Swamp	0.032	Isolated	Basin	Histic Epipedon (A2)	High Water Table (A2), Saturation (A3),	Herbs: *Dryopteris intermedia, Glyceria striata, and Ranunculus Repens.* Shrubs: *Betula alleghaniensis* Trees: *Acer rubrum, and Betula papyrifera*
79*	Treed Swamp	2.333	Discontinuous Throughflow	Sloped	Histic Epipedon (A2)	High Water Table (A2), Saturation (A3),	Herbs: *Doellingeria umbellata, Scirpus cyperinus, and Thelypteris noveboracensis*. Shrubs: *Betula alleghaniensis* Trees: *Picea rubens, Acer rubrum, Betula alleghaniensis*
80	Shrub Swamp	0.087	Continuous Throughflow	Floodplain	Depleted Matrix (F3)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Typha latifolia, Scirpus cyperinus, and Ranunculus Repens.* Shrubs: *Alnus incana, Betula alleghaniensis.* Trees: *Picea rubens*
81	Shrub Swamp	0.034	Isolated	Basin	Histosol (A1)	High Water Table (A2), Saturation (A3)	Herbs: *Osmundastrum cinnamomeum, Scirpus cyperinus, and Doellingeria umbellata.* Shrubs: *Betula alleghaniensis, and Alnus incana* Trees: *Betula alleghaniensis, and Alnus incana*
82	Treed Swamp	0.052	Outflow	Slope	Sandy Mucky Mineral (S1)	Surface Water (A1), High Water Table (A2), Saturation (A3), Sparsely Vegetated Concave Surface (B8), Drainage Patterns (B10)	Herbs: *Osmunda claytoniana*, *Dennstaedtia punctilobula*, *Solidago rugosa*, *Doellingeria umbellata*, *Galium palustre* Shrubs: *Acer spicatum*, *Corylus cornuta*, *Acer saccharum* Trees: *Acer saccharum*, *Betula alleghaniensis*, *Abies balsamea*
83*	Treed Swamp	1.339	Continuous Throughflow	Floodplian	Thin Dark Surface (S9)	Saturation (A3), Sparsely Vegetated Concave Surface (B8), Drainage Patterns (B10)	Herbs: *Impatiens capensis*, *Rubus hispudus*, *Carex scabrata*, *Oclemena acuminata*, *Dryopteris intermedia* Shrubs: *Abies balsamea*, *Betula alleghaniensis* Trees: *Betula alleghaniensis*, *Acer saccharum*
84*	Treed Swamp	0.169	Continuous Throughflow	Slope	Hydrogen Sulfide (A4)	Surface Water (A1), High Water Table (A2), Saturation (A3), Hydrogen Sulfide Odor (C1)	Herbs: *Carex scabrata*, *Ranuculus repens*, *Impatiens capensis*, *Viola renifolia* Shrubs: *Abies balsamea*, *Betula alleghaniensis* Trees: *Betula alleghaniensis*, *Fraxinus americana*, *Acer saccharum*
85	Treed Swamp	0.144	Continuous Throughflow	Flat	Depleted Matrix (F3)	Surface Water (A1), High Water Table (A2), Saturation (A3), Hydrogen Sulfide Odor (C1)	Herbs: *Carex scabrata*, *Onoclea sensibilis*, *Ranuculus repens*, *Solidago rugosa* Shrubs: *Acer spicatum*, *Betula alleghaniensis* Trees: *Betula alleghaniensis*, *Acer saccharum*

Wetland ID	Wetland Type	Area (ha)	Water Flow Path	Landform	Soil	Hydrology	Dominant Vegetation
86	Treed Swamp	0.034	Continuous Throughflow	Slope	Histic Epipedon (A2)	Surface Water (A1), High Water Table (A2), Saturation (A3), Drainage Patterns (B10)	Herbs: *Ranuculus repens*, *Viola renifolia*, *Solidago rugosa*, *Onoclea sensibilis*, *Caex crinata* Shrubs: *Abies balsamea*, *Abies balsamea*, *Betula alleghaniensis* Trees: *Abies balsamea*, *Abies balsamea*, *Betula alleghaniensis*
87*	Treed Swamp	0.164	Continuous Throughflow	Floodplain	Sandy Mucky Mineral (S1)	Saturation (A3), Sediment Deposits (B2), Water marks (B1), Water-Stained Leaves (B9), Sparsely Vegetated Concave Surface (B8), Drainage Patterns (B10)	Herbs: *Osmundastrum cinnamomeum*, *Dryopteris intermedia, Caex crinata*, *Thalictrum pubescens*, *Carex gracillima*, *Onoclea sensibilis* Shrubs: *Corylus cornuta*, *Betula alleghaniensis* Trees: *Betula alleghaniensis*
88*	Treed Swamp	0.550	Isolated	Basin	Histosol (A1)	Saturation (A3), Water-Stained Leaves (B9)	Herbs: *Onoclea sensibilis,* *Osmundastrum cinnamomeum, Thelypteris novaboracensis,* *Rubus pubescens, Dryopteris crista,* *Acer rubrum, Carex intumescens* Shrubs: *Abies balsamea, Picea rubens, Betula alleghaniensis* Trees: *Betula alleghaniensis, Abies balsamea, Acer rubrum, Picea mariana*
89*	Treed Swamp	0.392	Continuous Throughflow	Flat	Sandy Mucky Mineral (S1)	Surface Water (A1), High Water Table (A2), Saturation (A3)	Herbs: *Caex crinata, Onoclea sensibilis, Thalictrum pubescens, Solidago canadensis, Rubus hispudus* Shrubs: *Spiraea alba, Salix discolor* Trees: *Abies balsamea*

*Wetland continues beyond the Project Area boundary.

Swamps represent the most abundant wetland class in the Study Area (n=81), accounting for 91% of all wetlands and 69% of total wetland area (Table 12.13). Swamps identified in the Study Area are predominantly mixedwood or deciduous dominant, with few coniferous dominant swamps.

Most swamps delineated within the Study Area (92%) are under one ha in size, and collectively they account for 59% (12.7 ha) of the total wetland area. Approximately 60% of swamps delineated within the Study Area are isolated, 27% contain a throughflow watercourse, 10% have a defined outflow watercourse (e.g., headwater position), and 2% receive surface water through an inflow watercourse but lack a defined outflow within the Study Area.

Three marshes are located within the Study Area and one complex including marsh habitat. These wetlands experience daily fluctuations in water levels and are constantly saturated or semi-permanently flooded (NWWG, 1997). The dominant herbaceous cover is common woolly bulrush (*Scirpus cyperinus*), marsh blue violet (*Viola cucullata),* and Canada manna grass (*Glyceria canadensis*).

One fen (WL 4) is present within the Study Area, accounting for 1% of all wetlands. Additionally, three wetland complexes contain fen habitat (WL 5, 59, 73). There is one complex wetland with a bog component (WL 1). This wetland is relatively small and is less than 1 ha in size. WL 1 is a mixedwood treed bog characterized by an open canopy comprising black spruce, red maple, and balsam fir.

Table 12.13: Summary of Wetland Classes

Wetland Type	Area (ha)	Relative Abundance		
		# of Wetlands	% of all Wetlands	% of all Wetland Area
Swamp	21.293	81	91%	69%
Marsh	0.158	2	2%	1%
Fen	3.506	1	1%	11%
Complex	5.722	5	6%	19%

Of the 89 wetlands delineated within the Study Area, five are wetland complexes consisting of multiple wetland types (WL 1, 5, 59, 70 and 73). Within the Project Area, these complexes are comprised of swamp, fen, marsh, and bog habitats. All five wetland complexes contain swamp habitat. The largest wetland complex is WL 5, which is 2 ha and consists of tree swamp and bog habitats.

12.5.1.3 Functional Assessment

The WESP-AC functional assessment are summarized below, with detailed results provided in Appendix K. No functional WSS were identified through the WESP-AC WSS Interpretation Tool. The raw WESP-AC Excel files can be provided to NSECC upon request.

Hydrologic Group

The Hydrologic Group evaluates the effectiveness of a wetland to store or delay the downslope movement of surface water. However, the model does not account for wetland size, and in turn, the ability of larger wetlands to store more water than smaller wetlands. Wetlands that have the highest functions within this group tend to include those that do not have surface water outlets, and instead, are isolated from flowing surface water.

On average, the functions for the Hydrological Group, for all wetlands, were moderate and the benefits were moderate. Wetlands which received higher function ranks are isolated wetlands, typically in a higher topographic position such as WL15, WL31, and WL 40. These wetlands tend to store water on the landscape more effectively. Lower function wetlands either actively convey water with a throughflow or outflow watercourse such as WL 1, 9, and 33.

Water Quality Group

The Water Quality Group encompasses four different functions: sediment retention and stabilization, phosphorus retention, nitrate removal, and carbon sequestration. The main function of this group is to evaluate the wetland’s potential to intercept, retain, and filter sediments, particulates, and organic matter. Wetlands that have higher functions include those that do not have a surface water outlet, and instead are isolated from flowing surface water. This model does not account for wetland size and as such, larger wetlands do not necessarily score higher than small wetlands, although size may factor into this function.

Wetlands within the Study Area have a higher function rank, on average, for the Water Quality Group. The average benefit rank is moderate. The higher function rank for Water Quality is likely a result of the numerous isolated wetlands that have greater ability to retain and filter particulate and organic matter.

Aquatic Support Group

The Aquatic Support Group comprises four individual functions: stream flow support; aquatic invertebrate habitat; organic nutrient export; and water cooling. The main function of this group is to determine the wetland’s ability to support ecological stream functions that promote habitat health. Wetlands lying adjacent to or containing flowing water score higher than those that do not (e.g., isolated wetlands). In addition, headwater wetlands are crucial for supporting stream flow during the dry season by contributing to water flow via groundwater input and storage capacity.

On average, wetlands scored higher for function and lower for benefit in this group. The higher function score is a result of 33% of wetlands containing throughflow or outlet watercourse, as well as open waterbodies, including WL 23, 24, 46, and 55. Wetlands associated with throughflow watercourses in combination with ponded habitat, support a wider variety of microhabitats for invertebrates, and allow for a greater water cooling and organic nutrient export (WL 23).

Aquatic Habitat Group

The Aquatic Habitat Group encompasses five different functions: anadromous fish habitat, resident fish habitat, amphibian and turtle habitat, waterbird feeding habitat, and waterbird nesting habitat. Wetlands that have the higher functions within this group include those that are adjacent to or contain water features with potential habitat characteristics (e.g., in-stream cover, aquatic vegetation, etc.).

The average ranking for the Aquatic Habitat function is moderate with a higher benefit function. The higher function ranking wetlands are those associated with watercourse systems and open water features, such as WL 4, 23, 24, and 58.

Transition Habitat Group

The Transition Habitat Group comprises three different functions: songbird, raptor, mammal habitat; native plant habitat; and pollinator habitat. The main function of the group is to evaluate the wetland's ability to support healthy habitat for birds, mammals, and native plants.

Due to the location of the Study Area, many wetlands provide relatively remote, undisturbed and unfragmented habitat, resulting in a higher average function and moderate benefit rank for Transitional Habitat. In general, wetlands provide habitat that supports a variety of flora and fauna, which includes specific WESP-AC assessed functions such as downed wood, prevalent ground cover, varied microtopography, tree and shrub cover in and around the wetlands, and naturally vegetated buffer zones. The wetlands have a variety of woody heights and diverse forms, which allows for nesting habitat, perches, and feeding grounds. As such, wetlands within the Study Area generally provide habitat for songbirds, mammals, pollinators, and potentially rare plants.

Wetland Condition

Wetland Condition refers to the integrity or health of a wetland as defined by its vegetative composition and richness of native species. Scores are derived from the similarity between the wetland being evaluated and reference wetlands of the same type and landscape setting (NBDELG, 2018). Only wetland benefits, not functions, are scored in this group.

On average, wetlands had a moderate Wetland Condition rank. Wetlands with moderate to higher ranks contain a relatively successful level of vegetative community health and species diversity. Higher scoring wetlands may have greater ecological integrity, microhabitats, and species diversity (WL 1, 4, and 5). Lower scoring wetlands such as WL 2 and WL 47, may have lost their function and integrity due to historical natural or anthropogenic impacts and may be more susceptible to changes in their surroundings.

Wetland Risk

Wetland Risk takes sensitivity and stressors into account by averaging the two. Sensitivity is the lack of intrinsic resistance and resilience of the wetland to human or naturally caused stress (Niemi et al., 1990). Stress relates to the degree to which the wetland is or has recently been anthropogenically altered in a way that degrades natural condition and/or function.

The functional assessment tool uses five metrics to measure sensitivity: abiotic resistance, biotic resistance, site fertility, availability of colonizers, and growth rate. The model applies four stress groups: hydrologic stress, water quality stress, fragmentation stress, and general disturbance stress. Wetlands that are highly resilient may have lower risk scores despite their exposure to multiple stressors. Additionally, wetlands exposed to fewer threats, but with low resilience may have higher risk scores. Wetland resilience is tied to multiple factors, such as size, proximity to natural land cover, and presence of invasive species.

All but one wetland (WL 82) scored moderate or higher for Wetland Risk, meaning they are generally exposed to pre-existing stressors and/or may be less resilient and susceptible to change. These scores are likely related to the presence of existing roads, historically forested areas, and associated stressors.

Functional Assessment Summary

WESP-AC is a quantitative decision-making tool, but its results must be used qualitatively to form conclusions around wetland functions. The highest functioning wetlands are those that have both higher function and higher benefit scores. No wetlands assessed within the Study Area scored higher in both benefit and function for an individual functional group. The wetlands within the Study Area score higher in function than benefit, likely due to the relatively remote location of the Project.

12.5.1.4 Wetlands of Special Significance

Proposed WSS designation is reviewed in this section based on interpretation of field results and the Nova Scotia Wetland Conservation Policy, and NSECC guidance provided to date. This section provides proposed WSS designations only, as ultimately the WSS determination lies with NSECC.

No functional WSS were identified through the non-tidal WESP-AC WSS Interpretation Tool.

One wetland within the Study Area had field observations of SAR within the wetland boundary. A Canada Warbler was observed incidentally within WL 73 on June 13, 2023, <50 m north of the point count location, indicating it was likely using the margin of the wetland. On June 14, 2023, a Canada Warbler was observed from a point count location within WL 73; however, the location of the Canada Warbler was <100 m south of the point count location, indicating that it was outside of the wetland boundary at the time of detection. No breeding evidence was observed (detection was auditory). WL 73 is a complex with shrub swamp habitat, offering suitable nesting habitat for this species (Drawing 12.9).

A portion of WLs 58 to 61 intersect the Gully Lake Wilderness Area. According to the Nova Scotia Wetland Conservation Policy, wetlands within Protected Areas trigger WSS designation; however, this was clarified by CBC (2023) to include only the portion of the wetland that is within the Protected Area. As a result, only the portions of WL 58 to 61 that overlap the Gully Lake Wilderness Area are considered WSS.

In the 2012 EARD prepared by Stantec, black ash was observed within WL 1. This wetland was assessed for black ash on two separate occasions in summers 2023 and 2024. Strum biologists searched diligently for this species, and found no indication of black ash, living or dead. As described in Section 12.3.2, hydrologic alterations may have occurred since the 2012 observation (not Project related). The wetland currently has standing water, backed up on the west side of the road, which may have made this habitat unsuitable for black ash in the interim years since its observation. As no black ash was observed within this wetland, it does not trigger a WSS designation. A summary of the wetlands identified to have potential WSS triggers is provided in Table 12.14.

Table 12.14: Summary of Wetlands with Expected WSS Trigger

Wetland ID	Wetland & Habitat Available	WSS Trigger
58	Treed Swamp	The portion that is within Gully Lake Wilderness Area
59	Complex: Fen/ Tree Swamp	The portion that is within Gully Lake Wilderness Area
60	Treed Swamp	The portion that is within Gully Lake Wilderness Area
61	Treed Swamp	The portion that is within Gully Lake Wilderness Area
73	Complex; fen and shrub swamp	Canada Warbler observed in suitable habitat

12.5.2 Surface Water, Fish and Fish Habitat

The following sections outline the surface water, fish and fish habitat findings from the desktop review and field surveys.

The Fish Study Area is predominantly within the River John primary watershed (1DO), with portions of the Project Area within the Salmon/Debert River primary watershed (1DH) and the eastern most road within the East/Middle/West River primary watershed (1DP). The River John primary watershed within the Fish Study Area is subdivided into two secondary watersheds: River John (1DO-4) and Waugh River (1DO-3) secondary watersheds. The Salmon River secondary watershed (1DH-6) is the only secondary watershed within the Salmon/Debert primary watershed that the Project Area is within. The West River Pictou secondary watershed (1DP-1) makes up the eastern edge of the Project Area and is the only secondary watershed within the East/Middle/West River Primary watershed (Drawing 11.4).

The Project Area is characterized by a series of topographical highs (predominantly the Cobequid Mountains) that generates a division in flow, with surface water on the north of the mountain draining towards the Northumberland Strait and surface water on the south generally draining towards the Bay of Fundy. As the Fish Study Area is mainly situated to the north of the Cobequid mountains and other topographical highs, most of the surface water originating within the Fish Study Area is expected to drain north to the Northumberland Strait.

Seven priority fish species may occur within the Fish Study Area (Appendix E):

- Atlantic salmon, Inner Bay of Fundy population (*Salmo salar*; COSEWIC & *SARA* Endangered, S1)
- Atlantic salmon, Gaspe Southern Gulf of St. Lawrence Population (COSEWIC Special Concern, S1)
- American eel (*Anguilla rostrata*; COSEWIC Threatened, S5)
- Brook stickleback (*Culaea inconstans*; S3)
- Northern pearl dace (*Margariscus nachtriebi*; S3)
- Striped bass – Bay of Fundy population (*Morone saxatilis*; COSEWIC Endangered)
- Brook trout (*Salvelinus fontinalis*; S3)
- Lake trout (*Salvelinus namaycush*; S3)

The Project Area is within the known range of Inner Bay of Fundy Atlantic Salmon; however, none of the Project Area's secondary watersheds fall within critical habitat for this species, and no critical habitat for this species exists within the Project Area (DFO, 2024).

Of the priority species listed above, the ACCDC report identified three priority fish species in proximity to the Project Area (Appendix E): Atlantic salmon Gaspe – Southern Gulf of St. Lawrence population, Brook trout, and Alewife (*Alosa pseudoharengus*; S3B). There have been three Atlantic salmon observations within 11.5 ± 50 km, one Brook trout observation within 12.8 km, and one Alewife observation within 12.8 km of the Fish Study Area.

The following additional fish species have been documented in waterbodies within the River John, Salmon River, West River Pictou, and the Waugh River secondary watersheds (Alexander et al., 1986; Gilhen & Hebda, 2002; NSFA, 2019):

- Banded killifish (*Fundulus diaphanous*; S5)
- Eastern blacknose dace (*Rhinichthys atratulus*; S5)
- Brown bullhead (*Ameiurus nebulosus*; S5)
- Brown trout (*Salmo trutta*; SNA)
- Chain pickerel (*Esox niger*; SNA)
- Common shiner (*Luxilus cornutus*; S5)
- Ninespine stickleback (*Pungitius pungitius*; S5)
- Golden shiner (*Notemigonus crysoleucas*; S4)
- Lake chub (*Couesius plumbeus*; S5)
- Mummichog (*Fundulus heteroclitus*; S5)
- Smallmouth bass (*Micropterus dolomieu*; SNA)
- White perch (*Morone americana*; S5)
- White sucker (*Catostomus commersonii*; S5)
- Yellow perch (*Perca flavescens*; S5)

No additional fish species were identified through the review of DFOs Stock Status Reports or NSNRR Significant Species and Habitats database.

12.5.2.1 Watercourse Delineation

Throughout the Study Area, 63 watercourses were delineated and qualitatively described (Table 12.5). Eight open water features were delineated; however, no additional data was collected on open water features as all will be avoided by the Project. Characteristics presented are limited to the extent of watercourse contained within or overlapping the Study Area. A total of 89 wetlands were identified and delineated throughout the Study Area, which are described in Section 12.5.1. Wherever fish habitat extends into wetlands, it is described herein under the context of contiguous watercourses and/or open water bodies. Delineated wetlands, watercourses, and open water features are shown on Drawing 12.9.

Table 12.15: Summary of Watercourses in the Study Area

WC ID	Stream Order	Flow Regime[1]	Habitat Type	Substrate (%)	Width (m)	Depth (m)
1	1	P	Riffle	Gravel (30), muck (70)	0.8	0.08
2	1	E	Riffle	Rubble (20), cobble (40), gravel (20), muck (20)	1.9	0
3	1	P	Rapid	Bedrock (30), boulder (5), rubble (15), cobble (15), gravel (20), sand (10) muck (5)	1.5	0.05
4	1	I	Riffle	Rubble (10), cobble (40), gravel (30), sand (20)	1.1	0.05
5	1	E	Riffle	Boulder (50), rubble (20), cobble (10), muck (30)	0.5	0
6	1	I	Flat	Muck (100)	0.7	0.02
7	1	P	Run	Cobble (10), muck (90)	1.0	0.09
8	1	P	Riffle	Boulder (10), rubble (10), cobble (30), gravel (40), sand (10)	1.1	0.08
10	1	I	Flat	Muck (100)	0.5	0.09
11	1	I	Flat	Muck (100)	0.75	0.08
12	2	P	Riffle-run	Rubble (30), cobble (30), gravel (25), sand (15)	1.8	0.09
13	1	I	Riffle	Muck (80), gravel (10), rubble (10)	1.3	0.07
14	1	P	Run	Muck (80), gravel (10), sand (10)	0.75	0.11
15	1	I	Riffle	Boulder (30), rubble (30), muck (60)	0.6	0.02

WC ID	Stream Order	Flow Regime[1]	Habitat Type	Substrate (%)	Width (m)	Depth (m)
18	1	P	Riffle	Rubble (20), cobble (30), gravel (30), sand (10) silt (10)	1.4	0.07
19	1	E	Rapid	Cobble (50), rubble (20), gravel (20), sand (10)	1.7	0
20	1	I	Rapid	Boulder (30), rubble (30), cobble (20), sand (20)	1.65	0
21	1	E	Rapid	Cobble (15), gravel (65), sand (20)	1.6	0.03
23[2]	1	P	Riffle	Rubble (5), cobble (10), gravel (40), sand (30), muck (15)	1.7	0.1
23[2]	1	P	Riffle	Boulder (5), rubble (10) cobble (20), gravel (40), sand (10), silt (15)	1.7	0.2
24	1	I	Flat	Muck (100)	0.95	0.03
26	1	I	Riffle	Boulder (10), rubble (20), cobble (30), gravel (20), sand (10), silt (10)	1.4	0.08
27	1	I	Riffle	Cobble (20), gravel (30), sand (10), muck (40)	1.45	0.09
28	2	P	Riffle	Boulder (10), rubble (10), cobble (50), gravel (30)	3.7	0.35
29	1	P	Flat	Sand (10), muck (90)	6.2	0.53
30	1	P	Pool	Rubble (10), cobble (25), gravel (40), sand (20), muck (5)	1.9	0.26
31	1	P	Pool	Sand (60), muck (40)	3.1	0.2
32	1	P	Pool, riffle	Boulder (15), rubble (30), cobble (30), gravel (15), muck (10)	1.7	0.17
33	1	E	Flat	Muck (95), gravel (5)	2.2	0
34	1	I	Flat, riffle	Muck (60), gravel (20), cobble (20)	1.3	0.2
35	2	P	Flat	Muck (70), cobble (30)	2.3	0.2
36	1	P	Riffle-run	Cobble (20), gravel (60), sand (10), muck (10)	1.6	0.09
37	1	P	Run	Sand (50), muck (45), rubble (5)	1.0	0.13
38	1	I	Pool, flat	Muck (100)	2.55	0.11

WC ID	Stream Order	Flow Regime[1]	Habitat Type	Substrate (%)	Width (m)	Depth (m)
39	2	P	Riffle-run	Rubble (15), cobble (60), gravel (10), sand (10), muck (5)	2.45	0.09
40	1	P	Riffle-run	Boulder (20), rubble (40), muck (40)	1.30	0.15
42	2	P	Riffle, run, flat	Cobble (40), gravel (40), sand (10), muck (10)	1.35	0.11
45	1	E	Riffle	Cobble (30), gravel (50), rubble (5), muck (15)	0.45	0
46	1	I	Riffle, flat	Boulder (5), rubble (10), cobble (30), gravel (30), sand (15), muck (10)	2.5	0.21
51	1	I	Riffle-run	Rubble (5), cobble (15), gravel (15), muck (65)	0.65	0.08
54	1	I	Pool, riffle	Rubble (10), cobble (30), muck (60)	0.75	0.17
55	1	I	Flat	Boulder (10), rubble (10), muck (80)	1.25	0.35
56	1	I	Riffle	Cobble (50), muck (50)	0.55	0.025
57	1	E	Riffle	Rubble (10), cobble (20), gravel (20), muck (50)	1.65	0
58	1	I	Riffle	Rubble (20), cobble (20), muck (60)	1.70	0.12
59	1	I	Riffle	Gravel (10), sand (10), silt (10), muck (70)	2.4	0.06
60	1	I	Riffle	Boulder (10), rubble (30), cobble (30), gravel (20), sand (10)	2.6	0.12
61	1	I	Riffle flat	Cobble (10), gravel (30), sand (10), muck (50)	1.2	0.07
62	1	I	Flat pool	Muck (100)	1.7	0.17
63	1	I	Riffle	Rubble (10), cobble (20), gravel (50), muck (20)	1.4	0.01
65	1	E	Riffle	Bedrock (80), rubble (10), cobble (10)	1.1	0.04
66	1	P	Riffle	Boulder (40), rubble (30), cobble (30)	2.7	0.06
67	2	P	Riffle-run	Boulder (5), rubble (20), cobble (50), gravel (10), sand (5), muck (10)	3.8	0.07
69	1	I	Run, flat, pool	Rubble (30), gravel (50), cobble (15), muck (5)	0.55	0.02

WC ID	Stream Order	Flow Regime[1]	Habitat Type	Substrate (%)	Width (m)	Depth (m)
70	1	I	Run, flat, pool	Boulder (15), rubble (20), cobble (20), gravel (35), sand (5), muck (5)	0.85	0.04
71	1	I	Run, flat, pool	Boulder (5), rubble (10), cobble (10), gravel (5), muck (70)	0.4	0.1
72	1	I	Run, flat	Muck (80), sand (10), gravel (10)	0.35	0.01
73	1	I	Run, flat	Boulder (15), rubble (10), cobble (25), gravel (40), sand (10)	0.95	0.04
74	1	I	Flat	Gravel (90), muck (10)	0.95	0.12
75	1	I	Riffle	Rubble (20), cobble (50), gravel (30)	1.25	0.07
76	1	P	Flat	Muck (100)	0.45	0.29
77	1	P	Riffle	Rubble (30), cobble (40), gravel (30)	2.5	0.04
78	1	I	Riffle-run	Boulder (5), rubble (20), cobble (50), gravel (10), sand (5), muck (10)	1.5	0

[1]Perennial (P) – A stream that flows continuously throughout the year, Intermittent (I) – Streams that go dry during protracted rainless periods when percolation depletes all flow, Ephemeral (E) – A watercourse that flows during snowmelt and rainfall runoff periods only (AT, 2009).
[2]WC23 flows out of Study Area downstream of confluence with WC21 and then back into the Study Area where it is proposed to be crossed by a new road. Both sections described separately as they have different characteristics.
*WC #'s 9, 16, 17, 22, 23, 41, 43, 44, 47, 48, 49, 50, 52, 53, 64, and 68 were removed after subsequent field visits to complete Level 2 Fish Habitat Assessments, fish crew confirmed they did not meet NSECC requirements of a watercourse.

Typical of first-order streams, most watercourses within the Study Area run dry during rainless periods or only flow during rainfall runoff and were classified as intermittent or ephemeral. Substrates within these watercourses were predominantly recorded to have organic muck and embedded rocks (cobble, rubble, etc.). Some ephemeral and intermittent watercourses throughout the Study Area had a wide range of substrates observed, from soft substrates to larger rocks. Average water depths within the ephemeral and intermittent streams ranged from 0 to 35 cm, and average channel widths range from 0.35 to 2.7 m. Habitat types are generally homogenous, with low-gradient stretches typified by runs, pools, or flats, and more moderate-gradient stretches characterized by riffles and rapids. Cover is mostly provided by overhanging vegetation, with less frequent occurrences of large woody debris, instream vegetation, and undercut banks.

Perennial watercourses throughout the Study Area were recorded to have a high diversity of substrates; however, some were dominated by muck/detritus. Depths and widths within the perennial watercourses ranged between 0.04 to 0.53 m and 0.45 to 6.2 m, respectively. Habitat was typically characterized as moderate gradient habitat such as riffle, with lower gradient habitats (flats, runs) observed in lesser amounts.

All watercourses are presumed accessible to fish from downgradient aquatic features. However, access would only be possible to watercourses described as intermittent and ephemeral during periods of high flow or after heavy rain events. Fish habitat within these watercourses is limited by dry conditions and subterranean flow.

12.5.2.2 Water Quality

Water quality results related to the chemical characteristics required for suitable fish habitat are provided in Table 12.16. Where applicable, water quality sampling results are measured against the Canadian Council of Ministers of the Environment (CCME) Guidelines for the Protection of Freshwater Aquatic Life (FWAL). Water quality measurement locations coincide with fish collection locations (Drawing 11.4) and selected fish habitat assessments.

Table 12.16: In-Situ Water Quality Measurements Recorded

Site	Sampling Dates	Temp (ºC)	pH	DO (mg/L)*	Conductivity (µS/cm)	TDS (mg/L)
WC12	June 19, 2024	17.2	7.31	8.8	38.2	-
WC25	June 24, 2024	15.0	7.01	9.71	28.7	-
WC28	June 18, 2024	14.3	6.09	103.4	26.6	-
WC38	June 11, 2024	14.4	4.70	-	33.0	-
WC39	June 11, 2024	9.6	5.12	9.89	26.0	-
WC42	June 11, 2024	19.2	5.35	8.33	28.0	
WC46	June 11, 2024	12.9	5.44	10.6	22.0	
WC55	June 13, 2024	15.1	5.35	8.81	17.0	-
WC56	June 13, 2024	15.3	5.64	8.62	19.0	-
WC67	June 17, 2024	16.8	6.85	8.83	19.0	-
WC70	June 21, 2024	17.5	6.32	10.73	15.1	27.2
West Branch River John	August 28, 2023	17.1	8.02	10.26	45.2	29.9
	August 29, 2023	15.2	7.36	18.33	43.5	27.95
MacKay's Mill Brook	August 29, 2023	11.7	8.04	14.04	78.2	50.7
Steele Run	August 29, 2023	15.1	7.34	10.53	50.7	33.15

*DO = Dissolved Oxygen.

Water temperature affects the metabolic rates and biological activity of aquatic organisms, thus influencing the use of habitat by aquatic biota. There are no CCME guidelines related to temperature and aquatic biota. Temperature preferences of fish vary between species, as well as with size, age, and season. All temperatures recorded are considered within the suitable temperature range for cold-water fish species (<20 ºC).

The CCME FWAL suggests a range of pH from 6.5 to 9.0 is suitable within freshwater habitat to support aquatic health. Kalff (2002) indicates that the loss of fish populations is gradual and depends on the fish species, but decline is evident when pH is <6.5. Kalff (2002) further states that a 10 to 20% species loss is apparent when pH <5.5. The pH range for aquatic features sampled within the Fish Study Area was 4.7 to 8.04, with an average pH of 6.39. Seven of the 14 sampled sites exhibited pH levels within CCME FWAL recommended range (6.5 to 9). Five exhibited pH so low to expect species loss (<5.5).

The CCME FWAL establishes a minimum recommended concentration of dissolved oxygen (DO) of 9.5 mg/L for early life stages of cold-water biota and 6.5 mg/L for other life stages. For warm-water biota, the CCME guidelines recommend 6.0 mg/L for early life stages, and 5.5 mg/L for all other life stages. DO was recorded in summer of both 2023 and 2024 and generally showed suitable oxygen levels to support cold-water fish populations (<6.5 mg/L). However, DO can vary daily and seasonally, as the concentration of oxygen in water is affected by several independent variables including water temperature, atmospheric and hydrostatic pressure, microbial respiration, and growth of aquatic vegetation. It is anticipated that DO levels would likely increase outside of summer low-flow periods as temperatures cool and flow increases.

Conductivity and TDS are often used as baseline for comparison with background measurements. Significant changes in these parameters could indicate that a discharge or some other source of pollution has entered the aquatic resource. Conductivity and TDS levels measured within the Fish Study Area are considered typical for Nova Scotia (NSSA, 2014).

12.5.2.3 Fish Collection Surveys

The following sections outline the results of fish collection efforts within the Fish Study Area.

Electrofishing

The results of electrofishing surveys are presented in Table 12.17. Relative abundance is expressed as the number of fish captured per 300 seconds of electrofishing effort. Electrofishing survey locations within the Fish Study Area are presented in Drawing 11.4.

Table 12.17: Summary of Electrofishing Results Within the Fish Study Area

Site	Survey Date	Fish Species Collected		Catch Per Species	Total Catch	Total Effort (seconds)	CPUE (fish/300 seconds)
		Common Name	Scientific Name				
West Branch River John (1)	August 28, 2023	Eastern blacknose dace	*Rhinichthys atratulus*	4	5	458	3.28
		Atlantic salmon	*Salmo salar*	1			
	August 29, 2023	White sucker	*Catostomus commersoni*	2	13	417	9.35

Site	Survey Date	Fish Species Collected		Catch Per Species	Total Catch	Total Effort (seconds)	CPUE (fish/300 seconds)
		Common Name	Scientific Name				
West Branch River John (2)		Eastern blacknose dace	*Rhinichthys atratulus*	10			
		Atlantic salmon	*Salmo salar*	1			
MacKay's Mill Brook	August 29, 2023	Brook trout	*Salvelinus fontinalis*	12	15	606	7.43
		Brown trout	*Salmo trutta*	3			
Steele Run	August 29, 2023	White sucker	*Catostomus commersoni*	1	8	631	3.80
		Common shiner	*Notropis cornutus*	2			
		Eastern blacknose dace	*Rhinichthys atratulus*	4			
		Lake chub	*Couesius plumbeus*	1			

*West Branch River John was sampled twice in the same location on subsequent days.

Fish Species Observed

Table 12.18 presents a summary of fish species captured through electrofishing within the Fish Study Area.

Table 12.18: Fish Species Captured Within the Fish Study Area

Common Name	Scientific Name	SARA/COSEWIC/ ESA	SRank	Total Catch	
				Total #	% Catch
White sucker	*Catostomus commersoni*	-	S5	3	7.32
Common shiner	*Notropis cornutus*	-	S5	2	4.88
Eastern blacknose dace	*Rhinichthys atratulus*	-	S5	18	43.90
Lake chub	*Couesius plumbeus*	-	S5	1	2.44
Atlantic salmon – Gaspé Southern Gulf of St. Lawrence	*Salmo salar*	COSEWIC: Special concern	S1	2	4.88
Brook trout	*Salvelinus fontinalis*	-	S3	12	29.27
Brown trout	*Salmo trutta*	-	SNA	3	7.32

Individual data for fish captured within the Fish Study Area are presented in Table 12.19.

Table 12.19: Individual Fish Measurements Within the Fish Study Area

Fish ID	Common Name	Scientific Name	Fork Length (mm)	Total Length (mm)	Weight (g)
1	Eastern blacknose dace	*Rhinichthys atratulus*	4.2	4.5	4.5
2	Eastern blacknose dace	*Rhinichthys atratulus*	4.2	4.5	4
3	Eastern blacknose dace	*Rhinichthys atratulus*	3.3	3.5	1.3
4	Eastern blacknose dace	*Rhinichthys atratulus*	---	3	0.5
5	Atlantic salmon	*Salmo salar*	5.5	6	4.5
6	Brook trout	*Salvelinus fontinalus*	19	20	76
7	Brook trout	*Salvelinus fontinalus*	12	13	30
8	Brown trout	*Salmo trutta*	13	14	48
9	Brook trout	*Salvelinus fontinalus*	12	12.5	33
10	Brook trout	*Salvelinus fontinalus*	8	9	12
11	Brook trout	*Salvelinus fontinalus*	17	18	50
12	Brook trout	*Salvelinus fontinalus*	6	6.5	2.8
13	Brook trout	*Salvelinus fontinalus*	12.5	13	24
14	Brook trout	*Salvelinus fontinalus*	12.5	14	38.6
15	Brook trout	*Salvelinus fontinalus*	10	12	17.4
16	Brook trout	*Salvelinus fontinalus*	12.5	13	28
17	Brook trout	*Salvelinus fontinalus*	6	6.5	1.5
18	Brown trout	*Salmo trutta*	5	6	1.04
19	Brown trout	*Salmo trutta*	6	7	3.5
20	Brook trout	*Salvelinus fontinalus*	12.5	13.5	17.2
21	White sucker	*Catostomus commersoni*	16.5	19.5	70
22	Common shiner	*Notropis cornutus*	8	9.5	5
23	Eastern blacknose dace	*Rhinichthys atratulus*	4.5	5	3.2
24	Eastern blacknose dace	*Rhinichthys atratulus*	5.5	6.5	9
25	Lake chub	*Couesius plumbeus*	6	6.5	4
26	Common shiner	*Notropis cornutus*	7	8	3.5

Fish ID	Common Name	Scientific Name	Fork Length (mm)	Total Length (mm)	Weight (g)
27	Eastern blacknose dace	*Rhinichthys atratulus*	7	7.5	4.5
28	Eastern blacknose dace	*Rhinichthys atratulus*	4.5	5	3
29	Eastern blacknose dace	*Rhinichthys atratulus*	6.5	7.5	6
30	White sucker	*Catostomus commersoni*	9.5	10	14
31	White sucker	*Catostomus commersoni*	8.5	9	11
32	Eastern blacknose dace	*Rhinichthys atratulus*	---	3	0.8
33	Eastern blacknose dace	*Rhinichthys atratulus*	6.7	7	14
34	Eastern blacknose dace	*Rhinichthys atratulus*	5.5	5.7	4.2
35	Eastern blacknose dace	*Rhinichthys atratulus*	5.5	5.7	3
36	Eastern blacknose dace	*Rhinichthys atratulus*	4.5	5	2
37	Eastern blacknose dace	*Rhinichthys atratulus*	---	3	0.5
38	Eastern blacknose dace	*Rhinichthys atratulus*	3.5	4	0.4
39	Eastern blacknose dace	*Rhinichthys atratulus*	7	7.5	8
40	Atlantic salmon	*Salmo salar*	6.5	7	5
41	Eastern blacknose dace	*Rhinichthys atratulus*	4.2	3	0.8

- Atlantic Salmon – Gaspé- Southern Gulf of St. Lawrence
  Atlantic salmon are one of the two SOCI found within the Fish Study Area. Atlantic salmon populations are categorized into three Designatable Units within mainland Nova Scotia, including the Inner Bay of Fundy population (iBoF; Schedule 1 – Endangered, COSEWIC - Endangered), Southern Uplands population (SU; Schedule 1 – pending, COSEWIC – Endangered), and the Gaspé-Southern Gulf of St. Lawrence population (COSEWIC – Threatened). The Gaspé-Southern Gulf of St. Lawrence population is known to be present within the northern draining features of the Fish Study Area and the Inner Bay of Fundy population is expected to be present within the southern draining Fish Study Area. No Atlantic salmon were found within the Atlantic Salmon Inner Bay of Fundy range during fish collection.

  Atlantic salmon require several different habitats to complete a life cycle including both marine and freshwater habitat. The major freshwater habitat types for Atlantic salmon are used for feeding, overwintering, spawning, early life-stage nursery, and rearing habitats (DFO, 2010). Atlantic salmon freshwater habitat preferences include streams that are generally clean, cool, and well oxygenated, characterized by moderately low (2 m/km) to moderately steep (11.5 m/km) gradients (DFO, 2010). Bottom substrates are composed of assorted gravel, cobble and boulder and the pH values are greater than 5.5 (DFO, 2010). Silt loads are low (<0.02%; DFO, 2010). Highest population densities and productivities are associated with rivers that have moderate summer temperatures (15°C and 25°C) and moderate flows (DFO, 2010). Stream gradient is a good indicator of habitat quality, with optimal gradients ranging from 0.5 to 1.5% (DFO, 2010). Atlantic salmon prefer stable stream channels that develop natural riffles, rapids, pools and flats which are used during different life stages.

Freshwater Atlantic salmon habitat is threatened by the effects of agriculture, urbanization, poor forestry practices, road building, and other factors related to human activities. Decreased smolt production due to habitat degradation, low pH, and temperature increases have been observed. Acidification of freshwater habitats brought about by acidic precipitation is a major threat, particularly for the SU population (DFO, 2013).

- Brook trout

  Brook trout are known to inhabit a wide range of cool, freshwater environments, from small headwater streams to large lakes. Water temperature is a critical factor influencing brook trout distribution and production. Though typically not anadromous, brook trout require free passage along streams to move between areas of use, including spawning grounds, overwintering areas, and summer rearing areas.

  In Nova Scotia, mature Brook trout migrate to spawn in lakes or streams in the fall of the year. Brook trout spawning sites are usually near groundwater upwelling or spring seeps and within a lake or stream with gravel substrate (NSAF, 2005). Optimal spawning conditions for brook trout include clear substrate 3 to 8 mm in size in shallow water with limited fines (<5%), and velocities of 25 to 75 centimetres per second (cm/s) (Raleigh, 1982).

  Young of the Brook trout require cold water, stable, low velocities and an abundance of in-stream cover. Optimal temperature for juvenile growth is 10 to 16℃, while cover in the form rubble, vegetation, undercut banks, and woody debris should account for a minimum of 15% of total stream area (Raleigh, 1982). In winter, Brook trout aggregate in pools beneath silt-free rocky substrate and close to point sources of groundwater discharge (Cunjak & Power, 1986; Raleigh, 1982). Adults use both pools and riffles, with more than 25% in-stream cover being optimal (Raleigh, 1982). Brook trout respond negatively to flashy or hydrologically dynamic systems and require stable flow for all life stages (Raleigh, 1982).

12.6 Socioeconomic

12.6.1 Economy

The Project Area is located near Mount Thom in Pictou County and Colchester County, Nova Scotia. According to the 2021 census (Table 12.20), the population of Pictou County was

43,657 which was approximately 4.5% of the population of Nova Scotia (Statistics Canada, 2024). From 2016 to 2021, the population within Pictou County decreased by 0.2%, from 43,748 to 43,657. The population of Colchester County was 51,476 which was approximately 5.3% of the population of Nova Scotia (Statistics Canada, 2024). From 2016 to 2021, the population within Colchester County increased by 1.8%, from 50,585 to 51,476.

Table 12.20: Population and Demographics for Pictou County and Colchester County

Information	Pictou County	Colchester County
Population in 2021	43,657	51,476
Population in 2016	43,748	50,585
2011-2016 Population Change (%)	-0.2	1.8
Total private dwellings (2021)	22,410	25,638
Population density per square km (2021)	15.4	14.2
Land area (square km) (2021)	2,844.10	3,627.50

*Source: (Statistics Canada, 2024)

According to the 2021 Statistics Canada census (Table 12.21), the economy of Pictou County is driven by retail trade (17.9%), followed by health care and social assistance (16.6%), and manufacturing (9.4%). The economy of Colchester County is driven by retail trade (15.5%), followed by health care and social assistance (14.2%), and manufacturing (10%).

Table 12.21: Labour Force by Industry, Pictou and Colchester Counties

Industry	Pictou County		Colchester County	
	Total	Percentage (%)	Total	Percentage (%)
Retail trade	3,475	17.9	3,820	15.5
Health care and social assistance	3,210	16.6	3,510	14.2
Manufacturing	1,830	9.4	2,435	10.0
Construction	1,640	8.5	2,145	8.7
Educational services	1,280	6.6	1,800	7.4
Accommodation and food services	1,155	6.0	1,695	7.0
Public administration	945	4.8	1,620	6.6
Transportation and warehousing	740	3.8	1,125	4.6
Other services (except public administration)	830	4.2	1,085	4.4
Agriculture; forestry; fishing and hunting	950	4.9	985	4.0
Professional; scientific and technical services	715	3.7	980	4.0
Wholesale trade	335	1.8	905	3.7
Administrative and support; waste management and remediation services	715	3.7	870	3.5
Finance and insurance	290	1.5	385	1.6
Arts; entertainment and recreation	270	1.4	385	1.6
Information and cultural industries	195	1.0	255	1.0

Industry	Pictou County		Colchester County	
	Total	Percentage (%)	Total	Percentage (%)
Real estate and rental and leasing	265	1.4	235	1.0
Mining; quarrying; and oil and gas extraction	220	1.1	185	0.7
Utilities	195	1.0	115	0.4
Management of companies and enterprises	130	0.7	30	0.1
Total	**19,385**	**100**	**24,565**	**100**

*Source: (Statistics Canada, 2024)

The participation rate in Colchester County's labour force is 58.2% and the unemployment rate is 12.2%. (Statistics Canada, 2022a). The participation rate of Pictou County's labour force is 54.2% and the unemployment rate is 13.5% (Statistics Canada, 2022c). In comparison, Nova Scotia's labour force participation rate is 59.5% with an unemployment rate of 12.7% (Statistics Canada, 2022b).

Economic activity within 1 km of the Project Area primarily consists of forestry activities along with some agricultural activities. The closest businesses to the Project Area include the Northern Lights Christmas Tree Farm, Mt Thom MX, a motorsports track located off Highway 4, Nova Scotia, and the Dalhousie Mountain Wind Farm, owned and operated by RMS.

Additional businesses/facilities further from the Project Area include (Drawing 12.10):

- Weeks Mt Thom Quarry
- Dalhousie Maple Products Inc
- Earltown Community Centre
- Earltown General Store
- Jonathan Otter Furniture Maker
- MacKays Mill Fall
- MacNutts Maple Syrup
- Maggie's Farm
- Mt. Thom Maple Farm
- Mt. Thom Soap Company
- Mt. Thom Spring
- Peaceful River Campground Ltd.
- Sugar Moon Farm

12.6.2 Land Use and Value

The Project Area consists primarily of private land, with several areas of Crown land throughout. Land use around the Project Area is primarily for forestry, recreation, and wind energy generation; however, there is a mix of residential and agricultural lands.

Public protected lands and parks are also located in the vicinity (Drawing 12.10), including Gully Lake Wilderness Area west of the Project and Dalhousie Mountain Nature Reserve east of the Project. Other points of interest near the Project include Bezanson's Falls and Mt. Thom Spring.

Pictou Landing First Nations reserve is approximately 30 km northeast from the Project Area. Millbrook First Nations reserve is approximately 30 km southwest of the Project Area. Further consideration of First Nations resources and the results of the MEKS are included in Section 7.4.

12.6.3 Transportation

The centre of the Project is located approximately 8 km north of Highway 104. The major arterial roads that grant access to most of the Project Area include Glen Road, Bezanson Lake Road, Vanderveens Road, and Gunshot Road. Glen Road begins at Highway 4 and travels north through the Project Area towards Loganville, Nova Scotia. Bezanson Lake Road, which begins in the southern extent of Glen Road, travels east and north, which also provides access to the adjacent Dalhousie Mountain Wind Farm. Vanderveens Road also begins in the southern extent of Glen Road, travelling west and north where it merges with Gunshot Road and eventually terminates at the northern extent of Glen Road. Overall, the existing access road network associated with the Dalhousie Mountain Wind Farm is well developed, maintained, and will likely be used for various Project activities (Drawing 5.2).

Throughout the Project Area, the roads are accessible by truck as well as other vehicles designed for rough dirt roads and tracks. Vehicle traffic within the Project Area is predominantly associated with forestry activities and maintenance of the adjacent Dalhousie Mountain Wind Farm; however, there is occasional/infrequent local and recreational traffic, primarily associated with well-maintained roads (i.e., Glen Road and Bezanson Lake Road). Smaller roads that cover the Project Area are primarily used for ATVs and snowmobiles.

The transportation route to deliver WTG components to the Project is subject to the final WTG technology provider, who will undertake a comprehensive logistics study to determine the transportation route from the receiving and unloading port. Primary access routes during the operational lifespan of the Project are expected to be Glen Road, Bezanson Lake Road, Vanderveens Road, and Gunshot Road along with the existing network of smaller access roads. Appropriate permits and engagement with NSPW will occur prior to transportation.

12.6.4 Recreation and Tourism

Colchester County

The communities of Nuttby and Kemptown are home to a variety of primarily outdoor recreational activities. Approximately 40 km northwest of the Project Area is the largest ski hill in the province. Ski Wentworth is a primary economic driver for local tourism and recreation sectors in Colchester County during the winter months, with mountain biking and trail use extending recreational use through the summer. The attractions to the area for recreational property owners include proximity to skiing, as well as the other recreational activities such as hiking and sight-seeing that can be enjoyed during all seasons (Municipality of Colchester, 2024).

In the summer, the draws include ATV use on the various trails that are used for snowmobiling in the winter. Most recreation within the Project Area is concentrated on the existing roads and trails. ATV use in the warmer months and snowmobile use in the winter account for most of the recreational use; however, other uses may exist including hikers using the Project Area to access Gully Lake Wilderness Area.

Pictou County

ATV, snowmobile, and other motorsports are also popular recreational activities in the Pictou County region with several established trail networks and local ATV clubs. Within the Town of Pictou, there are many outdoor music festivals/performances, markets, art shows, museums, along with the renowned Lobster Carnival held every July. There are also long stretches of sandy beaches that extend up the Northumberland Shore, making this region a popular recreational destination (Municipality of Pictou, 2024).

Parks and Protected Areas

The Gully Lake Wilderness Area abuts the western Project Area boundary (Drawing 5.1). Within the Gully Lake Wilderness Area there are over 25 km of hiking trails, which are managed by the Cobequid Eco-trails Society. Activities such as hiking, snowshoeing, and backcountry skiing are common recreational pursuits. Access to the trail is from Kemptown Road, Glen Road, and Earltown. Additionally, there are trails within the wilderness area designated for snowmobiling, ATV use, and bicycling, which are managed by the Snowmobilers Association of Nova Scotia, All-terrain Vehicle Association (ATVANS), and Nova Scotia Offroad Riders Association (NSORRA) (NSECC, n.d.).

The Dalhousie Mountain Nature Reserve is a 46-ha nature reserve located approximately 5 km northeast of the Project Area. This nature reserve is known to support at least six rare plant species and is partially surrounded by the Dalhousie Mountain Wind Farm.

The nearest provincial parks include the Balmoral Mills Provincial Park and Salt Springs Provincial Park which are located approximately 16 km northwest and 12 km east of the Project Area respectively (Nova Scotia Parks, n.d.).

12.6.5 Cultural and Heritage Resources

An ARIA was undertaken by CRM under HRP A2023NS183; updated in 2024 under HRP A2024NS120. The final report was reviewed and approved by the Special Places Program of NSCCTH. The results described below are taken directly from the assessment completed by CRM Group. While not appended to this EARD; the ARIA has been provided to NSECC for review.

Background Study

No registered archaeological sites or National Historic Sites were identified within the Project Area through a historic background study. The nearest registered archaeological site (the Charles McIntosh House) is approximately 1 km north of the Project Area.

One cemetery exists within the Project Area known as Bezanson Cemetery (approximately 230 m northwest of Bezanson Lake). Several other cemeteries were also identified in proximity to the Project Area: Creighton Cemetery (1.2 km south), the Cameron Headstone (315 m east), the MacKay Farm Cemetery (200 m southeast), and the Ebenezer Cemetery (75 m southeast).

Mi'kmaq Engagement

As part of Mi'kmaq engagement, CRM Group contacted the KMKNO-ARD requesting information pertaining to historic or traditional Mi'kmaq use of the land. KMKNO-ARD provided traditional and historic Mi'kmaq land use information that was taken into consideration when preparing the ARIA. The traditional use information is confidential, but was considered in background research, assessment, and field methodology completed by CRM Group.

Archeological Reconnaissance

CRM Group conducted a field reconnaissance of the Project footprint between September 21 and October 5, 2023, with additional field reconnaissance occurring on June 26 to 28, 2024. During the ARIA, five high potential areas (HPAs) with visible archaeological resources, other cultural heritage features, or ascribed archaeological resource potential were identified within the proposed Project infrastructure alignment

12.6.6 Other Undertakings in the Area

The Dalhousie Mountain Wind Farm exists in proximity to the Project (Drawing 5.2). The 35 WTGs generate 175,000 MW hours of energy and are owned by RMS (RMS Energy, 2024).

The Mount Thom Quarry, owned by S.W Weeks Construction Ltd. also operates in proximity to the Project. The quarry produces aggregates which are supplied to PEI, Truro, and Pictou County (Weeks Construction, 2024).

No other undertakings, industrial facilities, or industrial or commercial developments are known to be within or immediately adjacent to the Project Area.

13.0 EFFECTS OF THE UNDERTAKING ON THE ENVIRONMENT

The following detailed effects assessment involves the following steps:

1. Identification of potential Project interactions on a selected VEC (Table 13.1).
2. Identification of potential effects.
3. Description of recommended mitigation and monitoring.
4. Identification of expected residual effects (post mitigation).
5. Identification of the significance of residual effects.

Results of the detailed effects assessment process listed above are presented for each VEC in the following sections.

Table 13.1: Potential Project Interactions with Valued Environmental Components

Group	Valued Environmental Component	Construction			Operations and Maintenance		Decommissioning and Reclamation	
		Clearing and Grubbing	Access Roads, Collector Lines, Laydown Yards, and WTG Pads	Turbine Assembly, Erection, and Commissioning	WTG Operation	Inspection and Maintenance	Infrastructure Removal	Site Reclamation
Atmospheric	Climate change	X	X	X	X	X	X	X
	Air quality	X	X	X		X	X	X
	Noise	X	X	X	X	X	X	X
Geophysical	Surficial and bedrock geology		X				X	X
	Groundwater		X					
Terrestrial	Habitat, flora, and lichens	X	X					X
	Fauna	X	X		X		X	X
	Bats	X	X		X		X	X
Avifauna	Avifauna	X	X	X	X		X	X
Aquatic	Wetlands	X	X				X	X
	Surface water, fish and fish habitat	X	X				X	X

Group	Valued Environmental Component	Construction			Operations and Maintenance		Decommissioning and Reclamation	
		Clearing and Grubbing	Access Roads, Collector Lines, Laydown Yards, and WTG Pads	Turbine Assembly, Erection, and Commissioning	WTG Operation	Inspection and Maintenance	Infrastructure Removal	Site Reclamation
Visual/Technical	Visual aesthetics				X			
	Shadow flicker				X			
	EMI				X			
Socioeconomic	Economy	X	X	X	X	X	X	X
	Land use and value	X	X	X	X	X	X	X
	Transportation	X	X	X		X	X	X
	Recreation and tourism				X			
	Human health	X	X	X	X	X	X	X
	Cultural and heritage resources	X	X	X				
	Other undertakings in the area				X			

13.1 Atmospheric

This section outlines the undertaking's effects on the following atmospheric VECs: climate change, air quality, and noise.

13.1.1 Climate Change

Increases in concentrations of GHGs in the atmosphere from human activities cause climate change (ECCC, 2024a). GHGs will be emitted during all phases of the Project, which includes construction, WTG maintenance, decommissioning, and reclamation. However, any emissions generated from operational maintenance can be considered negligible. During operations, WTGs produce emission-free electricity.

Natural Forces completed the GHG emissions assessment. This assessment calculated GHG emissions based on the International Organization for Standardization (ISO) international standards for quantification, reporting, and monitoring GHG emissions (ISO 14064-1 and 14064-2) (ISO, 2018, 2019). The methods and results of this assessment are provided herein.

The methodology followed to complete the GHG emission analysis for the Project follows the international standard ISO 14064-1 and 14064-2. As is standard for this type of analysis, all emission values are presented in tonnes of carbon dioxide equivalent (tCO_2e).

Define Project Scenario

The Project consists of 18 wind turbines that collectively produce 76.7 MW of renewable energy. By supplying clean, renewable energy to the Nova Scotia Power Inc. electrical grid, the Project is a GHG emissions reduction project within Nova Scotia. The operational term of the Project is assumed to be 25+ years, from 2025 to the end of 2049.

Identify Project GHG Sources, Sinks, and Reservoirs

The main sources of GHG emissions associated with the Project are during construction. This includes emissions related to manufacturing, installation, and commissioning for all Project components. A secondary source of GHG emissions will be during decommissioning, but this is not included in this analysis because it is difficult to estimate these sources so far in advance, especially since the Project could be retrofitted after the 25 years of assumed operation, rather than being decommissioned.

The main sink for GHG emissions, which reduces the emission rates, is the operational phase of the Project. This is when the Project is producing renewable, emission-free electricity that offsets emission-intensive sources of energy production.

There are no reservoirs associated with the Project.

Define Baseline Scenario

In order to quantify GHG emission reductions associated with the Project, a baseline scenario must be established as a reference point from which reductions can be made. In this case, the baseline scenario is a business-as-usual scenario in which the Project is not constructed and the Nova Scotia electricity emission intensities projected by the Government of Canada over what would have been the operational term of the Project are not offset (GoC, 2020).

This baseline scenario assumes that electricity imports have no emissions and that all fossil fuel-based generation in Nove Scotia goes to domestic consumption.

Identify Baseline GHG Sources, Sinks, and Reservoirs
The main source of GHG emissions associated with the baseline scenario is associated with the existing and projected electricity production sources in Nova Scotia. There are no sinks or reservoirs associated with the baseline scenario.

Calculate Annual GHG Emissions Reduction for Project
Using standard emission factors from the Inventory of Carbon & Energy, Version 2.0; the Idemat App for Material Selection; and Canada's Greenhouse Gas Emissions Projections for Nova Scotia, the annual GHG emissions from each source and sink associated with the Project and the baseline scenarios was calculated. The emission factors are listed in Table 13.2. This calculation also used the following information:

- An estimate of annual production by the Project, in MWh/yr.
- The following information about wind turbine manufacturing and transport:
  - Weight of steel for one wind turbine: 669,650 kg
  - Turbine tower distance traveled by marine cargo: 15,000 km
  - Weight of fibreglass for the blades of one wind turbine: 60,030 kg
  - Turbine blade distance traveled by marine cargo: 5,500 km
  - Weight of concrete for foundations of one wind turbine: 703,200 kg
  - Concrete distance traveled by road: 32 km

Table 13.2. Calculated Annual GHG Emissions for the Project

Input	Emission Factor
Electricity generated by wind turbines	0
Steel Production	1.50 kg CO_2e/kg
Marine Cargo	15.10 g CO_2e/tonne-km
Fibreglass Production	1.4 kg CO_2e/kg
Concrete Production	0.30 kg CO_2e/kg
Heavy Duty Diesel Truck	135.0 g CO_2/tonne-km
Average NS Electricity Production Emission Factor Projected from 2024 to 2049	0.1341 t CO_2/MWh

The following steps were taken using this information to calculate the annual GHG emission reduction that will result from the Project:

1. Project Scenario:
    a. Total emissions from Project manufacturing, installation, and commissioning were calculated. This value was then divided by 25 to get an emission value per year of Project operation. This value is 1,049.58 tCO_2e/yr.
    b. Annual emissions from Project operations were calculated. This value is 0 tCO_2e/year because it is a non-emitting, renewable source of electricity generation.
2. Baseline Scenario:
    a. Annual emissions from the Nova Scotia grid from 2025 to 2049 based on the projected emission factor and the expected annual production from the Project were calculated to be 38,636.01 tCO_2e/yr.
3. GHG Emission Reduction
    a. The annual Project scenario emissions were subtracted from the annual baseline scenario emissions.

The proposed project is estimated to generate 288,122 MWh/year. The associated emissions from the Project are limited to manufacturing and installation, and are estimated to be 1,049.58 tCO_2e/year. To match the amount of power equivalent to the Project's production, the current NS grid would produce 38,636.01 tCO_2e/year in emissions. The clean power generated from the Project would be enough to power 27,000 Nova Scotian Homes, and if this power were to replace only non-renewable forms of electricity in the province, there would be a reduction of up to 242,230 tCO_2e/year.

The Project phases and associated timelines are as follows:

1. Construction - Site preparation, grubbing, road construction, foundations, WTG equipment and infrastructure installation (~2 years).
2. Operation and Maintenance (~25+ years).
3. Decommissioning and Reclamation (~2 years).

13.1.1.1 Mitigation

The following mitigation measures will be included in the design of the Project to minimize the effects to climate change:

- Complete regular maintenance on equipment.
- Adhere to speed limits.
- Encourage contractor carpooling.
- Post speed limit signage on Project access roads.
- Minimize idling.

13.1.1.2 Monitoring

Based on the Project scope and information provided above, long term monitoring of climate change criteria and GHG emissions are not deemed necessary at this time.

13.1.1.3 Residual Effects and Significance

Magnitude
The Project is predicted to have a **low**, **but positive** magnitude of effect on climate change.

Likelihood
It is **certain** that the Project will affect climate change, as renewable energy will be produced resulting in a net benefit to GHG emissions.

Duration
The Project's effect on climate change will be **long term**. During construction, decommissioning, and reclamation (a combined 4 years), the Project will be a GHG emission source, while during operations (25+ years), it will be a net sink for GHG emissions.

Frequency
The effects on climate change will occur **continuously** throughout the life of the Project.

Significance
The Project will have a **not significant** but positive effect on climate change (Table 10.4).

13.1.2 Air Quality
Project operations have limited potential to affect air quality by changing particulate levels (Table 13.1).

Fugitive dust will be the primary source of particulate matter (known as Total Particulate Suspended Matter) and can be emitted during the construction, maintenance, and decommissioning/reclamation phases of the Project. Construction activities likely to generate fugitive dust include blasting (if required), grubbing, stockpiling material, and travel of trucks on unpaved roads. Maintenance during operations can generate fugitive dust from trucks travelling on unpaved roads. Decommissioning and reclamation activities likely to elevate fugitive dust and particulate levels include earthwork and the travel of trucks on unpaved roads.

An increase in fugitive dust can cause nuisance to local residents or people in proximity to the Project. Fugitive dust travel distance is based on several factors, including particle height, wind conditions, and particle size. Under most standard conditions, fugitive dust above 30 μm settles out within 100 m of the emission source. Other finer particles have a slower settling velocity and may travel further (US EPA, 1995). The nearest receptor to the construction area is 625 m away (Appendix D); however, several receptors are located near the entrance to the Project Area. Therefore, caution entering and exiting the Project Area should be taken (i.e. reduced travel speeds). Based on the distance of the receptors to many of the construction areas, it is anticipated that fugitive dust will have minimal impact on residents (Drawing 5.3).

The generation of fugitive dust may result in deposition onto vascular plants, lichens, and surface water features within proximity of the Project Area, especially when conditions are dry. Dust on the leaves of vascular plants can temporarily reduce evapotranspiration and photosynthesis, and over time, this may reduce overall growth rates (Farmer, 1993). Refer to Section 13.3.1 for more details.

13.1.2.1 Mitigation

The following mitigation measures will be included in the Project design to minimize effects to air quality:

- Control, as needed, dust emissions with the application of water imported via a water truck.
- Cover trucks and minimize dust.
- Abide by speed limits.
- Post speed limit signage on Project access roads.
- Use alternatives to water on roads if evaporation is too rapid, such as calcium chloride, magnesium chloride, potassium chloride and sodium chloride (the use of alternative methods may be confined to within 200 m of homes and residences or further depending upon traffic requirements in specific areas during construction).
- Wet (with water) material stockpiles to control dust.
- Design storage areas and material stockpiles with prevailing wind directions in mind.
- Implement the Complaint Resolution Plan, which will provide a process for responding to potential air quality-related complaints. A draft of the Plan is provided in Appendix O.
- Implement the Contingency Plan, including site-specific measures to reduce and mitigate dust levels during all Project phases. This plan should be based on ongoing engagement with the closest residents to understand their concerns. A draft of the Plan is provided in Appendix P.
- Require Project personnel adhere to all safety protocols and wear appropriate personal protective equipment (PPE) in the event of significant fugitive emissions events (i.e., wind storms, dust storms).

13.1.2.2 Monitoring

No dust emission or particulate matter monitoring is proposed currently.

13.1.2.3 Residual Effects and Significance

Magnitude

The Project is predicted to have a **low** magnitude of impact, as air quality is anticipated to remain less than or equal to the maximum permissible ground-level concentrations as defined by NSECC within the Air Quality Regulations, N.S. Reg. 8/2020 made under Sections 25 and 112 of the *Environment Act*, S.N.S. 1994-95, c.1.

Likelihood
The probability of impact on air quality is **possible**, as activities during the construction, decommissioning, and reclamation phases of the Project may generate dust.

Duration
The duration of the effects on air quality is confined to the construction, decommissioning, and reclamation phases of the Project, as such, they are **short term**.

Frequency
Potential impacts on air quality will be **sporadic** during the construction, decommissioning, and reclamation phases of the Project. Increases in Project-generated dust are dependent on the activity taking place and the site conditions (e.g., dry ground).

Significance
The Project is predicted to have a **not significant** effect on air quality (Table 10.4).

13.1.3 Noise
During the Project's construction and operational phases, sound will be generated by mechanical equipment and WTG operation.

Natural Forces completed a sound-level impact assessment for the Project's construction and operational phases (Appendix D). Construction noise was calculated based on a review of sound levels for construction equipment, assuming a worst-case scenario cumulative effect.

The results of the sound assessment indicate that, in the worst-case scenario (construction), noise levels will reach 70 dBA at 61 m from the construction site and not exceed 40 dBA at 1 km from the site. The nearest existing receptor from the construction site is 625 m. Therefore, during construction, it is possible for sound levels to exceed 40 dBA at nearby receptors. However, these activities are intermittent and non-permanent and will primarily be restricted to working hours.

For the operational phase, the WindPRO v.4.0 software was chosen for the sound-level assessment. This assessment modelled noise levels emitted from the WTGs based on wind speed and distance to the WTGs. The modelled WTGs were the Nordex N-163 WTG, representing the WTG model with the highest possible impact. Existing WTGs within 3 km of the Project were included in the sound assessment. The model included assumptions for ground attenuation to account for vegetative surfaces and their ability to affect sound attenuation. The model also incorporated ambient noise assumptions, with 35 dBA used as the assumed ambient nighttime sound level.

The results of the sound assessment indicate that following standard operations, the nearest receptor to WTG2 would experience noise levels above the 40 dBA threshold. The Proponent intends to operate WTG2 at a reduced capacity (de-rating the operational mode) to ensure compliance with the 40 dBA threshold. Given operation de-rating of WTG2, no receptors exceed the provincial threshold of 40 dBA.

Furthermore, one receptor within the Municipality of the County of Colchester exceeds the limit defined in the Municipality's Wind Turbine Development By-law of 36 dBA, by 0.2 dBA. However, this By-law allows for a variance from this 36 dBA requirement (to a maximum of 40 dBA) provided the Proponent has written permission from landowners who share a common boundary with the Project lands. It should be noted that there are no adverse health effects anticipated below 40 dBA. If the sound modelling of the finalized Project layout exceeds the threshold in this by-law, a variance will be obtained. If a variance cannot be obtained, the nearest turbine will be adjusted or de-rated such that the modelling is within the threshold. The full report, including its methodologies and findings, is included in Appendix D.

13.1.3.1 Mitigation

The following mitigation measures will be included in the Project design to minimize the effects of noise:

- Complete blasting (if required) in accordance with regulatory requirements
- Adhere to Municipal noise by-laws during construction.
- Implement the Complaint Resolution Plan, which will provide a process for responding to potential noise-related complaints.

13.1.3.2 Monitoring

No noise level monitoring is currently proposed.

13.1.3.3 Residual Effects and Significance

Magnitude

The Project is predicted to have a **low to medium** magnitude of impact. Construction noise levels may exceed the 40 dBA threshold; however, these are intermittent and non-permanent sources. Operational noise is predicted to remain less than the maximum allowable noise limits (40 dBA) at existing residential receptors during operation.

Likelihood

It is **certain** that the Project will generate noise.

Duration

The Project will generate noise for the **long term** as noise is produced from activities associated with all Project phases.

Frequency

During construction, decommissioning, and reclamation, noise will be **intermittent**. During operations, noise will be generated by WTGs **continuously** (except for periods with no/low wind speeds).

Significance

The Project is predicted to have a **not significant** effect on noise (Table 10.4) as effects on receptors are anticipated to create only moderate levels of noise to some receptors intermittently during construction. All regulatory thresholds and requirements will be met during Project operations.

13.2 Geophysical

This section outlines the effects of the undertaking on the following geophysical VECs: geology, soils, and groundwater.

13.2.1 Surficial and Bedrock Geology

The construction of access roads and WTG foundations has the potential to affect the following topography, surficial geology, and bedrock geology variables (Table 13.1):

- Topography: Topography (land elevations) will be altered by levelling for WTG foundations, access roads, laydown areas, and the substation location.
- Soil Destabilization: Clearing and disturbance of lands has the potential to cause soil erosion and transport.
- Acid Rock Drainage: Upon exposure to oxygen and water, blasted or otherwise disturbed rock has the potential to release acidic compounds and leach soluble metals into surface and groundwater systems. The production of ARD is a possibility in areas comprising rock containing high levels of iron-sulphides. As discussed in Section 12.2.2, the Project Area is not located in acid-bearing slates, and therefore, the potential for ARD is considered low.
- Colluvial (Talus) Deposits: Loosely consolidated, surficial deposits at the toe of steep slopes. These surficial features have the potential for mass wasting (avalanches or falling debris) and pose a danger to property.
- Karst Landscape: The dissolution of soluble bedrock can cause subsidence at grade level, which can pose a danger and harm to humans and infrastructure.
- Groundwater: Earthwork activities have the potential to impact the local flow of groundwater. This could cause a change in groundwater quantity and/or quantity to nearby groundwater users. This is especially true if there is a naturally elevated risk for uranium and arsenic. The Project Area is located within an area listed as low and medium risk for the potential of uranium and low to high risk for arsenic in bedrock groundwater wells (Section 12.2.3).

Project development will minimally alter site topography as the access roads and WTGs are constructed. These potential minor impacts to receiving surface water systems (e.g., watercourses and wetlands) are possibly from ground disturbances associated with earthwork related to WTG foundation and access road construction. Ground disturbances may cause a temporary increase in sediment loads that can degrade water quality conditions. Effects related to wetlands are assessed in Section 13.5.1, and potential effects on surface water, fish and fish habitat are assessed in Section 13.5.2.

The overlying soil's erosion potential is anticipated to be moderate when exposed to physical weathering. However, for initial ground-level construction works and support infrastructure within the Project Area, associated erosion concerns are minor, as their spatial extent will be limited to the footprint of the Project Area. Furthermore, their effects will be intermittent and temporary, only having the potential for significant effect during the development's construction phase.

Colluvial deposits are located near the northeastern portion of the Project Area (Drawing 12.1). When present over a significant slope, these deposits pose a hazard to people and infrastructure because they have the potential for mass wasting. These features should be avoided where possible. Otherwise, mitigation of these features, where identified, should be conducted through consultation with a qualified professional.

Karst risk is found in the southern and northern portions of the Project Area. The underlying bedrock has the potential risk of subsidence, and this must be considered in the project design. These features should be avoided where possible; otherwise, mitigation of these features, where identified, should be conducted through consultation with a qualified professional.

Although it is not anticipated at this time, strategic blasting may be necessary for earthwork activities. Blasting can impact topography by changing landforms and reducing elevation; if used improperly, it can destabilize earth material (soils or rocks).

13.2.1.1 Mitigation

The following erosion and stabilization control and mitigation measures will be enacted during the Project. These mitigation measures are aimed at minimizing impacts to topography, surficial geology, and bedrock geology and resulting potential effects on air quality, groundwater, or surface water conditions if they are to occur:

- Implement sediment control measures (e.g., sediment fencing) and erosion control (e.g., mulching/revegetation). A draft Erosion and Sediment Control Plan (ESCP) is provided in Appendix Q.
- Complete site reclamation to stabilize and revegetate slopes and exposed surfaces.
- Save topsoil and organic soil material removed during construction for use during reclamation to restore the local seed bank.
- Replace soil material during reclamation when weather is optimal (i.e., minimal precipitation), if possible.
- Implement the Project Contingency Plan (Appendix P), which will include site-specific measures to prevent sedimentation and erosion and respond to spills.
- Avoid areas where colluvial deposits situated along steep slopes have been identified.
- Consult a qualified professional to stabilize steeply banked slopes where colluvial deposits or unstable materials are present.
- Avoid areas where sinkholes are identified.

- Consult a qualified professional to repair sinkholes or engineer structures to accommodate sinkholes.
- Conduct blasting, if required, in accordance with provincial legislation and subject to the terms and conditions of applicable permits.
  - Conduct pre-blast surveys for wells within 800 m of blasting activities.
  - Ensure all blasts are conducted and monitored by certified professionals.
  - Ensure all protective measures outlined in the Environmental Management and Protection Plan (EMPP, Appendix R) are implemented in advance of blasting activities.
  - Notify landowners in advance of any blasting activities.
  - Recover and revegetate exposed soils or bedrock as required to minimize any exposure following blasting.
- Develop a mitigation plan for managing sulphide-bearing materials if they are identified through pre-construction geotechnical surveys.
- Require rock removal in known areas of elevated sulphide-bearing material will conform to the Sulphide Bearing Material Disposal Regulations, N.S. Reg. 57/95 and in consultation with relevant regulatory departments.

13.2.1.2 Monitoring

No monitoring is recommended for the geophysical environment at this time.

If blasting is required for the Project's construction, groundwater wells within 800 m will be monitored per NSECC Procedures for Conducting a Pre-Blast Survey (1993). If necessary, blasting will be completed in accordance with the guidelines for the use of explosives in or near Canadian fisheries waters (Wright & Hopky, 1998).

Soil and bedrock materials testing will be completed, if necessary, based on the geotechnical assessment to identify ARD potential. If any excavated material is found to contain levels above the applicable threshold criteria, a management plan will be developed.

13.2.1.3 Residual Effects and Significance

Magnitude

There is no regulatory threshold for impacts to geology. Since disturbance to site geology can impact water quality [e.g., total suspended solids (TSS), metals, ARD, sediments, etc.], the magnitude is defined as is for surface water: a regular exceedance (e.g., >2 per year) of the standard parameters for TSS[7]. These parameters are defined in the Nova Scotia Watercourse Alterations Standard (NSECC, 2015).

The Project is predicted to have a **low** magnitude of impact as TSS levels are anticipated to remain within acceptable limits.

[7]The turbidity and TSS levels of runoff from a construction area must not exceed the levels immediately upstream by 25 mg/L unless levels immediately upstream are greater than 250 mg/L, in which case construction area runoff turbidity and TSS levels must not exceed levels immediately upstream by more than 10% (NSECC, 2015).

Likelihood

It is **almost certain** that the Project will disturb site geology as groundwork is required to support the construction of access roads and WTG foundations.

Duration

The time period over which the effects are likely to persist is predicted to be **short**, as they are confined to the Project's construction, decommissioning, and reclamation phases.

Frequency

Effects on site geology will occur **regularly** during the Project's construction, decommissioning, and reclamation phases.

Significance

The Project is predicted to have a **not significant** effect on geology (Table 10.4).

13.2.2 Groundwater

Groundwater impacts from a wind project can be variable and depend on conditions such as underlying geological conditions, natural groundwater characteristics, and the construction activities taking place.

13.2.2.1 Quality

Precipitation or surface water that comes into contact with rock could affect surface water runoff quality or leach into the groundwater, which could potentially make its way to water wells or surface water features. Effects to groundwater quality (and surrounding wells) from the Project are unlikely because of the Project's low potential for ARD, and due to the limited spatial extent of any groundwater flow path disruptions. Refer to Section 13.5.2 for Project effects on surface water and Section 13.2.1 for a discussion of ARD and uranium potential. Potential residual impacts on groundwater quality may be associated with contamination from hazardous material spills during all activity phases. It is expected, however, that potential spills will be mitigated during construction. It is also assumed that operations will not include hazardous material storage. It is anticipated that WTG foundations will be left in place during decommissioning and that Project construction, operation, and/or decommissioning will not result in increased aquifer vulnerability at foundation sites. The potential effects associated with decommissioning are considered to arise from potential spills and can be mitigated with best construction practices.

Blasting (if required) has the potential to impact the quality of the surrounding groundwater supply depending on the proximity to drinking water wells and the extent of disturbance caused by construction activities. Disturbance of arsenic and/or uranium containing bedrock can mobilize arsenic/uranium within groundwater, and subsequently degrade nearby groundwater well quality. Risk mapping shows the Project Area is primarily situated in a region that has a “Low to High Risk” of arsenic containing bedrock; with areas of “Medium Risk” along sections of Earltown and Mount Thom where most well users are located (Drawing 12.5 and 12.6). Risk mapping also showed that the Project Area is entirely within a

"Low Risk" and "Medium Risk" area for uranium containing bedrock; with areas of "Low Risk" around most of Earltown and Mount Thom where the majority of well users are located [Drawing 12.5 and 12.6] (Kennedy & Drage, 2017, 2020).

The Project has the potential to affect groundwater quality during the construction and decommissioning phases. However, the spatial extent of any impact is likely to be minimal, and mitigation measures (Section 13.2.1.1) are likely sufficient. The pathway of effect to groundwater well users is primarily through mobilizing rocks through blasting. Blasting is expected to be localized if necessary, and will be completed in accordance with guidelines, including completion of a pre-blast survey if wells are present within 800m. Furthermore, groundwater quality impacts relating to hazardous spills may be reversible. Operational effects are considered to be negligible.

Pre-construction sampling for arsenic or uranium was not completed due to the low risk to individual wells from Project activities. Nova Scotia Guidelines advise that individual well users should test their personal wells for metals every two years (Government of Nova Scotia, 2024).

13.2.2.2 Quantity

Changes to the natural surface conditions within the Project footprint have the potential to alter groundwater recharge and could cause temporary lowering or rising of the water table relative to baseline conditions (BLM, 2005). Clearing and grubbing can increase recharge, and conversely, hardened surfaces (e.g., access roads and construction pads) have the potential to reduce recharge. Overall, groundwater recharge and discharge are expected to remain unchanged from existing conditions.

Localized groundwater flow paths within the Project footprint may be disrupted from initial construction operations (e.g., blasting; BLM, 2005). Blasting can increase bedrock fracture frequency and change the direction of groundwater interflow, potentially impacting flow to wells or surface water features. Blasting associated with WTG foundations, if required, is less likely to impact surrounding wells as WTGs are situated 800 m from all existing residential receptors, except for one. If blasting is required to support access road construction, it may occur in closer proximity to residential receptors, which would result in a greater potential for impacts to residential water wells.

Raft foundations, with typical excavation depth between 3 to 5 m below grade, are proposed for most WTGs. Well records demonstrate that static water levels in drilled bedrock wells in the surrounding area (Table 12.3) are generally greater than 5 m. Therefore, it is unlikely that the bedrock aquifer will be encountered during excavation. However, static levels may vary across the Project Area, or otherwise, a shallower aquifer may be encountered. Either way, dewatering may be required if groundwater is encountered during the construction of WTG foundations. The dewatering would create a local drawdown of the groundwater table that may temporarily alter normal groundwater flow directions. However, based on the minimal size of the excavation, the limited time it is left unfilled, and the distance to adjacent aquatic receptors and groundwater wells, a reduction in groundwater quantity to these features is not anticipated. Furthermore, WTGs are typically installed on topographic highs where groundwater elevation is typically deeper than surrounding areas, and therefore the groundwater elevation may be deeper than indicated by the surrounding well records.

The Project has the potential to affect groundwater quantity during the construction and decommissioning phases. However, the spatial extent of any impact is likely to be minimal. Operational effects are considered negligible.

13.2.2.3 Mitigation

The following mitigation measures will be included in the design of the Project. These mitigation measures are aimed at minimizing impacts to groundwater in the unlikely event they are to occur:

- Grade construction areas (e.g., laydown areas) to control runoff.
- Use an emulsion compound that is insoluble in water if blasting is required. This will prevent contaminants such as Ammonium Nitrate Fuel Oil entering surface water bodies and groundwater during blasting activities.
- Complete refueling in designated areas, >30 m from a watercourse or wetland.
- Require the operator to remain with the equipment during refueling.
- Require that spill response equipment will be readily available.
- Conduct blasting, if required, in accordance with provincial legislation and subject to the terms and conditions of applicable permits.
    - Conduct pre-blast surveys for wells within 800 m of blasting activities.
    - Ensure all blasts are conducted and monitored by certified professionals.
    - Ensure all protective measures outlined in the EMPP are implemented in advance of blasting activities.
    - Notify landowners in advance of any blasting activities.
    - Recover and revegetate exposed soils or bedrock as required to minimize any exposure following blasting.
- Implement the Project Contingency Plan for the Project to outline the prevention and response methods regarding spills and/or substance loss.

13.2.2.4 Monitoring

No groundwater monitoring is proposed as part of the Project at this time.

If blasting is required for the Project's construction, groundwater wells within 800 m of the blast location will be monitored per NSECC Procedures for Conducting a Pre-Blast Survey (1993).

13.2.2.5 Residual Effects and Significance

Magnitude

The Project is predicted to have a **low** magnitude impact on groundwater. No regulatory threshold is available; therefore, the Project team has considered a change in the groundwater quantity such that it has a negative effect on a groundwater receptor such as drinking water wells as the threshold.

Likelihood

The likelihood of an effect to groundwater is largely dependent on the requirement to blast, which is currently not known. Even if blasting does occur, the potential for groundwater interaction is unknown as it is dependent on many unknown variables (e.g., rock type, blast charge, distance to nearest well etc.). Conservatively, the likelihood of an effect to groundwater was deemed as being **possible**.

Duration

Potential impacts to groundwater are anticipated to be **long term**, considering any change would be permanent without intervention. Impacts are more likely to occur during the construction (2 years) and decommissioning/reclamation (2 years) phases of the Project. During these phases, Project related activities have the potential to interact with groundwater. During operations (35 years), there is no anticipated impact to groundwater.

Frequency

Potential impacts to groundwater are predicted to be **sporadic**, as the activities likely to interact with groundwater occur at irregular intervals through the construction phase of the Project.

Significance

The Project is predicted to have a **not significant** effect on groundwater (Table 10.4).

13.3 Terrestrial Environment

This section outlines the effects of the undertaking on the following biophysical VECs: habitat, flora, and lichens, and fauna, and bats.

13.3.1 Habitat, Flora, and Lichens

The Project will result in both indirect and direct impacts to habitat types (i.e., wetland and upland habitats), flora (vascular and nonvascular plants), and lichens (Table 13.1).

13.3.1.1 Direct Impacts

The Project will have direct impacts on habitat structure and on flora and lichens. Clearing and grubbing for road and pad construction account for the most notable impact. The Study Area will be restored during the reclamation phase of the Project.

Direct impacts during the operations phase (25+ years) are minimal and include vegetation management (i.e., cutting and clearing) along the collector line corridor and road ROWs. This localized impact is anticipated to occur approximately once every 10 years, or as required locally in the interim. The vegetation (brush) clearing and maintenance activities, largely occurring within areas previously cleared or impacted during the construction phase, are expected to have a negligible impact during the operations phase.

Table 13.3 displays the habitat types and areas overlapped by the Project footprint. These estimations were derived using the same tools to estimate land types in the Project Area (Section 12.3.1).

Table 13.3: Habitat Types Affected

Habitat Type	Project Area		Project Clearing[1]	
	Total Area of Habitat Type (ha)	Percentage of Habitat Type	Total Area of Habitat Type Affected (ha)	Percentage of Project Area Habitat Type Affected
Cutover	141	2%	7	5.0%
Cutover Wetland[2]	8	0%	0	0.0%
Hardwood Forest	2760	38%	15	0.5%
Hardwood Wet Forest	159	2%	1	0.6%
Mixedwood Forest	1152	16%	21	1.8%
Mixedwood Wet Forest	157	2%	1	0.6%
Open Areas	295	4%	25	8.5%
Open Wetland[2]	163	2%	1	0.6%
Shrub/Alders	16	0%	0	0.0%
Softwood Forest	2151	29%	68	3.2%
Softwood Wet Forest	291	4%	3	1.0%
Urban/Developed	46	1%	0	0.0%
Water	10	0%	0	0.0%
TOTAL	**7348**	**100**	**142**	**1.9%**

[1]Total area cleared within the Project Area to support Project infrastructure.
[2]Includes wetlands from provincial forestry layer (NSNRR, 2021c) and does not include field delineated wetlands.

No SAR vascular plant species were identified within the Project Area; however, two SOCI plant species, American beech and heart-leaved foamflower, were observed (Drawing 12.8) within the Project footprint and are anticipated to be removed during development (i.e., clearing activities; Drawing 11.1).

Two SAR lichens, frosted glass-whiskers and eastern waterfan, were observed within the Project Area. As requested by NSECC, specific locations of SAR are not publicized in the EARD; rather, they are provided directly to NSECC on submission of the EARD.

Frosted glass-whiskers was observed in the northern part of the Project Area, near a proposed WTG, as well as two observations in the southern portion of the Project Area. The At-Risk Lichens – Special Management Practices (NSNRR, 2018a) considers frosted glass-whiskers a rare and sensitive lichen and recommends a 100 m buffer on Crown land with no forest harvesting or road construction to occur within the buffer area. These observations are not located within the Project footprint; however, the 100 m buffer intersects with the Project footprint.

As avoidance is the primary mitigation measure, alternate routes were considered to avoid impacts to frosted glass-whiskers. A road alignment was considered near turbine WTG 15 that runs directly north along the west side of Bezanson's Lake; however, the proposed routing was selected to reduce impacts to wetlands, watercourses, and fish habitat. The alignment proposed could not be shifted further east nor west due to slope and grade constraints. The lichen itself will not be directly impacted by the road alignment; however, the 100 m buffer will not be maintained. Buffer avoidance will be further prioritized through detailed design of the Project infrastructure.

Eastern waterfan was observed 25 times across the Project Area. The At-Risk Lichens – Special Management Practices (NSNRR, 2018a) considers eastern waterfan a very rare and highly sensitive lichen and recommends a 200 m buffer with no forest harvesting or road construction to occur within the buffer area on Crown lands. The Project does not involve direct impact or loss of any eastern waterfan individuals; however, the 200 m buffer on eastern waterfan streams intersects with proposed road infrastructure in four locations. These four locations will require upgrades to existing roads, and no new road construction is proposed in any eastern waterfan buffers.

Seven SOCI lichen were identified in 10 locations across the Project Area: *Stereocaulon consensatum* (n=1), *Fuscopannaria sorediata* (n=2), *Heterodermia speciosa* (n=2), *Chaenotheca hispidula* (n=1), *Synctinium subtile* (n=2), *Anaptychia palmulata* (n=1), and *Phaeophyscia pusilloides* (n=1). The single *Stereocaulon consensatum* observation is within the Project footprint and is anticipated to be lost from Project development. Project infrastructure was sited to avoid SOCI lichens to the greatest extent possible.

13.3.1.2 Indirect Impacts

Removal of vegetation and habitat loss during the construction phase can result in indirect impacts through edge effects. These effects include changes in microclimate, increased light availability, dust deposition, and changes in vegetation communities. Clearing of habitat could also result in the potential for invasive plant species to establish.

Lichens and nonvascular plants are notably sensitive to edge effects and air quality due to being poikilohydric organisms with an inability to regulate and maintain their water content (Nash III, 2008). Forested communities adjacent to clearings often have a microclimate which varies from interior forests. This is a result of increased solar radiation, high wind velocity and lower humidity (Rheault et al., 2003). Edge effects can result in the desiccation and death of lichen species and is one of the biggest threats to SAR and SOCI lichens. The extent to which lichens and plants are impacted by edge effects (referred as depth of influence) is well documented; however, the depth of influence is context-dependent (e.g., dependent on the size of the clearings, substrate, type of climate, etc.).

Vascular plants could also be affected by dust deposition which can cover the leaves, block stomata and cellular respiration, and reduce the overall efficiency of photosynthesis (Farmer, 1993). Dust can be absorbed through the soil, resulting in an overall decline in plant health and can lead to necrosis (Hosker & Lindberg, 1967). Dust deposition would largely be associated with activities during the construction and decommissioning phases of the Project and limited to the area directly adjacent to roads (and to a lesser extent WTG pads).

13.3.1.3 Mitigation

The following mitigation measures are included in the Project design to minimize impacts/effects to habitat, vascular plants, and lichens:

- Maintain buffers on SAR and SOCI lichens to the greatest extent possible while limiting the clearing footprint, by continued micro-siting and reducing clearing to only approved areas.
- Maintain surface water flow via cross drainage culverts on access roads.
- Monitor wetlands as directed in regulatory approvals.
- Implement the ESCP (draft provided in Appendix Q), with an additional level of protection where existing roads intersect buffered eastern waterfan locations.
- Avoid travel across erosion prone areas.
- Manage vegetation through cutting rather than using herbicides.
- Use dust suppressants (e.g., water trucks), as required, to control dust.
- Require equipment to have spill kits and that site personnel are instructed on their use.
- Employ measures to reduce the spread of invasive species (e.g., cleaning and inspecting vehicles).
- Reclaim the Project footprint as much as possible to re-establish native vegetation communities. Where vegetation restoration is required, natural regeneration of native species will be favored.
- Implement the EMPP (Appendix R), which includes site-specific measures to prevent sedimentation and erosion, dust level management, and spills.

13.3.1.4 Monitoring

Monitoring for invasive species and overgrowth is proposed at infrastructure locations that may require clearing during operations. Further, monitoring of rare lichens is proposed where buffers are encroached. Refer to Section 13.5.1.4 for the proposed monitoring of wetlands.

13.3.1.5 Residual Effects and Significance

Magnitude

The Project is predicted to have a **low** magnitude of impact on habitat, flora, and lichens. No regulatory threshold is available; therefore, the Project team has considered an effect that is likely to cause a permanent, unmitigated, alteration to habitat that supports flora/lichen, where similar habitat is not currently available at the local/regional level as the threshold.

Likelihood

It is **certain** that the Project will impact habitat, flora, and lichens as clearing and grubbing associated with the construction phase of the Project will directly impact this VEC.

Duration
The time over which the effects are likely to persist are predicted to be **long term**, as they commence in the construction phase and will remain in an altered state through operations and potentially closure.

Frequency
Effects to habitat, flora, and lichens will occur **once** during the construction phase of the Project.

Significance
The Project is predicted to have a **not significant** effect on habitat, flora, and lichens (Table 10.4).

13.3.2 Fauna

The following potential effects to fauna (excluding bats and birds) may occur from construction, operations, and decommissioning activities (Table 13.1). These effects will be a result of activities such as tree clearing, road building and infrastructure installation and maintenance, including:

- Mortality
- Sensory disturbance
- Loss or alteration of habitat and habitat fragmentation

13.3.2.1 Mortality

Direct mortality of terrestrial fauna species could result from Project activities, particularly from wildlife vehicle collisions. The Project phases with the highest levels of truck traffic, and therefore the highest risk of wildlife vehicle collisions, are the construction and decommissioning phase. During operations, maintenance will require trucks to access the site periodically but at a much lower frequency than during the construction and decommissioning phases of the Project.

According to Fahrig and Rytwinski (2009), road construction can have greater impacts on amphibians, reptiles, and large mammals compared to small mammals and birds. Small mammals and birds are generally able to avoid collisions with vehicles. However, road infrastructure and traffic have a negative impact on species that are attracted to roads but lack the speed or reaction time to avoid traffic (e.g., turtles attracted to gravel roadsides for nesting). Further, ruts caused by equipment and vehicles may fill with water in the spring and attract breeding amphibians. Since these ruts would likely dry up in the summer, this presents a potential risk to species that hatch. As amphibians can experience high mortality, they can benefit from culvert installation where wetlands and watercourses intersect roads as an alternative to crossing roads (Bouchard et al., 2009).

The risk of collisions with wildlife will vary depending on the season and the species. For instance, during winters with deep snow conditions, white-tailed deer are more likely to use roads and trails, putting them at an elevated risk of collisions. During spring and summer, porcupines and skunks forage on roadside vegetation at dawn and dusk, increasing the risk of collisions with those species. Further, turtles are drawn to the roadside to nest in the gravelly shoulders in June. As such, the risk of wildlife collisions is present at any time of year.

Direct mortality may occur during clearing and grubbing activities for the construction of roads and WTG pads for low mobility species such as reptiles and amphibians. Operational activities are infrequent and limited mortality is expected.

Additionally, accidents such as fuel spills have the potential to cause indirect mortality to fauna due to exposure of contaminants. Proper spill preparedness will reduce the risk of indirect effects to fauna to negligible levels.

13.3.2.2 Sensory Disturbances

Wildlife sensory disturbance may occur from ongoing human activity on-site as well as visual and auditory disturbance related to the operation of the WTGs. Sensitivity of wildlife to disturbance varies by species and life-stage, and noise type. Due to the extensive use of highways in North America, the effects of highway noise have been studied in many different animal groups including birds, mammals, amphibians, and fish. Studies show that although wildlife often respond negatively to the presence of roads, there are several other factors that can affect wildlife presence and activity near roads. These factors may include pollution, substrate vibrations, moving cars, different microclimate, and vegetation and food availability, therefore, it is difficult to differentiate among them and identify the principal causal factors of avoidance to sensory disturbance (California Department of Transportation, 2016).

Sensory disturbance to fauna is expected during all Project phases. During the initial construction phase of roads and WTG pads, noise will be generated from activities such as rock blasting (if required), clearing, and grubbing. During the operations phase, noise will be generated from the WTGs. Heavy equipment use will generate noise during the construction and decommissioning and reclamation phase. These sensory disturbances may result in localized wildlife avoidance of the Project Area. Some species may avoid the area, while others may be attracted to the increased activity, including opportunistic species such as eastern coyote, northern raccoon, striped skunk, or American black bear.

Human presence and vehicles may disturb wildlife. Primarily during operations, Project-related vehicles and personnel will be in the vicinity of WTGs on a semi-regular basis for ongoing maintenance.

Noise is the type of sensory disturbance that is most likely to affect fauna within the Project Area. Although the auditory capabilities of fauna species vary (Shannon et al., 2016), and fauna behavior in response to noise is largely related to perceived threats, not noise intensity (Bowles, 1995), changes to ambient noise levels have the potential to adversely affect fauna. Noise can affect behavioral patterns (Patthey et al., 2008), stress fauna (Kight & Swaddle, 2011), cause avoidance behavior (Ware et al., 2015), and reduce the ability for communication and hunting success (Barber et al., 2009). Combined, these effects can negatively impact the overall population health of a particular species (Ware et al., 2015).

Drolet et al. (2016) reported no changes to the density of white-tailed deer when a simulated drilling noise was played at 55 to 65 dBA. A literature review conducted by Shannon et al. (2016) found that an increase in stress and decrease in reproductive success in terrestrial mammals has the potential to occur at noise levels ranging from 52 to 68 dBA. It is predicted that operational sound levels will be below 55 dBA within approximately 140 m from each WTG, so the area of avoidance is a small proportion of the Study Area and Project Area.

Blasting and heavy equipment use during both the construction and decommissioning phases of the Project will generate noise. The levels of noise during construction and decommissioning will exceed the levels cited by Drolet et al. (2016) and Shannon et al. (2016) and indirectly impact wildlife. Worst-case sound levels were estimated during construction (Section 12.1.3). The highest expected sound level during combined construction activities is 86 dBA, 15.2 m from the proposed construction activities (Table 13.4). At 975m from the source of the noise, sound levels reach approximately 41 dBA. See Section 13.1.3 for further details on the Noise Impact Assessment.

Table 13.4: Worst-case Sound Levels During Construction

Noise (dBA)	Distance from Site
86	15.2 m
78.5	30.5 m
71	61 m
63.5	122 m
56	244 m
48.5	488 m
41	975 m

Light is another source of sensory disturbance that can impact fauna by potentially causing disorientation or by causing attraction or avoidance behaviour (Longcore & Rich, 2004). In turn, these behavioural changes can affect the success of foraging, reproduction, and communication of wildlife (Longcore & Rich, 2004) and can disrupt habitat connectivity (Bliss-Ketchum et al., 2016). During construction, decommissioning, and reclamation, light will be sourced from heavy equipment and light plants. Sensory disturbance from lights will be mitigated by installation of motion activated lights on ground-based infrastructure. Aerial lighting on WTGs is regulated by Transport Canada.

13.3.2.3 Habitat Loss

Vegetation clearing of the Project footprint will account for the loss of 142 ha of habitat, which is approximately 1.9% of the total Project Area.

There is little established literature pertaining to the response of wildlife to wind project development. A wildlife monitoring report from the Searsburg wind project in Vermont reported that moose were using the area under a WTG (Wallin, 2006). Twenty-three images of moose were captured using a remote camera installed under the WTG, and of these, 61% occurred when the WTG was on and generating power. Furthermore, observations of a single moose foraging as well as moose scat reported on the site of the Dokie Wind Energy Project in British Columbia indicates that moose continued to use the area after the wind farm was in operation (Jacques Whitford AXYS Ltd. & UNBC, 2008).

While habitat preferences can change as the abundance of available habitat changes (Osko et al., 2004), and habitat selection shows a high degree of variability among individuals (McLaren et al., 2009), mammals may require large areas with diverse habitat types (Snaith et al., 2002). Habitat preferences are correlated with forage and cover requirements, as well as breeding behaviours (Peek et al., 1976).

Vegetation clearing will occur during the construction phase, specifically around WTG pads, new and upgraded access roads, along transmission line corridors, and laydown yards (specific locations to be determined; however, they will be sited in the Study Area, in disturbed habitats wherever possible). A concrete batch plant may be used during construction; however, it will be in the active quarry with no additional clearing required. If footprints overlap with suitable ungulate habitat, this vegetation removal could result in the loss or fragmentation of habitat for ungulates. This effect has the potential for long term impacts when established forest (potentially suitable security or thermal habitat) is converted to early succession stages (less suitable security or thermal but potentially suitable food habitat).

Limited research exists on the effects of infrastructure development (i.e., powerlines, ski trails, wind power) on ungulate behaviour, habitat use, and movement. In a study conducted at a wind energy facility in Oklahoma using telemetry data, the movement patterns of Rocky Mountain Elk prior to construction, during construction, and during operation did not vary and overall trends in home range size were not affected (Walter et al., 2006). Climatic variables and their effects on forage availability potentially have a greater influence on ungulate movement than the construction of wind-power facilities (Walter et al., 2006).

Any construction activities undertaken during the fall could potentially affect the rutting behaviour of ungulates. It is assumed that construction activities undertaken in spring (May to June) will not affect ungulate calving areas. Most ungulates prefer riparian areas, typically with high shrub vegetation cover to give birth. As the WTGs were sited away from riparian areas to the extent practicable, the noise associated with the construction and assembly of WTGs is not likely to affect the selection of calving areas. Walter et al. (2006) observed that elk continued to use riparian habitats located within the project area during and after construction since this habitat was not altered by the installation of the wind-power project.

Linear features such as roads, trails, and transmission corridors have the potential to influence wildlife movement patterns. They create a barrier to movement for certain species, may act as a conduit to movement for other species, and the types of human activity can influence wildlife movement. For example, bears are tolerant of some human activity but will avoid features when human frequency is high (Jalkotzky et al., 1997).

The impacts and effects on wildlife movement associated with linear features will vary depending on the feature type, frequency of human activity, season of use, and width of the feature. The existing roads and ATV trails already enable access within the Project Area, and it is anticipated that there will not be an appreciable increase in hunting activity due to construction activities.

Studies completed by Buckmaster et al. (1999) indicate that wildlife populations may be expected to disperse from the area during periods of construction. Based upon the vegetation characteristics in adjacent areas, and the conclusions of Buckmaster et al. (1999), it is expected that displacement of wildlife will be temporary. Development of the WTG sites and access roads is expected to increase forage potential as grass and forb species re-establish during interim reclamation. Some loss of thermal and security cover is unavoidable; however, surrounding vegetation is expected to maintain these requirements.

Overall effects to fauna habitat from the Project are limited due to the relatively small geographic extent of alteration (142 ha) when compared to the vast expanse of available habitat in the vicinity (1.9% of the Project Area). Mainland Moose (or signs thereof) were not observed during any biophysical surveys completed within the Study Area. The habitat present in the Study Area is common to the regional area and alternate habitat for wildlife exists on adjacent undeveloped lands, therefore, changes in abundance and distribution could be expected, but overall fauna population changes are not expected.

13.3.2.4 Ecological Connectivity

Wind project developments likely do contribute to habitat fragmentation and alterations in landscape connectivity, albeit often to a lesser extent than other anthropogenic land uses such as timber harvesting. The construction of access roads and WTG pads creates new edges and potential barriers to wildlife movement, particularly for species sensitive to human disturbance or dependent on continuous forest cover (Kuvlesky et al., 2010). However, the Project involves impact to 1.9% of the Project Area and prioritizes the use of existing road corridors and disturbed areas.

When considering cumulative effects, it's crucial to evaluate wind farm impacts within the context of existing and future landscape modifications. Forestry operations create a dynamic mosaic of different-aged stands and temporary clearings, while agriculture often results in more permanent habitat conversion. The addition of wind farm infrastructure to this landscape matrix can exacerbate fragmentation effects, potentially reducing core habitat areas and increasing edge influences (Harper et al., 2005). However, the relative stability of wind project land use compared to the cyclical nature of forestry or agriculture may provide some predictability in the landscape structure over time (Northrup & Wittemyer, 2013).

The cumulative impacts of these various land uses can have synergistic effects on landscape permeability and habitat connectivity. For instance, edges created by wind farm roads in forested areas might facilitate access for logging or agricultural expansion, potentially amplifying fragmentation (Popp & Boyle, 2017). Research in Nova Scotia shows that population density of Mainland Moose in Nova Scotia is inversely correlated with road density (Beazley et al., 2004). Conversely, some edge-tolerant or open-habitat species may benefit from the resulting habitat mosaic (Farrow & Broders, 2011). The net effect on biodiversity and ecosystem function depends on the specific landscape context, the species of concern, and the spatial configuration of the various land uses.

Effects of the Project on ecological connectivity are mitigated through the site optimization process, whereby existing roads and disturbed areas are prioritized for development over intact undisturbed forests. This results in reduction of new fragmentation as a result of the Project. This approach not only minimizes the Project's footprint but also consolidates linear disturbances, potentially lessening the overall impact on wildlife movement patterns. Careful siting of WTGs and associated infrastructure to avoid sensitive environmental features is crucial. By making efforts to avoid mature forests, wetlands, and riparian areas, developers can preserve natural habitats and maintain important ecological corridors.

13.3.2.5 Mitigation

The following mitigation measures will be included in the Project design to minimize effects to fauna:

- Install motion-activated lighting, which is only applicable to the ground-based infrastructure (i.e., at doorways and at the substation) as WTG lighting at the top of individual WTGs is regulated by Transport Canada.
- Educate Project staff about wildlife potential on roads especially for Project traffic.
- Use dust suppressants (e.g., water trucks), as required, to control dust.
- Require equipment to have spill kits and site personnel will be instructed on their use.
- Use good waste management practices to reduce attractants to opportunistic wildlife species, where applicable.
- Complete vegetation management by cutting (i.e., no use of herbicides).
- Limit vehicle speeds on access roads.
- Install cross drainage culverts to maintain site surface water flow and allow passage for amphibians/reptiles.
- Avoid clearing around wetlands and riparian areas to the greatest extent possible. Avoidance of wetlands and watercourses in Project design was heavily weighted.
- Leave coarse woody debris in areas that will be re-vegetated after construction in place to provide alternative refugia and foraging areas for herpetofauna.
- Complete road maintenance regularly in the form of grading to prevent water pooling and to minimize deep ruts to prevent amphibians from laying eggs in pools.
- Implement the draft Mainland Moose Monitoring Plan (Appendix S)
- Implement Wildlife Management Plan (WMP, Appendix T).

13.3.2.6 Monitoring
A post-construction monitoring program for Mainland Moose will be implemented for two years. No additional monitoring is proposed for this VEC.

13.3.2.7 Residual Effects and Significance

Magnitude
The Project is predicted to have a **low** magnitude of impact on fauna. No regulatory threshold is available; therefore, the Project team has considered an effect that is likely to cause a permanent, unmitigated, alteration to habitat that supports fauna, where similar habitat is not currently available at the local/regional level as the threshold. The Project is expected to impact 1.9% of the landscape within the Project Area.

Likelihood
It is **almost certain** that the Project will impact fauna as clearing and grubbing associated with the construction phase of the Project will directly impact habitat. Further, activities associated with all phases of the Project will generate noise that may adversely affect fauna. The likelihood for the Project to cause direct mortality to fauna is less likely but still possible.

Duration
The time over which the effects are likely to persist is predicted to be **long term**, as there is potential for interaction during all phases of the Project.

Frequency
Loss of habitat will occur **once** during the construction phase of the Project and sensory disturbance will occur regularly during the construction phase but **continuously** during operations.

Overall, effects to fauna are anticipated to occur at **regular** intervals during the Project.

Significance
The Project is predicted to have a **not significant** effect on fauna (Table 10.4).

13.3.3 Bats
The following potential effects on bats may occur from construction, operations, and decommissioning activities (Table 13.1):

- Direct and indirect mortality
- Sensory disturbance
- Loss or alteration of habitat

13.3.3.1 Direct and Indirect Mortality
Mortality potential is strongly impacted by region, habitat, and bat species in the vicinity of WTGs (Hein et al., 2013). Siting WTG locations in areas that avoid bat migratory routes is the most significant step to decrease mortalities available (DNV GL, 2018).

According to the Ontario Ministry of Natural Resources (OMNR) (2024), “Bat mortality has been documented at wind power projects in a variety of habitats across North America. In Ontario, annual mortality estimates at wind power projects range from 4 to 14 bat mortalities/turbine/year. Annual bat mortality estimates at wind power projects in North America vary from less than 1 to over 50 bat mortalities/turbine/year”.

The prominent causes of bat mortality at WTG sites are direct collision (i.e., direct blunt-force trauma) and barotrauma (indirect trauma) although it is difficult to attribute individual fatalities exclusively to either direct or indirect trauma (Baerwald et al., 2008; Grodsky et al., 2011). Barotrauma involves tissue damage to air containing body structures (i.e., the lungs) caused by rapid or excessive air pressure changes. It is believed that air pressure changes in air space directly adjacent to moving WTG blades causes expansion of air in the lungs not accommodated by exhalation, therefore resulting in lung damage and internal hemorrhaging. Grodsky et al. (2011) used radiology to investigate causes of bat mortality and found that a majority of the bats examined (74%; 29 out of 39 individuals) had bone fractures that are likely to have occurred during direct WTG collisions. Approximately half (52%; 12 out of 23 individuals) of the examined bats had mild to severe hemorrhaging in the middle or inner ears (or both) (Grodsky et al., 2011).

Project construction is not expected to significantly impact bats present in the area, although it may result in some direct mortality as bat habitat is present within the Project Area and bats were identified during assessments.

All construction will occur during normal working hours (i.e., daylight) therefore collisions with flying bats are unlikely. No hibernacula were identified during baseline surveys; therefore, disturbances are not expected during the construction phase in areas of the Project footprint.

There are low levels of bat activity across the Project Area with 31 bat passes recorded during the 2023 spring and fall, and 2024 spring seasons. A minority (42%, n=13) of recorded bat passes were identified as migratory species or species group, with the majority of those being Hoary bat. Peak bat activity occurred in early August 2023, with five bat passes recorded in a single night. On average 0.01 migratory passes per detector night occurred for the Project Area.

Bat fatalities occur through direct collision with blades or indirectly from rapid decompression (barotrauma) near WTGs (Baerwald et al., 2008). Studies have shown that on average, greater than 80% of bat fatalities currently recorded at wind energy developments in North America involve migratory species (Arnett et al., 2008). In Alberta, during fall migration (July 15 to September 30), bat fatalities consist mainly of hoary and silver-haired bats (Government of Alberta, 2013).

Due to the lack of readily available data in Nova Scotia to which the data collected for this EARD can be compared to the Alberta model has been adopted for the purposes of analyzing potential impacts to bats. The Alberta Government’s Bat Mitigation Framework for

Wind Power Development (Government of Alberta, 2013) uses a Precautionary Principle whereby the following bat passes per night for migratory species is considered when determining project risk:

> Less than 1 migratory bat passes per detector night = potentially acceptable risk
> 1 to 2 migratory bat passes per detector night = potentially moderate risk
> Greater than 2 bat passes per detector night = potentially high risk of bat fatalities

Based on precautionary guidance from the Alberta Government (2013) the average of 0.01 migratory passes per detector per night observed across the Project Area would be considered a potentially acceptable risk and is the lowest risk threshold for bats identified. The Alberta Government also states that “Pre-construction surveys indicating “less than 1 migratory-bat passes/detector-night” (equating to less than four mortalities per turbine) suggests that bat fatality issues are unlikely; however, post-construction monitoring is required.”

13.3.3.2 Sensory Disturbance

Noise will be generated during all phases of the Project. During construction, decommissioning, and reclamation, noise will be generated by heavy equipment. During operations, noise will be consistent and will be generated by WTGs. During construction and reclamation, noise will only occur during daylight hours (typically) and therefore sensory disturbance is expected to be limited to roosting bats. Project related effects will be associated with noise conditions that exceed those levels whether they be cumulative or independent.

All noise attenuates (diminishes) with distance from the source (California Department of Transportation, 2016). This occurs through geometric spreading and signal reduction from ground and atmospheric absorption. Noise from point sources (i.e., construction equipment) traveling through a soft site (e.g., a forest or meadow), are reduced by attenuation rates of 7.5 dBA for each doubling of distance (based on 15 m) (California Department of Transportation, 2016). As indicated in Table 13.3, sound attenuation from construction through forested habitats, with the exception of intermittent blasting (if required) or intermittent truck horns, sound attenuation for all construction related equipment is expected to be at existing background levels at 135 m from the source of the sound and less depending upon the equipment being used.

Anthropogenic noise can interact with an animal’s ability to process information, in turn reducing survival and reproduction (Gomes et al., 2016). Anthropogenic noise can cause acoustic masking during foraging (Siemers & Schaub, 2011). Jones (2008) found that traffic noise reduced foraging time and effort in Mouse-eared bats (*Myotis myotis*). Anthropogenic noise can also cause an avoidance response which in turn can reduce foraging efficiency (Luo et al., 2014). The effects of anthropogenic noise on bats are not well understood (Bunkley et al., 2015; California Department of Transportation, 2016).

Due to the extensive work on highway construction, a number of studies have been summarized by the California Department of Transportation (2016). Those studies assumed principal potential effects of traffic noise and highway construction on bats were thought to include acute acoustic trauma, disturbance and displacement from important food and shelter resources, and signal masking. However, because of the multiple behavioural and physiological defensive mechanisms they have developed to prevent noise overexposure, most bats are likely effectively shielded from most trauma events that would result from highway or construction noise (California Department of Transportation, 2016). Furthermore, masking can only occur if the noise spectrum overlaps with that of the bat echoes (California Department of Transportation, 2016).

For bat species, echolocation calls are in the ultrasonic range beyond the upper frequency limits of construction noise (California Department of Transportation, 2016). For these species, there is effectively no echolocation masking effect from construction noise. Additionally, the lack of construction activity during bat activity (30 minutes before sunset to 30 minutes after sunrise), further limits any potential masking effects in the ultrasonic ranges.

Disturbance is likely to be the most pervasive and significant effect associated with construction projects. Construction noise (e.g., heavy equipment, blasting, and pile-driving) could potentially affect bats, particularly those species that roost nearby. Sudden, loud noises can potentially disturb bats and cause abandonment of roosts (Fenton, 1997; Ferrara & Leberg, 2005; Humphrey & Kunz, 1976; Kunz, 1982; Pearson et al., 1952). If loud enough and sudden, such noise can also potentially cause temporary or permanent hearing loss in bats, but this has yet to be tested. Chronic disturbance may also alter important colony activity patterns, particularly during the breeding season (Shirley et al., 2001; Mann et al., 2002) and disrupt critical torpor cycles of hibernating/overwintering bats, forcing them to overuse critical energy resources (Fenton, 1997; Johnson et al., 1998; Speakman et al., 1991; Thomas, 1995).

However, bats are well adapted morphologically, physiologically, and behaviourally to avoid acoustic trauma (California Department of Transportation, 2016). Because they are often aurally confronted with exceptionally loud sounds from their own and other bat echolocation signals (e.g., 110 dB) they have evolved very fast protective mechanisms to prevent sensory overload and damage to the auditory system (Henson, 1965; Vater & Braun, 1994; Wever & Vernon, 1961). These mechanisms include behavioural avoidance, changing the shape and orientation of the pinnae (Wever & Vernon, 1961), closing the cartilaginous fold in the outer ear canal (Wever & Vernon, 1961), the tympanic reflex (Wever & Vernon, 1961), and resonance absorption (Vater & Braun, 1994). While these mechanisms are very effective in achieving the needed protection from constant noise exposure (i.e., in the case of WTGs), it is speculated that these mechanisms also can prevent over exposure from sudden, unexpected anthropogenic noise shocks (e.g., blasting).

Henson (1965) found Brazilian free-tailed bats could initiate the tympanic reflex very quickly (4-10 milliseconds) before echolocating. Additionally, because the spectra of construction noise do not appreciably overlap with most bat echolocation calls or their hearing of them, echolocation in most species of bats is likely not adversely affected by these noise types (California Department of Transportation, 2016).

13.3.3.3 Loss or Alteration of Habitat

As noted in the ACCDC report, bat species and/or hibernaculum are known to occur within 5 km of the Project Area. Correspondence from NSNRR (Sara Spencer, email dated August 20, 2023) confirmed that there are no bat hibernacula within the Project Area; however, occurrences of bats have been documented 4 km east, 5.5 km east, and 4.5 km northeast of the Project Area.

Habitat suitable for bat roosting and foraging was reviewed incidentally for all proposed WTG's. Observations at each WTG location indicate that for the most part, habitat to support these activities will continue to be present as only 1.9% of habitat within the Project Area will be affected by construction through direct loss. Similar to the effects on birds, the habitat across the Project Area (and WTG locations specifically), is also present extensively in surrounding undeveloped forested lands. As such, removal of this habitat for the construction of WTGs and access roads associated with the Project is not expected to affect bat populations in the region. Decommissioning of the Project will result in the return of potential bat habitat.

13.3.3.4 Mitigation

Bat mortality risk has been found to be greater during low wind speed conditions than during high-wind conditions with fewer bats observed at wind speeds greater than 6 metres per second (m/s) (21.6 km/hr; Arnett, et al., 2008). Baerwald et al. (2008), found that by increasing the low wind cut-in speed of a WTG from the rated 4 m/s (14.4 km/h) to 5.5 m/s (19.8 km/h), a reduction in WTG-caused bat fatalities occurred. It has been shown that increasing cut-in speeds to 5.5 m/s, significantly reduced WTG-related bat fatality, as bat activity is reduced during higher wind speeds (Arnett et al., 2008; Baerwald et al., 2008).

Cut-in speeds can be managed remotely via WTG operators and can be implemented immediately (depending on the WTG and software used). As increases in cut-in speed have financial implications to the generation capacity of the Project, it is recommended that an iterative review and adjustment of cut-in speeds be developed in consultation with NSECC and NSNRR to ensure effective mitigation, while not excessively affecting energy production. In addition to financial implications of revised cut-in speeds, broad revisions of cut-in speeds may have implications to the province's renewable energy goals. As adjustments to cut-in speed can be implemented without delay, reaction to field results (e.g., high fatality numbers during post-construction fatality monitoring, wind speed or time of day) could be applied rapidly. Through continued carcass surveys and iterative adjustments in cut-in speed, the need for mitigation (if required) can be assessed and met while still allowing energy production by the Project during bat migratory periods.

Additional mitigations for bats include:

- Complete clearing activities that may impact potential roosting habitat outside of the bat roosting period (May 15 to September 30).
- Install motion activated lights on site infrastructure to reduce insect attraction and subsequent attraction by bats during operations. Motion activated lighting is only applicable to the ground-based infrastructure (i.e., at doorways and the substation) as WTG lighting at the top of individual WTGs is regulated by Transport Canada.
- Provide wildlife awareness training to site personnel.
- Implement the WMP and Adaptive Management Plan (AMP, Appendix U).

13.3.3.5 Monitoring

Post-construction mortality surveys are an important monitoring process during the first two years of operation to evaluate the correctness of the predictions and to test the possibility of unexpected risk factors. Post-construction mortality monitoring for bats will be completed in conjunction with bird mortality surveys as described in the Post-Construction Survey Protocols for Wind and Solar Energy Projects (AEP, 2020). In past EARD applications protocols as listed in Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds (CWS, 2007a) were suggested for use; however, the Alberta Environment and Parks (AEP) document contains updated protocols to reflect current information and knowledge around post-construction monitoring. More details on post-construction monitoring will be provided with the Adaptive Management Plan (AMP), for which a draft is included as Appendix U.

13.3.3.6 Residual Effects and Significance

Magnitude

The Project is predicted to have a **low** magnitude of impact on bats. No regulatory threshold is available; therefore, the Project team has considered the Government of Alberta's (2013) Precautionary Principle of a potentially acceptable risk as the threshold.

Likelihood

It is **almost certain** that the Project will impact bats as clearing and grubbing associated with the construction phase of the Project will directly impact habitat and activities associated with all Project phases will generate noise that may adversely affect foraging success of bats. The likelihood for the Project to cause direct mortality to bats is likely; despite bat usage of the Project Area being quite low.

Duration

The time over which the effects are likely to persist is predicted to be **long term**, as there is potential for interaction during all Project phases.

Frequency

Loss of habitat will occur once during the construction phase of the Project and sensory disturbance will occur regularly during the construction phase but continuously during operations.

Potential for direct mortality is most likely during the operational phase of the Project, therefore, effects to bats are anticipated to occur at a **continuous** interval during the Project.

Significance

The Project is predicted to have a **not significant** effect on bats (Table 10.4).

13.4 Avifauna

WTG effects on birds and bird migrations have been studied in great detail over the past decades (Drewitt & Langston, 2006; Kerns & Kerlinger, 2003; Smallwood, 2013). The impact that WTGs may have on birds, and bird movements, depends largely on local topography, WTG design, and the bird communities inhabiting the Project Area. Birds may be affected throughout the life cycle of the Project, from operational impacts such as mortality and avoidance behaviour, to habitat alteration during construction and decommissioning, and throughout with sensory disturbances of varying degrees.

13.4.1 Direct Mortality

There is the potential for direct mortality, including direct mortality of eggs/unfledged nestlings, during site preparation when clearing and grubbing vegetation (construction phase = 2 years). Vehicle collisions could occur during any Project phase but are more likely to occur during construction (2 years) or decommissioning/reclamation (2 years) as there will be an increase in truck traffic during these phases. Mortality associated with WTG collisions may occur during operations (25+ years).

Birds may avoid a wind project, either due to being displaced from the area, or avoiding WTGs/taking evasive action to prevent a collision. Band et al. (2007) stated that birds with flight heights coinciding with the rotor swept area (RSA) of WTGs have a higher likelihood of collision[8]. However, species-specific behaviours may also affect collision rates. The project is in a region of Nova Scotia that has not been observed to support a significant migratory route, as was observed during field surveys and remote sensing. This consideration from a developmental perspective helps to minimize interactions of birds with the Project, ultimately minimizing mortalities.

Mortality rates do not depend on bird abundance alone, but on other factors, such as differential use of areas within a wind project (Ferrer, et al., 2012). Collision mortality is influenced by abundance, frequency of passage, flight behaviour, weather, and topography (De Lucas et al., 2008). Verification of collision is confirmed through post-construction mortality monitoring.

[8]The RSA for the N163 WTG is 20,897 m^2

In Canada, 69% of bird fatalities recorded from wind power projects were passerines (Bird Studies Canada et al., 2016). It is likely that passerines make up an even larger percentage of fatalities than estimated, due to the difficulty in detection of individuals during surveys than larger birds (Erickson et al., 2014), as well as rapid scavenger removal (70 to 80% within two days) (Lekuona & Ursua, 2007).

Avoidance behaviour varies between species (Whitfield, 2009), with raptors appearing to be more vulnerable to collision with WTGs than most other avian groups (Erickson et al., 2002; Young et al., 2003). Behaviour of diurnal migrants such as raptors makes them potentially more vulnerable to collisions with WTGs, particularly during hunting (Higgins et al., 2007), or while using thermal updrafts to increase altitude and conserve energy. Barrios and Rodriguez (2004) reported increased mortality during fall/winter migration, with birds flying closer to WTGs.

Some studies have also correlated raptor abundance with a higher collision risk. Breeding grounds and areas with foraging habitat have been identified as sites that increase high flight abundance (Bevanger, et al., 2010; Eichhorn et al., 2012). Additionally, diurnal migrants (raptors, vultures, etc.) are more constrained by topographical features than nocturnal migrants – they tend to be concentrated along linear features such as rivers, ridges, and valleys (Richardson, 2000); resulting mitigation suggests placing WTGs away from such features. From a developmental perspective, the Project has been placed in a location that does not contain significant landscape features that encourage nocturnal migration, such as those noted above.

Ferrer et al. (2012) further suggests there is clear evidence that the likelihood of bird collisions with WTGs depends critically on species behaviour and topographic factors, not solely local abundance. Birds do not move over the area at random, but follow main wind currents, which are affected by topography. Therefore, certain locations of WTGs could be harmful for birds even where there is a relatively low density of birds, whereas other locations would be relatively risk free even with higher densities of birds (Ferrer, et al., 2012).

The risk to avian species for collision with WTGs is highest during migration periods (AEP, 2018), when the most fatalities tend to be reported. Fatalities can also occur from meteorological (MET) towers and guywires, or through nest mortality/disturbance from clearing of vegetation/loss of habitat (Band et al., 2007). Bird fatalities due to WTG collision have been identified as an ecological challenge in wind energy (Drewitt & Langston, 2006), however, mitigating this is not forthright, due to the complexity of factors influencing collisions (Marques, et al., 2014).

Bird collision likelihood depends on species, WTG height, location and elevation, implicating species-specific and topographic factors in collision mortality. There is no evidence of an association between collision likelihood and WTG type or the position of a WTG in a row (De Lucas et al., 2008).

Populations of several groups vulnerable to collisions are increasing across Canada (e.g., waterfowl, raptors). This suggests collision mortality at current levels does not limit population growth. The factors that contribute to a species' vulnerability to collisions include species that flock, have rapid flight, and are large with slow maneuverability (high wing loading and low wing aspect ratio) (Rioux et al., 2013).

13.4.1.1 National Averages

While collision with WTGs causing direct mortality is an often-cited effect on birds, a study completed in 2013 found that after completing carcass searches at 43 wind projects across Canada, the average number of birds killed per WTG per year was 8.2 ± 1.4 (Zimmerling et al., 2013).

In Canada, the Wind Energy Bird and Bat Monitoring Database is a joint initiative among Bird Studies Canada, CanWEA, ECCC, and OMNR (Birds Canada, 2024). Data from Atlantic Canada available on the database come from only two sites from New Brunswick, three in Prince Edward Island, two in Newfoundland and Labrador, and one in Nova Scotia. In Atlantic Canada, the estimated average mortality rate is 1.17 birds per WTG per year (Bird Studies Canada et al., 2016).

Another study completed in 2013 reviewed 22 wind projects in the eastern U.S. and found that after accounting for varying proportions of the year being sampled, annual per WTG mortality was modeled to be 6.86 birds per WTG per year (95% CI=5.41 – 8.30) (Loss et al., 2013).

13.4.1.2 Dalhousie Mountain Wind Farm Mortality Surveys

The Dalhousie Mountain Wind Farm is a 34-WTG facility located east of the Project, with the nearest inter-project WTG-to-WTG distance being 2.7 km. In operation since 2009, the Dalhousie Mountain Wind Farm completed post-construction mortality surveys during the first few years of operations to assess the impacts of the WTGs on birds in the area.

While the size, spacing, height, and overall conditions are very different at the Dalhousie Mountain facility, given its close proximity, there is a possibility that WTG-related avian mortality could be comparable. Mortality surveys at the Dalhousie Mountain Wind Farm observed mortalities of 0.5 birds per WTG per year (RMS Energy, 2011).

13.4.1.3 Clydesdale Ridge Wind Project Estimate

To estimate bird mortality associated with this Project, a guidance document from Scottish Natural Heritage (SNH) (2000) was followed. The document from SNH (2000) provides guidance on calculating a theoretical collision risk for birds and wind power projects assuming there is no avoidance behaviour (SNH, 2000). However, in reality, most birds do use avoidance behaviours to avoid the WTG structures, as has been observed industry and province wide in Nova Scotia. Therefore, the results of the no-avoidance calculations are moderated by an important factor that represents the proportion of birds often hit which are likely to take effective avoiding action.

There are methodologies that may be appropriate depending on the species and flight behaviour to determine the probability of birds flying through an RSA. Guidance presents the assumption of a bird population making regular flights through the wind project in a reasonably defined direction, while then subsequently calculating the probability that a bird flying through the RSA being hit (SNH, 2000). The generalizations presented in this model create a close-to real case scenario for those birds present in the area, as observed through field and remote sensing surveys.

Avian species were surveyed at the Project using point count plots and radar tracking methods. These data sets differ to a large degree in timing, area coverage, and resolution, among others, resulting in incompatibility when calculating mortality estimates. For this reason, estimates were made separately using each data set to highlight information unique to those surveys. Multiple estimates also provide a measure by which the outputs can be scrutinized.

13.4.1.4 Total Mortality Estimates

The results of the Project-specific bird mortality estimates from point count surveys are provided in Table 13.5 and estimate that total annual mortality will be 15.12 birds, or 0.84 birds per WTG per year.

Table 13.5: Summary of Collision and Mortality Estimates Using Field Survey Data

Species Group	Total Collision Estimates (birds/year)	Estimated mortality (birds/WTG/year)
Waterfowl	0.18	0.01
Shorebirds	0.054	0.003
Passerines	14.13	0.785
Raptors	0.072	0.004
Other landbirds	0.684	0.038
Total	**15.12**	**0.84**

As described in the Avian Mortality Estimate Report (Appendix J), the estimated mortality for all bird passes associated with the Project as detected from radar and using a 98% avoidance and 75% operational uptime is 11.54 birds per year or approximately 0.641 birds per WTG per year[9]. Table 13.6 summarizes the estimated mortality rates provided above as birds per WTG per year, compared directly with literature-based estimates to demonstrate the low predicted mortality rates associated with this Project.

[9]Due to radar limitations, radar captures ‘target’ signals. There is a broad assumption in the results that the targets are birds. In addition, targets (assuming they are birds), cannot be broken down easily by size, and there is no method to determine species. Therefore, the estimate includes all radar targets and applies the 98% avoidance rate. The below estimate would then represent total estimated mortality and is not a cumulative mortality to be added with point count data.

Table 13.6: Mortality Estimates Summary

Study	Estimated Bird Mortality per WTG (birds/WTG/year)	Estimated Project Bird Mortality (birds/year for Project [18 WTG])
Zimmerling et al. (2013)	8.2	147.6
Birds Canada (2024)	1.2	21.6
Loss et al. (2013)	6.9	124.2
Literature based average	**5.43**	**97.8**
Strum Estimates – Field Survey	0.84	15.12
Strum Estimates – Radar	0.64	11.54
Project estimated average	**0.73**	**13.33**

Literature reviews regarding mortality, in addition to literature on avoidance rates, and estimations of mortality using the SNH Collision Risk Model suggest that direct mortality will occur but is not related specifically to bird numbers. Additionally, studies of ~25,000 mortality assessments at wind projects in the U.S. did not indicate the presence of significant large scale mortality events (Kerlinger et al., 2010).

The mortality estimates (0.73 birds per WTG per year, compared with the average from cited literature being 5.43 birds per WTG per year) indicate that while there will likely be some mortality, it will likely not be significant given the population numbers and the expected mortality from the Project. Scientific and regulatory literature notes that mortality risk does exist but is likely low, as demonstrated in Table 13.5, which shows predicted Project-related mortalities below each of the literature-based mortality rates. The anticipated cumulative effects for this Project on migratory bats and birds are anticipated to be negligible and unmeasurable. In the context of other infrastructure that is also a source of collision effects, such as transmission/distribution lines, roads (Highway 14, Highway 101) and communication towers, the cumulative effect of these projects on wildlife, specifically on migrating birds is expected to be negligible (Zimmerling et al., 2013).

13.4.2 Habitat Alteration

Approximately 142 ha of avian habitat will be cleared for new access roads and WTG pad area construction. Clearing and grubbing for site preparation will remove vegetation, reducing the quantity of terrestrial habitat, and affecting the quality of habitat present within the Study Area for potential breeding. However, through the site optimization process, roads and other infrastructure were largely sited in areas with existing disturbance, so habitat loss will largely occur in already marginal and fragmented habitat.

Bird species that currently use the habitat within the Study Area may be displaced during the initial stages of construction, have changes in habitat availability, and experience sensory disturbances. This could potentially lead to mortality if individuals are unable to relocate to alternate suitable habitat. The Project is in a rural setting surrounded by forested landscape that likely provides alternative suitable habitat. Clearing activities during the avian breeding season have the potential to cause direct mortality, abandonment of nests, and the destruction of nest contents, all of which could include species designated as SAR or SOCI. If adjacent suitable habitat is not available, birds that have been displaced will not likely nest until habitat becomes available. This may result in a higher non-breeding population percentage.

The Project is likely to result in an increase in habitat fragmentation and an increased amount of forest edge. This could lead to decreased forest quality for species that rely on interior forest conditions (i.e., areas within a forest sheltered from edge effects), although such habitat is already limited due to historical human disturbance. These effects have both positive and negative outcomes depending on the bird species using the habitat.

A study by Manolis et al. (2002) found that distance to nearest clear-cut was the best predictor of nest predation in multiple ground laying birds. However, some bird species benefit from forest edge habitat and have shown to return in subsequent years after an area is cleared due to the availability of foraging opportunities and other niche habitats. A study in Alberta showed that the abundance of alder flycatchers increased in a previously cut area (Tittler et al., 2001). Additionally, rusty blackbirds can also tolerate forestry activities if their habitat of coniferous dominant trees of varied heights near waterbodies is maintained (C. Stacier, personal communication, 2018).

The Project will alter habitat within the Study Area; alterations will have both negative and positive effects depending on the bird species. Not all alterations will be permanent, and these alterations will not have a substantial negative impact on habitat. Similar habitat for avifauna is present in the surrounding landscape, particularly in the adjacent Gully Lake Wilderness Area.

13.4.3 Sensory Disturbances

Sensory disturbance refers to changes in ambient noise levels caused by Project activities (Section 13.1.3) Noise and vibrations are provincially regulated under the Workplace Health and Safety Regulations, N.S. Reg. 52/2013 to protect the health and safety of site workers and the general public, which will help mitigate any negative impacts to bird species.

Sensory disturbance from noise can impact birds in a number of ways. Birds can exhibit greater susceptibility to noise impacts as many species rely on vocal communication (Blickley & Patricelli, 2010). Avifauna may be displaced from areas adjacent to the Project from construction related noise.

Impacts can also differ between acute and chronic noise sources. Chronic exposure may degrade auditory cues, feedback, and vocal development over time, important for predator/prey detection, communication, breeding, and orientation (Blickley & Patricelli, 2010; Marler et al., 1973; Shannon et al., 2016). A direct physiological impact causing a temporary decrease in auditory sensitivity can occur at acute noise levels above 93 dBA, while permanent damage to avian auditory systems is not recorded until 125 to 140 dBA (Blickley & Patricelli, 2010).

Some bird species may not be impacted by sensory disturbances. A study of the impact of logging truck traffic on bird reports no observed effects on nesting at noise levels of 53 dBA (Grubb et al., 1998). It was also found that noise tolerant species had increased nest success through decreasing nest predation (Francis et al., 2009).

A literature review conducted by Shannon et al. (2016) found that birds have the potential to exhibit changes in song characteristics, reproduction, abundance, stress levels, and species richness at levels greater than 45 dBA.

All noise attenuates (diminishes) with distance from the source (California Department of Transportation, 2016). This occurs through geometric spreading and signal reduction from ground and atmospheric absorption. Noise from point sources (i.e., construction equipment) travelling through a soft site (e.g., a forest or meadow), are reduced by attenuation rates of 7.5 dBA for each doubling of distance (based on 50 feet) (California Department of Transportation, 2016). As indicated in Table 2 of the Sound Assessment (Appendix D) with the exception of intermittent blasting (if required) or intermittent truck horns, sound attenuation for all construction related equipment is expected to meet the 45 dBA range referred to above between 488 to 975 m from the source of the sound (i.e. construction activities within the Study Area), and less depending upon the equipment being used.

Light is a source of sensory disturbance that can impact birds by potentially causing disorientation, avoidance, or attraction (Longcore and Rich, 2004). In turn, these behavioural changes can affect the success of foraging, reproduction, and communication of wildlife (Longcore and Rich, 2004) and can disrupt habitat connectivity (Bliss-Ketchum et al., 2016). It has been known that exterior structures such as substations, buildings and other floodlit structures can attract birds during the night and lead to mortality events. In addition, migratory birds during fall and spring are especially attracted to lighting on tall structures. Modifications and timing of use for lighting can be managed to limit impacts on birds and, therefore, no effects to avifauna are expected related to light pollution.

13.4.4 Mitigation

13.4.4.1 Avoidance of Habitat and Habitat Features

Based on baseline habitat and avifauna surveys and other factors, such as landowner considerations, regulatory setbacks, and public/municipal consultation, a constraints analysis was used to develop the current Project footprint by identifying appropriate lands for Project infrastructure.

Setback requirements provided initial guidance on how to best design the Project. Field surveys were then used to identify environmental features (i.e., wetlands, nests) and key habitat within or near the Project. Project design and siting was optimized to avoid wildlife features and habitat using the setback requirements and the field survey results.

The Project will develop a WMP that will specify best management practices associated with bird species using the Project Area, mitigation methods, and contingency plans associated with vegetation removal, WTG operation, progressive reclamation, and re-vegetation of the Project footprint. Additional mitigations include:

- Complete clearing of vegetation and timber for the Project footprint outside of the breeding season between April 15 to August 30. If, during construction, additional areas need to be cleared, a nest sweep will be completed by a biologist prior to construction start and repeated as necessary prior to any disturbance.
- Avoid disturbance of any ground- or burrow-nesting species should they initiate breeding activities within stockpiles or exposed areas during construction or operations, until chicks can fly, and the nesting areas are no longer being used.
- Salvage and store grubbings and topsoil for use in site restoration.
- Equip site machinery with spill kits and instruct site personnel on their use.
- Implement a reclamation program to re-establish similar habitat to support reintroduction of birds post-decommissioning.
- Install movement detection lighting on office structures, doors to WTGs, gates, etc. which turn off when not in use, instead of permanent lighting during operations.

13.4.4.2 Adaptive Management
Should post-construction monitoring identify significant mortality events to a particular species of bird, at a particular time of the year, or during specific weather conditions, the Proponent will implement an AMP to monitor and mitigate future effects to the greatest extent possible.

Adaptive management is an iterative learning process producing better understanding and improved management over time (Kerlinger et al., 2010). An adaptive approach involves exploring alternative ways to meet management objectives, predicting the outcomes of alternatives based on the current state of knowledge, implementing one or more of these alternatives, monitoring to learn about the impacts of management actions, and then using the results to update knowledge and adjust management actions (Williams et al., 2009).

Adaptive Management options will be discussed with NSECC, NSNRR, and CWS. The literature states that Adaptive Management being coupled with an agreed-upon set of criteria that is consistent with the regulatory context is important for success.

Adaptive Management will be applied to assess the effectiveness of the site-specific mitigation strategies devised during pre-project planning; identify appropriate management responses or adjustments of operations to address unforeseen impacts; and inform and improve longer term mitigation strategies going forward. The AMP will also include other measures deemed necessary by the Proponent based on Project-specific details, emerging technology, or as a result of improved understanding of potential impacts. A draft version of this AMP is provided in Appendix (U), to be updated and submitted to NSECC prior to operations.

13.4.5 Post-Construction Monitoring

Post-construction mortality monitoring for birds will be completed in conjunction with bat mortality surveys as described in the Post-Construction Survey Protocols for Wind and Solar Energy Projects (AEP, 2020). Carcass searches are an important monitoring process during the first two years of operation to evaluate the correctness of the predictions and to test the possibility of unexpected risk factors. In past EARD applications, protocols as listed in Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds (CWS 2007a) were suggested for use. However, in the AEP document, the protocols have been updated to reflect current information and knowledge around post-construction monitoring. Consultation with NSNRR and CWS will be undertaken to determine the extent of post construction monitoring required.

13.4.6 Residual Effects and Significance

The predicted residual environmental effects of the Project on avifauna are assessed to be adverse, but not significant after the implementation of mitigation measures, monitoring, and further adaptive management, should it become necessary.

The Project footprint will account for the loss of 143 ha of habitat, which is approximately 1.9% of the total Project Area. Avian habitats present within the Project Area are not unique and are extensively present within the surrounding landscape and across large tracts of undeveloped land. It is expected that any birds using habitat that will be disturbed by Project activities will move to similar habitats within and adjacent to the Project Area. This supports the conclusion that loss of habitat will not be significant.

Temporary sensory disturbance is expected during construction, and limited disturbance is expected through operations; therefore, no significant residual environmental effects on avifauna are expected.

Mortality estimates indicate that the Project may result in avian mortality of 0.73 birds per turbine per year. Compared with literature review and Alberta guidelines, avian mortality is predicted to be not significant.

Decommissioning of the WTGs will result in mitigation of some of the impacts of the Project involving the reclamation of land and re-establishment of vegetation and habitat for birds across the Study Area.

Magnitude

Biophysical surveys resulted in the observation of 7,683 individuals, representing 117 bird species within the Study Area. Estimated mortality of 13 birds per year is 0.17% of the total birds counted in avifauna surveys. Therefore, population level impacts are likely **negligible** in magnitude.

Habitat loss for bird species is low in magnitude as only 1.9% of the current habitat will be directly lost due to project infrastructure. The potential effect of the loss of breeding bird habitat from clearing for the Project would be **negligible** in magnitude.

Sensory disturbance during operations would be low. Ambient wind noise is expected to be high in the vicinity of the WTGs which is expected to mask some of the WTG operating sound.

The Project commits to conducting post-construction to provide project-specific baseline data on mortality (both avian and bat) to allow for determination of the magnitude of effects.

Likelihood
The likelihood of mortality from WTG operation is **almost certain** as no literature could be found that indicated that an operating wind project did not result in bird mortality. However, the estimate of collisions and mortality on populations of birds is **low**.

The likelihood of habitat loss is **almost certain** because the Project layout requires clearing to support Project infrastructure.

Duration
The potential effect of collisions with WTGs on birds would be **long term** during the operation of the Project (25+ years) with higher effects during migratory periods.

The potential effect on habitat is **short term** during construction and sensory disturbance is long term during the operation of the Project.

Overall, the duration of potential effects on avifauna is considered **long term**.

Frequency
The frequency of all effects is considered **continuous**, as there is potential for the Project to interact with avifauna continuously during operations (except for periods with no/low wind speeds).

Significance
The Project is predicted to have a **not significant** effect on birds (Table 10.4).

13.5 Aquatic
This section outlines the effects of the undertaking on the following aquatic VECs: surface water/fish and fish habitat, and wetlands.

13.5.1 Wetlands
The Project has potential to interact with wetlands (directly and indirectly) through clearing and grubbing, new access road and WTG pad construction, expansion and upgrades to current access roads, WTG foundation installation, site reclamation, infrastructure removal and accidental erosion and sedimentation events, fuel spills and fire as summarized in Table 13.1.

These potential interactions could affect wetlands through direct alteration, or indirect impacts to wetland function (e.g., hydrology, habitat and vegetation integrity). Direct and potential indirect effects to wetlands are discussed in the following sections, along with avoidance and mitigation measures to eliminate or minimize the described potential Project interactions with wetlands.

13.5.1.1 Direct and Potential Indirect Impacts

Direct impacts are defined as the physical alteration (e.g., soil and/or hydrological disturbance) of wetland area due to Project infrastructure. Indirect impacts are changes to baseline wetland condition and function where wetland habitat is not directly impacted but may be indirectly altered as the result of Project activities.

A total of 89 wetlands were identified within the Study Area. Over the temporal lifetime of the Project, direct impacts are expected to 30 wetlands, totaling 0.95 ha (9,548 m^2) in disturbance, as a result of proposed WTG locations, and associated access roads. A total of 59 wetlands (66%) within the Study Area have been avoided in the proposed Project Footprint. WTG pads have been sited to completely avoid direct impacts to wetlands.

Direct impacts have been calculated based on the proposed WTG pad footprints and the proposed road footprint layer, considering only Option A roads. When detailed civil design is available, slight shifts in impact areas are expected; however, this will mostly likely be done to reduce impacts, and no substantial changes in impact area is expected. The final impact areas will be communicated during the wetland alteration application process when detailed civil design is available. Impacts to wetlands are not expected to occur through construction of collector lines, as they follow the road layout and collector line towers can be micro sited outside of wetlands so that the overhead lines span wetlands.

With the exception of WL 29, 32, 34, 40, and 50, WTG pad infrastructure has been sited to avoid construction and clearing within 30 m of wetlands (these listed wetlands are fully avoided by project infrastructure). Wetlands within 30 m of proposed roads were qualitatively assessed to have reasonable potential for indirect effects and are further considered herein. Project-related potential indirect impacts to wetlands may include:

- Construction resulting in changes to hydrological flow paths (groundwater and surface water) resulting in wetting or drying of wetlands (e.g., inadvertent drainage or impoundment).
- Potential sedimentation within wetlands from up-gradient activities resulting in soil erosion (e.g., earth moving, removal of vegetation) during construction.
- The spread or introduction of invasive species into wetlands during construction and operations.

The Project will not require surface water collection or surface water re-routes; as a result, no indirect impacts based on hydrological chances are expected. All watercourse crossings will be designed in accordance with watercourse alteration guidelines, and in adherence to the

Project's draft Surface Water Management Plan (SWMP) and ESCP (Appendices V and Q, respectively).

Vegetation clearing will be required along roads during construction and through operations to ensure site lines for traffic along the roads. Vegetation clearing does not qualify as wetland alteration under the Nova Scotia Wetland Conservation Policy, provided that best-practices and appropriate mitigations are applied.

Project interactions with surface water features and fish and fish habitat are described further in Section 13.4.2.

Expected direct wetland impacts are presented in Table 13.7 and Drawing 13.2. No indirect impacts within wetlands are expected. All impacts are tied to road construction, as turbine siting was completed to avoid wetland impacts.

Table 13.7: Expected Wetland Impacts Within the Study Area

Wetland ID	Wetland Type	Area (ha)	Area (m^2)	Impact Area (m^2)	Road Impact Type	% Area Impacted
5*	Complex-Fen/ Swamp	2.155	21550	653.67	New	3%
9	Shrub Swamp	0.298	2980	44.70	Upgrade	2%
18	Treed Swamp	0.124	1240	14.27	Upgrade	1%
21	Treed Swamp	0.057	570	9.48	Upgrade	2%
22	Treed Swamp	0.03	300	22.26	Upgrade	7%
27*	Shrub swamp	0.194	1940	147.98	New	8%
31*	Shrub Swamp	0.181	1810	312.53	New	17%
32*	Treed Swamp	0.455	4550	647.24	Upgrade	8%
33*	Shrub Swamp	0.064	640	39.27	Upgrade	6%
39*	Shrub Swamp	0.155	1550	356.07	New	23%
46*	Shrub Swamp	0.264	2640	310.43	New	12%
51	Treed Swamp	0.031	310	17.27	Upgrade	6%
53*	Treed Swamp	0.068	680	205.34	Upgrade	30%
56*	Treed Swamp	0.449	4490	210.12	Upgrade	5%
57	Treed Swamp	0.03	300	41.94	Upgrade	14%
58*	Treed Swamp	1.167	11670	423.12	Upgrade	4%
59*	Complex: Fen/ Tree Swamp	1.056	10560	426.98	Upgrade	4%
60*	Treed Swamp	0.145	1450	72.36	Upgrade	5%
61*	Treed Swamp	0.447	4470	176.56	Upgrade	4%
68*	Shrub Swamp	0.366	3660	75.25	Upgrade	2%
70*	Complex: Marsh/Shrub Swamp	1.057	10570	1939.01	New	18%
71	Treed Swamp	0.111	1110	24.44	Upgrade	2%
72*	Treed Swamp	0.371	3710	120.44	Upgrade	3%
73*	Complex: Fen/Shrub Swamp	0.938	9380	1174.15	Upgrade	13%

Wetland ID	Wetland Type	Area (ha)	Area (m^2)	Impact Area (m^2)	Road Impact Type	% Area Impacted
75*	Treed Swamp	0.232	2320	24.09	Upgrade	1%
83*	Treed Swamp	1.339	13390	337.80	New	3%
84*	Treed Swamp	0.169	1690	178.68	New	11%
87*	Treed Swamp	0.164	1640	102.41	New	6%
88*	Treed Swamp	0.55	5500	1129.79	New	21%
89*	Treed Swamp	0.392	3920	311.12	New	8%
	Total		130590	9548.76		

*Wetlands with an asterisk extend beyond the Study Area. Therefore, the total area is underestimated and the % of the wetland impacted is overestimated.

13.5.1.2 Wetlands of Special Significance

Four wetlands within the Study Area have a portion designated as WSS based on portions of the wetland falling within the Gully Lake Wilderness Area (WL 58 to 62). No direct impact will occur within the portion of these wetlands that lie within the Wilderness Area, thereby avoiding impacts to the WSS portion of these wetlands.

WL 73 is expected to be designated as a WSS based on field observations of Canada warbler (provincially and federally endangered) in suitable habitat. WL 73 is currently bisected by a trail. Through civil design and consultation with NSECC, the specific road alignment will be adjusted where possible to reduce impacts to WL 73. The southern portion of WL73 is a cleared treed swamp, with little suitable habitat for Canada Warbler. During detailed design of the road, priority will be given to adjust the road into less suitable habitat for this species, and the Proponent will consult with NSECC regarding WSS designation in the context of mobile species.

13.5.1.3 Mitigation

The Project team used avoidance as the first step in the hierarchical process for wetland conservation, as described in the Wetland Conservation Policy (NSE 2019). Avoidance of wetland alteration was achieved during the initial design of the Project, where micro-siting was used to minimize wetland direct and potential indirect impacts whenever practicable.

Where wetland avoidance is not possible, the Proponent will apply for wetland alteration approvals through NSECC, implement mitigation measures during construction, conduct wetland monitoring during and following construction, and support wetland compensation plan(s) as required by approvals.

A preliminary wetland monitoring approach is discussed in Section 13.5.1.4 and a detailed wetland compensation and monitoring plan will be prepared through the wetland permitting process.

The following mitigation measures will be included the Project design to maintain natural function of unimpacted wetland and reduce loss of function in wetlands proposed for partial alteration.

- Acquire and adhere to wetland alteration permits, as required, and implement wetland monitoring as directed by permits and in consolation with NSECC.
- Engage in wetland compensation activities for the wetland loss associated with the Project as required by the provincial wetland alteration process and in consultation with NSECC.
- Complete pre-construction site meetings for all relevant staff/contractors related to working in and around wetlands and watercourses to mitigate unauthorized disturbance.
- Ensure all wetlands are visually delineated (i.e., flagged).
- Conduct vegetation management (cutting and clearing) in or near wetlands in accordance with applicable guidelines and in consideration of breeding bird windows and maintain wetland vegetation wherever practicable.
- Mitigate risk of soil disturbance (e.g., rutting) by using mitigations such as swamp mats, limiting the use of machinery within wetlands, and avoiding work in wetlands in highly saturated conditions (e.g., consider seasonality), as is practicable.
- Implement the ESCP. All erosion and sediment control structures will be regularly inspected and repaired.
- Direct construction and/or operational runoff through natural upland vegetation, wherever possible.
- Maintain or construct appropriate cross-drainage on existing and new access roads.
- Employ measures to reduce the risk of spread of invasive species (particularly by inspecting and cleaning equipment prior to travel within the site) into wetlands and retain habitat integrity (e.g., revegetate exposed soil surfaces with native vegetation, include invasive species monitoring in the wetland monitoring program).
- Avoid storing fuel on site and only complete refueling in designated areas, >30 m from wetlands and watercourses. Spill response equipment will be readily available.

13.5.1.4 Monitoring

Wetlands are protected under the *Environment Act*, S.N.S. 1994-95, c.1 and Wetland Conservation Policy (NSE, 2019) to mitigate net loss of habitat and function. The wetland alteration permitting process will be completed as required and in consultation with NSECC.

As is required through the wetland alteration permitting process, wetland monitoring will be completed to verify the accuracy of the predicted environmental effects, the effectiveness of the mitigation measures outlined in Section 13.5.1.3, and the potential need for additional mitigation measures or compensation. A preliminary proposed monitoring approach is proposed herein. A detailed wetland monitoring plan will be prepared through the wetland permitting process in consultation with NSECC.

Generally, wetland monitoring is proposed based on the expected impact assessments described above. This includes the remaining unaltered portions of the impacted wetlands.

Typical wetland monitoring methods include hydrological and vegetative approaches to assess potential shifts in wetland characteristics and function over time. Visual observations of wetland conditions are also used to supplement this information. A hierarchy of monitoring approaches will be applied in consideration of the magnitude and type of individual wetland impacts (e.g., direct vs. potential indirect). Generally, baseline monitoring (pre-construction) will take place before construction commences to acquire baseline conditions from which to compare post-construction monitoring results. Comparison methods and indicators of change will be detailed in the wetland monitoring plan.

Should post-construction wetland monitoring indicate a potential shift from natural variation, the Proponent will consult with NSECC to identify whether corrective actions or compensation will be required.

Annual monitoring results, as well as any changes to the program, will be provided to NSECC, as per wetland alteration permit conditions. NSECC will be contacted and consulted in the instance of an unintended direct and/or indirect impact to a wetland.

13.5.1.5 Residual Effects and Significance

Magnitude

Expected Project wetland impacts are confined to 30 wetlands (Table 13.6). The direct impact area totals 0.958 ha (9548.76 m^2) or 3.1% of delineated wetland area (30.68 ha) over the lifetime of the Project. Wetland alteration approvals (including appropriate compensation and monitoring) will be obtained prior to completing wetland alterations and any compensation effectively follows the NSE Policy of No Net Loss. The Project will have a **low** magnitude of impact on wetlands.

Likelihood

It is **certain** that the Project will impact wetlands as road and pad construction is proposed to directly impact 30 wetlands.

Duration

The time over which the effects are likely to persist are predicted to be **short term**, as they are confined to the construction phase of the Project and impacts will be compensated for as required.

Frequency

Effects to wetlands will occur **once** during the construction phase of the Project.

Significance

The Project is predicted to have a **not significant** effect on wetlands (Table 10.4).

13.5.2 Surface Water, Fish and Fish Habitat

The Project has potential interactions with the aquatic environment and associated fish habitat (directly and indirectly) through clearing and grubbing, access road and WTG pad construction, WTG foundation installation (through dewatering), site reclamation, infrastructure removal, as well as from accidents and malfunctions (Table 13.1).

The Project interactions described relate to the potential effects to fish and fish habitat from direct Project development and/or indirect changes to fish habitat quality.

13.5.2.1 Direct and Indirect Impacts

A total of 63 watercourses were identified within the Study Area. To be conservatively inclusive, all watercourses identified are presumed to be accessible to fish, even though there may be seasonal restrictions to the ephemeral and intermittent watercourses.

Surface water features were identified as a constraint to be avoided to the greatest extent possible in the planning process for the Project footprint. Therefore, the only predicted direct impact to fish habitat involves standard road crossings, as summarized in Table 13.8.

Table 13.8: Anticipated Impact Areas to Fish Habitat

WC#	Proposed Culvert Construction	Habitat Type	Wetted Width (M)	Bankfull Width (M)	Road Width (M)	Impact (M^2)
1	New	Riffle	0.7	3.6	12	43.20
4	Upgrade	Riffle	0.7	1.1	12	13.20
6	New	Flat	0.7	0.7	12	8.40
8	Upgrade	Riffle	0.75	1.1	12	13.20
12	New	Riffle	0.7	1.8	12	21.60
23	New	Riffle	0.8	2.5	6	15.00
24	Upgrade	Flat	0.95	0.95	6	5.70
28	New	Riffle	1.8	3.7	6	22.20
29	New	Flat	5.8	6.2	6	37.20
30	Upgrade	Pool	1.6	1.9	6	11.40
32	Upgrade	Riffle	1.2	1.7	6	10.20
33	Upgrade	Flat	0	2.2	6	13.20
34	Upgrade	Riffle, flat	1.15	1.3	6	7.80
35	Upgrade	Flat	1.6	2.3	6	13.80
36	Upgrade	Riffle-run	1.5	1.6	6	9.60
38	Upgrade	Flat, pool	1.15	2.55	6	15.30
39	Upgrade	Riffle-run	1.16	2.44	6	14.64
42	New	Run, riffle, flat	1.28	1.37	6	8.22
55	Upgrade	Flat	1.19	1.23	12	14.76
63	New	Riffle	0.83	1.4	6	8.40
67	New	Riffle-run	2.63	3.79	6	22.74
70	New	Flat	0.95	0.97	6	5.82
75	New	Riffle	0.64	1.25	6	7.50
77	New	Riffle	2.5	2.5	12	30.00
Total						**373.08**

While the detailed road design and culvert sizing has not yet been finalized, it is estimated that the road width will be between 6 and 12 m. The total impact area for all 24 crossing locations is 373 m^2. The Proponent will proceed through NSECC permitting under the watercourse alteration process (NSE, 2015). At this time, permitting under DFO is not expected; however, this will be confirmed in the detail design phase. No additional direct impacts are expected to watercourses, waterbodies, or wetlands that support fish habitat. With the exception of WC33, 34, and 35, none of the watercourses with proposed alterations flow into the Gully Lake Wilderness Area.

With the exception of T12 and T15, all WTG pads have been located to respect a 30 m buffer on all fish habitat. Two watercourses with potential fish habitat are present within 30 m of planned site access roads (WC26 and 54). Indirect impacts to these watercourses are not expected, provided mitigation measures are implemented to control erosion and sedimentation in proximity to these features.

Blasting

Blasting may result in sensory disturbance to fish, impacting fish behaviour, spawning grounds, and migration patterns. The detonation of explosives near watercourses can produce post-detonation shock waves which involves a rise to a high peak pressure and then a subsequent fall to below ambient hydrostatic pressure. This pressure deficit can cause impacts in fish (Wright and Hopky, 1998). An overpressure more than 100 kPa can result in effects to fish including damage to the swim bladder in finfish, and potential rupture and hemorrhage to the kidney, liver, spleen and sinus venous. It is also possible that fish eggs and larvae can be damaged (Wright and Hopky, 1998). The degree of damage is related to the type of explosive, size and pattern of the charges and the distance to the watercourse, depth of water within the watercourse, and species, size and life stage of the fish.

Sublethal effects have also been observed including changes in fish behavior as a result of noise produced during blasting (Wright and Hopky, 1998). Should blasting be required, guidance for setback distances outlined by Wright and Hopky (1998) will be adhered to, and a Blast Management Plan will be developed to ensure compliance.

Water Quality and Quantity

Indirect impacts to fish and fish habitat may be possible from water quality changes sourced from up-gradient development activities, including unplanned events and release of deleterious substances, spills and erosion and sediment control failure (and associated siltation). Impacts to water quality are not expected, provided mitigation measures related to erosion and sediment control and spill prevention are implemented.

Acid generating rock, if exposed, can result in changes in water quality and impacts fish health and fish habitat. The Project Area is in an area with low bedrock ARD potential (NSNRR, 2021b). As a result, impacts to water quality and indirect effects to fish habitat are not expected. Construction staff will be instructed to stop work if acid generating rock is identified.

Indirect effects to fish habitat may occur through movement of water across a landscape, and resultant changes in catchment areas and instream flows. The Project will not require alteration of catchment areas or changes in instream flows in any site watercourses. Access roads will be constructed to allow cross drainage if and as required.

13.5.2.2 Summary of Impacts

The Project is predicted to result in a direct impact to 373 m^2 of fish habitat at 24 separate crossing locations. Of those, 12 crossings involve upgrades to existing road crossings, while 12 road crossings involve new construction.

The Project is not predicted to result in indirect effects to surface water features or associated fish habitat. This is based primarily on proactive Project planning and implementation of a mitigation sequence which prioritizes avoidance of impacts, and implementation of 30 m buffers on watercourses wherever practicable. Additionally:

- Wetlands expected to be directly impacted by Project development do not provide habitat for fish (i.e. fish habitat in impacted wetlands is limited to incised watercourse channels).
- With the exception of road crossings, site infrastructure has been planned to avoid direct impacts to all fish habitat.
- Roads will be built to allow cross-drainage if and as required and adhere to provincial standards for culvert sizing.

13.5.2.3 Mitigation

The Project team followed a mitigation sequence to reduce impacts to fish and fish habitat. This was accomplished primarily by avoidance of direct impacts to fish habitat throughout the Study Area.

The following mitigation measures will be included in the design of the Project:

- Install road crossings in compliance with Nova Scotia Guide to Altering Watercourses (NSE, 2015) and fish rescue will be completed during crossing construction, if required.
- Implement the ESCP. All erosion and sediment control structures will be regularly inspected and repaired.
- Minimize use of equipment within the 30 m watercourse buffer.
- Obtain approval from DFO/NSECC for all watercourse crossings or where impacts to fish habitat are expected, as required, prior to undertaking work.
- Implement the draft SWMP following detailed design, prior to construction (Appendix V).
- Design spill prevention, response and management in the EMPP (Appendix R) and implement across the Project.

13.5.2.4 Monitoring
No monitoring is proposed for this VEC.

13.5.2.5 Residual Effects and Significance

Magnitude
As impacts are limited to road crossings, half of proposed crossings are upgrades to existing infrastructure, the crossing will be designed in accordance with regulatory requirements, and mitigation measures are proposed to limit other effects, the Project is predicted to have a **low** magnitude of impact to surface water, fish and fish habitat.

Likelihood
It is **certain** that the Project will impact surface water, fish, and fish habitat as culverts are required to be installed on 24 watercourses to construct/upgrade access roads.

Duration
The time over which the effects are likely to persist are predicted to be **short term**, as they are confined to the construction phase of the Project. Culvert installation will occur during construction and the highest potential for sediment related issues will also occur during this phase of the Project.

Frequency
Effects to surface water, fish, and fish habitat will occur **once** during the construction phase of the Project. Frequency of impacts includes the culvert installation and excludes potential sediment related issues which may occur **sporadically** but are not anticipated after mitigation measures have been implemented.

Significance
The Project is predicted to have a **not significant** effect on surface water, fish and fish habitat (Table 10.4).

13.6 Technical Components
This section outlines the effects of the undertaking on the following technical VECs: visual aesthetics, shadow flicker, and EMI.

13.6.1 Visual Aesthetics
As Shown in Appendix L, at least one of the WTGs will be visible from much of the surrounding landscape. This is due to higher-elevated areas being favoured for WTG locations, where wind resource is more available. The topography of the surrounding area results in some sections to the east and west of the Project having no WTGs visible.

During the operational phase of the Project, lighting may be visible on the WTG during the night. A Lighting Plan for the WTGs will be developed and approved by Transport Canada to minimize impacts while ensuring aviation safety. The lighting plan will comply with Transport

Canada recommendations and Standard 621 – Obstruction Marking and Lighting – Canadian Aviation Regulations, S.O.R./96-433 (Transport Canada, 2021).

The standard requiring lighting midway up the tower came into effect in 2016 and follows European practices for tall structures. This standard has been improved from the European practice by implementing flashing instead of steady burning lights. This change was recommended from the Federal Aviation Administration's technical report on Evaluation of New Obstruction Lighting Techniques to Reduce Avian Fatalities (Patterson, 2012).

13.6.1.1 Mitigation

There are no policies or guidelines concerning ZVI or viewshed, as visual aesthetics are subjective to the observer. However, the visual impact on the landscape is mitigated by the siting of the Project away from receptors and the selection of paint for the WTGs that reduces contrast with the environment and minimizes blade glint.

To mitigate impacts on visual aesthetics by WTG lighting, the following mitigation measures are proposed:

- Use light-emitting diode (LED) lighting to minimize light throw.
- Use the minimum amount of pilot warning and obstruction avoidance lighting.
- Use lights with short flash durations and the ability to emit no light during the 'off phase' of the flash (i.e., as allowed by strobes and modern LED lights) on WTG structures.

13.6.1.2 Monitoring

No monitoring is proposed for this VEC.

13.6.1.3 Residual Effects and Significance

Magnitude

There is no defined threshold as visual aesthetic is subjective to the observer. The Project is therefore predicted to have a **low** magnitude of effect on visual aesthetics as there were no concerns expressed during public consultation.

Likelihood

It is **certain** that the Project will affect visual aesthetics as 18 WTGs are proposed as part of the Project.

Duration

The duration of the Project's effect on visual aesthetics is **long term** as the WTGs are proposed to be in operation for 25+ years.

Frequency

The effects on the visual aesthetics will occur **continuously** throughout the life of the Project.

Significance

The Project is predicted to have a **not significant** effect on the visual aesthetic (Table 10.4).

13.6.2 Shadow Flicker

The results of the shadow flicker prediction model comply with provincial guidance. Detailed results of the shadow assessment study for all receptors are included in Appendix L.

13.6.2.1 Mitigation

The Proponent is committed to operating the Project to comply with the NSECC guidelines for shadow flicker (30 hours per year and/or 30 minutes per day).

The Proponent will implement the Complaint Resolution Plan (draft provided in Appendix O), which includes a process for investigation and case-specific mitigation measures (e.g., vegetation or awnings).

13.6.2.2 Monitoring

No monitoring is proposed for this VEC.

13.6.2.3 Residual Effects and Significance

Magnitude

The Project is anticipated to have a **low** magnitude of effect on shadow flicker as modelling (Appendix L) predicts the Project will meet the guidelines for shadow flicker as defined by NSECC.

Likelihood

It is **likely** that the Project will cause some shadow flicker as 18 WTGs are proposed and during certain conditions there is potential for shadow flicker to occur.

Duration

The duration of the Project's effect on shadow flicker is **long term** as the WTGs are proposed to be in operation for 25+ years.

Frequency

The effects from shadow flicker will occur **sporadically** throughout the operations phase of the Project.

Significance

The Project will have a **not significant** effect on shadow flicker.

13.6.3 Electromagnetic Interference

A study was conducted following the RABC and CanWEA (2020) guidelines to investigate the potential interference of the Project on radiocommunication and radar systems. The results of the EMI study indicate that no interference will result from the Project, as the proposed WTGs have been sited to avoid consultation zones. Detailed methodology and results are available in Appendix M.

DND, Nav Canada, National Radio Services (NRS), and the Royal Canadian Mounted Police (RCMP) have provided letters of non-objection the Project, and the Canadian Coast Guard (CGC) has been notified (Appendix C).

13.6.3.1 Mitigation
As there are no anticipated effects due to EMI, no mitigation is proposed.

13.6.3.2 Monitoring
No monitoring is proposed for this VEC.

13.6.3.3 Residual Effects and Significance

Magnitude

The Project is anticipated to have a **low** magnitude of effect on EMI as the Radiocommunication Study shows the Project meets all applicable consultation requirements within the RABC and CanWEA (2020) guidelines and/or additional Proponent-led consultation with potentially impacted licenses indicates no concerns.

Likelihood

It is **unlikely** that the Project will generate EMI.

Duration

The duration of the Project’s potential generation of EMI is **long term** as the WTGs are proposed to be in operation for 25+ years.

Frequency

The effects of EMI will occur **sporadically** throughout the operations phase of the Project, if they occur at all.

Significance

The Project will have a **not significant** effect on EMI (Table 10.4).

13.7 Socioeconomic
This section outlines the effects of the undertaking on the following socioeconomic VECs: economy, land use and value, transportation, recreation and tourism, human health, cultural and heritage resources, and other undertakings in the area.

Refer to Table 13.1 for potential Project interactions with each socioeconomic VEC.

13.7.1 Economy

The Project will contribute to Nova Scotia's targets to producing 80% renewable energy by 2030 and becoming net-zero by 2035 (Nova Scotia Power, 2024). The Project will provide a low-cost, fixed price, clean form of electricity for the Province of Nova Scotia. As outlined in the *Wind Turbine Facilities Municipal Taxation Act*, S.N.S. 2006, c. 22, Colchester and Pictou Counties will receive tax revenues per MW on an annual basis and as such, the royalty will annually increase as the Consumer Price Index rises. Assuming the final capacity is 76.7 MP, the Project is expected to enhance the community's economic development by providing tax revenues of approximately $400,000 annually ($5500/MW) to the Municipality, escalating in each year of operation.

The Glen Dhu Wind Power Project (GDWPP), is a 27-WTG, 62.1 MW project in Antigonish, Nova Scotia. Though values for the Project will differ from the GDWPP due to size, capacity, and inflation, the data provides a reasonable comparison of the scale of the economic impact for the region. Economic data from the GDWPP in 2011 is as follows:

- $150 million investment
- 175,000 person hours of work during the permitting, construction and operation phases
- 70 to 80% Nova Scotia labour content
- $2,000,000 in direct worker spending in the local area
- $38,000,000 in construction spending with Nova Scotia companies
- 55 companies from Nova Scotia employed on the Project

The Proponent intends to fulfill construction and operations contracts/positions with local personnel and contractors wherever possible. However, due to the specialized nature of WTG delivery, erection, and energization, if local personnel cannot be found, it may be necessary to hire from other municipal, provincial, national, or international firms.

In addition to the direct investments that the Project would bring to Nova Scotia's economy, the Project will provide indirect and induced economic benefits that will be realized by governments, local businesses, communities, and residents (through support services such as food services, accommodations, road maintenance, etc.). Workers that are directly involved with the development will contribute to the local economy by redistributing wealth to a variety of goods and services such as hotels, restaurants, and grocery stores (USDE, 2008).

13.7.1.1 Mitigation

The Proponent will employ local contractors to complete Project tasks, whenever possible.

13.7.1.2 Monitoring

No monitoring is proposed for this VEC.

13.7.1.3 Residual Effects and Significance

Magnitude

The Project is anticipated to have a **moderate** and positive magnitude of effect on the local economy, as the Project is predicted to contribute revenue to the local economy and be an important part of Nova Scotia's natural resource sector.

Likelihood

It is **certain** that the Project will interact with the local economy. The Project will directly cause an increase in local jobs and provide a stimulus to other local businesses (e.g., restaurants and hotels).

Duration

The duration of the Project's potential interaction with the local economy is **long term** as it will occur during all Project phases.

Frequency

The effects of Project on the local economy will occur **regularly** throughout the life of the Project.

Significance

The Project will have a non-significant, but positive, effect on the economy (Table 10.4).

13.7.2 Land Use and Value

13.7.2.1 Land Use

The Project Area consists of private and Crown land (Drawing 5.3). Informal recreational activities including ATV trails, hunting (several tree stands observed), and possible berry harvesting evidence was observed within the Study Area during field surveys.

During construction, access may be limited to manage health and safety concerns for the public and construction teams. The Proponent is committed to working with local landowners to continue to allow access to the lands within the bounds of all safety considerations. The Proponent does not intend to limit passage to Crown lands at any time throughout the lifetime of the Project. The presence of WTGs is highly compatible with most land-based recreation activities and is not expected to limit the usability of the area.

Following the operations period, the Project may be decommissioned if not repowered. During decommissioning, the Project footprint will be reclaimed which will aim to revert the land back to existing conditions and allow for the recreational activities conducted prior to Project development.

Gully Lake Wilderness Area

The Gully Lake Wilderness Area is within the Project Area, bordering the western extent of a portion of the Study Area (refer to Section 6.2.5 for more details on the Wilderness Area). The Project will not directly impact the Wilderness Area. The existing Vanderveens forestry service road that borders a portion of the east side of the Gully Lake Wilderness Area will require upgrades, but no new roads will be built adjacent to the Wilderness Area, and WTGs will maintain a minimum setback of 200 m.

No impacts to water quality (i.e., sediment and erosion) are anticipated within the Wilderness Area. Refer to Section 13.5.2 which discusses the Project's potential effects to surface water, fish and fish habitat.

The Wilderness Area provides protection for the Cobequid Mountain woodlands, including rich tolerant hardwood forests and habitat for Mainland Moose (NSECC, n.d.). Sound generated by the Project during the construction, operations, and decommissioning/ reclamation phases may temporarily displace wildlife, bats, and birds. Refer to Section 13.3.2, Section 13.3.3 and Section 13.4 for more details related to the effects of sensory disturbance on wildlife, bats, and birds, respectively. The determination of effects indicates temporary displacement of wildlife during the construction and decommissioning/ reclamation phases. However, long term effects for the Wilderness Area are not expected. The results of the bird studies (migration, breeding bird, radar) indicate limited flyover to the Wilderness Area (Appendices H-I).

During a meeting held on October 6, 2023, between the Proponent, Strum (then MEL), and the NSECC Protected Areas Branch, the Project footprint was discussed, specifically methods to optimize the layout by using existing roads wherever possible and placing WTGs in cleared or disturbed habitats where possible. The Proponent committed to maintaining a 200 m WTG setback from the Gully Lake Wilderness Area boundary.

13.7.2.2 Property Value

The potential for property values to be adversely affected by wind development is often a concern raised by neighbouring residents at other wind power projects throughout North America. In 2009, a study by Hoen et al. (2009) was commissioned by the U.S. Department of Energy to determine if this impact does in fact exist. The study collected data on almost 7,500 sales of single-family homes situated within 10 miles of 24 existing wind facilities in nine different U.S. states (Hoen et al., 2009). In addition, the study reviewed a number of data sources and published material. Although the reviewed information addressed concerns about the possible impact of wind energy facilities on the property values of nearby homes, Hoen et al. (2009) found that “the available literature that has sought to quantify the impacts of wind projects on residential property values has a number of shortcomings”. The list of shortcomings identified in that study (Hoen et al., 2009) are as follows:

- Studies relied on surveys of homeowners or real estate professionals, rather than trying to quantify real price impacts based on market data.

- Studies relied on simple statistical techniques that have limitations and that can be dramatically influenced by small numbers of sales transactions or survey respondents.
- Studies used small datasets that are concentrated in only one wind project study area, making it difficult to reliably identify impacts that might apply in a variety of areas.
- Many studies had no reported measurements of the statistical significance of their results.
- Many studies have concentrated on an investigation of the existence of Area Stigma and have ignored Scenic Vista and/or Nuisance Stigma.
- Only a few studies included field visits to homes to determine WTG visibility and collect other important information about the home (e.g., the quality of the scenic vista).
- Only two studies have been published in peer-reviewed academic journals.

Ultimately, the Hoen et al. (2009) study indicated that “none of the models uncovers conclusive evidence of the existence of any widespread property value impacts that might be present in communities surrounding wind energy facilities. Specifically, neither the view of the wind facilities nor the distance of the home to those facilities is found to have any consistent, measurable, and statistically significant effect on home sales prices”. Although the analysis cannot dismiss the possibility that individual homes or small numbers of homes have been or could be negatively impacted, it finds that if these impacts do exist, “they are either too small and/or too infrequent to result in any widespread, statistically observable impact.” (Hoen et al., 2009)

Critiques have been developed in response to the Hoen et al. (2009) report, notably by Gulden (2011) and Wilson (2010). These both outline concerns with methodology in the Hoen et al. (2009) report including the conclusion that the analytical methods cannot be shown to be reliable or accurate (Gulden, 2011; Wilson, 2010). Another study completed by Gardner (2009) in Texas, USA states that “market data and common sense tell us property values are negatively impacted by the presence of wind turbines.” Heintzelman and Tuttle (2012) found that properties within 1 km of a wind farm have the potential to lose value of 8.8% to 15.8%.

As a follow up to the 2009 study, Hoen et al. (2013) conducted another study to address these apparent gaps in data. Hoen et al. (2013) collected data from 51,276 homes across 27 counties and nine states in the USA relating to 67 different wind facilities. All homes included in the study were within a 10-mile (16 km) radius of a wind power project and 1,198 homes were within a 1-mile (1.6 km) radius of a wind power project. The study results revealed no statistical evidence that residential property values near WTGs were affected in the post-construction or post-announcement/pre-construction periods. Therefore, the authors conclude that if effects do exist, either the impacts are sporadic and impact only a small subset of homes or are relatively small and are present within the margin of error in the models (Hoen et al. 2013).

Brinkley and Leach (2019) completed a review of seven studies on the impact of wind farms (various scales) on property values. Their review found that “wind power studies overwhelmingly indicate no significant impact on nearby property values” (Brinkley & Leach, 2019).

13.7.2.3 Mitigation

No mitigation is proposed for this VEC.

13.7.2.4 Monitoring

No monitoring is proposed for this VEC.

13.7.2.5 Residual Effects and Significance

Magnitude’

The Project is anticipated to have a **low** magnitude of effect on the land use and value, as the Dalhousie Mountain Wind Farm is located adjacent to the Project and has been in place since 2009. Based on a literature review on the effects of property values in proximity to wind power projects, there is no anticipated decrease in property values. Additionally, the change in land use is anticipated to be positive as it is adding a renewable energy resource to the area.

Likelihood

It is **almost certain** that the Project will interact with land use. The Project’s interaction with land value is **unlikely**.

Duration

The duration of the Project’s potential interaction with land use and value is **long term** as it may occur during all Project phases.

Frequency

The effects of the Project on land use and value may occur **continuously** throughout the life of the Project.

Significance

The Project will have a not significant effect on land use and value (Table 10.4).

13.7.3 Transportation

An increase in truck traffic will occur during the construction (2 years) and decommissioning phases (2 years) of the Project. No change to local transportation is anticipated during operations, the Project phase with the longest duration (25+ years). The increase in transportation during decommissioning will also recover to baseline levels after the completion of the Project.

Access to the Project Area during the construction period will be from a combination of Glen Road, Bezanson Lake Road, Vanderveens Road, Gunshot Road, and Biorachan/Berichon Road (Drawing 12.10). Construction equipment and vehicles will access the Project Area primarily from Highway 4 (to the south). WTG component delivery will be via Highway 104 and Highway 4, which may cause delays in traffic. Transportation routes are subject to NSPW approval.

Nav Canada and DND have provided letters of non-objection indicating that there are no impacts on the air navigation system and specifically on civil and military air traffic control radars, navigation aids, and airports in the vicinity of the Project. Refer to Appendix C for the letters of non-objection.

13.7.3.1 Mitigation

The following mitigation measures will be included in the design of the Project:

- Obtain and comply with NSPW approval requirements for road construction.

13.7.3.2 Monitoring

No monitoring is proposed for this VEC.

13.7.3.3 Residual Effects and Significance

Magnitude

The Project is anticipated to have a **low** magnitude of effect on transportation, as there will only be an increase in truck traffic during the construction and decommissioning phases of the Project.

Likelihood

It is **certain** that the Project will impact transportation as heavy equipment and WTG components will need to be mobilized to the site to support construction of the Project.

Duration

The duration of the Project’s potential interaction with transportation routes is **short term** as it will only occur within the construction (2 years) and decommissioning (2 years) phases of the Project.

Frequency

The effects of the Project on the transportation will occur **sporadically** during the construction and decommissioning phases of the Project.

Significance

The Project will have a **not significant** effect on transportation (Table 10.4).

13.7.4 Recreation and Tourism

13.7.4.1 Recreation

Local residents and tourists use the watershed for fishing, swimming, and recreation. The Project Area is also near the Gully Lake Wilderness Area.

There is some opportunity within the Project Area for public access for hiking and walking; however, there are no designated public recreational trails present inside the Study Area. Hiking trails exist within the Project Area (specifically within the Gully Lake Wilderness Area). Berry picking, hunting, and fishing may also occur.

ATV use is widespread within the Project Area and there are interconnected trails and tracks suggesting intermittent use. All trails appear to be informally used by public riders, although these trails are on private and Crown land. Trails within the adjacent Gully Lake Wilderness Area, and presumably trails within the Project Area, are used by ATVANS and NSORRA.

The construction and operation of the Project may result in modified use by ATVs, hunters, general users or landowners. Once the Project is developed, no limitations to land access are expected. Access to Crown lands under lease is not expected to be restricted at any time.

13.7.4.2 Tourism

From a literature review of nine papers, Aitchison (2012) found that the percentage of tourists not discouraged from visiting an area with a wind farm averaged 91.3%. Virtually all visitors to Sortelha, Portugal, where two wind farms (39 MW and 18 MW) were constructed in 2010 to 2011, stated that the wind farms did not impact their selection of destination (Silva & Delicado, 2017). Wind farms are unlikely to impact tourist volume, expenditure, or the experience of a tourist (Aitchison, 2004; Glasgow Caledonian University, 2008). The "clear consensus is that there has been no measurable economic impact, either positively or negatively, of wind farms on tourism" (Aitchison, 2012).

In 2002, Market & Opinion Research International (MORI, 2008) completed an independent research study on the "Economic Impacts of wind farms on Scottish tourism" for the British Wind Energy Association (BWEA) and the Scottish Renewables Forum. MORI interviewed 400 tourists visiting Argyll and Bute, Scotland, an area chosen because, at the time, had the greatest concentration of wind farms in Scotland. In addition, the tourism industry in the region has a strong reliance on the area's high landscape value (the study indicates that 48% of the respondents who came to the area reported doing so for the scenery).

The MORI (2008) study indicates that 40% of tourists interviewed were aware of the existence of wind farms in the area and when asked whether this presence had a positive or negative effect, 43% indicated that it had a positive effect, while a similar proportion (43%) felt it made no difference, and 8% felt that it had a negative effect.

In comparison, a 2003 study was completed for the Wales Tourist Board (NFO World Group, 2003) in response to an inquiry from the Welsh Assembly to "assess the effects of renewable energy, and particularly wind farms, on tourism." (NFO World Group, 2003). This study used a 266-person sample size and found that 78% of respondents were positive or neutral towards wind farms, with 21% negative, and 1% with no opinion.

Although the effects of the Project on local tourism and tourist perceptions cannot definitively be known until the Project is implemented, past research in the Scottish and Wales examples indicates that the dominant perceptions of the Project will likely be either positive or neutral. Additionally, the Municipality of the District of Argyle released a video on the Pubnico Wind Project (Municipality of Argyle, 2014) which provides details on how that community perceives the wind farm and notes that the wind farm is a draw for tourism.

An increase in construction personnel (e.g., equipment operators) is required during the construction (2 years) and decommissioning (2 years) phases of the Project. The influx of workers (~ 100+ people) during these phases will require hotel rooms for extended periods. This may reduce the availability of rooms for tourists to the area.

13.7.4.3 Mitigation
No mitigations are proposed for this VEC.

13.7.4.4 Monitoring
No monitoring is proposed for this VEC.

13.7.4.5 Residual Effects and Significance

Magnitude
The Project is anticipated to have a **low** magnitude of effect on recreation or tourism.

Likelihood
It is **possible** that the Project will affect recreation and tourism but only through very limited use of the existing lands, and during construction resulting from the use of hotel rooms in the area.

Duration
The duration of the Project's potential interaction with recreation or tourism is **long term** as there is potential for it to occur for the life of the Project.

Frequency
The effects of Project on recreation or tourism will occur **sporadically**, if they occur at all.

Significance
The Project will have a **not significant** effect on recreation or tourism (Table 10.4).

13.7.5 Human Health

The Project has the potential to interact with human health during all Project phases. During construction and decommissioning, there will be an increase in traffic and heavy equipment will be in operation. These activities may also affect air quality (Section 13.1.2; and in turn country foods). During operations, there is potential for the Project to result in ice throw and fire hazards which may affect human health.

13.7.5.1 Country foods

No known country foods are harvested on a commercial scale within the Project boundaries. A determination of the exact nature and extent of private gardens was not undertaken for this Project as all residences with permanent and sustained gardens appear to be located at least 600 m from any single WTG.

13.7.5.2 Ice Throw

Under certain meteorological conditions, ice can form on the blades, tower, or any surface of the WTG. Ice formation on the blades can lead to vibrations and imbalances in the WTG, often resulting in the need to temporarily shut down the WTG. As the ice melts or is shaken loose by vibrations, it is possible for chunks of ice to fall from the structure or be thrown by the rotating blades. Ice throw causes a potential hazard to anyone in the vicinity of the WTG. The maximum ice throw distance is calculated using the following formula:

$$d_t = 1.5 \times (D + H)$$

Where: d_t = Maximum throwing distance (m)
D = Rotor diameter (m)
H = Hub height (m)

The above formula is in accordance with the Canadian Renewable Energy Association (CREA, 2020) Best Practices for Wind Farm Icing and Cold Climate Health and Safety.

The WTGs assumed for the Project (Nordex N-163) have a rotor diameter of 163 m and a hub height of 118 m which equates to a maximum throw distance of d_t = 421.5 m.

Due to certification requirements which outline load cases which must be used in the design of WTGs (including iced blades) manufacturers incorporate ice build-up on the blades as a load resulting in additional vibration caused by both mass and aerodynamic imbalance (LeBlanc, 2007).

A number of factors such as wind speed, rotational speed, size of the ice chunk, and position of the ice on the structure affect how far it may be thrown. It is widely accepted that the formula above generates a conservative ice throw distance and in practice this distance may be much smaller. The Project's WTGs are setback by a minimum of 625 m from existing residential receptors, well beyond the maximum ice throw distance.

The calculated strike risk does not factor in the presence of forest vegetation providing additional shelter or topographic variations.

All WTGs considered will be equipped with a reliable ice detection system. Once ice has been detected, the WTG rotor stops spinning, and will remain stopped until the ice has been melted, which will occur either passively through a natural melting process based on climatic conditions or actively with a de-icing system that heats and melts the ice on the WTG blade. This effectively reduces the risk of ice throw.

13.7.5.3 Fire Hazard

Numerous fire prevention systems are in place to prevent such an occurrence. A robust lightning protection system is implemented to efficiently ground lightning strikes anywhere on the WTG. In direct drive WTGs there is no gearbox or gearbox lubricants, reducing the risk of fire from overheating mechanical parts. There are many sensors throughout the WTG that continuously monitor temperatures and send alerts or shut down the WTG if temperature limits are exceeded. Fire extinguishers are located throughout the tower and nacelle.
The Proponent will engage local fire departments to discuss fire safety related to the Project and address any concerns presented by the fire department. The West River Fire Department is located at 19 Gates Road, Salt Springs, NS, approximately 12 km west of the entrance to the Project.

13.7.5.4 Mitigation

The following mitigation measures are proposed to reduce impacts of the Project on Human Health:

- Ensure safety standards are met by selectively gating access to the Project during construction, as needed.
- Ensure fencing is in place surrounding the substation.
- Post warning signs at site entrance(s).
- Include an automated control system that will shut down the WTG to mitigate for ice throw if WTG icing causes blades to become off balance.
- Implement a robust lightning protection system to efficiently ground lightning strikes anywhere on the WTG.
- Require fire extinguishers to be located throughout the tower and nacelle of each WTG.
- Require trucks to abide by posted speed limits.
- Require trucks to cover loads.
- Apply water on access roads to control dust, as necessary.

13.7.5.5 Monitoring

No monitoring is proposed for this VEC.

13.7.5.6 Residual Effects and Significance

Magnitude

The Project is anticipated to have a **low** magnitude of effect on human health. No regulatory threshold is available; therefore, the Project team has considered a proven adverse effect on human health as the threshold.

Likelihood

It is **unlikely** that the Project will affect human health due to the mitigations proposed and the setback distance to existing residential receptors (625 m).

Duration

The duration of the Project's potential interaction with human health is **long term** as it may occur during all Project phases.

Frequency

The effects of Project on human health will occur **sporadically**, if it occurs at all.

Significance

The Project will have a **not significant** effect on human health (Table 10.4).

13.7.6 Cultural and Heritage Resources

The construction phase has the potential to interact with cultural and heritage resources. The ARIA concluded that the Study Area contains five HPAs, with the remainder of the Study Area being of low archaeological resource potential.

13.7.6.1 Mitigation

The following recommendations were provided in the ARIA for the Study Area:

- Avoid ground impacts to identified HPAs to the extent possible during refinements in the Project design.
- Complete shovel testing at ground disturbance at HPAs 1, 2, 4, and 5 cannot be avoided. This program should include documentation in advance of any ground disturbance to further assess and delineate cultural heritage resource potential.
- Develop an archaeological mitigation plan through engagement with the Special Places Program and parties identified in the ARIA if ground distance at HPA 3 cannot be avoided.
- Conduct a comprehensive archaeological reconnaissance to the footprint of any proposed expansion or alteration of the Project Study Area.
- Develop a chance find procedure related to the potential unexpected discovery of archaeological deposits or human remains during activity associated with the development of the Project. This would include halting all work in the associated area(s) and immediately contacting the Special Places Program.

13.7.6.2 Monitoring
No monitoring is proposed for this VEC.

13.7.6.3 Residual Effects and Significance

Magnitude
The Project is anticipated to have a **low** magnitude of effect on cultural and heritage resources. No regulatory threshold is available; therefore, the Project team has considered this magnitude based on the ARIA indicating predominantly low potential for archaeological resources, of either First Nations or European-descended origin within the Study Area. For HPAs identified in the ARIA, archaeological shovel testing will be completed within HPAs that cannot be avoided by Project infrastructure.

Likelihood
It is **unlikely** that the Project will affect cultural and heritage resources due to the predominantly low potential for resources to be located within the Project footprint and commitment to complete archaeological shovel testing in HPAs that cannot be avoided.

Duration
The duration of the Project's potential interaction with cultural and heritage resources is **short term** as it would occur during the construction phase of the Project, if it were to occur at all.

Frequency
The effects of the Project on cultural and heritage resources will occur **once**, if they occur at all.

Significance
The Project will have a **not significant** effect on cultural and heritage resources (Table 10.4).

13.7.7 Other Undertakings in the Area
The Dalhousie Mountain Wind Farm exists in proximity to the Project (Drawing 5.2). The 35 WTGs generate 175,000 MW hours of energy and are owned by RMS (RMS Energy, 2024). The nearest Dalhousie Mountain Wind Farm WTG to the Project is WTG4 and is located approximately 2.7 km (east).

13.7.7.1 Cumulative Impacts
Cumulative impacts are defined as the combined impacts that may occur when wind power projects or other types of projects are in the same region (NSECC, 2021). As described above, the Project is in close proximity to the Dalhousie Mountain Wind Farm (currently in operation). Based on the proximity of the Dalhousie Project WTGs to the Project, there is potential for cumulative effects between the Project's, to be evaluated qualitatively herein.

The total linear length of access roads for the Dalhousie Mountain Wind Farm is approximately 20 km. The Project will require the construction of approximately 28 km of new access roads (Option A, new roads and upgrades to existing roads) which will increase local habitat fragmentation in the Project Area, and direct impacts to habitat and vascular plants. Refer to Section 13.3.2 for more details on the effects of habitat fragmentation on fauna and to Section 13.3.1 for more details on the Project's effects on habitat and vascular plants.

The Project has avoided direct impacts to SAR (e.g., frosted glass whiskers and eastern waterfan), and minimized impacts to fish and fish habitat and wetlands, therefore, cumulative impacts on these VECs are not anticipated.

The Dalhousie Mountain Wind Farm is a 35-WTG development, and therefore, underwent an EARD and associated post-construction mortality monitoring. According to RMS (2011), post-construction mortality monitoring was completed, including standard corrections for searcher efficiency and scavenger removal. The results of this survey indicated that mortality rates at the Dalhousie Mountain Wind Farm were 0.508 birds per WTG per year.

Per Section 13.3.3 and 13.4.1 the Project is predicted to cause bird and bat mortalities during operations and the cumulative impact on birds and bats is elevated due to the existence of the adjacent Dalhousie Mountain Wind Farm. Mortality estimates completed for the proposed Project indicate potential mortality rates of up to 0.84 birds per WTG per year, based on inclusion of avifauna surveys, and radar and acoustic monitoring data. The potential cumulative effect to avifauna between Dalhousie Mountain Wind Farm and the proposed Project is 1.35 birds per WTG per year, which is expected to be not significant.

The cumulative impact of the operational noise generated by the Project and the existing Dalhousie Mountain Wind Farm WTGs was captured in the predictive noise report, where all WTGs within 3 km were incorporated into the model (Appendix D). Therefore, cumulative effects of the Project on noise are considered in the effects assessment.

The development of the Project will benefit Nova Scotia by providing an additional renewable source of energy and contribute to the reduction of GHG emissions. There is a positive cumulative impact between the Project and the Community Feed-in Tariff WTGs related to the climate change VEC.

13.7.7.2 Mitigation

No mitigation is available for cumulative effects except for those already provided within the other sections of this EARD.

13.7.7.3 Monitoring

No monitoring is proposed for this VEC.

13.7.7.4 Residual Effects and Significance

Effects of this Project on existing conditions have already been discussed in this document.

14.0 EFFECTS OF THE ENVIRONMENT ON THE UNDERTAKING

Effects of the environment on the undertaking considers local conditions or natural hazards that can affect the Project's operations and may contribute to further environmental impacts. Extreme storms and forest fires are natural hazards that have the potential to affect the Project. These hazards are described in more detail in the following subsections.

14.1 Extreme Storms

Climate change is increasing the frequency, strength, and intensity of storms (US EPA, 2024) and extreme storms have the potential to affect Project infrastructure.

14.1.1 Extreme Wind

Although WTGs are designed to harness the kinetic energy of the wind in a wide range of speeds, including gusts and sustained high winds, extreme wind (e.g., hurricanes) can damage WTG blades.

WTG control systems are designed to protect the WTG in high wind conditions. During elevated wind speed conditions, the WTGs will pitch the blades to catch less wind and will yaw to efficiently and safely manage the wind loads.

WTGs have a 'cut in speed' (wind speed at which the WTG is begins to produce energy) of approximately 4 m/s or 11 km/h, and a 'cut out speed' (wind speed at which the WTG shuts down or limits energy production for safety reasons) of approximately 26 m/s or 93.6 km/h. Modern WTGs are equipped with storm control technology that allows the WTG blades to 'feather' or 'spill' wind in higher wind speeds, reducing the load on the blades and WTG as a whole, while still producing energy.

Control and condition monitoring systems shut down the WTGs during high and extreme wind conditions and pitch the blades into an idle/vane position, to ensure operational safety and reduce risk of WTG failure.

14.1.2 Lightning

Lightning strikes have the potential to damage WTG components. A robust lightning protection system is implemented to efficiently ground lightning strikes anywhere on the WTG, ensuring the electrical current is redirected away from the nacelle and towards the ground. Fire extinguishers and/or other fire protection mechanisms are located throughout the tower and nacelle.

14.1.3 Snow and Ice Storms

Heavy snow, freezing rain, and ice pellets have the potential to damage WTGs. Ice buildup on WTG blades can cause ice throw. If WTG icing causes the blades to become off balance, an automated control system will shut down the WTG. The WTG will remain shut down until the ice has melted. Regular maintenance will also be implemented to mitigate the potential impacts of a snow and ice storm. The potential effect of ice throw on human health is described in Section 13.7.5.

14.1.4 Flooding

Flooding has the potential to impact Project access roads and other infrastructure. The Project Area is inland and at a high elevation, where storm surges from extreme weather events will not infringe. The Maritime Coastal Flood Risk Map (NSCC, n.d.) was reviewed but does not provide coverage of the Project Area. The Project WTGs are above 200 masl and over 2 km from the Minas Basin and the Northumberland Strait, meaning that the Project Area is situated away from potential effects of storm surge. The Project will mitigate the risks of flooding by concentrating the road and WTG layout in high elevation areas, maintaining regular upkeep of roads to reduce formation of ruts, designing roadside ditches and water off-take infrastructure next to all roads to encourage drainage of rainwater off the roads, and revegetating roadsides to absorb excess water.

Overall, the risk of flooding is considered low based on the distances from the Atlantic Ocean and the WTGs respective elevations above sea level.

14.2 Forest Fires

Forest fires have the potential to damage Project infrastructure such as collector lines. The risk of a forest fire is dependent on several weather conditions such as extended periods without precipitation and high temperatures. Forest fire risk is also dependent on potential ignition sources such as lightning or human-caused fires (campfires, cigarettes etc.). Climate change is causing an increase in the frequency and strength of heatwaves (US EPA, 2024). Forest fires are impossible to predict, however, the Project Area is situated in an area with the lowest likelihood (0 to 5) according to the fire weather index (NRCan, n.d.).

Should the risk of fires increase throughout the lifetime of the Project, mitigation strategies to protect Project infrastructure and relevant VECs will be adapted accordingly.

15.0 OTHER APPROVALS REQUIRED

In addition to approval of the EA, the Project also requires federal, provincial, and municipal permits/approvals (Table 15.1).

Table 15.1: Other Approvals Required

Approval / Permit Required	Responsible Department	Timeline to Obtain Approval	Description	Anticipated Submission
Federal Approvals				
Aeronautical Lighting Permit	Transport Canada	12 weeks	The Civil Aviation Directorate within Transport Canada is responsible for the review of wind projects to assess the potential for the facility to interfere with navigation safety. WTGs and MET towers must have markings and lighting installed according to Transport Canada's Standard 621 - Obstruction Marking and Lighting - Canadian Aviation Regulations, S.O.R./96-433 (CARs). Under Standard 621, WTGs of total height exceeding 150 m must adhere to additional lighting requirements (i.e., mid-tower lights). MET towers which exceed 60 m require specific markings.	Complete
Aeronautical Obstruction Clearance		12 weeks	Required for all WTGs and MET towers that exceed 90 m above ground level (AGL).	Complete
Letter of Non-Objection	NAV Canada	12 weeks	Consultation with NAV Canada is required as NAV Canada assesses all land use proposals near airports and air navigation infrastructure before construction.	Complete

Approval / Permit Required	Responsible Department	Timeline to Obtain Approval	Description	Anticipated Submission
Letter of Non-Objection	DND	At least 90 days before construction	DND will review the wind farm to determine if a proposed project may create an unacceptable level of interference to military operations, safety, readiness or training of the Canadian Armed Forces.	Complete
Letter of Non-Objection	ECCC	4 weeks	ECCC will review the wind farm to assess the potential to cause significant interference with its weather radar.	Complete
Letter of Non-Objection	RCMP	4 weeks	RCMP will review the wind project to assess the potential to cause interference issues with communications or radar.	Complete
Notification	Canadian Coast Guard (CCG)	1 week	CCG will review the wind farm to assess the potential to cause interference issues with communications or radar.	Complete
Provincial Approvals				
Crown land Easement	NSNRR – Lands Services Branch and NSCCTH	9 to 12 months for any permanent lease agreement	Application occurs early in the permitting process and requires a development plan (e.g., Project Description Document). Integrated Resource Management process (4 to 6 months) will be initiated for permit activities. Easement approval is not issued until the EA has been approved.	September 2024
Heritage Approval		3 months	Following the completion of an ARIA, approval from CCTH is required before construction.	Submitted to CCTH

Approval / Permit Required	Responsible Department	Timeline to Obtain Approval	Description	Anticipated Submission
Wetland Alteration Permit	NSECC	90 days	Nova Scotia Wetland Alteration Application is required when alterations to wetlands are required.	Application to be submitted after EA approval.
Blasting Permit	Access Nova Scotia	At least 7 days before work	Blasting permit is required under the General Blasting Regulations made under Section 82 of the *Occupational Health and Safety Act*	Application to be submitted after EA approval.
Special Move Permit	Access Nova Scotia	At least 7 days before work	A special move permit is required for movement along the highway of a vehicle which exceeds the legal weight limits or the legal dimensions limits set out in the Weights and Dimensions of Vehicles Regulations, N.S. Reg. 137/2001 made pursuant to Section 191 of Chapter 293 of the *Motor Vehicle Act*.	Application to be submitted after EA approval.
Municipal Approvals				
Wind Turbine License	Municipality of the County of Colchester	At least 30 days	Per Clause 4 of the Wind Turbine Development By-Law, a Wind Turbine Licence is required for all large-scale WTGs	Application to be submitted August 2024.
Development Permit	Municipality of the County of Pictou	2 to 3 weeks	Per Section 2 of the Wind Energy By-law, a development permit is required for a WTG development.	Application to be submitted August 2024.
Building Permit	Municipality of the County of Pictou	2 to 3 weeks	Per section 4 of the Building By-law, which lists WTGs as one of the buildings to be charged a fee under the by-law.	Application to be submitted August 2024.

16.0 FUNDING

No government funding has been secured for the Project. Should any be obtained during the development of the Project, the Proponent will notify NSECC and provide contact information for the source of the government funding.

17.0 ADDITIONAL INFORMATION

All applicable information has been included above.

18.0 SUMMARY

The EARD has been prepared to evaluate the effect of the Project on selected VECs, which includes a detailed assessment of baseline conditions and predicted impacts to each VEC.

18.1 Summary of Residual Effects

Table 18.1 provides a summary of the effects assessment completed for each VEC.

Table 18.1: Effects of the Undertaking on the Environment – Summary

VEC		Magnitude	Likelihood	Duration	Frequency	Significance	Monitoring
Atmospheric	Climate Change	Low, but positive	Certain	Long term	Continuous	Not significant, but positive	None proposed
	Air Quality	Low	Possible	Short term	Sporadic	Not significant	None proposed
	Noise	Low to medium	Certain	Long term	Intermittent to continuous	Not significant	None proposed
Geophysical	Surface and Bedrock Geology	Low	Almost certain	Short term	Regularly during construction and decommissioning phases	Not significant	None proposed. If blasting is required, wells within 800 m will be monitored
	Groundwater	Low	Possible	Long term	Sporadic	Not significant	
Terrestrial	Habitat, Flora and Lichens	Low	Certain	Long term	Once	Not significant	Monitoring of rare lichens is proposed where buffers are encroached
	Fauna	Low	Almost certain	Long term	Regular to continuous	Not significant	Mainland Moose monitoring is proposed
	Bats	Low	Almost certain	Long term	Continuous	Not significant	Post-construction mortality monitoring for birds and bats is proposed
Avifauna		Negligible	Almost certain	Short term to long term	Continuous	Not significant	Post-construction mortality monitoring for birds and bats is proposed
Aquatic	Wetlands	Low	Certain	Short term	Once	Not significant	Post-construction monitoring of partially altered wetlands is proposed
	Surface Water, Fish, and Fish Habitat	Low	Certain	Short term	Once	Not significant	None proposed
Technical components	Visual Aesthetics	Low	Certain	Long term	Continuous	Not significant	None proposed
	Shadow Flicker	Low	Likely	Long term	Sporadically	Not Significant	None proposed
	Electromagnetic Interference	Low	Unlikely	Long term	Sporadically	Not significant	None proposed

VEC		Magnitude	Likelihood	Duration	Frequency	Significance	Monitoring
Socioeconomic	Economy	Moderate positive	Certain	Long term	Regularly	Not significant	None proposed
	Land Use Value	Low	Almost certain (land use) to unlikely (land value)	Long term	Continuously	Not significant	None proposed
	Transportation	Low	Certain	Short term	Sporadically	Not significant	None proposed
	Recreation and Tourism	Low	Possible	Long term	Sporadically	Not significant	None proposed
	Human Health	Low	Unlikely	Long term	Sporadically	Not significant	None proposed
	Cultural and Heritage Resources	Low	Unlikely	Short term	Once	Not significant	None proposed
	Other Undertakings	As per above – described per VEC					None proposed

18.2 Summary of Mitigation Measures

A compiled list of mitigation measures identified throughout the EARD is provided below.

18.2.1 Atmospheric

General mitigation measures for impacts to climate change, air quality, and noise include:

- Complete regular maintenance on equipment.
- Adhere to posted speed limits.
- Encourage contractor carpooling.
- Post speed limit signage on Project access roads.
- Minimize idling.
- Control, as needed, dust emissions with the application of water imported via a water truck.
- Cover trucks and minimize dust.
- Use alternatives to water on roads if evaporation is too rapid, such as calcium chloride, magnesium chloride, potassium chloride and sodium chloride (the use of alternative methods may be confined to within 200 m of homes and residences or further depending upon traffic requirements in specific areas during construction).
- Wet (with water) material stockpiles to control dust.
- Design storage areas and material stockpiles with prevailing wind directions in mind.
- Implement the Complaint Resolution Plan, which will provide a process for responding to potential air quality-related complaints. A draft of the Plan is provided in Appendix O.
- Implement the Contingency Plan, including site-specific measures to reduce and mitigate dust levels during all Project phases. This plan should be based on ongoing engagement with the closest residents to understand their concerns. A draft of the Plan is provided in Appendix P.
- Require Project personnel adhere to all safety protocols and wear appropriate personal protective equipment (PPE) in the event of significant fugitive emissions events (i.e., wind storms, dust storms).
- Complete blasting (if required) in accordance with regulatory requirements
- Adhere to Municipal noise by-laws during construction.

18.2.2 Geophysical

General mitigation measures for impacts to surficial and bedrock geology; and groundwater include:

- Implement sediment control measures (e.g., sediment fencing) and erosion control (e.g., mulching/revegetation). A draft Erosion and Sediment Control Plan (ESCP) is provided in Appendix Q.
- Complete site reclamation to stabilize and revegetate slopes and exposed surfaces.
- Save topsoil and organic soil material removed during construction for use during reclamation to restore the local seed bank.
- Replace soil material during reclamation when weather is optimal (i.e., minimal precipitation), if possible.

- Implement the Project Contingency Plan (Appendix P), which includes site-specific measures to prevent sedimentation and erosion and respond to spills.
- Avoid areas where colluvial deposits situated along steep slopes have been identified.
- Consult a qualified professional to stabilize steeply banked slopes where colluvial deposits or unstable materials are present.
- Avoid areas where sinkholes are identified.
- Consult a qualified professional to repair sinkholes or engineer structures to accommodate sinkholes.
- Conduct blasting, if required, in accordance with provincial legislation and subject to the terms and conditions of applicable permits.
  - Conduct pre-blast surveys for wells within 800 m of blasting activities.
  - Ensure all blasts are conducted and monitored by certified professionals.
  - Ensure all protective measures outlined in the Environmental Management and Protection Plan (EMPP, Appendix R) are implemented in advance of blasting activities.
  - Notify landowners in advance of any blasting activities.
  - Recover and revegetate exposed soils or bedrock as required to minimize any exposure following blasting.
- Develop a mitigation plan for managing sulphide-bearing materials if they are identified through pre-construction geotechnical surveys.
- Require rock removal in known areas of elevated sulphide-bearing material will conform to the Sulphide Bearing Material Disposal Regulations, N.S. Reg. 57/95 and in consultation with relevant regulatory departments.
- Grade construction areas (e.g., laydown areas) to control runoff.
- Use an emulsion compound that is insoluble in water if blasting is required. This will prevent contaminants such as Ammonium Nitrate Fuel Oil entering surface water bodies and groundwater during blasting activities.
- Complete refueling in designated areas, >30 m from a watercourse or wetland.
- Require the operator to remain with the equipment during refueling.
- Require that spill response equipment will be readily available.

18.2.3 Terrestrial Environment

General mitigation measures for impacts to habitat, flora, and lichens; fauna; and bats include:

- Maintain buffers on SAR and SOCI lichens to the greatest extent possible while limiting the clearing footprint, by continued micro-siting and reducing clearing to only approved areas.
- Maintain surface water flow via cross drainage culverts on access roads to allow passage for amphibians and reptiles.
- Monitor wetlands as directed in regulatory approvals.
- Implement the ESCP (draft provided in Appendix Q), with an additional level of protection where existing roads intersect buffered eastern waterfan locations.

- Avoid travel across erosion prone areas.
- Manage vegetation through cutting rather than using herbicides.
- Use dust suppressants (e.g., water trucks), as required, to control dust.
- Require equipment to have spill kits and that site personnel are instructed on their use.
- Employ measures to reduce the spread of invasive species (e.g., cleaning and inspecting vehicles).
- Reclaim the Project footprint as much as possible to re-establish native vegetation communities. Where vegetation restoration is required, natural regeneration of native species will be favored.
- Implement the EMPP (Appendix R), which includes site-specific measures to prevent sedimentation and erosion, dust level management, and spills.
- Educate Project staff about wildlife potential on roads especially for Project traffic.
- Use dust suppressants (e.g., water trucks), as required, to control dust.
- Require equipment to have spill kits and site personnel will be instructed on their use.
- Use good waste management practices to reduce attractants to opportunistic wildlife species, where applicable.
- Limit vehicle speeds on access roads.
- Avoid clearing around wetlands and riparian areas to the greatest extent possible. Avoidance of wetlands and watercourses in Project design was heavily weighted.
- Leave coarse woody debris in areas that will be re-vegetated after construction in place to provide alternative refugia and foraging areas for herpetofauna.
- Complete road maintenance regularly in the form of grading to prevent water pooling and to minimize deep ruts to prevent amphibians from laying eggs in pools.
- Implement the draft Mainland Moose Monitoring Plan (Appendix S)
- Implement WMP and AMP (Appendices T and U, respectively).
- Complete clearing activities that may impact potential roosting habitat outside of the bat roosting period (May 15 to September 30).
- Install motion activated lights on site infrastructure to reduce insect attraction and subsequent attraction by bats during operations. Motion activated lighting is only applicable to the ground-based infrastructure (i.e., at doorways and the substation) as WTG lighting at the top of individual WTGs is regulated by Transport Canada.
- Provide wildlife awareness training to site personnel.

18.2.4 Avifauna

General mitigation measures for impacts to avifauna include:

- Complete clearing of vegetation and timber for the Project footprint outside of the breeding season between April 15 to August 30. If, during construction, additional areas need to be cleared, a nest sweep will be completed by a biologist prior to construction start and repeated as necessary prior to any disturbance.
- Avoid disturbance of any ground- or burrow-nesting species should they initiate breeding activities within stockpiles or exposed areas during construction or operations, until chicks can fly, and the nesting areas are no longer being used.
- Salvage and store grubbings and topsoil for use in site restoration.

- Equip site machinery with spill kits and instruct site personnel on their use.
- Implement a reclamation program to re-establish similar habitat to support reintroduction of birds post-decommissioning.
- Install movement detection lighting on office structures, doors to WTGs, gates, etc. which turn off when not in use, instead of permanent lighting during operations.
- Implement the WMP and AMP.

18.2.5 Aquatic

General mitigation measures for impacts to wetlands, surface water, fish, and fish habitat include:

- Acquire and adhere to wetland alteration permits, as required, and implement wetland monitoring as directed by permits and in consolation with NSECC.
- Engage in wetland compensation activities for the wetland loss associated with the Project as required by the provincial wetland alteration process and in consultation with NSECC.
- Complete pre-construction site meetings for all relevant staff/contractors related to working in and around wetlands and watercourses to mitigate unauthorized disturbance.
- Ensure all wetlands are visually delineated (i.e., flagged).
- Conduct vegetation management (cutting and clearing) in or near wetlands in accordance with applicable guidelines and in consideration of breeding bird windows and maintain wetland vegetation wherever practicable.
- Mitigate risk of soil disturbance (e.g., rutting) by using mitigations such as swamp mats, limiting the use of machinery within wetlands, and avoiding work in wetlands in highly saturated conditions (e.g., consider seasonality), as is practicable.
- Implement the ESCP. All erosion and sediment control structures will be regularly inspected and repaired.
- Direct construction and/or operational runoff through natural upland vegetation, wherever possible.
- Maintain or construct appropriate cross-drainage on existing and new access roads.
- Employ measures to reduce the risk of spread of invasive species (particularly by inspecting and cleaning equipment prior to travel within the site) into wetlands and retain habitat integrity (e.g., revegetate exposed soil surfaces with native vegetation, include invasive species monitoring in the wetland monitoring program).
- Avoid storing fuel on site and only complete refueling in designated areas, >30 m from wetlands and watercourses. Spill response equipment will be readily available
- Install road crossings in compliance with Nova Scotia Guide to Altering Watercourses (NSE, 2015) and fish rescue will be completed during crossing construction, if required.
- Minimize use of equipment within the 30 m watercourse buffer.
- Obtain approval from DFO/NSECC for all watercourse crossings or where impacts to fish habitat are expected, as required, prior to undertaking work.

- Implement the draft SWMP following detailed design, prior to construction (Appendix V).
- Design spill prevention, response and management in the EMPP and implement across the Project.

18.2.6 Technical Components

General mitigation measures for impacts to visual aesthetics, shadow flicker, and EMI include:

- Use light-emitting diode (LED) lighting to minimize light throw.
- Use the minimum amount of pilot warning and obstruction avoidance lighting.
- Use lights with short flash durations and the ability to emit no light during the 'off phase' of the flash (i.e., as allowed by strobes and modern LED lights) on WTG structures.
- Implement the Complaint Resolution Plan (draft provided in Appendix L), which includes a process for investigation and case-specific mitigation measures (e.g., vegetation or awnings).

18.2.7 Socioeconomic

General mitigation measures for impacts to the economy; land use and value; transportation; recreation and tourism; human health; cultural and heritage resources; and other undertakings in the area include:

- The Proponent will employ local contractors to complete Project tasks, whenever possible.
- Obtain and comply with NSPW approval requirements for road construction.
- Ensure safety standards are met by selectively gating access to the Project during construction, as needed.
- Ensure fencing is in place surrounding the substation.
- Post warning signs at site entrance(s).
- Include an automated control system that will shut down the WTG to mitigate for ice throw if WTG icing causes blades to become off balance.
- Implement a robust lightning protection system to efficiently ground lightning strikes anywhere on the WTG.
- Require fire extinguishers to be located throughout the tower and nacelle of each WTG.
- Require trucks to abide by posted speed limits.
- Require trucks to cover loads.
- Apply water on access roads to control dust, as necessary.
- Avoid ground impacts to identified HPAs to the extent possible during refinements in the Project design.
- Complete shovel testing at ground disturbance at HPAs 1, 2, 4, and 5 cannot be avoided. This program should include documentation in advance of any ground disturbance to further assess and delineate cultural heritage resource potential.

- Develop an archaeological mitigation plan through engagement with the Special Places Program and parties identified in the ARIA if ground distance at HPA 3 cannot be avoided.
- Conduct a comprehensive archaeological reconnaissance to the footprint of any proposed expansion or alteration of the Project Study Area.
- Develop a chance find procedure related to the potential unexpected discovery of archaeological deposits or human remains during activity associated with the development of the Project. This would include halting all work in the associated area(s) and immediately contacting the Special Places Program.

18.3 Conclusion

Through the planning process for this Project, the Proponent implemented a mitigation sequence to first avoid impacts, mitigate unavoidable impacts, and compensate where applicable. Avoidance was attained by conducting a constraints analysis and designing Project infrastructure to avoid impacts to sensitive habitats and receptors to the greatest extent practicable. Development of the Project is not predicted to result in significant effects on any of the VECs evaluated.

Monitoring will be completed to confirm the predicted effects and determine if additional mitigation measures need to be implemented using an adaptive management approach.

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DRAWINGS

PROVIDED IN SEPARATE PDF FILES

APPENDIX A
PROJECT TEAM CVS

Melanie Smith, MES
Vice President – Environmental Assessment & Approvals, Partner
Total Experience: 22 years

EDUCATION

- MES, Dalhousie University, Halifax, NS (2004)
- BSc. (Honours), Environmental Science, Acadia University, Wolfville, NS (2001)

TRAINING

- GBA+ Micro-learning Series (2022)
- Cultural Safety (2021)
- Unconscious Bias (2021)
- Emergency First Aid (2021)
- Management Development Program (2019)
- Advanced Training, *Impact Assessment Act* (2019)
- Introduction to CEAA 2012 (November 2012)
- Water Management & Wetland Restoration Training Course, University of Guelph (2010)

AREAS OF SPECIALIZATION

- Project Management
- Environmental Assessment
- Ecological Assessment
- Habitat Assessment
- Regulatory Permitting, Monitoring, and Compliance Assessments
- Environmental Protection Plans
- Wetland/Watercourse Alterations
- Wetland and Fish Habitat Compensation

RELEVANT EXPERIENCE

Ms. Smith is the Vice President of Environmental Assessments and Approvals. She has a strong background in a variety of environmental program and policy areas. Ms. Smith has extensive experience leading teams, as well as building relationships and communicating with the public, regulators, the Mi'kmaq of Nova Scotia, clients, experts, and other stakeholders.

Prior to her appointment as Vice President of Environmental Assessments and Approvals at Strum, Ms. Smith held a Team Lead position with the Impact Assessment Agency of Canada. That role included the following:

- Led a team of professionals in completing federal environmental and impact assessments to support the Minister in decision making.
- Managed all aspects of assembling project teams, executing priorities, performance, deliverables, and overall quality.
- Supported the team in conducting Indigenous consultation, coordinating with federal and provincial departments, communicating with proponents, and engaging with stakeholders.
- Supported the team in the technical review of regulatory submissions under the *Canadian Environmental Assessment Act, 2022* and the *Impact Assessment Act*.
- Advised senior Agency officials on complex regulatory considerations.

Ms. Smith also held multiple roles with Nova Scotia Environment which included the following responsibilities:

- Led the development, management, and implementation of the Risk-Based Audit Project. The purpose of this corporate priority project was to modernize inspection services by using risk to maximize the allocation of limited resources while fulfilling the Department's mandate.
- Conducted extensive cross-sector collaboration within the Department, including all regions, inspectorates, divisions, and staff levels to ensure the project met the needs of working level staff and the goals of senior management.
- Provided strategic policy support and analysis for departmental programs and policies using the Regulatory Management Process.
- Conducted focus group sessions, coordinated stakeholder consultation, and provided recommendations to senior management.
- Completed inspections, responded to complaints, reviewed applications, and generated approvals related to the protection and sustainable use of air, land, and water resources in NS.

At Strum, Ms. Smith previously held progressive management roles including acting as the Team Lead during a long-term secondment of a senior manager and managed all aspects of a variety of projects within the Environment Group, including environmental assessments, watercourse alteration applications, wetland alteration applications, wetland compensation, environmental protection plans, environmental monitoring, and ecological assessments. This also included successfully and simultaneously managing multiple provincial Environmental Assessments. Ms. Smith also has extensive experience creating budgets, schedules, staff resourcing and supervision, deliverables, and client communication. She has presented at public open houses, community liaison committee meetings, public hearings, and testified at a UARB hearing.

REPRESENTATIVE PROJECTS AND ROLES

Strum Consulting (current)

Wind Power Environmental Assessments, 2022-Present – Senior Reviewer: Providing senior review and management on several 100 MW+ wind farms in Nova Scotia.

Post-Approval Work, EverWind Point Tupper Green Hydrogen/Ammonia Project Phase 1, NS, 2023 – Senior Reviewer: On-going post-approval work (following approval of the EA Registration Document) including the development of environmental management and monitoring plans. These plans are developed to avoid/mitigate potential impacts to nearby environmental and residential receptors throughout the lifespan of the Project.

Environmental Assessment EverWind Point Tupper Green Hydrogen/Ammonia Project - Phase 1, NS, 2022 – Senior Reviewer: Completed senior review of field studies and key reporting requirements for the submission of an EA Registration Document for a green ammonia/hydrogen facility located in Cape Breton, NS. This was the first green ammonia/hydrogen facility to be approved in both Nova Scotia and Canada.

Impact Assessment Agency

Boat Harbour Remediation Project, 2018-2022 – **Team Lead:** Team Lead for the Agency's technical review of this project, as well as associated consultation with the Mi'kmaq of Nova Scotia and public engagement. This project conducted the Agency's first external technical review as part of the process.

Beaver Dam Mine Project, Fifteen Mile Stream Project, **2017-2022**– **Team Lead:** Team Lead for the Agency's technical review of these gold mining projects, as well as associated consultation with the Mi'kmaq of Nova Scotia and public engagement.

Canso Space Port, Northern Pulp Replacement Effluent Treatment System, Touquoy Mine Expansion, Goldboro Gold Mine, 2017-2021 – **Team Lead:** Team Lead for requests to the Minister for these projects to be subject to the *Impact Assessment Act*. Review and analysis involved input from federal departments and a decision package to the Minister.

Howse Property Iron Mine Project, 2018– **Team Lead:** Team Lead for the Minister's decision package for the Howse Property Iron Mine.

Strum Consulting (past)

Wind Power Environmental Assessments, 2011-2014 – Project Manager/Team Lead: Project managed and coordinated all aspects of the provincial EA process for seven wind power projects ranging in size from 4 MW to 10 MW. Project components included wetlands, watercourses, wildlife, avifauna, bats, sound, shadow flicker, visual aesthetics, socio-economic conditions, and effects assessment. Also highly involved in public engagement activities including participation at several municipal planning meetings and project open houses, as well as the preparation of presentation materials (e.g. posters, handouts, etc.).

South Canoe Wind Project, **2011-2013 – Project Manager/Team Lead:** Project managed and coordinated the completion of numerous desktop and field studies in support of a 100 MW wind power project. Studies included exclusion mapping; a desktop review of site habitat, species at risk (including flora, fauna, and avian species), and archaeological resources; a sound and shadow flicker assessment; a visual impact assessment; and field assessment for wetlands, watercourses, wildlife, and avian species. Managed the launch of the project website and completed the effects assessment for the biophysical components of the provincial environmental assessment registration document. Also developed presentation materials for and attended three public open houses and delivered multiple technical presentations to the Community Liaison Committee and as part of the Development Agreement Public Hearing process.

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CONSULTING

Melanie Juurlink, MREM
Senior Project Manager and Ecology Lead
Environmental Assessments & Approvals
Total Experience: 20 years

AREAS OF SPECIALIZATION

- Environmental Assessments
- Fish community & habitat assessments
- Fish rescues
- Wetland delineation and functional assessment
- Species at Risk Evaluation
- Flora and Fauna surveys
- Avian surveys
- Public Consultation

EDUCATION

- Masters of Resource and Environmental Management, Dalhousie University, Halifax, NS (2011)
- Bachelor of Science (Advanced Major in Biology & Interdisciplinary Studies in Aquatic Resources), St. Francis Xavier University, Antigonish, NS (2005)

TRAINING

- Standard First Aid, AED, CPR (A) (2023)
- Joint Occupational Health and Safety Committee Level 1 (2023)
- Avian Nest Sweeps & Monitoring (2021)
- Fish Habitat Restoration, In-stream Techniques (2021)
- Fish Habitat Assessments (2019)
- eDNA Methods (2019)
- Freshwater & Diadromous Fishes of New England (2019)
- Field Hike Leader Certification, Basic and Winter Modules, Outdoor Council of Canada (2015 & 2018)
- Wetland Ecosystem Services Protocol (WESP-AC) (2017)
- WHMIS (2017)
- Electrofishing Crew Leader (2015)
- Wetland Delineation Certification (2013)
- Small Vessel Operator Proficiency & Marine Emergency Duties A3 Certified (2006)

RELEVANT EXPERIENCE

Ms. Juurlink is a Senior Environmental Scientist, with the role of Project Manager and the Ecology Lead of Environmental Assessments & Approvals. She is highly skilled at completing ecological habitat assessments via geospatial desktop review (GIS) and implementation of field studies. Melanie has worked on both project and research-related field assessments primarily in NS, PE, and AB. She has gained extensive experience completing habitat and ecological integrity studies across the NS landscape. She has an in-depth knowledge of NS flora and fauna which has provided her with the tools to determine habitat uniqueness and ecological sensitivity.

Before joining Strum, Melanie was the Senior Ecologist at McCallum Environmental Ltd, in NS. In that role, Melanie coordinated all McCallum field biologists required to complete all environmental baseline and ecological inventory programs for Provincial and Federal Environmental Assessment registration. She has been responsible for the implementation of environmental baseline programs in mining, quarry development, and energy sector development projects in NS in advance of environmental assessment registration. In addition, Melanie has been responsible for communicating the results of baseline environmental conditions to industry and project-related stakeholders. Her effective communication skills, broad technical knowledge, and personability have furthered her involvement in multiple community liaison committees and other community organizations.

Melanie held previous positions as the Environmental Specialist and Area Environmental Lead for the Shell/Albian Sands Expansion and the Regulatory and Environmental Specialist for the Canadian Natural Resources, Ltd both in Fort McMurray, AB.

REPRESENTATIVE PROJECTS

Environmental Baseline Surveys, Mining, NS, (2016-2023): Completion of environmental baseline surveys for the federal and provincial environmental assessment process for proposed development of four separate gold mines in eastern Nova Scotia. This involved collection of baseline data and effects assessment for terrestrial habitats (flora and fauna), avifauna, wetlands, fish and fish habitats, including completion of the Cumulative Effects Assessments for those projects within the federal process.

Fish & Fish Habitat Assessment, NS, (2019-2023): Completed detailed evaluation of effects to fish and fish habitat to support application for Harmful Alteration, Disruption and Destruction of Fish Habitat for one provincially approved gold project. This involved detailed fish habitat assessment, fish community structure evaluation, effects assessment based on direct impact and flow reduction, and compensation for residual effects.

Environmental Baseline Surveys, NS (2013-2024): Completion of environmental baseline surveys for multiple provincial environmental assessments for various wind power projects and quarries. This involves detailed desktop and constraints analyses to determine required field assessments, implementation of all field programs, interpretation and reporting of results, across multiple taxa and habitat types.

Wetland Delineation, Functional Assessments, and Training, NS, (2011-2024): Completed wetland delineation and functional assessment for over 1000 wetlands in support of multiple development projects in both permitting and environmental assessments. Instructed wetland delineation training with Fern Hills institute, and internally within both McCallum Environmental Ltd., and Strum Consulting. Instructed WESP-AC functional assessment for wetland through the Maritime College of Forest Technology, and internally at both McCallum Environmental Ltd., and Strum Consulting.

Avian Surveys, NS, (2012-2024): Completion of avian surveys, including baseline studies, post-construction studies and pre-construction nest searches for over ten projects, such as mines, quarries, wind power projects and residential development. Implemented and completed avian surveys from 2015-2018. From 2018-2024, guided implementation of programs and interpretation of results.

Fish Rescues, NS, (2020-2023): Completed more than 70 fish rescues in the past three years to support various transportation projects throughout Nova Scotia.

Baseline Studies, WESP-AC Calibration Study, NS, (2018): Completed baseline studies on 125 wetlands across the province to implement a new wetland functional assessment technique (WESP-AC) to the Nova Scotian regulatory landscape.

strum CONSULTING

Mark MacDonald, M.ScF.
Senior Project Manager and Terrestrial Lead
Environmental Assessments & Approvals
Total Experience: 17 years

AREAS OF SPECIALIZATION

- Environmental Assessments
- Flora and Fauna Surveys
- Species at Risk Assessments
- Field Implementation
- Technical Review
- Project Management
- Project Design
- Staff Training

EDUCATION

- Masters of Science in Forestry, University of New Brunswick, Fredericton, NB (2012)
- Bachelor of Science in Forestry (Major in Forest Management, Minor in Wildlife Ecology), University of New Brunswick, Fredericton, NB (2004)

TRAINING

- Emergency First Response & CPR (2022)
- Wilderness First Responder (2014)

RELEVANT EXPERIENCE

Mr. MacDonald a Senior Project Manager and Terrestrial Lead. He has a strong terrestrial survey design and oversight background and extensive experience in avian and botanical studies. Mark provides survey design and oversees the drafting of terrestrial baseline reports and effects assessments for many projects. He has consulted regularly with provincial regulatory agencies, local landowners, and other stakeholder groups.

Mark is a versatile, conservation-focused ecologist with over 17 years in adaptive project management in challenging environments. He is a dedicated learner with a proven record of quickly developing new skills and an excellent writer for both a technical and general audience. Diplomatic and capable when navigating differing values of multiple stakeholders.

REPRESENTATIVE PROJECTS AND ROLES

Environmental Baseline Surveys, NS, 2022-Present – Project Manager: Completion of environmental baseline surveys for multiple provincial environmental assessments for various wind power projects and quarries. This involves detailed desktop and constraints analyses to determine required field assessments, implementation of all field programs, interpretation and reporting of results, across multiple taxa and habitat types.

Environmental Assessment, Various Projects, 2022-Present – Project Manager: Lead terrestrial baseline reporting and environmental effects chapters for various mine, quarry, and wind projects, as well as other development projects across the maritime provinces (e.g., Walden Quarry Expansion, Six Mile Brook Quarry Expansion, Rhodena Wind Project, Wedgeport Wind Project, Caribou and Wood Islands Ferry Terminal Expansion Projects).

Botanical Surveys, NS, 2022-2024 – Project Manager: Planned and developed botanical survey programs, including species at risk and habitat assessments, for various mine, quarry, solar, and wind projects, as well as other development projects across the maritime provinces (e.g., Walden Quarry Expansion, Six Mile Brook Quarry Expansion, Shaw Sand Pit, Wedgeport Wind Project, Clydesdale Wind Project, Rhodena Wind Project, Wejipek Wind Project, Apitamkiejit Wind Project, Upper Afton Wind Project, New Prospect Wind Project, White Cedar Wind Project, Port Malcolm Solar Project, Caribou and Wood Islands Ferry Terminal Expansion Projects, Sungro Horiculture Peat Harvesting Projects, etc.).

Avian Survey Design and Completion, 2022-2024 – Project Manager: Planned and developed avian survey programs, including species at risk, coastal, migration, nocturnal owl surveys, breeding, and raptor/diurnal watch count surveys, for various mine, quarry, solar, and wind projects, as well as other development projects across the maritime provinces (e.g., Walden Quarry Expansion, Six Mile Brook Quarry Expansion, Shaw Sand Pit, Wedgeport Wind Project, Clydesdale Wind Project, Rhodena Wind Project, Wejipek Wind Project, Apitamkiejit Wind Project, Upper Afton Wind Project, New Prospect Wind Project, White Cedar Wind Project, Port Malcolm Solar Project, Caribou and Wood Islands Ferry Terminal Expansion Projects, Sungro Horiculture Peat Harvesting Projects, etc.).

Ryan Gardiner, BSc.
Project Manager – Permitting Lead
Environmental Assessments & Approvals
Total Experience: 13 years

AREAS OF SPECIALIZATION

- Surface Water Quality Sampling Programs
- Surface Water Quantity Monitoring Programs
- Wetland and Watercourse Delineation
- Biophysical Assessments
- Bat surveys
- Flora, Fauna and Habitat Field Surveys
- Construction Monitoring
- Sediment and Erosion Control Management Plans
- Provincial Regulatory Applications

EDUCATION

- Bachelor of Science Dalhousie University, Halifax, NS (2011)

TRAINING

- Standard First Aid, AED, CPR (A) (2023)
- Watercourse Alteration Certification, New Brunswick (2018)
- Bat Acoustics Training (Techniques and Analysis) (2017)
- Wetland Ecosystem Services protocols (Freshwater, Tidal) – Nova Scotia/New Brunswick (2016)
- Watercourse Alteration Certification for Sizers – Nova Scotia (2016)
- Watercourse Altercation Certification for Installers – Nova Scotia (2016)
- Wetland Delineator's course – Nova Scotia/New Brunswick (2014)

RELEVANT EXPERIENCE

Mr. Gardiner has worked in biology related environmental consulting since 2011. He has worked on both research related field assessments and project related field assessments in Nova Scotia, New Brunswick, Newfoundland, Ontario, Saskatchewan, Alberta, and Honduras. At Strum, Mr. Gardiner completes biophysical assessments, which include flora and fauna surveys including acoustic bat surveys and analysis, fish and terrestrial habitat assessments, water quality and hyrologic flow volume surveys, and conducts wetland and watercourse delineations and functional assessments. Mr. Gardiner also develops and coordinates field monitoring programs, and communicates field survey results and methodologies for Environmental Assessments and other provincial regulatory applications. Project tasks include the development of Post Construction Monitoring Plans in wetland habitat, surface water quality/quantity sampling programs, species at risk assessments, and sediment and erosion management plans.

REPRESENTATIVE PROJECTS AND ROLES

Wetland and Watercourse Alteration Applications, 2016-Present – Project Coordinator/ Project Manager: Completing desktop and field assessments on wetlands and watercourses including the completion of wetland data determination forms, WESP-AC functional assessments, and species at risk surveys to support wetland and watercourse alteration applications for 100+ small and medium scale projects. Authoring wetland and watercourse alteration applications to support residential, commercial, and industrial developments across Nova Scotia.

Biophysical Assessments, Touquoy Gold Mine, 2017 to Present – Project Coordinator/ Project Manager: Completing and coordinating biophysical assessments to comply with post approval conditions to support mine development in Mooseland, Nova Scotia including long term wetland monitoring, moose surveys, watercourse volume discharge monitoring, and avian surveys, complete with the submission of annual reports and meetings with NSECC to review results.

Bat Acoustic Monitoring and Reporting, 2018-Present – Project Coordinator/Project Manager: Designing bat acoustic monitoring programs in support of Wind Power development projects ranging from 3 to 50+ turbines for multiple projects across Saskatchewan, Alberta, New Brunswick, and Nova Scotia. Coordinating equipment maintenance and data quality assurance and collection. Analysis of acoustic bat data and preparation of report to support the submission of Environmental Assessments.

Water Quality and Quantity Assessments, 2018-Present – Project Coordinator: Designing and coordinating the collection of baseline and post construction surface water monitoring programs to collect high quality volume discharge measurements and water quality samples from natural surface water features in support of quarry and mining development in Nova Scotia. Quality control of field data prior to submission to support Environmental Assessments or post approval conditions.

Post Construction Wetland Monitoring, Highway 104 Twinning Project, 2022-Present – Project Coordinator/ Project Manager: Coordinating the collection of post-construction wetland monitoring data in 67 wetlands partially altered by the Hwy 104 twinning project in Nova Scotia. Authoring the annual report for submission to NSECC in compliance with approval conditions.

Wetland and Watercourse Assessments, Goldboro Gold Mine, 2022 to 2023 – Project Coordinator/ Project Manager: Completing and coordinating desktop and field assessments on wetlands and watercourses, including the completion of wetland data determination forms, WESP-AC functional assessments, and species at risk surveys to support wetland and watercourse alteration applications for a proposed gold mine. Primary author in the submission of one of the largest wetland alteration applications (n=127 wetlands) to Nova Scotia Environment and Climate Change (NSECC) as well as 23 watercourse alteration applications in support of mine development in Goldboro Nova Scotia. Developed a multi-year wetland monitoring program in consultation with NSECC to comply with approval conditions.

Wetland and Watercourse Assessments, Route 332 Widening Project, 2020-2021 – Project Coordinator/ Project Manager: Completing and coordinating desktop and field assessments on wetlands and watercourses including the completion of wetland data determination forms, WESP-AC functional assessments, and species at risk surveys to support wetland alteration applications for both freshwater and tidal wetlands. Was the primary author in the submission of a tidal and freshwater wetland alteration application to NSECC inclusive of the development and implementation of a multi-year wetland monitoring program to comply with approval conditions.

Construction and Environmental Approval Compliance Monitoring, 2011-2020 – Project Coordinator: Conducting environmental audits to ensure compliance with environmental approval conditions on the Muskrat Falls Transmission Line development in Newfoundland and Labrador as well as various other smaller developments in New Brunswick and Nova Scotia. Compliance measures included coordinating spill and contamination clean-up, development and implantation of sediment and erosion control plans, species at risk surveys, avian nesting surveys, construction monitoring and watercourse and wetland identification. Coordinated with project managers to ensure compliance was met and mitigation measures were implemented. Provided daily, weekly, and annual reports to track compliance and update stakeholders and regulatory authorities.

Wetland Ecosystem Services Protocol – Atlantic Canada Calibration Study, 2017 – Field Evaluator: Completed necessary field and desktop assessments to support baseline studies on 125 wetlands across Nova Scotia to implement a new wetland functional assessment technique (WESP-AC) for the nova Scotia regulatory process.

strum CONSULTING

Nicholas Doane, BSc.
Project Manager
Environmental Assessment & Approvals
Total Experience:10 years

AREAS OF SPECIALIZATION

- Wetland and Watercourse Assessment/Delineations
- Wildlife Surveys
- Radar Surveys
- Acoustic Recording Surveys
- Field Survey Design and GIS
- Data Management
- Technical Training
- Industrial Approvals
- Environmental Approvals

EDUCATION

- Bachelor of Science (Major – Biology, Minor – Management), Dalhousie University, Halifax, NS (2012)

TRAINING

- St. John Ambulance First Aid and CPR (2023)
- WHMIS (2023)
- Pleasure Craft/Boating License (2023)
- ATV/OHV Safety Certificate (2010)
- Rescue S.C.U.B.A. Diver Certification (2009)

RELEVANT EXPERIENCE

Mr. Doane has been in the environmental and biological professions since 2012, after completing a Bachelor's degree in biological sciences. He has managed projects, authored reports, developed methods, and patented an apparatus for controlled ecology. Nicholas has worked as a field biologist on projects throughout Atlantic Canada as well as in western Canada. He has conducted surveys including bird surveys, wildlife surveys, evaluation for Species at Risk, wetland functional assessment, wetland delineation, electrofishing, as well as radar and acoustic monitoring. Mr. Doane completes project management, designs and leads field programs, creates maps using ArcGIS, authors technical reports, writes environmental assessment reports, and submits environmental permitting.

REPRESENTATIVE PROJECTS AND ROLES

Proposal and Application Preparation, Winnifred Solar Project, AB, 2022-Present – Project Manager: Coordinated with client to complete successful proposals. Coordinated with field team to provide budgets and work scopes. Verified field data and wrote regulatory applications for provincial wildlife department as well as utilities approvals.

Environmental Assessment, Various Projects, 2022-present – Project Manager: Worked on terrestrial baseline reports and environmental effects chapters for various mine, quarry, and wind projects, as well as other development projects across the maritime provinces (e.g., Walden Quarry Expansion, Wedgeport Wind Project, Clydesdale Wind Project, Wejipek Wind Project, Bluebery Acres Wind Project).

Alberta Solar and Wind Farm Permitting, 2022-Present – Project Manager: Authored Alberta Parks and Environment Applications (AEPA) and Alberta Utilities Commission (AUC) Environmental Evaluations to support the permitting of eight proposed solar energy and two wind energy projects in Alberta. Applications included field-level project coordination, regulatory consultation, Conservation and Reclamation Plans, Environmental Protection Plans, and participation in public town halls and engagement sessions.

Avian and Bat Acoustic Monitoring, Wedgeport Wind Farm, NS, 2022-2023 – Project Coordinator: Coordinated the deployment, collection, analysis, and reporting for avian and bat acoustic programs. Deployed, maintained, and assisted in the reporting of avian radar program. Conducted avian field surveys, identifying birds by sight and sound throughout the project area. Conducted wetland and watercourse delineations and characterizations through proposed infrastructure areas with the project area.

Lynx Surveys, Rhodena Wind Farm, NS, 2023 – Project Coordinator: Developed, planned, and conducted lynx surveys for the Rhodena wind farm. Created GIS map models to predict lynx habitat and designed surveys to capture high probability area within the project area.

Wildlife, Fish, and Habitat Surveys, 2022-2023 – Project Coordinator: Conducted avifauna surveys: nest sweeps, nocturnal owl surveys, diurnal raptor surveys, nightjar surveys, species at risk surveys, spring/fall migration surveys, and breeding bird surveys. Conducted fauna surveys (e.g., species at risk, turtle surveys, moose surveys, PGI, and wildlife track surveys). Conducted watercourse assessments and wetland monitoring. Conducted fish and fish habitat assessments including electrofishing, fish collection, and fish rescues during construction. Completion of watercourse and wetland boundary determination and characterizations for regulatory wetland and watercourse alteration permitting. Conducted forest habitat assessments using the FEC guide. Surveys were completed for various mine, quarry, solar, and wind EA, and other small- or large-scale development projects across the maritime provinces.

Jessica Lohnes, BSc.H.
Environmental Scientist
Environmental Assessment & Approvals
Total Experience: 3 years

AREAS OF SPECIALIZATION

- Avian Surveys (e.g., breeding, migration, SAR surveys, nocturnal owl surveys, nightjar, diurnal raptor surveys, etc.)
- Fish Habitat Assessment and Electrofishing/Fish Collection
- Wetland and Watercourse Assessment and Delineations
- Wildlife and Habitat Surveys
- Surface and Groundwater
- Construction Monitoring
- Field Survey Design and GIS
- Spatial Analysis and Creation of Maps using QGIS and ARCGIS
- Data Management
- Industrial Approvals
- Environmental Approvals and Technical Reporting
- Company Mentor – Avian Training (i.e., bird identification and nest sweeps)

EDUCATION

- Bachelor of Science (Biology Honours and Co-op), Environment, Sustainability and Society, Dalhousie University, Halifax, NS (2016)

TRAINING

- Emergency First Aid AED CPR “C”, Red Cross (2024)
- Pleasure Craft License (2024)
- WESP-AC (2023)
- WHMIS (2023)
- Electrofishing Certification – Crew Supervisor (2021)
- Introduction to the Care and Use of Wildlife (2016)

RELEVANT EXPERIENCE

Ms. Lohnes has been in the environmental consulting profession since May 2021. She primarily performs environmental monitoring for a variety of large and small-scale development, construction and exploration initiatives, as well as project related field assessments across Nova Scotia, Prince Edward Island, Ontario, and Alberta, Canada. Ms. Lohnes has completed environmental assessment reporting, specialized avifauna surveys, nest sweeps, species at risk assessments, various fauna and habitat assessments, wetland delineation, watercourse assessments, fish and fish habitat assessments, fish rescues, and construction monitoring. She also has experience with independent/remote field work, GIS, environmental regulation, and project management/coordination (e.g., regulator and client collaboration, budgets, proposals, and survey design/scoping). Ms. Lohnes has been an avid bird watcher since 2014, is skilled in identifying bird species by sight and sound, and is also skilled in identifying nests. Ms. Lohnes also participates in the ECCC/CWS North American breeding bird survey and the Christmas Bird Count yearly through the Audubon Society and volunteers with the Marine Animal Rescue Society, the Back to Sea Society, as well as Hope for Wildlife.

REPRESENTATIVE PROJECTS AND ROLES

Environmental Monitoring and Various Assessments/Surveys, Transmission Line Construction Project, ON, 2021 – Present – Environmental Scientist: Environmental monitoring of a transmission line construction project (Wataynikaneyap Power Transmission Project) that includes regulatory advising, spill response/reporting, erosion/sediment control, wildlife monitoring/reporting, wildlife surveys (e.g., nest sweeps and caribou surveys), water quality monitoring, hazardous waste and environmental supply management, camp/equipment inspections, watercourse delineation, and reporting on construction activity.

Environmental Assessment, Various Projects, 2021-2024 – Environmental Scientist: Worked on terrestrial and fish baseline reports and environmental effects chapters for various mine, quarry, and wind projects, as well as other development projects across the maritime provinces (e.g., Lantz Quarry Expansion, Walden Quarry Expansion, Six Mile Brook Quarry Expansion, Tote Road Quarry Expansion, Shaw Sand Pit, Goldboro Gold Mine, Wedgeport Wind Project, Clydesdale Wind Project, Rhodena Wind Project, Wejipek Wind Project, Antrim Gypsum Mine, and the Caribou and Wood Islands Ferry Terminal Expansion Projects). Also involved in the development of management and monitoring plans regarding birds and species at risk for the Fifteen Mile Stream Gold Mine Project.

Avian Survey Design and Completion/Project Coordination, 2021-2024 – Environmental Scientist: Planned and developed avian survey programs, including species at risk, coastal, migration, nocturnal owl surveys, breeding, and raptor/diurnal watch count surveys, for various mine, quarry, solar, and wind projects, as well as other development projects across the maritime provinces (e.g., Tote Road Quarry Expansion, Lantz Quarry Expansion, Walden Quarry Expansion, Six Mile Brook Quarry Expansion, Shaw Sand Pit, Goldboro Gold Mine, Wedgeport Wind Project, Clydesdale Wind Project, Rhodena Wind Project, Wejipek Wind Project, Apitamkiejit Wind Project, Upper Afton Wind Project, New Prospect Wind Project, White Cedar Wind Project, Port Malcolm Solar Project, Caribou and Wood Islands Ferry Terminal Expansion Projects, Sungro Horiculture Peat Harvesting Projects, etc.). During the avian survey design and planning process, the applicable governmental regulators (e.g., through CWS and NSNRR) were consulted, as well as project managers and clients. Once design and planning was completed, surveys were scheduled and completed by Jessica and other bird surveyors on the team.

Wildlife, Fish, and Habitat Surveys, 2021-2024 – Environmental Scientist: Conducted avifauna surveys: nest sweeps, nocturnal owl surveys, diurnal raptor surveys, nightjar surveys, species at risk surveys, spring/fall migration surveys, and breeding bird surveys. Conducted fauna surveys (e.g., species at risk, turtle surveys, moose surveys, PGI, and wildlife track surveys). Conducted water quality sampling and surface water flow sampling. Conducted watercourse assessments and wetland monitoring. Conducted fish and fish habitat assessments including electrofishing, fish collection, and fish rescues during construction. Completion of watercourse and wetland boundary determination and characterizations for regulatory wetland and watercourse alteration permitting. Conducted forest habitat assessments using the FEC guide. Surveys were completed for various mine, quarry, solar, and wind EA, and other small- or large-scale development projects across the maritime provinces.

Wetland Restoration and Fish-Offsetting Projects, 2021-2024 – Environmental Scientist: Level-logger and piezometer monitoring well installation and maintenance, wetland and watercourse delineation and data collection, as well as fish collection and fish habitat suitability index surveys to contribute to various wetland restoration and fish-offsetting programs in Nova Scota.

Cole Vail, MREM
Environmental Scientist
Environmental Assessments & Approvals
Total Experience: 3 years

AREAS OF SPECIALIZATION

- Wildlife Surveys
- ArcGIS and QGIS

EDUCATION

- Master of Resource and Environmental Management, Dalhousie University, Halifax, NS (2023)
- Bachelor of Science with Major in Biology (Honors) Acadia University, Wolfville, NS (2021)

TRAINING

- Remote First Aid (2023) – Doyle Adventure and Safety
- Lichen and Bryophyte Identification and Handling (2018) – Eagle Hill Institute

RELEVANT EXPERIENCE

Mr. Vail is knowledgeable in survey methods and identification skills necessary in searching for several at-risk species groups, including snakes, bats, and plants. Mr. Vail has been involved with tasks ranging from watercourse and wetland delineation and habitat assessments, snakes, and bat surveys – in addition to being the sole surveyor for Lichens. Mr. Vail is also experienced in office-based tasks including the development of survey protocols, background research, and desktop reviews of species-at-risk organisms and their critical habitats. Cole has found several table two lichen species in project areas, in addition to select table one species. These include, but are not limited to, populations of Blue Felt Lichen and Wrinkled Shingle Lichen, as well as several occurrences of Frosted Glass Whiskers at various projects. Cole has demonstrated expertise as a lichen surveyor, with experience and success searching for every Nova Scotian lichen species with a Special Management Plan (SMP). Mr. Vail also produces figures in ArcGIS and QGIS and has developed and assisted in survey protocols for at-risk species, including background research and survey methods.

REPRESENTATIVE PROJECTS AND ROLES

Long-Term Monitoring, Goldboro Gold Mine Permitting, NS, 2023 – Junior Environmental Scientist: Played a leadership role as the field lead in a long-term monitoring program for Blue Felt populations surrounding the proposed Gold mine. He conducted background research on monitoring methodology and climate monitoring equipment in addition to leading the monitoring work on-site. This work involved health assessments and population assessments for Blue Felt Lichen populations.

Biophysical Surveys, Apitamkiejit Wind Project, NS, 2023 – Junior Environmental Scientist: Conducted a series of surveys for various organism groups, including lichens, bat maternity roosts, and ribbonsnake. In these survey types, Cole found significant populations of each, including dozens of Wrinkled Shingle Lichen occurrences in addition to several other species of conservation concern (SOCI), several bat maternity roosts, and two Ribbonsnake observations.

Wetland/Watercourse Assessments, Antrim Gypsum Mine, NS, 2023 – Junior Environmental Scientist: While on site performing wetland delineations and watercourse assessments, Cole observed new occurrences of Frosted Glass Whiskers. Cole also assisted in writing the biophysical sections of this Environmental Assessment registration application document, focusing primarily on the lichen and terrestrial section generally.

Lichen Surveys & Wetland/Watercourse Assessments, Clydesdale Ridge Windfarm, NS, 2023 – Junior Environmental Scientist: Conducted multiple lichen surveys and wetland delineation & watercourse assessments. During these visits, Cole found several new occurrences of Eastern Waterfan, Frosted Glass Whiskers, Blue Felt Lichen, and several SOCI lichens. Cole also played a large role in the delineation of several wetlands and watercourses. Cole wrote both the geophysical and lichen portions of the biophysical section within the resultant environmental assessment registration application document.

Wetland Delineation/Watercourse Assessment, Upper Afton Wind Project, NS, 2023 – Junior Environmental Scientist: Performed wetland delineation and watercourse assessments in addition to lichen surveys on the Upper Afton wind project, playing an instrumental leadership role for wetland delineators present during his participation in that survey type. Cole found new occurrences of Eastern Waterfan, Blue Felt Lichen, Frosted Glass Whiskers, and several SOCI lichens.

Various Surveys, Wejipek Wind Project, PEI, 2023-2024 – Junior Environmental Scientist: Travelled to site several times over the projects duration to perform lichen surveys in addition to pileated woodpecker nest and bat maternity roost surveys. Cole found Tree Flute Lichen (S1), as well as a historical bat maternity roost. Authored both the atmospheric and lichen portions of the biophysical section within the resultant environmental assessment registration application document.

Lichen Survey, Six Mile Brook Pit Expansion Project, NS, 2023 – Junior Environmental Scientist: Conducted lichen surveys and assisted with the environmental assessment registration document in writing the lichen and vascular plant sections of the biophysical section.

Biophysical Surveys, Higgins Mountain Wind Project, NS, 2023 – Junior Environmental Scientist: Identified one new occurrence of Frosted Glass Whiskers and documents several SOCI lichens. He was also heavily involved in the wetland delineation and watercourse assessments within the project and wrote one biophysical report on the work completed in addition to providing oversight and editing to later sperate biophysical report.

Various surveys, Wedgeport Wind project, NS, 2023 – Junior Environmental Scientist: Conducted additional wetland delineation and watercourse assessments in addition to surveying for lichens within the study area, observing new occurrences of Wrinkled Shingle Lichen, Blue Felt Lichen, and Frosted Glass Whiskers, in addition to several SOCI lichens. Authored the biophysical report for this additional work, providing an overview of the results for both survey types.

Lichen Surveys, Shaw-Middleton Sandpit EA, NS, 2023 – Junior Environmental Scientist: Conducted lichen surveys on this site and played a large role in writing the terrestrial portion of the biophysical section within the environmental assessment registration document.

Research and Technical Report Writing, Blue Mountain Birch Cove Ecological Connectivity Report, NS, 2024 – Environmental Scientist: Performed background research and wrote on the habitat, ecology, and movement of the North American Beaver and the Northern Flying Squirrel, two focal species. Also wrote on the mitigatory options the client could implement to bolster the regional movement of the two focal species between the proposed national urban park and other wilderness areas in the region.

Biodiversity Assessment, LaHave Coastal Lands Assessment, NS, 2024 – Environmental Scientist: To support the grant application process of the client to purchase lands for conservation, Cole conducted a biodiversity assessment of the area, focusing on lichens, birds, and bat maternity roosts. Cole found several SOCI lichens, in addition to Frosted Glass Whiskers, Blue Felt Lichen, and Scaly Fringe Lichen. In addition to the field work involved, Cole wrote a biophysical report for the project outlining the wetland connectivity of the area and the species within the larger project area.

Rhodena Wind Project, NS, 2024 – Environmental Scientist: Conducted lichen and plant surveys on this project, observing new occurrences of Blue Felt Lichen and Frosted Glass Whiskers.

Kerry Wallace, BSc (Hons)., Adv Dipl
Geomatics Technician
Environmental Assessment & Approvals
Total Experience: 4 years

AREAS OF SPECIALIZATION

- Geographic Information Systems (GIS)
- Location, Spatial, and Data Analytics
- Database Management
- Geoprocessing, Model Building
- Civic Addressing

COMPUTER EXPERIENCE

- GIS Software: ArcGIS Suite, QGIS
- Other Software: CorelDRAW X7
- Scripting: SQL, Python 2 & 3

EDUCATION

- Advanced Diploma in Geographic Information Systems (GIS), Centre of Geographic Sciences (COGS), Lawrencetown, NS (2020) ‘
- Bachelor of Science with Honours, Major in Geology, Saint Mary’s University, Halifax, NS (2019

TRAINING

- Emergency First Aid CPR Level ”C” & AED (2021)
- WHMIS (2023)
- Over 100 hours ESRI Academy Training (2019 – Present)

RELEVANT EXPERIENCE

Ms. Wallace is a GIS Technician working in the Environmental Assessments and Approvals group. She joined the team in early 2023 and has been helping the GIS team with data analysis and creating mapping products for environmental assessments and other projects.

Ms. Wallace received her Bachelor of Science with Honours in Geology at Saint Mary’s University in 2019. While studying at Saint Mary’s, Ms. Wallace was a research assistant, and was able to use a variety of tools to aid in the analysis of minerals and in their identification process. Ms. Wallace then went on to receive an Advanced Diploma in Geographic Information Systems at the Centre of Geographic Sciences in 2020.

Before joining Strum, Ms. Wallace worked for the Province of Nova Scotia as part of the Civic Addressing team, where she was able to continue to use GIS and was involved in the emergency management operations during Hurricane Fiona where she analysed data and created a dashboard to help the team with their planning going forward.

REPRESENTATIVE PROJECTS AND ROLES

Wind Farm Projects, NS, 2023 - Present - Geomatics Technician: Compiled and checked collected field data, performed geospatial data analysis, and completed numerous drawings as a visual aid in environmental assessments and other reports.

Detrital Mineral Provenance Analyses from the Cretaceous McMurray Formation, Alberta and the Holocene Portneuf River Delta, North Shore of Quebec (2021) – Research Assistant: Used a scanning electron microscope to determine mineral composition and to identify mineral assemblages in different offshore wells in the Scotian Basin. Supplementary graphs were created to aid in demonstrating mineral assemblages and chemical composition.

Sedimentary Petrology of the Upper Cree Member in the Cohasset A-52 Well, Scotian Basin, Offshore Nova Scotia (2020) – Research Assistant: Used a scanning electron microscope to determine mineral composition and to identify mineral assemblages in different offshore wells in the Scotian Basin. Supplementary graphs were created to aid in demonstrating mineral assemblages and chemical composition.

Electron Microprobe and Scanning Electron Microscope Mineral Analyses of Diagenetic Minerals from Lower Cretaceous Reservoir Sandstone, Scotian Basin, Offshore Nova Scotia (2019) – Research Assistant: Computer software was used to combine all backscattered electron images captured from a scanning electron microscope.

Detrital Petrology and Provenance of the Logan Canyon Formation Sandstones, Scotian Basin (2019) – Research Assistant: Analyzed petrographic information from samples using a scanning electron microscope, where mineral composition was determined using Energy dispersive spectroscopy and identification was helped with backscattered electron images using texture and brightness as a guide. Heavy mineral separation and identification was used to determine mineral assemblages and understand origins.

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Emma Halupka, MSc.
Environmental Scientist
Environmental Assessment & Approvals
Total Experience: 5 years

AREAS OF SPECIALIZATION

- Wetland Monitoring and Functional Assessments
- Vegetation Surveys
- Species at Risk
- Habitat modeling and mapping

RELEVANT EXPERIENCE

Ms. Halupka is an environmental professional with a wide range of skills in vegetation surveys, wetland monitoring and functional assessments, and species at risk conservation planning. She has a background in non-profit work, designing habitat restoration strategies for birds and reptiles, and organizing citizen science projects. Emma has a wide variety of field work experience in upland, wetland, and aquatic ecosystems.

EDUCATION

- Master of Science (Ecological Restoration), Simon Fraser University & BC Institute of Technology (2019)
- Bachelor of Science (Environmental Science), Dalhousie University, Halifax, NS (2015)

TRAINING

- St. John's Ambulance First Aid & CPR/AED Level C (2023)
- Introduction to Lichens, Eagle Hill Institute (2023)
- Introduction to Grasses, Eagle Hill Institute (2023)
- Winter Identification of Trees and Woody Plants, Eagle Hill Institute (2023)
- Pleasure Craft Operator License (2022)
- Alberta Safety Council All Terrain Vehicle (ATV) Safety Training (2019)

REPRESENTATIVE PROJECTS AND ROLES

Biophysical Assessments, Mine Project, NS, 2023 – Field Technician/Lead Biologist: Completed baseline biophysical assessments including wood turtle surveys, botany surveys, wetland and watercourse delineation, and watercourse habitat assessments. Contributed to writing the Environmental Assessment Registration Document for this project.

Wetland Ecosystem Services Protocol Calibration Study, NS, 2022 – Field Lead: Assisted project manager to organize field work across Nova Scotia including route planning, field logistics, and desktop evaluation of wetlands and access. Helped to conduct field assessments of >600 wetlands covering different ecoregions in Nova Scotia over the 2021 and 2022 growing seasons. Project was in collaboration with Nova Scotia Environment wetland scientist Ian Bryson, who developed the WESP-AC evaluation system.

Wetland Monitoring Program, Highway Twinning Project, NS, 2021-Present – Field Lead: Completed wetland monitoring and baseline monitoring for Highway 104 twinning project near Barney's River, Nova Scotia on behalf of Dexter Nova Alliance. Conducted visual observations of wetlands along the study site, soil conditions, vegetation surveys, and collected data from monitoring wells. Contributing to planning and logistics for the project and assisted in reporting. Trained other staff in wetland observational study methods.

Biophysical Assessments, Mine Project, NS, 2021 – Field Technician/Biologist: Completed wetland delineation and functional assessments using WESP-AC for 300 wetlands in Goldboro, Nova Scotia to support the biophysical components of a provincial Environmental Assessment. Evaluated habitat using the Forest Ecosystem Classification guidelines, surveys for Species at Risk, and assisted in data organization and analysis. GIS and geospatial data management.

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Christina Daffre, BSSc, NRET
Junior Environmental Scientist
Environmental Assessment & Approvals
Total Experience: 2 years

PROFESSIONAL ASSOCIATIONS

- Canadian Institute of Forestry - Forestry Technician

AREAS OF SPECIALIZATION

- Rare plant surveys
- Wetland and Watercourse Assessment and Delineations
- Wildlife Surveys
- Fish Habitat Assessments
- Environmental Approvals

EDUCATION

- Natural Resource Environmental Technology, Nova Scotia Community College (2022)
- Bachelor of Social Science (International Development and Environmental Studies), University of Ottawa (2017)

TRAINING

- St. John's Ambulance First Aid & CPR/AED Level C (2023)
- Winter Identification of Trees and Woody Plants, Eagle Hill Institute (2023)
- Electrofishing Certification (2023)
- Wetland Ecosystem Services Protocols Training (2023) – Nova Scotia
- Wilderness First Aid + CPR Level C (2021) – Canadian Red Cross
- Chainsaw Safety Certification (2021) – Safety First Nova Scotia
- ATV/OHV Operator Certification (2021)
- WHIMIS (2021)

RELEVANT EXPERIENCE

Ms. Daffre has been an environmental professional since 2022. She has a background working in environmental sustainability and natural resource management in both local and international settings. She has experience conducting fieldwork such as vegetation surveys, species at risk and invasive species monitoring. Ms. Daffre has strong forest mensuration skills such as timber cruises, biodiversity, biomass and carbon biomass inventories as well as, forest and vegetation classification. Ms. Daffre has authored baseline technical reports for provincial environmental assessments and regulatory applications and has completed watercourse and wetland assessments, including field delineation, habitat assessment, species at risk identification and data management, and mapping and spatial analyses (ArcGIS and QGIS).

REPRESENTATIVE PROJECTS AND ROLES

Biophysical Assessments, Clydesdale Ridge Wind Farm, NS, 2023-Present- Field Technician/ Biologist: Completed baseline biophysical assessments including fish habitat and collection surveys, botany surveys wetland and watercourse delineation, and watercourse habitat assessments. Contributed to writing the Environmental Assessment Registration Document for this project.

Biophysical Assessments, Antrim Gypsum Mine, NS, 2023-Present- Field Technician/ Biologist: Completed baseline biophysical assessments including fish habitat surveys, wetland and watercourse delineation, and watercourse habitat assessments. Contributed to writing the Environmental Assessment Registration Document for this project.

Wetland Monitoring Program, Highway Twinning Project, NS, 2023-Present – Field Technician: Completed wetland monitoring and baseline monitoring for Highway 103 and 104 twinning projects near Barney's River, and Hubbard's Nova Scotia on behalf of Dexter Nova Alliance. Conducted visual observations of wetlands along the study site, soil conditions, vegetation surveys, and collected data from monitoring wells.

Wood Turtle Habitat suitability study, Department of Defense, NS 2024- Field Technician/Biologist: Completed desktop suitability exercise using aerial photography and available GIS databases to identify suitable wood turtle habitat at 14 Wing Greenwood in Kings County, Nova Scotia. Conducted field surveys to identify suitable habitat and visual encounter surveys for wood turtles to inform habitat management and future development. Contributed to report writing for this project.

Biophysical Assessments, Six Mile Brook Pit Expansion, NS, 2023-2024- Field Technician/ Biologist: Completed baseline biophysical assessments including botany surveys, wetland and watercourse delineation, and watercourse habitat assessments. Contributed to writing the Environmental Assessment Registration Document for this project.

Emily MacLean, BASc.
Environmental Scientist
Environmental Assessment & Approvals
Total Experience: 2 years

AREAS OF SPECIALIZATION

- Wetland and Watercourse Delineation
- Wildlife Surveys
- Fish Collection and Fish Habitat Assessment
- Data Management
- Spatial Analysis and Creation of Maps using QGIS and ARCGIS

EDUCATION

- Bachelor of Arts and Science (Climate and Environment) St. Francis Xavier University (2023)

TRAINING

- Standard First Aid (2024)
- Pleasure Craft Licence (2024)
- WESP-AC (2023)
- WHMIS (2022)

RELEVANT EXPERIENCE

Ms. MacLean has gained environmental experience in Nova Scotia through environmental consulting and non-profit organization. She has experience with environmental sampling, wildlife surveys, wetland and watercourse delineation, fish collection and habitat assessment, environmental monitoring, and data management/analysis. Ms. MacLean also completes spatial analysis and maps using ArcGIS and QGIS.

REPRESENTATIVE PROJECTS AND ROLES

Wetland and Watercourse Delineation, NS, 2023 – Environmental Scientist: Worked on a team for the biophysical assessments for a wind farm EA. The scope of work included wetland and watercourse delineation and characterization in the Study Area, as well as data management and mapping using QGIS.

Wetland Vulnerability Study, NS, 2023 – Environmental Scientist: Worked on a team to complete a wetland study as a method of wetland compensation. The scope of work included supporting field planning, executing the field program, spatial analysis and the creation of maps using QGIS, and supporting the final report. This involved developing new field forms for the purpose of the study and assessing one hundred wetlands throughout the Study Area. The final product of this Study can be used to identify which wetlands are most vulnerable to stressors and identify potential restoration opportunities.

eDNA, Detailed Fish Habitat Assessment, and Flow Monitoring, NS, 2023-2024 – Environmental Scientist: Worked on a team for a biophysical and provincial gypsum mine Environemtnal Assessment. The scope of work included three rounds of eDNA collection to provide evidence on the presence/absence of IBoF Atlantic Salmon in watercourses surrounding mining projects, flow monitoring, detailed fish habitat assessment, and wetland and watercourse delineation.

Wildlife Surveys and Surface Water Monitoring, NS, 2023-2024 – Environmental Scientist: Worked on a team for the biophysical assessments of an open pit gold mine Environemtnal Assessment. The scope of work included winter Mainland Moose surveys, PGI Moose surveys, surface water monitoring, flow monitoring, and species at risk (SAR) habitat observations.

Wood Turtle Survey, NS, 2024 – Environmental Scientist: Worked on a team for a wood turtle survey field program. The scope of work included wood turtle surveys over a period of three weeks, data collection/management, and final report writing.

Habitat Suitablity Index Assessment, NS, 2024 – Environmental Scientist: Worked on a team to complete Habitat Suitablity Index Assessment in watercourses to support offsetting for multiple projects. This assessment helps identify areas that could be used for restoration efforts.

Lyndsay Eichinger, BSc., MREM
Environmental Scientist
Environmental Assessment & Approvals
Total Experience: 6 years

EDUCATION

- Masters of Resource and Environmental Management (MREM) - Dalhousie University, Halifax, NS (2021)
- Bachelor of Science - University of British Columbia (2019)

TRAINING

- ATV Certification (2022)
- RPAS Pilot Certification (2022)
- BICO – Search and Rescue Program (2022)
- Electrofishing Certification (2021)
- Standard First Aid and WHMIS (2021)
- Stream Gauging Training from UBC (2019).
- Environmental Impact Assessment Certificate received from the Centre for Environmental Assessment Research at UBC (2019).
- Derailment Response - CP Railway (2018)
- Railway Safety Training (2018)
  Transportation of Dangerous Goods (2018)

AREAS OF SPECIALIZATION

- Environmental Assessment
- Environmental Approvals & Permitting
- Industrial Approvals
- Management & Monitoring Planning
- Wildlife, Wetland, & Watercourse Assessments
- Dangerous Goods Assessment

RELEVANT EXPERIENCE

Miss Eichinger first joined the Strum team in 2020 as an Environmental Intern, while working towards her Masters of Resource and Environmental Management degree at Dalhousie. While studying at Dalhousie, Lyndsay specialized in remediation, environmental assessment, and natural resource management in Nova Scotia. Lyndsay also obtained her Bachelor of Science degree in 2019 from the University of British Columbia where she specialized in Earth and Environmental Science with a minor in Economics.

During her graduate studies, Lyndsay conducted a desktop study on the Boat Harbor Remediation Project, producing a technical review paper evaluating the cost-effectiveness of the different remedial components and technologies considered by the project. This paper has since been published in the journal Remediation titled: Review of remedial options for the Boat Harbour remediation project in Nova Scotia, Canada.

Lyndsay has worked across a variety of roles, from field intern to project manager, focusing on renewable energy projects within Atlantic Canada. She is active in the development and coordination of environmental assessments, industrial approvals, environmental approvals/permitting, along with field and monitoring programs. Lyndsay also has valued experience with and knowledge of provincial and federal regulations, allowing her to provide advisory services for various projects. More recently, she has been responsible for post-approval regulatory compliance and associated management and monitoring planning for both small-scale and large-scale projects.

Lyndsay held a previous position with RAM Environmental Response as a HAZMAT Responder based in the BC interior. Her role was fast-paced and multidisciplinary, working in tandem with senior management on emergency response planning and remediation teams on site. Lyndsay has responded to an array of emergency situations involving dangerous goods, such as train derailments and fuel spills, all requiring coordination between clients, contractors, first responders, and government parties. She has a strong background in safety protocols, erosion control implementation, response tactics, and emergency remediation measures for a variety of contaminants. Lyndsay is well practiced in remote travel along with ATV, snowmobile, and 4x4 use.

REPRESENTATIVE PROJECTS AND ROLES

Post-Approval Work, EverWind Point Tupper Green Hydrogen/Ammonia Project Phase 1, NS, 2023 – Environmental Scientist: On-going post-approval work (following approval of the EA Registration Document) including the development of environmental management and monitoring plans. These plans are developed to avoid/mitigate potential impacts to nearby environmental and residential receptors throughout the lifespan of the Project.

Environmental Assessment EverWind Point Tupper Green Hydrogen/Ammonia Project - Phase 1, NS, 2022 – Environmental Scientist: Completed field studies and key reporting requirements for the submission of an EA Registration Document for a green ammonia/hydrogen facility located in Cape Breton, NS. This was the first green ammonia/hydrogen facility to be approved in both Nova Scotia and Canada.

Post-Approval Work, Various Wind Developments, 2023 – Environmental Scientist: On-going post-approval work for various wind projects (following approval of the EA Registration Document) including the development of environmental management and monitoring plans. These plans are developed to avoid/mitigate potential impacts to nearby environmental and residential receptors throughout the lifespan of the Project.

Wind Development Environmental Assessments, 2022-Present – **Environmental Scientist:** Providing project coordination and report writing on several 100 MW+ wind farms in Nova Scotia.

Environmental Assessment Registration and Environmental Protection Plan, NL, 2022 – Junior Environmental Professional: Completed reporting requirements for the submission of an EA Registration Document and associated Environmental Protection Plan for a transmission line decommissioning project located in Newfoundland and Labrador.

Windsor Forks Wetland Compensation Project, NS, 2021-2022 – Junior Environmental Professional: Completed reporting requirements for the final year of wetland monitoring and assessment for a constructed wetland.

Watercourse Alteration Approval and Fish Surveys, NS, 2021 – Junior Environmental Professional: Conducted electrofishing / fish salvage for an emergency watercourse alteration along a section of railway. This involved the capture, identification, documentation, and release of fish from the impacted section of the watercourse.

Mahone Bay Well Installation and Monitoring, NS, 2021 – Junior Environmental Professional: Groundwater well installs were completed at a construction site in Mahone Bay, NS along with vegetation transects to characterize the sites environmental features.

Pirate Harbour Wind Farm Project, NS) 2021-Present – Junior Environmental Professional: Participated in field

Melford Atlantic Gateway Project, NS, 2020-Present – Junior Environmental Professional: Completed various reporting and background research requirements such as consultation documents, engagement record keeping, and the development of a wetland compensation plan.

Transmission Line, NS, 2020 – Environmental Technician: Participated in wetland and watercourse assessments, Wildlife surveys, and rare plant and lichen surveys, along the linear corridor spanning 100kms from the NS/NB border to Onslow, NS.

Shellfish Harvesting and the Persistent Threat of Sewage Pollution, NS, 2020 – MREM Tri-course project: Working in a multi-disciplinary team to assess the threat of sewage pollution on the shellfish industry of Nova Scotia, including the biophysical, socio-political, law and policy aspects of the greater issue of pollution in the near shore environment. This involved research into government programs, policies and regulations, as well as different stakeholders in the industry.

Katrina Ferrari, BSc.
Environmental Scientist
Aquatic Ecology
Total Experience: 4 years

PROFESSIONAL ASSOCIATIONS

- PADI Professional

AREAS OF SPECIALIZATION

- Fish and Fish Habitat
- Fish Rescue
- Freshwater Mussels
- Environmental Monitoring

EDUCATION

- Bachelor of Science (Biology), Saint Francis Xavier University, Antigonish, NS (2019)

TRAINING

- Intermediate Workplace First Aid Level C CPR & AED (2023)
- WHMIS Certificate (2023)
- PADI Open Water Scuba Diving Instructor (2022)
- Backpack Electrofishing Certificate (2020)
- Pleasure Craft Operator (2020)

RELEVANT EXPERIENCE

Ms. Ferrari has been in the environmental consulting industry since June 2020. She primarily specializes in fish and fish habitat sciences. Ms. Ferrari has a range of experience in the planning and implementation of aquatic field programs, as well as experience in regulatory permitting. She has worked as a field biologist responsible for conducting a variety of biophysical assessments including wetland delineation, watercourse delineation, fish habitat surveys, fish collection, benthic invertebrate sampling, periphyton sampling, sediment sampling, fish rescues, turtle surveys, snorkel surveys, water quality sampling, flow monitoring, and brook floater surveys.

REPRESENTATIVE PROJECTS AND ROLES

Shoreline Assessment, Fishermans Harbour, NS, 2024 – Field Lead: Acted as a field lead for a shoreline assessment to prevent erosion during large storm events. Ms. Ferrari was the primary author for the Fisheries Act authorization (FAA).

Federal Environmental Assessment, Trafalgar, NS, 2024 – Field Technician: Acted as a field technician for a gold mine federal EA in Trafalgar, NS. The scope of work included fish collection, periphyton sampling, eDNA, benthic invertebrate sampling, geomorphological surveys, water quality sampling, moose surveys, flow monitoring, and detailed fish habitat assessment. Ms. Ferrari was the primary author of the baseline report submitted in 2024.

Environmental Assessment, Cook Brook, NS, 2023 – Field Lead: Acted as a field lead for a biophysical and provincial gypsum mine Environmental Assessment. The scope of work included a preliminary bank survey and habitat assessment for brook floaters, detailed habitat assessment, wetland delineation, and fish collection. Ms. Ferrari was the primary author for the biophysical report submitted in 2023.

Biophysical Assessment, Cooks Brook, NS, 2023 – Technician: Acted as a technician for a biophysical report in Cooks Brook, NS. The scope of work included a preliminary bank survey and instream brook floater survey along a portion of the Gays River to identify brook floaters or their habitat.

Federal Environmental Assessment, Sherbrooke, NS, 2023 – Field Technician: Acted as a field technician for a gold mine federal Environmental Assessment in Sherbrooke, NS. The scope of work included fish collection, periphyton sampling, benthic invertebrate sampling, water quality sampling, flow monitoring, and detailed fish habitat assessment. Ms. Ferrari was the primary author of the baseline report submitted within 2023.

Highway Twinning Project, New Glasgow to Antigonish, NS, 2021-2023 – Field Technician: Acted as a field technician for a highway twinning project along Highway 104 from New Glasgow to Antigonish. The scope of work included completing various sized fish rescues, detailed fish habitat assessment, and turtle surveys. Ms. Ferrari was also the primary author of various fish rescue reports.

Environmental Assessment, Goldboro, NS, 2021-2023– Field Technician: Completed field work for a provincial gold mine Environmental Assessment in Goldboro, NS. The scope of work included detailed fish habitat assessment, eDNA, redd surveys, benthic surveys, and fish collection. Ms. Ferrari was the primary author of various baseline reports and supported the submission of the EARD, FAA, Aquatic Effectiveness Monitoring Plan (AEMP), and Offsetting Plan.

Environmental Monitoring, Pickle Lake, ON, 2020-2023 – Environmental Monitor: Acted as an environmental monitor for a 1300 km transmission line project. Completed regulatory advising, spill response, erosion/sediment control, wildlife monitoring, water quality monitoring, and reporting on construction activity.

Fisheries and Oceans Canada (DFO) Request for Review, Halifax, NS, 2022 – Field Technician: Acted as field technician for DFO Request for Review (RfR) to upgrade a boat ramp within the Halifax Harbour. The scope of work included fish collection, shoreline assessment and water quality. Ms. Ferrari was the primary author.

Federal Environmental Assessment, Marinette, NS, 2020– Field Technician: Acted as a field technician for a gold mine federal Environmental Assessment in Marinette, NS. The scope of work included fish collection, eDNA sampling, water quality sampling, flow monitoring, and detailed fish habitat assessment.

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CONSULTING

Reilly Cameron, BSc.
Environmental Scientist
Aquatic Ecology
Total Experience: 2 years

AREAS OF SPECIALIZATION

- Fish and Fish Habitat
- Fish Rescue
- Wetland Delineation
- Environmental Monitoring
- Freshwater Mussels

EDUCATION

- Bachelor of Science (Environmental Sciences), Saint Mary's University, Halifax, NS (2020)

TRAINING

- Intermediate Workplace First Aid Level C CPR & AED (2023)
- WHMIS Certificate (2023)
- Wetland Ecosystem Services Training (2022)
- Backpack Electrofishing Certificate (2020)
- Pleasure Craft Operator (2020)

RELEVANT EXPERIENCE

Ms. Cameron entered the environmental consulting profession in 2022. She is diligently working to broaden her professional field skills and familiarizing herself with various aspects of professional field biology and environmental sciences. Ms. Cameron has worked on projects related to field surveys, and education and outreach in Nova Scotia and Prince Edward Island.

Ms. Cameron has been involved in watercourse and wetland delineation, fish and fish habitat assessments, fish rescues and electrofishing, water quality monitoring, wildlife surveys, construction monitoring, and various types of environmental report writing.

REPRESENTATIVE PROJECTS AND ROLES

Shoreline Assessment, Fishermans Harbour, NS, 2024 – Field Lead: Acted as a field lead for a shoreline assessment to prevent erosion during large storm events. Scope of work supported the Fisheries Act authorization (FAA).

Environmental Assessment, Trafalgar, NS, 2024 – Field Technician: Acted as a field technician for a provincial gold mine Environmental Assessment in Trafalgar, NS. The scope of work included fish collection, water quality sampling, moose surveys, flow monitoring, and detailed fish habitat assessment. Submission of a baseline report was completed in 2024.

Environmental Assessment, Cook Brook, NS, 2023 – Technician: Acted as a technician for a biophysical and provincial gypsum mine Environmental Assessment. The scope of work included habitat assessment, wetland delineation, fish collection and supplementary eDNA sampling. Ms. Cameron supported the submission of the biophysical in 2023.

Environmental Assessment, Pictou, NS, 2023 – Field Technician: Acted as field technician for a provincial wind farm EA. The scope of work included wetland delineation and moose surveys.

Highway Twinning Project, Glasgow to Antigonish, NS, 2022 – Field Technician: Acted as a field technician for a highway twinning project along Highway 104 from New Glasgow to Antigonish. The scope of work included completing various sized fish rescues, detailed fish habitat assessment, and turtle surveys.

Environmental Assessment, Goldboro, NS, 2023 – Field Technician: Completed field work for a provincial gold mine Environmental Assessment, in Goldboro, NS. The scope of work included detailed habitat assessment and installation of long-term monitoring wells.

Environmental Monitoring, Pickle Lake, ON, 2023 – Environmental Monitor: Acted as an environmental monitor for a 1300 km transmission line project. Completed regulatory advising, spill response, erosion/sediment control, wildlife monitoring, water quality monitoring and reporting on construction activity.

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CONSULTING

Brayden Thomas, BSc.
Environmental Scientist
Environmental Assessment & Approvals
Total Experience: 2 years

AREAS OF SPECIALIZATION

- Wetland and Watercourse Assessment and Delineations
- Wildlife Surveys & Biophysical Assessments
- Wetland Monitoring Programs
- Nova Scotia Provincial Wetland & Watercourse Permitting
- Alberta Solar Energy Permitting

EDUCATION

- Ba Bachelor of Science (Environmental Science), Dalhousie University, Halifax, NS (2022)

TRAINING

- Emergency First Aid (2023)
- Watercourse Alteration Certification for Sizers – Nova Scotia (2024)
- Watercourse Alteration Certification for Installers – Nova Scotia (2024)
- Canadian Council on Animal Care (CCAC) Wildlife Care and Use Certification (2021)
- Natural Resources Training Group (NRTG) Electrofishing Certification (Crew Supervisor) (2023)
- Science and Land Management Training and Education Centre (SALMTEC) Online Learning (ACIMS Tools & Alberta Soil Information Viewer)

RELEVANT EXPERIENCE

Mr. Thomas has worked in environmental consulting and research since 2022. During this time, he has gathered wide-ranging regulatory experience with a focus on Nova Scotia wetland/watercourse regulatory permitting and solar energy permitting in Alberta. Mr. Thomas possesses a well-rounded set of environmental field skills while also completing project coordination of various projects in Nova Scotia and Alberta. In his role as Environmental Scientist, Mr. Thomas completes wetland and watercourse delineations for the purposes of regulatory wetland/watercourse alteration permitting, completes WESP-AC wetland functional assessments, Long Term Wetland Monitoring (authors Wetland Monitoring Plans, Setup and Installed Solinst Level Loggers, Conducted Soil and Vegetation Monitoring), and completes Wildlife Surveys (Mainland Moose, Wood Turtle, Marine). Mr. Thomas also performs flow monitoring assessments and surface water quality assessments, completes avian nest sweeps, provides project coordination and proposals/cost estimates, client communication, field program logistics, and final deliverables, and produces figures using ArcGIS and QGIS. Reporting experience includes:

- Nova Scotia Reporting: Wetland Alteration Applications, Watercourse Alteration Applications, Wetland Monitoring Plans, Erosion and Sedimentation Control, Biophysical Baseline Reports (Wetlands & Fauna), Various NSECC Directive Responses
- Alberta Reporting: AUC Environmental Evaluations, Environmental Protection Plans, Conservation and Reclamation Plans, Desktop Constraints

REPRESENTATIVE PROJECTS AND ROLES

Nova Scotia Wetland and Watercourse Permitting, 2022-Present – Environmental Scientist:
Completing wetland and watercourse delineation, functional assessments, and Species at Risk surveys on 100+ projects in Nova Scotia to support regulatory permitting. Authoring wetland and watercourse alteration applications, wetland monitoring plans, and NSECC directive responses. Sole Project Coordinator on 25+ small to medium scale permitting projects throughout Nova Scotia and providing sound regulatory consultation and deliverables to clients.

Wetland Vulnerability Study, NS, 2023-2024 – Project Coordinator:
Project coordinated a multi-week, multi-personnel field program based in Halifax Regional Municipality and Municipality of East Hants. Provided field training to staff, coordinated study design and data collection methodologies, and land access. Participated in numerous public engagement sessions with local stakeholders in the Study Area to assist the development of a GIS-based tool to assess wetland vulnerabilities to a variety of natural and anthropogenic stressors.

Alberta Solar Farm Permitting, 2023-Present, - Environmental Scientist
Authored Alberta Parks and Environment Applications (AEPA) and Alberta Utilities Commission (AUC) Environmental Evaluations to support the permitting of eight proposed solar energy projects in Alberta. Applications included field-level project coordination, regulatory consultation, Conservation and Reclamation Plans, Environmental Protection Plans, and participation in public town halls and engagement sessions.

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Lucas Bonner, MEM
Environmental Scientist
Environmental Assessment & Approvals
Total Experience: 2 year

AREAS OF SPECIALIZATION

- Wetland and Watercourse Assessment and Delineations
- Wetland Compensation and Restoration
- Fish and Fish Habitat Assessment
- Wildlife Surveys
- Environmental Approvals
- Environmental Monitoring

EDUCATION

- Master of Environmental Management, University of New Brunswick, NB (2023)
- Bachelor of Science (Biology and Conversation Biology), Memorial University of Newfoundland, NL (2020)

TRAINING

- Intermediate Workplace First Aid Level C CPR & AED (2023)
- Natural Resources Training Group (NRTG) Electrofishing Crew Supervisor (2023)
- Pleasure Craft Operator License (2023)
- Wetland Ecosystem Services Protocol (WESP-AC) Training (2022)
- Wetland Delineation Training (2022)

RELEVANT EXPERIENCE

Mr. Bonner has acquired a wide range of regulatory and professional field experience working on projects across Nova Scotia, with a focus on wetland and aquatic assessments. He is responsible for completing biophysical assessments, including wetland and watercourse delineation, characterization, and functional assessment, flora and fauna surveys, wetland monitoring, species at risk evaluations, construction monitoring, fish collection, and fish rescues. Mr. Bonner also has experience in implementing field programs, wetland restoration projects, and regulatory permitting.

REPRESENTATIVE PROJECTS AND ROLES

Completed >100 wetland assessments over the past two years to support various projects across Nova Scotia, including those in the wind, mining, and residential development sectors.

Supported fisheries offsetting scoping and design over the past two years to support various mining projects across Nova Scotia.

Wetland Restoration, Upper Musquodoboit Wetland Restoration Project, NS (2024): Worked as part of an experienced wetland restoration team by completing regulatory permitting, coordinating various phases of restoration construction, and leading biophysical field programs. Conducted construction monitoring, fish rescues, wood turtle surveys, nest sweeps, and collected groundwater data.

Environmental Monitoring, Higgins Mountain Wind Farm Project, NS (2024): Worked as part of an experienced environmental monitoring team to ensure environmental compliance and excellence during and after construction of a 17-turbine wind farm.

Various Assessments, Antrim Gypsum Mine, NS (2024) – Field Lead/Support: Completed wetland / watercourse delineation and fish habitat assessments. Wetland / watercourse delineation involved the identification and mapping of wetlands and watercourses. Fish habitat assessments included collecting data on flow, riparian habitat, channel morphology, as well as assessing whether fish can access a watercourse reach and the types of habitats available to different species.

Wetland/Watercourse Delineation and Assessment, Rhodena Wind Project, NS (2022-2024) – Field Support: Completed wetland / watercourse delineation and assessments across the Project Area. Provided project coordination support for GCP and EARD submission.

Wetland/Watercourse Delineation and Assessment, Wedgeport Wind Project, NS (2022) – Field Support:. Completed wetland / watercourse delineation and assessments across the Project Area.

Cuun Niesink, MREM
Junior Environmental Scientist
Environmental Assessment & Approvals
Total Experience: 3 years

AREAS OF SPECIALIZATION

- Data Collection & Analysis
- Environmental Assessment
- Environmental Noise
- Environmental Reporting
- Old-Growth Forest Assessment

EDUCATION

- Master of Resource and Environmental Management (MREM) - Dalhousie University, Halifax, NS (2023)
- Bachelor of Science, Major in Biology - University of Prince Edward Island (2021)

TRAINING

- UTV Certification – Canada Safety Council (2023)
- Emergency First Aid & CPR/AED Level C – St. John Ambulance (2023)
- WHMIS (2023)
- Pleasure Craft Operator License – Transport Canada (2021)

RELEVANT EXPERIENCE

Miss Niesink first joined the Strum team in 2023 as an Environmental Scientist upon completing her master's degree in Resource and Environmental Management at Dalhousie University. While studying at Dalhousie University, Cuun specialized in forestry, species at risk management, GIS, and remote sensing. Cuun also obtained her Bachelor of Science degree in 2021 from the University of Prince Edward Island where she specialized in biology.

During her graduate studies, Cuun worked on a number of large projects, collaborating with multidisciplinary teams to contribute to local issues. Through the Dalhousie Faculty of Management's 'Management Without Border's course, Cuun helped provide recommendations for the Ecology Action Centre in determining the conditions necessary for success for micro- and small-scale kelp farmers and entrepreneurs in Nova Scotia. During her MREM internship, Cuun worked for Halifax Regional Municipality (HRM) Urban Forestry as an urban forest research assistant. In this role, Cuun developed guidelines for arboricultural practices during the songbird breeding season in HRM. For her final MREM Research Project, Cuun further researched this topic to identify research gaps and provide recommendations on improving urban forest management.

Cuun has held numerous teaching assistant positions at Dalhousie University for several different courses, including the Integrated Science Program where Cuun mentored and aided first-year university students with scientific research and writing. Cuun also held a previous position with the Prince Edward Island Department of Environment as a Surface Water Monitoring Technician where she conducted water quality sampling in many rivers and estuaries across Prince Edward Island. Through this position, Cuun gained technical experience through using many different pieces of equipment and software, as well as marine navigation skills, trailering, and operating a boat. Further, Cuun worked for the Stratford Area Watershed Improvement Group (SAWIG), a local watershed group in Prince Edward Island, where she worked on various environmental projects. These included weekly water quality monitoring, tree planting, invasive species management, conducting benthic macroinvertebrate surveys, and stream enhancement. Cuun was an active member of the team, helping to create informational material for several social media platforms as well as co-authoring the 2020 SAWIG Field Report.

Cuun is active in conducting environmental assessments, wetland delineations, watercourse assessments, old-growth forest surveys, and other ecological studies. She has conducted significant fieldwork across large projects in remote locations. She is knowledgeable with provincial and federal regulations and works closely with senior staff preparing reports and regulatory submissions.

REPRESENTATIVE PROJECTS AND ROLES

Wind Power Environmental Assessments, NS, 2023-Present – Junior Environmental Scientist: Conducted field work on several 100 MW+ wind farms in Nova Scotia, including wetland, watercourse, fish and fish habitat, old-growth, avian, avian radar, bat, wildlife, flora, and lichen surveys. Prepared, reviewed, and organized field data using several methods of collection. Prepared EA related documents, including methodologies, effects assessments, and desktop reviews.

Post-Approval Work, NS, 2023-Present – Junior Environmental Scientist: Conducted data compilation and reports for various wind farm projects including the Goose Harbour Lake Wind Farm, Mersey River Wind Farm, and Weavers Wind Farm to fulfill post-approval conditions such as the creation of Wildlife Management Plans, and Baseline Noise Monitoring Plans.

Groundwater Monitoring, NS, 2023 – Junior Environmental Scientist: Conducted fieldwork including water level monitoring, water quality sampling, flow rate monitoring, and aided with data compilation.

Environmental Noise Measurement, NS, 2023-Present – Junior Environmental Scientist: Aided in the development of Strum's noise monitoring program through the familiarization of NSECCs Guidelines for Environmental Noise Measurement and Assessment. Created a standard operating procedure for deployment purposes, data analysis, and report compilation. Analyzed baseline noise data via NoiseTools and Microsoft Excel for various projects including the Mersey Wind Farm Project and the EverWind Point Tupper Green Hydrogen/Ammonia Project and helped lead the writing of noise monitoring plans for these projects.

Nesting Bird Searches, NS, 2023 – Junior Environmental Scientist: Surveyed areas pre-construction and vegetation clearing for the presence of nesting bird activity. Collected field data related to observations and flagged off buffer areas surrounding nesting bird species.

Cooke's Expansion of Open-water Finfish Aquaculture Pens in Nova Scotia, 2022 – MREM Tri-course Project: Worked in a multi-disciplinary team to address the biophysical, environmental law and policy, and sociopolitical challenges of Cooke Aquaculture's expansion of open-pen aquaculture facilities in Digby County, Nova Scotia. This involved research into the different stakeholders in the industry, and into provincial and federal policies and regulations, as well as in other jurisdictions such as Norway.

Darcy Kavanagh, BSc., MREM
Junior Environmental Scientist
Environmental Assessment & Approvals
Total Experience: 5 years

AREAS OF SPECIALIZATION

- Wetland and Watercourse Assessment
- Wetland Delineation & Functional Assessment
- Wildlife Surveying and Assessment
- Environmental Reporting and Permitting
- Baseline Study Data Collection & Interpretation

EDUCATION

- Master of Resource and Environmental Management (MREM) - Dalhousie University, Halifax, NS (2022)
- Bachelor of Science (Honours in Environmental Science) - Saint Mary's University, Halifax, NS (2018)
- Diploma of Engineering - Saint Mary's University, Halifax, NS (2016)

TRAINING

- Nova Scotia Watercourse Alteration for Sizers (2023)
- Nova Scotia Watercourse Alteration for Installers (2023)
- Wetland Ecosystem Services Protocol - Atlantic Canada (WESP-AC) Training – Maritime College of Forest Technology (2022)
- Wetland Delineation Training – Maritime College of Forest Technology (2022)
- Backpack Electrofishing – Canadian Rivers Institute (2022)
- Wilderness First Aid – Saint John Ambulance (2022)
- ATV Training – Canada Safety Council (2022)
- WET-Pro Certification (2018)

RELEVANT EXPERIENCE

Mr. Kavanagh joined Strum in 2022, having just completed a master's degree in Resource and Environmental Management at Dalhousie University. While studying at Dalhousie University, Mr. Kavanagh specialized in freshwater resource management, wetland alteration/compensation, and stormwater management. He also obtained his diploma of engineering in 2016 and Bachelor of Science degree in 2018, from Saint Mary's University. While there, he completed an honours thesis focused on enhancing the effectiveness of wind power source assessment, responding to the need of having a measure of the relationship of wind speed and its consistency.

Throughout his academic career, Mr. Kavanagh has had the opportunity to partake in a number of research initiatives, including collecting and processing water chemistry data, the remediation of trampled pollinator habitat, an assessment of the carbon sequestration capabilities of species mixes within the boreal forest, and an evaluation of the acid rock drainage potential within the watersheds of Nova Scotia. Further, for the final project of his graduate studies, Darcy assessed the climate resiliency of wetland compensation projects within the province of Nova Scotia, providing a series of research-backed recommendations to continue working towards the provincial goal of no net loss of wetland structure and function, while also ensuring a net gain of climate resiliency.

Mr. Kavanagh has proven critical thinking and problem-solving skills through collaboration with multiple real-world organizations. This includes a partnership with the Atlantic First Nations Water Authority to analyze the biophysical, socio-political, and law & policy related dimensions associated with the self-determination of water resources in First Nations communities, as well as aiding the District of Argyle in their efforts to mitigate their localized mosquito problem through a series of research tactics including a literature review, policy review, jurisdictional scan, and feasibility analysis. For the internship portion of his graduate degree, Mr. Kavanagh worked with a consulting company where he was involved with various tasks including soil, sediment, and surface water sampling, wetland delineation, electrofishing, watercourse assessment, and air quality monitoring.

Mr. Kavanagh is active in conducting numerous field surveys to fulfill baseline studies, environmental permits, and conditions of approval, as well as any relative complementary desktop research. Further, Mr. Kavanagh is well practiced in working in remote areas, along with ATV, snowmobile, and 4x4 use.

REPRESENTATIVE PROJECTS AND ROLES

Wind Power Environmental Assessments, 2022-Present– Environmental Scientist/Field Coordinator: Providing coordination and field work on several 100 MW+ wind farms in Nova Scotia. Responsible for conducting field assessments and environmental assessment report writing for multiple prospective wind farm locations in NS. Field surveys were conducted for terrestrial flora & fauna, herpetofauna, avifauna, fish & fish habitat, wetlands, and watercourses. Other methods of data collection included snowshoe expeditions, ATV driving, and trial camera, acoustic monitor, and ultrasonic monitor deployment. Environmental assessment documentation included field data compilation and interpretation to inform effects assessments, mitigation measures, and monitoring strategies.

Wetland Monitoring, NS (2022 – Present) – Environmental Scientist: Responsible for conducting field assessments and report writing for a wetland and wetland fish & fish habitat monitoring program to be completed 2022 – 2027 to facilitate the dewatering of the reservoir necessary for capital upgrades. Field assessments included wetland delineation & functional assessment, monitor well installment, vegetation plot monitoring, and in-situ water chemistry sampling.

Nesting Bird Searches, NS (2022 – Present) – Environmental Scientist: Surveyed prospective project areas for the presence of nesting birds. Collected field data related to any observed species and reported on the findings. Flagged buffer areas for any identified species.

Wetland Delineation and Permitting, NS (2021 – Present) – Environmental Scientist: Completed wetland delineation, functional assessments, and permitting submissions at numerous sites around Nova Scotia. Projects include pre-construction and post-construction monitoring, compensation planning, contingency planning, and erosion and sedimentation control planning.

Environmental Assessment EverWind Point Tupper Green Hydrogen/Ammonia Project - Phase 1, NS, 2022 – Environmental Scientist: Completed field studies and key reporting requirements for the submission of an EA Registration Document for a green ammonia/hydrogen facility located in Cape Breton, NS. This was the first green ammonia/hydrogen facility to be approved in both Nova Scotia and Canada.

Transmission Line, NS (2022) – Environmental Scientist: Participated in wetland and watercourse assessments, wildlife surveys, and rare plant and lichen surveys along the linear corridor spanning 100 km.

Liquified Natural Gas (LNG) Project, NS (2021) – Environmental Scientist: Undertook soil and water sampling, stream flow monitoring, and avian surveys to satisfy conditions for environmental permits and approvals for the construction of an LNG facility. Soil samples were taken along the perimeter of the study area in order to delineate the presence of contaminants associated with historic gold mining. Water samples were analyzed in a lab for parameters including total & dissolved metals, dissolved organic carbon, and total suspended solids. Surveys included MBBA-style early morning passerine surveys, nighttime nocturnal surveys following the *Nova Scotia Nocturnal Owl Survey* sampling methodology, as well as circumnavigating multiple waterbodies and conducting waterfowl nest surveys. Other tasks included the periodic maintenance and data extraction of both acoustic avian monitors and ultrasonic bat monitors.

Highway Connector Road Project, NS (2021) – Environmental Scientist: Responsible for conducting field surveys and aiding in the reporting for birds and bats to inform science-based decision making within the project laydown area. Surveys included acoustic monitoring, point-count surveys. and nighttime nocturnal surveys. Other tasks included the periodic maintenance and data extraction of ultrasonic bat monitors, as well as aiding in the development of a wildlife crossing plan to mitigate wildlife-vehicle collisions.

Historic Mine Remediation Project, NS (2021) – Environmental Scientist: Flow monitoring was conducted at eight locations within and around a historic gold mine site in tandem with a surface water sampling program. Eight transducers were submerged (one per sample site), along with an additional datalogger nearby to measure air pressure. A discharge transect was also completed for each sample site using a handheld flow meter. Surface water samples were analyzed in a lab for parameters including total & dissolved metals, dissolved organic carbon, and total suspended solids. This program was conducted as part of an ecological risk assessment for the remediation of the contaminated tailings area.

DustTrak Air Monitoring Program, NS (2021) – Environmental Scientist: Responsible for conducting direct-read real time sampling in response to periodic elevated dust levels at a gold mine site to better understand the reasons for the elevated dust levels. TSI DustTrak instruments were used to strategically perform monitoring upwind and downwind of known areas of concern. During the monitoring, record was taken of any mining activities occurring, localized weather conditions, and any other potential dust sources in the area. This program was useful for providing a relative comparison of on-site dust levels, offering a good indication of whether compliance with the IA could be achieved.

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Dafna Schultz, BSc., MREM, EPt
Junior Environmental Scientist
Environmental Assessment & Approvals
Total Experience: 5 years

AREAS OF SPECIALIZATION

- Wetland and Watercourse Assessment
- Wildlife Surveying and Assessment
- Ecological Forestry and Agriculture
- Benthic Invertebrate Analysis
- Environmental Data Collection, Interpretation, and Reporting

EDUCATION

- Masters of Resource and Environmental Management (MREM) - Dalhousie University, Halifax, NS (2022)
- Bachelor of Science (Hons.) - University of Manitoba, Winnipeg, MB (2019)

TRAINING

- Nova Scotia Watercourse Alteration for Installers (2023)
- Wetland Ecosystem Services Protocol for Atlantic Canada Training – Maritime College of Forest Technology (2022)
- Wetland Delineation Training – Maritime College of Forest Technology (2022)
- Backpack Electrofishing – Canadian Rivers Institute (2022)
- Pilot Certificate for Small Remotely Piloted Aircraft System (RPAS), Visual line-of-sight (VLOS) – Transport Canada (2022)
- Wilderness First Aid and CPR “C” – St. John’s Ambulance (2022)

RELEVANT EXPERIENCE

Ms. Schultz joined the Strum team in 2022 as an Environmental Scientist upon completing her coursework for her Masters of Resource and Environmental Management degree at Dalhousie. While studying at Dalhousie, Ms. Schultz specialized in a number of different areas of natural resource management in Nova Scotia, such as forestry, agriculture, and wetlands. She obtained her Bachelor of Science degree in 2019 from the University of Manitoba in the department of biological sciences where she specialized in ecology and environmental sciences. Her honours thesis focused on the ecological application of double-stranded RNA-based pesticides to control flea beetles in canola cropping systems in Manitoba. This project incorporated both field-based sample collection and lab-based sample preparation using techniques in molecular biology. During her graduate studies, Ms. Schultz worked on a number of large projects, collaborating with multidisciplinary teams to contribute to local issues. As her final MREM Research Project, she produced GIS and statistics-based recommendations for Nova Scotia Natural Resources and Renewables regarding identification of old-growth forest locations in the province. Through the Dalhousie Faculty of Management’s ‘Management Without Borders’ course, Ms. Schultz helped develop recommendations for pest control in the Municipality of the District of Argyle. She also developed an understory vegetation sampling protocol to be used in the Acadia Research Forest by the Canadian Forestry Service.

Ms. Schultz has previously contributed to a research project on bat activity hosted by a global non-profit organization by conducting statistical analysis on acoustic data. Ms. Schultz also held a previous position with Nova Scotia Department of Lands and Forestry as a summer intern while completing her graduate studies. This role required remote field work to carry out the provincial old-growth scoring protocol, and desktop GIS-based work to plan and navigate to study locations. Prior to this internship, Ms. Schultz held a position with Agriculture and Agri-Foods Canada as a Junior Policy Analyst. In this role, she focused on the development of the Clean Fuel Standard, which included significant correspondence with agricultural stakeholders and a major deliverable of a jurisdictional scan of clean fuel regulations across the world.

Ms. Schultz is active in conducting ecological studies to contribute to a variety of environmental assessments. She has conducted significant fieldwork across large projects in remote locations, in both Nova Scotia and Manitoba. She is knowledgeable with provincial and federal regulations, working closely with senior staff preparing reports and regulatory submissions.

REPRESENTATIVE PROJECTS AND ROLES

Wind Power Environmental Assessments, 2022-Present – Environmental Scientist/Field Coordinator: Providing coordination and field work on several 100 MW+ wind farms in Nova Scotia. Coordinated and completed all aspects of field surveys for environmental assessments, including wetland, watercourse, fish & fish habitat, avian, avian radar, bat, wildlife, flora, and lichen surveys. Prepared, reviewed, and organized field data using several methods of collection. Prepared materials for and participated in public consultation meetings, as well as aiding in the preparation of materials for public outreach. Led regulatory meetings to brief provincial and federal agencies on project activities. Prepared EA related documents, including methodologies, effects assessments, and desktop reviews.

Environmental Effects Monitoring Program, Halifax International Airport Authority, NS, 2022-Present – **Environmental Scientist:** Conducting preliminary research, planning, field work, data composition, and reporting for benthic macroinvertebrate monitoring plan following CABIN protocol.

Environmental Assessment EverWind Point Tupper Green Hydrogen/Ammonia Project - Phase 1, NS, 2022 – Environmental Scientist: Completed field studies and key reporting requirements for the submission of an EA Registration Document for a green ammonia/hydrogen facility located in Cape Breton, NS. This was the first green ammonia/hydrogen facility to be approved in both Nova Scotia and Canada.

Environmental Study, Wind Farm, NS, 2022 – Environmental Scientist: Reporting on winter wildlife tracking and winter avian surveys for several Environmental Screening Reports.

Environmental Study, Transmission Line, NS, 2022 – **Environmental Scientist:** Collecting winter wildlife data, reviewing a summary report of winter field work, and preparing a proposal for an old-growth forest assessment within the transmission line right-of-way.

Contaminated Site Assessment, Ross Bay Junction, NL, 2022 – **Environmental Scientist:** Identifying previously collected benthic macroinvertebrate samples and preparing a report and data summary on the diversity and abundance of species present on the Project site.

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Alex Scott, EPt
Junior Environmental Scientist
Environmental Assessment & Approvals
Total Experience: 2 years

PROFESSIONAL ASSOCIATIONS

- Eco Canada (Environmental Professional in-training)

AREAS OF SPECIALIZATION

- Wetland and Watercourse Assessment and Delineations
- Wildlife Surveys
- Surface and Groundwater
- Climate Change and GHG Assessments
- Industrial Approvals
- Environmental Approvals

EDUCATION

- Bachelor of Science (Environmental Science), Saint Mary's University, Halifax, NS (2022)

TRAINING

- Wetland Delineation and Classification Training (2023) – Fern Hill Institution of Plant Classification
- Wetland Ecosystem Services Protocol Atlantic Canada (WESP-AC) Training (2023) – Maritime College of Forestry Technology
- Backpack Electrofishing Training (2023) – Maritime College of Forestry Technology
- Standard First Aid Level C CPR & AED (2022) – St John's Ambulance
- ATV Training Course (2022) – Canadian Safety Council
- Pilot Certificate – Small Remotely Piloted Aircraft System (RPAS), Visual line-of-sight (VLOS) (2022) – Transports Canada

RELEVANT EXPERIENCE

Mr. Scott joined the Strum team in 2022 and is working as a Junior Environmental Scientist with the Environmental Assessment and Approvals Group. Mr. Scott is experienced in many components of Environmental Assessments, including field surveys, delineations, avian radar analysis, wildlife acoustic analysis, and GHG quantification. In an industrial setting, Mr. Scott has experience managing projects and ensuring regulatory compliance and successful approvals. Mr. Scott is experienced in groundwater monitoring, groundwater development, sampling, and conducting aquifer testing and interpreting results.

Mr. Scott has completed fieldwork and report writing to support wetland permitting, Environmental Management Plans and Environmental Assessments for numerous projects across Nova Scotia. Additionally, Mr. Scott has been involved in fieldwork, report writing, and analysis concerning projects throughout the province relating to Level I/II Groundwater Assessments for Subdivisions, groundwater withdrawal approvals, and groundwater monitoring plan programs.

REPRESENTATIVE PROJECTS AND ROLES

Municipal Groundwater Supply Assessment, NS, 2023 – Junior Environmental Scientist: Worked with a team of groundwater experts to analyze well logs, available pump tests and well chemistry data to inform municipal planning around groundwater supply development. This assessment involved determining the depth and stratification of sediments, yields and water quality to understand the yield and safety of a potential groundwater supply.

Groundwater Monitoring Program, Canso, NS, 2023 – Junior Environmental Scientist: Ongoing groundwater monitoring work (following approval of the groundwater monitoring plan), including developing groundwater wells, groundwater sampling, aquifer testing and analysis. The purpose of the monitoring plan is to avoid/mitigate potential impacts to nearby environmental receptors throughout the lifespan of the Project.

Greenhouse Gas Inventories, NS, 2023 – Present – Junior Environmental Scientist: Experienced in conducting direct and indirect GHG emission inventories to quantify large-scale industrial impacts and identify areas for mitigation.

Post-Approval Work, Point Tupper Green Hydrogen/Ammonia Project, NS – Phase 1, NS, 2023 – Junior Environmental Scientist: Development of the groundwater monitoring plan for the hydrogen/ammonia industrial facility as required following the EA approval. Completed fieldwork to support surface water monitoring.

Wetland Carbon Sequestration, NS, 2023 – Present – Junior Environmental Scientist: Designing methods and procedures for fieldwork and subsequent analysis to quantify carbon stored in wetland soils.

Wetland Delineation and Permitting, NS, 2023 – Present – Junior Environmental Scientist: Completed wetland delineations, functional assessments, and permitting applications for pre-construction wetland alterations.

Groundwater Geothermal Heating and Cooling Systems Review and Permitting, NS, 2023 – Present – Junior Environmental Scientist: Withdrawal flow monitoring, water level monitoring, equipment inspection, water quality sampling, data compilation, data analysis, and regulatory reporting.

Nesting Bird Searches, NS, 2023 – Junior Environmental Scientist: Surveyed areas pre-construction for the presence of nesting bird activity. Collected field data related to observations and flagged off buffer areas surrounding nesting bird species.

Wind Power Environmental Assessments, NS, 2022 – Present – Junior Environmental Scientist: Conducted watercourse, wetland, fish/fish habitat, wildlife and avian assessments, and environmental assessment reporting. Quantified greenhouse gas and climate change impacts of the projects on the environment.

Level I/II Groundwater Assessments, NS, 2022—Present—Junior Environmental Scientist: Completed desktop assessments to determine the viability of sustainable groundwater withdrawals. Conducted drilling and pump test supervision. Sampled water to compare with drinking water guidelines and analyzed aquifer test data to determine adequate safe yields for groundwater users.

Radar and Avian Acoustic Assessments NS, 2022 – Present – Junior Environmental Scientist: Built and ran remote radar and acoustic monitor assemblies to record the passage of avian migrant species. The radar and acoustic data were processed and analyzed to determine the patterns of avian migration. The acoustics were analyzed with machine-learning software and manually verified for accuracy.

Various Management and Leadership Roles, NS, 2018- 2022 – Self-Employed: Competed internationally for Canada in Sprint Kayaking. This required creating sponsorship proposals, developing relationships with sponsors and stakeholders, and managing travel and shipping logistics. Part of this role required public speaking engagements, client receptions, and providing mentorship.

Jeff Bonazza, BSc., M.Env.Sci
Jeffb@mccallumenvironmental.com

Years in Practice
7

Education
Master of Environmental Science, *Memorial University of Newfoundland*, 2015

B.Sc. Major in Biology, *St. Francis Xavier University*, 2010

Certifications
- Wetland Plants and Delineation, Fern Hill Institute
- Backpack Electrofishing, Canadian Rivers Institute
- Project Management Planning Course, Environmental Project Management & Sustainability Solutions

Training
- Brook Floater Virtual Workshop, Fisheries and Oceans Canada Species at Risk Program, Jan. 19-20, 2021
- Land Bird Species at Risk in Forested Wetlands Workshop, Jan. 2018
- Technical Writing for Professionals, Natural Resource Training Group, July 2019
- Fish and Fish Habitat Characterization, Natural Resource Training Group, July 2019
- Standard First Aid AED CPR "A", St.

Experience

Mr. Jeff Bonazza has been in the environmental consulting profession since 2015, after completing a master's degree in environmental science. He has managed projects, authored reports, and conducted regulatory consultation and First Nations engagement. Mr. Bonazza has worked as a field biologist on projects throughout Atlantic Canada as well as in western Canada and Ontario. Mr. Bonazza has conducted surveys including; bird surveys, wildlife surveys, evaluation for Species at Risk, herpetofaunal and reptile evaluations, wetland functional assessment, wetland delineation, fish habitat characterization and electrofishing.

McCallum Environmental Ltd., Halifax, NS
Project Manager
Feb. 2022 – present

- Project management
- Report writing
  - Federal Environmental Impact Statements, Provincial Environmental Assessments, Species at Risk permitting, wetland alteration applications etc.
- Regulatory consultation and First Nations engagement
- Design and lead field programs
  - Flora and fauna surveys, Species at Risk assessments, wetland delineation, wetland functional assessment (WESP-AC completed on >50 wetlands in NS), etc.
- Create maps using ArcGIS
- Projects:
  - Dexter Construction Company Limited
    - Environmental assessment registration
  - Cabot Gypsum
    - Environmental assessment registration

McCallum Environmental Ltd., Halifax, NS
Project Coordinator
Dec. 2016 – Feb. 2022

- Project management
- Report writing
  - Federal Environmental Impact Statements, Provincial Environmental Assessments, Species at Risk permitting, wetland alteration applications etc.
- Regulatory consultation and First Nations engagement
- Design and lead field programs
  - Flora and fauna surveys, Species at Risk assessments, wetland delineation, wetland functional assessment (WESP-AC completed on >50 wetlands in NS), etc.
- Create maps using ArcGIS
- Projects:
  - NextBridge Infrastructure LP.
    - Species at Risk permitting.
  - Atlantic Mining Nova Scotia
    - EIS reporting, wetland alteration applications, field surveys.
  - Zutphen Resources

Jeff Bonazza, BSc., M.Env.Sci
Jeffb@mccallumenvironmental.com

John Ambulance, Dec. 2017
- Geographic Information System (GIS) Training, ESRI, Feb. 2015
- WHMIS, CCOHS, March 2018
- PADI Open Water certified scuba diver, Nov. 2010
- MED A1, Canadian Sailing Expeditions Inc. and Transport Canada, May 2008

        - Environmental Protection Plan, reporting and permitting requirements.
    - Bio Design Earth Products
        - Environmental Assessment registration.

McCallum Environmental Ltd., Halifax, NS
Environmental Coordinator
Sept. 2015 – Dec. 2016
- Environmental monitoring
    - Regulatory advising, spill response, erosion/sediment control, wildlife monitoring, water quality monitoring, and reporting on construction activity.
- Provided field support for flora and fauna surveys, Species at Risk assessments, and wetland delineation/functional assessment.
- Report writing (monitoring reports, wetland alteration applications).
- Created maps using ArcGIS
- Projects
    - Valard Construction
        - Environmental coordinator for Muskrat Falls Transmission Line in Newfoundland and Labrador.
    - Terra Firma Development Corp
        - Reporting and permitting requirements.

Memorial University of Newfoundland, St. John's, NL
Research Assistant
2014- 2015
- Conducted a literature review investigating the role of predator/prey interactions of freshwater fish in Ontario.
- Developed a food web of piscivorous fish species in Ontario.

Agriculture and Agri-Food Canada, Truro, NS
Research Technician
2011- 2014
- Entered and analyzed scientific data
- Conducted quadrat sampling and botanical separation
- Prepared samples for analysis
- Operated specialized laboratory instruments
- Supervised and trained laboratory visitors and volunteers
- Assisted research scientists and graduate students in their research

Jody Hamper, Forest Technician

2796 Laggan Road
Laggan NS
B0K 1A0
902-759-3234

Highlights of Qualifications:

- Graduated from the Maritime Forest Ranger School
- Work well in team settings and individually
- Energetic, motivated, honest and reliable
- Excellent communication and organizational skills
- Excellent problem solving abilities

Employment History and Accomplishments:

Wood Buyer
Group Savoie
Present Employer
Job Responsibilities:
- Procurement
- Scaling
- Operations Supervisor

Operation Supervisor
E&R Langille Contracting
2006-2015
Job Responsibilities:
- Managing Logging Crews for Woodlands Operation

Operations Supervisor
NR Kenney Logging
2002-2006
Job Responsibilities
- Managing Logging Crews for Woodlands Operation

Education:

Nova Scotia Community College – Electro Mechanical
Holland College – Renewable Resource Management Technology
Maritime Forest Ranger School – Forest Technician

Skills and Experiences:

- Volunteer Fire Fighter with Barney's River Volunteer Fire Department
- Licensed Scaler
- Environmental Assessments for Wind Farms
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MEG MORRIS - RESUMÉ

Profession:	Renewable Energy Project Developer
Specialisation:	Permitting, Consultation, Land Use Planning, Wind Resource
Position in Firm:	Project Manager
Years of Experience:	5
Year Joined Firm:	2019
Languages:	English

PROFESSIONAL QUALIFICATIONS

- Licensed Professional Planner – 2022, Licensed Professional Planners Association of Nova Scotia, Atlantic Planners Institute, and Canadian Institute of Planners
- Master of Planning – 2018, Queen's University, Kingston, Ontario
    - Specialization: Environmental Services
- Bachelor of Science, Physics – 2016, Mount Allison University, Sackville, New Brunswick
    - Minors: Environmental Science and Mathematics

KEY EXPERIENCE AND RESPONSIBILITIES

- Managing development, environmental assessment, and permitting activities for new utility-scale wind projects in Atlantic Canada
- Coordinating engagement with the relevant Indigenous peoples for renewable energy projects across Canada
- Negotiating and applying for land contracts with private landowners and provincial Crown land regulators

WORK HISTORY

Project Manager	**Natural Forces Services Inc.**
2023 - present	**(Halifax, Canada)**

- Manage development activities for new utility-scale wind projects in Atlantic Canada
- Advise on the identification and feasibility of new renewable energy project sites in Nova Scotia
- Lead engagement with the appropriate Indigenous peoples for wind projects in Nova Scotia, New Brunswick, and British Columbia
- Negotiate, revise, and prepare real property contracts with both individual and corporate landowners
- Manage the completion of wind resource assessments for projects by third-party engineering firms
- Manage public, stakeholder, and rightsholder engagement and consultation by carrying out presentations, participating in open houses and meetings, answering individual concerns, and assisting with the preparation of the relevant materials
- Complete and manage interconnection applications with utility companies
- Support team members in applications for various municipal, provincial, and federal permits and funding sources

Development Manager | **Natural Forces Services Inc.**
2020 - 2023 | **(Halifax, Canada)**

- Manage development activities for new utility-scale wind projects in Atlantic Canada
- Lead the drafting, review, and editing of environmental assessment documentation for wind projects in Nova Scotia
- Manage engagement with the relevant Indigenous peoples for renewable energy projects across Canada
- Assist in identifying and determining the feasibility of new large scale wind projects using GIS software and field studies
- Assist in micro-siting new wind project infrastructure based on the information gathered during the feasibility stage
- Manage the completion of wind resource assessments for new wind projects by third-party engineering firms
- Negotiate and revised real property contracts with both individual and corporate landowners
- Assist with public and stakeholder consultation by carrying out presentations, participating in open houses and meetings, answering individual questions and concerns, and preparing the relevant materials
- Complete and manage interconnection applications with utility companies
- Manage and assist with applications for various municipal, provincial, and federal permits and funding sources, including those associated with the use of Crown land
- Work with municipal staff and councils to advise on new land-use policies
- Contract and manage consultant fieldwork programs

Development Officer | **Natural Forces Services Inc.**
2019-2020 | **(Halifax, Canada)**

- Completed sound level and shadow flicker impact assessments for a wide range of projects with varying sizes and constraints
- Carried out radiocommunication impact studies in alignment with guidance documents from regulators and the Canadian Wind Energy Association
- Assisted with public consultation for several wind and solar projects across Canada
- Completed and managed interconnection applications with utility companies
- Managed and assisted with applications for various municipal, provincial, and federa permits, including those associated with the use of Crown land
- Operated GIS software and used wind atlases to assess areas for suitable wind energy development
- Organized the installation and wind data measurement instrumentation such as meteorological towers, and LiDAR and SoDAR devices
- Identified and assisted with approaching landowners of potential project sites and preparing the land contracts
- Performed high-level desktop assessments of potential project sites
- Assisted with data logging and instrumentation troubleshooting for meteorological masts throughout Nova Scotia
- Produced numerous maps and documents required for securing land and permit applications

Research Assistant | **Queen's University**
2017-2019 | **(Kingston, Ontario)**

- Assisted with the work of the Planning with Indigenous Peoples research group
- Developed and managed an individual research project on the importance of including Indigenous peoples in environmental planning
- Carried out interviews with Indigenous representatives and municipal and provincial government officials

KELLAN DUKE - RESUMÉ

Profession:	Renewable Energy Project Developer
Specialisation:	Environmental Permitting
Position in Firm:	Environmental Permitting Specialist
Years of Experience:	2
Year Joined Firm:	2022
Languages:	English, French

PROFESSIONAL QUALIFICATIONS

- Graduate Certificate in Geographic Information Systems – 2022, Nova Scotia Community College: Centre of Geographic Sciences, Nova Scotia, Canada
- Bachelor of Science (Environmental Science) - 2018, Mount Allison University, New Brunswick, Canada

KEY EXPERIENCE AND RESPONSIBILITIES

- Consulting regulatory authorities on environmental legislation and policies related to utility scale energy projects in Canada
- Liaising with third-party consultants to scope, schedule and coordinate environmental field studies for energy projects in various stages of development, construction and operation
- Writing and reviewing environmental impact assessments and related documents and technical reports
- Expertise in permitting, environmental science, and GIS

WORK HISTORY

Environmental Permitting Specialist 2022 - present	Natural Forces Services Inc. (Halifax, Canada)

- Creating and reviewing Environmental Impact Assessments and related reports for renewable energy projects.
- Consulting with federal, provincial, and regional government regulators on environmental legislation, policy, and permitting.
- Planning and coordinating environmental field studies with third-party consultants
- Managing applications for various environmental permits.
- Advising on and maintaining a deep understanding of federal, provincial, and regional environmental policies.
- Assisting with public outreach and liaising with stakeholders.
- Working with consultants to review proposals, create study plans, and manage budgets
- Operating GIS software to assess and present spatial data for various stakeholders and regulators.

- Modelling and assessing sound, shadow flicker and visual impact for potential wind projects.

Water Treatment Technician	**CleanEarth Technologies**
2019 - 2021	**(Goffs, Canada)**

- Operated, regulated, and supervised the industrial wastewater treatment system.
- Prepared sampling and laboratory data, methodologies, and summary reports.
- Applied laboratory techniques and fieldwork skills to collect and test various water samples to ensure requirements for compliance are met.

Laboratory Sample Technician	**Maxxam Analytics**
2018 – 2019	**(Bedford, Canada)**

- Unpacked, prepared and logged environmental samples for scientific testing.
- Ensured accurate entry and exchange of information, and resolved issues through departmental collaboration and/or investigation.

JESSICA PITMAN - RESUMÉ

Profession:	Renewable Energy Project Developer
Specialisation:	Permitting, Consultation
Position in Firm:	Project Developer
Years of Experience:	1
Year Joined Firm:	2023
Languages:	English

PROFESSIONAL QUALIFICATIONS

- Master of Resource and Environmental Management – 2022, Dalhousie University, Halifax, Canada
- Bachelor of Science, Environmental Science - 2020, Dalhousie University, Halifax, Canada
    - Minor: Business

KEY EXPERIENCE AND RESPONSIBILITIES

- Managing development and permitting activities for new utility-scale wind projects in Atlantic Canada.
- Coordinating engagement with government officials, local communities, and other stakeholders.
- Consulting regulatory authorities on renewable energy projects in Canada.

WORK HISTORY

Project Developer 2023 - Present	Natural Forces Services Inc. (Halifax, Canada)

- Manage and assist with applications for various municipal, provincial and federal permits, including those associated with the use of Crown land.
- Consult with federal, provincial, and regional government regulators on renewable energy legislation, policy, and permitting.
- Assist with public outreach and liaising with stakeholders.
- Assist with public and stakeholder consultation by carrying out presentations, organizing and participating in open houses and meetings, answering individual questions and concerns, and preparing the relevant materials.

Data Entry Clerk 2022-2024	Indigenous Services Canada (Gatineau, Canda)

- Accurately transfer data from physical documents to an online template form.
- Perform quality control reviews of online templates and perform the necessary corrections.
- Follow procedures for inputting missing or illegible data.

Sustainability Planner 2021	**West Hants Regional Municipality (Hants County, Canada)**

- Research emissions reduction targets and strategies to meet those targets.
- Create a report with key actions for the Municipality to implement.
- Present actions to council and stakeholders to be approved through the municipal process.

GRACYN MCLAUGHLIN - RESUMÉ

Profession:	GIS Specialist
Specialisation:	Spatial data design and management
Position in Firm:	GIS Specialist
Years of Experience:	1
Year Joined Firm:	2023
Languages:	English

PROFESSIONAL QUALIFICATIONS

- Graduate Certificate in Geographic Information Systems – 2022, NSCC Centre of Geographic Sciences, Lawrencetown, Canada
- Bachelor of Science, Environmental Science - 2021, Acadia University, Wolfville, Canada

KEY EXPERIENCE AND RESPONSIBILITIES

- Managing provincial geospatial data for the use of developing renewable energy projects.
- Processing and analyzing geospatial data to determine site suitability for renewable energy projects.
- Preparing high-quality maps to use when engaging with external parties.

WORK HISTORY

GIS Specialist — **Natural Forces Services Inc.**
2023 - Present — **(Halifax, Canada)**

- Manage all geospatial data relating to the development of renewable energy projects.
- Perform constraint analysis to determine site suitability for new renewable energy projects.
- Create preliminary project layouts using results of constraint analysis as well as input from various team members.
- Assist with public and stakeholder consultation by preparing materials for open-houses and external meetings.

Analyst — **BMO Radicle**
2022 — **(Calgary, Canda)**

- Develop workflow for identifying rates of forest regrowth using satellite imagery.
- Create documentation on the process of developing carbon farming projects in Australia.
- Build automated models for iterative workflows.

Stewardship Technician — **Nature Trust of New Brunswick**
2019 — **(Fredericton, Canada)**

- Monitor organization’s properties for human activities and species of key interest.
- Use GPS to log path travelled in the field and any areas of interest that may be revisited.
- Input species identified on site into organization’s property databases.

MEGAN MACISAAC - RESUMÉ

Profession: Renewable Energy Project Developer
Specialisation: Permitting, Consultation, Environmental Science
Position in Firm: Development Manager
Years of Experience: 4
Year Joined Firm: 2020
Languages: English, French

PROFESSIONAL QUALIFICATIONS

- Bachelor of Science with Honours (Environmental Science) - 2019, Acadia University, Wolfville, Canada

KEY EXPERIENCE AND RESPONSIBILITIES

- Managing internal resourcing for new utility-scale renewable energy projects across Canada
- Worked as part of the development team in the successful deployment of 6 wind and solar energy projects throughout Nova Scotia, New Brunswick, Saskatchewan and British Columbia
- Expertise in permitting, stakeholder and rightsholder consultation, and environmental science

WORK HISTORY

Development Manager — **Natural Forces Services Inc.**
2023- Present — **(Halifax, Canada)**

- Plan and allocate internal resourcing for new utility-scale renewable energy projects across Canada
- Manage team members conducting project development works across Canada
- Advise on the drafting, review and submission of several Environmental Assessments for large-scale wind projects in Nova Scotia, New Brunswick, and Prince Edward Island
- Advise on stakeholder and rightsholder engagement for utility-scale renewable energy projects across Canada
- Support the development of budgets, schedules, and development plans for utility-scale renewable energy projects across Canada

Environmental Permitting Manager — **Natural Forces Services Inc.**
2023 — **(Halifax, Canada)**

- Managed the drafting, review and submission of several Environmental Assessments for utility-scale wind projects in Nova Scotia and New Brunswick
- Contract and coordinate consultant field work programs in New Brunswick, Nova Scotia, and Prince Edward Island
- Managed applications for various environmental permits

- Assisted in consultation for several wind farm projects throughout Nova Scotia, New Brunswick, and Prince Edward Island
- Managed team members conducting environmental permitting works across Canada

Project Developer **2020- 2023**	**Natural Forces Services Inc.** **(Halifax, Canada)**

- Assisted with the drafting, review and submission of several Environmental Assessments for large scale wind projects in Nova Scotia and New Brunswick
- Assisted in drafting, review and editing of a Technical Proposal for a utility scale solar project in Saskatchewan
- Contracted and coordinated consultant field work programs in New Brunswick, Nova Scotia, and British Columbia
- Managed applications for various environmental permits
- Assisted in consultation for several wind farm projects throughout Nova Scotia and New Brunswick
- Produced numerous maps and documents required for regulators and stakeholders
- Assisted in drafting, review and submission of a Technical Proposal for a utility scale solar project in Saskatchewan
- Conducted site constraint analysis and micro-sited wind projects, wind turbines and solar projects based on the results of the analysis
- Completed noise and shadow flicker impact assessments for a wide range of projects with varying sizes and constraints

JIM ROYCROFT

2215 Hwy 4
Saltsprings, Nova Scotia
CANADA

(902) 921-0634
jim@codesilver.ca

CURRENT SKILLS / RESPONSIBILITIES

- 15 year + Senior Wind Turbine Technician / Quality Assurance Manager with Rotor Mechanical Services at the Dalhousie Mountain Windfarm and Affinity Wind Projects.
- 8 year + Development project manager, organizing subcontractors and overseeing work for environmental studies, turbine technical requirements, interconnection, transport, electrical infrastructure, land contracts, budgeting.
- Manage wind data collection from met towers and assist in analysis.
- Oversee purchasing and inventory management of Turbine and BOP parts/consumables.
- Network infrastructure and server support, communication systems (SCADA).
- In depth knowledge of the GE wind turbine platform and its associated control systems.
- Natural troubleshooting ability of electrical and mechanical problems. Assist other technicians in resolving complex problems.
- Design and develop retrofits and long term fleet solutions.

RELEVANT EXPERIENCE

RMS Energy
Senior Tech / QA Manager
Nova Scotia, Feb 2012 –

At RMS Energy, my primary responsibility is to ensure the long-term health of the turbines at Dalhousie Mountain, and any other turbines that we are responsible for. I provide support for complex troubleshooting issues, and work with our team to develop technically sound solutions to problems. I still climb the towers on a semi-regular basis, performing maintenance and repairs. This gives me the opportunity to make sure we are covering all the items we need to.

I'm involved in a variety of special projects that come up from time to time, such as new project developments, blade work, main bearing and gearbox changes, met towers, and turbine software upgrades and modifications.

Granite Services International / GE
Wind Turbine Technician
Nova Scotia, Oct 2009 – Feb 2012

I started with Granite for the electrical commissioning of the turbines, and getting them online. Once the park came fully online, I transitioned to maintaining and repairing the turbines in operation.

My focus on the turbines expanded to include work on resolving long term problems, parts/inventory management, and servers and control systems. I gained an in-depth knowledge of troubleshooting the towers which I could pass on to my co-workers.

In early 2012, the two year warranty agreement for the towers came to an end, and I transitioned over to RMS Energy and assumed the role of Lead Tech / QA Manager.

EDUCATION

GE 1.5MW, Converter&Pitch, ESS, and Scada Training Certification
Energy Learning Center, Schenectady, New York
2010 and 2011

These specialized courses from GE train technicians on the proper maintenance, care, and troubleshooting for the 1.5MW and ESS platforms. I attended three of these while working for Granite/GE.

BZEE Certified Wind Turbine Technician
Lethbridge College, Alberta
Graduated Oct 2009

This is a BZEE certified hands-on training program. BZEE is an international standard for turbine technicians that originated in Germany. In this course we learn:

- First Period Electrician Apprenticeship (with AB govt exam)
- Forklift and Skid Steer operation
- Confined Spaces and Fire Safety
- PPE, tower climbing and emergency egress
- Wind Turbine Electrical, Mechanical, and Hydraulic
- Wind dynamics and turbine design
- Blade repair

OTHER EDUCATION

Bachelors of Applied Information Systems – with Honours
Southern Alberta Institute of Technology (SAIT)
Graduated in 2007

Diploma of Computer Technology
Southern Alberta Institute of Technology (SAIT)
Graduated in 2003

High School Diploma
William Aberhart High, Calgary, Alberta
Graduated in 2000

Cultural Resource Management Group Limited

Kyle G. Cigolotti, BA *Managing Partner - Archaeologist*

Education: Bachelor of Arts – Anthropology, Saint Mary's University, 2009

Affiliations: Nova Scotia Archaeology Society (Member 2012 – present; Treasurer 2018 – 2023; President 2023 - present)
Canadian Archaeological Associated (Member 2012 – present)
Ontario Archaeological Research License Holder, R1281

Employment: CRM Group Ltd., Managing Partner, 2020 – Present
CRM Group Ltd., Archaeologist, 2016 - 2020
CRM Group Ltd., GIS Technician/Draftsperson, 2012 – 2016
Saint Mary's University, Data Entry/Archaeological Report Preparation, Dept. of Classics, 2011

OHS Certs: OSH Training for Managers & Supervisors
Standard First Aid; CPR Level C & AED
CCOHS Hazard Identification, Assessment, & Control; Accident Investigation
WHMIS 2015

REPRESENTATIVE ARCHAEOLOGICAL EXPERIENCE

2016 - 2024 Project Manager during the development of Archaeological and Cultural Heritage Resource Impact Management Protocols for resource mining projects and Archaeological Best Practices Protocols for the utilization of Underwater Benthic Habitat Surveys;

Project Manager development of archaeological potential models for various wind energy and mining projects;

Licensed Field Director and Project Coordinator during Stage 1 through Stage 4 archaeological assessments in Southern Ontario;

Principal Investigator during numerous federal, provincial, municipal, and private archaeological assessments throughout the Maritime provinces;

2012 - 2016 GIS Technician, Draftsperson, Assistant Field Director, Field Supervisor, Laboratory Technician, and Field Technician with over 70 archaeological assessments across Southern Ontario and the Maritimes;

2011 Data Entry/Report Preparation for the San Felice Field School in Gravina, Italy through Saint Mary's University;

2009 - 2010 Participant in the San Felice Archaeological Field School in Gravina, Italy, through Mount Allison University;

Participant in Grand Pré Archaeological Field School through Saint Mary's University;

Jason Googoo

Manager

Membertou GEOMATICS SOLUTIONS

EDUCATION

1999-2001 Centre of Geographic Sciences (C.O.G.S) – Computer Technician/Analyst Diploma
1998 University College of Cape Breton (UCCB) – BA Degree in Sociology

PROJECTS

All MGS Mi'kmaq Ecological Knowledge Studies (MEKS) projects - Project Manager.

Jamaica Cadastral Conversion Project. The conversion of land parcels using IKONOS satellite imagery as the ground control. Involved in implementing QC procedures.

Involved in the implementation of the Membertou community plan.

Flood Model Project. Simulated a flood based on Truro, NS. Created several routines which modified and displayed aerial photographs as a flood progressed.

SKILLS

Computer Assisted Drafting (AutoCAD)
ArcView, ArcMap
Various scripting and programming (VB/VBA, Perl, C/C++, java/javascript

EXPERIENCE

2002 to Present — Manager – Membertou Geomatics Consultants

- Responsible for supervision and job performance evaluations for staff.
- Project Manager for MEKS, member of MEKS project team.
- Assist a team of GIS specialists and provide GIS data to various projects.
- Provide consulting services including needs analysis and gap analysis to assist clients in meeting their GIS requirements
- Assist Membertou First Nation to meet their community planning goals and objectives

2002 – 2003 — Eastcan Geomatics Limited – Involved in a training program

- Trained in data capturing, data converting.
- Data converting includes AutoCAD training and softcopy photogrammetry.
- Involved with quality assurance/quality control aspects.

Dave Moore

Planner \ GIS Technologist

EDUCATION

1982	Holland College - Construction Technology
2000	Nova Scotia College of Art and Design (NSCAD) - Bachelor of Design (Honours), Environmental Planning, Minor Degree in Digital Media
2007	Queen's University - Master of Urban and Regional Planning

PROJECTS

All MGS Mi'kmaq Ecological Knowledge Studies (MEKS) projects - Research.

Membertou Connector Road, Business Case and Routing Study (CBCL)

Habitat Threats – Sedimentation – Bras d'Or Lakes Watershed (UINR)

Physical, infrastructure and policy design and Community Planning for Membertou First Nation

On-site project management, multi-residential condominiums, Chandler's Cove, Chester, N.S.

Numerous design and research projects with both public and private engineering and architectural organizations

SKILLS

Remote Sensing (PCI Geomatics)	AutoCad (Autodesk)	SSPS Statistics
Civil Design (Autodesk)	3D Studio Max (Autodesk)	IDRISI Raster GIS
ArcView and ArcMap (ESRI)	MapInfo	MS Office

EXPERIENCE

2003 to Present	Planner\GIS Technician - Membertou Geomatics Consultants
1999- 2001	CAD Technician\Planner, W.M. Fares & Associates, Halifax, N.S.
1985- 1995	Survey Supervisor\Cartographic Assistant, Public Works and Government Services Canada
1984- 1985	Estimator\Technician, MBB-Trecan, Halifax, N.S.
1983- 1984	Project Manager, Research Project, Municipality of Chester

Devin Abbass

GIS Technician

EDUCATION

2022	Nova Scotia Community College, Centre of Geographic Sciences (COGS): GIS, Geovisualization and Cartography Diploma (Honours)
2013	Cape Breton University: Bachelor of Engineering Technology – Environmental Studies
2010	Nova Scotia Community College, Strait Area Campus: Natural Resources-Environmental Technology Diploma

PROJECTS

All MGS Mi'kmaq Ecological Knowledge Studies (MEKS) and Traditional Use Studies (TUS) projects.

Updating and managing the Nova Scotia Civic Address File (NSCAF) on behalf of Membertou.

SKILLS

Arc GIS (ESRI)	Python	Adobe Suite
QGIS	SQL (MySQL, PostgreSQL)	Inkscape
Tableau	R (ggplot2, dplyr)	MS Office

EXPERIENCE

2022 to Present	GIS Technician - Membertou Geomatics Consultants, Sydney, NS
2017- 2022	Engineering Technologist - Wood / Amec Foster Wheeler, Atlantic Canada
2010- 2012	Materials Technician – ADI / exp, Sydney, NS.

Ausenco

FLORIAN REURINK, Ph.D., M.Sc., B.Sc.

Wildlife Biologist

5+ years of experience

Area of expertise

Ecosystem Functioning
Ecological Restoration
Forests and Wetlands
Birds, Bats, Amphibians & Reptiles
Project Coordination
Study Design
Data Analysis
EIAs for Wind Farms, Power Lines & Highways

Most notable publication

Site-specific flight speeds of nonbreeding Pacific dunlins as a measure of the quality of a foraging habitat." Behavioural Ecology, 2015

CAREER SUMMARY

Florian is a wildlife biologist at Ausenco with more than five years of professional experience in wildlife ecology, environmental assessment, conservation, management, and restoration, and he has more than ten years of cumulative experience in the discipline. Florian holds a B.Sc., M.Sc., and Ph.D. in nature conservation and wildlife biology, and he is currently in the process of obtaining his P.Biol. At Ausenco Florian has been lead author and data analyst for technical avian radar and acoustic studies for wind energy development in Atlantic Canada, he has been lead data analyst and co-author on post-construction monitoring reports in Alberta, he has led avian survey and monitoring programs, and he has developed and improved technical reporting and SOPs within the environmental discipline.

Before Ausenco Florian has worked professionally for three years as an environmental consultant and later as Ecological Adviser for the federal government of the Netherlands where he learned about environmental impact assessments, legislation, client relations, integrity, collaboration, and communication. As regulator Florian led reviews for EIAs for wind farm and high voltage power line projects, he reviewed EIAs for building renovations, highways, railways, and habitat restoration, he attended client meetings to advice on ecological impact, monitoring, mitigation, and compensation, and he attended court meetings to defend ecological aspects of government approved projects.

Next to his professional work, Florian also spent many hours volunteering for everything from pond maintenance to bird banding and website design. Most recently Florian became program coordinator of the BC Marsh Monitoring Program where he applies his expertise in wetlands, marsh birds and amphibians. His strongest assets are his technical expertise in wildlife conservation and ecosystem functioning, his organizational skills, time management and his out of the box thinking to solve complex problems.

PROFESSIONAL HISTORY

Wildlife Biologist, Ausenco, Burnaby, BC, Canada	2022-present
Ecological Adviser, Netherlands Enterprise Agency, The Hague, The Netherlands	2016-2018
Wildlife Biologist, Loo Plan, De Steeg, The Netherlands	2015-2016

RELEVANT EXPERIENCE

- 84th Avenue Extension Bear Creek Park, Surrey, BC, Canada (2022): Co-author and field lead. The project is located in Bear Creek Park in the city of Surrey. BC Hydro planned to raise four existing transmission towers and clear vegetation around the work areas. Ausenco was responsible for an environmental overview assessment and conducted a terrestrial and aquatic habitat assessment. The results were summarized in a report.
  Client: BC Hydro.
  - Co-author on report
  - Field lead for the terrestrial habitat assessment
- Pitt-Meadows Rail Expansion Project Offsetting Plan, Coquitlam, BC, Canada (2022): Author. The offsetting site is located in a Wildlife Management Area south from Minnekhada Regional Park and west of the Pitt River. Ausenco developed an offsetting plan for the Pitt-Meadows Rail Expansion to compensate for impacts from construction activities on fish habitat.
  Client: CPKC.

  - Lead author on memo summarizing the painted turtle surveys

- Iron Workers Memorial Bridge Bird Management, Vancouver, BC, Canada (2022-2023): Author and field staff. The project is located at the Iron Workers Memorial Bridge located between the city of Vancouver and North Vancouver. Ausenco reviewed environmental monitoring reports conducted by a sub-contractor, and cormorant nest surveys conducted by our own staff during the bridge recoating works. The results from the environmental monitoring reports and nest surveys are summarized in an annual report. Client: Ministry of Transportation and Infrastructure.
  - Reviewed monitoring reports
  - Conducted cormorant nest and behavioural surveys
  - Co-author for the annual report
- Box Canyon Monitoring Report, Port Mellon, BC, Canada (2022-2023): Co-author and data analyst. The project is located in the McNab watershed approximately 20 kilometers northeast of Gibsons on the Sunshine Coast. Ausenco monitored potential impact of the run-off-river hydro project on water temperature, fish abundance, and coastal tailed frog abundance. Temperature, fish, and frog data was analyzed using a BACI study design and results were summarized in an annual report.
  Client: Elemental Energy.
  - Co-author on annual report
  - Analyzed and visualized data in R
  - Summarized data in annual report
- Highway 91 to 17 and Deltaport Way Project, Delta, BC, Canada (2022-2023): Field lead. The project is located at the intersection of hwy 91and hwy 17 in the city of Delta and includes several hwy upgrades. Ausenco was responsible for general environmental services, reviewing design-builder submittals, construction review and monitoring, and project close-out activities. One of the environmental services was monitoring water quality in Burns Bog located adjunct to the project site.
  Client: Ministry of Transportation and Infrastructure.
  - Developed and updated Health and Safety Plan
  - Field lead for water quality monitoring
- Site C Clean Energy Project, Fort St John, BC, Canada (2023): Field staff. The project is located in the Peace River approximately 5 kilometers southwest of the city of Fort St John. Ausenco was responsible for wildlife monitoring services during the construction phase of the Site C hydroelectric dam.
  Client: BC Hydro
  - Wetland and waterbird surveys
- Deltaport Transmission Line Bird Mitigation, Delta, BC, Canada (2023): Technical lead. This project is located on the Delta Port Jetty in the city of Delta. BC Hydro had upgraded the bird flight diverters and asked Ausenco to conduct a pilot study to evaluate the feasibility of studying the effectiveness of the bird flight diverters. The findings and recommendations for a bird flight diverter effectiveness study have been summarized in a report.
  Client: BC Hydro
  - Client contact
  - Budgeting and planning of fieldwork

- Field lead and training
- Data analyst and lead author on submission report

o Clydesdale Wind, Earltown, Nova Scotia, Canada (2023): Lead author and data analyst. The project is located in Colchester County on the near the town of Earltown in Nova Scotia. The project comprises of ten wind turbines with a total capacity of 70 MW. Ausenco conducted the radar and acoustic surveys to inform about nocturnal avian migration throughput, flight elevation and species of birds. Migration throughput and flight elevation was tested against weather variables to understand during what weather conditions migration intensity at low elevations is greatest. The results have been summarized in a report including figures and tables to visualize the data.
Client: Clydesdale Wind LP c/o RMS Energy Co.

- Lead author for the annual report
- Visualized the radar and acoustic data in figures
- Summarized the acoustic results in tables

o Riplinger Wind Project, Spring Hill, Alberta, Canada (2023): Lead author on complementary memo's. The project is located near Spring Hill in Cardston County, Alberta. The project comprises of 56 wind turbines with a total capacity of 300 MW. Ausenco has prepared a submission report for TransAlta including required field surveys for birds and bats. In addition to the regulatory submission report Ausenco prepared two memos to address stakeholder concerns.
Client: TransAlta Corporation

- Prepared a memo for potential risks and impact on Trumpeter Swan.
- Prepared a memo to clarify the potential impact on earth worms

o Kinkora PEI Wind Project, Middleton, PEI, Canada (2023): Lead author and data analyst. The project is located in Prince County on the coast of Prince Edward Island near the town of Middleton. The project comprises of three wind turbines with a total capacity of 6 MW. Ausenco conducted the radar and acoustic surveys to inform about nocturnal avian migration throughput, flight elevation and species of birds. Migration throughput and flight elevation was tested against weather variables to understand during what weather conditions migration intensity at low elevations is greatest. The results have been summarized in a report including figures and tables to visualize the data.
Client: Natural Forces

- Lead author for the annual report
- Visualized the radar and acoustic data in figures
- Summarized the acoustic results in tables

o Richmond Nature Park Biophysical Assessment, Richmond, BC, Canada (2022 – 2024): Author and field staff. The project is located in the city of Richmond at the intersection of Highway 99 and 91. Ausenco conducted a biophysical and hydrological assessment. A report was prepared to update and document the biophysical and hydrological conditions in the park, including recommendations for restoration and management.
Client: City of Richmond

- Gathered and summarized wildlife data
- Created habitat suitability maps for wildlife species at risk
- Lead-author on wildlife section of report and presentation

- Windrise PCM 2023, Fort MacLoad, AB, Canada (2023 – 2024): Author and data analyst. The project is located near the town of Fort MacLeod and consists of 43 wind turbines with a total capability of 206.4 MW. Ausenco conducted post-construction carcass surveys to predict bird and bat mortality for the Project. Carcass estimates from the field were analysed in GenEst to predict the total mortality for the surveyed periods. The results have been summarized in a report including figures and tables to visualize the data.
  Client: Windrise Wind L.P.
  - Co-author for the annual report
  - Analyzed field data in Genest
  - Visualized and summarized mortality predictions from GenEst
- Garden Plain PCM 2023, Hanna, AB, Canada (2023 – 2024): Author and data analyst. The project is located near the town of Hanna and consists of 26 wind turbines with a total capability of 130 MW. Ausenco conducted post-construction carcass surveys to predict bird and bat mortality for the Project. Carcass estimates from the field were analysed in GenEst to predict the total mortality for the surveyed periods. The results have been summarized in a report including figures and tables to visualize the data.
  Client: Garden Plain I L.P.
  - Co-author for the annual report
  - Analyzed field data in Genest
  - Visualized and summarized mortality predictions from GenEst
- Forty Mile Granlea Wind GP, Bow Island, AB, Canada (2023 – 2024):Author and data analyst. The project is located near the town of Bow Island and consists of 45 wind turbines with a total capability of 228 MW. Ausenco conducted post-construction carcass surveys to predict bird and bat mortality for the Project. Carcass estimates from the field were analysed in GenEst to predict the total mortality for the surveyed periods. The results have been summarized in a report including figures and tables to visualize the data.
  Client: Forty Mile Granlea Wind GP Inc.
  - Co-author for the annual report
  - Analyzed field data in Genest
  - Visualized and summarized mortality predictions from GenEst
- Windy Ridge Wind Power Project, Halifax, NS, Canada (2023 – 2024): Lead author and data analyst. The project is located in near the Town of Truro and consists of 49 wind turbines with a total capacity of 343 MW. Ausenco conducted the radar and acoustic surveys to inform about nocturnal avian migration throughput, flight elevation and species of birds. Migration throughput and flight elevation was tested against weather variables to understand during what weather conditions migration intensity at low elevations is greatest. The results have been summarized in a report including figures and tables to visualize the data.
  Client: EverWind Fuels
  - Lead author for the annual report
  - Visualized the radar and acoustic data in figures
  - Summarized the acoustic results in tables
- Avian Construction and Nest Monitoring, Vancouver, BC, Canada (2022 – present): Field lead and project coordinator. The project is located in the city of Vancouver and includes

the Granville and Burrard bridge. Ausenco conducts cormorant nest surveys, construction monitoring, and supporting services during bridge construction works. The results from the nest surveys and construction monitoring are summarized in an annual report.
Client: City of Vancouver

- Conducted cormorant nest and behavioural surveys
- Provided supporting services on Invitation to Tender documents
- Co-author for the annual report

o Roberts Bank Terminal II Extension, Delta, BC, Canada (2022 – present): Co-author and field lead. The project is located at the Delta Port in the city of Delta. The Vancouver Port Authority is proposing to extend the existing terminal to increase terminal capacity as part of the Container Capacity Improvement Program. Ausenco is responsible for environmental studies to inform a future effects assessment for the projects.
Client: Vancouver Fraser Port Authority

- Co-author on study design for shorebird monitoring programs
- Technical support for different study components
- Field lead for multiple study components

o Surrey-Langley Skytrain Environmental Services, Surrey, BC, Canada (2023 – present): Field lead and co-author. The project is situated between the city of Surrey and the city of Langley and runs along the Fraser Highway. Ausenco is responsible for environmental services work for the project. The scope includes environmental screening, consultation with First Nation, environmental fieldwork, drafting an environmental technical report, and supporting services during open houses and hearings.
Client: TransLink

- Field lead for breeding bird surveys
- Provided training for environmental monitoring

EDUCATION

Ph.D. in Wildlife Biology, Simon Fraser University, Burnaby, BC, Canada	2018 - 2022
M.Sc. in Ecology, Wageningen University, Wageningen, The Netherlands	2011 - 2013
B.Sc. in Forest & Nature Conservation, Van Hall Larenstein, Velp, The Netherlands	2008 - 2011

ADDITIONAL TRAINING

First Aid Training, Alert First-Aid Inc., Burnaby, BC, Canada	2023
Fall Arrest Training, Metro Safety Training, Coquitlam, BC, Canada	2023

AWARD

Graduate Dean's Entrance Scholarship 2018-2022
to finance my Ph.D. at Simon Fraser University

PUBLICATIONS AND PRESENTATIONS

Publications

- Site-specific flight speeds of nonbreeding Pacific dunlins as a measure of the quality of a foraging habitat. Behavioural Ecology, 2015
- Amfibieen in straatkolken, Orienterend onderzoek naar straatkolken als valkuil voor amfibieen. RAVON, 2010

Presentations

- Canadian Society for Ecology and Evolution, Kelowna, BC. May 12-15, 2013.
- International Ornithological Conference, 2018, Vancouver, BC. Month August 19 - 26, 2018
- Eco Evo retreat, Squamish, BC. October 26-28, 2018.

LANGUAGE

English

Dutch

PATRICK BURKE, MSC, RPBIO, CC-P

National Director, Power

16 years of experience

Professional certifications

Registered Professional Biologist, College of Applied Biology

Certified Climate Change Professional, Association of Climate Change Officers

Professional Certificate for Global Standard for Nature-based Solutions, International Union for Conservation of Nature

Area of expertise

Environmental and Social Impact Assessment (ESIA)
Climate Change Risk
Nature-based Solutions (NbS)
Regulatory Compliance
Marine & Coastal Ecosystems
Biodiversity & Business

Most notable publication

Tamburello, N., J. Eyzaguirre, R. Hodgson, C. Quirion, and P. Burke. 2022. Marine Climate Change Assessment for the South Coast of British Columbia. Report prepared by ESSA Technologies Ltd. for the British Columbia Ministry of Land, Water and Resource Stewardship. 130 pp.

CAREER SUMMARY

Patrick Burke is a National Director, Power sector at Ausenco. He provides leadership in environmental assessment and regulatory approval to renewable energy developers and operators. He has expertise in regulatory strategy, environmental and social impact assessment, operational compliance, and project feasibility planning. He leads a multi-disciplinary team of technical experts with experience in development of onshore wind energy, solar energy, battery storage, pumped hydro, and transmission infrastructure.

Patrick has over 16 years of experience as a climate change professional. He provides data-driven, evidence-based advice to clients in the private and public sector regarding climate, biodiversity, ecosystems, and energy. Patrick's experience in renewables includes supporting the commissioning or operation of 18 wind, solar, and energy storage facilities in the United States and Canada, totalling over 1.8 GW of installed capacity. He has also supported the preparation and submission of regulatory approvals for another forty-eight other renewable energy developments across North America. He has experience working in many regulatory jurisdictions, and he takes a collaborative approach to advising his clients through new, changing, and uncertain approvals processes.

PROFESSIONAL HISTORY

National Director, Power; Ausenco Sustainability, Canada	2023-present
Senior Climate Adaptation Specialist; ESSA Technologies, Canada	2021-2023
Senior Biologist & Project Manager, Kerr Wood Leidal Associates, Canada	2019-2021
Principal Researcher, Quercus Associates, Canada	2016-2020
Project Manager and Scientist, Stantec Consulting, United States & Canada	2008-2016

SELECT EXPERIENCE | RENEWABLE ENERGY GENERATION AND TRANSMISSION

Patrick has expertise in siting, impact assessment, regulatory approval, monitoring, and operational compliance for onshore wind, solar, hydropower, battery storage, and pumped hydro energy projects. He has designed, led, and managed environmental inventories and regulatory applications for renewable energy facilities since 2008.

Environmental Impact Assessment: Regulatory Advice, Strategy, and Feasibility

- Directed a regulatory constraints assessment and strategic planning exercise for two wind projects in British Columbia (2023 and 2024).
  Client: Confidential client
- Directed a regulatory risk and due diligence assessment for acquisition of two wind project assets in British Columbia (2023).
  Client: Confidential client
- Provided strategic regulatory advice regarding impact assessment for a proposed brownfield pumped-hydro storage facility in western Canada (2023).
  Client: TransAlta Corporation
- Led an environmental regulatory assessment for the 100-km Ksi Lisms LNG transmission interconnect in British Columbia (2021).
  Client: Rockies LNG Partnership
- Led an independent technical review of a BC Utilities Commission application for two capital project upgrades on Indigenous territory in British Columbia (2021).
  Client: St'át'imc Government Services
- Completed a regulatory audit and compliance review for five operational wind and solar facilities in the desert southwest of the United States (2015 to 2016).

Client: Brookfield Renewable Energy Partners

- Managed an environmental impact scoping and survey protocol assessment for confidential wind project in western Canada (2014).
  Client: EDP Renewables
- Provided federal regulatory advice regarding environmental risk of proposed projects in the United States Midwest (2012 to 2013).
  Client: EverPower

Environmental Impact Assessment: Project Development Support [select projects]

- Directed the development of regulatory submissions for the first wind energy development proposed on provincial Crown land in Alberta (2023 to 2024).
  Client: Confidential client
- Managed the development of a federal regulatory submission to Indigenous Services Canada for the Pe-na-koyim Wind Project in Alberta (2023 to 2024).
  Client: EDF Renewables
- Managed pre-construction environmental assessment and regulatory submissions for the Riplinger Wind Project in Alberta (2023 to 2024).
  Client: TransAlta Corporation
- Directed pre-construction environmental assessment and regulatory submissions for a confidential wind energy development in Saskatchewan (2023 to 2024).
  Client: Enel Green Power
- Senior reviewer for a feasibility level environmental constraints assessment for a wind energy development in Alberta (2023 to 2024).
  Client: Capstone Infrastructure Corporation
- Managed the pre-construction environmental assessment for the Willow Creek 1 and 2 Projects in Alberta (2023).
  Client: TransAlta Corporation
- Senior reviewer for technical baseline studies to support an environmental assessment for the Wejipek Wind Project in Prince Edward Island (2023).
  Client: Natural Forces
- Senior reviewer for regulatory submission to the Apberta Utilities Commission for the Alderson Solar Power Project (2023).
  Client: hep Canada
- Senior reviewer for technical baseline studies to support an environmental assessment for the Rhodena Wind Project in Nova Scotia (2023).
  Client: ABO Wind
- Managed pre-construction wildlife surveys and federal regulatory strategy for the proposed Great Bay Wind Facility in Maryland (2011 to 2014).
  Client: Pioneer Green Energy
- Managed pre-construction monitoring and fatality estimation for the 63-turbine, 250 MW Scioto Ridge Wind Farm, Ohio, USA (2012 to 2013).
  Client: EverPower
- Conducted pre-construction eagle fatality estimation for the proposed South Mountain Wind Facility in New York (2012).
  Client: Ridgeline Energy (now Atlantic Power Corp)
- Conducted pre-construction wildlife surveys at the proposed Poor Mountain Wind Facility in Virginia (2010).
  Client: Invenergy
- Conducted pre-construction wildlife surveys and authored baseline reports for the 33-turbine, 99 MW Granite Reliable Wind Farm in New Hampshire (2009).

Client: Noble Environmental Power

- Conducted pre-construction eagle surveys as part of state permitting for the 40-turbine, 60 MW Rollins Wind Project, Maine, USA (2009 to 2010).
Client: FirstWind (now SunEdison)
- Conducted pre-construction wildlife surveys as part of state permitting for 24-turbine, 48 MW Groton Mountain Wind Facility, New Hampshire, USA (2008 to 2009).
Client: Iberdrola Renewables (now Avangrid Renewables)

Regulatory Compliance: Construction, Operations, and Maintenance [select projects]

- Directed regulatory submissions on operational monitoring and curtailment planning for the 130 MW Garden Plain Wind Project in Alberta (2023 to 2024).
Client: TransAlta Corporation
- Directed regulatory submissions on operational monitoring for the 228 MW Forty Mile Granlea Wind in Alberta (2023).
Client: ATCO
- Supported monitoring and fatality modelling at the 97.6 MW Laurel Mountain Wind Generation and Energy Storage Facility in West Virginia (2011 to 2013).
Client: AES Corporation
- Conducted fatality modelling at the 4-turbine, 10 MW Georgia Mountain Community Wind Farm in Vermont (2013).
Client: Georgia Mountain Community Wind
- Completed operational monitoring at the 25-turbine, 63 MW Highland Wind Project in Pennsylvania (2011 to 2013).
Client: EverPower
- Completed operational monitoring and fatality modelling at the 44-turbine, 132 MW Kibby Mountain Wind Farm, Phase I in Maine (2009).
Client: TransCanada Corporation

Wind-Wildlife Research

- Supported analysis and presented research findings for a study to assess bat activity and migratory use of coastal and offshore habitats in the Great Lakes, Gulf of Maine, and Mid-Atlantic United States (2009 to 2012).
Client: United States Bureau of Ocean Energy Management

SELECT EXPERIENCE | NON-RENEWABLE ENERGY GENERATION

Patrick has experience working on upstream and midstream fossil fuel infrastructure in the eastern United States and western Canada. His work in the oil and gas sector involves assessing environmental and social impacts of natural gas and oil extraction and transmission. He has also worked on oil spill cleanup assignments.

Environmental and Social Impact Assessment: Oil and Gas [select projects]

- Supported preparation of regulatory applications for the LNG Canada liquified natural gas terminal on Canada's west coast (2013 to 2014).
Client: LNG Canada Development (a consortium of Shell, Petronas, PetroChina, Mitsubishi, and Korea Gas)
- Supported preparation of regulatory applications and developed mitigation strategies for traditional use of wildlife species at the proposed Pacific NorthWest liquified natural gas terminal on Canada's west coast (2013 to 2014).
Client: Petronas
- Developed strategies to minimize and avoid impacts of construction activities on wildlife at the proposed Kitimat liquified natural gas terminal (2014)

Client: Chevron Canada

- Conducted wildlife assessments along the 900-kilometer Prince Rupert Gas Transmission pipeline corridor and along the 670-kilometer Coastal GasLink in British Columbia (2014 to 2015).
  Client: TC Energy

Regulatory Compliance: Oil Spills [select projects]

- Authored permit applications for eagle take under 50 CFR 22.26 as part of the Line 6B oil spill response in Michigan (2013).
  Client: Enbridge
- Conducted field surveys as part of the avian monitoring program under Section 7 Consultation under the *Endangered Species Act* [16 U.S.C. § 1531] for the Deepwater Horizon Spill in the Gulf of Mexico (2011).
  Client: British Petroleum

SELECT EXPERIENCE | BIODIVERSITY AND ECOSYSTEM RESTORATION

Patrick has experience in biodiversity research, risk assessment, policy development, and ecosystem restoration. His restoration experience includes both site-based and process-based ecosystem restoration. His biodiversity assessment experience includes substantial work with Indigenous and local communities throughout the western hemisphere, in both North, Central, and South America.

Ecosystem Restoration Planning [select projects]

- Managed a multi-disciplinary technical team in support of Indigenous-led freshwater restoration objectives in remote coastal British Columbia (2021 to 2023).
  Client: Central Coast Indigenous Resource Alliance
- Developed riparian enhancement and restoration plans for salmon habitat in the Fraser River estuary of British Columbia (2019 to 2020).
  Client: Vancouver International Airport

Biodiversity Assessment: Inventories and Analysis [select projects]

- Led a risk assessment for an historic Indigenous-led, multi-year salmon reintroduction to the Upper Columbia River in Canada (2021 to 2022).
  Clients: Ktunaxa Nation Council and Columbia River Salmon Restoration Initiative
- Made data-informed recommendations regarding the spatial distribution of larval release sites for the Taylor's Checkerspot (*Euphydryas editha taylori*) Recovery Project in British Columbia (2020).
  Client: BC Ministry of Environment
- Acted as the mammal inventory lead for remote biodiversity expeditions and inventories in the Amazon basin of Peru (2017 and 2019).
  Clients: Asociación para la Conservación de la Cuenca Amazónica and Alliance for a Sustainable Amazon
- Conducted backcountry songbird surveys for montane and boreal bird species in United States National Parks, Washington, USA (2007).
  Client: Institute for Bird Populations

Biodiversity Assessment: Policy [select projects]

- Developed a strategic framework to inform a municipal biodiversity policy, British Columbia, Canada (2019 to 2020).
  Client: City of Richmond
- Assessed spatially explicit land designations in British Columbia against the Convention on Biological Diversity Aichi Target 11 (2019).

Client: Canadian Parks and Wilderness Society

SELECT EXPERIENCE | CLIMATE ADAPTATION & NATURE-BASED SOLUTIONS

Patrick is certified by the International Union for Conservation of Nature (IUCN) as a professional to implement the Global Standard for Nature-based Solutions (NbS) and has credentials in forest vulnerability and climate data analytics. He works for communities, governments, and industry to proactively anticipate and effectively adapt to the impacts of climate change.

- As a member of a Global Advisory Panel for community-led NbS in Africa, Patrick advises project implementation team on knowledge products, publications, and case studies (2022 to 2027).
  Client: Farm Radio International
- Led a team in development of an Indigenous-led strategic plan for terrestrial and marine nature-based climate solutions on Cape Breton Island, Canada (2022 to 2023).
  Client: Unama'ki Institute of Natural Resources
- Led a regional assessment of climate risk and developed adaptation approaches for marine and coastal sectors in support of a regional Coastal Management Strategy, British Columbia, Canada (2021 to 2022).
  Client: BC Ministry of Land, Water, and Resource Stewardship
- Prioritized marine and coastal climate adaptation recommendations for communities, industries, and First Nations within a large region in central British Columbia, Canada (2020).
  Client: Marine Plan Partnership for the North Pacific Coast

SELECT EXPERIENCE | WATER RESOURCE ENGINEERING

Patrick has experience working with engineers to design coastal development and flood protection infrastructure that avoids and mitigates impacts on fish and fish habitat. He has experience guiding clients through regulatory reviews for projects near water.

- Led regulatory submissions for federal review of bank stabilization and coastal developments in the Fraser River estuary of British Columbia (2019 to 2020).
  Client: Conwest
- Developed a strategy for fish habitat offsetting associated with sea level rise mitigation in the Fraser River estuary of British Columbia (2019 to 2020).
  Client: City of Richmond
- Supported applications and reviews under the *Fisheries Act* [RSC , 1985, c. F-14], *Water Sustainability Act* [SBC 2014, c. 15], and *Species at Risk Act* [SC 2002, c. 29] for emergency erosion protection measures in the Nicola River watershed (2019).
  Client: Nooaitch Indian Band

EDUCATION

Graduate Certificate in Climate Data and Weather Analytics, University of Illinois Urbana-Champaign, Champaign, IL, United States 2023

M.Sc., Ecology, University of British Columbia and Biodiversity Research Centre, Vancouver, BC, Canada 2019

B.A., Anthropology and Environmental Studies, College of William and Mary, Williamsburg, VA, United States 2004

PROFESSIONAL QUALIFICATIONS

Registered Professional Biologist (RPBio), College of Applied Biology of British Columbia, RPBio # 3329.

Certified Climate Change Professional (CC-P), Association of Climate Change Officers, CC-P # A-0105.

Professional Certificate for Global Standard for Nature-based Solutions, International Union for Conservation of Nature and Natural Resources (IUCN), 2021.

PUBLICATIONS AND CONFERENCE CONTRIBUTIONS

- Tamburello, N, J Eyzaguirre, R Hodgson, C Quirion, and P Burke. 2022. Marine Climate Change Assessment for the South Coast of British Columbia. Report prepared by ESSA Technologies Ltd. for the British Columbia Ministry of Land, Water and Resource Stewardship.
- Burke, P, B Doyle, P Lilley. 2020. Evaluation of Existing Climate Change Impact Analyses, Adaptation, and Mitigation Plans in the North Vancouver Island Marine Plan Area. Report for the Marine Plan Partnership for the North Coast.
- Burke, P, R Murray, A Robertson, A Mitchell. 2017. Conserving riparian habitats and species at-risk in the Wahleach watershed. FWCP COA-F17-W-1211. Report ID: 53124. Available online.

LANGUAGE

English (native) and Spanish (conversational)

APPENDIX B
CLYDESDALE RIDGE RIGHTSHOLDER ENGAGEMENT PLAN

CLYDESDALE RIDGE WIND PROJECT MI'KMAQ ENGAGEMENT PLAN

12.07.2024

Clydesdale Holdings Ltd.
1701 Hollis St Suite 1200
Halifax, NS B3J 3M8
naturalforces.ca

List of Appendices

1 Land Acknowledgement

The Clydesdale Ridge Wind Project is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq.

Clydesdale Holdings Ltd. acknowledge that working on these lands is a privilege that comes with a great deal of responsibility.

2 Introduction

Rightsholder engagement and consultation are important aspects of project development. It is fundamental that the Mi'kmaq in Nova Scotia (the Mi'kmaq) have a full understanding of proposed projects to ensure they are able to meaningfully engage in the development process and assess potential impacts to their Aboriginal and Treaty rights. This process requires strong, active communication that considers the varied needs of individual communities and organizations. For the Clydesdale Ridge Wind Project (the Project), Clydesdale Holdings Ltd. (the Proponent) has developed and initiated an approach to this engagement that is in alignment with the guidelines of the Province of Nova Scotia (the Province) and remains flexible to adapt to the needs of each community and organization.

The Province of Nova Scotia is required to consult with the Mi'kmaq bands prior to making decisions on approving developments that have the potential to adversely affect an Aboriginal or Treaty right. In this way, the Mi'kmaq are not stakeholders, they are Rightsholders. Case law states that the province may delegate certain operational aspects of the duty to consult to project proponents, acknowledging that project proponents often have access to more detailed information on the planned phases and components of a given project, especially in early stages. In Nova Scotia, the actions taken by proponents in this respect are considered engagement, not consultation.

From past project experience, the Province often delegates the following aspects of consultation to the proponent:

- Engagement and Relationship Building,
- Information Sharing and Discussion,
- Consultation Meetings,
- Identification of Adverse Impacts to Aboriginal and Treaty Rights, and
- Discussion of Potential Accommodations

This Mi'kmaq Engagement Plan outlines the approach and general methods of engagement proposed and implemented by the Proponent to engage with the Mi'kmaq in NS. It is informed by initial conversations with the Province, experience from other projects, feedback from individual bands and organizations, as well as the *Proponent's Guide: The Role of Proponents in Crown Consultation with the Mi'kmaq of Nova Scotia* (the *Proponent's Guide)* from the Office of L'nu Affairs (OLA).

2.1 Project Overview

The Clydesdale Ridge Wind Project (the Project) is being developed by Clydesdale Holdings Ltd. (the Proponent). The Proponent represents a partnership between Natural Forces

Developments Limited Partnership (Natural Forces) and Dalhousie Mountain Wind Energy Inc. The Proponent is further partnering with Mi'kmaq bands in Nova Scotia to ultimately develop, construct, own, and operate the Project.

The Project consists of up to 18 wind turbine generators (WTGs) and is situated adjacent to the operational Dalhousie Mountain Wind Farm, which is owned and operated by an affiliate of Dalhousie Mountain Wind Energy Inc. The Project is located near Mount Thom, Earltown, Loganville, and Berichan in both Colchester County and Pictou County. The proposed WTG locations and associated infrastructure are predominantly on privately-owned lands owned by multiple landowners, with a portion of the access road and collector lines traversing provincial Crown land. The private lands are secured under Lease, Option to Lease, and Easement. The Proponent has an active application for an Easement over the provincial Crown land.

2.2 Purpose and Objectives of the Mi'kmaq Engagement Plan

This Plan was created to ensure a clear, transparent plan is established and followed to appropriately engage with the Rightsholders in Nova Scotia and to fulfill the recommendations for engagement as outlined in the *Proponent's Guide (2012)*. This Plan additionally provides an overview of the Rightsholder engagement work that has already been carried out to date for the Project. The Proponent is committed to meaningful engagement with Rightsholders and treats this as a top priority when developing renewable energy projects.

3 Mi'kmaq Engagement Approach

The following sub-sections list and describe the efforts and activities that the Proponent has used to engage with the Mi'kmaq in Nova Scotia on the Project.

Maintaining flexibility in consultation and engagement is vital to address current and future concerns in an appropriate manner that best suits the needs of the communities. The engagement strategies used for this Project have been developed in reference to various resources, including but not limited to the latest contact details for the bands provided by the OLA, conversations with representatives from Kwilmu'kw Maw-klusuaqn (KMKNO), the *Proponent's Guide*, previous experience, and advice from third-party experts in the field of First Nation engagement.

3.1 Engagement Topics

Throughout Project development, the Proponent has engaged with all 13 Mi'kmaq bands, KMKNO, and the NCNS on all major Project updates. Part of this engagement is information sharing as updated information becomes available. The updates provided to the Mi'kmaq include information related to:

- Project details and schedule,
- Permits acquired,
- Open houses,
- Mi'kmaq ecological knowledge study progress,
- EA studies, submission, and determination,

- Fish and fish habitat,
- Species at risk,
- Watercourses and wetlands,
- Vegetation and habitat,
- Archaeological surveys, etc.
- Power contract opportunities,
- Interconnection studies,
- Start of construction,
- Construction updates, and
- Commercial operation date.

3.2 Engagement Process Methodology

The Proponent has been engaging with the Mi'kmaq communities in Nova Scotia throughout development, and will continue to do so throughout the construction and operation of the Project. Methods used to engage with the Mi'kmaq have included update letters, presentations, open houses, meetings, and the Mi'kmaq Ecological Knowledge Study (MEKS). The methods that were used for each community are detailed below in section 3.4 Mi'kmaq Engagement Activities.

3.3 Engagement Participants and Rationale for Selection

The first step of the consultation process was the identification of the Mi'kmaq communities that could be impacted by the Project. This process provides a better understanding of the communities that currently and historically have lived and use these lands and ensures they have access to information and opportunities to discuss and voice any questions or concerns that may arise.

The Proponent initiated consultation with the Office of L'nu Affairs (OLA). The OLA identified three Mi'kmaq bands whose Aboriginal and Treaty rights may be impacted by the Project. These bands were Millbrook First Nation, Paqntkek Mi'kmaq Nation, and Pictou Landing First Nation. Therefore, early engagement efforts focused on contact with these three bands, as well as KMKNO and the Native Council of Nova Scotia (NCNS). As development has progressed, the Proponent has broadened the engagement efforts to include all 13 Mi'kmaq bands in Nova Scotia, which are:

- Acadia First Nation,
- Annapolis Valley First Nation,
- Bear River First Nation,
- Eskasoni First Nation,
- Glooscap First Nation,
- Membertou First Nation,
- Millbrook First Nation,
- Paqtnkek First Nation,
- Pictou Landing First Nation,
- Potlotek First Nation,
- Sipekne'katik First Nation,
- Wagmatcook First Nation, and
- We'koqma'q First Nation.

While most of the bands are represented by KMKNO for many aspects of consultation and engagement, Sipekne'katik First Nation, Millbrook First Nation, and Membertou are not and have been engaged with more directly. The Proponent has additionally committed effort to engaging with the Confederacy of Mainland Mi'kmaq (CMM).

3.4 Mi'kmaq Engagement Activities

The following sections provide an overview of the direct and indirect Mi'kmaq engagement activities that have been completed to date.

3.4.1 Direct Engagement Activities

All of the Mi'kmaq engagement activities have been carried out in alignment with the *Proponents' Guide*. Table 2 provides a summary of the actions taken to achieve each engagement step recommended in the *Proponents' Guide*. The following materials are attached in appendices as examples of this work:

- Appendix A: Example Project Update Letters
- Appendix B: Consultation Log (2012 Environmental Assessment)
- Appendix C: Consultation Log (to June 2024)

TABLE 1: SUMMARY OF ACTIONS TAKEN TO ENGAGE WITH THE MI'KMAQ IN NOVA SCOTIA.

***Proponents' Guide* Steps**	**Actions taken by the Proponent**
Step 1: Notify Mi'kmaq early in the development process	1) The OLA was engaged to initiate formal engagement with the Mi'kmaq. 2) Letters were sent to Millbrook First Nation, Paqtnkek Mi'kmaw Nation, and Pictou Landing First Nation introducing the Project as a proposed development. This initial contact included a Project description, maps, information on the Proponent, contact details for further comments or questions, and an offer to meet to further discuss the Project. Initial contact was followed by Project updates as applicable and meetings with presentations upon request. 3) A letter with the same information was sent to KMKNO and NCNS.
Step 2: Provide as much information as possible	1) The introductory letters included the appropriate amount of information to introduce the Project and offered the opportunity to meet with the bands as requested. 2) August 2021: introductory letters including an overview of the Project and offer to meet were sent to the NCNS. 3) September 2021: full long-form project descriptions and any updates provided to the Confederacy of Mainland Mi'kmaq (CMM) and NCNS. 4) October 2021: update emails were sent to NCNS, CMM, and Pictou Landing First Nation to provide a Project update. 5) April - June 2022: discussions regarding environmental monitoring plans for all phases of the Project, the Mainland Moose Guardians Program, and support for other programming ongoing between the Proponent and CMM. 6) August 2022: update emails and letters were sent to the Chiefs of all 13 Mi'kmaq bands in NS, KMKNO, and the NCNS to provide a Project update.

	7) May 2024: update emails and letters were sent to the Chiefs of all 13 Mi'kmaq bands in NS, KMKNO, and the NCNS to provide a Project update and overview of the GCP RFP.
Step 3: Meet with the Mi'kmaq communities	1) August 2021: meeting with NCNS to provide a detailed overview of the Project and opportunities for partnership. 2) September 2021: two meetings with CMM to provide a detailed overview of the Project and discuss partnership opportunities. 3) September 2021: meeting with Pictou Landing First Nation Council to present the Project, discuss potential partnership opportunities, and propose a site visit. 4) October 2021: presentation including a detailed overview of the Project to the Chiefs of all 13 Mi'kmaq bands in NS at the NCNS Annual Meeting. 5) March 2022: meeting with CMM staff to provide updates on the Project, introduce Natural Forces and their partnership with Rotor Mechanical, and to discuss how the Proponent can support the Moose Guardian Program as well as the monitor network in NS. 6) April 2024: meeting with CMM and KMKNO to discuss Project updates, the Moose Guardian Program, and Mi'kmaq forestry Initiative. 7) April 2024: meeting with KMKNO to provide an update on the Project, an overview of the GCP RFP, and discuss how to best collaborate.
Step 4: Complete a Mi'kmaq Ecological Knowledge Study (MEKS)	A first MEK study was completed for an early iteration of the Project in 2008 by the CMM Environmental Services Division. A second MEK study including an expanded study area was conducted by AMEC in 2013. A third MEK study, completed in 2024, for the current iteration of the Project was conducted by Membertou Geomatics. The final report is included with the Environmental Assessment. Membertou Geomatics employed a methodology of: 1. Conducting interviews with knowledge holders from nearby First Nation communities o 18 interviews occurred between October 2022 and February 2023 2. Conducting literature and archival research o Various archival documents, maps, oral histories and published works were reviewed to obtain accurate information regarding the past or present Mi'kmaq use or occupation relevant to the Project's location 3. Completing field sampling and site visits o Method to gather and document plants, trees, animal signs/tracks, fish and wildlife habitats, or any other land feature which would hold significance to the Mi'kmaq o Site visits occurred in October of 2022
Step 5: Address potential project-specific impacts	No project-specific impacts have been identified by the Mi'kmaq. The Proponent has committed to working with CMM to ensure that Mi'kmaq monitors are present at the Project site during ground-disturbance work during construction. The Proponent is additionally continuing to engage with CMM to scope the work associated with supporting their Moose Guardian Program

	since the Project is located within a Mainland Moose Concentration Area. The Proponent remains open to any feedback from the Mi'kmaq and actively seeks it out through ongoing communications with the bands, NCNS, KMKNO, and CMM.
Step 6: Document the engagement process	All engagement with the Mi'kmaq has been recorded. A communication log that lists all contact with the Mi'kmaq bands, NCNS, KMKNO, and CMM has and will be continually updated. The current logs are attached in Appendix B and C.

3.4.2 Indirect Engagement Activities

In addition to the direct activities that have been listed above, the Proponent is also performing indirect engagement activities. These activities are listed and detailed below.

Webpage, email, and social media

Project webpages are a great tool to share information and for receiving comments from community members. The advantages of a website are that it can be updated frequently, and it is continuously available to stakeholders and rightsholders. The webpage is primarily used to inform the general public, stakeholders, and First Nations about various aspects of the proposed development, including:

- Current project information;
- Notices for public information sessions;
- Maps of the Project location;
- Site specific turbine information;
- Posting of technical reports such as the EIA document;
- Project activity schedules;
- Construction activity notices; and
- Educational and media related material.

Additionally, the 'Frequently Asked Questions' section on the website allows the Proponent to address questions and concerns brought forward through all engagement and consulting activities.

A project-specific webpage was created when the Project was originally being developed in 2011. Since then, many updates and an additional webpage have been added. This has ensured that information has been available to community members should they wish to learn more about the Project. The Project webpage can be viewed at:

www.clydesdaleridgewindproject.ca

The current content of the webpage has been attached in Appendix D: Project Website. This webpage is updated on an ongoing basis.

The webpage has both a comment form, as well as a newsletter sign-up sheet. This way, individuals can have their questions answered quickly, sign-up to receive regular correspondence, or both.

Email has and will continue to be used to contact the Mi'kmaq bands and organizations, answer questions, plan engagement activities, distribute newsletters, and send Project updates. All email communication has been included in the consultation logs in Appendices B and C.

Signage

When the Project advances to construction and operation, signage will be posted at the site entry to identify the Project, the primary contact, and the presence of hazards, such as ice throw during certain weather conditions. The Proponent will use signage as an opportunity to provide additional information about the Project, including about the construction schedule. At a minimum, signage will include contact information for Proponent staff.

Other Engagement Tools

There are many other engagement tools that the Proponent may implement in discussion with community members. These include, but are not limited to:

Participation in community events: BBQs, sporting events, and other gatherings can allow an opportunity for the Proponent to have informal discussions about the Project with community members.

Workshops: Workshops can be facilitated in many different formats and for a number of different objectives, which include education by using theoretical design exercises; empowerment by using a World Café format; and joint fact finding on specific issues of interest or concern.

Expert visits: If a key area of concern is identified, an expert can be integrated into the engagement process as opposed to working solely with the proponent. Experts may attend a meeting, presentation, or community workshop as most appropriate to the level of interest and the issue of concern.

These additional engagement tools will be used when a specific need or synergy exists, on an opportunistic basis or when a specific need is identified that would be of benefit to the concerned Nation.

4 Mi'kmaq Engagement Results

As mentioned in the previous section, the meetings and general correspondence with the Mi'kmaq in Nova Scotia have resulted in some questions and requests. This section will list these items, the communications they arose from, and the ways in which the Proponent is working with these communities to address them.

KMKNO

Throughout the many years of engagement, KMKNO has provided insight and guidance for the Proponent. The following are the main topics have been raised throughout these email exchanges, meetings, and presentations:

- The hiring of Mi'kmaq monitors,
- Communication protocol with KMKNO,
- Best practice for who and how to reach out directly to the Mi'kmaq bands, and
- Process and contacts for conducting a MEKS.

The Proponent has worked consistently with KMKNO and prioritizes ensuring they have the most up to date information where they are often a first point of contact for communities with questions or concerns about proposed projects. The Proponent will continue to work with KMKNO on these actions and remain flexible in addressing future topics.

NCNS

Following the meeting with NCNS, a list of concerns was raised. These were:

- To add members of the NCNS to the Rightsholder mailing list,
- To determine whether fire-arm restrictions would change on new site roads on Crown lands, and
- For the previous name of WMA.

All of these requests were immediately followed up on. The internal actions were undertaken, while Crown lands were contacted regarding the use of fire-arms on newly constructed roads. In addition to this list, the NCNS also asked that the Proponent engage more with NCNS, as well as MAPC. In response to this, more of their contacts were added to the Rightsholder mailing list and were invited to the next open house.

CMM

Through discussions with CMM and prior to the completion on the newest MEKS, CMM staff recommended that the Proponent hire a Mi'kmaq monitor to assist with vegetation field studies for the Project to ensure that species of cultural significance to the Mi'kmaq are properly identified. CMM further recommended that monitors be hired from the nearest Mi'kmaq bands, if possible. The Proponent, through Strum Consulting who has been overseeing the environmental field surveys, made efforts to hire a Mi'kmaq monitor, but found there was no interest in the position. To resolve this hiring challenge in the future, CMM is working to develop a network of people interested in filling this type of monitoring position. The Proponent is continuing conversations with CMM about how best to hire monitors in the interim and how to support the development of this network.

CMM staff additionally recommended that the Proponent hire Mi'kmaq monitors to be present on site during any ground disturbance activities during Project construction. The Proponent is committed to doing this.

CMM has also been committing effort to re-energizing their Moose Guardian Program. Where the Project is located within a Mainland Moose Concentration Area, the Proponent is continuing conversations with CMM about how it can support this program.

Mi'kmaq Ecological Knowledge Study (MEKS)

As mentioned, the Proponent contracted Membertou Geomatics to complete an MEKS for the Project. By adhering to the Mi'kmaq Ecological Knowledge Study Protocol, 2nd Edition (2014), this study identified traditional and current Mi'kmaq uses of the land in the vicinity of the Project and incorporated a Mi'kmaq Significant Species Analysis. This report has been reviewed by KMKNO and provided with the Environmental Assessment. An overview of the conclusions of the MEKS are as follows:

- The Project Site and Study Area are within the Traditional Political District of Sipekni'katik of the central area of Nova Scotia
- There are no recorded traditional hunting territories with the study area
- There are potential natural resources within the Cobequid Hills
    - Rhyolite: stone of suitable properties for tools and weapons for early peoples
    - Reported Black Ash: for tool handles and basket making
- A review of Specific Claims shows no current and active First Nation Claims within the Project Study Area
    - It is possible that an "Indian Village" is the subject of a Specific Claim by Paq'tnkek First Nation regarding unlawful granting of 250 acres without surrender in 1827 – the status on that claim is "Concluded"
- Based on the data documented and analyzed, it was concluded that there is some Mi'kmaq activity reported on the Project Site
    - Activities in the Project Site include Berry harvesting, Trout fishing, and Deer, Rabbit, and Partridge hunting
    - All usage period-categorization breaks down as follows;
        - Current Use: ~1%
        - Recent Past: ~54%
        - Historic Past: ~45%

Based on the feedback provided in the MEKS, no large changes were required to be made to the Project design. The report and feedback are considered in all Project changes. Additionally, the Proponent has gained an increased understanding of the traditional Mi'kmaq uses of the land on which the Project is sited and will continue to limit disturbance.

5 Continued Mi'kmaq Engagement and Next Steps

As Project development progresses, the Proponent will continue to engage with the Mi'kmaq through regular update letters, open houses, meetings, presentations, emails, and frequent website updates. In addition, the Proponent will maintain efforts to hire Mi'kmaq individuals and businesses, especially those who are near the Project site.

In addition to the regular engagement activities, the Proponent has also created a Complaint Resolution Plan as part of the environmental assessment process. The plan identifies the appropriate individual to contact should there be any concerns about negative impacts affecting community members or to the environment caused by the Project. The Complaint Resolution Plan also outlines how concerns from the Mi'kmaq and other stakeholders will be addressed concerning the Project. This plan is attached in Appendix E. The Proponent is committed to act diligently to address any concerns raised in a timely manner.

Overall, the Proponent is committed to continuing consultation and engagement with the Mi'kmaq bands and organizations throughout the lifetime of the Project to ensure their concerns are properly addressed and that the bands have a full understanding of the Project, its schedule, construction activities, and work to be carried out. All feedback received has and will continue to be integrated into Project planning and design.

6 Closure

This Mi'kmaq Engagement Plan outlines the Proponent's approach to facilitating an open, transparent, and comprehensive dialogue with the Mi'kmaq in Nova Scotia. This plan aims to fulfill the procedural aspects of Mi'kmaq Consultation delegated to the Proponent by the Province, and to ensure that best engagement practices are being met or exceeded. The Proponent has developed this report to outline the efforts that have and will continue to be used to notify, inform, engage, and consult with the Mi'kmaq about the Project.

The Proponent has and will continue to address comments and concerns from all Mi'kmaq communities and organizations to the best of their abilities. To date, the Proponent has not received opposition to the proposed Project. Generally, the Project has been very well received.

The Proponent is committed to continuing engagement with the Mi'kmaq throughout the lifetime of the Project to ensure their concerns are properly addressed and that they have a full understanding of the Project, its schedule, and work to be carried out.

7 References

Assembly of Nova Scotia Mi'kmaq Chiefs. 2014. Mi'kmaq Ecological Knowledge Study Protocol. 2nd edition.

Nova Scotia Office of Aboriginal Affairs. 2012. Proponents' Guide: The Role of Proponents in Crown Consultation with the Mi'kmaq of Nova Scotia

Appendix A: Example Project Update Letters

1801 HOLLIS ST. SUITE 1205 HALIFAX, NS B3J 3N4 | (902) 422-9663 | NATURALFORCES.CA

Kwilmu'kw Maw-klusuaqn
75 Treaty Trail
Millbrook, NS
B6L 1W3

From: Meg Morris
Re: Update on Nova Scotia Projects

August 24, 2022

Dear Ms. Gaudet,

As you know, Natural Forces, a private independent power producer based in Halifax, is working in partnership with Wskijinu'k Mtno'taqnuow Agency (the Agency) to develop several wind energy projects in Nova Scotia. These projects will displace energy produced by fossil fuels and contribute to achieving the goal set by the Province of Nova Scotia to have 80% renewables on the electrical grid by 2030. In May 2022, Natural Forces, on behalf of the partnership with the Agency, submitted proposals for the projects into the Rate Based Procurement request for proposals. We are now thrilled to announce that we have been selected to build the Benjamins Mill Wind Project, an 8 turbine, 33.6 MW project in Hants County.

Below is further information on the Benjamins Mill Wind Project, as well as the other three projects currently in development with the Agency. Engagement with all 13 Mi'kmaw bands, KMKNO, and CMM is ongoing and will continue throughout the lifetime of the projects.

Benjamins Mill Wind Project

The proposed Benjamins Mill Wind Project has the potential to be up to 35 wind turbine generators capable of producing up to 150 MW of renewable energy. The first phase of this project, consisting of 8 wind turbines that will produce 33.6 MW, has been awarded a power contract with Nova Scotia Power through Nova Scotia's Rate Base Procurement program. This project is located approximately 15 km southwest of Windsor on a mix of private and provincial Crown lands.

This project is in an advanced stage of development with construction scheduled to begin in 2023 and commissioning in 2024, pending approval of all required permits. Below is an updated list of development work completed and ongoing for the project:

- Private lands have been secured and there is an active Crown land lease application;
- Wind data is actively being collected on site;
- Two public open houses were hosted – in-person in July 2021 and virtually in January 2022 - and a third open house is planned for October 2022;

- The environmental impact assessment (EIA) was submitted to the Province in January 2022; further environmental studies are now being conducted and Natural Forces is working on responses to the Minister's Additional Information Request;
- A power contract with Nova Scotia Power was secured through the provincial Rate Base Procurement program.

<u>Westchester Wind Project</u>

The proposed Westchester Wind Project consists of up to 12 wind turbines capable of producing up to 50 MW of renewable energy. The project site is on privately owned lands near Westchester Station in Cumberland County. Below is an updated list of development work completed and ongoing for the project:

- Sufficient private lands have been secured for the project with some additional lands still under negotiation;
- Wind data is actively being collected on site;
- The first open house was held in-person in July 2021 and a second open house is planned for November 2022;
- The EIA was submitted to the Province on February 2022; further environmental studies are now being conducted and Natural Forces is working on responses to the Minister's Additional Information Request.

<u>Aulds Mountain III Wind Project</u>

The proposed Aulds Mountain III Wind Project consists of up to 12 wind turbines capable of producing up to 50 MW of renewable energy. The project site is on a mix of privately owned and provincial Crown land near Piedmont in Pictou County. Natural Forces currently has three operational wind turbines adjacent to the proposed project site. Below is an updated list of development work completed and ongoing for the project:

- Many of the private lands have been secured with negotiations ongoing for additional lands and an active lease application for the Crown land;
- The first open house was held in-person in May 2022;
- Environmental surveys began in 2022.

<u>Clydesdale Ridge Wind Project</u>

The proposed Clydesdale Ridge Wind Project consists of up to 24 wind turbines project capable of producing up to 68 MW of renewable energy. The project site is on privately owned land about 25 km west of New Glasgow in Colchester County. This project is being developed in collaboration with Dalhousie Mountain Wind Energy Inc and is adjacent to the Dalhousie Mountain Wind Farm. Below is an updated list of development work completed and ongoing for the project:

- Many of the private lands have been secured;

- Six open houses have been hosted in the community since 2012;
- An environmental assessment for the project was approved in 2012 and extended in 2017; however, a new environmental assessment will be required for the project, the environmental surveys for which began in 2022.

Next Steps

The development work will continue for all of these projects, including future phases of the Benjamins Mill Wind Project, to prepare for upcoming procurement opportunities, the first of which is the upcoming provincial Green Choice Program.

If you or any members in your community have any questions or comments regarding any of the mentioned projects or would like to set up a time to meet, please don't hesitate to reach out to me. I can be reached at 902-422-9663, or by email at mmorris@naturalforces.ca.

Thank you,

Meg Morris

Meg Morris
Development Manager
Natural Forces

1701 HOLLIS ST. SUITE 1200 HALIFAX, NS B3J 3M8 | (902) 422-9663 | NATURALFORCES.CA

Kwilmu'kw Maw-klusuaqn
75 Treaty Trail
Millbrook, NS
B6L 1W3

From: Meg Morris, Natural Forces
Re: Update on Nova Scotia Wind Energy Projects

May 21, 2024

Dear Ms. Gaudet,

As you know, Natural Forces, a private independent power producer based in Halifax, is working with various partners to develop several wind energy projects in Nova Scotia. These projects will displace energy produced by fossil fuels and contribute to achieving the goal set by the Province of Nova Scotia to have 80% renewables on the electrical grid by 2030. Below, we provide updates on these 4 proposed projects.

Natural Forces intends to bid the Westchester Wind Project, the Clydesdale Ridge Wind Project, Phase 2 of the Benjamins Mill Wind Project, and the Aulds Mountain III Wind Project into the upcoming provincial Green Choice Program Request for Proposals. Discussions are underway with Mi'kmaq communities throughout Nova Scotia regarding partnership opportunities for this program.

Benjamins Mill Wind Project

The proposed Benjamins Mill Wind Project consists of up to 28 wind turbine generators capable of producing approximately 150 MW of renewable energy. This project is located approximately 15 km southwest of Windsor on a mix of private and provincial Crown lands. Below is an updated list of development work completed and ongoing for the fulsome project:

- Private lands have been secured and there is an active Crown land lease application under review by provincial staff;
- An Environmental Assessment was approved by the Province in February 2023;
- A Development Agreement was signed with the West Hants Regional Municipality;
- A Mi'kmaq Ecological Knowledge Study was completed for the project;
- An open house was held for Glooscap First Nation, the nearest Mi'kmaq band to the project site in February 2023;
- Four public open houses were hosted – in-person in July 2021, virtually in January 2022, in-person October 2022, in person April 2023, with a fifth planned for May 2024.
- The first phase of this project consists of 8 wind turbines that will produce 33.6 MW and is being developed, and will be owned and operated, in partnership with Wskijinu'k Mtno'taqnuow Agency. The project has been awarded a power contract with Nova Scotia Power through the Nova Scotia Rate Base Procurement program. Site

preparation began in the fall of 2023 with tree clearing and grubbing. Construction began in March 2024 with the civil works associated with access roads, crane pads, substation and turbine foundations, and electrical infrastructure. Construction will continue throughout 2024.

Westchester Wind Project

The proposed Westchester Wind Project consists of up to 12 wind turbines capable of producing approximately 50 - 84 MW of renewable energy. The project site is on privately owned lands near Westchester Station in Cumberland County. Below is an updated list of development work completed and ongoing for the project:

- The private lands have been secured for the project;
- An application has been submitted for a license to cross a small provincial Crown land parcel for a potential access to the project site;
- An Environmental Assessment was approved by the Province in February 2023;
- A Mi'kmaq Ecological Knowledge Study was completed for the project;
- An application has been made to Cumberland County for a Development Agreement for the project;
- Four open houses were hosted in-person in July 2021, two in February 2023, and March 2024.

Clydesdale Ridge Wind Project

The proposed Clydesdale Ridge Wind Project consists of up to 18 wind turbines capable of producing approximately 70 MW of renewable energy. The project site is on privately owned land about 25 km west of New Glasgow in Colchester County. This project is being developed in collaboration with RMS Energy, another wind developer based in Nova Scotia, and is adjacent to the Dalhousie Mountain Wind Farm. Below is an updated list of development work completed and ongoing for the project:

- The private lands have been secured;
- Eight open houses have been hosted in the community since 2012, with the most recent hosted in April 2024;
- A Mi'kmaq Ecological Knowledge Study was completed for the project;
- An Environmental Assessment for the project was approved in 2012 and extended in 2017; however, a new environmental assessment will be required for the project, the environmental surveys for which began in 2022. The Environmental Assessment will be submitted in August 2024.

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Aulds Mountain III Wind Project

The proposed Aulds Mountain III Wind Project consists of up to 12 wind turbines capable of producing approximately 50 MW of renewable energy. The project site is on a mix of privately owned and provincial Crown land near Piedmont in Pictou County. Natural Forces currently has three operational wind turbines adjacent to the proposed project site. Below is an updated list of development work completed and ongoing for the project:

- Many of the private lands have been secured with negotiations ongoing for additional lands and an active lease application for the Crown land;
- A Mi'kmaq Ecological Knowledge Study was completed for the project;
- The first open house was held in-person in May 2022.

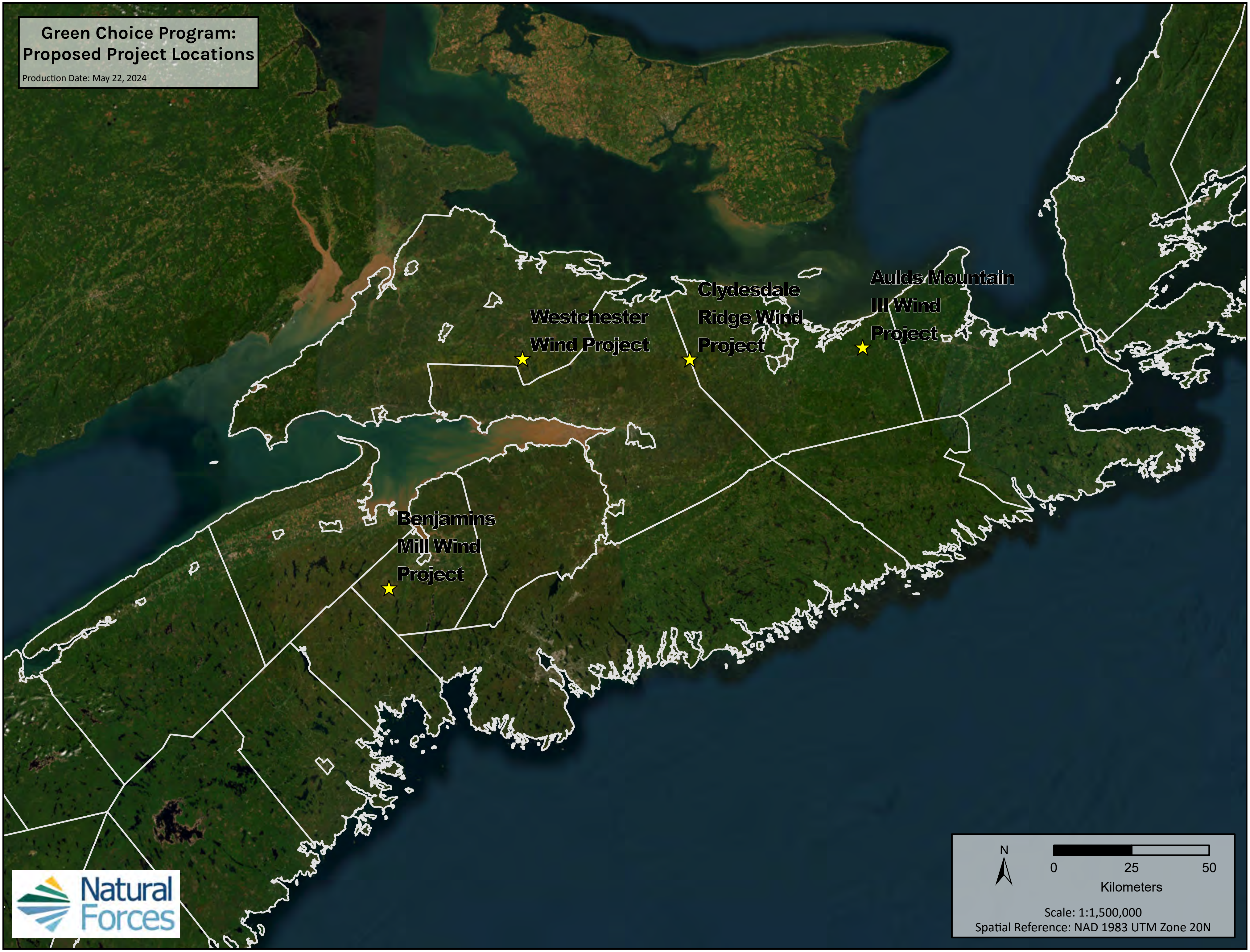
Next Steps

The development work will continue for all of these projects, including future phases of the Benjamins Mill Wind Project, to prepare for upcoming procurement opportunities, the first of which is the upcoming provincial Green Choice Program.

If you or any members in your community have any questions or comments regarding any of the mentioned projects or would like to set up a time to meet, please don't hesitate to reach out to me. I can be reached at 902-422-9663, or by email at mmorris@naturalforces.ca.

Thank you,

Meg Morris
Project Manager
Natural Forces


Green Choice Program:
Proposed Project Locations
Production Date: May 22, 2024
Westchester Wind Project
Clydesdale Ridge Wind Project
Aulds Mountain III Wind Project
Benjamins Mill Wind Project
N
0
25
50
Kilometers
Scale: 1:1,500,000
Spatial Reference: NAD 1983 UTM Zone 20N
Natural Forces

Appendix B: Consultation Log (2012 Environmental Assessment)

121510812

Dalhousie Mountain Wind Farm

CLYDESDALE RIDGE WIND LP

Clydesdale Ridge Wind Farm Environmental Assessment Registration

May 2012

Stantec

Table 3.4 Mi'kmaq Engagement Efforts Conducted in Support of the Clydesdale Ridge Wind Farm Project

Association/Contact	Dates	Topic	Comments
Mi'kmaq Rights Initiative (KMK)	December 2011, May 2012	Mi'kmaq interests	• Phone conversation with KMK discussing Clydesdale project and up to date consultation with CMM, Pictou Landing • Provided KMK copy of archaeological report • Invited KMK to Open House • Update of Clydesdale project activities and timeframes and provided copy of archaeological repot
Confederacy of Mainland Mi'kmaq (CMM)	December 2011, May 2012	MEKS	• CMM representative received site tour of the Dalhousie Mountain Wind Farm • Proponent has engaged CMM and received a proposal to commission a new MEKS for Phase II in April 2012 • Provided CMM copy of archaeological report and invitation to Open House in December • Proponent has contacted CMM to discuss ongoing timeline changes from April 2012 to August/ September 2012 in terms of contracting CMM to conduct a new MEKS upon receipt of PPA
Maritime Aboriginal People's Council (MAPC)/ Native Council of Nova Scotia (NCNS)	May 2012	Mi'kmaq interests	• Met with Roger Hunka and discussed vegetation and wildlife survey results • Will provide Mr. Hunka and staff of construction timelines and results of studies to ensure any harvesters are aware of the Proponents activities.
Local Band Council (Pictou Landing First Nation)	October 2011	Mi'kmaq interests	• Proponent offered site visit to Council members • Proponent spoke at council meeting, 4 of 6 Council were present, as well as the Chief and Manager • Proponent has spoken with Economic Development Officer on several occasions
	February 2012	Mi'kmaq interests	• Proponent discussed Project with four (of six) Council members, new Chief, and Band Manager • Proponent indicated MEKS would be updated pending PPA award • No specific issues raised by Band Council

Appendix C: Consultation Log (to July 2024)

Clydesdale Rightsholder Communication Log

Correspondence Date	Rightsholder Affiliation	Method	Proponent Member	Items Discussed
Various over the 10 years	Mi'kmaq Rights Initiative (KMK)	Telephone; digital information sharing; in person meetings	Twila Gaudet, Mellisa Nevin, Eric Christmas	Advising on the development of a benefits agreement to help construct and operate Clydesdale going forward to help with seeing through those benefits and the relationships we form with partners in the project
September 13, 2021 September 15, 2021 September 21, 2021 September 27, 2021 September 28, 2021 October 7, 2021	Confederacy of Mainland Mi'kmaq	Email Presentation Email Email Email / Presentation Email	Norma Prosper	Project updates and to update chief and council Presented Clydesdale Project and potential partnership
August 3, 2021 August 4, 2021 August 18, 2021 August 24, 2021 September 2, 2021 September 7, 2021 September 29, 2021 October 7, 2021 October 8, 2021 October 14, 2021 October 17, 2021	Maritime Aboriginal People's Council (MAPC) / Native Council of NS	Email Meeting Email Email Email Email Email Email Email Email Presentation	Roger Hunka, Josh McNeely	Project updates and overview Presented Clydesdale Project and potential partnership Presented the project details to NCNS Annual Meeting with the Chiefs of Nova Scotia Maintain contact for schedule to inform hunters/gatherers
September 13, 2021 September 14, 2021 September 21, 2021 October 7, 2021	Pictou Landing First Nation	Email Email Presentation Email	Band Council and Chief, elementary school Jeff S., Barry F., Gord J.	Presentation to council, proposed site visit, presentation to school Project updates and to update Chief and COuncil Presented Clydesdale Project and potential partnership
October 07, 2020 November 30, 2020	Millbrook First Nation	Email Email	Terry French, Financial Manager of Millbrook First Nation	Invitation to Millbrook for partnership with Clydesdale Set up scholarship for grade 12 students from Millbrook Clydesdale Project overview and meeting invites
	Nova Scotia Office of Aboriginal Affairs		Beata Dera	
24-Mar-22	Confederacy of Mainland Mi'kmaq	Teams	Meg Morris; Megan MacIsaac	MM and MM presented slides introducing NF, partnership, projects, development work, etc. AC asked what role CMM should play given partnership with WMA; MM to ask WMA. MM and MEM asked to stay in touch about Moose Guardian Program and monitoring efforts.
04-Apr-22	Confederacy of Mainland Mi'kmaq	Email	Megan MacIsaac,Meg Morris	MM requesting estimate of rates for environmental monitoring throughout all project stages. AK responded with a seasonal rate and noted setting up a standard offer with CMM for environmnetal services would be the most effecitve. MEM passed along this information and contact details to Dillon on April 27
21-Jun-22	Confederacy of Mainland Mi'kmaq	Email	Megan MacIsaac,Meg Morris	MEM followed up to request further details on how NF can support the Mainland Moose Guardians Program, and offered ability to support other programming as well.
02-Apr-24	Confederacy of Mainland Mi'kmaq and Mi'kmaq Rights Initiative (KMK)	Teams	Megan MacIsaac,Meg Morris,Kellan Duke	MM introduced NF and projects in NS; discussion followed about Moose Guardian Program and Mi'kmaw Forestry Initiative and how NF/RMS could support
10-Apr-24	Millbrook First Nation	Email	Austen Hughes	Proponent supplied slide deck containing info on partnerships and GCP materials
10-Apr-24	Potlotek First Nation	Email	Austen Hughes	Proponent supplied slide deck containing in on potential partnerships and related GCP materials
10-Apr-24	Potlotek First Nation	Emial	Austen Hughes	Darryl reached out informing there is a council meeting this Tuesday and typicially every 2 weeks after that, related to meeting attempting to be scheduled
10-Apr-24	Potlotek First Nation	Email	Austen Hughes	Proponent informed that date requested to meet would be too soon, asked if a date roughly 2 weeks out would work. After, Proponent offered to meet via Teams and discuss materials sent prior to this
23-Apr-24	Confederacy of Mainland Mi'kmaq	Email	Megan MacIsaac,Meg Morris	MEM requested a letter of support for BM,WMT GCP bids
18-Apr-24	Mi'kmaq Rights Initiative (KMK)	Email, Teams	Meg Morris, Megan Macisaac	Met with PB to provide update on the project, an overview of the GCP RFP, and discuss how we can best work together. PB followed up with contacts for Mi'kmaq rights awareness training and MM followed up with summary project information for reference.
22-May-24	All Mi'kmaq Chiefs	Email, Mail	Meg Morris	MM sent letter with updates on the projects to all Chiefs with KMKNO and appropriate Consultation Managers in copy on the emails.
22-May-24	Mi'kmaq Rights Initiative (KMK)	Email, Mail	Meg Morris	MM sent same letter as to Chiefs with updates on the project to KMKNO staff.
22-May-24	Confederacy of Mainland Mi'kmaq	Email, Mail	Meg Morris	MM sent same letter as to Chiefs with updates on the project to CMM staff.

22-May-24	Native Council of NS	Email, Mail	Meg Morris	MM sent letter with updates on the project to Chief.
03-Jun-24	Sipekne'katik First Nation	Email	Meg Morris	MC replied to MM's update letter to Chief Glasgow requesting further information. MM gathering information to provide a response

Appendix D: Project Website (July 2024)

English French

Natural Forces
(https://www.naturalforces.ca)

Table of Contents

CLYDESDALE RIDGE WIND PROJECT

SHARE

Community Liaison Committee

A Community Liaison Committee (CLC) facilitates communication between project proponents, local community members, and special interest groups throughout the lifetime of a project. The project partners are seeking interest in the formation of a CLC for the Clydesdale Ridge Wind Project to discuss project information and any local ideas and concerns. If you are interested in joining a CLC for the Project in a voluntary capacity, please reach out to us at the contact information below.

NOVEMBER 2, 2023 UPDATE:

Natural Forces and RMS Energy intend to bid the proposed Clydesdale Ridge Wind Project into the provincial Green Choice Program Request for Proposals. Updates will be posted here on the project website and will be sent to our mailing list, which you can join below. The following notice was sent to members of the surrounding community:

November 2023 Green Choice Program Notice (https://www.naturalforces.ca/wp-content/uploads/2023/12/clydesdale_ridge_-_gcp_notice_-_nov_2_2023.pdf)

MAILING LIST

To join the mailing list for the Clydesdale Ridge Wind Project, please click on the link below and fill out your contact information.

CLICK HERE TO JOIN THE CLYDESDALE RIDGE WIND PROJECT MAILING LIST (HTTPS://FORMS.GLE/D1FFJHVNJQ6T1URG9)

About The Project

This project is located in Mi'kmaki, the ancestral territory of the Mi'kmaq. Natural Forces acknowledges that working on these lands is a privilege that comes with a great deal of responsibility. We believe that private companies have an important role to play in the decolonization of the energy sector and, ultimately, the path towards reconciliation through partnerships and meaningful engagement. To honour and achieve this, we must look forward for generations and integrate the practices and knowledge of the original land stewards, the Mi'kmaq, into project planning.

The proposed Clydesdale Ridge Wind Project is being developed by a partnership formed between Natural Forces and RMS Energy who will together develop, construct, operate, and own the project.

The initial plans are for the proposed project to consist of up to an estimated 18 wind turbines. Depending on which wind turbine generators are deemed most appropriate for the project, these 18 turbines could have a total installed capacity up to approximately 70 MW. The project is located on the border between Colchester County and Pictou County in the Berichan area, approximately 7 km northwest of the operational Dalhousie Mountain Wind Farm.

Project Milestone Timeline

- **December 2021 – January 2022** – three open houses were hosted at the Kemptown Community Hall, two open houses were hosted at the Dalhousie Mt Snowmobile Clubhouse, and one open house was hosted at the West River Fire Hall
- **April 2022** – New environmental studies began on site
- **May 2022** – Project was bid into the Nova Scotia Rate Base Procurement Program
- **February 2023** – The new Colchester County Wind Turbine Development Bylaw came into effect. Information can be found here (https://www.colchester.ca/wind-turbine).
- **September 2023** – Two meteorological towers were installed on site to collect wind resource data

- **November 2023** – Notice sent to community members of the intention to bid the project into the Green Choice Program
- **March 2023** – Public information session held at the Kemptown Community Centre (59 Loop Old Hwy 4, Kemptown, NS B6L 2M4), 4-7 pm.

Who is proposing this project?

RMS ENERGY

RMS Energy is a full service wind turbine maintenance company based in Nova Scotia. RMS Energy oversees several different aspects of wind energy: development; construction; management; and operations including maintenance of large scale and community-based projects.

Alongside involvement in other wind projects in Nova Scotia, RMS Energy maintains and operates the Dalhousie Mountain Wind Farm near Mount Thom, Nova Scotia.

To learn more about RMS Energy, please visit their website here (https://rmsenergy.ca/).

Natural Forces

Natural Forces is an independent power producer that develops, owns, and operates renewable energy projects. Natural Forces was established in 2001 and has its head office in Halifax, NS, as well as regional offices in Chetwynd, British Columbia; Quispamsis, New Brunswick; Dublin, Ireland; and New York State. Collectively, Natural Forces has close to 300 MW of renewable energy projects in operation across Canada, with several ongoing projects at various stages of completion in Nova Scotia, New Brunswick, Prince Edward Island, Labrador, Saskatchewan, British Columbia, Ireland, and New York.

The senior management team at Natural Forces has over 70 years of combined renewable energy experience encompassing all project life cycle activities in a range of international locations including Canada, Ireland, Poland, the UK, and Australia. Natural Forces is an integrated developer and operator of renewable energy assets. The in-house team undertakes all activities from initial site selection, development, financing, construction, operations, and asset management. Our vision is to develop, construct, operate, and own clean renewable energy projects across Canada in partnership with local and Indigenous communities.

Why here?

When developing a wind project, it is crucial to find the most suitable location and community to host it. To do so, there are four main factors to consider during the site-finding phase of development:

- Wind resource
- Distance to existing electrical and civil infrastructure
- Environmental sensitivity
- Socio-economic concerns

Nova Scotia has excellent wind resources, so generating electricity is feasible in many locations around the province. Factors other than the strength and consistency of the wind must be taken into account when considering a site, such as proximity to the electricity grid, road access, ecology, archaeology, and cultural significance, proximity to residential dwellings, and health concerns.

The location of the proposed Clydesdale Ridge Wind Project was selected after a thorough review of all of these factors.

Public & Stakeholder Engagement

The development of wind energy in Nova Scotia provides a clean and stable source of energy and positively impacts local communities in a variety of ways. These include economic spinoff through the increase in demand of local goods and services and job creation, most notably during the construction phase. Natural Forces is committed to engaging with all stakeholders and stakeholder groups throughout the lifetime of the project, as we value community input greatly. Below are details on the newsletters that have been sent to our stakeholders, as well as summaries of the information that has been shared at our open houses.

Newsletters

The project partners have engaged with, and continues to engage with, stakeholders through a number of avenues, including newsletters. Each of the newsletters will be linked below:

- November 2023 (https://www.naturalforces.ca/wp-content/uploads/2023/12/clydesdale_ridge_ _gcp_notice_-_nov_2_2023.pdf)
- February 2024 (https://naturalforces.sharepoint.com/:b:/g/EcLZlEuhGgZFo6rRZskHT7MB5iMnl8uF_L1UCIjB1kjNnQ?e=9heWYa)

Open Houses

The project partners have held open houses to provide an opportunity for the community to engage with project staff. All of the information that will be presented at these open houses will be uploaded here.

March 2024 (https://naturalforces.sharepoint.com/:b:/g/ERgNlj8OhmtFuBvHwjmgmokBb e=HMvPVe)

The project partners will continue to host open houses throughout all phases of the project.

What is the process?

1
Development
(Current Stage)

- Assess the wind resource
- Survey for environmentally sensitive features
- Optimize turbine location to capture the wind efficiently and minimize impact on sensitive features
- Begin consultation with regulators and the public
- Conduct and present the Environmental Impact Assessment for environmental approval
- Apply for road, work and construction permits

2
Construction

- Clear trees for roads and turbine pads
- Build access roads and pad areas
- Pour the turbine foundation
- Assemble the wind turbine
- Connect to NS Power's electrical grid

3
Operation

- Commission the wind turbines to start producing power
- Conduct post-construction wildlife monitoring
- Monitor remotely for real time alerts when additional maintenance is needed

- Operate for 30 years

4
Decommission or Retrofit

- Assess wind turbines after 30 years
- Decommission wind turbines in 3-6 months
- Reclaim the site to its former state OR
- Receive approvals and permits to retrofit the turbine to continue harnessing energy

Environmental Assessment

In Nova Scotia, any wind projects that exceed 2 MW in size are required to complete a provincial environmental impact assessment (EIA). During this process, an entire committee made of provincial and federal agencies evaluate the location and overall impact of the project on the surrounding environment and the public. As the Clydesdale Ridge Wind Project will produce up to approximately 70 MW of electricity, it is subject to an EIA.

To fully assess the potential environmental impacts of the project, the following comprehensive studies are being conducted:

- Wetlands and Watercourses Surveys
- Bird and Bat Surveys
- Mainland Moose Surveys
- Vegetation and Habitat Surveys
- Noise and Visual Assessments
- Radiocommunication Impact Assessments
- Archaeological Assessments

While the project did gain EIA approval from the Nova Scotia Minister of Environment and Climate Change in August 2012, due to the time that has passed, the project partners are working to complete a new EIA. As such, experts, including biologists, botanists, and birders, were hired in 2022 to begin environmental studies on the project site and have continued their work through 2023. The final studies will be carried out in 2024. The results from these studies will be compiled in the EIA document that will be registered with the province. When complete, the full EIA document and the associated studies will be available for download below.

More information on the EIA process can be found on the provincial EIA website. (https://novascotia.ca/nse/ea/)

Frequently Asked Questions

- **Will there be an impact to the environment?**
- **How close are the turbines to residences?**
- **Are wind turbines bad for my health?**
- **How did Natural Forces get the land for this project?**
- **Can local companies take part during construction?**
- **Are wind turbines noisy?**

For more information contact:

Meg Morris, Project Manager
902-483-9592
community@naturalforces.ca

MORE PROJECTS

(https://www.naturalforces.ca/projects/westchester-wind-project/)

Westchester Wind Project…

The initial plans are for the proposed project to consist of an estimated 10-12 wind turbines that will have an installed capacity of approximately 5…

GO TO PROJECT (HTTPS://WWW.NATURALFORCES.CA/PROJECTS/WESTCHESTER-WIND-PROJECT/)

(https://www.naturalforces.ca/projects/wejipek-wind-project/)

Wejipek Wind Project (https://www.naturalfor…

Welcome to the website for the proposed Wejipek Wind Project! This website was created to provide information to community members,…

GO TO PROJECT (HTTPS://WWW.NATURALFORCES.CA/PROJECTS/WEJIPEK-WIND-PROJECT/)

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Appendix E: Complaint Resolution Plan

COMPLAINT RESOLUTION PLAN

Clydesdale Ridge Wind Project

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Clydesdale Holdings Ltd.
1701 Hollis St Suite 1200
Halifax, NS B3J 3M8
naturalforces.ca

Overview

The Clydesdale Ridge Wind Project (the Project) is being developed by Clydesdale Holdings Ltd. (the Proponent). The Proponent represents a partnership between Natural Forces Developments Limited Partnership (Natural Forces) and Dalhousie Mountain Wind Energy Inc. The Proponent is further partnering with Mi'kmaq bands in Nova Scotia to ultimately develop, construct, own, and operate the Project.

The Project consists of up to 18 wind turbine generators (WTGs) and is situated adjacent to the operational Dalhousie Mountain Wind Farm, which is owned and operated by an affiliate of Dalhousie Mountain Wind Energy Inc. The Project is located near Mount Thom, Earltown, Loganville, and Berichan in both Colchester County and Pictou County. The proposed WTG locations and associated infrastructure are predominantly on privately-owned lands owned by multiple landowners, with a portion of the access road and collector lines traversing provincial Crown land. The private lands are secured under Lease, Option to Lease, and Easement. The Proponent has an active application for an Easement over the provincial Crown land.

Purpose

The purpose of this plan is to ensure all public concerns are addressed consistently and effectively. The Proponent aims to:

- Manage concerns and complaints openly, promptly and properly;
- Resolve concerns and complaints as soon as possible; and
- Learn from the issues and minimize any impacts the Project has on the community.

Scope

This plan details how concerns can be reported to the Proponent regarding the Project, and how the Proponent will address those concerns.

Procedure

All concerns or complaints related to the Project can be directed to the communications phone line:

Natural Forces
Address: 1701 Hollis Street, Suite 1200, Halifax, NS, B3J 3M8
Phone: 902-483-9592

The complainant will be notified upon receipt of the complaint, which will be recorded in a Complaint Log maintained by the Proponent person of contact. The Proponent will start the review process for complaints within 5 business days of the concern or complaint being received. The Proponent will then conduct an investigation into the complaint in collaboration with relevant parties. Once the investigation is completed, the complainant will be notified of how the concern was or will be addressed.

The Complaint Log will be kept on file, along with records of communication, discussions and correspondence with the complainant. The Complaint Log will include the following information:

- Manage concerns and complaints openly, promptly and properly;
- Resolve concerns and complaints as soon as possible; and
- Learn from the issues and minimize any impacts the Project has on the community.
- Date and time that the complaint was received;
- Date and time that the complaint incident occurred;
- Complainant's name and contact information;
- Location and nature of complaint (e.g., sound levels, dust, shadow flicker, traffic, vibrations, etc.);
- Procedure and result of any investigation or follow-up; and,
- Weather conditions and meteorological measurements at the time of the complaint (in most cases, these conditions could be used to better understand and address the complaint).

Sound Levels and Shadow Flicker

Complaints regarding sound levels and shadow flicker will be assessed on a case-by-case basis. The Proponent will follow the steps listed below in resolving the issue:

1) Conduct an investigation to understand the conditions under which elevated sound levels or shadow flicker issues are experienced. The specific date, time, location of observed shadow flicker, and local weather conditions (including wind direction and wind speed) will be noted for each incident of elevated sound levels or shadow flicker, as well as the duration of the event.
2) If it is determined from the investigation that the shadow flicker was caused by the Project, the Operations Team for the Project will work to identify the best mitigation based on the circumstances, such as screening using vegetation.
3) The Operations Team will track any such events along with the supporting data, and will track the success of any mitigation measures employed in consultation with the complainant, which will inform future resolutions.

The complainant will also be asked to record any additional incidents or occurrences.

If several occurrences of issues regarding sound levels and/or shadow flicker that arise from the Project, an assessment of the causes of the impacts will be conducted and a monitoring program will be developed and implemented in consultation with the complainant.

Mitigation measures to reduce sound levels and shadow flicker have been described in the Environmental Impact Assessment.

Construction and Operation

Complaints regarding construction and operation activities will be discussed with workers or contractors involved.

Solutions to the complaints will be established with worker(s) and contractor(s), and complainants will be informed of how issues are addressed.

If complaints persist, then worker(s) and contractor(s) may be dismissed.

Closure

This plan acts as a guidance document to result in the resolution of any complaints communicated to the Proponent about the Project. Ultimately, the situation of the individual complaints will more specifically inform the procedure followed to address them.

If the complainant is not satisfied with the response from the Proponent in addressing their complaint, the complaint will be referred to a higher authority within the company to further resolve the issue.