Alternative
RESOURCE ENERGY AUTHORITY

ELLERSHOUSE WIND FARM

Environmental Assessment Registration

December 2013

Prepared By:

Strum Consulting
Railside, 1355 Bedford Hwy.
Bedford, NS B4A 1C5
t. 902.835.5560
f. 902.835.5574
www.strum.com

ELLERSHOUSE WIND FARM - Environmental Assessment Registration Document

Prepared For:

Alternative Resource Energy Authority
c/o Town of Mahone Bay
493 Main Street
Mahone Bay, NS B0J 2E0
t. 902.538.8068
f. 902.538.3724
www.areans.ca

December 2013

EXECUTIVE SUMMARY

Minas Energy, on behalf of the Alternative Resource Energy Authority, has proposed to develop a 16.1 MW wind project in the community of Ellershouse, Nova Scotia. The owner of the Project, the Alternative Resource Energy Authority, is a partnership between the municipal authorities of the towns of Berwick and Mahone Bay. The proposed Project site is approximately 11 km southeast of Windsor, Nova Scotia in the Municipality of the District of West Hants (44°55'16.28"N, 64° 1'7.25"W).

The Project is considered a Class 1 undertaking under the Nova Scotia Environmental Assessment Regulations and as such, requires a registered Environmental Assessment as identified under Schedule A of the Regulations. The Environmental Assessment and the registration document have been completed according to the methodologies and requirements outlined in the document "A Proponent's Guide to Wind Power Projects: Guide for Preparing an Environmental Assessment Registration Document", as well as accepted best practices for conducting environmental assessments. As the Project consists of seven turbines, it is considered a small project. Based on the known occurrence of a bird species ranked 'red' by the Nova Scotia Department of Natural Resources, and the presence of a bat hibernacula less than 25 km from the Project site, the Project is classified as having a 'Very High' potential sensitivity. As such, the Project is determined to be a Category 4.

A number of environmental components were evaluated for this assessment. Based on field data and associated research, mitigation strategies and best management practices were identified to avoid or mitigate potential effects of the Project for the majority of the components. Following the preliminary assessment, the components identified for further assessment were: avifauna, bats, and species of conservation interest. The effects assessment for these components determined that residual effects are expected to be not significant. Cumulative effects were also considered to be not significant.

TABLE OF CONTENTS

page

LIST OF TABLES

LIST OF APPENDICES

LIST OF ACRONYMS

ACCDC	Atlantic Canada Conservation Data Centre
ARD	Acid Rock Drainage
AREA	Alternative Resource Energy Authority
ARIA	Archaeological Resource Impact Assessment
ATC	Air Traffic Control
ATV	All-terrain Vehicle
AQHI	Air Quality Health Index
BEC	Berwick Utility Commission
BMPs	Best Management Practices
CanWEA	Canadian Wind Energy Association
CEAA	*Canadian Environmental Assessment Act*
CLC	Community Liaison Committee
COMFIT	Community Feed-In-Tariff
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWS	Canadian Wildlife Service
dBA	Decibel
DFO	Fisheries and Oceans Canada
DND	Department of National Defense
EA	Environmental Assessment
EC	Environment Canada
EMI	Electromagnetic Interference
EMF	Electromagnetic Field
EPP	Environmental Protection Plan
ESCP	Erosion and Sediment Control Plan
FIT	Feed-In-Tariff
GHG	Greenhouse Gas
GIS	Geographical Information System
IBAs	Important Bird Areas
IBoF	Inner Bay of Fundy
KMKNO	Kwilmu'kw Maw-klusuaqn Negotiation Office
LWT	Large Scale Wind Turbine
MBBA	Maritime Breeding Bird Atlas
MBCA	*Migratory Birds Convention Act*
MW	Megawatt
NRC	National Research Council
NRCan	Natural Resources Canada
NSDE	Nova Scotia Department of Energy
NSE	Nova Scotia Environment
NSEA	*Nova Scotia Environment Act*
NS *ESA*	*Nova Scotia Endangered Species Act*
NSPI	Nova Scotia Power Inc.
NSTIR	Nova Scotia Department of Transportation and Infrastructure Renewal
PID	Property Identification Number
PTP	Point-to-Point
RABC	Radio Advisory Board of Canada
RCMP	Royal Canadian Mounted Police
RRS	Radiocommunication, Radar and Seismoacoustic
SARA	*Species at Risk Act*
SOCI	Species of Conservation Interest

UTM	Universal Transverse Mercator
VEC	Valued Ecosystem Component
WAM	Wet Areas Mapping
WHMIS	Workplace Hazardous Materials Information System

1.0 PROJECT INFORMATION

1.1 Project Introduction

Minas Energy (Minas), on behalf of the Alternative Resource Energy Authority (AREA), has proposed to develop a 16.1 MW wind project near the community of Ellershouse, Nova Scotia. The owner of the Project, AREA, is a partnership between the municipal authorities of the Towns of Berwick and Mahone Bay. The Ellershouse Wind Farm (the Project) has been proposed in support of Nova Scotia's "Renewable Electricity Plan: A Path to Good Jobs, Stable Prices and a Cleaner Environment" (Renewable Electricity Plan) (NSDE 2010), which is a strategic plan designed to decrease the province's dependence on carbon-based energy sources (*i.e*., fossil fuels) and move towards greener, more affordable and more reliable sources of electricity. Nova Scotia recognizes the numerous benefits of supporting the development of renewable energy within the province, as currently 82% of the province's energy comes from non-renewable sources, mostly sourced from outside of the province (NSPI 2013). Dependence on fossil fuels increases the vulnerability of Nova Scotians to rising international energy prices, weakens energy security, and takes valuable revenue out of the province (NSDE 2010). Negative impacts to human health, particularly in developing countries, and the environment, mainly in the form of climate change, are among the widely cited problems associated with fossil fuel consumption around the world.

In its most recent assessment report, "Climate Change 2007 - Impacts, Adaptation and Vulnerability", the United Nations Intergovernmental Panel on Climate Change provides a detailed synopsis of the impacts associated with climate change on both global and regional scales. Evidence from all continents indicates that many biological systems and habitats are currently being affected by regional climate change. Ecological changes include: changes to the thermal dynamics and quality of aquatic habitats; shifts in migratory timing and ranges of fauna and flora; changes in fish abundance; and increased risk of extinction and loss of forest habitat (IPCC 2007).

Canadian climate experts acknowledge that the debate has largely evolved from questions about the reality and causes of climate change, to what actions can be taken to adapt to the realities of a changing climate. As the second most important and fastest growing (along with solar) renewable energy source in Canada (NRCan 2009), wind energy is a critical component of Canada's renewable energy strategy. Wind energy is emission-free, with every megawatt of wind energy generated reducing greenhouse gas emissions by as much as 2,500 tons per year, and improving air quality (NSDE 2009). Numerous benefits can be expected from the transition to renewable energy, and may include:

- Long term stability in energy prices;
- Long term security in locally-sourced energy supply, and decreased dependence on international markets;
- Creation of jobs and economic opportunities throughout the province;
- Community investment and economic return;
- Protection of human health and the environment;
- Retaining revenue within the province; and
- Educational opportunities for youth and the broader community about renewable energy technology, its benefits, and the role played in Nova Scotia's energy future.

As part of this overall strategy, the Project will contribute to meeting Nova Scotia's renewable energy goals by producing enough green energy to provide 4,500 NS homes with stable, locally-produced renewable energy. The Project is committed to sharing economic opportunities with the local community, throughout the development and life-span of the Project via the use of local skills and labour where possible, municipal tax revenue, and on-going energy literacy/education. The Project team has created a Community Liaison Committee (CLC), which will help to identify Project-related opportunities and benefits for the local community. No public funding is required for this Project.

1.2 Project Summary

This section of the Environmental Assessment (EA) report provides a summary of the Project, description of the proponent, and regulatory requirements. The structure of the overall document and the investigators and authors involved are also provided.

Table 1.1: Project Summary

General Project Information	Minas Energy, on behalf of AREA, intends to construct and operate a 16 MW wind project at a site in the community of Ellershouse, Nova Scotia.
Project Name	Ellershouse Wind Farm
Proponent Name	Minas Energy, acting on behalf of AREA
Proponent Contact Information	Minas Energy Chris Peters 3 Bedford Hills Rd., Bedford, NS B4A 1J5 Phone: (902) 799-0365 Fax: (902) 835-8062 Email: chris.peters@minasenergy.com Jim Wentzell AREA 493 Main Street Mahone Bay, NS B0J 2E0 Phone: 902-624-8327 Fax: 902-624-8069 Email: jimw@townofmahonebay.ca
Project Location	• The Project site is located in the community of Ellershouse, approximately 11 km southeast of Windsor, Nova Scotia in the Municipality of the District of West Hants (Drawing 1.1). • The approximate center of the Project site is located at 44°55'16.28"N, 64° 1'7.25"W. • Project lands include Property Identification Number (PID) 45007903.
Landowner(s)	Atlantic Star Forestry
Closest distance from a turbine to a permanent/seasonal structure	894 m – seasonal shed (Turbine 5) 1,018 m – permanent residence (Turbine 2)
Expected rated capacity of proposed project in MW	16.1 MW

1.3 Proponent Description

AREA is a partnership between the municipal utilities of the Towns of Berwick and Mahone Bay. The purpose of AREA is to provide the following municipal services:

- production of electrical energy;
- the purchase from, sale to, and management of electrical energy and services involving municipal electric commissions in Nova Scotia, Nova Scotia municipalities which operate electric utilities, and other customers eligible under the Open Access Transmission Tariff or other enabling legislation; and
- the ownership of physical facilities to provide these services.

The towns each operate electric utilities and distribute power to customers within their service areas.

The Berwick Electric Commission (BEC) operates the distribution system serving the Town of Berwick and some adjacent areas of Kings County. This includes line construction and maintenance, meter installations and meter reading, hydro control and maintenance, and standby duty and trouble calls. Operationally, the BEC employs three powerline technicians who conduct meter work and hydro operations as well. The Mahone Bay Electric Utility supplies electricity to approximately 725 customers located within the Town of Mahone Bay, as well, 26 customers residing near the Town limit in the Maders Cove area. The Town purchases electricity from Nova Scotia Power Inc. (NSPI), and distributes it to customers from the electrical substation located on Pond Street. The Town's Electrical Department is staffed by two powerline technicians.

AREA will own the Project and has commissioned Minas to develop the Project on its behalf. The development team at Minas has significant experience working on energy projects with local communities throughout the Maritimes. A member of Scotia Investments Ltd., Minas traces its roots to R. A. Jodrey, one of Nova Scotia's most successful entrepreneurs, whose first company was incorporated in 1927. Minas' involvement in energy development began in 1935 when Mr. Jodrey endeavored to develop hydroelectric power to gain control of his companies' energy destiny. Today, Minas continues to operate the resulting 2 MW and 3 MW facilities on the St. Croix River system, and has a portfolio of power projects under development including wind and tidal energy. Minas is also a berth holder at the Fundy Ocean Research Center for Energy and is an active trader of carbon credits. On May 12, 2011, Mr. Jodrey was named the first Energy Pioneer by the Maritimes Energy Association.

1.4 Regulatory Framework

1.4.1 Federal

A federal EA is not required for the Project as it is not located on federal land or listed as a physical activity that constitutes a "designated project" as listed under the Regulations Designating Physical Activities of the *Canadian Environmental Assessment Act (CEAA) (*2012*).*

Additional federal requirements are provided in Section 11.2 and 17.0.

1.4.2 Provincial

The Project is subject to a Class I EA as defined by the Environmental Assessment Regulations under the Nova Scotia *Environment Act (*NS*EA)*. As such, the proponents are required to register the Project with Nova Scotia Environment (NSE) and subsequently comply with the Class I

registration process as defined by the document "A Proponent's Guide to Environmental Assessment" (NSE 2009a).

The use of provincial roads during the construction, operation, and decommissioning phases of the Project will be in compliance with the "Nova Scotia Temporary Workplace Traffic Control Manual" (NSTIR 2009).

Additional provincial permits will be required as outlined in Section 16.

1.4.3 Municipal

A Municipal Planning Strategy (the Strategy) and Land use By-law exists in the Municipality of the District of West Hants, which require approval for wind power projects. Approval for 'Large Wind Turbines' (>100 kW production capacity) is only considered by development agreement (Municipality of the District of West Hants 2008a and b). A summary of the applicable sections of the Strategy and By-Law is provided in Appendix A.

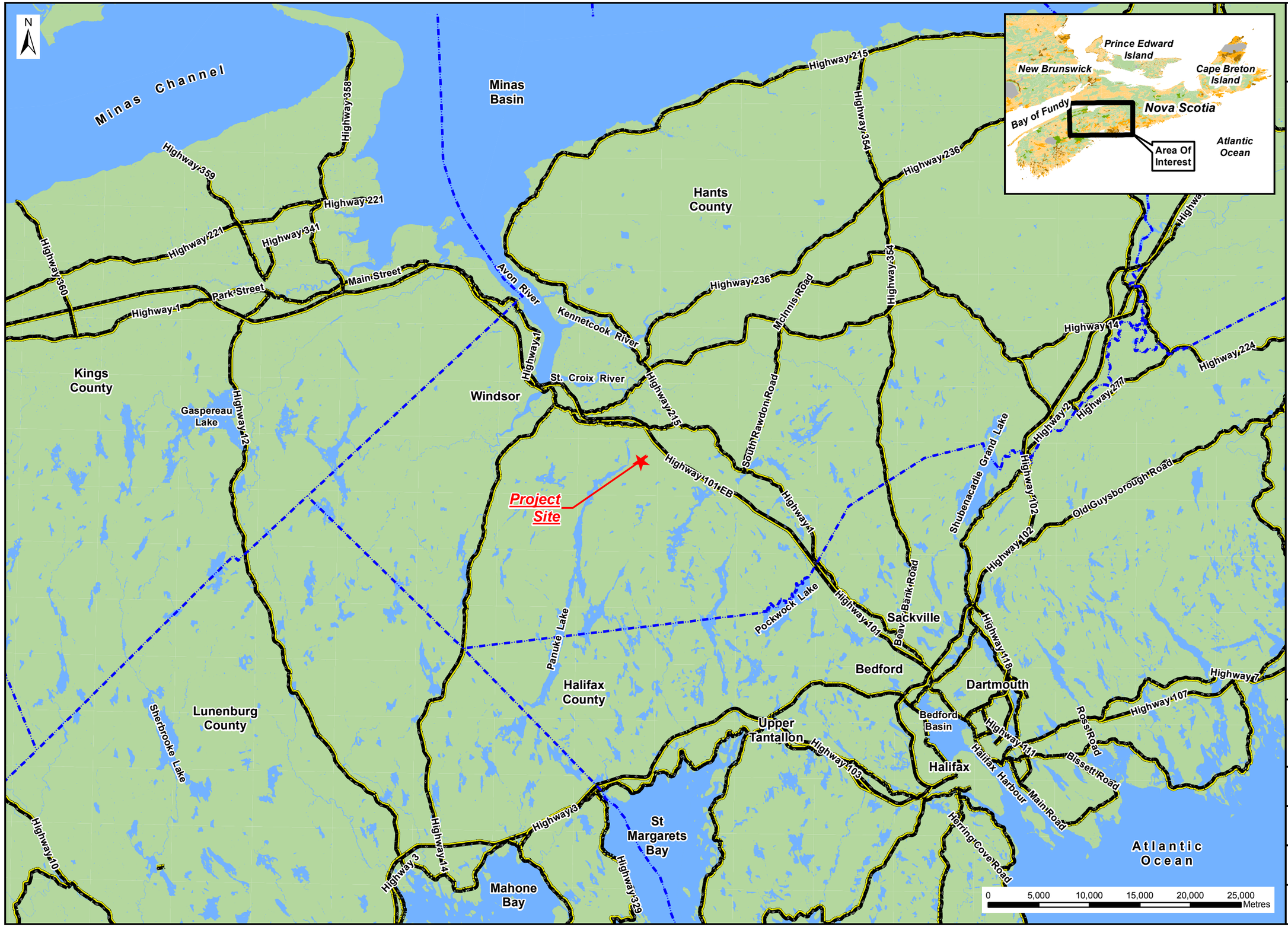
All required municipal permits (Section 16) and approvals will be obtained prior to construction.

1.5 Structure of Document

Table 1.2 outlines the content of each section of the EA report.

Table 1.2: EA Report Structure

Section	Content
Section 1	Project Information
Section 2	Project Description including an overview of Project location, activities and schedule
Section 3	Project Schedule
Section 4	General Environmental Mitigation/Best Practices
Section 5	Environmental Management
Section 6	Project Scope
Section 7	EA Methodology
Section 8	Biophysical Environment
Section 9	Socio-Economic Environment
Section 10	Cultural and Heritage Resources.
Section 11	Other Considerations
Section 12	Consultation and Engagement
Section 13	Effects Assessment
Section 14	Effects of the Environment on the Project
Section 15	Cumulative Effects Assessment
Section 16	Other Approvals
Section 17	Conclusions
Section 18	References



Notes:

1. Reference: Digital Topographic Mapping By Nova Scotia Geomatics Centre.
2. Projection: NAD83(CSRS), UTM Zone 20 North.

Legend:

- County Boundary
- Major Roads and Highways
- Water Bodies

Site Location

Strum CONSULTING

Date: Nov. 2013	Project #: 12-4583
Scale: 1:350,000	Drawing #: 1.1
Drawn By: H. Serhan	
Checked By: M. Smith	

1.6 Author of the Environmental Assessment

This EA was completed by Strum Consulting, an independent, multi-disciplinary team of consultants with extensive experience in undertaking EAs across Atlantic Canada and internationally. This report was prepared and reviewed by:

Ms. Melanie Smith, MES
Environmental Specialist, Strum Consulting
1355 Bedford Highway,
Bedford, NS B4A 1C5
Phone: 902.835.5560
Email: msmith@strum.com

Ms. Carys Burgess, MMM
Senior Environmental Specialist, Strum Consulting
1355 Bedford Highway,
Bedford, NS B4A 1C5
Phone: 902.835.5560
Email: cburgess@strum.com

2.0 PROJECT DESCRIPTION

2.1 Turbine Specifications

The Project will be powered by seven wind turbines, rated at 2.3 MW, for a nominal capacity of 16.1 MW in total. Under normal conditions the turbines will operate 24 hours per day, 7 days per week. The Enercon E92 has been selected as the turbine model for the Project. Specifications are provided in Table 2.1.

Drawing 2.1 provides the turbine and access road layout.

Table 2.1: Turbine Technical Specifications Enercon E92

Turbine Component	Enercon E92 Specifications
Rated capacity	2.3 MW
Rotor diameter	92 m
Hub height	98 m
Cut – out wind speed	28.0 – 34 m/s (with ENERCON storm control)
Number of blades	3
Swept area	6,648 m^2
Rotor speed (variable)	5 – 16 rpm
Pitch control	ENERCON single blade pitch system, one independent pitch system per rotor blade with allocated emergency supply
Generator	ENERCON direct-drive annular generator
Brake system	3 independent pitch control systems with emergency power supply, rotor brake, rotor lock
Yaw control	Active via adjustment gears, load-dependent damping
Remote monitoring	ENERCON SCADA

N

Ellershouse Rd

Hillcrest Lane

Maple Ave

Highway 101 WB

Highway 101 EB

Williams Rd

Salmon Hole Dam Rd

Panuke Lake

Taylor Lake

Turbine 1

Turbine 2

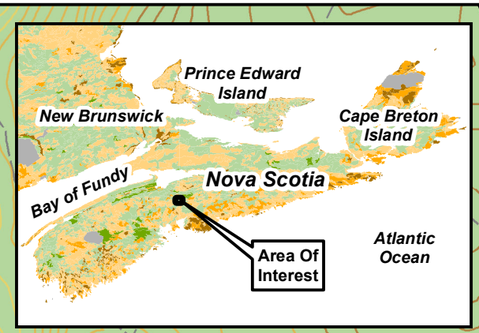
Turbine 3

Turbine 4

Turbine 5

Turbine 6

Turbine 7



0 100 200 400 600 800 1,000 Metres

Notes:

1. Reference: Digital Topographic Mapping by Nova Scotia Geomatics Centre.
2. Projection: NAD83(CSRS), UTM Zone 20 North.

Legend:

- Project Study Area
- Proposed Turbine
- Proposed Access Road

5 m Contours

- 0 - 35
- 35 - 70
- 70 - 120
- 120 - 225
- 225 +
- Building
- Active Railroad
- Major Roads and Highways
- Public Roads
- Access Roads / Trails
- Existing Transmission Lines
- Large Structure
- Mapped Stream
- Mapped Indefinite Stream
- Water Bodies
- Mapped Wet Area

Proposed Turbine and Road Layout

Strum CONSULTING

Date: Nov. 2013	Project #: 12-4583
Scale: 1:15,000	Drawing #: **2.1**
Drawn By: H. Serhan	
Checked By: M. Smith	

2.2 Project Phases

The proposed Project will include three phases: site preparation and construction; operations and maintenance; and decommissioning. Activities and requirements associated with each phase are discussed in the following sections. Standard environmental mitigations that have been incorporated into the Project design are presented in Section 4.0.

2.2.1 Site Preparation and Construction

Services required prior to and during construction include, but are not limited to:

- Staging and storage facilities;
- Temporary offices;
- Laydown areas for construction and maintenance equipment;
- Temporary sanitary facilities;
- Water and rinsing facilities;
- Utilities and communications; and
- Garbage collection and off-site disposal.

Site preparation activities include:

- Land surveys for placement of roads, turbines, and associated works;
- Geotechnical investigations;
- Placement of erosion and sedimentation control measures; and
- Clearing of trees and grubbing areas for construction.

General construction activities include:

- Access road upgrading and construction;
- Laydown area and turbine pad construction;
- Transportation of turbine components;
- Turbine assembly;
- Construction of collection system and substation;
- Grid connection;
- Removal of temporary works and site restoration; and
- Commissioning.

Weather constraints may affect the proposed schedule and weather dependent activities (*e.g.,* turbine delivery construction) which have been scheduled to occur during optimal time frames to minimize delay. For example, the delivery of the turbine pieces will occur outside of the spring weight restrictions, which are pursuant to Subsection 20(1) of Chapter 371 of the Revised Status of Nova Scotia, *The Public Highways Act (*1989*).*

Equipment needs will likely include:

- Light trucks;
- Drilling rigs;
- Backhoes; and
- Bunch feller (and similar harvesting equipment).

Access Road Construction
Approximately 5.8 km of an existing road will be used to access the Project site. The detailed design phase of the Project will determine which portions of the existing road will require upgrades or modification. Approximately 1.6 km of new road construction is required to provide direct access to the turbines. The new access road is expected to be constructed to a standard carriageway width of 6 m; plus ditches sloped at a ratio of 2:1. There will be areas where the road width could increase to 11 m to accommodate cut and fill areas and/or wide turns. Conversely, areas of flat straightaways can allow for a road surface as narrow as 4.5 m.

During the construction phase, the Project roads will be maintained with additional stone or periodic grading. Any material removed for road construction will be stored or disposed of in accordance with regulations and best practices for road construction. Any material stored on-site will be accompanied with appropriate erosion and sedimentation control measures, or re-used.

The following equipment is typically used during road upgrading and construction:

- Excavators;
- Dump trucks;
- Bull dozers;
- Rollers;
- Graders;
- Crusher; and
- Light trucks.

Laydown Area and Turbine Pad Construction
General activities during the creation of the laydown and turbine pad construction areas may include:

- Installation of erosion and sedimentation control measures;
- Removal of vegetation;
- Removal of overburden and soils;
- Blasting/chipping of bedrock (to be determined);
- Pouring and curing of concrete pads (complete with reinforcing steel);
- Placement of competent soils to bring area to grade;
- Compaction of soils; and
- Excavation for electrical conduits and fibre optic communication trenches.

The tower foundations will be approximately 15 m diameter (typical for a 2 MW wind turbine) and extend to a depth of 3 m below grade.

Each turbine pad and laydown area is expected to be approximately 100 m x 100 m. The exact arrangement of each turbine pad and crane pad will be designed to suit the specific requirements of the turbine and the surrounding topography during the detailed design process.

The construction of a typical turbine pad (from clearing to final preparation for erecting of the turbine) can take between 1 to 4 months, depending on weather, soil, and construction vehicle access. The following equipment may be used for the laydown area and turbine pad construction:

- Excavators;
- Dump trucks;
- Bull dozers;
- Rollers;
- Graders;
- Crusher (not required if a local quarry can supply gravel sizes);
- Concrete trucks;
- Light cranes; and
- Light trucks.

Transportation of Turbine Components

A detailed transportation study will be completed by the turbine supplier as part of the design phase to determine appropriate routes and means for equipment and materials to be delivered to Project site. A preliminary study indicates that turbines will likely be delivered using Hartville, Ellershouse and Hartville Quarry roads. At certain locations, turning radii will need to be widened and some roads on the Project site will need to be modified. Upon completion, the study will be provided to the Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR) for review and comment.

The following permits are expected to be required:

- Work Within Highway Right of Way Permit (NSTIR): required if removing access signs and guard rails.
- Overweight Special Moves Permit (Service NS and Municipal Relations): to transport oversized and overweight components. In some cases, due to the size and weight of the components, some may only be transported on Sundays.
- Provincial road weight restrictions, especially Spring Weight Restrictions, for heavier equipment and materials that will be transported to the Project site.
- Access points will be designed with proper height and width to accommodate large trucks and will adhere to commercial stopping sight distances.

The transportation route is expected to require a few slight road modifications, mostly involving the removal of signage and guardrails. To mitigate any negative effects on motorists where modification is required, a notice will be placed in public areas to inform local residents of signage removal or road infrastructure alterations. Removed signage and guardrails will be immediately replaced and appropriate temporary signage will be provided as necessary to ensure travelling public safety. Upgrades will also be made to roads and overhead wires, branches, and signs if conflicts arise. For

areas requiring modifications, these will be completed to relevant specifications and any areas requiring reinstatement will also be completed as requested.

To the extent possible, transportation through Halifax will avoid high traffic times (*e.g.*, 7-9 am and 3-6 pm; Monday to Friday). All travel will be conducted using safe work practices for transporting oversized loads.

Transport of equipment will be via a minimum number of vehicles to minimize impacts to road-way flow and impacts on air quality due to exhaust.

During the Project's construction phase, trucks and other vehicles will be frequently visiting the Project site resulting in increased vehicular sound. To mitigate this effect, vehicles will only be visiting and working on-site during normal daytime hours of operation, where possible, and will avoid high-traffic times of day to reduce local traffic congestion.

Turbine Assembly
The wind turbine assembly includes tower sections, the nacelle, the hub, and three-blade rotors (*i.e.,* a total of eight major components). All sections will be delivered by several flatbed trucks and the pieces will require a crane for removal from the vehicle at each of the prepared turbine pads.

The tower sections will be erected in sequence on the turbine foundation, followed by the nacelle, hub, and rotors. Rotors are usually attached to the hub on the ground prior to lifting. This assembly will occur with the use of cranes. Erection will depend on weather, specifically wind and lightening conditions. Typical assembly duration should be between 2 to 5 days.

The following equipment is expected to be used for turbine assembly:

- Main crane unit (up to 400' high in some cases);
- Assembly cranes; and
- Manufacturer's support vehicles.

Collection System and Substation
The final substation location has not yet been determined. However, it will be centrally located to minimize environmental disturbance. The collection system is expected to follow the road network (where practical).

Grid Connection
Electricity produced by this Project will be fed into the grid at NSPI's St Croix 17V substation and the electricity will be delivered to the electric utilities of the towns of Berwick and Mahone Bay under contract.

The following equipment is expected to be used during the grid connection process:

- Excavator and/or back hoe;
- Bucket trucks;

- Light cranes; and
- Light trucks.

Removal of Temporary Works and Site Restoration
Once construction has been completed, all temporary works will be removed and the site will be appropriately graded.

The following equipment is expected to be used this process:

- Excavator and/or back hoe;
- Grader;
- Hydroseeder; and
- Light trucks.

Commissioning
The turbines will undergo a series of tests for mechanical, electrical, and controls prior to unit start-up sequence. Once the start-up sequence has been initiated, another series of performance checks for safety systems will be completed. When the turbines have cleared all tests, the commissioning of the units can begin.

Commissioning will require coordination with NSPI as electrical energy will need to be managed both within the substations and on the transmission line. These performance tests will be completed by qualified wind power technicians and NSPI employees.

Additional testing may also be required for transformers, power lines, and substation components, all of which will be performed by qualified engineers and technical personnel.

2.2.2 Operations and Maintenance
Maintenance will conform to manufacturer equipment specifications, industry best management practices (BMPs), and standard operating procedures.

The life span of the Project is estimated to be a minimum of 20 years. During this time, roads will be used to access the turbines by staff and maintenance personnel. The roads will be maintained with additional gravel and grading, as required. During the winter months, all roads will be plowed, sanded, and/or salted, as required for safe driving and to ensure access in the event of an emergency.

A vegetation management plan will be initiated to ensure that access roads and turbine locations remain clear of vegetation. Timing of vegetation management will depend on site specific conditions.

Due to the potential for public access to the wind farm, signage will be affixed and maintained on all access roads to provide essential safety information such as emergency contacts and telephone numbers, speed limits, and the hazards associated with being within close proximity to the turbines (*i.e.*, ice throw). These signs will be maintained during the life of the Project.

Scheduled maintenance work will be carried out on a periodic basis. Maintenance work may require the use of a variety of cranes for brief periods of time for replacement of blades or other turbine components. The most common vehicle during maintenance work will be light/medium pickup trucks.

2.2.3 Decommissioning

As noted above, the operational life of the Project is estimated to be a minimum of 20 years. Prior to year 20, NSE will be either provided with decommissioning plans or a copy of the new power purchase agreement.

Generally, the decommissioning phase will follow the same steps as the construction phase:

- Dismantling and removal of the turbines from the Project site.
- Decommissioning of the turbine foundations as per the conditions of the land lease agreement.
- Removal, recycling (where possible), and disposal of collection system, conductor, and poles with NSPI's permission/cooperation.
- Removal of all other equipment and reinstatement and stabilization of land.

3.0 PROJECT SCHEDULE

Table 3.1 presents the Project schedule from EA registration to Project decommissioning.

Table 3.1: Project Schedule

Project Activity	Timeline
EA Registration	December 2013
Post-EA Environmental Monitoring Programs	2014/2015
Geotechnical Assessment	Winter/Spring 2014
Engineering Design	Winter/Spring 2014
Municipal Decision on Development Agreement	Summer 2014
Clearing	Fall 2014
Construction	Fall 2014
Commissioning	2015
Operation	Late 2015
Decommissioning	TBD

4.0 GENERAL ENVIRONMENTAL MITIGATION

The following general environmental mitigation is considered to be standard practice and will be implemented as part of the Project design. Specific mitigation, monitoring, and follow-up that may be required to address residual environmental effects are discussed in Section 13.

4.1 Clearing and Grubbing

- Environmentally sensitive features will be identified and clearly marked where feasible (*e.g.,* watercourses, wetlands, areas of high archaeological potential).

- All watercourses will be kept free of chips and debris resulting from clearing activities.
- Appropriate erosion and sedimentation controls will be implemented to stabilize the slopes/banks on either side of watercourses and prevent sediment run-off.

4.2 Blasting (if necessary)

- Blasting will be conducted in accordance with provincial legislation and subject to terms and conditions of applicable permits.
- All blasts are to be conducted and monitored by certified professionals.
- Once the location of any required blasting is confirmed and the geotechnical investigation is completed, the need to implement mitigation measures or monitoring programs will be evaluated.
- If required, all protective measures will be outlined in the Environmental Protection Plan (EPP) and approved by NSE in advance of blasting activities.
- Landowners will be notified of any blasting activities.
- Following any blasting or disturbance of soils or bedrock, exposed soils or bedrock will be recovered with soil and re-vegetated as required to minimize any exposure.
- Blasting near watercourses will only occur in consultation with Fisheries and Oceans Canada (DFO), and will follow the requirements of the *Fisheries Act* (1985) as well as the requirement of the DFO Factsheet: "Blasting – Fish and Fish Habitat Protection" (DFO 2010a); and/or the DFO "Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters" (Wright and Hopky 1998), as applicable.
- If sulphide bearing materials are identified through pre-construction geotechnical surveys, these areas will be referenced in the EPP.
- Rock removal in known areas of elevated potential will conform to relevant legislation (*e.g.,* the Sulphide Bearing Material Disposal Regulations of the NS*EA*), and in consultation with relevant regulatory departments).

4.3 Transportation

- A notice will be placed in public areas along Hartville and Ellershouse Roads to inform local residents of signage removal or road infrastructure alterations. Removed signage and guardrails will be immediately replaced and appropriate temporary signage will be provided as necessary to ensure public safety.
- To the extent possible, transportation of materials through Halifax will avoid high traffic times (7-9 am and 3-6 pm; Monday to Friday). All travel will be conducted using safe work practices for transporting oversized loads. Consideration will be given to transporting turbine blades and other oversized loads at night to avoid high traffic periods and allow lane closures, as necessary, to navigate turns along the route.
- Equipment transport will utilize a minimum number of vehicles to minimize effects to road-way flow and effects to air quality from exhaust.
- Upgrades will be made to roads and overhead wires, branches, and signs if conflicts arise. Modifications and subsequent reinstatement will be completed to NSTIR specifications.

4.4 Avifauna

- Tree clearing activities will be executed in a manner that complies with the *Migratory Bird Convention Act* (*MBCA*) and the *Species at Risk Act* (*SARA*), specifically to avoid incidental take.
- Primary mitigation for avifauna will be through Project planning and scheduling of clearing activities, on a best-efforts basis, to avoid key migratory bird nesting periods.
- Should vegetation clearing be required during nesting periods, searches for migratory bird nests should be undertaken within the area to be disturbed, in consultation with Canadian Wildlife Service (CWS), and all identified nests should be flagged.

4.5 Dust and Noise

- Where required, dust will be controlled by using water or a suitable, approved dust suppressant.
- Construction equipment will be maintained in good working order and properly muffled.
- Noise control measures (*e.g.,* sound barriers, shrouds, enclosures) will be used where warranted.
- All reasonable efforts will be made to restrict construction-related noise and lighting to between the hours of 9am-6pm, wherever possible. During specific phases of construction, completion of some activities (*e.g.*, "flying" of rotors and towers) may be required outside of these hours due to the nature of the Project.
- Engine idling will be restricted.

4.6 Erosion and Sedimentation Control

Contractors will use the erosion and sedimentation control measures listed below at all sites where soil or sub-soil has been exposed and there is potential for erosion:

- A site specific erosion and sedimentation control plan will be developed during the design phase of the Project.
- The area of exposed soil will be limited, and the length of time soil is exposed without mitigation (*e.g.,* mulching, seeding, rock cover) will be minimized through scheduled work progression.
- Both temporary and permanent control measures for erosion and sedimentation will be implemented in an appropriate time frame.
- Erosion and sedimentation control structures will be maintained and inspected regularly with particular emphasis before and after forecasted heavy rain events, and with consideration of the timing and types of activities involved.
- Existing roads and access routes will be used to the extent feasible.
- With the exception of temporary water crossing locations, travel through wetlands and within watercourse buffers with machinery will be avoided, when feasible. If travel through a wetland is required, the appropriate mitigation measures will be employed, (*e.g.,* geotextile matting, work timed to occur during frozen ground conditions, and travel routed through drier portions of the wetland).
- Care will be taken to ensure that the potential for surface run-off containing suspended materials or other harmful substances is minimized.

- Where necessary, erosion and sedimentation control measures will remain in place after work is completed, areas have stabilized, and natural re-vegetation occurs. All temporary erosion and sedimentation control materials will eventually be removed from the construction site.
- Permits/approvals related to site construction will be kept on-site.

4.7 Wetlands

- Wetlands will be avoided to the extent possible. Where unavoidable, wetland crossings/alteration will be completed in accordance with the Nova Scotia Wetland Conservation Policy and the wetland alteration application process during the permitting stage of the Project.
- Crossing of wetlands will not result in permanent diversion, restriction or blockage of natural flow, such that hydrologic function of wetlands will be maintained.
- Run-off from construction activities will be directed away from wetlands.
- Any wash water from the cleaning of construction vehicles will be disposed of on-site, using standard industry practices and following environmental regulations/guidelines for the protection of wetlands.
- Work vehicles and/or heavy equipment will be cleaned and inspected prior to use to prevent the introduction of weed/invasive/non-native species to sensitive habitats such as wetlands.

4.8 Dangerous Goods Management

- All fuels and lubricants used during construction will be stored according to containment methods in designated areas, located a minimum 30 m from surface waters and wetlands.
- Where possible, refueling in the field will not occur within 30 m of watercourses, water bodies or wetlands.
- Storage of all hazardous materials will comply with Workplace Hazardous Materials Information System (WHMIS) requirements. Appropriate material safety data sheets will be located at the storage site.
- Transportation of dangerous goods will comply with the *Transportation of Dangerous Goods Act* (1992).
- Equipment will be kept in good working order, will be inspected regularly, and any observed leaks will be repaired.

4.9 Waste

- Solid wastes, including waste construction material, will be disposed of in approved facilities.
- Temporary storage of waste materials on-site will be located at least 30 m from known watercourses, wetlands, and water bodies.
- Waste materials will be removed from the site by a qualified waste hauler and disposed/recycled in accordance with provincial waste regulations. All applicable materials will be stored as per WHMIS requirements and transported as per requirements of the *Transportation of Dangerous Goods Act* (1992).

4.10 Excavation and Site Reinstatement

- All soils removed during the excavation phase will be stored according to provincial regulations and best practice guidelines.

- Any soil needed for backfilling, after foundations have been poured, will be stored temporarily adjacent to the excavations until needed. Any remaining excavated material will be used on-site or removed and sent to an approved facility.
- Prior to excavation activities, erosion and sedimentation control measures will be deployed and assessed on a regular basis.
- Once backfilled material has stabilized, temporary erosion and sedimentation controls will be removed. Attention will be paid during site reinstatement to ensure areas will promote wildlife return to the area, to the extent possible.

4.11 Watercourse Crossings

- Any watercourse crossings required will comply with existing regulatory requirements.
- Crossing of watercourses will not result in permanent diversion, restriction, or blockage of natural flow.
- Crossings will be restricted to a single location on a watercourse and occur at right angles to the watercourse or wetland.
- Crossings should be located in areas which exhibit a stable soil type and where grades approaching the crossings will not be too steep.
- The approaches to watercourse crossings will be stabilized with brush mats, where necessary. Stream banks prone to erosion may require additional stabilization. Material used to stabilize/repair stream banks will be clean, non-erodible, and will not come from the stream bank or bed.
- Any wash water from the cleaning of construction vehicles will be disposed of on-site, using standard industry practices and following environmental regulations/guidelines for the protection of watercourses.

5.0 ENVIRONMENTAL MANAGEMENT

5.1 Environmental Protection Plan

An EPP will be developed following EA approval of the Project. The EPP will be approved by NSE prior to start of construction of the Project and will detail best practices and mitigative measures to be employed during construction to minimize potential environmental impacts. The EPP document is the primary mechanism for ensuring that mitigation is implemented, as determined through the EA process, to avoid or mitigate potential adverse environmental effects that might otherwise occur from construction activities, and as required by applicable agencies through permitting processes.

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

- means to comply with requirements of relevant legislation;
- environmental protection measures identified as part of the EA; and
- environmental commitments made as part of the EA.

A suggested Table of Contents for the EPP is provided in Appendix B.

6.0 PROJECT SCOPE

As a Class 1 EA, this registration document and supporting studies have been developed to meet all requirements under Section 9(1A) of the NS*EA.*

In addition, the document has been prepared using the following provincial guidelines:

- "A Proponent's Guide to Wind Power Projects: Guide for preparing an Environmental Assessment" (NSE 2012a); and
- "A Proponent's Guide to Environmental Assessment", published by the Environmental Assessment Branch of NSE and revised in 2009 (NSE 2009a).

The following regulatory bodies have been contacted by the Project team to provide input into the Project planning process and advice regarding the EA scope:

- CWS;
- Nova Scotia Department of Communities, Culture and Heritage;
- NSE; and
- Nova Scotia Department of Natural Resources (NSDNR).

During the EA review process, additional consultation may be required with these and other agencies.

6.1 Site Sensitivity

Potential wind farms are assigned a category level, according to a matrix provided in "A Proponent's Guide to Wind Power Projects" (NSE 2012a). This matrix considers the overall Project size and the sensitivity of the Project site to determine the category level. The category level then outlines guidance with respect to the collection of baseline data for the EA, as well as post-construction monitoring requirements.

As the Project consists of seven turbines, it is considered a small project. Based on the known existence of a bird species ranked 'Red' by NSDNR; and the presence of a bat hibernaculum less than 25 km from the Project site, the Project is classified as having a 'Very High' potential sensitivity. Overall, the Project is has therefore been determined to be a Category 4.

6.2 Assessment Scope

EA is a planning tool used to predict the environmental effects of a proposed project, identify measures to mitigate adverse environmental effects, and predict whether there will be significant adverse environmental effect after mitigation is implemented.

The EA focuses on specific environmental components called valued environmental components (VECs). VECs are specific components of the biophysical and human environments that, if altered by the Project, may be of concern to regulatory agencies, Aboriginals, stakeholders, resource managers, scientists, and/or the general public. VECs incorporate biological systems as well as human, social, and economic conditions that are affected by changes in the biological environment.

As such, VECs can relate to ecological, social, cultural, or economic systems that comprise the environment as a whole.

The scope of the assessment for this Project includes: selection and preliminary assessment of potential interactions; identification of VECs; identification of environmental effects; and identification of the standards or thresholds that are used to determine the significance of residual environmental effects. This scoping relies upon direction from regulatory authorities; consideration of input from stakeholders; and the professional judgment of the Project team.

6.3 Spatial and Temporal Boundaries of the Assessment

For this Project, unless otherwise identified, the assessment of effects was undertaken for the area identified as the Project site (Drawing 2.1). For the purpose of data collection and the socio-economic environment, the Municipality of the District of West Hants was considered. In addition, structures located within a 2 km buffer of the Project site were assessed as potential receptors for the purposes of evaluating potential impacts from sound.

The temporal scope of this assessment covers the construction, operation, and decommissioning phases of the Project, and associated activities, as described in Sections 2.2.1, 2.2.2, and 2.2.3. Accidents, malfunctions, and unplanned events are addressed separately.

6.4 Site Optimization

As part of the Project planning process, a detailed constraints analysis was conducted to ensure that potential effects to the environment and neighboring residents were minimized. This analysis was continually updated and refined based on the results of Project specific desktop studies, modeling, and field assessments. As a result, several layout iterations were reviewed to reflect a growing knowledge of the Project site and surrounding community. Specifically, layout modifications were incorporated into the planning process in consideration of the following:

- Sighting within an optimal wind regime;
- Avoidance of interference with telecommunication and radar systems;
- Maintenance of a vegetated buffer between turbine locations and field identified watercourses;
- Avoidance of lakes, or other visible open water bodies as identified in 1:50,000 provincial mapping;
- Maintenance of a minimum 30 m (from tip of blade) buffer between turbine locations and field identified wetlands (NSE standard). NSDNR requests that larger buffer distances (*i.e.*, 70-80 m from the tip of blade) are incorporated into Project design where a species of conservation interest (SOCI) has been identified during breeding season within a wetland. Where appropriate, this buffer has been incorporated into Project planning.
- Avoidance of known protected areas, field identified archaeological resources, significant habitats, wildlife sites, provincial parks or reserves;
- Avoidance of Mi'kmaq resources;
- Maintenance of a minimum 550 m setback (NSE standard) between turbines and occupied dwellings, cottages, camps, daycares, hospitals, and schools;

- Predictive sound modeling results to meet NSE standards (*i.e.,* 40 dBA for dwellings, daycares, hospitals, and schools);
- Predictive shadow flicker modeling results to meet NSE standards (*i.e.,* no more than 30 hours of flicker over a year and no more than 30 minutes of flicker on the worst day); and
- Maintenance of the municipal setback from adjoining property (lot) lines, which is consistent with the height of the tower plus the distance from the top of the tower to the highest extended tip of the rotor blades.

In addition to the general planning "constraints" and minimum setbacks mentioned above, the Project site and associated layout offers considerable development and ecological advantages that were incorporated into the Project design to minimize potential effects to surrounding land uses, local residents and environmental features. These include:

- Accommodation of a large residential setback of over 1,000 m (approximately 900 m for seasonal camps/sheds), well in excess of the NSE Standard;
- The use of a site that has been previously disturbed by forestry activities (*i.e.*, tree clearing and logging trails/roads throughout the Project site);
- Incorporation of 5.8 km of existing roads into the Project design, resulting in minimal (*i.e.*, approximately 1.6 km) overall new road disturbance impacts and clearing requirements;
- No wetland or watercourse alterations required at turbine locations;
- No new watercourse crossings associated with roads;
- Accommodation of a buffer distance between turbines and the field identified watercourse in excess of 1.0 km; and
- The original site layout, which saw the turbines spread over a wider area, was revised to locate turbines closer together, minimizing the geographic extent of disturbance.

This siting exercise, using the above noted constraints and setbacks, resulted in the current turbine locations that this EA was based on. Through this process, these locations were selected to provide a minimal disturbance to surrounding land uses, local residents and environmental features.

7.0 ENVIRONMENTAL ASSESSMENT METHODOLOGY

The methodological framework used in this EA has been developed to meet the requirements of the NS*EA*. This framework is based on a structured approach that:

- focuses on issues of greatest concern;
- considers Aboriginal concerns as well as concerns raised by the public and other stakeholders; and
- integrates mitigative measures into Project design.

The methodology provides an overview of the baseline conditions and an assessment of VECs that reflect key issues of concern. Within the specified spatial and temporal boundaries, the potential for interaction between individual VECs and Project activities are determined. Where there is potential for Project-related environmental effects, each effect is assessed using the results of preliminary investigations, guidance from regulators, and the collective knowledge and expertise of the Project

team. The residual Project-related environmental effects, (*i.e.*, after mitigation has been applied), are characterized using specific criteria (direction, magnitude, geographic extent, duration, frequency, and reversibility) that are applied to each VEC. The significance of these residual effects is then determined based on pre-defined and VEC-specific thresholds.
Project-related environmental effects are assessed and include potential interactions; mitigation and environmental protection measures proposed to reduce or eliminate adverse environmental effects; and the characterization of the residual environmental effects of the Project. The ultimate focus of the assessment is on residual environmental effects that remain after planned mitigation has been applied.

7.1 Preliminary VEC Selection

A preliminary assessment of potential interactions between selected environmental components and the Project was undertaken to identify VECs. This preliminary assessment is summarized in Table 7.1. For some of the identified environmental components, additional information has been provided in the report. Many of the interactions can be addressed using industry BMPs and adhering to existing regulations to mitigate potential effects. Where environmental BMPs and regulations are considered to be insufficient to fully mitigate potential effects, or where additional information is required, the components are identified as VECs and are therefore subject to further assessment in Section 13.0. Specific environmental requirements and mitigation practices are identified in the effects assessment and will be refined in subsequent environmental regulatory permitting processes.

Table 7.1: VEC Selection Table

Environmental Component	Description	Assessed further?	Applicable Section in the Report
Atmospheric Environment	Atmospheric environment includes consideration of air quality and climate conditions. Concerns include: • Dust generation from construction and operation activities. • Interaction with air quality due to exhaust emissions, including greenhouse gas emissions from Project equipment and vehicles during construction and operation. Only minimal amounts of dust and air emissions are expected. Mitigation for these potential effects is provided in Section 4. Project-related emissions are anticipated to be temporary, localized, and minor in nature. Measurable changes to the atmospheric environment are not expected.	No	Section 8.1
Geophysical Environment	Geophysical components include consideration of hydrogeology, groundwater, and bedrock and surficial geology. Concerns include: • Damage from blasting to domestic water sources. • Localized disturbances to surface soils and shallow bedrock. • Potential for acid rock drainage (ARD) at the site. • Presence of radon gas. Once the location of any required blasting is confirmed and the geotechnical investigation is completed, the need to implement mitigation measures or monitoring programs will be evaluated.	No	Section 8.2

Environmental Component	Description	Assessed further?	Applicable Section in the Report
	The likelihood of ARD to occur at the site will be determined following the results of the geotechnical evaluation. If ARD is found to be present, it will be handled in accordance with the Sulphide Bearing Material Disposal Regulations under the NS*EA*. As a proactive measure, any structures placed at the Project site can be provided with venting if radon is suspected. Further mitigation for disturbance or exposure of this rock type (*e.g.* from blasting) will be outlined in the EPP. Project-related effects on the geophysical environment are anticipated to be temporary, localized, and minor in nature. Measurable changes to the geophysical environment are not expected.		
Freshwater Environment	Freshwater environments involve consideration of fish and fish habitat and water quality which may be impacted by watercourse crossings, erosion and sedimentation etc. Concerns include: • Loss or damage to fish habitat. • Decreased water quality. • Mortality of aquatic species. Based on the proposed Project layout, one watercourse alteration may be required to accommodate road upgrades which will be confirmed when the final engineering design is complete (refer to Section 8.3.1). All construction activities near watercourses will comply with the applicable regulations and guidelines. Any potential impacts to watercourses should be easily addressed through the provincial permitting process. Additional mitigation is described in Section 4. Project-related effects on the freshwater environment are anticipated to be temporary, localized, and minor in nature. Measurable changes to the freshwater environment are not expected.	No	Section 8.3
Terrestrial Habitat, Flora and Fauna (including wetlands)	Terrestrial habitat involves consideration of general and specialized terrestrial habitats, such as wetlands, as well as terrestrial flora and fauna *(Note: Birds and rare species have been considered separately)*. Concerns include: • Habitat fragmentation. • Introduction of invasive species. • Damage to wetland ecosystems. • Mortality of some smaller faunal species due to clearing activities. • Loss of vegetation and effects to fauna and flora species due to herbicide application (vegetation management). Habitat fragmentation is considered to be minimal due to the small-scale clearing required. Environmental protection practices will be incorporated into clearing and grubbing activities as described in Section 4.	No	Section 8.4, 8.5, and 8.6

Environmental Component	Description	Assessed further?	Applicable Section in the Report
	Mitigation to control and prevent the introduction of invasive species is provided in Section 4 and will be included as part of the Project Vegetation Management Plan. Avoidance of wetland habitat has been taken into consideration in Project planning and design including access roads and placement of turbines. Additional mitigative measures provided in Section 4 will be employed to protect wetland habitat. It is expected that temporary sensory disturbance related to the site preparation and construction phases of the Project will not persist in the long-term. Sensory disturbance related to turbine operations will be negligible. Mortality of fauna will be minimal due to the utilization of existing access roads, small scale clearing requirements and attention to seasonal mitigation. Project-related effects on the terrestrial environment are anticipated to be temporary, localized, and minor in nature. Measurable changes to the terrestrial habitat and flora and fauna are not expected.		
Species of Conservation Interest (SOCI)	SOCI are those species assessed as being at risk or sensitive to some degree. For the purposes of this EA, SOCI include those species listed as: • "Endangered", "Threatened", or "Special Concern" under *SARA;* and • "Endangered", "Threatened " or "Vulnerable" under the Nova Scotia *Endangered Species Act* (NS *ESA*) Consideration is also given to species: • Ranked as "Red" or "Yellow" under the NSDNR General Status Ranks of Wild Species in Nova Scotia; and • Listed "Endangered", "Threatened", or "Special Concern" by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Based on the above criteria, three fish SOCI and five terrestrial fauna SOCI have the potential to occur at the Project site. No plant SOCI were identified at the Project site. Concerns include: - Sensory disturbance. - Direct and indirect adverse environmental effects to habitat (loss or alteration). - Effects to fish passage/migration. - Direct mortality of individuals. Loss of terrestrial fauna and aquatic SOCI is considered minimal due to the utilization of existing access roads, small scale clearing requirements, and attention to seasonal mitigation. However, due to special status under federal and provincial federal legislation/guidance, aquatic and terrestrial fauna SOCI are considered further in the assessment as a VEC.	Yes	Sections 8.3, 8.5, 8.6 and 14.2.1

Environmental Component	Description	Assessed further?	Applicable Section in the Report
Avifauna	The effects of wind turbines on avifauna are variable and depend on factors such as the development design, topography of the area, habitats affected, and the bird community in the wind farm area. Concerns include: • Mortality resulting from collision. • Habitat alteration. • Sensory disturbance. The requirements as set out in the *MBCA* will be adhered to for clearing activities (Section 4). Due to the potential effects of wind turbines on avifauna, this component is considered for further assessment.	Yes	Sections 8.7 and 14.2.2
Bats	The installation of wind turbines has the potential to impact bats both directly and indirectly. Concerns include: • Mortality resulting from collision and/or barotrauma. • Habitat alteration. • Sensory disturbance. The significance of these impacts at the population level depends on a number of biotic and abiotic variables, including the number of individuals affected and the stability of the population, season, physiologic condition of the individuals affected, and weather factors. Due to the potential effects of wind turbines on bat populations, this component is considered for further assessment.	Yes	Sections 8.8 and 14.2.3
Local Economy/Land Use/Recreation and Tourism	Socio-economic aspects such as economy, land use/value, and recreation and tourism may be affected by the Project; however these effects may be positive and/or negative. The Project will likely create more local jobs, increase municipal tax revenues, and encourage “energy literacy” at local schools, thereby resulting in a positive change for community. Impacts to land use are not expected in the area since the Project is located on privately owned land. Research has consistently demonstrated that, in a variety of spatial settings and across a wide temporal scale, sale prices for homes surrounding wind energy facilities are not significantly different from those attained for homes sited away from wind energy facilities. The Project represents a small footprint on privately owned land. Though the property is frequently used by various recreational groups (ATV and snowmobile associations), the Project team is working with these groups to ensure continued access. Effects on the socio-economic environment are expected to be positive in nature, or temporary, localized, and minor in nature. Measurable changes to the local economy, recreation and tourism are not expected.	No	Section 9.0

Environmental Component	Description	Assessed further?	Applicable Section in the Report
Human Health	The public is often concerned about the potential for impacts to human health from wind turbines. Concerns include: • Sound (addressed as a separate section). • Shadow flicker (addressed as a separate section). • Infrasound. • Electromagnetic fields (EMF). • Effects to air quality from dust and air emissions. • Risk of ice throw. A literature review regarding the potential for impacts to human health from wind turbines was completed (Appendix C). The main findings from this review are as follows: • There is no evidence that the levels of infrasound produced by the turbines present a risk to human health. • There is no discernible evidence that there are health risks associated with EMFs. • Effects to air quality are expected to be temporary, minor, and localized in nature (refer also to Section 4.4 and to 'Atmospheric Environment', above). • Setbacks and safety awareness measures minimize any potential risk from ice throw. Effects to human health are considered minimal or non-existent due to the size and location of the wind farm, mitigation, and setback distances.	No	Section 11, Appendix C
Cultural and Heritage Resources	If present, cultural and heritage resources may be affected by ground disturbance during construction and decommissioning activities. An Archeological Resource Impact Assessment (ARIA) indicated that no impacts to cultural and heritage resources are expected. Procedures related to potential discovery of archaeological items or sites during construction will be described in the EPP.	No	Section 10
Shadow Flicker	Shadow flicker can occur when rotating blades cast flickering shadows during times of direct sunlight. Modeling results indicate that all residential receptors are predicted to comply with the industry standard of no more than 30 hours of shadow flicker per year and no more than 30 minutes of shadow flicker on the worst day. Shadow flicker, therefore, is not expected to be an issue at any existing residence/dwelling in the vicinity of the Project.	No	Section 11.1
Electromagnetic Interference (EMI)	The rotating blades and support structures of wind turbines can interfere with various types of electromagnetic signals emitted from telecommunication and radar systems. An EMI study completed for this Project. Preliminary results indicate that there were no objections regarding EMI effects associated with the Project provided to date.	No	Section 11.2

Environmental Component	Description	Assessed further?	Applicable Section in the Report
Visual Landscape	Wind farms produce visual effects to the local landscape. A visual assessment was completed for the Project. Predicted view planes generated by the assessment are presented in Section 11.3. Effects to the visual landscape are considered minimal to non-existent due to the size and location of the wind farm and setback distances.	No	Section 11.3
Sound	Sound is generated during all phases of the wind farm. Concerns include: • Noise during construction and decommissioning phases. • Annoyance and unpleasantness, for local residents in close vicinity, from turbine blades during operation. Construction and decommissioning phases will be short-term. Effects of noise created during these phases are expected to be temporary, minor, and localized in nature. Modeling results for wind farm operation indicate that all residential receptors are predicted to comply with the NSE standard of 40 dBA (exterior of the residence). Effects from sound during operation are therefore considered minimal due to the size and location of the wind farm and setback distances. Post-construction monitoring will be completed during operation, as required.	No	Section 11.4

Based on the preliminary assessment of potential interactions summarized in Table 7.1, the VECs addressed in this EA are as follows:

- SOCI;
- Avifauna; and
- Bats.

8.0 BIOPHYSICAL ENVIRONMENT

8.1 Atmospheric Environment

8.1.1 Weather and Climate

Nova Scotia's climate is quite varied and is largely governed by coastal influences and elevation (Davis and Browne 1996). The Project site (centered at 44°55'16.28"N, 64° 1'7.25"W) lies within the Beaver Bank Ecodistrict which encompasses about 1,290 km^2 in the central area of Nova Scotia centered around Shubenacadie Grand Lake (Webb and Marshall 1999). Forestry is the dominant land use in the area, with agriculture being practised on a small-scale. The typical growing season in the area of the Project site is 196 days (Webb and Marshall 1999).

Local temperature and precipitation data were obtained from the Windsor Martock meteorological station (44°56'00.000" N, 64°10'00.000" W) located approximately 11.8 km west of the Project site.

For the period from 1971-2000, the mean annual temperature was 7.4°C, with a mean daily high of 12.3°C and a mean daily low of 2.4°C (EC 2011a). January and February were the coldest months (-5.2 °C and -4.4°C, respectively), while the warmest months were July and August (19.8 °C and 19.3°C, respectively) (EC 2011a).

From 1971-2000, mean annual snowfall was 234.6 cm and rainfall was 1,073.6 mm (EC 2011a). Most snowfall is received in January and February (63.4 cm and 50.1 cm, respectively), while the rainiest months are October and November (108.5 mm and 127 mm, respectively) (EC 2011a).

Environment Canada (EC) measures wind conditions in Nova Scotia at those meteorological stations that are under long term observation. The closest such station to the Project site is the Halifax Stanfield International Airport meteorological station (44°53'00.000"N, 63°31'00.000"W) located 39.8 km east of the Project site. The Canadian Climate Normals (1971-2000) for this station indicate an annual wind speed of 16.8 km/h, most commonly out of the south (EC 2011b). The maximum hourly wind speed for this station was 89 km/h, recorded on February 10, 1969, with the highest single wind gust measuring at 132 km/h on December 26, 1976 (EC 2011b). According to the NS Wind Atlas (NSDE 2007), average wind speeds at 30 m and 50 m above the ground at the Project site range from 18.0-21.6 km/h, and range from 21.6-25.2 km/h at 80 m above the ground.

8.1.2 Air Quality

Currently in Nova Scotia, 42% of total greenhouse gas (GHG) emissions come from electricity use and 89% of electricity comes from fossil fuels (NSDE 2009). Because of this heavy reliance on coal and other fossil fuels for electricity, every MW of wind power installed reduces GHG emissions by as much as 2,500 tonnes per year (NSDE 2011). By reducing Nova Scotia's reliance on fossil fuels, wind energy will therefore contribute to improving local air quality (NSDE 2011).

Nova Scotia monitors air quality at six stations throughout the province. Measured parameters include ground-level ozone (O_3), particulate matter (PM2.5), and nitrogen dioxide (NO_2), and these values are used to calculate a score on the Air Quality Health Index (AQHI) (EC 2011c). The AQHI is a scale from 1-10+, in which scores represent the following health risk categories: Low (1-3), Moderate (4-6), High (7-10), and Very High (10+). The AQHI monitoring station closest to the Project site is located at Kentville, approximately 41 km northwest of the Project site. The AQHI at this site is usually low at all times of the year (EC 2011c).

Mitigation measures for potential effects to the atmospheric environment are provided in Section 4.0.

8.2 Geophysical Environment

8.2.1 Physiography and Topography

The Project site lies within the Beaver Bank Ecodistrict of the South-Central Nova Scotia Uplands Ecoregion (Webb and Marshall 1998). The ecodistrict is located on a rolling to hummocky till plain controlled by the underlying, parallel banded Cambrian slate and quartzite bedrock, aligned in a northeast-southwest orientation. Till is predominantly gravely, moderately fine textured, and reddish-brown derived from Carboniferous shale (Webb and Marshall 1999). The Project site is located on a hummocky terrain with elevations ranging from 120 m to 175 m above sea level.