WOCAWSON ENERGY PROJECT

Environmental Impact Assessment Registration

September 2018

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Executive Summary

This Environmental Impact Assessment has been prepared for the proposed Wocawson Energy Project by Natural Forces NB Inc. on behalf of the Proponent. The Proponent for the project will be Wocawson Energy Limited Partnership formed between Natural Forces NB Inc. and Tobique First Nation. The purpose of this document is to assess the potential environmental impact of the proposed Project on valued environmental components.

The Project is located on Crown Land in Cardwell Local Service District approximately 20 km northeast of Sussex, New Brunswick. This Project will consist of 6 - 12 Enercon wind turbine generators, a new substation, and the installation of 5.25km of new 69kV transmission line. The Project will have an installed capacity of 20 - 40MW, which is enough to power up to 6750 New Brunswick homes.

Construction activities required for the Wocawson Energy Project will include clearing vegetation and grading for access roads, crane pads and concrete turbine foundations, electrical laydown, installation of new collector lines and transmission lines, turbine delivery and erection, turbine commissioning, substation installation and site restoration and clean-up. Pre- construction activities are expected to begin in Q2 of 2018 and turbine commissioning is expected in Q4 2019.

Work completed as part of this Environmental Impact Assessment includes all study methodologies as well as desktop and field studies conducted. These studies have gathered background information to identify and assess potential impact to biophysical, physical, and socio-economic VECs. The Proponent has engaged the services of Dillon Consulting Ltd. who have completed Spring and Summer surveying efforts. Fall surveys will be completed from August – October and submitted as an Addendum. Field surveys completed include avian spring migration and breeding surveys, raptor surveys, waterfowl survey, wetland delineation, and vegetation surveys. The results of these studies have been compiled and are included in the assessment of the existing environment. Additional desktop and field surveys completed by the Proponent and third parties include an archaeological predictive model, species at risk potentials, current and future predicted climate comparisons, an electromagnetic interference study, and noise and shadow flicker assessments.

Further, a brief description of consultation efforts is provided. However, the Proponent will submit detailed information about their consultation efforts in a stand alone Public Consultation Summary Report during the review period.

Upon completion and compilation of field surveys a proper assessment of the potential Project impacts on the surrounding environment has been assessed for the following VECs:

- Ground Water
- Geophysical Conditions
- Atmospheric Conditions
- Wind Resource
- Noise
- Shadow Flicker and Visual Aesthetics
- Birds, Bats (Spring) and other wildlife
- Vegetation and Habitats
- Wetlands and Watercourses
- Fish Habitat
- Archaeological Resources
- Electromagnetic Interference
- Land Use and Property Values
- Vehicle Traffic and Pollution
- Public Health and Safety

Due to the timing of this submission the following datasets are yet to be compiled and presented and will be submitted as an addendum:

- Fall Avian Surveys
- All Bat Surveys
- Archaeological Test Pits
- Updated Vegetation Report – to include survey results along the transmission line access routes.
- Updated Aquatic Report – to include survey results along the transmission line access routes.
- Updated Wildlife Report - to include survey results along the transmission line access routes.

From the data that has currently been assessed it has been determined that no significant residual effects are predicted. The Proponent is committed to minimizing any potential for environmental impact as a result of the construction and operation of the Proposed Wocawson Energy Project and has therefore, outlined any post construction monitoring and mitigation details that may be required given the predicted impacts.

The Proponent believes that the turbine, substation, and transmission line locations demonstrated reduce many environmental concerns while providing an excellent opportunity to transform a heavily disturbed and fragmented site into a productive source of environmentally friendly renewable energy. The Wocawson Energy Project will also help to meet provincial goals of providing 40% renewable energy to the Province by 2020 and will support community economic development.

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*DUE TO THE TIMING OF THIS SUBMISSION FALL BIRD AND BAT MONITORING HAS NOT BEEN INCLUDED IN THIS REPORT. AN ADDENDUM WITH APPLICABLE DATA WILL FOLLOW.

** TRANSMISSION LINE ACCESS ROUTES WERE NOT DETERMINED UNTIL MID-AUGUST. BIOPHYSCIAL SURVEYS HAVE BEEN COMPLETED BUT DATA HAS NOT BEEN COMPILED FOR THIS REPORT. AN ADDENDUM WITH APPLICABLE DATA WILL FOLLOW SHORTLY.

*** ARCHAEOLOGICAL TEST PITS HAVE BEEN RECOMMENDED ALONG THE TRANSMISSION LINE. SHOVEL TESTS WILL BE COMPLETED ONCE POLE LOCATIONS ARE FINALIZED. RESULTS OF THE SHOVEL TESTS WILL BE PROVIDED AS AN ADDENDUM.

List of Acronyms

AAS	Aboriginal Affairs Secretariat
ACCDC	Atlantic Canada Conservation Data Center
AMO	Abandoned Mine Openings
AR5	Assessment Report #5 (IPCC)
CLC	Community Liaison Committee
COSEWIC	Committee of the Status of Endangered Wildlife in Canada
CRI	Canadian Rivers Institute
CWS	Canadian Wildlife Services
dB(A)	Decibel A-weighting
DELG	Department of Environment and Local Government
DERD	Department of Energy and Resource Development
DFO	Department of Fisheries and Oceans Canada
DND	Department of National Defence
EIA	Environmental Impact Assessment
ECCC	Environment and Climate Change Canada
EMF	Electromagnetic Field
EMI	Electromagnetic Interference
ESA	Environmentally Significant Area
IBA	Important Bird Area
IDF	Intensity-Duration-Frequency (rainfall curves)
IEC	International Electrotechnical Commission
IPCC	Intergovernmental Panel for Climate Change
km	Kilometer
KWRC	Kenebecasis Watershed Restoration Committee
LORESS	Locally Owned Renewable Energy that is Small Scale
MBBA	Maritime Breeding Bird Atlas
MET	Meteorological Tower
MTI	Mi'gmawe'l Tplu'taqnn Inc
MW	Megawatt
NBP	New Brunswick Power
OHS	Occupation Health and Safety (Act)
PC	Point Count
PID	Property Identification
PNA	Protected Natural Area
PPA	Power Purchase Agreement
Project	Wocawson Energy Project
Proponent	Wocawson Energy Limited Partnership

RABC	Radio Advisory Board of Canada
SAR	Species at Risk
SARA	Species at Risk Act (Canada)
SCADA	Supervisory Control and Data Acquisition
SOCC	Species of Conservation Concern
SPL	Sound Pressure Level
STP	Standardized Test Pits
SVA	Subtended Vertical Angle
TRC	Technical Review Committee
VEC	Valued Environmental Component
WAWA	Wetland and Watercourse Alteration
WEP	Wocawson Energy Project
WESP	Wetland Ecosystem Services Protocol
WTG	Wind Turbine Generator
ZVI	Zone of Visual Influence

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1.0 Proponent

1.1 Name

The Proponent for the project is the Wocawson (Wa·jow·son) Energy Limited Partnership formed between Natural Forces NB Inc. and Tobique First Nation. For clarification throughout this document, Natural Forces NB Inc (Natural Forces) is also the developer acting on behalf of the Proponent.

1.2 Address

1205-1801 Hollis Street, Halifax, NS, B3J 3N4

1.3 Chief Executive Officer

John Brereton – President of Natural Forces – jbrereton@naturalforces.ca – (902) 422-9663

1.4 Principal Contact Person

Amy Pellerin – Development Engineer at Natural Forces – apellerin@naturalforces.ca– (902) 422-9663

1.5 Property Ownership

The lands in which the project will reside are Crown Lands owned by the Province of New Brunswick. An Option agreement and Investigative License of Occupation were obtained from the province to study the wind resource in this area in April, 2017. Prior to construction, a License of Occupation to Construct and Operate will be obtained.

The Project will require New Brunswick Power (NBP) to install 5.25 km of new transmission line running to the north of the site. This line will cross four private land parcels. NBP has been in consultation with these landowners to obtain easements. NBP will own and operate the installed transmission line.

The Project will also make use of an existing unmaintained public road (Mitton Road) owned by the Department of Transportation and Infrastructure (DTI) and an existing forestry road.

1.6 Proponent Qualifications

The Proponent of the Wocawson Energy Project is the Wocawson Energy Limited Partnership. This Environmental Impact Assessment (EIA) report has been prepared by Natural Forces on behalf of this partnership.

Natural Forces was established in 2001, and has offices located in Halifax, Nova Scotia and Vancouver, British Columbia. Composed of a small team, Natural Forces has over 75 years of combined local, national, and international experience in the renewable energy sector. Natural Forces is a renewable energy

developer, constructor, operator, and long-term asset owner. Currently active in many of the major Canadian renewable energy markets, Natural Forces specifically focuses on wind, solar and small hydro technologies.

Natural Forces has a long and successful history of delivering permitted wind farms to a construction ready stage. By utilizing both third-party professional environmental consultants, and in-house environmental and engineering teams, projects are permitted and delivered on schedule while maintaining an economic competitiveness.

Natural Forces, in partnership with TransAlta Renewables developed, constructed, and co-owns New Brunswick's first wind farm: the Kent Hills Wind Farm l and ll which has an installed capacity of 150 MW. Additionally, Natural Forces and has recently conducted an EIA in New Brunswick for the Richibucto Wind Project in partnership with Pabineau First Nation.

In addition to these New Brunswick Projects, Natural Forces developed, constructed, owns and operates the following eight wind farms in Nova Scotia in partnership with community groups or stakeholders as shown in Table 1-1.

Table 1-1: Natural Forces wind energy projects.

Project Name	Partnerships	Number of WTGs	Rated Capacity
Fairmont Wind Farm	Wind4All – a CEDC	2	4.6 MW
Hillside Boularderie Wind Farm	Wind4All Communities – a CEDC	2	4 MW
Pictou Landing Wind Farm	Pictou Landing First nation and Wind4All Communities lll – a CEDC	1	1.6 MW
Gardiner Mines Wind Farm	Cape Breton University	3	5.4 MW
Gaetz Brook Wind Farm	Wind4All Communities – a CEDC	1	2.3 MW
Barrachois Wind Farm	Wind4All Communities IV	2	4 MW
Aulds Mountain Wind Farm	Wind4All Communities ll	2	4.6 MW
Amherst Community Wind Farm	The Assembly of Nova Scotia Mi'Kmaq Chiefs and Wind4AllCommunities lll	2	6 MW

Natural Forces has successfully permitted all of their wind farms in both Nova Scotia and New Brunswick. Eight of the sites were required to follow provincially legislated EIA processes under their respective provincial *Environmental Assessment Acts*. Natural Forces has worked closely with Provincial regulators, stakeholders, and First Nations on all previously approved projects, and are well versed in existing New Brunswick EIA legislation and guidelines. In addition to environmental and engineering teams, Natural Forces also possesses construction management, and operation teams who carry projects through to completion. With Natural Forces' experience permitting and constructing wind farms partnered with abundant traditional knowledge from Tobique First Nation, the Proponent is confident the Wocawson Energy Project can be constructed and commissioned with minimal environmental impact following expected timelines and budgets.

2.0 The Undertaking

2.1 Name of the Undertaking

The name of the undertaking is the Wocawson Energy Project (Project or WEP).

2.2 Project Overview

The proposed WEP consists of 6-12 wind turbines capable of producing 20-40 MW of renewable energy. The WEP will be constructed, owned, operated and maintained by the Proponent. The Project will be connected to the existing NBP transmission grid via a new 5.25km 69kV transmission line that will be constructed, owned, operated and maintained by NBP.

The Project is located on Crown Land in Kings County, approximately 20 km northeast from the Town of Sussex, New Brunswick between the communities of Springdale and Portage Vale.

A 20 MW Power Purchase Agreement (PPA) has been signed with NBP which can be fulfilled with six of the proposed turbines. An additional six (6) turbines are also demonstrated throughout this EIA to demonstrate alternative locations should one of the preferred six (6) turbines need to be moved, or as a possible expansion of the project.

It is anticipated that the WEP will require approximately 10 - 15 km of new and upgraded access roads and can make use of 13 km of existing roads onsite significantly reducing the Projects clearing footprint. Road widths will be approximately 6 m wide and up to 15 m wide on turns. A 70m by 70 m crane pad will be required at each turbine location. A new substation will be constructed onsite and approximately 5.25 km of new transmission lines will connect the Project to the NBP grid via an existing line tap.

Table 2-1: Length of Collector Lines and Roads for a 20 MW and 40 MW layout

	20 MW 6 Turbine Layout	40 MW 12 Turbine Layout
New and Upgraded Roads	11.6 km	14.5 km
Collector Lines	4.9 km	6.4 km

The Proponent is developing the Project under New Brunswick's Locally Owned Renewable Energy that is Small Scale (LORESS) regulation. The LORESS regulation itself is integral to New Brunswick's 2011 *Energy Blueprint* and has been developed by NBP to introduce locally-based renewable electricity projects that are majority owned by eligible entities such as Aboriginal Businesses or Local Corporate Entities including First Nation Communities, Municipalities or their wholly-owned subsidiaries, Not-for-Profit Organizations, and Universities. The projects proposed under the LORESS program we're awarded in two phases to provide 40 MW of renewable energy by the end of 2019 and another 40 MW to be operational by the end of 2020. The WEP is part of the first phase of the LORESS program and will be operational by the end of 2019.

In acknowledgement of *New Brunswick Regulation 2015-60, Electricity from Renewable Resources Regulation - Electricity Act*, the WEP conforms to the requirements of having local ownership. Currently, pre-construction and clearing activities are expected to begin in Q1 of 2019. The Project will be commissioned by the end of 2019 as per the PPA with NBP. The Project will have an operational phase of 30 years.

2.3 Project Need and Purpose

The New Brunswick *Energy Blueprint* (DERD, 2011) sets out clear requirements regarding the source of electricity to be supplied to the province. The purpose of this Project is to help achieve provincially mandated targets outlined in the *Energy Blueprint,* which requires the province of New Brunswick to achieve 40 percent renewable energy by 2020.

The project is located in a heavily disturbed and fragmented habitat in the Cardwell Local Service District near the communities of Springdale and Portage Vale. There are also larger towns and villages near the proposed Project including the Town of Sussex and the Village of Sussex Corner where there is an increase energy demand to power town centres, industrial activities and populated residential areas. Therefore, there is a need to provide additional safe, clean energy sources to help offset and meet increasing energy demands.

The Energy Blueprint was developed in response to the growing knowledge base and action required toward reducing greenhouse gas emissions and mitigating risks associated with climate change. The most recent report by the Intergovernmental Panel on Climate Change (IPCC) states that energy accounts for a significant 25% of global greenhouse gas emissions. Continued emissions of green house gasses will amplify existing risks and create new risks for natural and human systems; the risk of abrupt irreversible changes increase as the magnitude of warming increases. Mitigation measures must be used to reduce the greenhouse gas intensity; measures such as reducing energy usage and moving towards decarbonised energy supply should be taken to move towards achieving these goals (IPCC, 2014).

The land on which the WTGs are proposed is excellent for it's intended use as the turbines will reside on land that was clear cut over several years creating a highly fragmented habitat. The Proponent can transform this disturbed habitat into a site that will provide an environmentally friendly, productive source of renewable energy for the local communities.

Additionally, the Project is majority owned by Tobique First Nation. This will provide the Nation with a stable revenue source created and kept within New Brunswick for the duration of the Project's operation. The Project is also estimated to create full-time jobs throughout its construction and operation while contributing to community economic development. It is expected the Project will bring in revenue to many of the local businesses as Project workers expense food and accommodations to conduct work on site. Where possible, the Proponent will hire local contractors and workers for the completion of different project phases. According to Statistic Canada (2016), 18.2% of Cardwell Local Service Districts labour force is unemployed. With relatively high unemployment rates in this area, there is a need for community economic development that can bring additional jobs to these communities.

There are no alternatives to the Project being proposed as the development of wind energy projects have provided direct contributions, globally, to reducing harmful greenhouse gasses associated with traditional carbon-based energy sources. Further, as previously mentioned, the New Brunswick provincial requirements are to produce 40% of its energy from renewable sources by the year 2020. With less than two years from this deadline, the development of wind energy is the most feasible option and can help meet renewable energy goals while providing much needed economic development for the local communities.

2.4 Project Location

The Project is located in the Cardwell Local Service District between the communities of Springdale and Portage Vale, New Brunswick (Figure 2-1). The proposed WTG locations are situated on existing crown land located approximately 20 km northeast of the Town of Sussex. The location for the proposed WEP is 20T 324180m E; 5072950m N (65° 15' 43.21" W 45° 47' 15.78" N).

2.5 Siting Considerations

The Proponent has extensive knowledge with respect to site finding and development of community-based wind farms. There are many considerations to take into account while developing these types of projects and a detailed assessment of these considerations have led the Proponent to determine the location of the WEP, which presents the best opportunity to provide efficient renewable energy to the local community with the least impacts to the community and environment. Specifically, the WEP is an attractive site due to the wind resource, distance from dwellings and environmentally sensitive features, proximity to the NBP transmission system, and previously disturbed ground conditions.

The following is a list of factors that have been considered during the site finding and development process. The project location and layout from a regional and local context are shown in Figure 2-1 and Figure 2- 2.

- Technical Considerations;
    - Sufficient wind resource;
    - Regional topography;
    - Proximity to transmission system; and
    - Turbine technology.
- Environmental Considerations;
    - Proximity to wetlands;
    - Proximity to residential dwellings or other noise/shadow sensitive areas;
    - Sensitivity of flora & fauna;
    - Proximity to provincial or national parks and nature reserves; and
    - Risk of archaeological resource disturbance.
- Land use considerations;
    - Available access to the land;
    - Current land use;
    - Future land use; and
    - Proximity to residential properties, communities and towns.
- Planning Considerations.
    - Regional Service Commission 8 regulations.

2.5.1 Technical Considerations

The WEP is located on a ridge with an elevation of 230-270m. As a result of the elevated topography, relative proximity to the Bay of Fundy coastline and prevailing winds coming from the coastline (southwest), the Project site provides an attractive wind resource for a wind energy project.

Natural Forces has been in discussion with NBP since 2013 regarding small projects in New Brunswick and together have identified that there is a suitable 69kV line located approximately 5 km north of the Project

site. The Feasibility Review and System Impact Study identified no technical issues with the proposed Project connecting to line L0003. This line tap will require the construction of 5.25 km of new transmission line and a new substation onsite. The transmission line will be constructed, owned, and operated by NBP, however, it has been included in the scope of this EIA. The point of interconnection, collector lines, and location of the new proposed substation is demonstrated in Figure 2-2.

The Proponent will be using the services of a third-party consultant to conduct a geotechnical investigation to determine geophysical conditions for turbine design and construction. This assessment will be completed in the Fall of 2018.

Lastly, based on site specific measured wind data, the turbine availability, and the capacity available on the grid, an appropriate turbine technology was chosen. This decision was also influenced by certain environmental considerations.

2.5.2 Environmental Considerations and Setbacks

Many environmental impacts associated with the construction and operation of a wind farm can be reduced or eliminated through proper screening during development. The Proponent has consulted with regulators and conducted desktop and field studies to locate wetlands, watercourses, sensitive habitats, endangered species, and residential dwellings in an effort to design the project to avoid as many of these sensitive features as possible. The Project layout allots for the following setbacks from all proposed turbine locations:

- 880 m from all regulated and unmapped wetlands and watercourses;
- 1.1 km from all residential dwellings and cabins;
- 35 km to nearest Important Bird Area (IBA) Shepody Bay West;
- 25 km to the nearest Provincial Park (Fundy Trail Provincial Park)
- >5 km to known bat hibernacula;
- >5 km to nearest Ecologically Significant Area (ESA);
- 2 km to nearest communication tower; and
- 7 km to the nearest Protected Natural Area (PNA) (Picadilly Mountain)

A thorough desktop review of available data for flora and fauna species in the area has been conducted in order to identify species at risk and species of high importance that may be impacted by the proposed development. From this review, a single plant species of conservation concern (Herb-Robert) was identified but is not expected to be impacted by the proposed Project activities. Fauna species at risk or of high importance identified are discussed in Section 4.2.6.

Desktop and field studies conducted in consultation with New Brunswick's Archaeological Services have determined there is a possibility of archaeological resources along the proposed transmission line. Archaeological test pits were recommended and details on the archeological assessment are further discussed in Section 4.3.1.

2.5.3 Land Use Considerations

The WEP requires consideration of current land uses within the proposed Project site. As provincial crown lands, these lands are open to a variety of uses. Currently, there are three additional land users where consultation and further consideration is required.

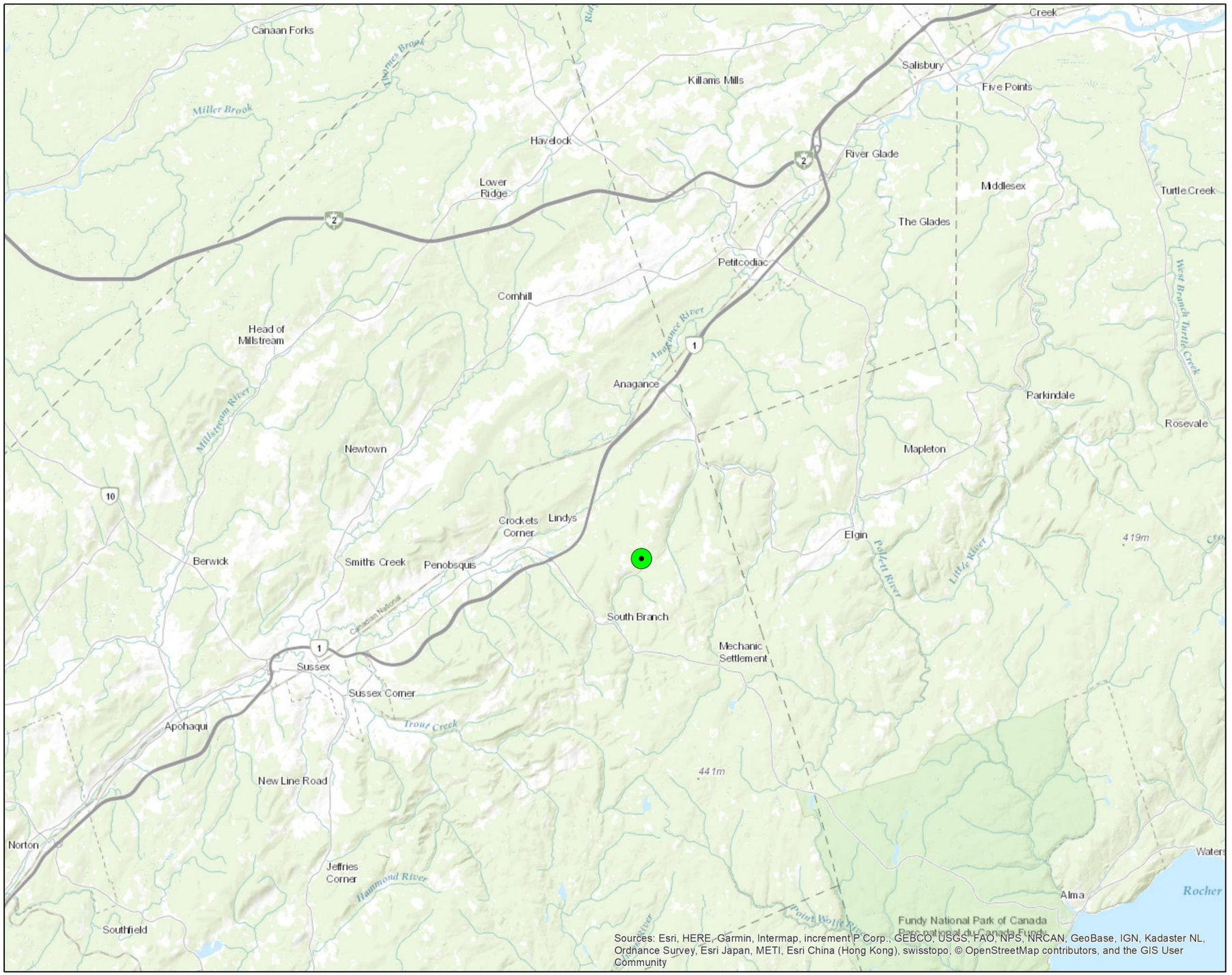
J. D. Irving Ltd. (Irving) has an active forestry operation within the area and uses site roads to truck lumber out. The Proponent has been in consultation with Irving and the proposed Project is not anticipated to impact forestry activities. The second land use consideration is recreation, primarily for snowmobiling. Part of the main access road of the Project is a provincial, well used snowmobile trail and the Goshen snowmobile warming shelter is located onsite. Lastly, the Department of National Defence (DND) also has an existing land tenure that overlaps with the current WEP lease area. However, there were no concerns expressed by DND in relation to wind development within its land tenure.

There are various land uses to consider on the Project lands. Consultation with these land users will be ongoing to ensure safe use and enjoyment of these lands.

2.5.4 Planning Considerations

The Cardwell Local Service District does not have a Land Use Plan over the area used for the proposed Project site. The Proponent has consulted the Regional Service Commission 8 on zoning regulations for the project area. The project area is not located within a land use regulated area and therefore there are no designated zones and the Province, rather than the commission, would have authority over the area.

Further consultation with the appropriate planning body will occur and a building and development permit will be obtained prior to construction, if required.



Wocawson Energy Project

Regional Location

Legend

Project Location

Notes

N

1:300,000

0 6,000 12,000 18,000

Metres

WGS 1984 Web Mercator Auxiliary Sphere

Production Date: Aug 2, 2018

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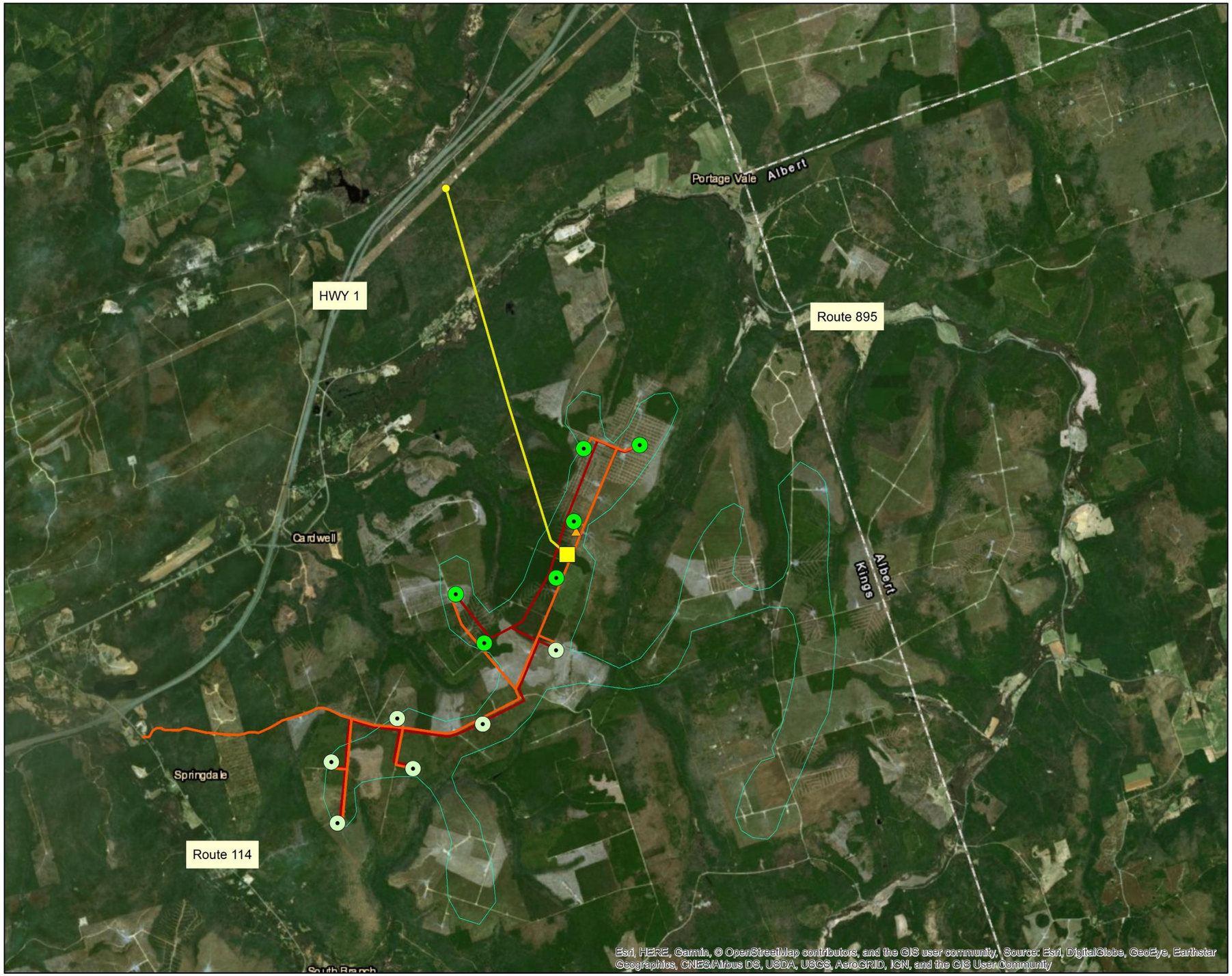
Figure 2-1: Project location.



Wocawson Energy Project

Preliminary Project Layout

Legend

- Proposed Turbines
- Proposed Alternate/Expansion Turbines
- Point of Interconnection
- Proposed Substation
- Meteorological Tower
- Roads
- Collection System
- Crown Land Option
- Proposed Transmission Line

Notes

N

1:70,000

0 900 1,800 2,700

Metres

WGS 1984 Web Mercator Auxiliary Sphere

Production Date: Sep 7, 2018

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Figure 2-2: Proposed Project Layout with Electrical and Interconnection

2.6 Physical Components and Dimensions

2.6.1 Property

The parcel identification (PID) numbers on which the WTGs will be located are 62067 and 62059 which encompass a total area of 2,586 ha. The Option to Lease obtained in 2017 includes an area of 1,150 ha within the aforementioned PIDs. Once the project becomes operational a Lease will include only the lands each turbine sits on and a License of Occupation to Operate will encompass the access roads, collector lines, transmission lines, and substation.

The maximum footprint of the Project is estimated to cover 48.5 ha of the project lands. This includes the following:

- 12 hectare for the turbine base and crane pads,
- 1 hectare for the substation
- 10 hectares required for the access road (includes 14.5 km of new and upgraded roads).
- 9.6 ha for the collector lines that are not parallel to the roads.
- 15.8 ha for the proposed transmission line and 30m cleared right of way.

The project infrastructure can be viewed in Figure 2-2.

2.6.2 Surveying, Siting and Logistic Activities

Prior to the construction of the access roads, foundations, transmission and collector lines and, turbine installations, a number of enabling works need to be undertaken. These will include:

- Engineering site visits to evaluate the Project land and soil conditions;
- Improvement of land drainage as required to facilitate construction; and
- Widening and improvement of the site entrance for safe vehicle access.

The Proponent, or appropriate contractor and the turbine manufacturer will coordinate transportation of the turbine components that will require overweight special move permits. Service New Brunswick, the DTI and the local Municipalities in which the transportation will occur will be consulted by the appropriate party to ensure any other potential permits (i.e. over-dimensional and overweight vehicle permits) are obtained and transportation regulations are followed. Although the exact WTG transportation route has yet to be planned, the Proponent is aware of certain road weight restrictions during spring conditions that may be applicable. Roads used for the construction phase of the Project will comply with maximum weight road restriction lists (Transportation and Infrastructure, 2017).

2.6.3 Wind Turbine Generator

It is anticipated that 6 - 12 Enercon WTGs will be installed on site for the duration of the Project. The turbine model is still to be determined, however, the current turbine models being considered include the E-126 at 116m or 132m hub height, the E-138 at 132m hub height or the E-141 at 135m hub height. Table 2-2 below compares the specifications of each model and Enercon Datasheets are provided in Appendix A.

Though the turbine model has yet to be selected, the turbine with the maximum size has been used throughout this assessment to ensure a worst-case assessment. From base to blade tip the E-141 WTG will have a maximum height of approximately 205.5 m.

Enercon GmbH is a privately owned German based wind turbine manufacturer. Established in 1984, with production facilities around the globe, including Canada, Enercon is known within the industry to produce the most reliable wind turbines in the world. Enercon is the fourth largest wind turbine producer globally, and currently has over 25,000 machines in operation.

All Enercon WTGs are designed and certified according to the latest international standards. Currently the basis for design is the International Electrotechnical Commission (IEC) standards of the IEC-61400 series.

This IEC standard uses assumptions and conditions to define the loads that a WTG can withstand. The safety system of Enercon WTGs include control sensors that protect the turbine and its components from damage. In the case that one or more of these sensors detect conditions outside its design limits, the main control of the WTGs will take the appropriate measures, which range from small power limitations to complete stop of the turbine. These reactive measures can protect the turbine from high and low temperatures, vibrations, oscillations and strain.

All Enercon turbines operating throughout North America are monitored 24-7 in real-time by a team of technicians at their North American Operations headquarters bases in Dartmouth, Nova Scotia. Natural Forces' operations team will also monitor the turbine from Halifax, Nova Scotia and Saint John, New Brunswick. Enercon operation technicians will have the ability to shut off the turbine should they observe conditions that could pose a risk to the turbine's proper functioning or risk to people near the turbine.

Ice may form on the rotor blades of the WTGs in specific weather conditions. The ice build-up poses the risk of ice fragments detaching and creating safety hazards to the surrounding area. The Enercon WTGs will be equipped with a reliable ice detection system. Once ice has been detected, the turbine rotor stops spinning, and the de-icing system will activate and effectively melt the ice on the WTG blade in order to reduce the risk of ice throw.

Table 2-2: Enercon turbine specification specifications.

Characteristic	E-126 EP3	E-138 EP3	E-141
Rotor diameter	127 m	138.6	141 m
Swept area	12, 668 m^2	15, 088 m^2	15, 615 m^2
Rotations per minute	4.4 – 11.8 min^{-1}	4.4 – 10.8 min^{-1}	4.0 – 11.0 min^{-1}
Cut out wind speed	24 – 30 m/s	22 – 28 m/s	28 – 34 m/s
Hub height	86, 116, 135	81, 111, 131, 160	99, 129, 135, 159
Max sound pressure level	106 dB(A)	Unknown at this time.	105.5 dB(A)
Tower Material	Steel and/or Concrete Pre-cast Sections		

Turbine Lighting Requirements

A Lighting Plan for the turbines will be developed and approved by Transport Canada and Canadian Wildlife Services (CWS) to minimize impacts on migrating birds and to ensure aviation safety. The lighting plan will comply with Transport Canada recommendations and Standard 621 – Obstruction Marking and Lighting (Transport Canada, 2017). Chapter 12 of the standard outlines regulations for wind turbines greater than 150 m. The current standard requires two CL-864 (medium intensity, flashing red – 20-40 flashes per minute) lights installed on the nacelle with one operating and one as a back-up. At least three CL-810 (low intensity, flashing red in sequence with nacelle) lights are also required mid way up the tower and are to be visible in all directions. These types of lights are likely to be used for the WEP but will be adjusted as per Transport Canada recommendations.

The standard requiring lighting midway up the tower has come 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).

2.6.4 Crane Pad & Turbine Foundation

Crane Pad

The installation of the WTGs will require crane pads that will be approximately 70m by 70m in size. Its purpose is to safely accommodate the weight of the large crane necessary for turbine installation and maintenance. An initial arrangement of the crane pad has been designed to suit the specific requirement of the turbine and the surrounding topography of the Project site.

Construction of the main crane pads will involve the removal of soil to a depth of between 0.25 – 0.5 m, depending on the ground condition encountered during the geotechnical investigation. The subsoil would be covered by layers of graded crushed stone. Total construction depth is between 0.25 – 0.5 m, also dependent on the characteristics of the underlying soil formations.

The crane pads may be retained throughout the operation life of the wind farm to allow for periodic WTG maintenance, and to accommodate any crane necessary for the replacement of large components should they require replacement during the operational phase of the Project.

Turbine Foundation

Concrete foundations approximately 20 m in diameter will be required for the WTGs. A detailed geotechnical investigation will be undertaken to establish the nature of the soil at the WTG locations. A registered Engineer will design the foundations to match the soil conditions. Foundations will most likely be a gravity (inverted “T”) design, designed by Enercon, similar, but larger than that shown in Figure 2-3 and 2-4.

The construction of the reinforced concrete foundations will include excavation to a depth of several meters, the placement of concrete forms and steel reinforcement, and the pouring of concrete within the forms. The upper surface of the base will lie approximately 1 m below ground level. Rock chipping may be required to facilitate excavation. The central support pedestal would extend 0.20 m above existing ground level to receive the bolted bottom tower section. Suitable excavated material would be compacted in layers on top of the concrete foundation to terminate in line with the existing ground level, leaving room to allow sufficient topsoil reinstatement for vegetation growth.

The soils removed would be stored in accordance with provincial regulations and best practice guidelines, outside of provincially regulated wetland buffers, and replaced during the restoration phase in consultation with the Crown Lands department. Soil material needed for backfill would be stored temporarily in a designated area adjacent to the excavation location until needed. Any remaining excavated material will likely be recycled to another site needing clean fill material or removed from site and sent to an approved landfill as deemed appropriate.

Figure 2-3: Construction of a concrete foundation at Natural Forces' Fairmont Wind Farm.

Figure 2-4: Finished concrete foundation for Natural Forces' Fairmont Wind Farm in Nova Scotia

2.6.5 Civil and Electrical Works

The electricity produced from the WTGs will be stepped-up from 34.5kV to 69kV at the substation via the main step-up transformer. Each wind turbine has a small pad mount transformer located inside the wind tower which initially steps up the voltage to 34.5kV.

A bare copper earthing (grounding) cable will be laid alongside the WTG foundation 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. This will be installed according to the design engineer's specification. Typical design would require the cables to be installed by the direct buried method consisting of excavation of a trench just over one meter in depth, placement of a layer of sand, then the collection system cables and fibre optic cable which are then covered by another layer of sand. Clean aggregate, as specified by the design engineer, is then placed on top of the sand and the trench is filled back in. Caution tape, stating "Danger Underground Electrical cable" is placed along the full length of the trench at approximately 1 foot below the finish grade.

Any buried electrical cable will likely 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 Crown Lands department and be in accordance with applicable safety standards.

2.6.6 WTG assembly and installation

The main WTG components include the tower sections, nacelle, hub and blades. Towers are typically delivered in four large sections if using steel towers or numerous smaller sections if using the pre-cast concrete variety.

Once delivered, the tower sections will be erected in sequence on the WTG foundations using a 150-tonne tailing crane and a large 800 – 1000 tonne main lift crane. The smaller crane will erect the base and lower-midsection of the towers and then assist the main crane with the erection of the upper-midsection, the tower top section, the nacelle, the rotor and the blades. The main erection crane will also lift heavy internal components such as the generator.

For the nacelle and blades, the assembly will involve the use of a small 135 tonne rough-terrain crane for vehicle off-loading, a 150-tonne tailing crane for preliminary assembly, and a main erection crane of approximately 800-1000 tonnes for the main lift. The blades are attached one at a time on the hub which will already be installed on the nacelle. The tailing crane helps to control the orientation of the blades during this lift, while the main crane lifts the weight.

2.6.7 Access Road

The access roads for the WEP will be approximately 6 - 7 m wide with a maximum width of 15 m in areas to facilitate moving large turbine components. The access road will be used to move workers and equipment about the site during construction, operation and decommissioning phases.

New Access Roads

The new access roads will likely involve the removal of soil to a depth of between 0.25 – 1.0 m (depending on the ground conditions encountered during the geotechnical investigations) and placing layers of crushed stone. The stone is usually compacted, with a finished construction depth between 0.25 – 0.5 m, again dependent on the strength of the underlying ground formation. The internal site roads would be maintained in good condition during construction and throughout the lifetime of the Project to facilitate maintenance and on-going environmental studies.

The removed topsoil would be stored in accordance with best practice guidelines, and later used for site restoration. Soils needed for backfill would be stored temporarily in bunds adjacent to the excavations until needed. Any remaining excavated material would be shaped into fill slopes in the road bed, or removed from site to an approved landfill.

Upgraded Existing Access Roads

The Project site has many existing roads currently used by the forestry industry and by recreational users. It is anticipated that 13km of existing roads can be used with minor upgrades. Existing roads will need to be widened to support large truck and material movements and turning radii. The process for upgrading roads is similar to that of constructing new roads, however, clearing and grading is only required where roads need to be widened which will greatly minimize the new disturbance from the proposed Project.

Transmission Line Access Roads

In addition to the main Project access roads which will be used to transport WTG parts and used by construction crews, there is also a need for access routes into the proposed transmission lines. These access roads will make use of existing trails near the proposed line but these trails will need to be upgraded to support construction crews. Upgrades to widen the roads to approximately 6m will be needed. Additionally, where significant turns are located, access roads will need to be widened up to 12m. Proposed access routes to the transmission line have recently been provided by NBP. Biophyscial surveys have been completed for the proposed access routes but have not been compiled in this EIA submission. Results of these surveys will be provided in and addendum report.

2.6.8 Interconnection to Grid

Natural Forces has been in discussion with NBP and have conducted a Feasibility Study for the interconnection of 20 MW of wind power generation near Portage Vale, NB. The Feasibility Review, System Impact Study, and Facility study have identified that the proposed Project can connect to a 69 kV line, L0003. This line tap will require the construction of 5.25 km of new transmission and the construction of a substation onsite located at UTM 20 T 324872m E 5074180m N (45°47'56.24"N 65°15'12.81"W). The transmission line will be constructed, owned, and operated by NBP. All project infrastructure can be viewed in Figure 2-2.

The purpose of the Project's electrical infrastructure is to collect the energy generated by the wind turbines and deliver the energy to NBP's transmission grid. This electrical infrastructure will consist of:

1. 34.5kV Collection System – the underground and overhead 34.5kV collection system is to collect the energy from the turbines and delivery it to the substation. The collection system consists of electrical conductors, a fiber optic cable, poles and insulators, and disconnect switches. A short section of underground cables, approximately 100m, connects the turbines to the first riser pole of the overhead collection system. The overhead collection system, poles and wires, takes the energy to the substation.

2. Substation – the basic function of the substation is to receive the energy from the 34.5kV collection system and step-up the voltage to the 69kV level in order to deliver the energy to NBP's 69kV transmission system
3. 69kV Transmission Line – a new section of 69kV transmission line, approximately 5.25km long, will be designed and installed by NBP to connect the Project's substation to their existing 69kV transmission line which delivers the Project's energy into the transmission grid.

The Project substation will consist of a fenced yard, approximately 70m x 70m, which will include a small pre-fab control building containing all the instrumentation for the protection & control panels, revenue metering panels, AC/DC charger, UPS system, and Supervisory Control and Data Acquisition (SCADA) system. In the substation yard will be outdoor equipment and structural steel supports for the 34.5kV circuit breaker & disconnect switches, grounding transformer, station transformer (for power to the control building), a main step-up transformer (34.5kV to 69kV), 69kV circuit breaker & disconnect switches, lightning protection, ground grid, and PTs & CTs for protection & control & revenue metering.

The transmission line will require the installation of approximately 31 wooden pole structures to run the line from the proposed substation to the location of the Line Tap at approximately UTM 20 T 323406m E 5079103m N (45°50'34.30"N 65°16'27.15"W). A standard NBP H-Frame structure for supporting three 266 kcmil "Partridge" ACSR conductors (one per phase) and two 0.36" diameter Grade 180 "Bridge Strand" overhead ground wires is proposed for the powerline as shown in Figure 2- 5.

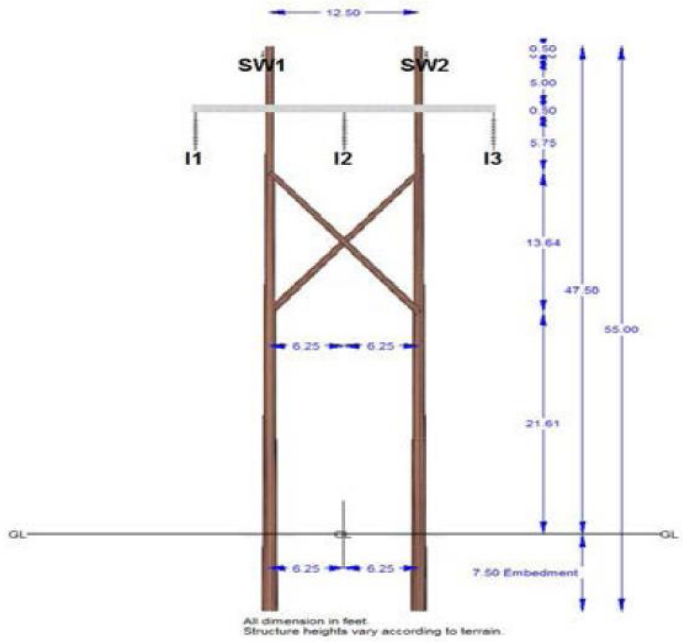


Figure 2-5: Typical H-Frame structure supporting three phase conductors and two overhead ground wires.

2.7 Construction Details

The approximate proposed schedule for the construction activities is presented in Table 2-3. Pre-construction activities and clearing are expected to start in Q1 of 2019 with operation of the WEP in Q4 2019.

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

- Construction of access roads, lay down areas and crane pads;
- Pouring of turbine foundations;
- Installation of power poles, power lines and underground electrical;
- Installation of transmission lines and substation;
- Turbine erection;
- Commissioning of the WTGs; and
- Removal of all temporary works and restoration of the site.

Construction activities will be limited to daytime hours when feasible. The overall erection process for the WTGs will take approximately two to six days each, depending on the wind conditions, and would not start until suitable wind conditions prevail. Turbines cannot be erected when wind speeds exceed 4 m/s, and the optimal time for assembly often occurs during the early evening. As a result, some construction in the early evening is possible during this stage of construction, however, it will be minimized to the extent possible.

Table 2-3: Anticipated schedule of construction activities.

Construction Activity	Estimated Timeline
Pre-Construction Activities	Q1 2019
Tree Clearing and Grubbing	Q2 2019
Construction of access road and crane pad	Q2/Q3 of 2019
Installation of Transmission Line	Q2/Q3 2019
Construction of Substation	Q2/Q3 2019
Construction of electrical works	Q2/Q3 of 2019
Construction of turbine foundation	Q2/Q3 of 2019
Wind turbine assembly and installation	Q3 of 2019
Removal of temporary works and site restoration	Q4 of 2019

2.7.1 Site Access

The access road starts from Mitton Road located off of Route 114 in Springdale which is located less than one kilometer from Highway 1. The majority of the access roads will make use of existing unmaintained public road that will require upgrades to support oversized vehicle movements as described in Section 2.6.1 . Using existing roads allows the project to significantly minimize its footprint. Minor temporary road widening may be required along specific portions of the road allowing for wider turn width. This road widening would be coordinated with New Brunswick DTI and the Regional Planning Commission 8 and all necessary permits will be acquired before commencing work. Mitton Road will be the entry point for all workers, construction equipment and WTG components for the duration of the construction phase.

2.7.2 Clearing and Grubbing

Clearing and grubbing activities will be planned to occur outside of the breeding bird season where possible. If clearing is required during this time, a qualified biologist will be onsite to conduct monitoring to identify possible breeding birds in the area and their active nests. These monitoring efforts will follow Environment and Climate Change Canada's (ECCC) specific considerations related to determining the presence of nests. A biologist will observe the bird species in the area and determine if there is presence of suitable nesting habitat within the proposed clearing area. As well, they will observe bird behaviour including, but not limited to, territorial males and individuals carrying food to determine the potential for active nests in the area.

Additionally, the results of the bird surveys will be assessed to identify species of ground nesters at the project location. A large portion of the Project lands has been previously cleared during forestry activity and should ground nesters be found to reside in the project area, nest searches will be conducted prior to construction activities that may impact ground nesters during the breeding bird season.

Any unwanted, merchantable timber cleared onsite will either be transported to the nearest sawmill upon obtaining appropriate permits or the timber will be left on site for pickup. As a result of construction, compaction of the topsoil will be minimized to the extent possible and any topsoil removed from the site will be disposed of at an appropriate facility.

2.7.3 Fill Material

Fill material will likely be sourced from a local supplier and will be coordinated by the Project's construction manager. It is not likely that any construction, excavation or grading will be required in important wildlife habitat or ESA's as none were identified onsite through desktop or field reviews. Some construction will involve crossing mapped regulated, and unmapped wetlands for interconnection. The Proponent will engage in ongoing consultation with the Department of Environmental and Local Government (DELG) to determine the proper alteration applications required and applicable wetland compensation. The Proponent is committed to following the proper measures as indicated by DELG. Details on the Projects interactions with wetlands and watercourses is further discussed in Section 4.2.3 and 5.2.3.

2.7.4 Site Restoration

After construction, turbine erection, and commissioning are completed and the Project is in the operation phase, all temporary works will be removed and the land re-graded. The stored topsoil will be replaced fine graded, and given an aesthetically pleasing appearance.

2.8 Operation and Maintenance Details

2.8.1 Site Access and Traffic

Once the wind farm is operational, minimal vehicle activity will be required. The internal site roads will be used for periodic maintenance and safety checks. A comprehensive SCADA system will be installed within the turbines for remote monitoring and control of the wind turbines, which will minimize the need for on-site personnel. The SCADA system ensures safe efficient operation of the turbines and of the overall Project site.

2.8.2 Project Safety Signs

A Project sign will be located at the entrance to the site. This sign will provide essential safety information such as emergency contacts and telephone numbers. As well, the sign will provide information about the wind project and the companies involved in the Project. Safety signs and information will also be installed throughout the Project Site as required. These signs will be maintained throughout the operational life of the wind project.

2.8.3 Maintenance Plans

Scheduled maintenance work will be carried out several times each year throughout the operational phase as well as routine site visits. Unscheduled maintenance is minimal, as the SCADA system allows 24-hour monitoring of the turbines by the manufacturer and the operations team at Natural Forces. Maintenance procedures may require the use of small or large cranes for brief periods of time, for replacement of blades or other turbine components.

2.9 Decommissioning

The WEP will be in operation for approximately 30 years. The lifetime is based on the duration of the PPA signed between NBP and the Proponent as well as the operational life of the turbine.

Decommissioning will commence within six months after the PPA has been terminated. The WTG components will be dismantled and removed from the site. Similar traffic movements to those experienced during the delivery of the turbine components are anticipated. 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 from the site for scrap or resale. The base will be removed to below plough depth, and the top soil will be reinstated so that the land may be returned to its former use.
2. The internal site roads and site entrance may be removed if required. After removal, the land will be reinstated to its former use.
3. The underground cables will be below plough depth and contain no harmful substances. They may be recovered if economically attractive or left in the ground. Terminal connections will be cut back below plough depth.
4. All other equipment will be dismantled and removed, and the land will be returned to its former use.

2.10 Future Modifications, Extensions, or Abandonment

There are no future phases planned for the WEP at this time, though six additional turbine locations were surveyed and are demonstrated throughout this EIA should there be an opportunity to expand the Project from the current 20 MW PPA to include an additional 20 MW. The Proponent has agreed to a 30-year PPA with NBP which is consistent with the WTGs life expectancy of approximately 30 years. Prior to the end of the PPA agreement, decommissioning and site reclamation plans will begin or a new PPA may be signed with significant maintenance occurring to extend the life of the wind project.

2.11 Project Related Documents

All project related documents have been placed in their corresponding appendices as follows:

Appendix A: Turbine Model Datasheets
Appendix B: Noise Report
Appendix C: Shadow Report
Appendix D: Avian Report
Atlantic Canada Conservation Data Centre (ACCDC) Report
Appendix E: Bat Report
Appendix F: Aquatic report
Appendix G: Wildlife Report
Appendix H: Vegetation report
Appendix I: Archaeology Report
Archaeological Spatial Database Predictive model
Appendix J: Environmental Management Plan
NBP Environmental Field Guide
Appendix K: Adaptive Management Plan
Appendix L: Complaint Resolution Plan
Appendix M: Permits Obtained
Navigation Canada Land Use Proposal application
Transport Canada Obstruction Evaluation Form

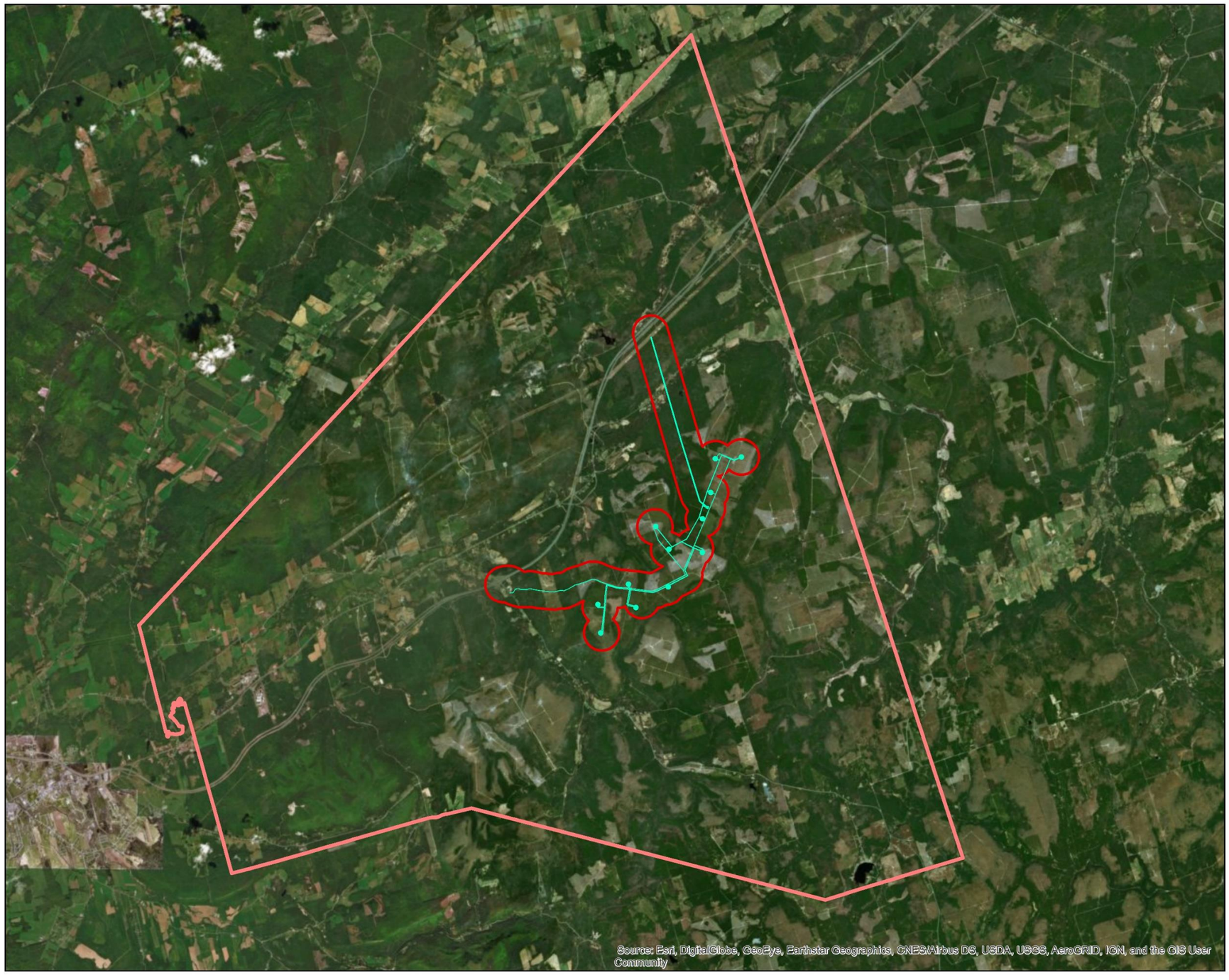
3.0 Approach to the Assessment

This section outlines the Project scope by identifying Valued Ecosystem Components (VECs) relevant to the current development determined through consultation with local stakeholders, the TRC, and provincial regulators. For each VEC, the study methodology is outlined to provide a clear understanding of how the state of the existing environment was collected. For clarification through this assessment document the following definitions are provided:

Local Study Area – refers to the region of Kings County encompassing the Cardwell Local Service District (Figure 3-1)

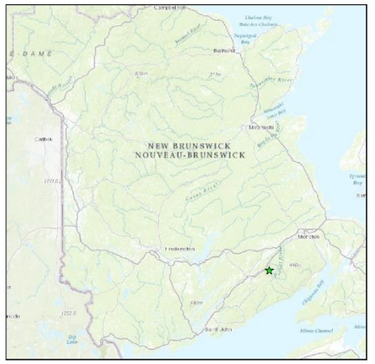
Project Study Area – refers to the land surrounding the Project Footprint to include wildlife and hydrologic movements. The Project study area has been used for all survey activities.

Project Footprint – refers to the land that will directly interact with project activities.



Wocawson Energy Project

Project Study Areas



Legend

Project Footprint

Project Study Area

Local Study Area

N

1:150,000

0 3,000 6,000 9,000

Metres

WGS 1984 Web Mercator Auxiliary Sphere

Production Date: Sep 6, 2018

naturalforces

Figure 3-1: Visual Representation of the Project Footprint inside the Project Study Area.

3.1 Scoping and Bounding

The scoping process identifies the physical, biophysical and socio-economic VECs that may be subject to impact given the work proposed. The proposed work is composed of the construction, operation, and maintenance phases of the Project conducted by the Proponent including any accidents and malfunctions that may occur. The decommissioning of the WEP will also be included as part of the assessment. The identification of the VECs is based on the potential interaction of the Project within the environmental and socio-economic settings described herein. Additionally, any concerns from stakeholders and the general public as identified through the consultation process were taken into consideration when identifying the VECs.

The scope of the assessment is formed by the potential interaction of the project activities with the VECs. The scoping was completed to define the appropriate desktop and field studies that would be relevant to the Project. The scoping is continually refined as the Project progresses, the environmental setting is studied, and consultation activities are held. While it is difficult to assess all the potential effects of a project, properly defining a scope reduces the risk of overlooking important project impacts.

The Proponent has identified physical, biophysical and socio-economic VECs that were subject to assessment based on knowledge and experience, Technical Review Committee (TRC) comments and a review of the regulatory requirements. The VECs are listed in Table 3-1 and addressed throughout this report.

Table 3-1: Identified Valued Environmental Components.

Physical	Biophysical	Socio-economic
Ground Water	Avian	Archaeological Resources
Geophysical	Bats	Electromagnetic Interference
Atmospheric Conditions	Wetlands and Watercourses	Land Use & Property Value
Wind Resource	Fish and Fish Habitat	Vehicular Traffic
Noise	Wildlife	Public Health and Safety
Shadow Flicker and Visual Aesthetics	Vegetation and Habitat	Community and Local Economy
	Significant and Sensitive Habitat	

Spatial and temporal boundaries must be determined for each component in the assessment process to properly evaluate the Projects impacts on the aforementioned VECs. Spatial boundaries are the physical

bounds in which the Project facilities and activities are located, as well as zones affected by project activities. Temporal boundaries are the time frame in which the activities will occur within the spatial boundary.

The Project study area includes a spatial boundary that encompasses the Project Footprint of all activities associated with the construction, operation, and decommissioning of the proposed Project as well as a buffer area around the footprint to include the surrounding environment as wildlife and hydrology are not confined to the Project Footprint itself.

The temporal boundaries include, a short-term temporal boundary for construction and decommissioning activities and a long-term temporal boundary for the 30-year operational phase of the project. The specific temporal and spatial boundaries will be identified for each VEC in the impact analysis in Section 5.

3.2 Approach to Physical VEC Surveying

3.2.1 Ground Water

Management of ground water quality is important as it is an integral aspect of a diverse ecosystem and functional ecology. A desktop analysis using the GeoNB Data Catalogue to identify protected wellfields on the project land and adjacent area was conducted. The DELG's Online Well Log System was also searched to identify potential wells in the local study area.

3.2.2 Geophysical

A desktop analysis of the geology found onsite has been conducted using available literature and the GeoNB Geological layer. Additionally, a geotechnical field survey will be conducted by a third party consultant to identify appropriate construction materials and processes required for the construction of the WEP. The geotechnical survey is estimated to be completed in the Fall of 2018 and will consist of Borrow Pit exploration and a Test Pit program. Borrow Pit exploration will include the excavation of four to six test pits within the Project Footprint, sampling and laboratory testing of the borrow to identify its quality / suitability for road building. A Test Pit program is intended to investigate subsurface conditions at the proposed substation and crane pad footprint areas. Test pits are also anticipated along the access roadway. A total of twenty test pits are expected for the proposed project.

3.2.3 Atmospheric Conditions

A desktop review of historical climate data has been conducted by consulting the Sussex, New Brunswick ECCC weather station and the New Brunswick's Future Climate Predictions based on the IPCC 5th Assessment Report (AR5) (Roy & Huard, 2016). Data collected includes maximum, minimum, and average temperatures, and rainfall and snowfall amounts to get a sense of the weather regime to be expected near the Project study area. Future climate predictions and intensity-duration-frequency graphs (IDFs)

were used to compare current and future expected rainfall amounts and intensities to determine appropriate storm water management techniques that may be required.

Visibility and fog data has also been compiled with the two or the nearest weather station that collect fog and visibility data. This data was obtained from Moncton and Saint john, New Brunswick. To obtain more relevant data to the Sussex region, Environment Canada's Handbook on Fog and Fog Forecasting (Toth et al., n.d.) was consulted to determine general fog hours per year and fog days per year.

3.2.4 Wind Resource

Initially, a desktop review of the wind atlas for the project region was conducted to determine preliminary wind speeds in the Project study area. A detailed wind resource assessment program at the WEP was then initiated on April 25, 2017 with the installation of an 80m meteorological mast (MET) containing anemometers at 38 m, 58 m and 78 m above ground level. The instrumentation on the meteorological mast measures wind direction, wind speed, temperature, relative humidity and atmospheric pressure. With the installation of a met mast in Spring 2017, sufficient wind data will be collected to accurately assess the wind resource prior to proposed construction activities in 2019. A wind resource assessment has been completed at the 12-month mark of data acquisition and an additional assessment will be completed at the 18-month mark.

3.2.5 Noise Impact Assessment

A noise impact assessment was conducted for the proposed WTG locations to assess the impact of wind turbine generated noise on houses and buildings near the project site during the operational phase of the project. The Cardwell Local Service District does not have any noise guidelines or by-laws pertaining to maximum noise levels from wind turbines. However, the *Additional Information Requirements for Wind Turbines Guidance Document* (DELG, 2004) states noise impact studies must include all dwellings within one kilometer of the nearest turbine and must demonstrate compliance with Ontario guidelines and criteria demonstrated in Table 3-2 (HGC Engineering, 2007).

Table 3-2: Recommended Sound Criteria for Wind Turbines.

Wind Speed (m/s)	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
Wind Turbine Noise Criteria [dBA]	*40*	*40*	*40*	*43*	*45*	*49*	*51*	*53*

The noise assessment was completed with the use of the WindPRO software; the software uses models that follow ISO 9613-2: Acoustics – Attenuation of sound during propagation outdoors standards to assess the predicted noise levels at each receptor included in the assessment. By assuming conservative estimates of factors contributing to the propagation of the sound pressure levels (SPL) created by the WTGs, the model results represent a worst-case scenario.

As the anticipated turbines to be installed on site are yet to be determined, a maximum hub height of 135m and rotor diameter of 141m has been used in this assessment. Based on the calculated sound power levels provided by the manufacturer, the loudest SPL at the hub height of the E-141 will be 105.5 dB(A).

In this noise assessment, all receptors within 2.0 km of the turbines were used in the model to predict the maximum noise level that could be expected when the turbines are operational. The input parameters and the assumptions for the assessment are included in the full noise impact assessment attached in Appendix B.

Construction noise can also be a source of temporary noise impact. Construction noise is not always constant and can produce impulsive and variable sounds at different noise levels, which could create heightened annoyance levels in the surrounding community. A construction noise assessment has been conducted and considers the maximum noise levels produced by various construction equipment to determine maximum sustained noise levels when all equipment is running and at what distance the noise attenuates to ambient levels. The construction noise assessment and the sound levels predicted for each piece of equipment were conducted in accordance with the guidelines in the *Biological Assessment Preparation for Transportation Projects – Advanced Training Manual for Noise Impact Assessments document* (WSDoT, 2017). This document specifies guidelines for decimal addition and noise attenuation in a soft forested environment.

3.2.6 Shadow Flicker and Visual Aesthetics Assessment

Shadow flicker

A shadow flicker impact assessment has been completed for the WEP to assess the potential impact of shadow flicker on the regional area within a 2.0 km radius. Shadow flicker is the change in light received by a receptor due to a WTG blade impeding the light path between the sun and the receptor resulting in a flicker of light on the receptor from the moving blades.

There are two factors that naturally limit the shadow flicker effect, due to optic conditions in the atmosphere:

1. The angle of the sun over the horizon, which must be at least 3 degrees; and
2. The blades of the WTG must cover at least 20 % of the sun.

The Cardwell Local Service District does not have any guidelines or by-laws pertaining to shadow flicker. However, the requirements outlined in the New Brunswick's *Additional Information Requirements for Wind Turbines Guidance Document* (DELG, 2004) adhere to the Ontario guidelines which recommend the following acceptable levels of shadow flicker at a receptor if mitigation is not feasible:

- No more than 30 hours per year of astronomical maximum shadow flicker; and
- No more than 30 minutes on the worst day of astronomical maximum shadow flicker.

Receptors exposed to no more than 30 minutes per day on the worst affected day or a total of 30 hours per year from the WTG are considered unlikely to require technical mitigation.

The model uses conservative assumptions to produce a maximum expected duration of shadow flicker, or a worst-case scenario. Details on input parameters are included in the full shadow flicker impact assessment provided in Appendix C.

Photomontage

ReSoft Ltd WindFarm software was used to create photomontages of the WEP. Three locations were chosen in the local study area to present a predicted view of the WTG using a 135 m hub height. This software has provided insight on how the wind turbine may alter views of the landscape from different locations of interest to the community.

Zone of Visual Influence

The Zone of Visual Influence (ZVI) was calculated using the WindPRO v.3.1 software and considers the topography of the surrounding environment and the height of the proposed turbine. The ZVI is the area of land in which any part of the WTG (tower -blade tip) would be visible. With land elevation and turbine height the software can predict the distances at which the WTG will be visible on the landscape. The ZVI calculation assumes no vegetation barrier or obstructions, and therefor is modeled as a worst-case scenario.

3.3 Approach to Biophysical VEC Surveying

The Proponent engaged the expertise of Dillon Consulting Ltd (Dillon Consulting) to complete the biophysical surveys for the WEP including avian, bat, wildlife, habitat, wetland and watercourse, and vegetation surveys. Dillon Consulting has been involved in several resource development projects in New Brunswick and has assisted many Proponents through the EIA Process and has been involved in Contaminated Sites Management, Civil and Infrastructure Projects, Water and Waste Water Projects, and Environmental and Community Planning.

Extensive desktop and field surveys were conducted for each biophysical VEC. In order to properly scope the field surveys many resources and departments were consulted to obtain baseline information about species, habitats, and ecological features that are likely to be found onsite. The following resources and departments were consulted on one, or all of the biophysical VECs:

- ACCDC;
- New Brunswick Department of Natural Resources Species at Risk Reports (NBDNR);
- The Committee on the Status of Endangered Wildlife in Canada (COSEWIC);
- Department of Fisheries and Oceans (DFO);
- New Brunswick Department of Energy and Resource Development (NBDERD);

- New Brunswick Department of the Environment and Local Government (NBDELG);
- Kennebecasis Watershed Restoration Committee publications (KWRC);
- Canadian Rivers Institute (CRI) watercourse and fish population study (2015);
- Publicly available GIS map layers (e.g, ecological land classification, forest and non-forest inventory, wetland inventory, PNAs, Wildlife Management Zones);
- Atlas of Breeding Birds of the Maritime Provinces;
- IBAs of Canada;
- Ramsar (Wetlands of International Importance) Sites Database;
- Atlas of Canada Migratory Bird Sanctuaries;
- Bird Studies Canada;
- Available aerial photography; and,
- Local naturalist/interest groups prior to conducting the field activities.
- ECCC Species at Risk Reports;
- Province of New Brunswick's Mine Opening Inventory Map;
- The General Status of Wildlife in New Brunswick publication; and
- New Brunswick Light Detection and Ranging (LiDAR) mapping projections;
- GeoNB wetland and watercourse mapping;
- Forest Watershed Research Center Cartographic Depth to Water Index (Arp, 2018);
- The federal Species at Risk Registry;
- High resolution aerial photography;
- Environmentally Significant Areas database; and,
- Ecological Reserves in the Maritimes.

3.3.1 Avian Survey

Site Sensitivity

The proposed project is a 6 – 12 turbine project which, according to the "Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds" (CWS, 2007a), is considered to be a small to medium sized facility. In determining the "Potential Site Sensitivity", a conservative assessment was applied and the site was ranked as "Medium" sensitivity. The site is not known to be regionally or locally significant to birds, nor believed to be part of a major migration route.

Following the specifications outlined in the CWS guidance document (CWS 2007b), the proposed Project was considered to be "Category 2".

WLP understands that one of the most significant environmental concerns associated with wind projects is the potential impacts to birds. As such, WLP undertook consultation with DERD and CWS regarding the sensitivity of the proposed project location. In email correspondence dated May 17, 2018 the DELG EIA project manager indicated that DERD was satisfied with the Category 2 classification for the proposed project and with the proposed level of effort for project surveys (Colwell, C., pers. comm., 2018).

During subsequent consultation, CWS indicated that "all turbine sites with wind turbines greater than 150 m in height [are classified] as *Very High site sensitivity* because they are within a known migratory corridor as per Table 1 in CWS (2007a) guidance document. Turbine heights greater than 150 m in height are in the 150 – 600 m nocturnal flight corridor of songbirds (Horton et al. 2016)."

The methods used in the Horton et al. (2016) study referred to by CWS were limited in that flight altitudes were recorded in 10 m increments starting at 150 m above ground surface, likely because long-range Doppler radar cannot accurately detect below 150 m due to curvature of the earth and landscape obstructions. This study did not collect data from below the 150 m elevation; therefore, suggesting that the flight corridor commences at 150 m elevation, or is increased compared to those at a lower elevation, is not scientifically defensible.

Alternatively, Mabee et al. (2006) concluded that migration altitudes from ground surface to 1.5 km altitude averaged at approximately 415 m, with nightly ranges from approximately 215 m to 770 m. The Mabee study also identified a relatively uniform distribution of flight paths between ground surface and 500 m, indicating that there would be no increased risk to birds based on turbine height.

In addition, diurnal bird flight patterns for many species have been found to be at lower altitudes (below 100 m) where they can move among obstacles and avoid them more easily by sight. Anecdotal evidence from bird migration surveys at several migration sites, such as Tadoussac Dunes Bird Observatory, where over 700,000 migrant birds, mostly passerines, were observed to support this.

Based on the scientific evidence presented, WLP maintains the proposed project is appropriately classified as a Category 2 site.

Scope of Work

Based on the recommended ECCC and CWS protocols, and feedback from the consultation process, the following scope of work was completed as part of the bird and bird habitat surveys for the proposed project. As field work progressed, and as more information became available, the surveys were refined based on the available habitat types and expected species diversity within the study area. The scope of work included:

- Background and Desktop Analysis;
- Winter Surveys (targeting overwintering birds and early breeding owls);
- Spring Surveys (targeting migrating birds using the area as a stopover and late breeding owls);
- Summer Surveys (targeting breeding birds and common nighthawk (a species at risk)); and
- Fall Surveys (targeting migrating birds)—to be conducted in Fall 2018 and to be documented as an addendum to this report.

The methodologies used for the scope of the desktop analysis and field surveys listed above are outlined within the following sections.

For the purpose of this assessment, the spatial boundaries (i.e., the assessment area) have been identified as a 500 m buffer surrounding the Project Footprint of the proposed turbine locations, substation, connector lines, road upgrades and transmission line corridor.

Field Survey Methodology

Based on the level of concern for the proposed project (CWS, 2007a), and the findings of the initial literature review, the following approach for the avian surveys was completed with the objective of gaining an estimate of both the number of bird species using the project area, and their relative abundance.

The surveys were performed by an experienced bird specialist skilled at identifying birds by song, call and sight. The surveys were scheduled to ensure that observations were made during all seasons to determine which species regularly use the area, and during which times, throughout the year. Survey protocols were developed based on professional experience, knowledge of the project area, and review of recommended techniques from the CWS guidance documents (CWS, 2007a; CWS, 2007b).

Breeding bird surveys were conducted using point count survey methods based on the Standard North American Breeding Bird Survey protocol (ECCC, 2018 a). Point count locations were chosen systematically within the assessment area (shown in Figure 3-2). A total of 29 point count locations (PC#) were selected with points at each turbine location at the time of survey and dispersed throughout the study area in representative habitats with an emphasis on habitats that may have higher potential to be used by Species at Risk (SAR) or Species of Conservation Concern (SOCC). Point counts were spaced at least 250 m apart and each point count location was surveyed at least twice during the breeding season. The total number of individuals detected (i.e., heard or seen) during the ten-minute observation period were recorded at each point count along with the timing, and survey conditions (temperature, wind speed and direction, cloud cover, and precipitation).

Four point count locations were selected for surveys for nightjar SOCC such as: Common Nighthawk (Threatened, Schedule 1 of the Species at Risk Act (SARA)), and Eastern Whip-poor-wills (Threatened, Schedule 1 of SARA). As prescribed in the “Canadian Nightjar Survey Protocol – 2018” (ECCC 2018c), these surveys were completed within the June full moon phase (June 25th to 30th, 2018).

Line Transects along existing roads and trails within the study area were used during the winter and spring months to detect presence of overwintering birds and birds that may have been using the area as a stopover for shelter and/or for feeding during the spring migration. Approximately 7 transects of various lengths (starting and stopping at obvious breaks or as daylight hours permitted), were surveyed over about 15 km of forest roads and undeveloped properties.

Area Searches were used in conjunction with other survey techniques (such as transects) and were used during the winter months, specifically to detect resident bird species that may not have been readily singing or calling.

Watch Counts were conducted during the spring migration period to detect birds passing through the area at the height of the turbine blades and birds that may use the project area as a stopover during migration. Three watch count locations with clear views over the area were used for the surveys. Watch counts were carried out one half hour before dusk and/or one half hour before sunrise. Additional 4-hour watch counts targeting diurnal raptors were conducted once per week during the spring migration period between April 15th – June 7th, 2018.

Targeted Call Back (playback) surveys, completed in March 2018, using recordings of territorial calls were used at targeted locations for owl species. Playbacks were limited to a few minutes to avoid prolonged disturbance, especially during breeding season. Owl survey points were completed at four locations within the study area.

The survey schedule associated with each survey method is outlined in Table 3-3 below.

Table 3-3: Avian Survey Schedule

Survey Phase	Key Components	Survey Dates (2018)
Winter Surveys	Line transects/area searches, play backs for early breeding owls	February 6-7, March 11-12, March 20-21, April 2-3
Spring migration and early breeding	Watch counts, playbacks for late Owls, point counts and area searches	April 19, April 22-24, May 2, May 7-8, May 16-17, May 22, May 29, June 5-6
Summer breeding	Point counts, area surveys, Nightjar surveys	June 20-21, June 27-28
Fall migration	Watch counts and area surveys	Planned for August 15 – October 31 (exact dates TBD)

Additional surveys, including watch counts and area surveys, are planned to be completed during the fall 2018 migration period, with focused daily watch counts completed over a 2-week period of peak migration. These surveys have been designed to evaluate the potential of the project area to be used as a migration stopover and to detect species migrating through the project area. The additional methodology and observations will be provided in an addendum to this report following the conclusion of the surveys.

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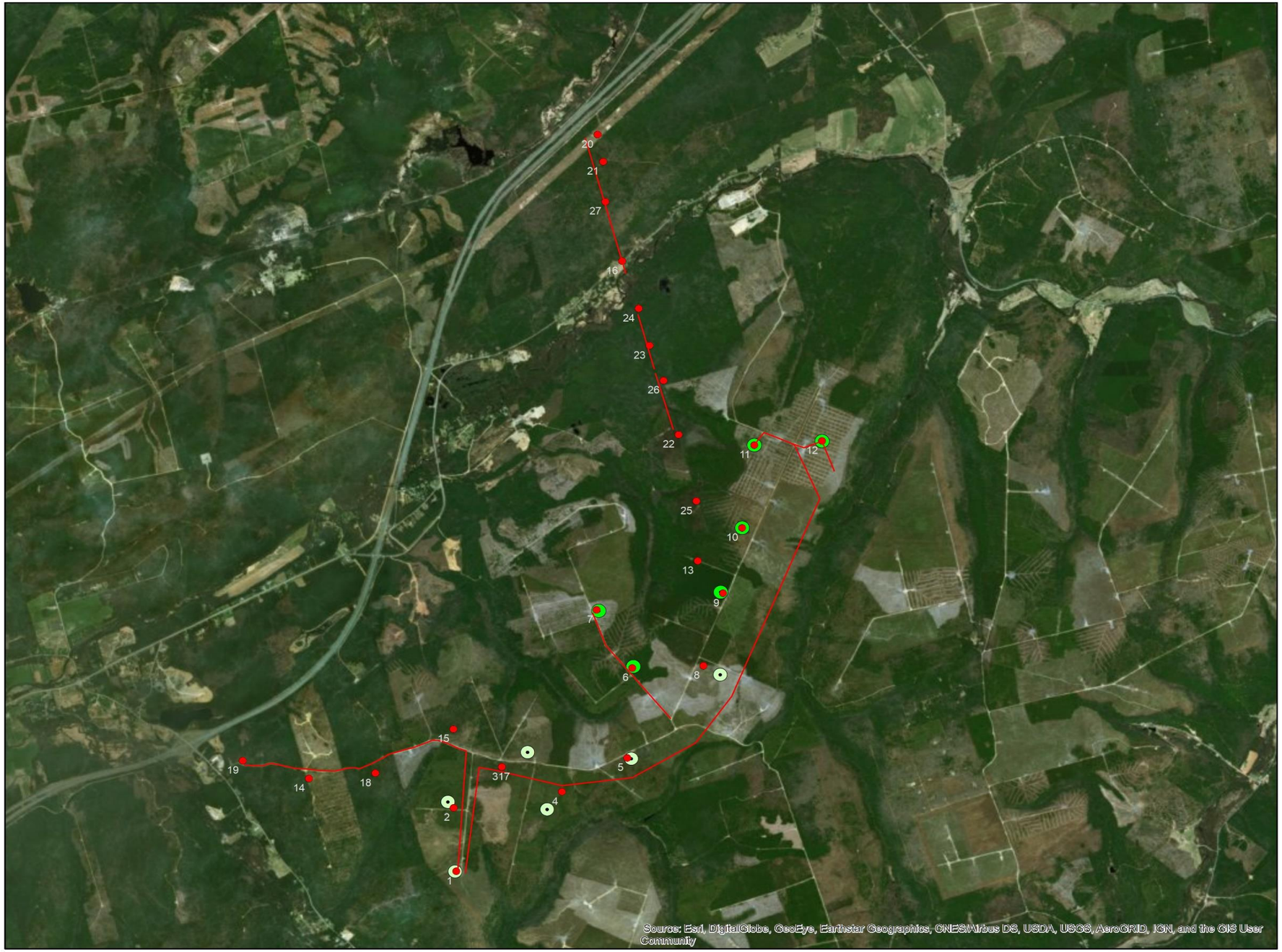


Wocawson Energy Project

Avian Point Count and Line Transect Surveys

Legend

- Bird Survey Point Count
- Line Transect Surveys
- Proposed Turbines
- Proposed Alternate/Expansion Turbines

N

1:60,000

0 600 1,200 1,800

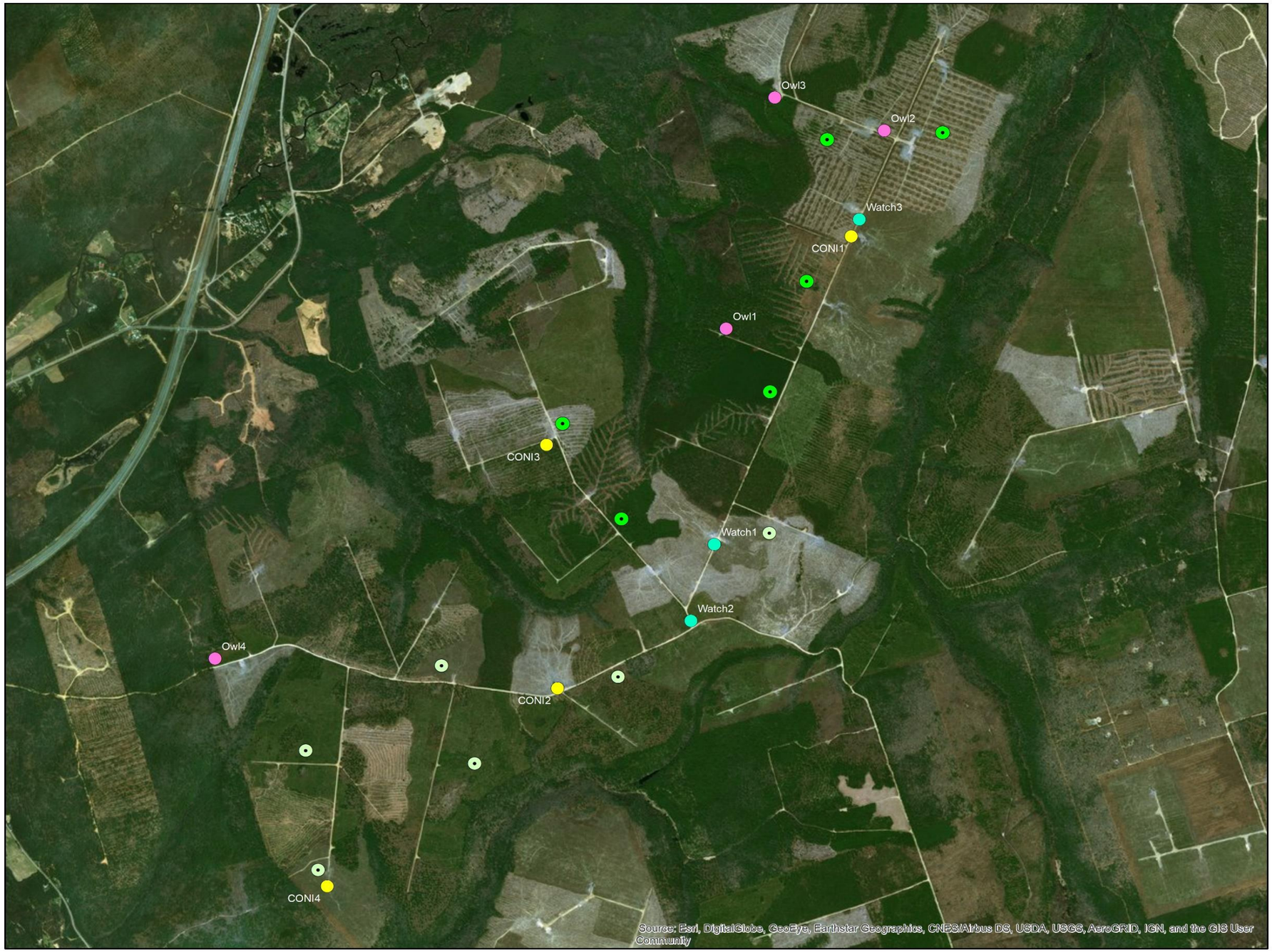
Metres

WGS 1984 Web Mercator Auxiliary Sphere

Production Date: Sep 7, 2018

natural forces

Figure 3-2: Avian survey point count and line transect locations.



Wocawson Energy Project

Additional Avian Survey Locations

Legend

- Watch Counts
- Owl Counts
- CONI
- Proposed Turbines
- Proposed Alternate/Expansion Turbines

N

1:35,000

0 600 1,200 1,800

Metres

WGS 1984 Web Mercator Auxiliary Sphere

Production Date: Sep 7, 2018

naturalforces

Figure 3-3: Watch Counts, Owl Counts, and Common Nighthawk Survey Locations.

3.3.2 Bat Survey

The 2009 Pre-Construction Bat Survey Guidelines for Wind Farm Development in New Brunswick (DERD, 2009) require, acoustic bat surveys for a minimum of one year prior to construction during both the breeding season (June 1 to June 30) and the late summer – early fall migratory period (August 15 to September 15).

The guidelines require additional pre-construction bat acoustic survey effort if the proposed wind facility and surrounding areas contain high risk habitat features (i.e., within 5 km of a known hibernacula, or potential cave or abandoned mine; within 500 m from a coast line or other major water bodies; or located on or near forested ridge habitats). A review of existing information indicates that there are no known hibernacula, caves or abandoned mines (based on the Province of New Brunswick's Mine Opening Inventory Map) within 5 km of the project area and it is not within 500 m of a coast line or major water body (ECCC, 2015).

For the purpose of this assessment, the spatial boundaries (i.e., the assessment area) have been identified as the area encompassing the access roads, each turbine location (plus a 150 m radius surrounding each turbine), and the transmission/connection lines (consisting of a 150 m-wide corridor), extending between the proposed project location to the existing power infrastructure.

Scope of Work

Based on the Pre-Construction Bat Survey Guidelines (DERD, 2009), a background and desktop analysis followed by one year of pre-construction survey including the summer and fall season is required. A minimum of 40 hours of survey distributed over a minimum of 10 nights with a minimum of 4 hours per night starting 30 minutes after sunset is required for the early summer breeding (June 1st – June 30th) and late summer/fall migration (August 15th – September 15th) periods. Additional surveys during the summer breeding (July 1st – July 31st) and fall migration (September 15th – October 15th) periods are recommended in high risk areas with 40 hours of survey over a minimum of 5 nights. Although the site is not considered as a high-risk area, surveys were designed to commence prior to the breeding season and extend through the late fall migration period (June 1st until October 31st, 2018 inclusive). This approach allowed for collection of data which could capture bat activity levels during the vulnerable periods (i.e., breeding and migration) while considering seasonal and environmental fluctuations. Methodologies used for the scope of the desktop analysis and field surveys listed above are outlined within the following sections.

WLP understands that one of the key environmental concerns associated with wind projects is the potential for effects to bats. As such WLP undertook consultation with DERD regarding the level of effort for the acoustic survey program. In email correspondence dated May 17, 2017, the DELG EIA project manager indicated that DERD was satisfied with the level of effort for the acoustic survey program;

however, it was recommended that one of the acoustic monitors be relocated. The acoustic monitor was thus set up in the location suggested by DERD prior to starting the survey as a result of the feedback.

Field Survey

Four acoustic survey stations were installed in the assessment area of the proposed project (Figure 3-6) to collect data from the different terrain and habitat types located in the area of the proposed project. Each station was equipped with a Wildlife Acoustics SM3BAT or SM4BAT ultrasonic bat detector and condenser microphones (i.e., SMM-U1/U2) (Figure 3-4 and Figure 3-5), aimed upward and away from the prevailing wind direction, that has an effective recording range of approximately 25 – 30 m. Each bat detector included the following programmed settings:

- Trigger Frequency Minimum: 16 kHz;
- Trigger Frequency Maximum: 192 kHz;
- Trigger Level: Automatic (12dB);
- Trigger Wind Setting (recording continues until no trigger is detected): 3 seconds, or when the maximum file duration (i.e., 15 seconds) was reached;
- Sample Night: from dusk to sunrise; and
- Gain Level: Automatic (12dB).

Each station was deployed on May 31st, 2018. Bat activity data was collected daily at each of the acoustic survey stations from dusk to sunrise, between June 1st to present (and planned to be ongoing until October 31st).

Figure 3-4: Acoustic Bat Detector

Figure 3-5: Acoustic Bat Detector Setup

One station was located on the existing MET at approximately 30 m above ground level, to collect bat activity within the blade sweep area, with the remaining 3 acoustic survey stations at ground level such that they capture the site boundaries, turbine clusters and unique habitat types. In an attempt to determine whether significant differences exist between bat activity collected at ground level versus within the blade sweep area, an additional microphone will be installed at ground level in association with the MET. Based on the differences (or lack thereof) between bat activity at ground level versus within the blade sweep area at the MET, the results will be extrapolated against the ground level acoustic monitoring stations as a mechanism to estimate potential bat activity within the blade sweep area.

Table 3-4: Acoustic Station Characteristics

Acoustic Station ID	Representative Photo	Station Height	Description
Acoustic Station 1		Ground Level	Acoustic station 1 was deployed at the southwestern end of the ridge near the proposed locations of turbines 8-12 at the edge of a recent clear cut adjacent to a small patch (approx. 3.2 ha) of mature mixed softwood trees.
Acoustic Station 2		Ground Level	Centrally located in the project assessment area near the proposed locations of turbines 6-7 at the edge of a clear cut adjacent to an area of hardwood dominant mixed forest that has been strip cut.

Acoustic Station 3a and 3b		30 m Above Ground Level and Ground Level.	At the on-site MET tower, near turbine 3, in a large clearing adjacent to semi-mature mixed forest and a large clear cut. One microphone was raised to 30 m above ground with an additional microphone recording at ground level.
Acoustic Station 4		Ground Level	At the northeastern end of the project assessment area at the edge of a hardwood dominant stand between the proposed locations of turbines 1 and 2.

Analysis

Bat acoustic data will be analyzed using the automated software Kaleidoscope Pro (Wildlife Acoustics) with the following settings:

- Minimum number of pulses = 2;
- Division Ratio = 8;
- Time Expansion Factor = 1;
- Duration = 2 – 500 ms; and,
- Frequency Range = 16 – 120 kHz.

Using the automatic species identification feature provided by Kaleidoscope Pro, each acoustic file will be first identified to species and species groups (where possible), or identified as either NOID (i.e. pulses recorded but unable to identify species) or NOISE (i.e. no pulse recorded). Species/species groups will be identified based on maximum frequency, minimum frequency, call duration and shape (Jones & Siemers 2010).

When bats are far from the detectors or at an angle that reduces detectability, calls can become fragmented where the higher frequency components of the calls are not recorded. This confounds the

ability to reliably differentiate several species with overlapping call parameters. For example, several *Myotis* species can be differentiated based on the maximum frequency of their calls, but not the minimum frequency (Agranat 2012). Although call shape can also aid in differentiating *Myotis* species, shape varies considerably with habitat structure as bats modify their calls for better long-distance detection in more open habitat and to reduce interference from echoes generated in more cluttered habitat (i.e. within woodlands) (Jones & Siemers 2010). As such, based on the auto ID generated by Kaleidoscope Pro, calls will be classified as follows (van Zyll de Jong 1985).

- **EPFU/LANO/LABO** – [Big brown (*Eptesicus fuscus*)/ silver-haired (*Lasionycteris noctivagans*)/eastern red bat (*Lasiurus borealis*)]: Both silver-haired bats and big brown bats produce calls with a constant frequency (CF) tail around 22 – 25 kHz. Although eastern red bats are the only species to produce calls with a minimum frequency between 30 – 35 KHz, they also produce calls with lower minimum frequencies within the range of big brown and silver-haired bats. As such, eastern red bats were included in this species group.
- **LACI** – Hoary bat (*Lasiurus cinereus*): Noticeably lower in frequency, with calls ranging from 25 to 18 kHz (maximum to minimum frequency). Calls are also noticeably longer in duration, with a longer CF tail compared to other bat species known to occur within the project assessment area. Hoary bats can, therefore, be reliably differentiated from all other species.
- **MYOTID SSP** (*Myotis*): Unlike the species outlined above, the species in this group produce shorter duration calls with a minimum frequency between 40 – 45 kHz, and maximum frequencies ranging between 120 kHz and 80 kHz. Occasionally, myotis calls can have a minimum call frequency of 35 kHz.
- **HFUN** (High Frequency Unknown) – NOID files with ≥ 2 pulses: Given that the main goal of the bat acoustic data program is to determine bat activity, NOID files with ≥ 2 pulses with a minimum frequency of ≥ 30 kHz were classified as HFUN bat calls. In this case, for data interpretation purposes HFUN bat calls will be included in the reported data.
- **LFUN** (Low Frequency Unknown) – NOID files with ≥ 2 pulses: Given that the main goal of the bat acoustic data program is to determine bat activity, NOID files with ≥ 2 pulses with a minimum frequency of < 30 kHz were classified as LFUN bat calls. In this case, for data interpretation purposes, LFUN bats calls will be included in the reported data.

Ecologically, these classifications make sense as Hoary Bats are typically confined to more open habitat, the EPFU/LANO/LABO group typically forage in the open and along woodland edges, and the MYOTID SSP are the most agile and therefore may be found in more cluttered environments, near water bodies, and along woodland edges (van Zyll de Jong 1985).

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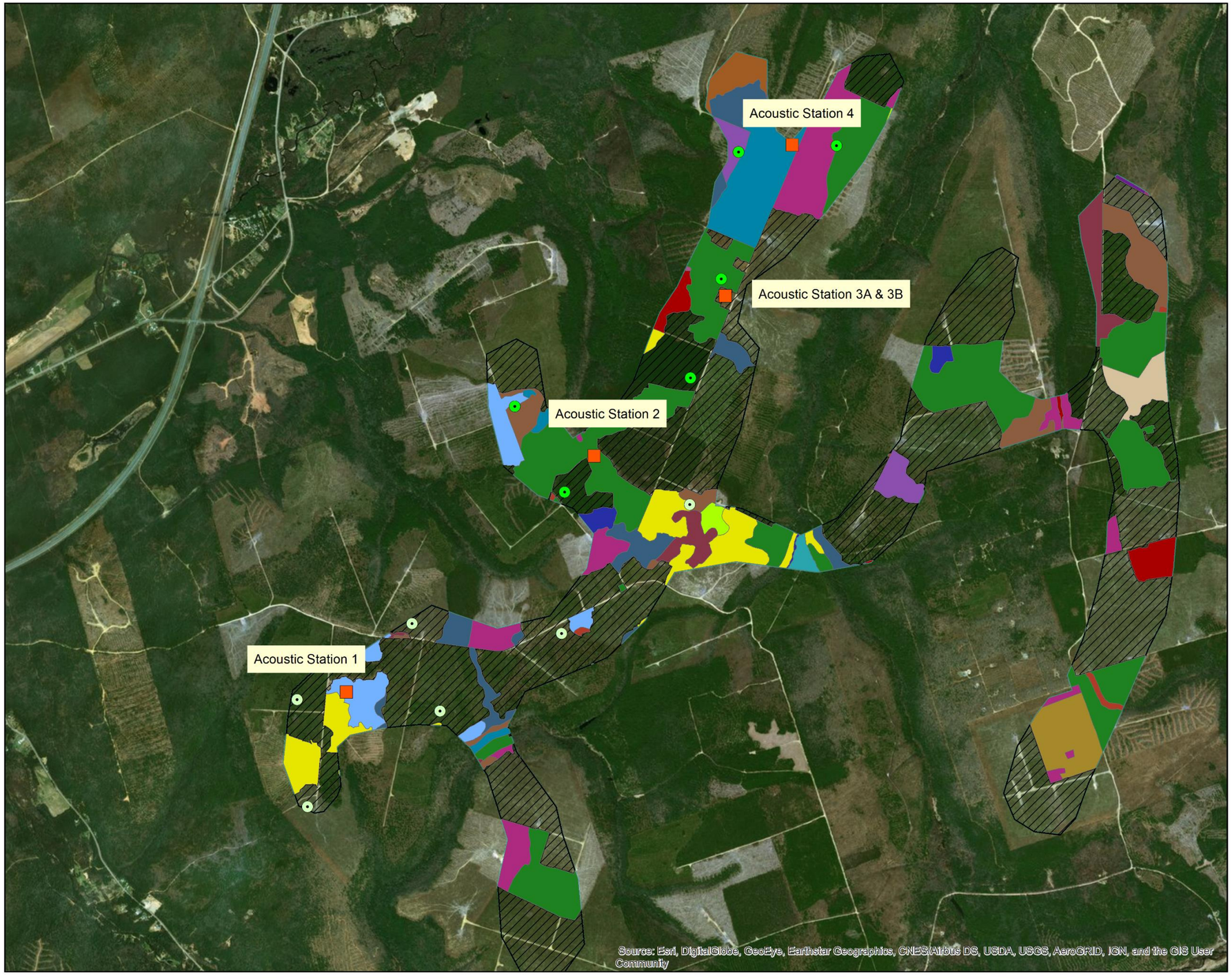


Wocawson Energy Project

Bat Monitor Locations

Legend

- Proposed Turbines
- Proposed Alternate/Expansion Turbines
- Bat Monitors

Habitat Types (GeoNB Forest Layer)

- Not Specified
- HW cover type birch hardwood
- MW cover type birch mixedwood
- SW cover type black spruce balsam fir
- HW cover type flood plain hardwood
- HW cover type intolerant hardwood
- SW cover type intolerant softwood
- SW cover type jack pine softwood
- MW cover type pine mixedwood
- HW cover type poplar hardwood
- MW cover type poplar mixedwood
- SW cover type red pine softwood
- MW cover type red spruce mixedwood
- SW cover type red spruce
- MW cover type spruce mixedwood
- SW cover type spruce
- HW cover type tolerant - mid-tolerant hardwood
- HW cover type tolerant hardwood
- SW cover type tolerant softwood
- WPSW

N

1:40,000

0 900 1,800 2,700

Metres

WGS 1984 Web Mercator Auxiliary Sphere

Production Date: Aug 31, 2018

naturalforces

Figure 3-6: Location of Bat Monitors in relation to turbine locations and habitat types.

3.3.3 Wetland and Watercourse Survey

The New Brunswick "Guide to Environmental Impact Assessment in New Brunswick" (DELG, 2018) requires that physical and natural features of the land be described. In relation to the aquatic environment, the guide recommends consideration of the following features:

- Aquatic or wetland features that could affect the project;
- The type or significance of any fish populations or habitat;
- Any known presence of aquatic species at risk or their habitat; and
- Any known presence of critical, sensitive or protected aquatic or wetland habitat.

Furthermore, the DELG's "Additional Information Requirements for Wind Turbines" sector guideline (DELG, 2004) requires that a description of habitat types (including the components above) be obtained at and surrounding each turbine site.

The scope of work included a desktop and field assessment of mapped and unmapped watercourses and wetlands within the assessment area. The goal of the desktop evaluation was to identify where wetlands, watercourses, or waterbodies may be located based on mapped systems, topography, forest cover type and satellite imagery, while also identifying where the Project study area lies within primary and secondary watersheds.

The aquatic environment for the purposes of this EIA considers watercourses and wetlands, which herein includes descriptions of the following:

- **Watercourses** – Watercourses in New Brunswick are defined as: "*A feature in which the primary function is the conveyance or containment of water, which includes: a) the bed, banks and sides of any watercourse that is depicted on the New Brunswick Hydrographic Network layer (available on GeoNB Map Viewer); b) the bed, banks and sides of any incised channel greater than 0.5 metres in width that displays a rock or soil (mineral or organic) bed, that is not depicted on New Brunswick Hydrographic Network layer (available on GeoNB Map Viewer); water/flow does not have to be continuous and may be absent during any time of year; or c) a natural or man-made basin (i.e. lakes and ponds).*";
- **Wetlands** – Wetlands in New Brunswick are defined as "*land that either periodically or permanently has a water table at, near or above the land's surface or that is saturated with water, and sustains aquatic processes as indicated by the presence of hydric soils, hydrophytic vegetation and biological activities adapted to wet conditions*" (DELG, 2012);

Field Survey

The aquatic habitats and wetlands field survey included the assessment of mapped and unmapped watercourses and the delineation and functional assessment of regulated (mapped) and non-regulated (unmapped) wetlands. Field surveys of the aquatic habitats and wetlands in the assessment area were conducted from June 26 to 28, 2018 and July 5 to 6, 2018, by Dillon Consulting biologists experienced in aquatic/ fish habitat surveys and certified in wetland identification, delineation and ecology as well as Wetland Ecosystems Services Protocol (WESP-AC) functional assessment methods. The detailed methods used for both watercourse and wetland assessments are summarized in the following sections.

Watercourse Assessment

The watercourse assessments were conducted within the assessment area in concert with other targeted field surveys including: rare plants and vegetation, wetlands, and terrestrial wildlife and wildlife habitat. Using the DERD and DFO standard aquatic assessment forms, fish habitat and aquatic features were assessed within 50 m upstream and 100 m downstream of the proposed “crossing”.

Assessment criteria included:

Description of aquatic habitat type:
Habitat types within each watercourse were described as riffle, run, pool or flat, where possible in the area of the proposed project;

Dominant substrate type and embeddedness:
Dominant substrate types were described and documented by percent of relative abundance. Substrate type (e.g. gravel or silt) is especially important for fish spawning habitat;

Stream channel characteristics:
Stream channel characteristics including average wet width, approximate bankfull width, average wetted depth and maximum wetted depth were measured in the field;

Instream cover and overhead canopy cover ratings:
Instream cover such as submerged woody debris, cobble, boulders, aquatic vegetation was documented, and overhead canopy cover ratings (percent covered by shrubs and trees) were scored;

Environmental Conditions and Water Level:
Environmental conditions (e.g. drier than normal seasonal conditions) were noted during the assessment and water level was rated as “low, moderate or high”. Hotter and drier environmental conditions resulting in lower water levels will stress salmonid fish populations;

Bank stability:
Bank stability and presence of eroding banks (potential for natural and anthropogenic sources) was assessed within the area of the project; and,

Riparian vegetation community:
In addition to recording each vegetation species the riparian vegetation community was described by percent trees, shrubs grasses and bare ground.

Wetland Assessment

The methods of wetland determination and delineation are based upon established protocols for wetland delineation, which are outlined in the US Army Corps of Engineers Wetland Delineation Manual (Environmental Laboratory, 1987/2008). Wetland determination and delineation is primarily focused upon establishing the wetland-upland edge, and is based upon the presence of positive indicators for three parameters, including:

- Hydric (wet) soil conditions;
- Hydrophytic (wet adapted) vegetation; and
- Wetland hydrology.

These parameters are further described in Appendix F.

Sample points for these three parameters were established at representative locations within the field identified wetlands. Upon positive wetland determination (i.e., positive indicators identified for soils, hydrology and vegetation), a wetland edge condition was established and georeferenced using a handheld GPS (3 to 5 m accuracy).

Functional Assessment: Wetland Ecosystem Services Protocol-Atlantic Canada (WESP-AC)

WESP-AC represents a standardized approach to the way data is collected and interpreted to indirectly yield relative estimates of a wide variety of important wetland functions and their associated benefits.

WESP-AC generates scores (0 to 10 scale) and ratings (Lower, Moderate, Higher) for a variety of wetland functions using visual assessments of weighted ecological indicators. The number of indicators that is applied to estimate a particular wetland function depends on which function is being assessed. The indicators are then combined in a spreadsheet using logic-based, mathematical models to generate the score and rating for each wetland function and benefit. Together they provide a profile of “what a wetland does.”

For each function, the scores and ratings represent a particular wetland’s standing relative to those in a statistical sample of non-tidal wetlands previously assessed in the Province (98 for New Brunswick) (Adamus, 2018). Table 3-5 provides a list of various functions, their definitions, and potential benefits.

Table 3-5: Benefits of Wetland Functions Scored by WESP-AC

Function	Definition	Potential Benefits
Hydrologic Functions:		
Water Storage and Delay	The effectiveness for storing runoff or delaying the downslope movement of surface water for long or short periods.	Flood control, maintain ecological systems
Stream Flow Support	The effectiveness for contributing water to streams especially during the driest part of a growing season.	Support fish and other aquatic life
Water Quality Maintenance Functions:		
Water Cooling	The effectiveness for maintaining or reducing temperature of downslope waters.	Support cold water fish and other aquatic life
Sediment Retention & Stabilisation	The effectiveness for intercepting and filtering suspended inorganic sediments thus allowing their deposition, as well as reducing energy of waves and currents, resisting excessive erosion, and stabilizing underlying sediments or soil	Maintain quality of receiving waters. Protect shoreline structures from erosion.
Phosphorous Retention	The effectiveness for retaining phosphorus for long periods (>1 growing season)	Maintain quality of receiving waters.
Nitrate Removal and Retention	The effectiveness for retaining particulate nitrate and converting soluble nitrate and ammonium to nitrogen gas while generating little or no nitrous oxide (a potent greenhouse gas).	Maintain quality of receiving waters.
Organic Nutrient Transport	The effectiveness for producing and subsequently exporting organic nutrients (mainly carbon), either particulate or dissolved.	Support food chains in receiving waters.
Ecological (Habitat) Functions:		
Fish Habitat	The capacity to support an abundance and diversity of native fish (both anadromous and resident species)	Support recreational and ecological values.

Aquatic Invertebrate Habitat	The capacity to support or contribute to an abundance or diversity of invertebrate animals which spend all or part of their life cycle underwater or in moist soil. Includes dragonflies, midges, clams, snails, water beetles, shrimp, aquatic worms, and others.	Support salmon and other aquatic life. Maintain regional biodiversity.
Amphibian and Reptile Habitat	The capacity to support or contribute to an abundance or diversity of native frogs, toads, salamanders, and turtles.	Maintain regional biodiversity
Waterbird Feeding Habitat	The capacity to support or contribute to an abundance or diversity of waterbirds that migrate or winter but do not breed in the region.	Support hunting and ecological values. Maintain regional biodiversity.
Waterbird Nesting Habitat	The capacity to support or contribute to an abundance or diversity of waterbirds that nest in the region.	Maintain regional biodiversity.
Songbird, Raptor, and Mammal Habitat	The capacity to support or contribute to an abundance or diversity of native songbird, raptor, and mammal species and functional groups, especially those that are most dependent on wetlands or water	Maintain regional biodiversity.
Native Plant Habitat and Pollinator Habitat	The capacity to support or contribute to a diversity of native, hydrophytic, vascular plant species, communities, and/or functional groups, as well as the pollinating insects linked to them	Maintain regional biodiversity and food chains.
Public Use and Recognition*	Prior designation of the wetland, by a natural resource or environmental agency, as some type of special protected area. Also, the potential and actual use of a wetland for low-intensity outdoor recreation, education, or research.	Commercial and social benefits of recreation. Protection of public investments.

*Considered a benefit rather than a function of wetlands
Source: Adamus (2018)

3.3.4 Fish and Fish Habitat

While reviewing the resources for the wetland and watercourse surveys the information was reviewed to evaluate the potential for aquatic SOCC and/or aquatic SAR within the general area of the proposed project and to assist in scoping the field programs.

During the wetland and watercourse survey, fish habitat suitability was also recorded:

Fish habitat suitability:
Habitat suitability for fish is assessed (based on the evaluation of habitat type, substrate type, instream cover, overhead cover and other ecological observations made during the watercourse assessment).

A fish presence or absence visual survey was conducted where fish habitat was present within the proposed project area. Representative photos and GPS points (using a handheld GPS unit and Arc Geographic Information Systems (ArcGIS) applications) were collected for each watercourse during the field assessments.

The technique of backpack electrofishing was considered as a method for conducting fish presence or absence surveys, but was not conducted during the field studies due to the breadth of avaibale literature (i.e. extensive aquatic studies conducted in areas surrounding the proposed project by both the CRI and KWRS).

3.3.5 Wildlife and Wildlife Habitat

The scope of work for the wildlife and wildlife habitat surveys is based upon an understanding of the nature of the proposed project and project area, as well as the field biologists experience in assessing similar landscapes. For the purposes of this report, Wildlife and wildlife Habitat (excluding bats and birds) – includes all terrestrial wildlife species and their habitats that have the potential to be affected by the Project activities.

Field studies of terrestrial habitats were conducted between May and July 2018, in concert with other targeted field surveys (i.e., wetlands, watercourses, baseline vegetation and rare plants). Biologists focussed on the general characterization of available terrestrial habitats within the survey area, as well as the potential for sensitive species or their critical habitats occurring in the survey area. The following criteria were documented:

- Occurrence of species at risk/species of conservation concern;
- Potential habitat for species at risk/species of conservation concern;
- Potential habitat for wildlife species;
- Unique or limiting wildlife habitat;
- Representative or typical wildlife habitat;
- Incidental observation and documentation of observed wildlife (regardless of conservation status); and,
- Wildlife sightings from previous studies.

During the field surveys, Dillon Consulting biologists recorded wildlife and signs of wildlife in the form of dens, scat, browse marks, and visual observations within 150 m of the turbine locations, within 75 m of the transmission line, and road upgrade areas.

3.3.6 Vegetation and Habitat Survey

This section details the scope of assessment of vegetation within the proposed project area and the methods that were used to conduct the surveys. The primary focus of the vegetation assessment was to identify the potential occurrence of SAR (listed on the *SARA*, by the COSEWIC, or on the New Brunswick *SARA* or SOCC listed as S1 or S2 by the ACCDC).

Under the New Brunswick *Environmental Impact Assessment Regulation* 87-83 (EIA Regulation) under the *Clean Environment Act,* areas of sensitive habitat and legally listed SAR should be avoided to the extent possible. As such, to better understand the types and quality of habitat in the area of the proposed project, a baseline study of available vegetation and vegetation communities is required to be conducted within the proposed project area. This assessment can identify the potential for occurrences of vegetation species at risk or of conservation concern within the location of the proposed project.

The New Brunswick "Guide to Environmental Impact Assessment in New Brunswick" (DELG, 2018) requires that physical and natural features of the land be described. In relation to the terrestrial environment, the guide includes the following features:

- Existing vegetation;
- Any known presence of species at risk; and
- Any known presence of critical or sensitive habitat

Furthermore, the DELG's "Additional Information Requirements for Wind Turbines" sector guideline (DELG, 2004) requires that a description of vegetation (including the components above) be obtained at and surrounding each turbine site.

For the purposes of this EIA, the vegetation assessment includes the following:

Vegetation Identification – includes an assessment of identified vegetation species along with their regional rarity ranking that have the potential to be affected by the Project activities;

Species at Risk and Species of Conservation Concern – includes those species listed by the federal and provincial authorities as well as regionally sensitive by the ACCDC; and

Vegetation of Cultural or Traditional Importance – includes vegetation species identified by a member of TFN as culturally significant from a traditional knowledge/use perspective.

Field Surveys

Field studies of vegetation species were conducted between June 26, 2018 and July 6, 2018, in concert with other targeted field surveys (i.e., wetlands, watercourses, and wildlife and wildlife habitat). The survey area for the field studies was focused on the assessment area for the project including a 150 m allowance around the proposed turbine locations and a 75 m allowance along the proposed transmission line, and road upgrades.

Vegetation observation, areas of potential unique or pristine vegetation communities within the survey area, and forest habitat characterization was recorded.

3.3.7 Sensitive and Significant Habitat

During field surveys, any sensitive or significant habitat was identified including any wetlands, watercourses, IBA's, endangered fauna and/or flora, and associated critical habitat. The ACCDC was consulted to determine any ESA's, bat hibernacula, and wood turtle habitat near the proposed project. The GeoNB Data Catalogue was also searched for relevant data and the following data layers were reviewed:

- Aboriginal Lands
- Federal Parks and Protected Areas
- PNAs
- IBAs
- Protected Watersheds
- Protected Wellfields
- Provincial Parks
- Wildlife Refuges

3.4 Approach to Socio-economic VEC Studies

3.4.1 Archaeological Impact Assessment

A desktop archaeological review was initiated by the Proponent. A request to New Brunswick's archeological Branch to complete a review of the Project site on the Archaeological Spatial Database was submitted and a predictive model provided in November, 2017. This predictive model was provided to Archaeological Prospectors, an archaeological survey and excavation consultant, to aid in proper scoping of the Archaeological surveys.

Archaeological Prospectors completed a thorough literature review of relevant documents from Archaeological Services in Fredericton and published materials, including topographic and surficial geology maps & reports, aerial photographs, LiDAR data, and the New Brunswick Register of Historic Places.

Field Survey

An archaeological Field Survey Permit was obtained in June, 2018 and field surveys occurred on July 5th, and 6th, 2018. The field surveys were conducted using intensive visual inspection through pedestrian surveying. Each turbine area, the substation and along select areas of the transmission line were surveyed. Archaeological excavations were recommended by Archaeological Prospectors on some areas of elevated risk along the transmission line.

Based on the potential for the presence of archaeological resources after reviewing the spatial database predictive model, initial documentary research, and the pedestrian survey, there are indications that a portion of the footprint has a high potential for the presence of archaeological remains further discussed in Section 5.3.1.

In order to avoid the impact of archaeological resources a testing strategy will be developed based on the Provincial *Guidelines And Procedures For Conducting Professional Archaeological Assessments In New Brunswick* (2012). The accepted testing strategy will include the excavation of standardised test pits (STP) (STP's = 50 cm x 50 cm), which will be hand excavated with trowel and shovel and all material passed through 6 mm bi-pedal screens. Each STP will be placed at the approximate location of the power poles and structure anchors of the transmission line in the areas of elevated potential. Each test pit will be excavated to glacial till, marine clay or bedrock (equalling archaeological bottom). The testing strategy could require approximately 28 STP's.

3.4.2 Electromagnetic Interference Study

An impact assessment of the proposed WEP was completed on the performance of existing microwave radio links following the recommended Radio Advisory Board of Canada's (RABC) *Technical Information and Coordination Process Between Wind Turbines and Radiocommunication and Radar System (RABC & CanWEA, 2007)*. The desktop study was conducted by completing a search of the Industry Canada database to identify all licensed radio systems within 35 km of the proposed Project and all mobile towers within 10 km.

Based on radio links that were identified, an assessment of the potential impact was completed by calculating the recommended clearance corridor between the turbine and radio links using the RABC protocol. The recommended clearance corridor (also known as the Fresnel zone) was calculated for each radio link that crosses near the Project site, to determine whether a proposed turbine is within this buffer and could pose interference between the radio links.

Applications to Transport Canada and Land Use Proposal forms for Navigation Canada have been submitted and the DND has been notified about the proposed Project.

3.4.3 Land Use and Property Value

Current and historical uses of the project lands have been identified through consultation with regulators, First Nations, the current and local land owners, and surrounding business owners. Additionally, aerial imagery and ground truthing during field surveys provided insight into current and historical land uses.

The latest Statistics Canada data was reviewed to determine the average value of land and properties to obtain a baseline value prior to construction and operation. Further, a review of published literature on links between wind farms and property value have been provided. Property value is often a concern to local community members and a review of science-based studies will be beneficial during consultation activities.

3.4.4 Vehicle Traffic and Pollution

A list of expected vehicle movements and types of vehicles to be used during the construction phase have been compiled. After further analysis and specific WTG selection, delivery routes will be determined by the applicable party in consultation with the DTI prior to vehicle movements.

3.4.5 Public Health and Safety

A comprehensive review of possible health and safety concerns has been included in this assessment. The wind turbine model has been selected in order to comply with international wind class standards, and to help reduce the risk of ice build-up, lightning strikes and general malfunctions. Natural Forces has an inhouse construction manager who oversees construction activities and will encourage safe practices for worker safety. A copy of the Occupational Health and Safety (OHS) Act will also be located on site at all times.

Many of the mentioned assessments are conducted to ensure the construction and operation of the WEP will occur in the safest manner possible and will often reduce many of the concerns and risk before construction begins such as possible noise and shadow flicker annoyance.

3.4.6 Community and Local Economy

The latest Statistics Canada data was reviewed to obtain information on the local economy and population of the Cardwell Local Service District. This allows Natural Forces to determine how the Project may affect the community and local economy.

3.5 Methodology of Impact Assessment

This assessment is designed to focus on the evaluation of the potential interactions between the VECs and the various Project activities. VECs have been determined through consultation with local stakeholders and provincial regulators. The first step of this assessment has been to determine if there is a potential for the VEC to interact with the Project in a way that will cause an adverse environmental impact.

If it has been determined that an interaction between the Project and a VEC occurs, the significance of this interaction and potential impact will be determined and appropriate mitigation and control measures will be proposed and applied.

After applying mitigation measures, further assessments will be completed to determine if the measures have effectively reduced environmental impact. Environmental effects that remain after mitigation and control measures have been applied are considered the residual effects of the Project. The prediction of residual environmental effects follows three general steps.

- Determining any possible adverse environmental impact;
- Determining whether an adverse environmental effect is significant; and
- Determining whether a significant adverse environmental effect is likely to occur.

To determine the significance or residual effects on the VECs following mitigation, the following definitions will be used:

- *Significant:* Potential impact could threaten sustainability of the resource in the Project area and should be considered a management concern;
- *Minor:* Potential impact may result in a small decline of the quality of the resource in the Project area during the life of the Project – research, monitoring and/ or recovery initiatives should be considered;
- *Negligible:* Potential impact may result in a very slight decline of the quality of the resource in the Project area during the life of the Project – research; monitoring and/ or recovery initiatives would not typically be required;
- *No impact:* the consequences of the Project activity have no effect on the specific VEC; and
- *Beneficial impact:* the consequence of a Project activity enhances the specific VEC.

Further, a review of the effect of the environment on the Project such as climate and extreme weather events will be included in the assessment.

4.0 Existing Environment

4.1 Existing Physical VECs

4.1.1 Ground Water

There are no residential wells within 500m of the proposed WTGs. However, according to the Online Well Logs System, there was an exploratory well drilled in 2003 located approximately 150m from proposed Turbine 9 with water levels estimated at least 100m below ground. In referencing the GeoNB Protected Wellfield Data, Zone C of a protected wellfield is located 270m east of turbine 12. Turbine 12 is an alternative location to the primary proposed turbine locations (T1-T6).

The Geotechnical survey will determine the depth of the bedrock, in addition to other soil conditions, at each of the wind turbine locations. It is anticipated that bedrock will be encountered at less than 3m in depth. If ground water is detected before the drill reaches bedrock, it will be recorded, otherwise it will not be recorded.

4.1.2 Geophysical

The project site is located 20 km east of the Town of Sussex, New Brunswick. The regional land in this area is variable with many hills and ridgelines. The project lands vary in elevation from 230-270m. A desktop review has determined the geology of the site to be part of the Cumberland Group composed of Late Carboniferous terrestrial sediments. The surficial geology of the high ground where the turbines and substation are proposed, is referred to as the Boss Point till (Pronk, A., Allard, S., and Boldon, R. 2005). Boss Point till consists of well-drained matrix, high in sand content (as much as 75%) with additional clay/silt. Additional information on the geophysical environment will be obtained from the geotechnical surveys to be completed in the Fall of 2018.

4.1.3 Atmospheric Conditions

Historic climate data was taken from an Environment Canada weather station located in Sussex, New Brunswick located approximately 20 km southwest from the Project site. The data collected from Environment Canada can be found in Table 4-1 and represents climate averages and weather extremes.

Table 4-1: Sussex, New Brunswick Atmospheric Conditions (Environment Canada, 2018d).

Parameter	Time Period	Data Source	Value
Average Daily Temperature (°C)	Yearly Average (1981-2010)	Environment Canada	6.1
Extreme Maximum Temperature (°C)	August 18, 1935	Environment Canada	37.2

Extreme Minimum Temperature (°C)	January 15, 1957	Environment Canada	-44.4
Average Total Rainfall (mm)	Yearly Average (1981-2010)	Environment Canada	926.1
Maximum Daily Rainfall (mm)	September 22, 1999	Environment Canada	113.4
Average Annual Snowfall (cm)	Yearly Average (1981-2010)	Environment Canada	243.8
Maximum Snow Depth (cm)	March 18, 1987	Environment Canada	80.0

Historic and Predicted Rainfall

Potential changes in rainfall amounts due to climate change may require additional storm water management techniques. As such, the ECCC's Sussex weather station data was reviewed to determine historic rainfall amounts as shown in Table 4-2. Future predicted climate for New Brunswick based on the IPCC AR5 predictions for future precipitation throughout the province has also been demonstrated for comparison in Figure 4-1.

Table 4-2: ECCC Sussex Station data for historic precipitation amounts (ECCC, 2018d)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg (mm)	**108.8**	**85.0**	**114.7**	**89.7**	**103.0**	**88.4**	**84.0**	**74.3**	**99.9**	**106.5**	**110.0**	**105.6**
Extreme Daily (mm)	**97.3**	**85.9**	**98.0**	**98.8**	**71.9**	**72.9**	**94.5**	**95.0**	**113.4**	**91.2**	**74.2**	**59.2**

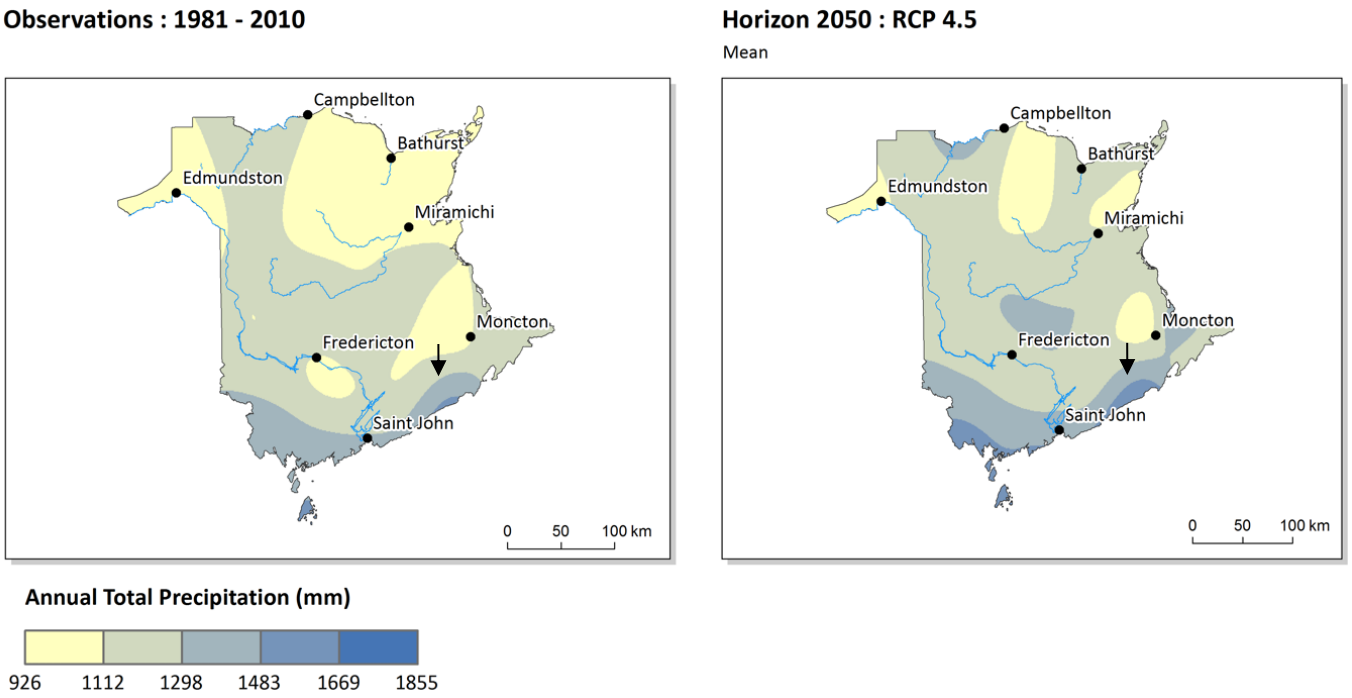


Figure 4-1: Annual Total Precipitation for the province of New Brunswick showing historical data (left) and Predicted 2050 data (right) to show the predicted precipitation near the end of the project lifespan (Roy & Huard, 2016).

Figure 4-1 demonstrates that the proposed project location will see an increase in precipitation as a result of climate change. The black arrow in the maps outline that the project location will increase in precipitation amounts from the 1112- 1298mm range annually to a possible 1298-1483mm. As Table 4-2 demonstrates, the Sussex weather station receives approximately 1169.9 mm of precipitation annually, predicted changes then result in a potential 11% - 27% increase in annual precipitation amounts.

In addition to these predictions, the Proponent researched IDF climate change curves to reflect future trends for extreme rainfall patterns using an IDF tool developed by the University of Western Ontario (2014). When reviewing the IDF tables (Table 4-3 and Table 4-4) and graphs for the proposed location, total precipitation and intensity was found to increase by a maximum of 32% over all timeframes and return periods and is predicted to increase, on average, by approximately 26% from historic levels. Though the data for IDF curves at the project location has been extrapolated using the IDF tool from nearby

weather stations, the approximate increase in precipitation is within the New Brunswick IPCC Assessment Report #5 predictions.

Table 4-3: University of Western Ontario's IDF Tool for Historic Rainfall Levels from the Project site (i.e. a 5-minute rainfall intensity of 72.6mm/h typically occurs every 2 years) (UoWO, 2014).

T (years)	2	5	10	25	50	100
5 min	72.6	103.46	124.96	153.60	176.01	199.31
10 min	51.35	72.85	87.80	107.58	122.95	138.82
15 min	42.02	59.01	71.05	87.23	100.00	113.34
30 min	27.56	37.81	45.16	55.17	63.17	71.66
1 h	18.56	25.22	30.57	38.65	45.81	54.06
2 h	12.37	16.53	19.88	24.94	29.40	34.52
6 h	6.64	8.75	10.14	11.89	13.19	14.51
12 h	4.11	5.48	6.39	7.53	8.38	9.22
24 h	2.43	3.26	3.82	4.53	5.07	5.61

Table 4-4: University of Western Ontario's IDF Tool for Predicting Future Rainfall Levels from the Project site during the years 2020-2070 using the moderate Representative Concentration Pathway of 4.5 W/m2 by the year 2100 (i.e. a 5-minute rainfall intensity of 73.99mm/h is expected to occur every 2 years now) (UoWO, 2014).

T (years)	2	5	10	25	50	100
5 min	83.99	127.81	161.02	201.98	229.68	254.53
10 min	59.40	90.00	113.13	141.47	160.44	177.29
15 min	48.62	72.89	91.55	114.71	130.49	144.74
30 min	31.89	46.71	58.19	72.54	82.44	91.51
1 h	21.48	31.15	39.39	50.83	59.78	69.04
2 h	14.31	20.42	25.62	32.80	38.37	44.09
6 h	7.68	10.82	13.07	15.63	17.21	18.53
12 h	4.76	6.78	8.23	9.90	10.93	11.77
24 h	2.81	4.02	4.92	5.96	6.62	7.17

From the historical and predicted rainfall amounts in the area of the proposed Project, it is evident that rainfall will increase. The predicted increase in precipitation amount and intensity has been considered in the location and design of the WTGs.

Visibility & Fog

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

Fog develops over the Bay of Fundy in warm, moist, southwest winds and is then advected onshore (Robichaud & Mullock, 2001). It tends to be prevalent throughout the entire Bay but will move farther inland on the New Brunswick coast than it will on the Nova Scotia side. Elevated ridgelines and hills such as the project location, have a tendency to act as a barrier and prevent the fog from penetrating inland.

A good indicator as to whether or not fog will develop is to look at the forecast winds at 3,000 and 6,000 feet (Robichaud & Mullock, 2001). When these winds parallel the Bay, fog can usually be expected until the winds shift significantly. A common tool in timing the fog at Saint John Airport is to look at the tide tables for the Saint John Harbour. Fog often moves into the airport 30 to 40 minutes prior to high tide. Another good predictor of fog development is to look at coastal stations along the coast of Maine. If fog is observed at Bar Harbour and Rockland, fog in the bay is almost guaranteed (Robichaud & Mullock, 2001).

ECCC's database of Canadian Climate Normals 1971-2000 was consulted to provide baseline fog data relevant to the Project region. However, the nearest weather station that collects this data is located in Moncton, New Brunswick (ECCC, 2018d) and may not be an accurate representation of the project region. Data was also gathered from Saint John, New Brunswick. It is anticipated that the Wocawson project site would receive fog amounts between these two locations. Based on the data presented in Table 4-5 fog can be expected to occur 1.96% - 6.34% of the time throughout the duration of an average year.

Table 4-5: Moncton and Saint John, New Brunswick fog data average from 1971-2000 (ECCC, 2018d).

	Moncton		Saint John	
Month	Hours with visibility less than 1 km	% of foggy weather*	Hours with visibility less than 1 km	% of foggy weather*
January	18	2.4	22.2	3.0
February	19.5	2.9	18.6	2.8
March	24.2	3.3	21.9	2.9
April	18.4	2.6	31.2	4.3
May	12.5	1.7	46.6	6.3
June	10.4	1.4	72.7	10.1
July	11.3	1.5	117.1	15.7
August	9.5	1.3	105.5	14.2
September	9.8	1.4	57.2	7.9
October	9.7	1.3	28.1	3.8

November	12.6	1.8	18.2	3.9
December	15.7	2.1	16.3	2.2
Annual	**171.8**	**1.96 %**	**555.4**	**6.34%**

* Based on days/month x 24 hr/day.

Moncton is located 50 km northeast of the project and could resemble inland conditions near the project while Saint John is located 80 km south west of the Project and could represent more coastal conditions. In an attempt to obtain data more relevant to the project region, Environment Canada's Handbook on Fog and Fog Formation Forecasting was consulted and it was determined that while the majority of New Brunswick receives between 30-60 fog days annually, southwestern New Brunswick just inland and along the Bay of Fundy receives between 60-90 days annually. Additionally, hourly observations between 1971-2003, estimated that the project area receives approximately 200-400 hours of fog per year equivalent to receiving fog 2.3% - 4.6% of the time.

4.1.4 Wind Resource

The New Brunswick wind atlas was used in the preliminary site finding exercise and indicates an approximate wind speed of 6.51 – 7.5 m/s at 80 m (NB Wind Atlas, 2017; Figure 4-2) for the Regional area. Preliminary data collected from the installed meteorological mast (Figure 4-3) demonstrates prevailing winds from the southwest (Figure 4-4).

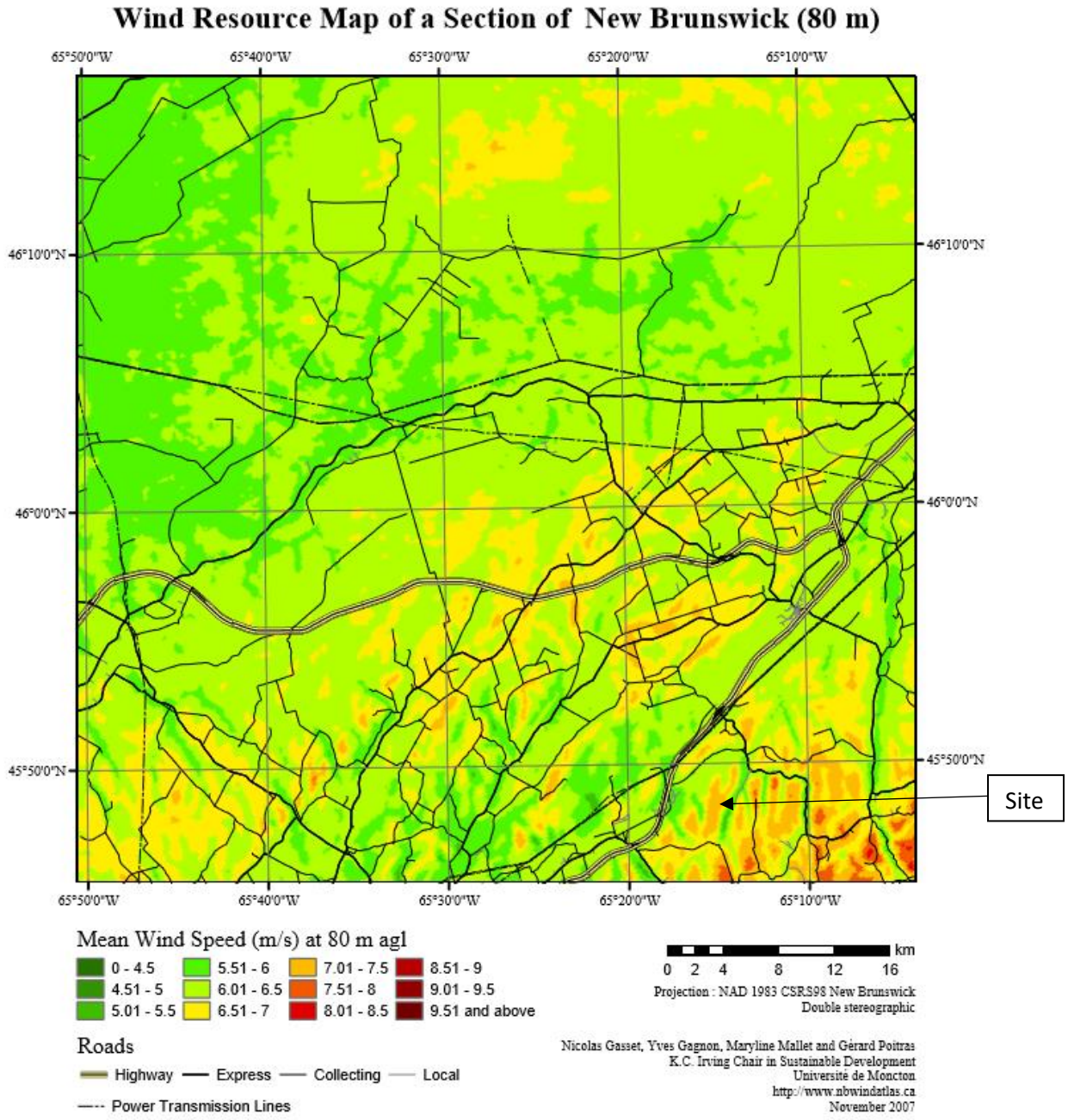


Figure 4-2:The Government of New Brunswick's wind atlas demonstrating the project site is located in an area with wind speeds between 6.51-7.5 m/s.

Figure 4-3: The 80m Met Tower installed in April 2017

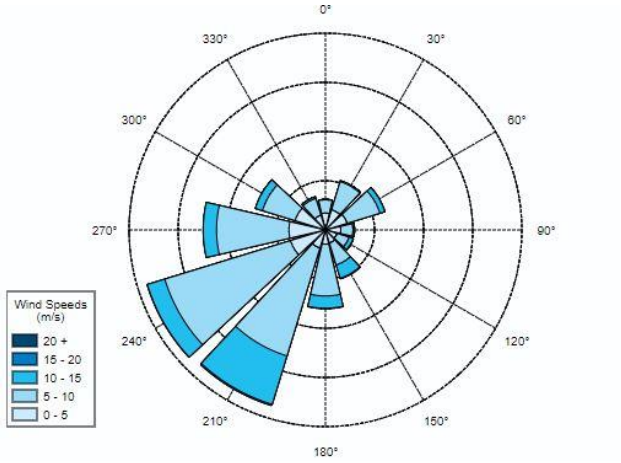


Figure 4-4: Wind Rose created from data collected from the installed met tower from April – Sept 2017 demonstrating prevailing winds from the southwest.

4.1.5 Existing Noise

Existing Ambient Noise

The area proposed for the WEP is located in a rural area with an active forest industry and recreational snowmobile use. Due to the sites elevation, wind resource, industrial and recreational uses, ambient noise levels in the area are generally elevated. As the site was chosen for it's excellent wind resource, particularly windy days can greatly increase existing ambient noise levels.

Low Frequency Sound and Infrasound

Low frequency sound is defined as sound with a frequency less than 200 Hertz (Hz) or cycles per second. Infrasound, also referred to as low-frequency sound, is sound that is not audible to humans, which is typically below a frequency of 20 Hz (HGC Engineering 2006).

Infrasound levels created by wind turbines are often comparable to the ambient levels prevalent in the natural environment, such as levels created by the wind itself. In terms of health, at sufficiently high levels, infrasound can be dangerous; however, it is grossly inaccurate to conclude that infrasound from wind turbines causes health risks (HGC Engineering 2006).

A recent study conducted by Massachusetts Institute of Technology found that infrasound near wind turbines does not exceed audibility thresholds. Epidemiological studies have shown a relationship between living near turbines and annoyance. Annoyance seems strongly related to individual characteristics rather than noise from turbines. However, infrasound and low-frequency sound do not present unique health risks. (McCunney et. At., 2012).

4.1.6 Existing Visual Aesthetics

The landscape surrounding the WEP has many rolling hills and a few small residential neighbourhoods. The current visual aesthetics of the landscape can be viewed in the following photos (Figure 4-5 to 4-7) which are later used to demonstrate how the landscape will change with the proposed turbines.

Figure 4-5: Landscape view in the direction of the turbines from Highway 1 near the Portage Vale Road overpass.

Figure 4-6: Landscape view in the direction of the turbines from Route 895 over looking farmers fields.

Figure 4-7: Landscape view in the direction of the turbines from Route 114.

4.2 Existing Biophysical VECs

4.2.1 Avian

The results of the avian surveys conducted within the area of the proposed project in winter, spring and summer are summarized within the following sections. The fall 2018 avian survey results will be submitted in an addendum following the completion of the fall field surveys.

During the 2018 avian surveys (winter, spring and summer), a total of 1,761 individual birds of 83 different species were recorded within the assessment area. The bird populations present in the assessment area were observed through the techniques of point counts, area searches / transects, and watch counts. A summary of the total number of species and individual birds by season is presented below in Table 4-6.

Table 4-6: Summary of the Number of Bird Species and Individual Birds Observed During the 2018 Avian Field Surveys

Season	Total Number of Species (Diversity)	Total Number of Individuals (Abundance)
Winter Surveys (February – March) Transect Area Searches and Early Breeding Owl Survey	17	247
Spring Surveys (April – June) Transect Area Searches, Point Counts, Watch Counts and Owl Surveys	76	1,164
Summer Surveys (June – mid July) Area Searches and Point Counts	50	350

Refer to Appendix D for detailed avian observation data tables, including: an overview of species identified during the 2018 field program, as well as seasonal abundance summaries.

Winter Surveys

Overwintering bird species that were identified during the winter surveys (February – March 2018) in the area of the proposed project included common resident species for New Brunswick, as well as some lesser common resident species according to the "Birds of New Brunswick: An Annotated List" (Christie et al., 2004). The most commonly observed species within the assessment area included:

Pine Siskin (*Spinus pinus*) – Irregularly fairly common resident associated with coniferous forests;

Black Capped Chickadee (*Poecile atricapillus*) – Very common resident associated with diverse forest types and feeders; and,

White-winged Crossbill (*Loxia leucoptera*) – Irregularly common resident associated with coniferous forests; known to breed erratically, including in January and February.

An uncommon resident: the Brown Creeper (*Certhia americana*) was also identified during the winter surveys. This species is associated with mature coniferous and hardwood forests (breeding) and is also known to visit large hardwood trees in the winter (Christie et al., 2004).

In total, 17 resident bird species were identified during the winter field survey program. One SAR (i.e. Bald Eagle, *Haliaeetus leucocephalus)*, no SOCC, and no species of owls were identified during the winter field survey program.

Spring Surveys and Spring Migration Summary

The spring survey program (April-early June) included: transect area searches, point counts, watch counts (including flyover), and owl surveys. The highest period of migration (in species abundance and diversity) observed during the spring migration (fly over) surveys was in early to mid-May (refer to Figure 4-8 and Figure 4-9). Some migration continues into late May and early June.

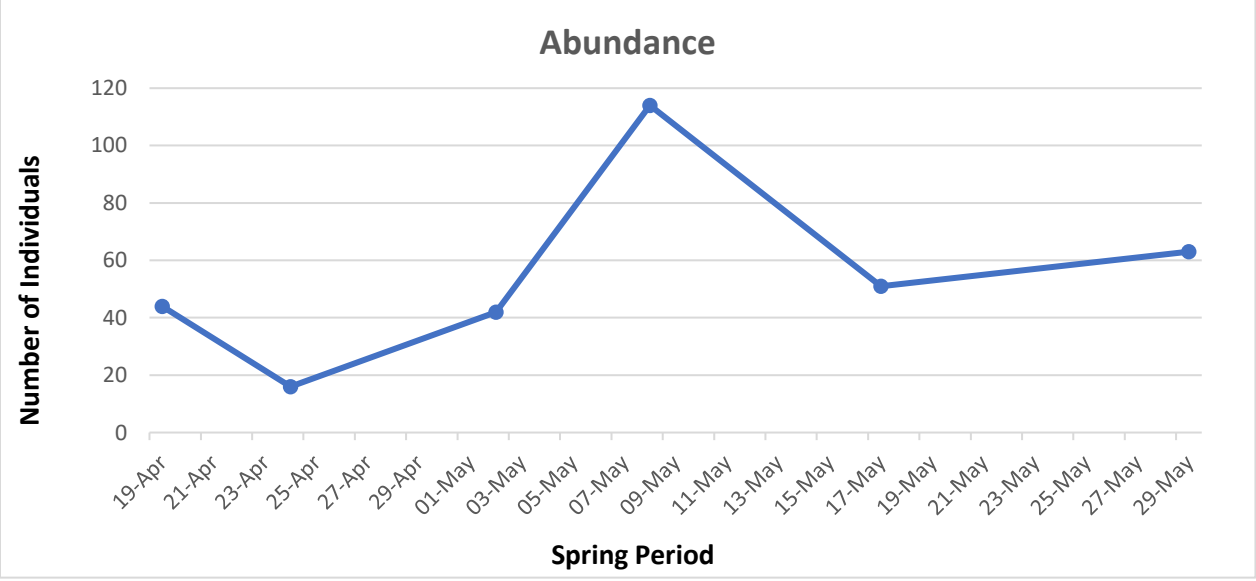


Figure 4-8: Bird Species Abundance at the Proposed Wocawson Energy Project Area During the 2018 Spring Survey Period

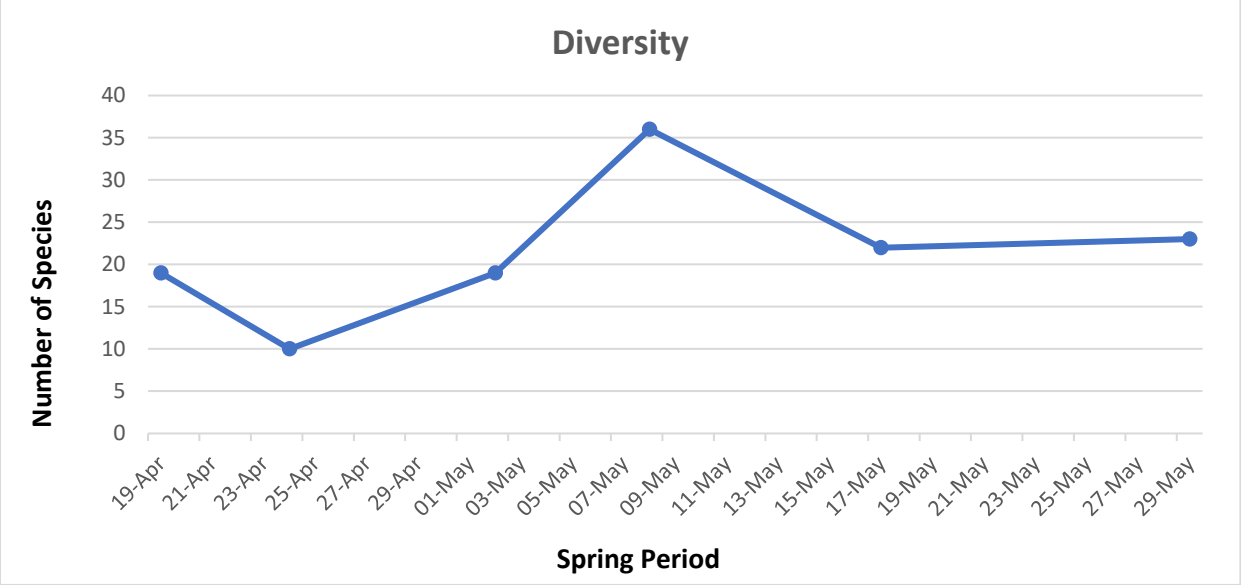


Figure 4-9: Bird Species Diversity at the Proposed Wocawson Energy Project Area During the 2018 Spring Survey Period

The most common species observed included common migrant and resident birds of New Brunswick. The most abundant species observed during the spring surveys included:

White Throated Sparrow (*Zonotrichia albicollis*) – Most abundant bird species observed during the spring surveys. Very common summer resident and migrant tolerant of a wide range of habitats;

American Robin (*Turdus migratorius*) – Very common summer resident and migrant associated with a variety of habitats and an early migrant;

Black-capped Chickadee (*Poecile atricapillus*) – Very common resident associated with diverse forest types and feeders;

Dark-eyed Junco (*Junco hyemalis*) – Very common summer resident and migrant associated with a variety of habitats; and,

Ovenbird (*Seiurus aurocapilla*) – Common summer resident and migrant associated with broadleaf and mixed- wood forests.

In total, 76 resident and migrant bird species were identified during the spring field survey program. Two species of owl were identified during the spring surveys: Barred Owl (*Strix varia;* common resident) and Northern Saw-whet Owl (*Aegolius acadicus;* uncommon resident). Although Barred Owls were not detected during the winter surveys, the species is known to begin nesting in February (Christie et al.,

2004). During the spring field survey program, five SAR, including: Bald Eagle, Barn Swallow (*Hirundo rustica*), Common Nighthawk (*Chordeiles minor*), Peregrine Falcon (*Falco peregrinus*) and Eastern Wood-peewee (*Contopus virens*) and two SOCC, including: Pine Siskin (*Spinus pinus*) and Turkey Vulture (*Cathartes aura*) were observed within the assessment area.

Summer Surveys

The summer survey program (June – mid-July) included area searches and point counts. The most common species observed included common migrant and resident birds of New Brunswick. The most abundant species observed during the summer surveys included:

Ovenbird (*Seiurus aurocapilla*) – Most abundant bird species observed during the summer surveys. Common summer resident and migrant associated with broadleaf and mixed- wood forests.

White Throated Sparrow (*Zonotrichia albicollis*) – Very common summer resident and migrant tolerant of a wide range of habitats;

Magnolia Warbler (*Dendroica magnolia*) – Very common summer resident and migrant that breeds in regenerating coniferous forest; and,

Black-throated Green Warbler (*Dendroica virens*) – Fairly common summer resident and migrant that breeds in mature mixedwood forest and second growth.

In total, 50 resident and migrant bird species were identified during the summer field survey program. Three SAR, including: Eastern Wood-peewee, Canada Warbler and Rusty Blackbird (*Euphagus carolinus*) were observed within the assessment area and no SOCC were observed within the assessment area.

Breeding Bird Summary

According to Bird Studies Canada (BSC, 2018), the proposed project is located within Zone C3, where the regional nesting period is considered to be from mid-April to late August.

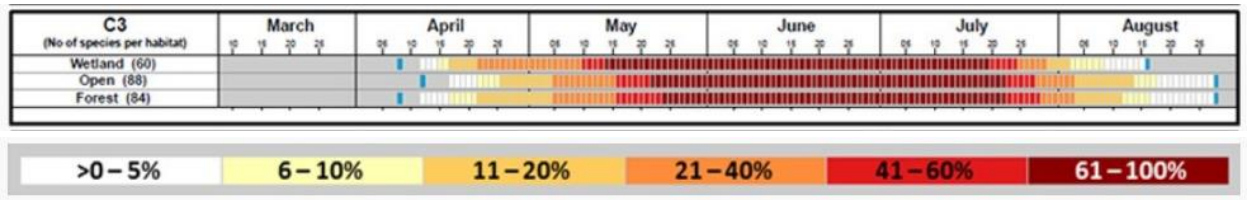


Figure 4-10: Breeding Bird Nesting Period in the Area of the Proposed Project (BSC, 2018)

The Maritime Breeding Bird Atlas (MBBA) (BSC, 2010) ranks the probability of breeding birds as “Possible” (birds were observed singing in their breeding habitat), “Probable” (pairs of birds, agitated or displaying birds were observed), and “Confirmed” (nests, distraction displays or fledged young were observed) (BSC, 2010).

Based on the behavioural observations noted or observations of birds in nests, two species were confirmed to be breeding within the assessment area, and three species were observed to be displaying agitated behaviour (i.e., defending nesting territory). These species include the following:

Confirmed Nesting within the Assessment Area:
(Birds were flushed from a nest during the 2018 field survey)

Hermit Thrush (*Catharus guttatus*); and

Least Flycatcher (*Empidonax minimum).*

Probable Breeders within the Assessment Area:
(Birds were observed defending nesting territory; no nest was observed)

White Throated Sparrow (*Zonotrichia albicollis*);

Northern Goshawk (*Accipiter gentilis*); and,

Blue-headed Vireo (*Vireo solitarius*).

During the 2018 spring and summer field survey programs, many other birds were observed singing within suitable breeding habitat, suggesting that many other species were using available breeding habitat within the assessment area.

Bird Species at Risk

In total, eight avian SAR were identified during the 2018 avian survey program, refer to Table 4-7, presented below. Descriptions of the species identified during the survey program and their preferential habitat is also provided below.

Table 4-7: Avian SAR Identified within the Assessment Area During the 2018 Avian Survey Program

Common name	Scientific name	AC CDC S-rank[1]	NB SARA Status	Federal SARA Status	COSEWIC
Bald Eagle*	*Haliaeetus leucocephalus*	S4	Endangered	-	-
Barn Swallow	*Hirundo rustica*	S2B,S2M	Endangered	Threatened Schedule 1	Threatened
Canada Warbler	*Wilsonia canadensis*	S3B,S3M	Threatened	Threatened Schedule 1	Threatened

Common Nighthawk*	*Chordeiles minor*	S3B,S4M	Threatened	Threatened Schedule 1	Special Concern
Eastern Wood-pewee	*Contopus virens*	S4B,S4M	Special Concern	Special Concern Schedule 1	Special Concern
Olive-sided Flycatcher*	*Contopus cooperi*	S3B,S3M	Threatened	Threatened Schedule 1	Special Concern
Peregrine Falcon*	*Falco peregrinus*	S1B,S3M	Endangered	Special Concern Schedule 1	Special Concern
Rusty Blackbird*	*Euphagus carolinus*	S3B,S3M	Special Concern	Special Concern Schedule 1	Special Concern

* Bird species was not identified by the ACCDC records review (ACCDC, 2018).

Notes: 1 S1: extremely rare in province; S2: rare in province; S3: uncommon in province; S4: widespread, common and apparently secure in province; S5: widespread, abundant and demonstrably secure in province S#S# = a numeric range rank used to indicate any range of uncertainty about the status of the species or community. B= Breeding, N = Nonbreeding, M = Migrant, U = Unrankable. (ACCDC, 2018)

Bald Eagle

This very large raptor is the largest bird that inhabits the Maritime Provinces, with the exception of the much rarer golden eagle (*Aquila chrysaetos*). In the Maritimes, Bald Eagles will typically nest in tall pine trees in forested areas near a large body of water. They will return to the same nest year-after-year, adding new sticks and other materials to the structure with each use. The Bald Eagle's diet consists of many species of fish, but they will also prey upon birds, reptiles, amphibians, invertebrates and carrion. Suitable breeding habitat for this species does occur within the vicinity of the project (the Kennebecasis River); however, this species is not currently anticipated to be nesting within the footprint of the proposed project and was not observed to be nesting within the assessment area during the field studies.

Barn Swallow

This species typically inhabits open areas near human settlements and land uses including parks, ball fields, golf courses and agricultural fields where they forage for flying insects. Barn Swallows will typically construct their nests on human-made structures, rarely selecting to nest in natural locations such as cliffs or caves. This species is migratory and spends its winters in Central and South America. Suitable breeding

habitat for this species does occur within the vicinity of the project, however this species is not currently anticipated to be nesting within the footprint of the proposed project.

Canada Warbler

These birds arrive in NB in the spring and are fairly common throughout the summer. Canada Warblers will inhabit a variety of forest habitats, but prefer mature to mid‐aged mixed forests where they build their nests on or near the ground in wet, swampy places in woods of mixed growth. They prefer areas with dense understory, particularly areas where large trees have long since been uprooted and tangled debris remains. They are also found in riparian areas, shrub forests on slopes, in ravines and in old-growth forests with canopy openings, as well as regenerating stands. Suitable breeding habitat for this species does occur within the footprint of the proposed project.

Common Nighthawk

The Common Nighthawk is a ground-nesting species that uses a wide variety of habitats including dunes, beaches, logged forests, bogs, marshes, open woodlands, grasslands, rock outcroppings, barren ground and even gravel rooftops. This species is an aerial insectivore preying on insects on the wing, usually at dusk or dawn, in open areas usually near a waterbody. From late August to early October, migrating flocks of nighthawks can number in the hundreds en route to wintering grounds in South America. Suitable nesting habitat for this species does occur within the footprint of the project.

Eastern Wood-Pewee

These birds breed throughout the Maritimes during the summer months before migrating to northern South America and wintering in countries such as Ecuador, Colombia, Venezuela, Guyana, Peru and Brazil. This species breeds in open woodland of all types in New Brunswick, but shows a preference for forests with a dominance of deciduous trees. The Eastern Wood-pewee forages on flying insects in the middle canopy and will often return to the same perch after capturing an insect. Suitable breeding habitat for this species does occur within the footprint of the proposed project.

Olive-sided Flycatcher

These birds breed throughout New Brunswick during the summer months and winter in Central and South America. Their preferred habitat includes coniferous forest edges, early post-fire landscapes, and openings such as meadows, rivers, bogs, swamps and ponds. Nests are typically built on horizontal branches 2-15 m off the ground and are most commonly located in spruce trees. Olive-sided Flycatchers feed on flying insects, especially bees, and are often see perched on the tops of tall trees or snags in open woodland habitat. Suitable breeding habitat for this species does occur within the footprint of the proposed project.

Peregrine Falcon

This medium sized falcon generally constructs its nest on the side of a cliff close to large bodies of water, and occasionally on an office tower or bridge. *Falco peregrinus* anatum (sub-species listed as special concern) breeds along the shores of the Bay of Fundy and the mouth of the Saint John River. This bird typically preys upon other medium sized birds, and sometimes preys upon small mammals, reptiles or insects. The Peregrine Falcon became endangered due to the widespread use of DDT pesticide; however, populations have rebounded due to the banning of the pesticide and conservation efforts. Suitable foraging habitat for this species does occur within the footprint of the proposed project although no suitable nesting habitat was identified.

Rusty Blackbird

Blackbird breeding habitat primarily consists of riparian zones, swamps, beaver ponds, marshes, peat bogs, pasture edges and sedge meadows. They are known to feed extensively on aquatic invertebrates within the riparian zones of shallow, slow moving rivers and streams. This species is typically located close to wetlands in forests dominated by conifers. Suitable breeding habitat for this species does occur within the footprint of the proposed project.

Bird Species of Conservation Concern

In total, three avian SOCC were identified during the 2018 avian survey program; refer to Table 4-8, presented below. Descriptions of the species identified during the survey program and their preferential habitat is also provided below.

Table 4-8: Avian SOCC Identified within the Assessment Area During the 2018 Avian Survey Program

Common name	Scientific name	AC CDC S-rank[1]	NB SARA Status	Federal SARA Status	COSEWIC
American Three-toed Woodpecker	*Picoides dorsalis*	S2S3	-	-	-
Pine Siskin	*Spinus pinus*	S3	-	-	-
Turkey Vulture*	*Cathartes aura*	S3B,S3M	-	-	-

* Bird species was not identified by the AC CDC records review (AC CDC, 2018).

Notes: [1] S1: extremely rare in province; S2: rare in province; S3: uncommon in province; S4: widespread, common and apparently secure in province; S5: widespread, abundant and demonstrably secure in province S#S# = a numeric

range rank used to indicate any range of uncertainty about the status of the species or community. B= Breeding, N = Nonbreeding, M = Migrant, U = Unrankable. (ACCDC, 2018)

American Three-toed Woodpecker

This medium-sized woodpecker species prefers coniferous-dominated forest types, particularly those disturbed by disease, fire, or land clearing. This species forages for the larvae of bark and wood-boring beetles in dying or dead-standing trees. Like most woodpeckers, the American Three-toed Woodpecker nests in the cavity of a tree, often lining it with wood chips and other fibers. Suitable breeding habitat for this species does occur within the footprint of the proposed Project. Land clearing during the breeding season would have the potential to unknowingly destroy American Tree-toed Woodpecker nests.

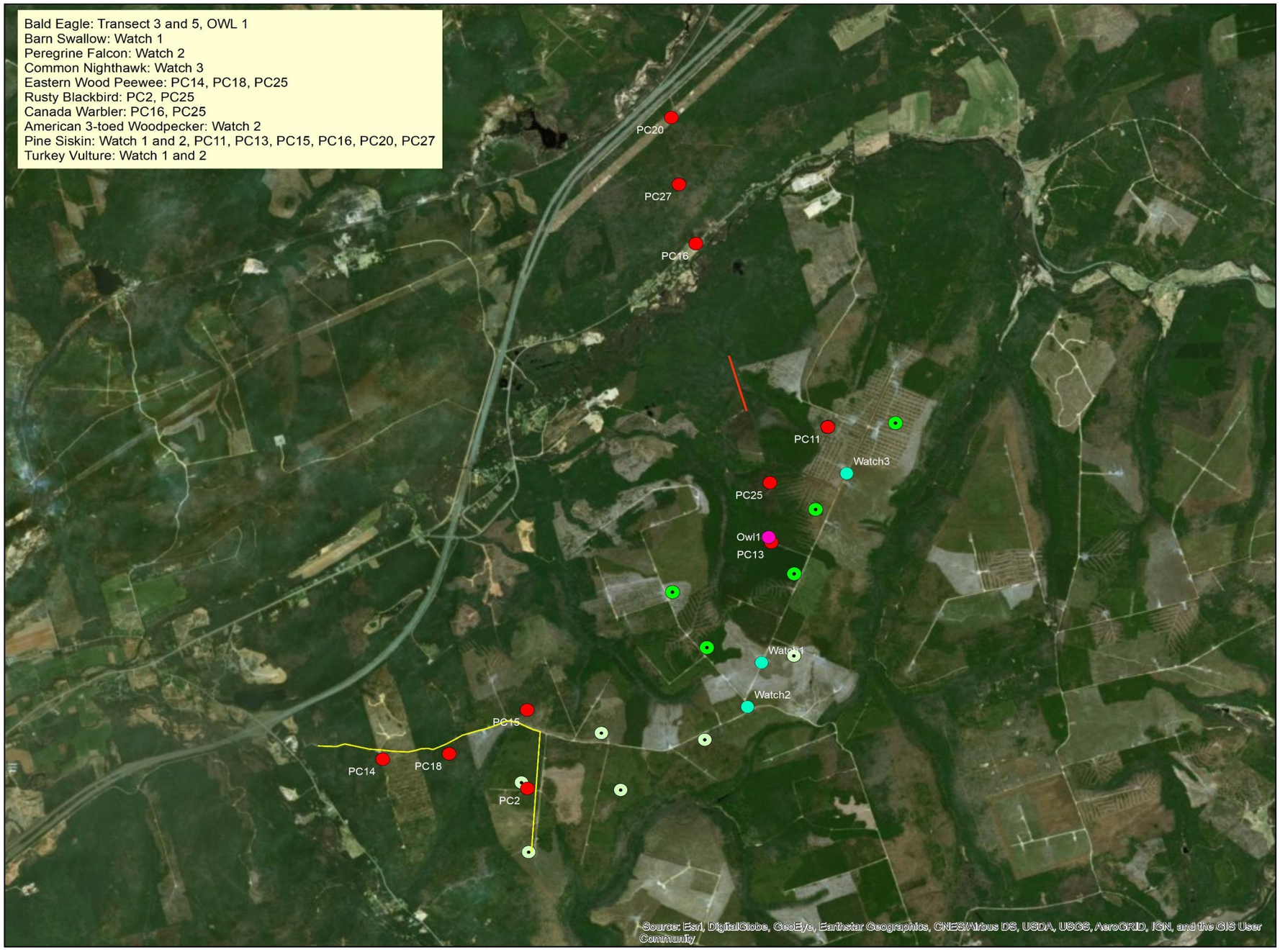
Pine Siskin

This finch species breeds across New Brunswick in open coniferous or mixed forests, but also commonly occur in suburban parks and residential areas. As their name suggests, these small birds prefer the seeds of pine trees and other conifers, but will also take maple, birch and elm seeds, as well as some insects.

Pine Siskins flock together during the winter months and remain in Nova Scotia year round, thus they are a resident species of the Province. Suitable breeding habitat for this species does occur within the footprint of the proposed Project. Land clearing during the breeding season would have the potential to unknowingly destroy pine siskin nests.

Turkey Vulture

Turkey Vultures are large birds that specialize in scavenging, almost never attacking living prey. They primarily feed on mammal carrion, but are known to eat almost any decomposing vertebrate. This species prefers open areas that include both forested areas and farmland. Turkey vultures typically nest in rock crevices or cliffs, but will also re-use abandoned hawk and heron nests. Once selected a nest site may be used repeatedly for decades. Suitable breeding habitat for this species does occur within the vicinity, however this species is not anticipated to be nesting within the footprint of the proposed project.



Wocawson Energy Project

Avian Survey Locations with Observed SAR/SOCC

Legend

- Owl Count with SOCI
- Point Count Locations with SOCI
- Watch Counts
- Line Transect 3
- Line Transect 5
- Proposed Turbines
- Proposed Alternate/Expansion Turbines

N

1:60,000

0 900 1,800 2,700

Metres

WGS 1984 Web Mercator Auxiliary Sphere

Production Date: Sep 7, 2018

naturalforces

Figure 4-11: Avian Survey Locations where a Species of Conservation Concern has been Observed.

4.2.2 Bats

According to the ACCDC report, no known bat hibernacula is present within 5km of the Project study area. The nearest cave identified as potential bat habitat is located 10 km southwest of the nearest proposed turbine known as Dalling's Cave (McAlpine, 1983). Additionally, as reported in the NB Mine Openings database, the nearest open mine is located 11.2 km east of a proposed turbine. The Recovery Strategy for Little brown myotis, Northern myotis, and Tri-coloured bats (ECCC, 2015) does identify critical habitat to the east of the proposed Project. However, as this recovery strategy only provides 10km blocks surrounding the identified habitat it is assumed that a small cluster of caves including Dalling's Cave, Glebe's Mine, Parlee brook Cave, and Kitt's Cave make up this critical habitat (McAlpine, 1983). These caves, as noted, are all located greater than 10km from the nearest proposed turbine. Lastly, no observations of potential bat hibernacula were identified in the Project study area during site visits and field surveys.

At the time of this report, the acoustic bat surveys were ongoing. Following the completion of the survey, bat acoustic data will be analyzed using the automated software Kaleidoscope Pro (Wildlife Acoustics) as described in Section 3.3.2.

The final reported data will identify the mean number of bat passes per detector and per detector period (e.g., breeding and migration). Once analyzed, the data will provide temporal and seasonal peaks in bat activity, of which the data could be used as a mechanism to minimize potential adverse effects on bats during the operation of the wind farm.

4.2.3 Wetlands and Watercourses

The proposed project is situated within the Kennebecasis Watershed (specifically the Upper Kennebecasis subwatershed) which encompasses a drainage area of 1346 square kilometers, beginning at its headwaters in Hamilton Lake and extending to the head of tide at Bloomfield Ridge, NB (KWRC, 2018). The Kennebecasis River (approximately 95 km in length) is the central system within this watershed (KWRC, 2018). The proposed project is situated between Spring Brook (to the west) and Calamingo Brook (to the east). The mapped watercourses that fall within the area of the proposed project include unnamed tributaries of the Kennebecasis River.

Watercourse Assessment Results

The Project Footprint overlaps the upper Kennebecasis River watershed. The GeoNB watercourse mapping (1:10,000) database identified three mapped watercourses within the assessment area that intersect with the proposed transmission line (Figure 4-15), though none of the turbine locations intersect any watercourse (since these locations were selected to avoid encroachment of watercourses). One additional unmapped watercourse associated with an unmapped wetland crossing the transmission line corridor was identified during the field surveys. Finally, a small unmapped watercourse was identified

during the field surveys which crosses Mitton Road. The results of the aquatic habitat assessment are summarized in the following sections.

Proposed Turbine Locations:

There were no watercourses (mapped or unmapped) identified within the assessment area of any of the proposed turbine locations.

Proposed Transmission Line:

The following watercourses, presented on Figure 4-15, were observed within the assessment area surrounding the proposed transmission line:

Unnamed Tributary (Dry Channel) - Watercourse 1 (WC 1)
WC 1 is a mapped watercourse that was characterized during the field survey as a completely dry, defined channel with steep high banks. Mature riparian forest covers much of the valley channel with little to no shrub layer where it intersects with the proposed transmission line. WC1 is not considered fish habitat due to the lack of substrate and presence of leaf litter. The lack of water and substrate material within the channel suggests that the channel remains dry with no water moving throughout much of the year with the exception of occasional runoff during extreme high flow events or spring freshet.

Unnamed Tributary - Watercourse 2 (WC 2)
WC2 is a mapped watercourse that was characterized during the field survey as a small drainage stream with a defined channel through an unmapped field-identified wetland (Wetland 1). The dominant bank vegetation consisted of grasses, herbaceous vegetation, and shrubs, with a substrate of mainly small gravel. WC2 is considered to be fish habitat, and an unidentified fish was observed during the survey.

Unnamed Tributary - Watercourse 3 (WC 3)
WC3 is an unmapped watercourse that was characterized during the field survey as an intermittent stream with a poorly defined channel associated with an unmapped field-identified wetland (Wetland 2) The bank vegetation was sparse, consisting of mainly small herbaceous plants and bare ground. Fish were not observed in WC3 during the field survey.

The Kennebecasis River - Watercourse 4 (WC 4)
The Kennebecasis River (WC4) is a mapped watercourse that was characterized during the field survey as a fish bearing watercourse with riffle, run, and pool habitats. The riparian vegetation consisted of shrubs, grasses, and trees which provide moderate in stream cover for fish.

At the time of the field assessment, an influx of sediment from an unknown source was noted within the channel at the Kennebecasis River bridge crossing located upstream of the assessment area. However, gravel trucks were observed making frequent trips from the active gravel pits in the area. It could not be

confirmed if the gravel trucks were the source of the sediment at the time of the field survey. Apart from the observed sedimentation and the surrounding clear-cuts/strip cuts and vegetation management, no other anthropogenic stressors were observed within the assessed watercourses.

Mitton Road Upgrade:

The following watercourses were observed within the assessment area surrounding the area of the proposed Mitton Road upgrade:

Unnamed Tributary (Dry Channel) - Watercourse 5 (WC5)
WC5 is an unmapped dry channel that was observed within the assessment area surrounding the Mitton Road upgrade and is characterized as a dry, defined channel with high steep banks. WC5 is not considered fish habitat due to the lack of substrate and presence of leaf litter.

Numerous offtake ditches (drainage channels) were noted along Mitton Road. These ditches were likely installed during the forest road construction to control drainage, erosion and sedimentation, and are not considered fish habitat. They were dry at the time of the field assessment.

Proposed Collector Line and Substation:

There were no watercourses (mapped or unmapped) identified within the area of the proposed collector lines or substation.

A summary of the aquatic habitats assessed within the assessment area (i.e. observed within the proposed transmission line and Mitton Road upgrade) is provided in Table 4-9.

Table 4-9: Aquatic Habitat Summary

Watercourse ID	Representative Photo	Average Widths (m)	Dominant Aquatic Habitat Type and Other Observations
Present Along the Proposed Transmission Line			
WC1		**Wet Width:** N/A **Bankfull Width:** 1 m	Mapped ***Dry channel*** (ephemeral drainage channel). No fish habitat observed.

WC2		**Wet Width:** 0.42 m **Bankfull Width:** 0.50 m	**Fish Habitat Suitability:** Small watercourse (mapped) with good riffle/run (fish) habitat associated with Wetland 1. Fish were observed during the field survey. **Dominant Substrate:** 10% Cobble, 70% Gravel, 10% Sand, 10% Silt **Average Depth(s):** 0.09 m – Riffles; 0.20 m – Runs
WC3		**Wet Width:** 0.30 m **Bankfull Width:** 0.50 m	**Fish Habitat Suitability:** Intermittent stream (unmapped) associated with field identified Wetland 2 in softwood forest. Fair fish habitat present (due to the intermittent flow); fish were not observed during the field survey. **Dominant Substrate:** 10% Gravel, 30% Sand, 35% Silt, 25% Detritus **Average Depth(s):** 0.15 m
WC4 (Kennebecasis River)		**Wet Width:** 8.75 m **Bankfull Width:** 9.30 m	**Fish Habitat Suitability:** A fish bearing watercourse (mapped) with riffle, run and pool habitats. **Dominant Substrate:** 10% Boulder, 35% Cobble, 40% Gravel, 5% Sand, 5% Silt **Average Depth(s):** 1.15 m – Pool 0.15 m – Riffle 0.25 m – Run
Present Along Mitton Road (Proposed Road Upgrade)			

WC5		**Wet Width:** N/A **Bankfull Width:** 0.5 m	Unmapped ***Dry channel*** - ephemeral drainage channel and culvert crossing observed. Fish habitat not observed.

Wetland Assessment Results

There are no mapped wetlands on the GeoNB mapping layer that would intersect with any portion of the proposed project area or assessment area. However, three unmapped (non-regulated) wetlands were surveyed, delineated and functionally assessed within the assessment area. Table 4-10, below, provides a summary of the identified wetlands. Refer to Figure 4-15 for mapped delineations of the field identified wetlands.

Table 4-10: Summary of Field Identified Wetlands

Wetland ID	Wetland Area[1] (ha)	Location	Wetland Type	Key Ecological Functions[2]
Wetland 1	0.38	Proposed Transmission Line	Treed Swamp	Organic nutrient export, waterbird feeding habitat, songbird, raptor and mammal habitat and pollinator habitat
Wetland 2	1.08	Proposed Transmission Line	Treed Swamp	Phosphorus retention, pollinator habitat and native plant habitat
Wetland 3	4.24	Proposed Transmission Line	Floodplain Shrub Swamp (Associated with WC 4; Kennebecasis River)	Organic nutrient export, anadromous and resident fish habitat, aquatic invertebrate habitat, amphibian and turtle habitat, waterbird feeding and nesting habitat, songbird, raptor and mammal habitat

Notes:

1. The wetland area provided in this table is the surface area of the field identified wetland that is encompassed within the assessment area only (i.e., the surface area of the portion of each wetland that intersects the assessment area, not the entire area of the wetland).
2. Key ecological functions were rated as 'higher' functions during the functional assessment.

Overall, the identified wetlands were characterized as highly fragmented/disturbed riparian wetland (forested) and freshwater marsh/swamp (non-forested wetland) associated with the Kennebecasis River. Plant species diversity within the identified wetlands was observed to be relatively low. Overall, the majority of the plant communities were made up of native species; however, many of the species were indicative of past disturbance (potentially associated with historic agricultural practices or forestry operations). A more detailed summary of the hydrophytic vegetation community assemblage, hydric soil profiles, and hydrological indicators for each field identified wetland is presented below. Refer to the field wetland determination and delineation data sheets in Appendix F.

Wetland 1 – Treed Swamp

Based on the results of the field assessment, Wetland 1 is characterized as a 0.38 ha throughflow wetland of natural origin, on a terrene slope that is seasonally flooded and permanently saturated.

Pre-existing anthropogenic effects may include adjacent clear cutting, former herbicide use, and logging road development. The wetland's primary and secondary indicators and attributes are described as follows:

Figure 4-12: Wetland #1

Dominant Wetland (Hydrophytic) Vegetation:

Trees (overstory): red maple (*Acer rubrum*, FAC), spruce species (*Picea* spp., FAC);

Shrubs: speckled alder (*Alnus incana*, FACW); and

Herbaceous plants (understory): bluejoint reed grass (*Calamagrostis canadensis*, FACW), golden ragwort (*Packera aurea*, FACW), muskflower (*Mimulus moschatus*, OBL), cinnamon fern (*Osmunda cinnamomea*, FAC).

The vegetation community identified at wetland 1 (treed swamp) is considered to be a hydrophytic vegetation community (i.e. >50% wet adapted vegetation).

Primary Wetland Hydrology Indicators Present:

Surface water; high water table; saturation; water marks; sediment deposits; drift deposits; sparsely vegetated concave surfaces; water-stained leaves; and aquatic fauna.

Soil Profile:

- 1 – 0" organics;
- 0 – 8" Sandy loam;
- redox concentrations within matrix and pore linings;
- 8 – 14" Loamy sand: Gleyed (100%); and,
- 14"+ Restrictive Layer: tightly packed sand and gravels.

Hydric Soil Indicators: Sandy gleyed matrix; and sandy redox features.

Overall, based on the results of the WESP-AC functional assessment, Wetland 1 functions highest as bird, mammal and pollinator habitat as well as for organic nutrient export services to downstream aquatic habitats.

Wetland 2 – Treed Swamp

Based on the results of the field assessment, Wetland 2 is characterized as a 1.08 ha throughflow wetland of natural origin, within a basin (lotic stream) that is seasonally flooded and permanently saturated. Pre-existing anthropogenic effects may include adjacent clear cutting, former herbicide use, and logging road development. The wetland's primary and secondary indicators and attributes are described as follows:

Figure 4-13: Wetland #2

Dominant Wetland (Hydrophytic) Vegetation:

Trees (overstory): spruce species (*Picea* spp., FAC); red maple (*Acer rubrum*, FAC); and eastern white cedar (*Thuja occidentalis*, FACW);

Shrubs: striped maple (*Acer pensylvaticum*, FAC); and speckled alder (*Alnus incana*, FACW); and,

Herbaceous plants (understory): cinnamon fern (*Osmunda cinnamomea*, FAC); spotted jewelweed (*Impatiens capensis*, FAC); and interrupted fern (*Osmunda claytonia*, FAC).

The vegetation community identified at Wetland 2 (treed swamp) is considered to be a hydrophytic vegetation community (i.e. >50% wet adapted vegetation).

Primary Wetland Hydrology Indicators Present:

Surface water; high water table; saturation; water marks; sediment deposits; sparsely vegetated concave surfaces; water-stained leaves; aquatic fauna; and hydrogen sulphide odour.

Soil Profile:

- 22 – 0" organics
- 0 – 6" Loamy sand: Gleyed
- 6"+ Restrictive Layer: gravels

Hydric Soil Indicators: Histic epipedon; hydrogen sulfide; and sandy gleyed matrix.

Overall, based on the results of the WESP-AC functional assessment, Wetland 2 functions highest as native plant and pollinator habitat as well as provides phosphorous retention (purifying).

Wetland 3 – Floodplain Shrub Swamp

Based on the results of the field assessment, Wetland 3 is characterized as a 4.24 ha floodplain shrub swamp of natural origin associated with a lotic river system (the Kennebecasis River), that is seasonally flooded and permanently saturated. Further to the field delineation (4.24 ha), an additional 1.14 ha of Wetland 3 has been inferred based on aerial imagery, as this part of the wetland was located outside of the assessment area. Pre-existing anthropogenic effects may include: adjacent clear cutting and herbicide-use; logging road development; historic agricultural uses; and possible historic quarry-use. The wetland's primary and secondary indicators and attributes are described as follows:

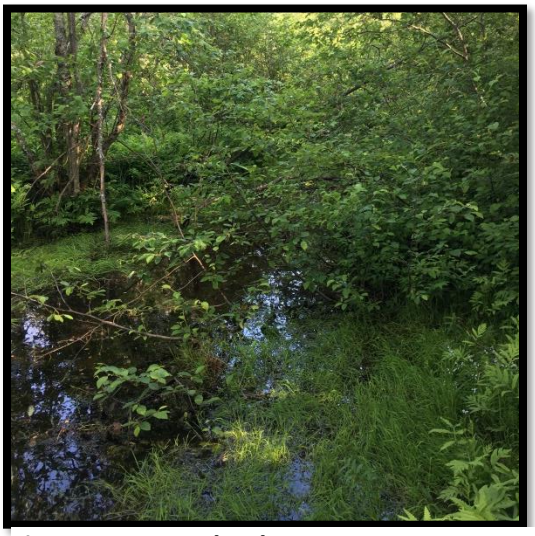


Figure 4-14: Wetland #3

Dominant Wetland (Hydrophytic) Vegetation:

Trees (overstory): willow species (*Salix* spp., FAC);

Shrubs: chokecherry (*Prunus virginiana*, FAC); and speckled alder (*Alnus incana*, FACW); and,

Herbaceous plants (undersotry): sensitive fern (*Onoclea sensibilis*, FACW); and shallow-water sedge (*Carex lurida*, OBL).

The vegetation community identified at Wetland 3 (treed swamp) is considered to be a hydrophytic vegetation community (i.e. >50% wet adapted vegetation).

Primary Wetland Hydrology Indicators Present:

Surface water; high water table; saturation; sediment deposits; drift deposits; sparsely vegetated concave surfaces; aquatic fauna; and hydrogen sulphide odour.

Soil Profile:

- 0 – 10” Silt loam
- 10 – 18” Sandy loam
- 18 – 24” Loamy sand
- 24”+ Restrictive Layer: gravels

Hydric Soil Indicators: Sandy gleyed matrix; and sandy redox features.

Overall, based on the results of the WESP-AC functional assessment, Wetland 3 functions highest as bird, mammal, amphibian, turtle and fish habitat as well as for organic nutrient export services to downstream aquatic habitats. For detailed field results, refer to the wetland delineation field data sheets provided in **Appendix F.**

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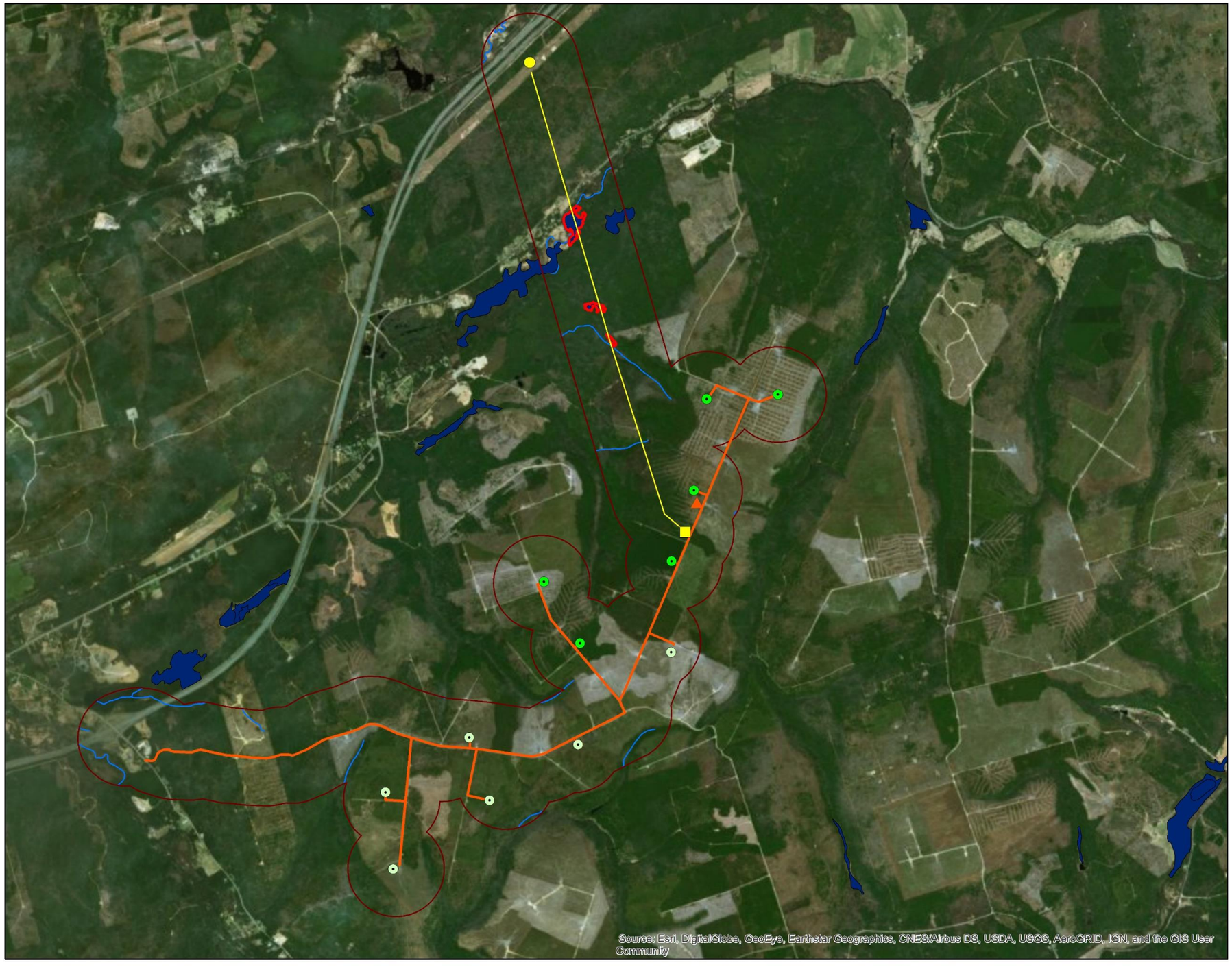

Wocawson Energy Project

Wetlands and Watercourses

Legend

- Proposed Turbines
- Proposed Alternate/Expansion Turbines
- MET
- Point of Interconnection
- Substation
- Roads
- Proposed Transmission Line
- Watercourses
- Mapped Wetlands
- Unmapped Delineated Wetlands
- Study Area

N

1:55,000

0 900 1,800 2,700

Metres

WGS 1984 Web Mercator Auxiliary Sphere

Production Date: Sep 7, 2018

naturalforces

Figure 4-15: Regulated and Delineated Wetlands and Watercourses in Proximity to the Wocawson Energy Project

4.2.4 Fish and Fish Habitat

Of the watercourses surveyed within the assessment area, two watercourses (WC2 – small unnamed tributary, and WC4 – Kennebecasis River) were observed to provide habitat for species such as salmonids (i.e., fish species of interest such as Atlantic salmon and brook trout) which require clean, clear and stable gravel substrates for successful spawning (DELG, 2012). Salmonids are generally considered cooler water species, and prefer water with a higher dissolved oxygen level (associated with cooler water) when compared to slower moving and warmer bodies of water (CRI, 2015).

It should be noted that the technique of backpack electrofishing was considered as a method for conducting fish presence or absence surveys, but was not conducted during the field studies due to the breadth of avaibale literature (i.e. extensive aquatic studies conducted in areas surrounding the proposed project by both the CRI and KWRS).

A summary of the fish species that have been historically documented to be present within the Kennebecasis River is provided in Table 4-11, below. For the purpose of this assessment, the Kennebecasis River species assemblage data is inferred to the small unnamed tributary (WC2) where fish were observed (visually) during the field assessment. Based on the aquatic habitat present in WC2, the species observed were likely cyrprinid (minnow) species; and the watercourse was deemed to have the potential to support brook trout (*Salvelinus fontinalis*).

Table 4-11: Summary of Fish Species Historically Observed within the Kennebecasis River[1]

Common Name	**Scientific Name**
American Eel[2]	*Anguilla rostrata*
Atlantic Salmon[2]	*Salmo salar*
Brook Trout	*Salvelinus fontinalis*
Common Shiner	*Luxilus cornutus*
Golden Shiner (not abundant at the time of data collection)	*Notemigonus crysoleucas*
Lake Chub (not abundant at the time of data collection)	*Couesius plumbeus*
Sea Lamprey	*Petromyzon marinus*

Slimy Sculpin	*Cottus cognatus*
Threespine Stickleback	*Gasterosteus aculeatus*
White Sucker	*Catostomus commersoni*

Notes:

1. The fish species noted in Table 4-11 include those species observed during fish population studies conducted by CRI in 2015, at locations adjacent (>100m) to the general study area. Other common fish species in New Brunswick not mentioned in the above table may be present within the Kennebecasis River. The above list is not exhaustive.

2. This species is considered a species of conservation concern.

Protected Aquatic Habitat

Although not officially protected, the Kennebecasis River (WC4) is widely managed by the KWRC. The KWRC undertakes strategic habitat restoration, educational and advisory initiatives, as well as promotes public awareness and participation in the restoration of the Kennebecasis River and overall watershed since 1994 (KWRC, 2018). The KWRC is considered an important stakeholder in relation to the proposed project.

Aquatic Species at Risk

In this report, we define SAR as those species that are listed as 'extirpated', 'endangered', or 'threatened' on the federal *SARA* or the NB *SARA*. We also define SOCC as those species that are not SAR but are listed in other parts of *SARA*, NB *SARA*, the COSEWIC, or as regionally rare or endangered by the ACCDC.

According to the ACCDC records review, there are no records of aquatic SAR or SOCC that have been historically observed within 5 km of the proposed project area.

However, according to CRI fish population studies conducted on the Kennebecasis River in 2015, Atlantic salmon (listed as 'endangered' by COSEWIC/*SARA*/NB *SARA*) is an SAR and has been historically observed within the river.

Aquatic Species of Conservation Concern

According to the ACCDC records review, there are no records of rare aquatic species or aquatic species of conservation concern or location sensitive species that have been historically observed within 5 km of the proposed project area. Additionally, no aquatic SOCC were observed during the field studies.

The proposed project is thus not anticipated to adversely affect rare aquatic species or aquatic SOCC or their habitat.

However, according to CRI fish population studies conducted on the Kennebecasis River in 2015, American eel (listed as 'threatened' by COSEWIC/NB *SARA*) is an SOCC and has been historically observed within the river (refer to Table 4-11).

4.2.5 Wildlife and Wildlife Habitat

The majority of the proposed project is located within an area that has been extensively used for forestry practices. The majority of the site (i.e., turbine locations and Mitton Road) is dominated by formerly harvested areas (clear-cuts or strip-cuts) that are now in different stages of natural regeneration, or plantations. The proposed transmission line extends through several habitat types, including areas of relatively mature hardwood and softwood forest stands, as well as wetlands and watercourses.

A total of eight observations of mammals and two observations of reptiles and amphibians were made within the assessment area during the terrestrial field studies. Direct observations (i.e., sightings) and/or indirect evidence (e.g., scat, tracks, bones, and browse) of these species were recorded during the field surveys. The mammal species observed included:

- Eastern coyote (*Canis latrans*);
- Bobcat (*Lynx rufus*);
- Snowshoe hare (*Lepus americanus*);
- Eastern chipmunk (*Tamias striatus*);
- White-tailed deer (*Odocoileus virginianus*);
- American moose (*Alces alces*);
- American black bear (*Ursus americanus*); and,
- North American porcupine (*Erethizon dorsatum*)

All the above species have populations in New Brunswick that are considered secure (ACCDC, 2017).

It was also noted that although the site is used heavily for forestry operations, the proposed project area still provides large tracts of habitat that would be suitable for most wildlife species common to New Brunswick. In particular, the proposed project area provided suitable habitat for moose and deer through the large areas of previously harvested forest in successional regeneration which provides abundant browse.

Evidence (i.e., tracks and scat) of eastern coyote were noted on the forestry roads and on old trails and woods/ATV/snowmobile trails, which coincided with observations of snowshoe hare, a major food item of the eastern coyote (DERD, 2017). Furthermore, evidence of these animals was observed in some locations along the proposed transmission line corridor, and on old trails and woods roads.

Reptiles and amphibians observed during field surveys included a wood frog and maritime garter snake.

According to the ACCDC records review, there are no records of wildlife species at risk (excluding birds and bats) that have been historically observed within 5 km of the proposed project area.

Wood turtle is also a SAR of primary interest associated with clear, meandering forested watercourses, farmland and marshland in New Brunswick (ECCC, 2018b). The wood turtle was not identified by the ACCDC as having been historically observed within 5 km of the proposed project area (ACCDC, 2018), nor was it observed during the field surveys. However, according to the KWRC, the Kennebecasis River and the other smaller watercourses located within the watershed, the area may provide potential nesting and feeding habitat for the species (Whalen, B., pers. comm., 2018). Wood turtles were not observed during the field surveys.

4.2.6 Vegetation and Habitat

As mentioned, the majority of the proposed project is located within an area that has been extensively used for forestry practices. Vegetation and habitat surveys have been completed and the dominant habitat types present within the proposed turbine locations, transmission line, and road upgrade areas are summarized in the sections below.

Proposed Turbine Locations:

The dominant habitat types within the proposed turbine locations range from recent clear-cuts to areas of early-successional regeneration of tree species indicative of the fertile ridgetop soils of the Anagance Ecodistrict (DERD, 2008). The dominant tree species (overstory) include red spruce (Picea rubens), white pine (Pinus strobus), jack pine (Pinus banksiana), balsam fir (Abies balsamea), American beech (Fagus grandifolia), yellow birch (Betula alleghaniensis), white birch (Betula papyrifera), and striped maple (Acer pensylvanicum). The dominant habitat types available within the area of the proposed turbines are summarized in Table 4-12, below.

Table 4-12: Terrestrial Habitat Types within the Proposed Turbine Locations

Turbine	Representative Photo	Dominant Habitat Type
1		Former strip-cut with early successional hardwood regeneration including American beech, sugar maple and red maple.
2		Former strip-cut with early successional hardwood regeneration including American beech, yellow birch and striped maple.
3		Former strip-cut with mid-successional hardwoods including American beech, striped maple, and white birch.

4		Immature white spruce plantation with white pine retention.
5		Immature white spruce plantation.
6		Immature white spruce plantation.

7		Regeneration of white spruce, balsam fir, white pine and jack pine.
8		Recent clear cut with scrubby mixed wood regeneration.
9		Young mixed wood forest dominated by red maple, American beech, white birch, white pine, and red spruce.

10		Immature white spruce plantation.
11		White spruce plantation, bordering a white spruce and white pine mixed plantation.
12		White spruce plantation, bordering recent harvest with some hardwood retention.

Proposed Transmission Line:

The habitat present within the proposed transmission line corridor transitions from managed and formerly harvested areas in various stages of regeneration, to patches of mature forest stands. Dominant tree (overstory) species include white spruce (*Picea glauca*), white pine (*Pinus strobus*), red pine (*Pinus resinosa*), jack pine (*Pinus banksiana*), balsam fir (*Abies balsamea*), American beech (*Fagus grandifolia*), yellow birch (*Betula alleghaniensis*), white birch (*Betula papyrifera*), red maple (*Acer rubrum*), red oak (*Quercus rubra*), trembling aspen (*Populus tremuloides*), and striped maple (*Acer pensylvanicum*). Forest

types were generally softwood dominant, with the exception of some small patches of semi-mature hardwood forest including red maple, red oak, and American beech within the overstory.

Within the area of the proposed transmission line, several areas of less disturbed habitat (i.e. semi-mature to mature) were observed. These areas included:

A mature stand of eastern hemlock (*Tsuga canadensis*) and white pine (Figure 4-16) was observed within the boundary of a well-defined channel, which was dry at the time of the field survey in May 2018.

Figure 4-16: Mature Stand of Eastern Hemlock

A mature stand of eastern hemlock, yellow birch, and white pine on a ridge within the boundary of a watercourse (refer to the detailed summary report for watercourses and wetlands).

A semi-mature hardwood stand of red oak, red maple, and American beech.

For additional site photographs, refer to Appendix G

Proposed Collector Line (not following road) and Substation:

The proposed collector line extends from Turbine 1 to Turbine 6. The habitat types present within these locations range from immature spruce plantations to formerly strip-cut areas in early successional hardwood regeneration. The hardwood species include American beech, sugar maple and red maple.

The proposed substation is located between Turbine 3 and 4 and on the southernmost extent of the proposed transmission line. The habitat within the immediate area of the substation includes a sparse tree canopy dominated by immature jack pine and white birch with white pine seedlings and limited vegetation within the understory. The remnants of former forestry activities (an old skidder track) are distinguishable and used as a game trail.

Mitton Road Upgrade:

The habitat within the proposed Mitton Road upgrade areas consists mainly of previously disturbed forest edge habitat with occasional patches of mature mixed or softwood dominant stands. Several large recent clear-cuts, young spruce plantations, and semi-mature jack pine plantations border the proposed road upgrade.

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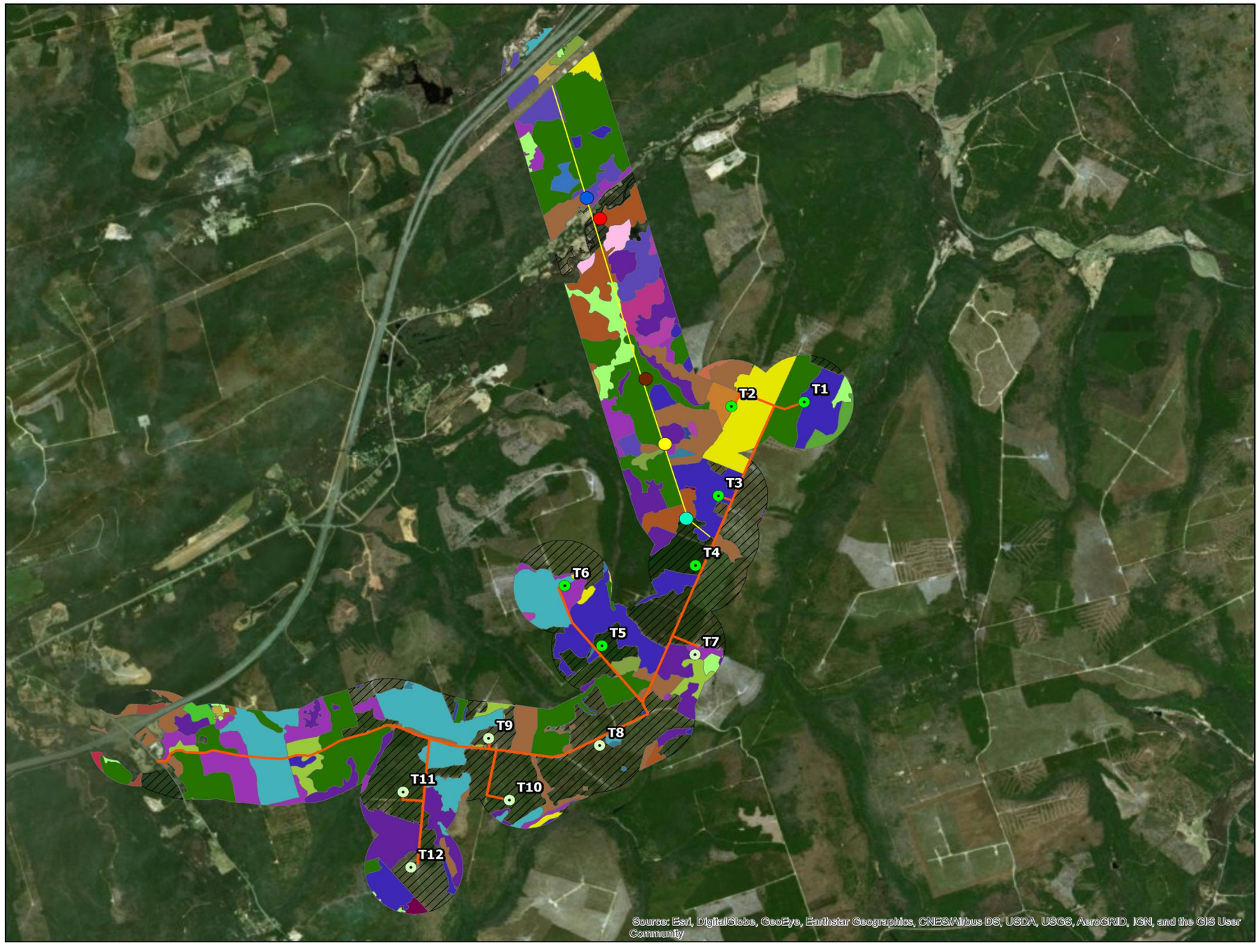

Wocawson Energy Project

Vegetation and Habitat

Legend

- Herb-Robert
- Mature hemlock and white pine stand
- Mature red pine
- Natural hemlock, white pine and yellow birch stand
- White Pine retention
- Proposed Turbines
- Proposed Alternate/Expansion Turbines
- Roads
- Transmission_Line

Habitat Types (GeoNB Forest Layer)

- Not Specified
- SW cover type balsam fir spruce
- HW cover type birch hardwood
- MW cover type birch mixedwood
- SW cover type black spruce balsam fir
- SW cover type eastern cedar softwood
- HW cover type intolerant hardwood
- MW cover type intolerant mixedwood
- SW cover type intolerant softwood
- SW cover type jack pine softwood
- MW cover type pine mixedwood
- HW cover type poplar hardwood
- MW cover type poplar mixedwood
- MW cover type red maple mixedwood
- SW cover type red pine softwood
- SW cover type red spruce balsam fir
- MW cover type red spruce mixedwood
- SW cover type red spruce
- SW cover type spruce fir
- MW cover type spruce mixedwood
- SW cover type spruce
- HW cover type tolerant - mid-tolerant hardwood
- HW cover type tolerant - intolerant hardwood
- SW cover type tamarack larch softwood
- HW cover type tolerant hardwood
- MW cover type tolerant mixedwood
- SW cover type tolerant softwood
- SW cover type white pine softwood
- SW cover type white spruce

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Metres

WGS 1984 Web Mercator Auxiliary Sphere

Production Date: Sep 7, 2018

natural forces

Figure 4-17: Habitat Classification and Vegetation of Interest Observed during field surveys

Vegetation Summary

A total of 149 vegetation species were observed within the assessment area during the field studies and identified as native species to New Brunswick with no identified non-native or exotic (SE) species. A total of 125 vegetation species (84%) were identified as being S4 to S5 according to the ACCDC S-ranks (ACCDC, 2017) (meaning they are common to widespread), 14 species (9%) identified as SNA (i.e., Not Applicable, because the species is not a suitable target for conservation activities), 9 species (6%) could not be definitively identified to species (i.e., identified to genus only), and 1 (0.7%) species identified as S2S3 (i.e., rare/uncommon). This species has been identified as an SOCC, and is discussed further. No SAR were identified during the field survey.

During the field assessments, botanists identified herb-Robert (*Geranium robertianum*) (S2S3) (Figure 4-18). Herb-Robert is typically found along rocky woods and wet ledges (Hinds, 2000) and was observed along similar type of habitat along the Kennebecasis River floodplain located approximately 70 m east of the transmission centreline, within the assessment area but outside the cleared transmission line corridor.

Refer to Figure 4-17 for the observed location.

Figure 4-18: Herb-Robert (*Geranium robertianum)*

According to the ACCDC records review (ACCDC, 2018), there are no records of vegetation SOCC or location sensitive species that have been historically observed within 5 km of the proposed project area.

A list of all species identified within the Project study area is provided in Appendix H.

4.2.7 Significant and Sensitive Habitat

A custom ACCDC (2018) data report was obtained for a 5 km radius around the proposed project area. According to the ACCDC records review and desktop analysis, there are no managed, biologically significant, or designated ESAs (including deer wintering areas) or PNAs within 5 km of the proposed project area. The nearest PNAs include the Picadilly Mountain PNA (located 15 km southwest of the proposed project) and the Cat Road PNA (located 15.5 km southeast).

During the field studies, there were no observations of unique or sensitive terrestrial habitat within the assessment area.

4.3 Existing Socio-economic VECs

4.3.1 Archaeological Resources

Only one recorded archaeological site is registered at Archaeological Services New Brunswick within the vicinity of the proposed construction activities in the area surveyed. Site BkDh-1 lies approximately 3 km east of the proposed turbines.

The Borden system is a nation-wide, geographically based method for recording sites of archaeological value. In New Brunswick, each Borden block is 10 minutes of latitude by 10 minutes of longitude. The Borden block that is of concern for the Project area is BkDh.

On July 5th to 6th, 2018, an archaeological pedestrian survey was conducted at a proposed WEP. The assessment of this area resulted in the failure to identify any evidence of significant past human use at the locations of the proposed 12 turbines and 1 substation locations. However, a large portion of the transmission line, the northern half, exhibits the geographical characteristics that are traditionally regarded as draws for human habitation since the retreat of the glaciers.

As the elevation decreases along the transmission line, a series of terraces were encountered. The uppermost terrace, at ~140 m asl is quite level and suitable for habitation, overlooking the wide valley, particularly during the early post-glacial period. Similarly, the middle terrace at ~100 m asl could be used for habitation and resource gathering as the meltwaters receded and the exposed valley floor started to dry up.

At the lower terrace, much of the ground is fairly wet and exhibits characteristics similar to wetland environments. However, there are many areas of marginally higher ground, that appear dry and have promoted the growth of different plants/trees. These areas are suitable for habitation and would certainly attract the ancestors of today's Wolastoqiyik when the conditions were similar. This area is approximately 800 m long, along the route of the transmission line, from the edge of the modern floodplain to the sharp rise in elevation to the south. The surficial geology along this section is described as glaciofluvial outwash (deltaic)(mainly sand and gravel)(Seaman, A., 1986). During periods of reduced precipitation and increased temperatures (the Hypsithermal (9000-5000 years ago)), this area may have been better suited for habitation.

The terraces highlighted in red in Figure 4-19 around the centre portion of the transmission line, the northern edges that are considered as holding high potential for the presence of early postglacial archaeology.

The area along the transmission line that is comprised of glaciofluvial outwash is highlighted in orange in Figure 4-19 and is likely deltaic, fairly flat and level, and often wet. While it is likely this area was suitable for habitation during different periods in the past, its current condition (quite wet) will make it exceptionally difficult to excavate. In the wet areas, archaeological monitoring is recommended.

At the northern end of the transmission line in the Kennebecasis Valley is a modern valley and along the outer edges, the entire area should be considered as holding high potential for the presence of significant archaeological remains. The modern floodplain is over 400 m wide (along the transmission line route). In the early historic aerial photos, satellite imagery and the LiDAR data, the abandoned channels of the former location of the Kennebecasis River are visible. The entire section of this modern floodplain and immediately adjacent, would be suitable for habitation for thousands of years previous. Portions of this modern valley are described as ancient alluvium (sand and gravel, some silt) (Seaman, A., 1986). Immediately south of the Portage Vale Road, towards the river, a farmer's field is evident. At the southern edge of the field, a steep drop in elevation (erosional face) was observed, leading to the modern floodplain and then to the Kennebecasis River. The section between the road and the river is also suitable for Indigenous and early European occupation. Some historic farm equipment was noticed on the southern edge of the farmer's field.

The proposed access roads to the transmission line will be surveyed for identify any evidence of significant past human use or areas with characteristics that could have been a draw for human use. Following the Guidelines (2012), archaeological test pits will be excavated where recommended along the transmission line at the proposed pole locations. The results of the archaeological pedestrian surveys along the access roads and the excavation test pits along the transmission line will be submitted as an addendum to this EIA report.

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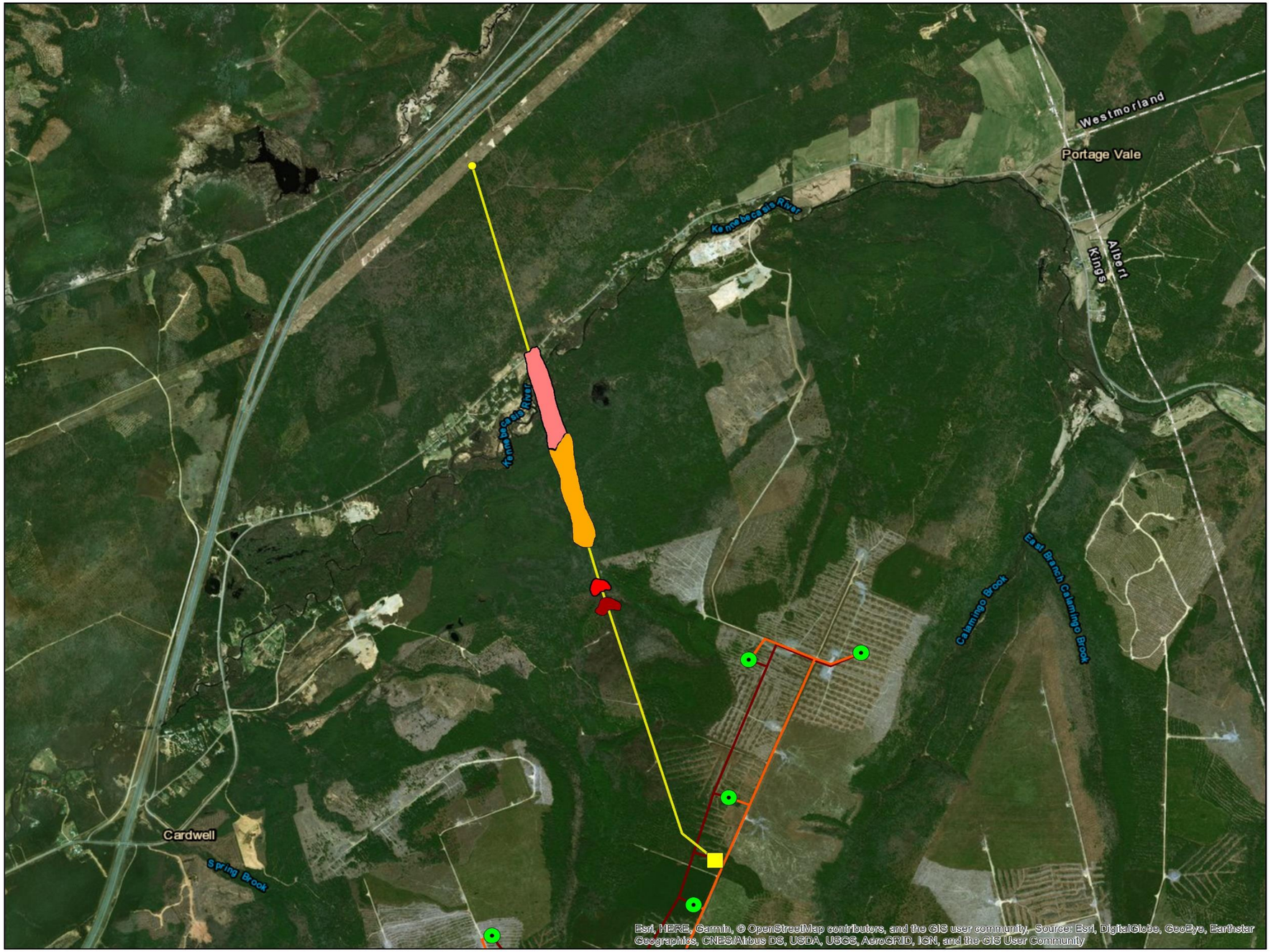

Wocawson Energy Project

Archaeological

Legend

- Proposed Turbines
- Proposed Substation
- Point of Interconnection
- Collection System
- Roads
- Proposed Transmission Line

Archaeology

- Northern High Potential
- Middle Terrace High Potential
- Upper Terrance High Potential
- Medium Potential

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Metres

WGS 1984 Web Mercator Auxiliary Sphere

Production Date: Sep 7, 2018

naturalforces

Figure 4-19: Areas of medium-high potential for archaeological resources based on desktop reviews and a pedestrian walkover.

4.3.2 Electromagnetic Interference

The results of the Electromagnetic Interference Study have identified 35 possible communication towers within a 35km radius. Three of which are used for broadcasting, four land mobiles (10 km radius), four satellite towers, a single aeronautical tower for the Havelock Flying Club, and 23 fixed point to point communication towers.

The closest tower to a proposed WTG is an Eastlink tower constructed in early 2018. The tower is located at the base of the access road about 2 km from the nearest proposed turbine. The nearest known point to point links or associated towers are located 4.5 km north of the nearest proposed turbine. This is a sufficient distance to prevent interference.

Depending on the type of Broadcasting transmitter (AM, FM, TV) a buffer of 2 – 15 km is required (RABC, 2010). Two of the broadcasting transmitters identified in this assessment are located in Sussex ~19.5 km from the nearest proposed turbine and the third broadcasting tower is located 34 km east of the nearest proposed turbine.

4.3.3 Land Uses and Property Value

The land in which the WTGs will be located is provincially regulated Crown Land and is being optioned for the exploration of wind energy. Upon a positive outcome of the EIA process, a Wind Farm Lease will be sought from the Province allowing construction and operation of the WEP on this land. Additionally, a License of Occupation will be obtained for the access road and southern portion of the transmission line. The WEP requires consideration of current land uses within the proposed Project site. As provincial crown lands, these lands are open to a variety of uses. Currently, there are three additional land user where consultation and further consideration is required.

Irving has an active forestry operation within the area and uses site roads to truck lumber out. The Proponent has been in consultation with Irving and the proposed Project is not anticipated to impact forestry activities. Irving will have the first right to lumber on the Project lands after clearing and will still be able to use the Project lands during operation.

The second land use consideration is recreation, primarily for snowmobiling. Part of the main access road of the Project is a provincial, well used snowmobile trail and the Goshen snowmobile warming shelter is located onsite.

The DND also has an existing land tenure that overlaps with the current Wocawson lease area. DND and the DERD have previous agreements for military activity within the proposed Project area. However, there were no concerns expressed by DND in relation to wind development within its land tenure.

There are various land uses to consider on the Project lands. Consultation with these land users will be ongoing to ensure safe use and enjoyment of these lands.

According to Statistic Canada (2016) the average value of a property within the Cardwell Local Service district upon selling is $130,774. For Kings County including the Sussex area, the average value of property upon selling is $221,416.

4.3.4 Vehicle Traffic and Pollution

Delivery of materials and equipment will be phased throughout the construction period depending upon the specific construction activity. The vehicles likely to be involved include:

- Large trucks with trailers for delivery of materials, earth-moving equipment and cargo containers for storage of tools and parts;
- Dump trucks to deliver and/or move stone for constructing the internal site road;
- Concrete trucks for constructing WTG foundation;
- One 800-1000 tonne main lift crane;
- One 150 tonne tailing crane;
- One 135 tonne rough-terrain crane for assembling WTGs;
- WTG component delivery vehicles; and
- Miscellaneous light vehicles including cars and pickup trucks.

Of these predicted vehicle movements, many will be oversized loads associated with the delivery of WTG component parts (towers, blades, and nacelles) and the cranes required for erection. These deliveries will be subject to movement orders as agreed upon with governing authorities.

The turbine manufacturer and supplier will be responsible for determining delivery routes to ensure the routes meet specific requirements for the turbine parts. The delivery route will be decided after a thorough review or the local road network and through consultation with local authorities in each jurisdiction. The main access to the site will be from Mitton Road and will likely also use a small section of Route 114.

4.3.5 Public Health and Safety

Many of the assessments that have been completed are to mitigate any potential impact to public health and safety. The few predominant health and safety issues with wind turbines include noise and shadow flicker impacts, rare turbine malfunctions, ice throw, electrical fires through lightning strikes, traffic accidents, and aviation hazards.

4.3.6 Community and Local Economy

The WEP is situated between the communities of Springdale and Portage Vale in Cardwell Local Service District which is made up of 1,353 residents according to the Statistic Canada 2016 Census data. Statistics Canada also identified that there are 555 residents actively employed and 125 unemployed. The

prominent industries for employment in the area, from most employed to least include trades, sales and service occupations, natural resources and agriculture, occupations in education, law, community and government services, management, business, finance, and administration, health, manufacturing and utilities, natural and applied sciences, and art culture, and recreation.

Within Cardwell Local Service District there are also small businesses and community buildings. All federal, provincial, and local recreational sites, tourism features, cultural features, and provincial parks within a 5 km radius of the project site are provided below in Table 4-13.

Table 4-13: Recreational, tourism, and cultural features near the project site.

Feature	Distance to Project Land
Portage Vale Baptist Church	3.4 km
Alpaca Farm	2.8 km
Lone Pine Park Camping	2.3 km
Aqua Fish Farms Hatchery	2.5 km
Pine Cone Motel	4.2 km
Three Bears Family Camping and RV Park	4.5 km

5.0 Predicted Environmental Impacts and Mitigation

The construction, operation, and decommissioning phases of the WEP have the potential to affect the physical, biophysical, and socio-economic environment. Identifying the VECs is an important part of the EIA process. Following the presentation of the Project's activities in Section 2 and the Existing Environmental Setting in Section 4, the interaction of the Project activities with the VECs can be completed.

Table 5-1 presents the potential interactions between Project activities and each identified VEC. These VECs are presented in the following sub-sections in terms of potential environmental effects of Project activities including accidents and malfunctions, as well as proposed mitigation strategy, cumulative effects and finally, the level of significance of the residual effects. This VEC assessment will be completed as outlined in the methodology as presented in Section 3.5.

Table 5-1: Potential Linkages of Project and the Environment.

	Site Preparation and Construction								Operation and Maintenance				Decommissioning		
	Clearing and Grubbing	Access Road and Laydown Area	Turbine Foundation	Electrical and Transmission	Crane Pad Construction	Turbine Installation	Commissioning	Accidents and Malfunctions	Turbine Operation	Transmission Line	Inspection and Maintenance	Accidents and Malfunctions	Infrastructure Demolition	Site Reclamation	Accidents and Malfunctions
Physical VECs															
Ground Water	•	•	•	•	•			•				•	•	•	•
Geophysical		•	•	•	•			•				•	•	•	•
Atmospheric	•	•			•			•					•		•
Wind Resource									•						
Noise	•	•	•	•	•		•		•				•	•	
Shadow Flicker &						•			•				•		
Biophysical VECs															
Avian	•	•			•	•			•	•				•	
Bats									•						

	Site Preparation and Construction								Operation and Maintenance				Decommissioning		
	Clearing and Grubbing	Access Road and Laydown Area	Turbine Foundation	Electrical and Transmission	Crane Pad Construction	Turbine Installation	Commissioning	Accidents and Malfunctions	Turbine Operation	Transmission Line	Inspection and Maintenance	Accidents and Malfunctions	Infrastructure Demolition	Site Reclamation	Accidents and Malfunctions
Wetlands & Watercourses	•	•			•			•	•			•	•		•
Fish and Fish	•	•			•			•				•	•		•
Wildlife and Wildlife Habitat	•				•				•					•	
Vegetation	•	•			•				•					•	
Significant & Sensitive Habitat	•	•			•			•				•			•
Socio-economic VECs															
Archaeological Resources	•	•	•	•				•						•	•
Electromagnetic Interference									•						
Land use & Property Value	•	•			•	•			•	•		•			•
Vehicle Traffic & Pollution			•	•	•	•		•				•	•		•
Public Health & safety								•	•	•		•			•
Local economy	•	•	•	•	•	•	•		•		•		•	•	

5.1 Assessment of Physical VEC Impacts

5.1.1 Ground Water

Management of ground water quality is important as it is an integral aspect of a diverse ecosystem and functional ecology. As a result, ground water quality and quantity have been identified as a VEC.

A significant environmental effect would result if a considerable change to ground water quantity or quality is identified as a result of project activities.

Boundaries – Spatial boundaries include the ground water at the Project site as well as any water bodies and watercourses that are supplied by the ground water. Temporal boundaries are focused on the construction and decommissioning phases but include all phases of the Project in the unlikely event of an unplanned release of contaminants.

Discussion – A geotechnical investigation will be conducted in the Fall of 2018, if ground water is encountered during these surveys, depth to groundwater will be recorded. Previous exploratory wells in the vicinity or the proposed Project identified groundwater 100m below surface. There are no residential wells within 500m of any proposed turbine. Though a protected wellfield is located in Springfield, a proposed alternate or expansion turbine is located 270m from the outer perimeter of Zone C, providing sufficient setbacks to mitigate any impacts.

Table 5-2: Potential impacts and proposed mitigative measures for ground water.

Potential Impacts on Ground Water	Proposed Mitigative Measures
Vegetation clearing, grubbing, ground stripping, excavation and machinery traffic during the construction of the WTG pads and access roads might induce a change in hydrology or sediment input into ground water.	• A setback distance of 30m between the site works and wetlands will be implemented where feasible; if not feasible, a Wetland and Watercourse Alteration (WAWA) permit will be obtained • Efforts will be made to design the access road such that it does not interfere with a watercourse, water body or drainage channel; • Where possible, clearing shall take place in the winter months on frozen ground; • Erosion control strategies (ie. Straw bales and geo-textiles) will be outlined in the Erosion and Sedimentation Control Plan in the Environmental Management Plan (EMP); and

Potential Impacts on Ground Water	Proposed Mitigative Measures
	• Where water must be pumped out of excavation pits, it will not be discharged into a wetland, watercourse or defined channel. If pumped water contains total suspended solids the water will be pumped to vegetated land with gentle slope to allow sediment to filter, or the water will be filtered before release with a filter bag.
Exposure or accidental spillage of hazardous materials such as fuel, oils and hydraulic fluids has potential to contaminate ground water supplies during construction, operation and decommissioning phases.	• Equipment shall be in good working order and maintained so as to reduce risk of spill/leaks and avoid water contamination; • Spill response kits will be provided on site for each piece of equipment to ensure immediate response to a potential waste release and will be stocked with supplies to handle a worst-case scenario on ground or in surface or groundwater; • Routine maintenance, refueling and inspection of machinery will be performed off-site or on level ground onsite; and If a spill occurs, corrective measures will be implemented immediately and reported to the DELG's Moncton Regional Office at (506) 856-2374 or outside of business hours to the Canadian Coast Guard's environmental emergencies reporting system at 1-800-565-1633.
Vehicular traffic during decommissioning might induce a change in hydrology or sediment input into ground water.	• Efforts will be made such that the access roads and the transmission line do not interfere with a watercourse, water body or drainage channel; • Erosion control strategies (ie. Straw bales and geo-textiles) will be outlined in the Erosion and Sedimentation Control Plan in the EMP attached in Appendix J in order to maintain baseline water quality conditions in the watercourses and wetlands onsite; and

Potential Impacts on Ground Water	Proposed Mitigative Measures
	• Used oil filters, grease cartridge containers and other products associated with equipment maintenance shall be collected and disposed of in accordance with regulatory guidelines.

Cumulative Effects – There are no other operating or proposed wind farms within a 10km radius from the project site. No cumulative effects are expected to occur with respect to ground water.

Significance of Residual Effects – After employing the proposed mitigative strategy, should any sedimentation and/or erosion occur it will be temporary, of small magnitude and contained. While any direct release into ground water would be a negative effect, it will be of small magnitude, of short duration and local. The significance of residual effects on ground and surface water is to be considered minor.

5.1.2 Geophysical

The surrounding geophysical environment needs to be considered in order to ensure a strong stable structure exists for the lifespan of the project. As a result, geophysical conditions have been identified as a VEC.

A significant environmental effect would result if a considerable change to geophysical conditions or quality is identified as a result of project activities.

Boundaries – Spatial boundaries include the construction site while the temporal boundary focuses on the construction and decommissioning phases.

Discussion – The construction of the WEP will require the excavation of materials in order to support the WTG foundations, and grading and filling for the crane pads and access roads. The geophysical conditions will be disturbed for the construction and installation of the WEP. Mitigation measures will be applied to minimize the impact.

Table 5-3: Potential impacts and proposed mitigative measures for geophysical conditions.

Potential Impacts on Geophysical Conditions	Proposed Mitigative Measures
Soil and ground conditions may need to be altered for construction.	• A geotechnical survey will determine the ground conditions and any potential limitations to construction; and • A designated professional will provide recommendations for design and

Potential Impacts on Geophysical Conditions	Proposed Mitigative Measures
	construction of the WEP based on the geotechnical survey results.
Excavation and transportation of material will be required for the turbine foundations, crane pads and access roads.	• Topsoil will be stored separately from excavated material • Topsoil and excavation material will be backfilled in a manner that does not result in soil inversion • Areas susceptible to erosion will be stabilized and erosion will be minimized through the use of control measures (i.e. haybales, coco mats etc.) • Soil compaction will be limited to the Project Footprint; • Soil and aggregate mixing will be minimized

Cumulative Effects – There are no other operating or proposed wind farms within a 10km radius from the project site. No cumulative effects are expected to occur with respect to geophysical conditions.

Significance of Residual Effects - It is expected that there will be disturbance to the immediate geophysical conditions. The impact is predicted to be of small magnitude, and local. The significance of residual effects on geophysical conditions after applied mitigation measures is considered to be negligible.

5.1.3 Atmospheric Conditions

Atmospheric conditions are an important topic facing all new developments due to the uncertainty climate change will bring in the future. It is important to understand how the climactic conditions of the proposed project will change over the Project's lifetime. Based on the 30-year lifespan of the proposed project, atmospheric conditions have been identified as a VEC.

A significant environmental effect would result if a significant change in atmospheric conditions was determined a result of Project activities.

Boundaries – Spatial boundaries include the Province of New Brunswick while the temporal boundary focuses on the duration of the project lifespan.

Discussion - The purpose of the Project is to provide renewable energy to the Province of New Brunswick to help reach goals of producing 40% of electricity from renewables by the year 2020. By reaching these targets there will be a significant reduction in CO_2 emissions through the reduction of fossil fuel generation in the energy sector. This reduction in CO_2 emissions will help global efforts of slowing climate change and will help mitigate the predicted changes and risks associated.

Table 5-4: Potential impacts and proposed mitigative measures for atmospheric conditions.

Potential Impacts on Atmospheric Conditions	Proposed Mitigative Measures
Climate change is predicted to bring increasing precipitation amounts to the project location.	• This impact is addressed in Section 5.4: Effect of the Environment on the Project.
The electricity produced from this project will supply approximately 6750 homes with clean renewable energy, reducing fossil fuel requirements.	• Reducing reliance on fossil fuels is a positive impact: no mitigation is proposed
The WEP is one step towards achieving the provinces renewable energy goals in an attempt to reduce emissions and slow climate change and associated risks.	• Reducing emissions to slow climate change is a positive impact: no mitigation is proposed.

Cumulative Effects – There are no other operating or proposed wind farms within a 10km radius from the project site. No cumulative effects are expected to occur with respect to atmospheric conditions.

Significance of Residual Effects – The WEP will help global long-term efforts to slow climate change as such, the significance of residual effects on atmospheric conditions is to be considered beneficial.

5.1.4 Wind Resource

In order for the operation of the WEP to be successful, the project site must be located in an area with sufficient wind resource. As a result, the wind resource has been identified as a VEC.

A significant environmental effect would result if a considerable change to the wind resource was a result of project activities.

Boundaries – Spatial boundaries include local wind regimes while the temporal boundary focuses on the duration of the project lifespan.

Discussion - The WEP will have over 18 months of wind resource monitoring data to determine the wind resource onsite prior to erection of the turbines. The data collected to date has provided information to determine the best possible technology to use to effectively and efficiently capture the wind resource.

Table 5-5: Potential impacts and proposed mitigative measures for the wind resource.

Potential Impacts on Wind Resource	Proposed Mitigative Measures
Sufficient wind is required to make the project financially successful.	• A minimum of one year of data collected from the installed meteorological mast

	will measure the wind to test for sufficient wind resource.
The Project will harness the wind resource to produce electricity.	• Producing electricity from the wind is a positive impact: no mitigation is proposed.

Cumulative Effects – There are no other operating or proposed wind farms within a 10km radius from the project site. No cumulative effects are expected to occur with respect to the wind resource.

Significance of Residual Effects – The WEP will use the wind resource in the local area over the lifetime of the project. As the WEP will use a renewable resource such as the wind regime in order to produce electricity, the significance of residual effects on the wind resource is considered beneficial.

5.1.5 Noise

Noise is defined as a sound, especially one that is loud, unpleasant or that causes disturbance. The Project poses two issues with noise pollution which could affect local residents. Noise from the construction and decommissioning phase, and noise from the WTG operation is to be expected. As a result, noise has been identified as a VEC.

A significant environmental effect would result if a considerable change in the ambient noise was found to be the result of project activities.

Boundaries – The spatial boundary is the area in which the noise impact study was conducted; this being a 2,000 m radius from the WTG location. The temporal boundary includes all Project activities from site preparation, construction, and operation to decommissioning.

Discussion

Noise Assessment

Natural Forces has conducted a noise impact assessment of a 2.0 km area surrounding the proposed turbine location. This assessment includes a total of 43 receptors. Prior to this assessment careful siting of the turbine has reduced the majority of sound impacts to neighbouring residents by applying sufficient setbacks. The New Brunswick maximum allowable noise impact starts a 40 dB(A) for wind speeds at 4 m/s. The SPL is defined as the force of sound on a surface area which is measured in dB(A); dB or decibels is a logarithmic unit that is used to measure SPL and (A) is the weighting applied to denote, as perceived by humans.

The results of the noise prediction model at the top 20 receptors are summarized in Table 5-6, while all receptor noise levels are provided in Appendix B. All receptors prove compliance with the *Additional Information Requirements for Wind Turbines* document created to outline additional requirements to the *Environmental Impact Assessment Regulation* specifically for wind turbines. The table below

demonstrates the loudest noise levels for any wind speed modelled between and including 4 to 12 m/s. The loudest sound noticed at any of the receptors at these wind speeds is 37.7 dB[A].

Table 5-6: Wind Turbine Noise Impact Assessment Summary of the Top 20 Loudest Receptors

Point of Reception ID	Max Sound Level from WTG [dB(A)]	Compliance with New Brunswick's Requirements
A	33.1	Yes
B	33.8	Yes
C	33.1	Yes
D	33.3	Yes
E	33.4	Yes
F	33.4	Yes
G	33.8	Yes
H	33.9	Yes
I	33.2	Yes
N	33.2	Yes
S	32.9	Yes
T	33.0	Yes
W	33.1	Yes
AB	33.3	Yes
AD	33.3	Yes
AK	34.4	Yes
AL	**37.7**	Yes
AM	33.1	Yes
AN	32.9	Yes

Point of Reception ID	Max Sound Level from WTG [dB(A)]	Compliance with New Brunswick's Requirements
AP	33.1	Yes

Based on the parameters used to run the WindPRO noise prediction model, it has been shown that the predicted SPL's emitted by the proposed WTG are less than 40 dB(A), thus demonstrating compliance with the *Additional Information Requirements for Wind Turbines* document created to support the New Brunswick *Environmental Impact Assessment Regulation*.

Construction Noise

Construction noise is not always constant and can produce impulsive and variable sounds at different noise levels, which could create heightened annoyance levels in the surrounding community. The construction noise assessment has considered the maximum noise levels produced by various construction equipment to determine maximum sustained noise levels when all equipment is running.

General construction activities include those associated with vegetation clearing, road building, foundations, and turbine erection. These activities will likely involve the use of backhoes, concrete mixers and pumps, cranes, dump trucks, excavators and light-duty pick-up trucks with the associated sound levels predicted in Table 5-7.

Table 5-7: Noise Levels Associated with Construction Equipment (WSDoT, 2017).

Equipment	Max dB[A]
Backhoe	78
Concrete Mixer	79
Concrete Pump	81
Crane	81
Dump Truck	76
Excavator	81
Pick-up Truck	75

It is not expected that all equipment would be running at the same time, but to determine maximum expected noise levels, the WSDoT (2017) guidelines for decibel addition were used to determine that 86 dB[A] is the highest expected noise during combined construction activities.

The environment in which the project construction will occur is considered a soft environment with normal unpacked earth. The normal unpacked earth and topography will facilitate attenuation of noise emissions at shorter distances. Table 5-8 identifies the noise levels predicted to be observed at distances from the construction site determined using WSDoT (2017) guidelines.

Table 5-8: Worst-case noise impact to the surrounding environment calculated using WSDoT (2017) guidelines assuming sound levels in a soft environment attenuate at -7.5 dB[A] per doubling of distance.

Distance	Construction Noise dB[A]
50 ft (15.2 m)	86
100 ft (30.5 m)	78.5
200 ft (61 m)	71
400 ft (122 m)	63.5
800 ft (244 m)	56
1600 ft (488 m)	48.5
3200 ft (975 m)	41

Many noise scales refer to 70 dB[A] as an arbitrary base of comparison where levels above 70dB[A] can be considered annoying to some people (Purdue University, 2017). As indicated in Table 5-8, at 61 m from the construction site, noise levels are approximately 70 dB[A], similar to that of a car travelling at 100 km/h and just at the threshold of possible annoyance (Purdue University, 2000). Also indicated in Table 5-8, noise levels from the construction site reach ~40dB[A] at 1 km from the site. With the nearest dwelling located ~1.1 km from a proposed turbine, construction noise is not expected to impact dwellings in the area. Further, the construction noise is not expected to be annoyingly high beyond 61m from the construction site as noise levels at this distance have already attenuated to approximately 70 dB[A].

Additionally, this site has been chosen due to it's excellent wind resource. Wind generally increases ambient sound levels in an area and in combination with the vegetative cover will aid in making construction noise less noticeable at even shorter distances (WSDoT, 2017). Dense vegetation is estimated to reduce noise levels by as much as 5 dB for every 100 ft (30.5 m) and wind is estimated to reduce noise levels by as much as 20-30 dB at long distances (USDOT, 1995).

Table 5-9: Potential impacts and proposed mitigative measures for noise.

Potential Impacts on Noise	Proposed Mitigative Measures
During construction and decommissioning phases the ambient noise SPLs will be elevated as a result of the use of equipment and machinery such as excavators, dump trucks and bulldozers. Elevated noise levels can disturb fauna and local residents.	• Noise impact will be limited by restricting construction and decommissioning activities to daytime hours when feasible; • Health Canada recommends the long-term average day-night sound level (Ldn) be below 57 dB[A] at the closest residence. An Ldn of 57 dB[A] is expected to be within the threshold for widespread complaints for construction noise. (USEPA, 1974). • At 250m from the construction site, construction noise levels are estimated at 56 dB[A].
Elevated SPLs will be observed during operation from the nacelle, which will be a maximum of 135 m above ground level.	• A noise impact assessment has been conducted to predict a 'worst case scenario' SPL that can be expected at the surrounding dwellings is well below 40 dB[A] at the nearest building; • A Compliant Resolution Plan has been provided in Appendix L for residents to refer to if they have concerns about any noise observed during operation; • The turbine locations have been sited in order to comply with Provincial wind turbine noise guidelines • The wind turbines chosen for the project incorporate advanced noise reduction technologies in order to mitigate noise generated by the moving blades. • By minimizing grubbing and clearing, flora on the Project site will aid in attenuation of noise produced from the WTG as perceived by local receptors.
Infrasound from wind turbines.	• Infrasound from wind turbines is not a concern given the distance the wind turbine is located in relation to homes and dwellings.

Cumulative Effects – There are no other operating or proposed wind farms within a 10km radius from the project site. No cumulative effects are expected to occur with respect to ambient noise.

Significance of Residual Effects – Elevated SPLs caused by construction and decommissioning phases will be temporary, during the day and short term. Noise production from the WTG during operation has been mitigated by setback distances and confirmed by a noise impact assessment. The Project is not anticipated to have any significant residual environmental effect on noise levels. While any effect on ambient noise will be negative, the significance of residual effects on ambient noise is to be considered negligible.

5.1.6 Shadow Flicker and Visual Aesthetics

There are three attributes associated with the Project that have potential to cause an impact on the visual aesthetics of the site; lighting during night time construction activities, WTG lighting, and shadow flicker during WTG operation are expected to contribute to the visual aesthetics. A visual impact assessment was completed by collecting photographs from high-traffic areas around the Project site. Photomontages were created at three high traffic areas using WindFarm software. As a result, shadow flicker and visual aesthetics have been identified as a VEC.

A significant environmental effect would result if a considerable change in the ambient light and visual aesthetics was found to be the result of project activities.

Boundaries – The spatial boundary is the area in which the visual impact study was conducted; this being a 2,000 m radius from the WTG locations. The temporal boundary is focused on the operation phase of the WTGs but also includes the turbine installation phase of construction.

Discussion

Shadow Flicker

A shadow flicker impact assessment for the proposed WEP has been conducted to assess the potential impact of shadow flicker on the surrounding receptors. Details outlining the shadow receptors, prediction methodology and assumptions made for the assessment are included in Appendix C.

Under the *Additional Information Requirements for Wind Turbines* document published by New Brunswick Ministry of Environment and Local Government pursuant to Section 5(2) of the *Environmental Impact Assessment Regulation* of the *Clean Environment Act*, requirements regarding visual impacts due to shadow flicker must be limited to 30 hours per year and 30 minutes per day based on a worst-case scenario if feasible mitigation is not effective. Prior to conducting an assessment, careful site design and applying sufficient setbacks can reduce the majority of predicted shadow flicker. In addition to the shadow flicker impact assessment, mitigation measures will be proposed to mitigate predicted shadow flicker impact.

The shadow receptors included in this shadow flicker assessment include a 2.0 km area surrounding the proposed turbine locations. A total of 43 receptors have been included in this assessment.

The desired results of the shadow flicker prediction model at each receptor is to prove compliance with the New Brunswick requirements of no more than 30 hours per year of shadow, and no more than 30 minutes on the worst day of shadow under a “worst case” scenario where mitigation is not feasible.

This study uses the E-141 EP4 and assumes a maximum hub height of 135 and rotor diameter of 141m. The turbine locations in this assessment demonstrate that all receptors located within 2.0 km of the wind turbine are subject to less than 30hrs/year or 30mins/day.

Table 5-10: Predicted preliminary worst case shadow flicker for E-141 @ 135m hub height for the receptors receiving any shadow flicker.

Receptor ID	Shadow hours per year (h/year)	Max shadow hours per day (h/day)
D	22:53	0:24
E	13:52	0:22
F	18:49	0:24
Z	14:49	0:20
AH	16:46	0:20
AL	19:03	0:26
AM	11:43	0:24

This study was conducted using a worst-case scenario for the WEP and does not consider the existing vegetation or local weather conditions. Though all receptors are expected to receive less than the regulatory threshold of shadow flicker, mitigation can be implemented should real-case scenarios demonstrate different results. Coniferous trees are considered a mitigation measure to shadow flicker as they block or screen the shadow of the turbine from reaching the receptor. Additional screening mechanisms and altering turbine operation have also been determined as effective mitigation measures for reducing shadow flicker impact, as described in Section 7.1.2.

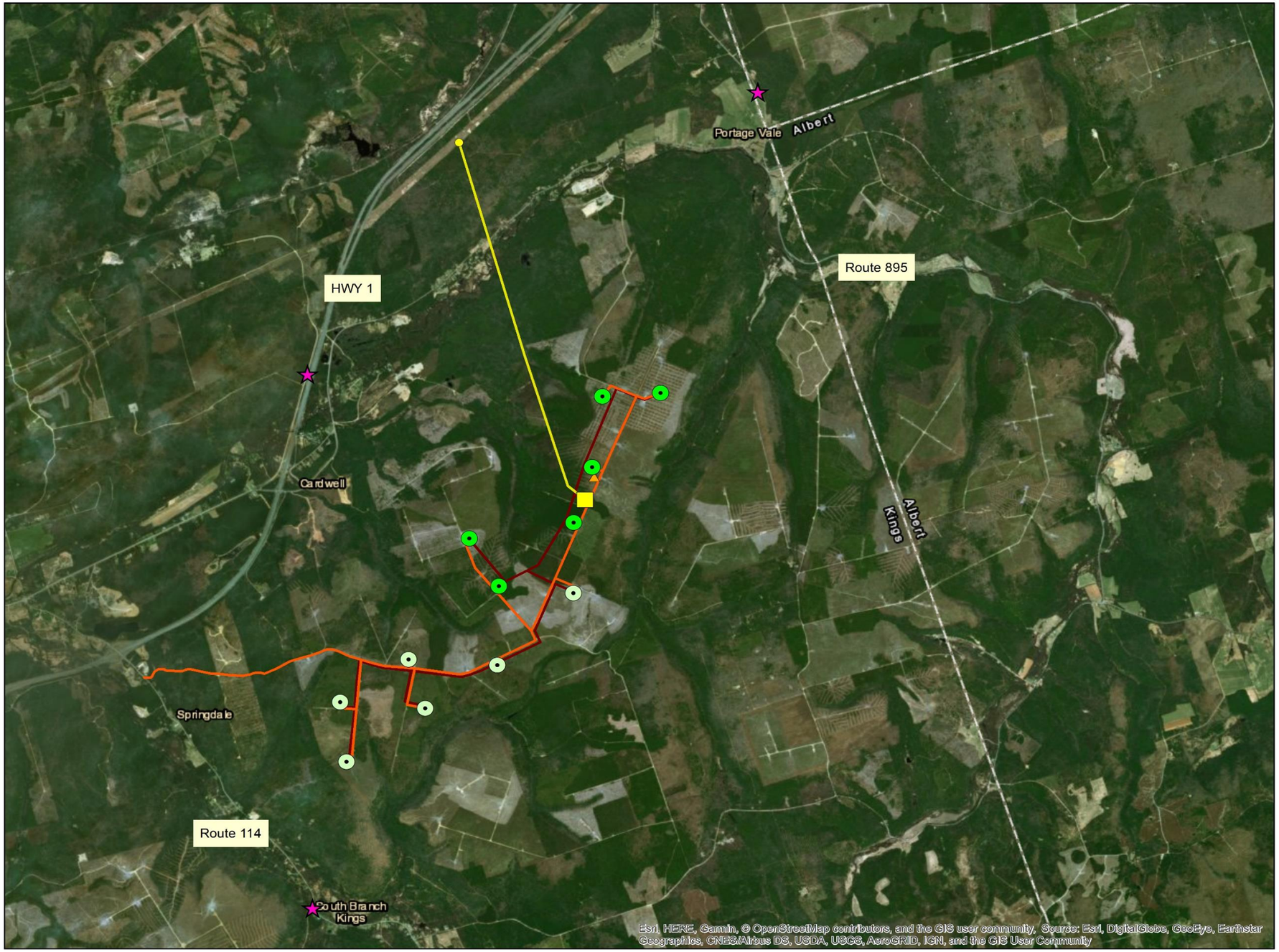
Photomontage

ReSoft Ltd WindFarm software was used to create three photomontages of the WEP from Highway #1 (3.0 km north), Route 895 (4.2 km northeast), and Route 114 (2.0 km southwest). Determining suitable locations for photomontages required an open area for some distance to ensure the turbine would be visible over the treeline. Areas in close proximity to the turbine were not suitable as the trees were an obstacle. Figure 5-1 through Figure 5-3 demonstrate how the WTGs are predicted to look on the landscape.

Figure 5-1: Predicted visibility from Highway #1

Figure 5-2: Predicted visibility overlooking a farm on Route 895.

Figure 5-3: Predicted visibility of the turbine on Route 114.



Wocawson Energy Project

Photomontage Locations

Legend

- Photomontage Locations
- Proposed Turbines
- Proposed Alternate/Expansion Turbines
- Point of Interconnection
- Proposed Substation
- Meteorological Tower
- Roads
- Proposed Transmission Line
- Collection System

Notes

N

1:70,000

0 900 1,800 2,700

Metres

WGS 1984 Web Mercator Auxiliary Sphere

Production Date: Sep 7, 2018

naturalforces

Figure 5-4: Photomontage Locations

Zone of Visual Influence

A ZVI model was conducted to determine the visual impact the turbines may have on the surrounding landscape. A hub height of 135m and rotor diameter of 141m was used to calculate the worst-case impact. Given the size of the turbines and the proposed hilltop location, it is expected the turbines will be visible at several locations throughout Kings County. Figure 5-5 shows the WindPRO ZVI model output showing a 48km visual radius recommended for visual analyses by Sullivan et al. (2012) in *Wind Turbine Visibility and Visual Impact Threshold Distances in Western Landscapes*. Though the turbines proposed are larger than included in the western study, it is noted that blade movements become less noticeable to the naked eye at closer distances. Further, Figure 5-6 demonstrates the subtended vertical angle (SVA). The SVA analysis helps to incorporate distance. The basic ZVI model only uses digital elevation to determine if any part of the turbine is visible whereas the SVA analysis will help determine how dominant the turbine appears on the landscape.

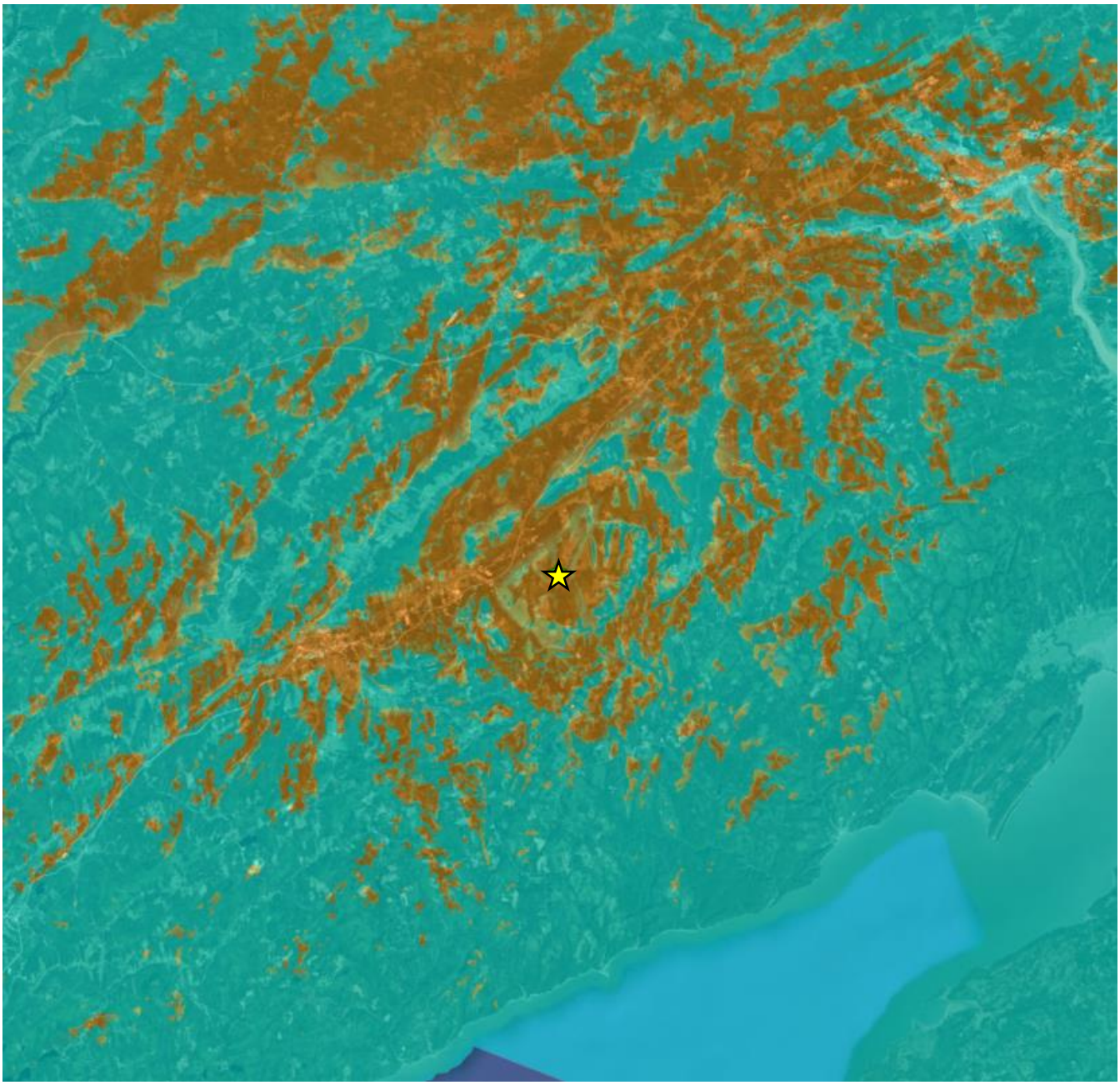


Figure 5-5: Zone of Visual Influence over a 48km visual analysis radius. Yellow color demonstrates some portion of the turbine may be visible.

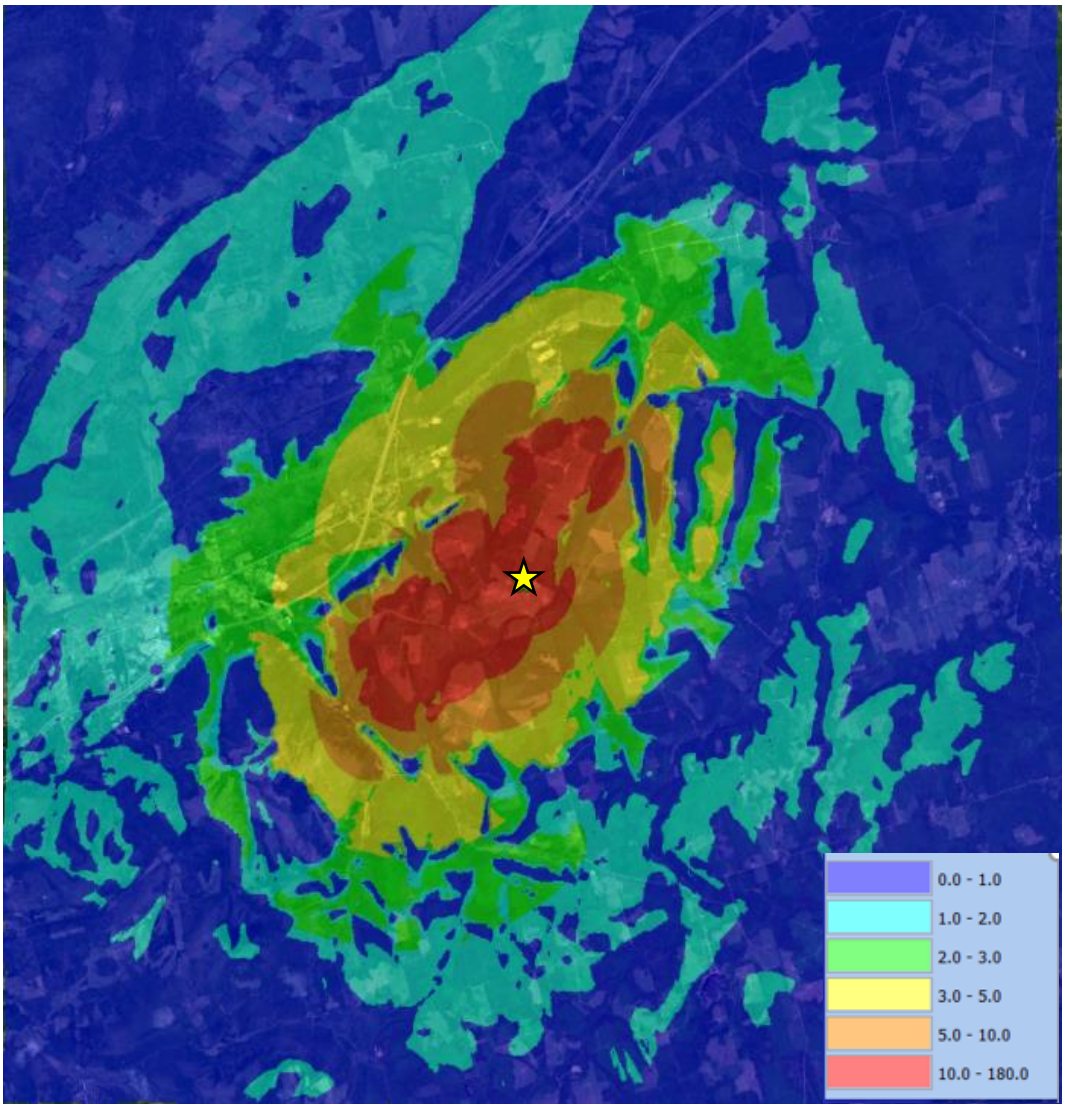


Figure 5-6: Subtended Vertical Angle

The SVA demonstrates that ~11 km from the WTG location the angle of view is less than one degree meaning the turbine appears very small upon the landscape and will no longer have a dominant impact on the landscape. The photomontages would have been taken at locations predicted to be in 2-3 degrees on Route 895 shown in Figure 5-2, 3-5 degrees on Highway #1 shown in Figure 5-1, and 5-10 degrees on Route 114 in Figure 5-3.

Table 5-11: Potential impacts and proposed mitigative measures for shadow flicker and visual aesthetics.

Potential Impacts on Shadow Flicker and Aesthetics	Proposed Mitigative Measures
During the night time, lighting will be seen on top and mid-way up the turbine tower.	• LED lighting will be used to minimize light throw; • Only the minimum amount of pilot warning and obstruction avoidance lighting will be used; • Only 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) will be installed on WTG structures; and • Lights will operate at the minimum intensity and minimum number of flashes per minute (longest duration between flashes) allowable by Transport Canada. • Exterior turbine maintenance lights will be turned off prior to maintenance staff leaving the site.
Shadow flicker may occur during certain weather conditions and times of the year.	• The potential negative effect of shadow flicker has been largely mitigated at the design stage through responsible turbine siting; • A shadow flicker assessment has been completed for dwellings and public areas within 2.0km of the proposed WTG; • Compliance with industry standard guidelines on shadow flicker has been adhered to. All dwellings will experience less than 30 hours of shadow flicker per year and 30 minutes of shadow flicker on the worst day; and • If shadow flicker occurrences during operation are found to be exceeding guidelines and annoying to surrounding houses and buildings, screening receptors may be considered as detailed in Appendix C.

Potential Impacts on Shadow Flicker and Aesthetics	Proposed Mitigative Measures
	• A Compliant Resolution Plan has been provided in Appendix L for residents to refer to if they have concerns about any shadow flicker observed during operation;
Lighting during night time construction activities such as turbine installation.	• Construction activities will be limited to the day time when possible. The turbine may be erected during the evening as the activity must be completed when the wind is less than 4 m/s. These conditions are commonly seen in the early evening.
Community members may have a negative reaction towards the aesthetics of the WTGs.	• The Proponent considered landscape aesthetics when deciding on specific siting of the WTGs; • The paint on the WTGs has been selected so that it does not contrast sharply with the environment; and • Policies regarding responsible siting of WTGs were followed to minimize the potential impact on the landscape aesthetics during WTG siting

Cumulative Effects – There are no other operating or proposed wind farms within a 10km radius from the project site. No cumulative effects are expected to occur with respect to shadow flicker and visual aesthetics.

Significance of Residual Effects – Annoyance during project construction from work lighting, if necessary, will be temporary and of short duration. Lighting concerns from residents during operations such as shadow flicker and WTG lighting is expected to be limited, as mitigation measures will be employed during site design and further mitigation can be implemented during operation. The perception of landscape aesthetics is a subjective matter. The Proponent recognizes the development of the proposed WTGs may have a negative effect in the perception of the community. It is possible that the negative reaction may be a result of a change in the landscape and may diminish over time. Therefore, while any effect from shadow flicker and on the visual aesthetics of the land will be negative, the significance of residual effects is predicted to be minor.

5.2 Assessment of Biophysical VEC Impacts

5.2.1 Avian

Throughout the construction, operation, and decommissioning of a wind farm the potential negative impacts can be classified into four categories: collision, displacement due to disturbance, barrier effects,

and habitat loss. As a result, migratory and breeding birds have been identified as a VEC. The Proponent will comply with the *Migratory Bird Convention Act* at all times and for all Project related activities.

A significant environmental effect would result if a considerable change to migratory and breeding birds was the result of project activities.

Boundaries – The spatial boundaries include the area where the WTGs will be located, and also includes pathways and locations that are frequented by birds. The temporal boundary is all phases of the Project.

Discussion

The results of the avian surveys conducted within the area of the proposed project in winter, spring and summer have been compiled and presented in Appendix D. The fall 2018 avian survey results will be submitted in an addendum following the completion of the fall field surveys.

During the 2018 avian surveys (winter, spring and summer), a total of 1,761 individual birds of 83 different species were recorded within the assessment area. Based on the behavioural observations noted or observations of birds in nests, two species were confirmed to be breeding within the assessment area (Hermit Thrush and Least Flycatcher*)*, and three species were observed to be displaying agitated behaviour (i.e., defending nesting territory) (White Throated Sparrow, Northern Goshawk and, Blue-headed Vireo).

In total, eight avian SAR were identified during the 2018 avian survey program (Bald Eagle, Barn Swallow, Canada Warbler, Common Nighthawk, Eastern Wood-Pewee, Olive-sided Flycatcher, Peregrine Falcon, and Rusty Blackbird)**.** Additionally, three avian SOCC were identified during the 2018 avian survey program (American Three-toed Woodpecker, Pine Siskin, and Turkey Vulture).

The locations of each SAR and SOCC are presented in Figure 4-11 in Section 4.2.1. It can be noticed that the locations of many of these observations occur along the most western portion of the access road and along the transmission line. These areas have the least fragmented habitat. There are very few occurrences of SAR and SOCC near the proposed turbines and even fewer near the preferred (6) six turbines. The Pine siskin is the only SOCC observed at a turbine location.

Table 5-12: Potential impacts and proposed mitigative measures for migratory and breeding birds.

Potential Impacts on Migratory and Breeding Birds	Proposed Mitigative Measures
During construction (clearing/grubbing) some vegetation might be cleared that may be habitat to some migratory and breeding birds.	• The Proponent will endeavor to conduct construction activities such as clearing and grubbing during a time period that does not coincide with the time period in which migratory and breeding birds would be in the area.
During operation there is a possibility that migrating birds could collide with the WTGs and Project infrastructure.	• A follow up avian mortality survey will be conducted after the WEP commissioning and appropriate actions will be taken in consultation with DERD and CWS should there be a significant negative impact to migration flyways; and • A comprehensive Adaptive Management Plan will be developed and implemented in consultation with DELG and CWS; and • The Proponent may participate in a regional radar and acoustic study to determine movement patterns and abundance across New Brunswick.
Birds may alter their migration flyways and/or local flight paths to avoid WTGs.	• A follow up avian mortality survey will be conducted after the WTG commissioning and appropriate actions will be taken in consultation with DERD and CWS should there be a significant negative impact to migration flyways.
Lighting on turbines can result in adverse impacts on birds. The Proponent recognizes that nocturnal migrant and night-flying seabirds are the birds most at risk of attraction to lights.	• Only the minimum amount of pilot warning and obstruction avoidance lighting will be used; • Only 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) will be installed on tall structures; • Lights will operate at the minimum intensity and minimum number of flashes per minute (longest duration between flashes) allowable by Transport Canada; • Instruction will be given to wind farm maintenance staff to ensure all work lights

Potential Impacts on Migratory and Breeding Birds	Proposed Mitigative Measures
	are turned off upon leaving the site particularly during foul weather events; and • A follow up avian mortality survey will be conducted after the wind farm commissioning, and appropriate actions will be taken in consultation with DELG, DERD and CWS should there be a significant negative impact to night migrants.
Fog events can impair avian visibility, increasing the likelihood of mortality from collision with WTGs.	• ECCC climate database has been consulted to predict the rate of fog occurrence; • An annual average of 2.3% – 4.6% fog is predicted for the Project site; and • Instructions will be given to wind farm maintenance staff to ensure all work lights are turned off upon leaving the site particularly during foul weather events.
The Project Footprint will cause a loss of habitat for breeding and migratory birds.	• Desktop and field studies conducted suggest a minimal loss of habitat due from clearing. The clearing footprint is minimized by using existing access roads and areas previously cleared from forestry activities.
There will be an increase in habitat when the Project site is reclaimed at the end of the 30 year project lifetime.	• N/A – no mitigation measures necessary for a positive potential impact.
When the WTG is removed there will no longer be the potential barrier effect impeding flyways or local flight paths.	• N/A – no mitigation measures necessary for a positive potential impact.

Cumulative Effects – There are no other operating or proposed wind farms within a 10km radius from the project site. No cumulative effects are expected to occur with respect to migratory and breeding birds.

Significance of Residual Effects – Disturbance of bird habitat will be minimal by employing the proposed mitigation measures. It is expected that the mortality rate of birds from collision or habitat loss during Project operation, if at all, will be low. Although the proposed turbines exceed the height of past turbines installed in New Brunswick, Mabee et al. (2006) reported that migration altitudes averaged 410 m a.g.l

within the ground to 1.5 km altitude range., and nightly averages ranged from 214 to 769 m. It is important to note that the percent of targets detected in that study was relatively uniform between 0 and 500 m a.g.l., which would indicate that there isn't a greater risk of avian collision if turbine heights were increased from 150m to 200m.

Horton (2016) indicates average heights of birds recorded from multiple studies ranged between 119.8m and 1135.6m. As these are averages, night migrants were found both above and below these levels suggesting current wind energy facilities are already within this migration corridor and thus, using turbines with a maximum height range of 205.5m does not pose a new risk. Erickson et al. (2014) indicated that bird mortality at wind energy facilities in North America account for at most 0.043 % of the population estimates for the species most affected by collision mortality; turbine collision mortality accounted for a lower rate for all other species and does not pose a threat to populations.

The Proponent does not anticipate increased mortality rates for the proposed turbines at a maximum height of 205.5m. Post-construction monitoring for bird mortality during operation will verify the impact the Project has on migratory and breeding birds. With the proposed mitigation measures employed, the significance of residual effects on migratory and breeding birds is predicted to be minor.

5.2.2 Bats

Throughout the construction, operation, and decommissioning of a wind farm the potential negative impacts to bats can be classified into two categories: collision and habitat disturbance. As a result, bats have been identified as a VEC.

A significant environmental effect would result if a considerable change to bat habitat, relative abundance/population decline was caused by the project activities.

Boundaries – The spatial boundaries include the area where the WTGs will be located. The temporal boundary is all phases of the Project.

Discussion

There are seven species of bats that occur in New Brunswick, three of which are listed as endangered by COSEWIC, the Canadian SARA and the NB SARA (Little brown myotis, Northern long eared myotis and the Tri-coloured bat). These species are also defined as S1 species by ACCDC. The remaining four species found throughout New Brunswick are defined by ACCDC as follows:

- Big brown bat (EPFU) – S3
- Eastern red bat (LABO) – S2
- Hoary bat (LACI) – S2
- Silver Haired bat (LANO) – S1

These four species are considered migratory, whereas the three endangered species mentioned previously are resident bats. 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). Bat fatalities, primarily migratory species, occur through direct collision with blades or indirectly from rapid decompression (barotrauma) near turbines (Baerwald et al. 2008).

The pre-construction acoustic bat surveys were ongoing at the time of EIA registration. Acoustic bat detectors have been collecting data since June 1 and will continue to collect data until October 31st to capture peak periods of bat activity. A full acoustic analysis will be conducted by Dillon Consulting and results will demonstrate bat passes per night and per detector. This data will be submitted to the TRC as an addendum to the EIA registration document. Though the data has yet to be analyzed, Table 5-13 outlines potential impacts to bats that have been known to occur at wind energy facilities. Additionally, standard mitigation measures have been proposed for these impacts. Upon completion of data analysis, impacts and proposed mitigation will be adjusted for site specific occurrences.

Table 5-13: Potential impacts and proposed mitigative measures for bats.

Potential Impacts on Bats	Proposed Mitigative Measures
Clearing and construction activities have the potential to cause disturbance to bat habitat.	• The project site has been designed to minimize the amount of land cleared. This reduces the ecological impact of the Project Footprint and minimizes the potential impact to bat habitat.
During operation there is a possibility that bats could collide with the WTG or succumb to barrotrauma.	• A follow up bat mortality survey will be conducted after the WEP commissioning and appropriate actions will be taken in consultation with DELG and DERD should there be a significant negative impact to bats; and • A mitigation scenario for this site may involve increasing the rotor cut-in speed to 5 m/s from half hour before sunset to half hour after sunrise.

Cumulative Effects – There are no other operating or proposed wind farms within a 10km radius from the project site. No cumulative effects are expected to occur with respect to bats.

Significance of Residual Effects – Disturbance of bat habitat during construction will be unlikely to occur by employing the proposed mitigation measures. The predicted mortality rate of bats due to collision and/or habitat loss cannot be accurately predicted at the time of EIA registration. However, due to lack of critical habitat, known caves, open mines, and coastlines in close proximity to the project site, preliminary estimates would suggest the WEP is well sited to avoid impacts to bats and bat habitat. Monitoring for

bat mortality during operation will also verify the effect the Project has on bats. The proposed curtailment scenario may be implemented if a significant amount of bat mortality is observed. When considering projects of similar nature to the WEP in Atlantic Canada, and that no bat hibernacula are located near the Project Footprint the preliminary prediction of impact is to be considered negligible. However, field surveys will confirm populations at the proposed WEP site.

5.2.3 Wetlands and Watercourses

Management of wetlands and watercourses is an important and integral aspect of maintaining a diverse ecosystem. The Projects impact on ground water quality and quantity as assessed in Section 5.1.1 was predicted to be minor in terms of significance of environmental effect. While the quality and quantity of ground water is important in terms of ecological functionality of wetlands and watercourses, the Project may also interact with surface wetlands and watercourses in terms of direct alteration.

A significant environmental effect would result if a considerable change to wetlands and watercourses was the result of project activities.

Boundaries – Spatial boundaries are limited to works associated with the Project focusing on the access roads and the WTG locations. The temporal boundary focuses on Project construction but also includes operation and decommissioning for the unlikely event of an accident or malfunction.

Discussion – The proposed project is situated within the Kennebecasis Watershed (specifically the Upper Kennebecasis subwatershed) which encompasses a drainage area of 1346 square kilometers, beginning at its headwaters in Hamilton Lake and extending to the head of tide at Bloomfield Ridge, NB (KWRC, 2018). The Kennebecasis River (approximately 95 km in length) is the central system within this watershed (KWRC, 2018). The proposed project is situated between Spring Brook (to the west) and Calamingo Brook (to the east). The mapped watercourses that fall within the area of the proposed project include unnamed tributaries of the Kennebecasis River.

The proposed turbine locations are not predicted to interact with any wetlands or watercourses as none were identified in proximity to these structures. However, four watercourses (three mapped and one unmapped according to the GeoNB data layer) were observed within the transmission line corridor and an additional unmapped watercourse with a dry channel was observed to cross the access road.

Though there were no mapped wetlands that intersect any portion of the proposed project infrastructure, three unmapped wetlands were observed to intersect the transmission line corridor.

The proposed transmission line is the only project infrastructure that has the potential to interact and disturb wetlands and watercourses onsite. After further consultation with NBP on pole placement for the proposed line it is likely that poles can span these aquatic features reducing any direct disturbance. Further, where possible, poles will be setback 30m from these features. Where poles are needed in

proximity to a wetland or watercourse, any clearing needed will be conducted as per conditions of a WAWA permit.

Table 5-14: Potential impacts and proposed mitigative measures for wetlands and watercourses.

Potential Impacts on Wetlands and Watercourses	Proposed Mitigative Measures
During the construction phase, possible impacts to wetlands may arise from clearing, grubbing, infilling and excavation activities. Such activities might induce silt run-off, alter flow into the wetlands or see them become repositories of significantly increased water flow, nutrients or sediments.	• Wind turbines have been set back at least 300m from any aquatic features; • Transmission line poles will span unmapped wetlands to reduce direct disturbance but a WAWA permit will be obtained for any poles that cannot be setback 30m; • Field surveys in the Spring and Summer of 2018 were completed to ensure unmapped wetlands were delineated; • Appropriate sediment erosion and run-off control measures (e.g. silt fencing, haybales) will be implemented when needed; • Natural regeneration of the site will be promoted to aid in storm water retention and reduce run-off; and • No stockpiling of materials will occur within 30m of a wetland
During installation of the transmission line, NBP contractors may need to cross wetlands and/or watercourses.	• Brush matting, and corduroy roads, are often used in wetted regions and will be implemented should a WAWA permit require such measures; • It is likely that all watercourse crossings will be spanned (i.e., bridged), and no in-stream work is currently proposed for this Project; • Contractors requiring watercourse crossings will make every reasonable effort to span the watercourse; • However, should in-stream work (i.e., culvert installation) be required for access, the work will be conducted within the June 1 to September 30 timeframe, unless otherwise approved by NBDELG.

Potential Impacts on Wetlands and Watercourses	Proposed Mitigative Measures
	• Clearing of vegetation within the transmission line corridor will occur by hand or by mechanical brushing within 30 m (100 ft) of a watercourse. Where practical, a riparian buffer with a width of 10 m (33 ft) will remain on each bank of the watercourse, where only tall (i.e., above 3.66 m or 12 ft) vegetation will be removed. Strict adherence to the WAWA permit will be enforced. • No watercourses will be forded by construction equipment. Temporary watercourse crossings may be installed where required to allow equipment to cross over each watercourse, and the temporary crossings will completely span the watercourse from bank to bank. • Where watercourse or wetland crossings are necessary, a 3 to 5 m (10 to 16.4 ft) wide trail/track will be used for travel in the buffers. • Watercourse and wetland crossings will not be permitted where access to the RoW is reasonably available from both sides of a watercourse or wetland.
Exposure or accidental spillage of hazardous materials such as fuel, oils and hydraulic fluids has potential to contaminate surface water supplies during construction, operation and decommissioning phases.	• Equipment shall be in good working order and maintained so as to reduce risk of spill/leaks and avoid water contamination; • Spill response kits will be provided on site for each piece of equipment to ensure immediate response to a potential waste release and will be stocked with supplies to handle a worst-case scenario on ground or in surface and groundwater; and • Corrective measures will be implemented immediately and reported to the DELG's Moncton Regional Office at (506) 856-2374 or outside of business hours to the Canadian Coast Guard's environment

Potential Impacts on Wetlands and Watercourses	Proposed Mitigative Measures
	emergencies reporting system at 1-800-565-1633 • Routine maintenance, refueling and inspection of machinery will be performed off-site whenever possible. • A spill contingency and emergency response plan has been developed and included within the EMP attached in Appendix J and will be implemented during construction.

Cumulative Effects – There are no other operating or proposed wind farms within a 10km radius from the project site. No cumulative effects are expected to occur with respect to wetlands and watercourses.

Significance of Residual Effects –The WTGs have been located such that a 300m buffer exists between the WTGs and any wetland or watercourse. The existing Mitton road will be used to access the site and crosses in close proximity to Watercourse #5. There are three unmapped wetlands along the proposed transmission line. However, no direct impact to these wetlands is expected and transmission line poles will span the sensitive area. A WAWA permit will be obtained, where required, for any work within a 30m wetland or watercourse buffer. With the proposed setbacks and mitigation to reduce direct impacts, the significance of residual effects on wetlands and watercourses is predicted to be minor.

5.2.4 Fish and Fish Habitat

Alteration of freshwater environments such as the potential watercourse crossing on Mitton Road and for the installation of the transmission line may be required. However, construction is not expected to impede any fish habitat on the Project site and it is unlikely that any alterations will be required for WC #5 along Mitton Road due to the existing infrastructure. Two of the watercourses were observed to be fish bearing (WC #2 and WC #4 (Kennebecasis)) and another observed to have intermittent flow but provide fair fish habitat (WC #3).

A significant environmental effect would result if a considerable change in fish and fish habitat was the result of project activities. As a result of the potential watercourse interaction along the transmission line fish and fish habitat has been identified as a VEC.

Boundaries – Spatial boundaries are limited to the watercourses that may require disturbance form the transmission line installation. The temporal boundary focuses on Project construction.

Table 5-15: Potential impacts and proposed mitigative measures for fish and fish habitat

Potential Impacts on Fish and Fish Habitat	Proposed Mitigative Measures
Loss or damage to fish and fish habitat during watercourse alteration.	• All construction activities near watercourses will comply with the applicable regulations and guidelines such as the *Fisheries Act*; • All required watercourse crossings will comply with existing regulatory requirements including the New Brunswick Watercourse Alteration Specifications; • Crossings should be located in areas that exhibit a stable soil type and where grades approaching the crossings will not be too steep;
During installation of the transmission line, NBP contractors may need to cross wetlands and/or watercourses.	• Brush matting, and corduroy roads, are often used in wetted regions and will be implemented should a WAWA permit require such measures; • It is likely that all watercourse crossings will be spanned (i.e., bridged), and no in-stream work is currently proposed for this Project; • Contractors requiring watercourse crossings will make every reasonable effort to span the watercourse; • However, should in-stream work (i.e., culvert installation) be required for access, the work will be conducted within the June 1 to September 30 timeframe, unless otherwise approved by NBDELG. • No watercourses will be forded by construction equipment. Temporary watercourse crossings may be installed where required to allow equipment to cross over each watercourse, and the temporary crossings will completely span the watercourse from bank to bank. • Where watercourse or wetland crossings are necessary, a 3 to 5 m (10 to 16.4 ft) wide trail/track will be used for travel in the buffers.

	• Watercourse and wetland crossings will not be permitted where access to the RoW is reasonably available from both sides of a watercourse or wetland.

Cumulative Effects – There are no other operating or proposed wind farms within a 10km radius from the project site. No cumulative effects are expected to occur with respect to fish and fish habitat.

Significance of Residual Effects – WLP has modified the project design such that poles for the transmission line will span aquatic features. It is unlikely that any direct impact will occur to a wetland or watercourse feature. However, where work is required within a 30m buffer, a WAWA permit will be obtained and all conditions will be adhered to. With the proposed mitigation measures, the WEP is not anticipated to adversely affect unique or sensitive aquatic habitat such as the Kennebecasis River (potential habitat for aquatic species at risk). The significance of residual effects on fish and fish habitat is predicted to be minor.

5.2.5 Wildlife

Information collected during field surveys has covered all habitat types and wildlife observations. Wildlife species including terrestrial mammals and herpetofauna have been identified in Section 4.2.5. In an effort to preserve wildlife habitat and ensure wildlife species remain unharmed, wildlife has been identified as a VEC.

A significant environmental effect would result if a considerable change to wildlife populations was the result of Project activities.

Boundaries – The spatial boundary is the entire Project site. The temporal boundary includes the construction phase focusing on clearing, grubbing and building the access roads, WTG crane pads and foundations, as well as the decommissioning phase focusing on site reclamation.

Discussion – The project is not expected to impact herpetofauna species. The wood frog and maritime garter snake were the only herpetofauna species observed onsite and are not of special conservation concern. Additionally, all terrestrial mammals observed using the Project Study Area are common to the area. Small temporary disturbance may occur during construction activities, but it is anticipated individuals will return to the site during operation.

The Project will decrease some wildlife habitat from the access roads and crane pads. While the construction phase presents potential for negative impact, once the decommissioning phase has started, land reclamation will restore the Project site to its previous state.

Table 5-16: Potential impacts and proposed mitigative measures for wildlife.

Potential Impacts on Wildlife	Proposed Mitigative Measures
Clearing and grubbing will result in the disturbance of wildlife habitat.	• There will be minimal land/habitat loss attributable to the construction phase as determined by desktop and field studies; • The access roads have been optimized to make use of existing roads at the Project site to reduce the amount of flora to be cleared; and • Location of the access roads will be optimized to reduce footprint and to avoid sensitive areas where feasible.
The Project Footprint will cause loss of habitat for herpetofauna and terrestrial mammals.	• Desktop and field studies conducted suggest a minimal loss of habitat due to clearing. This is considered to have minimal impact on wildlife as the project site was previously disturbed.

Cumulative Effects – There are no other operating or proposed wind farms within a 10km radius from the project site. No cumulative effects are expected to occur with respect to wildlife.

Significance of Residual Effects – With the proposed mitigation measures employed the significance of residual effects on wildlife is predicted to be negligible.

5.2.6 Vegetation and Habitat

Information collected during field surveys has covered all habitat types. Habitat types have been identified in Section 4.2.6. In an effort to preserve local flora species and to ensure flora species of conservation interest remain unharmed, vegetation and habitat has been identified as a VEC.

A significant environmental effect would result if a considerable change to vegetation and habitat was the result of Project activities.

Boundaries – The spatial boundary is the entire Project site. The temporal boundary includes the construction phase focusing on clearing, grubbing and building the access roads, WTG crane pads and foundations, as well as the decommissioning phase focusing on site reclamation.

Discussion – There was a single plant species of concern identified in the Project Study Area. Herb- Robert was identified outside of the clearing corridor along the proposed transmission line. This plant species was located within wetland #3. It is likely that NBP can span this wetland preventing any direct disturbance. In addition to spanning the wetland, a 30m buffer will be applied surrounding the plant SOCC.

There will be some loss of vegetation for the construction of turbines and the upgrading and widening of the access road but any areas of temporary disturbance will be revegetated upon site clean-up. Additionally, after decommissioning the site will be reclaimed to its previous state.

Table 5-17: Potential impacts and proposed mitigative measures for vegetation and habitat.

Potential Impacts on Vegetation and Habitat	Proposed Mitigative Measures
Clearing and grubbing will result in the disturbance of vegetation and habitat.	• There will be minimal land/habitat loss attributable to the construction phase as determined by desktop and field studies; • A 30m buffer will be placed around the observed plan SOCC; • The access roads have been optimized to make use of existing roads at the Project site to reduce the amount of flora to be cleared; and • Natural regeneration of the site will be promoted to replenish vegetation in some of the cleared areas that will not be needed during operation.
There is a risk of introducing invasive species through plant matter attached to construction equipment.	• Construction equipment will be cleaned prior to transportation and use to ensure that machinery is clean.

Cumulative Effects – There are no other operating or proposed wind farms within a 10km radius from the project site. No cumulative effects are expected to occur with respect to vegetation and habitat.

Significance of Residual Effects – The Project will decrease the flora footprint from the access roads, crane pads, transmission line, and substation. While the construction phase presents potential for negative impact, land that has been cleared and is not needed for operation will be allowed to naturally regenerate. Additionally, once the decommissioning phase has started, land reclamation will restore the Project site to its previous state. With the proposed mitigation measures employed, the significance of residual effects on flora is predicted to be minor.

5.2.7 Significant and Sensitive Habitat

Information collected during desktop and field surveys has covered all habitat types. In an effort to preserve this habitat, significant and sensitive habitat has been identified as a VEC.

A significant environmental effect would result if a considerable change to significant and sensitive habitat was the result of Project activities.

Boundaries – The spatial boundary is the entire project site. The temporal boundary includes the construction phase focusing on clearing, grubbing and building the access roads, WTG crane pads, foundations, and transmission line as well as the decommissioning phase focusing on site reclamation.

Discussion – Installation of the proposed transmission line may require working within 30m of a wetland or watercourse. There were no Provincially Significant Wetlands identified onsite. The Project Footprint does not interact with any ESA's or significant habitat.

Table 5-18: Potential impacts and proposed mitigative measures for Significant and Sensitive Habitat.

Potential Impacts on Significant and Sensitive Habitat	Proposed Mitigative Measures
Clearing and grubbing may result in the disturbance of significant and sensitive habitat.	• There will be minimal land/habitat loss attributable to the construction phase as determined by desktop and field studies; • The WTGs have been setback 300 m from all mapped and unmapped wetlands keeping all disturbance from the turbine base outside of the 30m wetland buffer; and • The WTG is setback a sufficient distance (>5km) from all ESA's reducing potential impacts.

Cumulative Effects – There are no other operating or proposed wind farms within a 10km radius from the project site. No cumulative effects are expected to occur with respect to sensitive and significant habitat.

Significance of Residual Effects – Some work may be required within a 30m wetland or watercourse buffer, this impact is addressed in Section 5.2.3. There have been no other areas of sensitive or significant habitat observed within the project site. The project is not expected to have any impacts on these features as none were identified.

5.3 Assessment of Socio-economic VEC Impacts

5.3.1 Archaeological Resources

The results of the desktop archaeological resource potential assessment and the pedestrian walkover have identified areas of medium and high potential for archaeological resources along the transmission line. As a result, archaeological resources have been identified as a VEC.

A significant environmental effect would result if a considerable change to archaeological resources was the result of project activities.

Boundaries – The spatial boundary for this VEC is the entire Project site. The temporal boundary is the construction phase where ground disturbance is likely to occur.

Discussion – There are three areas of high potential and one area of medium potential for archaeological resources along the proposed transmission line. Shovel test pits have been recommended by Archaeological Prospectors and will be completed at the proposed pole locations. Results of the shovel test pits will be submitted as an addendum to this EIA.

Table 5-19: Potential impacts and proposed mitigative measures for archaeological resources.

Potential Impacts on Archaeological Resources	Proposed Mitigative Measures
Direct impact to cultural resources during construction activities, such as blasting and excavation.	• Avoidance is the preferred method of mitigation in all instances where archaeological resources are present; • Construction workers working within 80m of a watercourse will be advised of the higher potential for archaeological resources; and • Should archeological resources including but not limited to an archaeological object, burial object, or human remains be encountered by chance during construction, all activities are to stop and the Archaeological Services Branch will be contacted as soon as practical via (506) 453-2738 to determine a suitable method of mitigation.

Cumulative Effects – There are no other operating or proposed wind farms within a 10km radius from the project site. No cumulative effects are expected to occur with respect to archaeological resources.

Significance of Residual Effects – The proposed transmission line crosses areas of medium- high potential for archaeological resources. Shovel tests will be completed in areas where ground disturbance is expected (i.e. pole locations) and if archaeological resources are observed, avoidance of resources will be implemented. In the unlikely event that archaeological resources are observed that cannot be avoided, further consultation with New Brunswick's Archaeological Branch will occur. Further, any resources observed by chance during the construction phase will be reported as soon as feasible. With the mitigation proposed, the significance of residual effects on archaeological resources is expected to be negligible as it is expected that should any resources be found onsite, that they can be successfully avoided.

5.3.2 Electromagnetic Interference

There is the potential that the turbine rotor may interfere with the transmission and receiving of telecommunication signals from telecommunication towers. Through consultation with Industry Canada and Eastlink, it was determined that no interference with the new tower and the wind project is expected.

Transport Canada and Navigation Canada have been consulted. Aeronautical Obstruction Evaluations and Land Use Proposal Forms have been submitted for evaluation of the proposed location. Previous evaluations for five wind turbines in this location have been approved by Navigation Canada and Transport Canada. Updated evaluation forms to include the additional turbines have been submitted. With the previous approvals, no issues are expected. Department of National Defence has also been notified about the proposed project and location and no objections have been received.A desktop study for electromagnetic interference was conducted to identify potential impact on microwave link communication. As a result, electromagnetic interference has been identified as a VEC.

A significant environmental effect would result if considerable interference was the result of project activities.

Boundaries – The spatial boundary consists of the local area including the proposed WTG and neighbouring communication infrastructure. Temporal boundaries include the operation phase of the Project.

Discussion – An electromagnetic interference assessment has been completed to locate the communication towers in the area. Appropriate buffers have been applied to all towers found based on the RABC guidelines and the WTG is located 2km away from the nearest communication tower. This distance is sufficient based consultation with Industry Canada, and Eastlink (License holder).

Over the past few years, there has been growing concern over public safety in relation to possible exposure to electromagnetic fields (EMFs) from wind turbines. Electric fields are generated by a difference in voltage while magnetic fields are generated when there is a flow of electric current. A higher voltage and greater the current will result in a larger EMFs (WHO, 2017).

EMFs can occur naturally in the environment and are generated from every electrical distribution line that connects to homes and from all household electronic devices. A study conducted in 2014 (McCallum et al.) found that EMF's around wind turbines do not present a health concern to the public and that levels surrounding wind turbines are found to be lower than levels found around homes from use of common household electrical devices.

EMFs generated form wind turbines do not pose any health concerns and are not considered a potential impact to public health and safety.

Table 5-20: Potential impacts and proposed mitigative measures for electromagnetic interference.

Potential Impacts on Electromagnetic Interference	Proposed Mitigative Measures
WTG operation may interfere with telecommunication and/or radar communication infrastructure	• Consultation was completed as recommended by CanWEA and RABC's guidance document – *Technical Information and Guidelines on the Assessment of the Potential Impact of Wind Turbines, on Radio Communications, Radar and Seismoacoustic Systems*; • A desktop EMI assessment was conducted by the proponent in line with the RABC guidelines. The results of the assessment showed that the turbine will not interfere with the telecommunication links of nearby towers; • Application process with Navigation Canada's Land Use Proposal Submission Form to ensure that the Project does not pose any hazard to the navigational systems; and • Transport Canada and Department of National Defence has also been consulted.

Cumulative Effects – There are no other operating or proposed wind farms within a 10km radius from the project site. No cumulative effects are expected to occur with respect to electromagnetic interference.

Significance of Residual Effects – Based on consultation with the appropriate authorities, no impedance on communication infrastructure is to be expected. As a result, the significance of residual effects on telecommunication and radar communication is expected to be negligible.

5.3.3 Land Use and Property Value

The proposed WEP is located on provincial crown land and a lease will be obtained for the purpose of developing the proposed WEP. Additionally, easements will be obtained for the construction of the transmission line. Lands surrounding the Project parcels are rural with some residential small communities. There are 43 dwellings within 2.0 km of the Project. As a result, land use and property value have been identified as VECs.

A significant environmental effect would result if a considerable change to land use, or property devaluation was the result of project activities.

Boundaries – The spatial boundaries include the proposed WTG location. The temporal boundary includes all phases of the Project including construction, operation and decommissioning.

Discussion - A review of the available literature found that there were no correlating negative associations between wind farms and property value. In 2010 a study in the Municipality of Chatham-Kent, Ontario was prepared to assess the effects of wind energy on real estate values. This report was prepared in accordance with the *Canadian Uniform Standards of Professional Appraisal Practice* for the Appraisal Institute of Canada (Canning et al., 2010). The report is widely recognized in the wind industry as a thorough study and demonstrates what many other studies also indicate. The study found that it was highly unlikely that a relationship exists between wind farms and the market values of rural residential real estate (Canning et. al., 2010).

A recent study by the University of Guelph analyzed more than 7,000 home and farm sales that occurred between 2002 and 2010 in Melancthon Township, Ontario, which saw 133 turbines erected between 2005 and 2008. Of the 7,000 homes and farms, 1,000 were sold once, and some multiple times. Co-authors, Richard Vyn and Ryan McCullough conclude that the turbines in question have not impacted the value of the surrounding properties. Further, the nature of the results, which indicate a lack of significant effect, is similar across both rural residential properties and farm properties (Vyn & McCullough, 2014).

Table 5-21: Potential impacts and proposed mitigative measures for property value & land use.

Potential Impacts on Property Value & Land Use	Proposed Mitigative Measures
Land use of the project site where the turbine is proposed will change from clear-cut, fragmented habitat to a source of renewable energy	• The land use changes are predicted to be positive: no mitigation is proposed.
Current land use may be impacted during the construction and operation of the Wind Farm	• Consultation with all current land users has occurred • Wind turbines will be set back 70m from snowmobile trails to provide additional safety to recreational users. • Ongoing Consultation with the Goshen Snowmobile Club has and will continue to occur to ensure safe recreational use of the project lands; • When forestry activities are occurring onsite, extra caution will be taken on roads.

	• The overlapping tenure where military activity occurred will be flagged due to the potential presence of old military equipment.
Public concern that property value may decrease as a result of the Project	• Recent real estate value studies have consistently determined no correlation between proximity to wind farms and property devaluation (Canning et. al., 2010); and • Education through public consultation can be effective in providing factual, relevant information to alleviate the concerns of local residents.

Cumulative Effects – There are no other operating or proposed wind farms within a 10km radius from the project site. No cumulative effects are expected to occur with respect to land use and property value.

Significance of Residual Effects – The significance of residual effects on land use and property value is expected to be negligible.

5.3.4 Vehicular Traffic and Pollution

The Project will be accessed via Mitton Road. During construction of the access roads and WTG foundations, there will be an increase in truck traffic on the roads leading to and from the Project site. During delivery of the WTG components, delivery of oversized loads may slow traffic flow. As a result, vehicle traffic and pollution have been identified as a VEC.

Boundaries – The spatial boundaries are all roads that will be used through the construction phase of the Project and the Project site. The temporal boundaries are those associated with the construction phase of the Project.

Discussion – Oversized loads will be associated with the delivery of WTG towers, blades, nacelles, and the cranes required for erection. These deliveries are anticipated to be subject to movement orders as agreed upon with governing authorities.

Some pollution is expected during the construction phase via transportation of materials and construction machinery. However, vehicle related emissions will be minimized by turning engines off when feasible to reduce idling and by sourcing local materials where possible. During the construction phase, there will also be elevated noise levels due to the increase in traffic and heavy machinery. However, with sufficient setbacks from dwellings, elevated noise levels due to construction will not be significant and is not likely to impact surrounding communities.

Table 5-22: Potential impacts and proposed mitigative measures for vehicular traffic and pollution.

Potential Impacts on Vehicular Traffic and Pollution	Proposed Mitigative Measures
Vehicular traffic may increase as a result of construction activities and transportation of WTG components to the Project site.	• Every effort will be made to ensure that oversized loads are delivered during times of lowest traffic to mitigate traffic jams. • Determine and enforce a speed limit to reduce unnecessary emissions and enhance worker safety; • Minimize idling of vehicles where possible; • Construction equipment and vehicles will be kept up to standards and in good working order to reduce inefficiencies; • Contractor car-pooling will be encouraged; • The Proponent or the appropriate contractor will consult with NBDTI as early as possible regarding the permits and approvals required for the construction of the WEP to ensure sufficient time is provided to process the permits; • Vehicle movements will follow traffic control guidelines outlined in the Work Area Traffic Control Manual for delivery of materials on provincial roads; • The Proponent of appropriate contractor will develop a Transportation Plan to be reviewed by NBDTI to receive approval and all applicable permits will be obtained for work within right-of ways, temporary road widening, and construction of the access road. • All trucks will adhere to legal load limits on New Brunswick roads including spring weight restrictions when applicable, though construction is estimated to begin in the fall. • Loads will be thoroughly checked and secured for delivery to minimize potential for spillage and any spills will be promptly

Potential Impacts on Vehicular Traffic and Pollution	Proposed Mitigative Measures
	removed following applicable safety procedures.
Vehicle traffic and use of equipment has the potential for accidental spillage of hazardous materials such as fuel, oils and hydraulic fluids during construction, operation and decommissioning phases.	• Equipment shall be kept in good working order and maintained so as to reduce risk of spill/leaks and to avoid water contamination; • Spill response kits will be provided on site for each piece of equipment to ensure immediate response to a potential waste release and will be stocked with supplies to handle a worst-case scenario in surface or groundwater; • Routine maintenance, refueling and inspection of machinery will be performed off-site or on level ground onsite; and • Corrective measures will be implemented immediately and reported to the DELG's Moncton Regional Office at (506) 856-2374 or outside of business hours to the Canadian Coast Guard's environment emergencies reporting system at 1-800-565-1633.
Local air quality may be affected through fugitive dust from the access road during construction and decommissioning	• Fugitive dust during dry weather conditions may be controlled with the application of water.
Local air quality may be affected through tailpipe emissions from construction vehicles and machinery	• All vehicles and machinery will comply with current emission standards and will be used efficiently, minimizing distances travelled whenever possible.

Cumulative Effects – There are no other operating or proposed wind farms within a 10km radius from the project site. No cumulative effects are expected to occur with respect to vehicular traffic and pollution.

Significance of Residual Effects – The time frame in which an impact to traffic may occur will be temporary, and combined with the proposed mitigative measure of avoiding high traffic times; the significance of residual effects on vehicular traffic is expected to be negligible.

5.3.5 Public Health and Safety

Public health and safety are of the greatest concern in the development of a Project such as the WEP. During the construction, operation and decommissioning phase the protection of workers and the public's health and safety is protected under the provincial OHS Act. It is best practice to consider a 'worst case scenario' when developing a health and safety policy / plan, as a result, health and safety has been identified as a VEC.

A significant environmental effect could result if a considerable change to health and safety was the result of project activities.

Boundaries – The spatial boundary includes the Project site and for the sake of ambient noise and ambient light, a 2, 000 m radius from the WTGs. The temporal boundaries include all phases of the Project.

Discussion - Proper setbacks have reduced the risk to public health and safety from noise and shadow flicker impact, possible fires, ice throw and malfunction. Technological considerations including a built-in heating system to detect and melt ice from the blades to reduced ice throw will be implemented. Further a lightning protection system will conduct electrical surges away from the nacelle to prevent fires. This system includes wiring around and throughout the turbine to transport and dissipate the surge to the ground.

Consultation with applicable aviation authorities has occurred, and the turbine lighting will conform to Transport Canada requirements for aviation safety. Project worker safety is also of the utmost importance and is protected under the provincial OHS Act while safe work practices will be encouraged onsite during the construction phase.

Table 5-23: Potential impacts and proposed mitigative measures for health and safety.

Potential Impacts on Public Health and Safety	Proposed Mitigative Measures
During extreme cold weather events there is the potential for ice to build up and throw ice from the WTG blades.	• WTGs are equipped with ice-detection systems on each blade; • WTGs are designed to shut down in the case of ice-buildup; and • When ice is detected the blade has a heating mechanism that will effectively melt the ice to mitigate ice-throw; and • Personal Protection Equipment (ie. hard-hats) will be worn when near the WTGs.
During extreme weather events, there is the potential for electrical fires within the turbine nacelle through lightning strikes.	• WTGs are equipped with lightning protection that, in the unlikely event of a lightning strike, will dissipate the lightning current to the ground.
Potential aviation hazard to low flying aircraft.	• Application process with NAV Canada's Land Use Proposal Submission Form to ensure that the Project does not pose any hazard to the navigational systems of NAV Canada.
Increase in vehicular traffic may have the potential to affect public safety.	• Every effort will be made to ensure that oversized loads are delivered during times of lowest traffic to mitigate road traffic.
Shadow flicker may affect human health.	• This potential impact has been addressed in the Shadow Flicker and Visual Aesthetics Section 5.1.6.
Noise impact may affect human health.	• This potential impact has been addressed in the Noise Section 5.1.5.
Potential for accidents and malfunctions pose a risk to workers and the public's health and safety;	• The OHS Act will be followed.

Cumulative Effects – There are no other operating or proposed wind farms within a 10km radius from the project site. No cumulative effects are expected to occur with respect to health and safety.

Significance of Residual Effects – Based on Project planning and design, the top priority has been health and safety. This is to make every reasonably possible effort to eliminate any negative potential impacts the Project may have on the public's health and safety. By following the proposed mitigative measures as well as regulatory guidelines pertaining to health and safety, the significance of residual effects on health and safety is expected to be negligible.

5.3.6 Community and Local Economy

During the Project phases, there will be a significant amount of money spent within the Kings County, New Brunswick. During the development, the need for contractors and trades will be required and the Proponent will make every effort to utilize local companies to promote the local economy.

A significant effect would result if a considerable change to local economy was the result of project activities.

Boundaries – The spatial boundary is any area, business and individual that may observe a financial impact from the Project. The temporal boundary includes all phases of the Project.

Discussion – The project is expected to bring jobs to the local community through the use of accommodations and services during onsite work and through local hiring of contractors. This is expected to be beneficial for the area as high unemployment rates have been observed in the Cardwell Local service District from Statistics Canada. The installation of the WTGs may also provide tourism benefits for the area as people may come through to view the project.

Table 5-24: Potential impacts and proposed mitigation measures for community and local economy.

Potential Impacts on Community and Local Economy	Proposed Mitigative Measures
The proposed Project will provide economic development opportunities for the local communities, Kings county, and New Brunswick.	• The proposed project will support community economic development through hiring local consultants and contractors, the use of local services such as accommodations, restaurants and fuels, and will be required to pay municipal taxes; • The proposed project will support a stable long term revenue source to Tobique First Nation, a Wolastoqey Nation in New Brunswick; and • Community economic development is a positive impact: no mitigation is required.

Cumulative Effects – There are no other operating or proposed wind farms within a 10km radius from the project site. The wind farm will provide clean, renewable energy to regions within Kings County.

Significance of Residual Effects – The Proponent will, when appropriate, make every effort to utilize local services and products, which is in line with the Proponents ideology of community-based projects. The predicted effects of this Project on the local economy are positive and as a result of the provincial taxes and economic spinoff, the significance of residual effects on local economy is expected to be beneficial.

5.4 Effect of Environment on Project

5.4.1 Extreme Weather and Climate Change

Severe weather events could potentially damage the WTGs due to conditions exceeding the operational design of the WTGs. High winds, extreme temperatures and icing on blades all have the potential to shut down the WTGs. Extreme weather events that could occur in the Kings County, New Brunswick region are listed in Table 5-25.

Table 5-25: Extreme events and climate change, associated effects and mitigation.

Weather Event	Effect	Mitigation
Extreme wind	• Damage to blades	• Automated control system would initiate shut down.
Hail	• Damage to blades	• Appropriate WTG maintenance.
Heavy rain and flooding	• Flooding of road and project site	• The project has been sited on an elevated ridgeline and the roads will be designed to maintain water flow where needed to prevent flooding and wash-outs from current precipitation levels and to mitigate risks associated with predicted increases in precipitation from climate change. Appropriate storm water management will also be implemented.
Heavy snow	• Damage to WTG components	• Automated control system would initiate shut down.
Ice storms	• Icing on blades resulting in potential ice throw	• Automated control system would initiate shut down procedures and initiate the blade heating system.
Lightning	• Potential for fires within nacelle of WTGs	• Lightning protection system would conduct electrical surge away from nacelle.

The Proponent recognizes the vulnerability of this project in the face of climate change. However, careful design measures have been implemented based on the Project's location and the Project's technology to protect the Project from potential changes in extreme weather over the 30-year operational phase resulting from climate change.

Extreme weather events have been considered while selecting the proper technology and the proper turbine model for its specific location. Using the most advanced technology will help ensure the turbine can withstand these events and that appropriate mitigation measures will be activated during the events. Examples of such mitigation measures include but are not limited to shutting down the turbine by pitching the blades, and rotating the hub to help avoid damage to the machinery.

Additionally, for extreme events occurring in the winter months, technology is now available that detects the formation of ice on the blades and triggers an automatic heating process to melt the ice ensuring the turbine will not suffer damages caused by ice accumulation.

5.4.2 Turbine Icing

Ice accumulation on WTG blades can occur during the winter months when the appropriate conditions of temperature and humidity exist, or during certain extreme weather conditions, such as freezing rain (Seifert et al., 2003). In the event that ice builds up on the WTG blades, there are two types of risks possible: the first is ice throw from an operating WTG, and the second is ice fall from a WTG that is not in operation.

When a WTG is in operation, it is assumed that ice may collect on the leading edge of the rotor blade and detaches regularly due to aerodynamic and centrifugal forces (Seifert et al., 2003). The distance that the ice will be thrown from the moving WTG blade will vary depending on the wind speed, the rotor azimuth and speed, the position of the ice in relation to the tip of the blade, as well as characteristics of the ice fragment.

In a Canadian study titled *Recommendations for Risk Assessments of Ice Throw and Rotor Blade Failure in Ontario* (LeBlanc et al., 2007) ice throw was investigated to determine the individual risk probability for an individual to be struck by ice thrown from an operating WTG. The following parameters and assumptions were used:

- Rotor diameter of 80 m;
- Hub height of 80 m;
- Fixed rotor speed of 15 RPM;
- Ice fragment is equally likely to detach at any blade azimuth angle and 3 times more likely from the blade tip than the rotor;
- Ice fragments have a mass of 1 kg and frontal area 0.01 square ms;

- All wind directions are equally likely; and
- Ever-present individual between 50 m and 300 m (dounut shaped buffer around WTG), individual equally likely in any given 1 square m within that area.

The statistical analysis found that individual risk probability for an individual is 0.000000007 strikes per year or, 1 strike in 137,500,000 years. For an individual to be ever-present in the defined area, this assumes that the individual would be outside during the unpleasant weather necessary for icing conditions. This analysis does not take into account the presence of trees that could provide shelter from potential ice throw (Seifert et al., 2003). The Enercon E-141 has different specifications than used in this example; however, this should be used as a general example to understand the incredibly low probability of an individual being struck by ice throw.

As with trees, power lines, masts, and buildings, ice can accumulate on a stationary WTG, and will eventually be released and fall to the ground. Depending on the rotor position of the stationary rotor, different fall distances along the current prevailing wind will occur (Seifert et al., 2003). The blade system would be initiated prior to the initiation of a stationary WTG should ice be detected.

5.5 Summary of Impacts

Based on the completed VEC analysis, the project effects have been determined. A summary of the VEC assessment has been presented in a table with the following assessment criteria:

- Nature – positive (+), negative (-), or No impact where no impact is predicted;
- Magnitude – order of magnitude of the potential impact: small, moderate, large;
- Reversibility – reversible (REV) or irreversible (IRR);
- Timing – duration of impact, short for construction or decommissioning and long for Project operation or longer;
- Extent – spatial extent of the impact, local, municipal, provincial etc.; and
- Residual Effect – negligible, minor, significant, and beneficial or no impact as described in Section 3.5.

Table 5-26: Summary of Identified VECs.

	Nature	Magnitude	Reversibility	Timing	Extent	Residual Effect
Ground Water	-	small	REV	Short	Local	Minor
Geophysical	-	small	REV	Long	Local	Negligible
Atmospheric Conditions	+	moderate	REV	Long	Provincial	Beneficial
Wind Resource	+	small	REV	Long	Local	Beneficial

	Nature	Magnitude	Reversibility	Timing	Extent	Residual Effect
Noise	-	small	REV	Long	Local	Negligible
Shadow Flicker & Visual Aesthetics	-	small	REV	Long	Local	Minor
Avian	-	small	REV	Long	Local	Minor
Bats	-	small	REV	Long	Local	Negligible
Wetlands & Watercourses	-	small	REV	Short	Local	Minor
Fish & Fish Habitat	-	small	REV	Short	Local	Minor
Wildlife	-	small	REV	Short	Local	Negligible
Vegetation & Habitat	-	small	REV	Short	Local	Minor
Sensitive & Significant Habitat	No Impact	N/A	N/A	N/A	N/A	No Impact
Archaeological	-	small	IRR	Short	Local	Negligible
Electromagnetic Interference	-	small	REV	Short	Local	Negligible
Land Use & Property Value	-	small	REV	Long	Local	Negligible
Vehicular Traffic & Pollution	-	small	REV	Short	Local	Negligible
Public Health & Safety	-	small	IRR	Long	Local	Negligible
Community & Local Economy	+	moderate	REV	Long	Provincial	Beneficial

6.0 Stakeholder Consultation

The New Brunswick EIA process has required minimum public engagement standards outlined in Section 6 of the *Guide to Environmental Impact Assessment in New Brunswick* developed by the DELG that must be applied when consulting with stakeholders who may be affected by the proposed development.

As part of this process, members of the public will have an opportunity to review and submit comments on the project's registered EIA document. After receiving final comments from all stakeholders, a Public Consultation Summary Report will be submitted within 30 days of the EIA public notice. Stakeholder comments will be considered by the Minister of Environment and Local Government while making their final decision to offer a certificate of determination to the proponents of the project.

The appropriate stakeholder consultation and engagement process required to meet the relevant EIA approval conditions will occur simultaneous as other engagement efforts occur. The engagement activities described in the following section have provided and will continue to provide an opportunity to facilitate meaningful dialogue between various stakeholders and the Project Proponent; and to provide accurate information pertaining to the Project in an open and transparent fashion. A comprehensive stakeholder engagement list has been formed and will be kept up to date as further stakeholders express their interest in the Project throughout its lifetime.

6.1 Community

6.1.1 First Public Meeting

An open house was held on the 7th of May, 2018 to provide preliminary project information to the community. The meeting was advertised via Canada Post Admail, a service offered that facilitates the distribution of invitations/ flyers to a defined geographic location. Advertisements have been distributed and were received by residents the week prior to the meeting. A copy of this advertisement will be provided in the Public Consultation Summary Report. Advertisements were also displayed in local newspapers. As well, invitations were sent to special interest groups and businesses near the Project. Open house attendance was tracked by a sign in sheet.

Questionnaires were distributed to attendees at the open house to express any concerns regarding the WEP and to provide contact information for the stakeholder list. The open house format was held as an open discussion where posters with Project relevant information was displayed with Proponent representatives present to answer questions and discuss public concerns.

Following the open house, the proponent addressed any questions or concerns from the questionnaires through telephone, email, letters and personal meetings. Additionally, the Proponent will frequently review the concerns from the public and post them in the FAQ section of the Project website. All questions, concerns, and responses will be compiled and included in the Public Consultation Summary Report to be submitted during the EIA review period.

A second open house will be held following a similar process during the EIA review process in September, 2018. Representatives will be present on behalf of the Proponent and information presented will be adapted based on the concerns that the public has voiced to provide information that directly addresses these concerns. The comments addressed during the second open house and through the EIA review process will be included as part of the Public Engagement Report that will be submitted to DELG following the commenting period.

6.1.2 Website

Websites have proven to be an excellent way to make project information available for the general public to access and stay up to date on the progress of wind farm developments. The website has and will be updated periodically and used to inform the general public, right-holders, and stakeholders about all aspects of the proposed development. Website content and updates will include some or all of the following items:

- Purpose of the project;
- Project details and progress;
- Contact information for Natural Forces;
- Notices for public information sessions;
- Photos of the Project location and turbine types;
- Progress reports on the EIA;
- FAQ section that addressed concerns identified during consultation activities;
- Construction activity notifications;
- Online questionnaire and comment form; and
- Media and Press Release related material.

The WEP website can be accessed with the following link: https://www.naturalforces.ca/wocawson-energy-project.html

6.1.3 Newsletters

Previous wind farms developed by the Proponent included newsletters as a key engagement tool to update and inform the local community on recent Project activities. The Proponent may circulate newsletters via email, website, and Canada Post to the community throughout the 2018, 2019 and 2020 calendar years.

6.1.4 Newspaper Advertisements

Advertisement will be placed in local newsletters to offer additional information to residents regarding the Project and upcoming events. The advertisement will also detail benefits of the Project as well as contact information for the Proponent.

6.1.5 Community Liaison Committee

A Community Liaison Committee (CLC) acts as an advisory body to a project proponent by providing input on existing or potential concerns the community may have with respect to the Project. In the event that ample interest arises in the project, the formation of a CLC will be considered to facilitate communication between the community and a project proponent.

A CLC typically consists of a few members of the community who have been nominated by the community to act as representatives on the CLC. Other members of the CLC may include First Nations, economic development organizations, municipal councillors and members of other community groups.

6.1.6 Issues Resolution

The Proponent has drafted a Complaint Resolution Plan as part of this EIA document. This plan will cover what community members should do and whom to contact should there be negative impacts affecting the community members or the environment caused by the WEP development. The Complaint Resolution Plan is located in Appendix L.

6.2 Aboriginal Peoples

The following section will highlight the efforts that have been made to date to engage and consult with First Nations communities and organizations whom may be impacted by the Project. As well, the section will discuss the steps anticipated to further engagement efforts with the Nations. The details of specific correspondence and discussions will be included in a First Nation Consultation Report that will be submitted to DELG.

To begin the consultation process with the Aboriginal People of New Brunswick, the Proponent initiated contact with Aboriginal Affairs Secretariat (AAS) in January 2018.

Natural Forces on behalf of the Proponent sent an introductory letter to all Mi'gmaq, Wolastoquey, and Passamaquoddy Chiefs in February 2018. As well, a letter was sent to the Kopit Lodge, the Wolastoqey Nation of New Brunswick and Mi'gmawe'l Tplu'taqnn Inc. (MTI). The letters included details on the Project and the Proponent and included contact information for Natural Forces who would be conducting First Nation Engagement on behalf of the Proponent.

Following the introductory letter from Natural Forces, Chief Sock of Elsipogtog First Nation initiated communications with Natural Forces to voice his support of the Project and Tobique First Nation's endeavour to acquire more environmentally friendly energy and helping counter global warming concerns.

Also following the introductory letter from Natural Forces, MTI reached out to Natural Forces for a meeting to learn more about the Project on behalf of Buctouche First Nation and Fort Folly First Nation. A meeting was held in April 2018 with representatives from MTI and Fort Folly First Nations were present.

As a result of this meeting, a site tour at one of Natural Forces existing wind farms was organized for all New Brunswick Mi'gmaq Chiefs and representatives of MTI. The tour was well attended and further discussions regarding the Project occurred at this site tour.

In May 2018, AAS conducted an Initial Assessment for the Project. As part of the Initial Assessment AAS sent letters to the Chiefs of the Mi'gmaq First Nation in New Brunswick and to the Chiefs of the Wolastoqey Nation in New Brunswick.

Throughout the summer months of 2018, the Proponent continued communications with MTI. As well, the Proponent discussed the Project with several Chiefs following an unrelated presentation made during a Mi'gmaq Chief meeting in July 2018.

In August 2018, the Proponent met with the Wolastoqey Nation of New Brunswick. This meeting was to introduce the Project and understand their process in reviewing EIAs and consultation with their First Nation members.

Correspondance with First Nations and AAS to date has been documented and summarized in the First Nation Consultation Report and will be submitted to DELG. Engagement efforts are ongoing and will continue through the development, construction and operation of the Project. As such, the First Nation Consultation Report will be updated periodically.

6.3 Public and Aboriginal Concern

Comments and concerns that have been received from open house questionnaires, individual discussions, aboriginal consultation, local residents and other stakeholders relating to the Project and project activities have been compiled. The majority of these concerns have been addressed in this EIA, while others have been addressed directly at the open house, through telephone conversations, emails, letters and one on one meetings. Following the open house in September, one-on-one discussions and other community engagement events, all concerns raised will be identified and presented in the Public Consultation Summary Report and the First Nation Summary Report. The Proponent is committed to addressing, to the best of their abilities, all concerns pertaining to this proposed development and wind energy projects in general raised by local residents, community members and First Nation people.

Consultation will continue throughout the life of the Project. During the registration and public review period of the EIA document, the Proponent will be available within the community to answer questions and explain the content to community members.

6.4 Regulatory

The Proponent has been in consultation with Municipal, Provincial, and Federal Government bodies regarding the proposed WEP, and will continue to do so throughout the development of the project.

6.4.1 Municipal Consultation

The Proponent has had formal and informal meetings to discuss the proposed Project. Presentations were made to the Sussex Economic Development Committee, while meetings were held with the Sussex MLA and Sussex Corner Mayor, and letters were sent to the Regional Service District 8 regarding the Proponent's background, the project activities, benefits of the project, and partnerships involved.

The correspondence between the Proponent and municipalities has and will be recorded and included in the Public Consultation Summary Report.

6.4.2 Provincial Consultation

The Proponent has met and discussed with various provincial organizations about the development of the WEP. The scoping of this EIA document was designed in consultation with the DLEG, DERD, CWS, and the Aboriginal Affairs Secretariat. Consultation topics included:

- Submission process and timelines;
- Pre-registration consultation;
- Consultation efforts; and
- Scoping and guidance of wildlife surveys and studies to conduct as part of the WEP EIA;

The proponent will maintain dialogue with provincial authorities when necessary throughout the duration of the Project.

6.4.3 Federal Consultation

The Proponent has consulted with various Federal Government entities regarding the construction of the WEP. ECCC, CWS, Navigation Canada, Transport Canada, and the DND were contacted. Similar to their provincial counterparts, federal regulators have provided guidance in the preparation of this document, Project planning, and design.

The Proponent will continue to engage Federal regulators, when required, throughout the development, construction, and operation of the WEP as appropriate.

7.0 Follow Up Monitoring and Mitigation

The purpose of this section is to describe the follow-up ecological field surveys, management plans, and consultation, which the Proponent is committed to undertake should it be required during the construction, operation or decommissioning phases of the Project.

7.1 Post-Construction Monitoring

A post-construction monitoring plan will be developed and implemented by a third-party consultant in consultation with DERD, DELG and CWS and will follow the *Post-Construction Bat and Bird Mortality Survey Guidelines for Wind Farm Development in New Brunswick* (DERD, 2011). The bird and bat monitoring plan will be designed to obtain information on the impacts to species and habitat use for birds and bats for a minimum of two years from the time the turbines become operational. This plan will typically involve point count surveys at various locations around the site as well as mortality studies. An annual report will be provided to authorities outlining the study methodologies and results of these post construction studies. These reports will also be posted on the project website for public review.

Mitigation

7.1.1 Bats

Active turbine mitigation at wind farms can lead to a significant decrease in bat fatalities. The mitigation involves increasing the turbine rotor 'cut-in' speed, essentially preventing the rotor from spinning at low wind speeds when bats are most active.

A mitigation scenario for this site may involve increasing the rotor cut-in speed from 2 m/s to 5 m/s, from half hour before sunset to half hour after sunrise, during months of high bat migration activity. Migration activity onsite will be confirmed once the pre-construction surveys are completed. An addendum to this EIA will be submitted with the final results of the bat studies.

The Proponent may commit to active mitigation should the post construction carcass searches reveal higher than normal mortality levels of migratory tree bats on site. Currently, it is industry standard to conduct post construction carcass searches for at least two years at wind farms operating in the Maritimes to determine the mortality levels at the wind farm site.

As there is already a mechanism in place to conduct post construction carcass monitoring, the Proponent will use this mechanism to review and assess the results of the post construction surveys. Should it be determined, in consultation with DERD and other bat researchers that in fact the wind farm is producing higher than normal bat fatalities, the Proponent, in collaboration with DERD and DELG will discuss and implement an active mitigation program, the ultimate aim of which is to reduce bat fatalities on site.

7.1.2 Birds

To support the post-construction monitoring and ensure impacts are addressed appropriately, an Adaptive Management Plan has also be developed and will be implemented in consultation with DELG and applicable TRC members to mitigate any impact to birds from the WEP. The purpose of this Adaptive Management Plan is address the risk of impacts to migrant avian species due to the turbine's proposed height.

The Adaptive Management Plan will:

- support science-based management of the Project to ensure wildlife and habitat impacts resulting from the Project are avoided, minimized, or offset;
- improve the understanding of interaction between wind turbines with heights over 150m and migrant avian species using evidence-based monitoring results in the field; and
- ensure that mitigation measures are implemented as required and that these measures are evaluated and continually improved.

Mitigation proposed as part of the Adaptive Management Plan may include the following:

- Cause and effect analysis;
- Extended monitoring program;
- Increased reporting frequency;
- Blade feathering;
- Compensation for fatalities; and,
- Extended monitoring program to determine mitigation effectiveness.

In addition to post-construction carcass monitoring and implementing an Adaptive Management Plan, the Proponent intends to participate in a regional radar and acoustic study to identify patterns of bird movements across the Province of New Brunswick. This study proposes to examine the patterns of movements of birds migrating through New Brunswick in a comprehensive regional study led by Phil Taylor with Acadia University and Bird Studies Canada. The goal is to describe:

- How the altitudinal density of migrant birds varies with topography, coastlines, time of year and weather;
- How migrants behave in different weather conditions (i.e. storms and fog); and
- How migrants use specific topographical features in New Brunswick such as the St. John River Valley and the Fundy coast.

This study will also help better inform the wind industry about avian populations and migration patterns when siting wind farms in the future.

7.1.3 Shadow Flicker Mitigation

As required in the *Additional Information Requirements for Wind Turbines* report for New Brunswick, a description of the mitigation measures to be used to mitigate effects on sensitive receptors has been presented. Though no shadow flicker impacts are expected that exceed provincial regulations, mitigation can be implemented should observed impact be higher than predicted. These measures include, turbine relocation and screening of receptors using vegetation and awnings.

Screening

Vegetation is a feasible, effective mitigation measure for reducing predicted shadow flicker impact. It can be further proposed that if businesses and landowners observe an annoyingly high amount of shadow flicker impact, the Proponent may propose vegetation efforts that will provide shade to buildings and windows effectively reducing shadow flicker annoyance. Similar results can also be obtained by installing awnings and window coverings.

8.0 Approval of the Undertaking

8.1 Federal

Federal environmental permits are not required for the proposed Project, however, approval from Navigation Canada, Transportation Canada, and the DND will be required for aviation and military safety. The Project is not expected to require permitting through harmful alteration, disruption or destruction of fish habitat or have an impact to navigable waters.

Consultation with Federal authorities has been ongoing with Navigation Canada, Transport Canada, the Department of National Defence, and the CWS.

8.2 Provincial

The EIA process, as required under the provincial *Clean Environment Act* is a Proponent-driven, self-assessment process. The Proponent is responsible for determining if the EIA process applies to the Project, what category the Project belongs to and when the EIA process should be initiated.

Under Section 31.1 of the *Clean Environment Act*, the *Environmental Impact Assessment Regulations* classify new Projects or 'Undertakings' under one of three categories, Category 1, 2, or 3 undertakings. According to Schedule A of these regulations, all electric power generating facilities with a production rating of three megawatts or more falls within paragraph (b) and is classified as a Category 1 undertaking. The rated capacity for the WEP is 20 - 40 MW and is therefore a Category 1 undertaking.

Numerous guidance documents were referred to in the preparation of this EIA. All guidance documents used throughout this report are provided in Section 11.

8.3 Permitting

A number of provincial permits are required to progress the various stages of development and construction of a wind farm. A list of the required provincial permits is shown in Table 8-1, although additional permits may be required following continued stakeholder consultation. Any applications or approvals provided or received from provincial or federal departments will be attached in Appendix M.

Table 8-1: Federal and provincial permitting requirements.

Permit Required	Permitting Authority	Status
Archaeology Field Research Permit	Provincial Tourism Heritage and Culture	Obtained
Special Move Permit	Provincial Transportation and Infrastructure	To be obtained

Permit Required	Permitting Authority	Status
Highway Usage Permit	Provincial Transportation and Infrastructure	To be obtained
Access Road Permit	Provincial Transportation and Infrastructure	To be obtained
Transportation Plan	Provincial Transportation and Infrastructure	To be completed by appropriate contractor
Environmental Impact Assessment	Provincial Department of Environment and Local Government	In Progress
Work Within a Highway Right of Way	Provincial Transportation and Infrastructure	To be obtained
Watercourse and Wetland Alteration	Provincial Environment and Local Government	To be Obtained
Aeronautical Obstruction Clearance Permit	Transport Canada	In Progress
Land Use permit	Navigation Canada	In Progress
Trail Pass	Energy and Resource Development	To be obtained
License of Occupation to Explore	Energy and Resource Development	Complete
Option Agreement	Energy and Resource Development	Complete
Crown Land Wind Farm Lease	Energy and Resource Development	To be obtained
License of Occupation for Construction and Operation	Energy and Resource Development	To be obtained

Permit Required	Permitting Authority	Status
Work permit	Energy and Resource Development	To be obtained
Cutting Permit	Energy and Resource Development	To be obtained

Table 8-2 lists the municipal permits and authorizations required. Additional permits may be required following further consultation with municipal stakeholders.

Table 8-2: Municipal permitting requirements.

Permit Required	Permitting Authority	Status
Building Permit	Municipal County or Environment and Local Government	To be obtained

9.0 Signature

Table 9-1 below defines the concluding signature of this EIA for Natural Forces NB Inc.

Table 9-1: Signature Declaration

EIA TO BE CONDUCTED BY:	Natural Forces NB Inc.
PROPONENT:	Wocawson Energy Limited Partnership
PROPONENT SIGNATURE:	 Robert Apold, Director
DATE:	September 07, 2017

10.0 Closure

Many adaptation and mitigation options can help address climate change though no single option is sufficient by itself. Substantial emissions reductions over the next few decades and a near zero emissions of carbon dioxide and other long-lived green house gasses by the end of the 21st century is required to limit warming to below 2°C relative to pre-industrial levels. (IPCC, 2014). The WEP and other similar projects represents an integral part of a global effort to reach these reduction targets.

A thorough analysis of the Project components and activities has been carried out for the construction, operation and decommissioning phases of the Project. Baseline existing environmental characteristics of the region, with the exception of bat surveys,fall birds surveys that are still ongoing, archaeological shovel tests, and monitoring the transmission line access routes have been documented and the VEC's have been assessed. Consultation has been undertaken with a wide variety of stakeholders to gauge the full range of impacts and concerns with regards to the Project. The impact of the Project on the local environment has been evaluated based on these criteria. Mitigative measures have been presented and adopted in an effort to reduce the significance of residual impact as a result of the Project's activities. Cumulative effects of the Project on the environment due to other regional Projects and activities have also been identified and assessed. From the data presented thus far in the EIA process, there are no significant residual environmental effects predicted for the construction, operation, and decommissioning phases of the proposed WEP.

The following benefits would result due to the WEP and are considered as advantages of the Project:

- Production of emission-free energy, which will displace energy produced from fossil fuels in New Brunswick;
- Help New Brunswick meet its renewable energy regulations and targets for 2020;
- Help decrease anthropogenic induced climate change, which has been proven beyond a doubt to be putting our entire human civilization at risk;
- Increased revenue for the province and Local Service District through payment of annual property taxes by the Project Proponent;
- Increased revenue for local businesses due to activities surrounding the construction, operation and decommissioning phases of the Project;
- Creation of supplementary income and income diversity for local landowners;
- Creation of long term revenue source for Tobique First Nation, a Wolastoqey Nation in New Brunswick; and
- Creation of additional employment in the region during the entire Project life.

The WEP provides an excellent opportunity to transform clear cut and fragmented habitat into a productive source of renewable energy providing source diversity while meeting increasing energy demands. The Proponent wishes to develop the proposed WEP with the intent of helping New Brunswick meet its renewable energy regulations and targets while providing local economic benefits. The

Proponent is pleased to provide this EIA to the Sustainable Development, Planning and Impact Evaluation Branch of the DELG and looks forward to working with provincial regulators to progress the WEP to a construction ready stage.

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