WHYNOTTS COMMUNITY WIND PROJECT

ENVIRONMENTAL ASSESSMENT REGISTRATION DOCUMENT

Proponent
Whynotts Wind Limited Partnership

Document Prepared By
Strum Consulting

May 2013

May 3, 2013

Mr. Steve Sanford
Nova Scotia Environment
5151 Terminal Road, 5th floor
Halifax, NS B3J 2P8

Dear Mr. Sanford,

Re: Environmental Assessment Registration
Whynotts Community Wind Project

Whynotts Wind GP, Ltd. in its Capacity as general partner for Whynotts Wind Limited Partnership is pleased to submit the Whynotts Community Wind Project Environmental Assessment Registration Document to Nova Scotia Environment.

Contact information is provided as follows:

Danny Splettstosser, Secretary
Whynotts Wind GP, Ltd.
4845 Pearl East Circle,
Suite 200, Boulder, Colorado 80301, USA
Phone: 303.953.5180
Email: splettstosser@juwi.com

Should you have any questions or concerns, please do not hesitate to contact us.

Thank you,

Danny Splettstosser
Secretary
Whynotts Wind GP, Ltd. in its Capacity as general partner for Whynotts Wind Limited Partnership

EXECUTIVE SUMMARY

Whynotts Wind Limited Partnership has proposed to develop a 4.0 megawatt wind, two-turbine wind project in the community of Whynotts Settlement, Nova Scotia. The proponent is Whynotts Wind Limited Partnership, a partnership between Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO) on behalf of the Assembly of Nova Scotia Mi'kmaq Chiefs, and juwi Wind Canada Ltd. (juwi). The partnership is utilizing Community Wind Farms Inc. (CWFI) for local development services. The proposed project location is approximately 5 km northeast of Bridgewater, Nova Scotia in the Municipality of the District of Lunenburg (44°24'20"N, 64° 28'11"W), and will consist of approximately 99 ha of privately owned land (PID 60245354). The Project will provide power to 1,320 homes.

The Whynotts Community Wind Project has been developed in support of Nova Scotia's "Renewable Electricity Plan: A Path to Good Jobs, Stable Prices and a Cleaner Environment" , which is a strategic plan designed to decrease the province's dependence on carbon-based energy sources (fossil fuels) and move towards greener, more affordable and more reliable sources of electricity. The Project is proposed under the province of Nova Scotia's recently developed Community Feed-In-Tariff program.

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 two turbines, it is considered a small project. Based on the known existence of three bird species considered to be provincially "At Risk" or "Maybe At Risk"; 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.

As part of the methodology of the assessment, the following environmental components were identified and evaluated based on the potential for interaction with the Project:

- Atmospheric environment;
- Geophysical environment;
- Freshwater environment (including fish and fish habitat);
- Terrestrial habitat (including wetlands);
- Terrestrial vegetation;
- Terrestrial fauna;
- Avifauna;
- Bats
- Local demographics and industry;
- Land use and value;
- Recreation and tourism;
- Cultural and heritage resources;
- Mi'kmaq resources;
- Human health;

- Shadow flicker;
- Electromagnetic interference;
- Visual landscape; and
- Sound.

Details of this preliminary assessment are provided in Section 7.1. Based on field data, associated research and the expertise of the Project team, mitigation strategies and best management practices that were identified in Section 4.0 were applied to each component to avoid or mitigate potential effects of the Project. Where these practices and strategies were considered to be insufficient to fully mitigate potential effects, or where additional information was required, the component was identified as a valued environment component and subject to further assessment. The following valued environment components were identified:

- species of conservation interest;
- avifauna; and
- bats.

An effects assessment was then completed for each valued environment component (Section 14). The effects assessment utilized an interaction matrix to evaluate interactions between the Project phases and each valued environment component and then considered the following elements to assess potential effects:

- Description of potential negative environmental effects;
- Mitigation measures;
- Residual effects;
- Significance of residual environmental effects; and
- Monitoring or follow up programs.

Best practices and standard mitigation methods will be implemented during all phases of the Project, to ensure methods and practices are comprehensive and are adhered to. Furthermore, an environmental protection plan will be developed and communicated to all employees working on the Project.

The potential for accidents and malfunctions was also considered for each Project phase.

The effects assessment for the identified valued environment components determined that there are no significant environmental concerns or impacts (residual or cumulative) that may result from the Project that cannot be effectively mitigated or monitored.

The Project team is committed to ongoing consultation with government stakeholders, First Nations communities, and members of the local community throughout all phases of the Project.

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LIST OF ACRONYMS

ACCDC	Atlantic Canada Conservation Data Centre
ARD	Acid Rock Drainage
ARIA	Archaeological Resource Impact Assessment
ATV	All-terrain Vehicle
AQHI	Air Quality Health Index
BCAF	Bluenose Coastal Action Foundation
BMP	Best Management Practice
CanWEA	Canadian Wind Energy Association
CCME	Canadian Council of Ministers of the Environment
CEA	Cumulative Effects Assessment
CEAA	Canadian Environmental Assessment Act
COMFIT	Community Feed-In-Tariff
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPI	Consumer Price Index
CSA	Canadian Standards Association
CWS	Canadian Wildlife Service
CWFI	Community Wind Farms Inc,
dBA	Decibel
DEM	Digital Elevation Model
DFO	Fisheries and Oceans Canada
DND	Department of National Defense
DO	Dissolved Oxygen
EA	Environmental Assessment
EC	Environment Canada
EMF	Electromagnetic Field
EPP	Environmental Protection Plan
ESCP	Erosion and Sediment Control Plan
GCDWQ	Guidelines for Canadian Drinking Water Quality
GHG	Greenhouse Gas
GIS	Geographical Information System
HC	Health Canada
IBAs	Important Bird Areas
IBoF	Inner Bay of Fundy
IPCC	Intergovernmental Panel on Climate Change
KMKNO	Kwilmu'kw Maw-klusuaqn Negotiation Office
MBBA	Maritime Breeding Bird Atlas
MBCA	Migratory Birds Convention Act
MEKS	Mi'kmaq Ecological Knowledge Study
MLA	Member of Legislative Assembly
MODL	Municipality of the District of Lunenburg's
MORI	Market & Opinion Research International
MSDS	Material Safety Data Sheet
MTO	Ministry of Transportation of Ontario
MW	Megawatt
NOAA	National Oceanic and Atmospheric Administration
NRC	National Research Council
NRCan	Natural Resources Canada
NSDE	Nova Scotia Department of Energy
NSDNR	Nova Scotia Department of Natural Resources
NSE	Nova Scotia Environment

NSEA	Nova Scotia Environment Act
NSESA	Nova Scotia Endangered Species Act
NSLIP	Nova Scotia Lake Inventory Program
NSPI	Nova Scotia Power Inc.
NSTBD	Nova Scotia Topographic Database
NSTIR	Nova Scotia Department of Transportation and Infrastructure Renewal
NWCC	National Wind Coordinating Collaborative
OHSA	Nova Scotia Occupational Health and Safety Act
PID	Property Identification Number
PWA	Protected Water Area
RABC	Radio Advisory Board of Canada
RCMP	Royal Canadian Mounted Police
SARA	Species at Risk Act
SOCI	Species of Conservation Interest
SWPP	Source Water Protection Plan
TAFL	Technical and Administrative Frequency Lists
TSS	Total suspended solids
UTM	Universal Transverse Mercator
VEC	Valued Ecosystem Component
WAM	Wet Areas Mapping
WHMIS	Workplace Hazardous Materials Information System
ZVI	Zone of Influence

1.0 PROJECT INFORMATION

1.1 Project Introduction

Whynotts Wind Limited Partnership has proposed to develop a 4.0 megawatt wind, two-turbine wind project in the community of Whynotts Settlement, Nova Scotia. The Project has been developed 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 (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 (IPCC) 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).

The goal of Nova Scotia's Renewable Electricity Plan is to gradually transition the province of Nova Scotia to local, renewable energy sources, including wind, tidal and solar technologies. In order to reach this objective, the province has set a commitment of 25% renewable energy by 2015, and 40% by 2020 (NSDE 2010). The plan encourages the participation of community-based organizations in this opportunity, through the incorporation of the community-based feed-in tariff (COMFIT) program. 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;
- Educational opportunities for youth and the broader community about renewable energy technology, its benefits, and the role played in Nova Scotia's energy future.

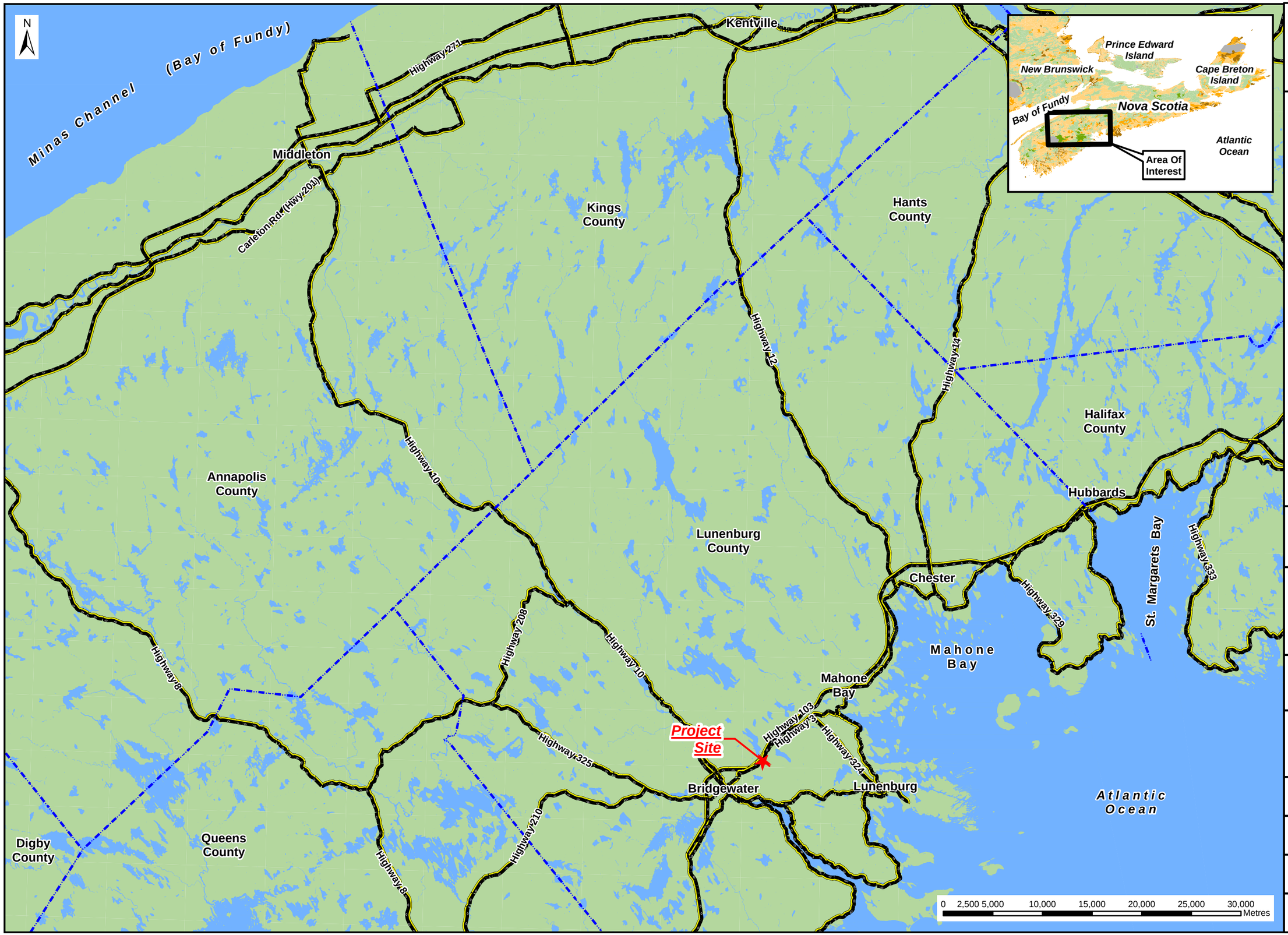
As part of this overall strategy, the Whynotts Community Wind Project will contribute to meeting Nova Scotia's renewable energy goals by producing enough green energy to provide 1,320 NS homes with stable, locally-produced renewable energy. The Project is committed to sharing economic opportunities with the local community and First Nations communities, throughout the development and life-span of the Project via job creation, tax revenue, revenue for the Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO), and the creation of a community sustainability fund. As the lead proponent of the Project, the KMKNO will be critical to forming successful, long-term professional relationships with these communities, ensuring local job-creation and the utilization of local contractors. 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	Whynotts Wind Limited Partnership intends to construct and operate a 4 megawatt (MW) wind project at a site in the community of Whynotts Settlement, Nova Scotia.
Project Name	Whynotts Community Wind Project
Proponent Name	Whynotts Wind Limited Partnership
Proponent Contact Information	Danny Splettstosser 4845 Pearl East Circle, Suite 200, Boulder, Colorado 80301 Phone: 303.953.5180 Fax: 303.953.5185 Email: splettstosser@juwi.com; please cc: j.rogers@juwi.com
Project Location	• The Project site is located in the community of Whynotts Settlement, approximately 5 km northeast of Bridgewater, Nova Scotia in the Municipality of the District of Lunenburg (Drawing 1.1). • The approximate center of the Project site is located at 44°24'20"N, 64°28'11"W. • Project lands include Property Identification Number (PID) 60245354.
Landowner(s)	Verna Iona Fraser
Closest distance from a turbine to a permanent residence	561 m
Expected rated capacity of proposed project in MW	4 MW
Project Website	http://www.whynottswindfarm.ca



Notes:

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

Legend:

- County Boundary
- Provincial Boundary
- Major Roads and Highways

Site Location

Kwilmu'kw Maw-klusuaqn Negotiation Office
Mi'kmaq Rights Initiative
Our Rights. Our Future.

Community Wind Farms Inc.

juwi

Strum CONSULTING

Date: April 2013	Project #: 12-4329
Scale: 1:350,000	Drawing #: 1.1
Drawn By: H. Serhan	
Checked By: M. Smith	

1.3 Proponent Description

The proponent is Whynotts Wind Limited Partnership, a partnership that is being formed between the KMKNO on behalf of the Assembly of Nova Scotia Mi'kmaq Chiefs, and juwi Wind Canada Ltd. (juwi). The partnership is also utilizing Community Wind Farms Inc. (CWFI) for local development services.

KMKNO works on behalf of the Assembly of Nova Scotia Mi'kmaq Chiefs in the negotiations and consultations between the Mi'kmaq of Nova Scotia, the Province of Nova Scotia and the Government of Canada. Under COMFIT rules, the KMKNO will be the majority owner of the Project. Additionally, KMKNO will be instrumental in ensuring the Project integrates smoothly with the local community and cultural surroundings. KMKNO will also assist the team to maximize local economic benefit to the community through job creation and utilization of Mi'kmaq labor and contractors.

juwi is the Canadian subsidiary of the juwi Group; an experienced renewable energy project developer with more than 2,600 megawatts in renewable energy projects successfully developed world wide, largely consisting of projects <20 MW each. The juwi Group has an extensive track record of community based projects with local investment opportunities, as well as turn-key projects for local municipalities, and co-operatives. The role of juwi Group will be to lead technical aspects of wind project development, fund early development activities, and act as the lead arranger in Project financing and implementing construction. Upon completion the Project will be minority owned by juwi Wind Canada. Additional information about juwi is available at; http://www.juwinorthamerica.com/ or http://www.juwi.com/.

CWFI has been retained by Whynotts Wind Limited Partnership and is responsible for conducting all the day to day development, community relations and permitting work associated with the Project. CWFI is a Nova Scotia based company focused on developing community based wind projects across Nova Scotia. The principals have accumulated 25 years of experience in the development of wind farms in Nova Scotia and across North America, and understand the complexity of the business as well as the benefits that can be passed directly to local communities. CWFI has extensive experience working with municipalities, First Nations, community groups and landowners across Nova Scotia to develop a portfolio of wind farms under the COMFIT program. Additional information about CWFI is available at: http://www.communitywind.ca/.

1.4 Regulatory Framework

1.4.1 Federal

A federal EA is not anticipated to be 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 12.2 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 17.

1.4.3 Municipal

The Municipality of the District of Lunenburg's (MODL) Municipal Planning Strategy designates specific areas that have secondary planning strategies covering approximately 12% of the municipality. Wind farm by-laws are restricted to these areas and are specific to each area. There is no general by-law in place for wind farms covering the entire municipality. The Project site is located outside of the boundaries of these secondary planning areas and, therefore, is not subject to any existing wind farm by-laws (J. Merrill, personal communication, 2011). The Proponents have engaged in consultation with Jeff Merrill, Acting Director of Planning and Development Services with MODL. Continued consultation will be on-going throughout the planning process to ensure all municipal requirements for the Project are met (Section 17).

1.5 Structure of Document

Table 1.2 outlines the content of each section of this 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	Mi'kmaq Ecological Knowledge Study
Section 12	Other Considerations
Section 13	Consultation and Engagement
Section 14	Effects Assessment
Section 15	Effects of the Environment on the Project
Section 16	Cumulative Effects Assessment
Section 17	Other Approvals
Section 18	Conclusions
Section 19	References

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:

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2.0 PROJECT DESCRIPTION

2.1 Turbine Specifications

The Project will be powered by two wind turbines, each rated at 2.0 megawatts, for a nominal capacity of 4.0 megawatts in total. Under optimal conditions the turbines will be in operation or available for operation in excess of 93% of the time over an expected lifespan of 25 years. Although a turbine manufacturer has not yet been selected, several models have been evaluated as part of the planning process, with some being excluded due to preliminary modeling results related to sound and shadow flicker. Of the technologies still under consideration, modeling has been completed using the turbine specifications that result in the most conservative conditions (e.g., tallest hub height, longest blade length, most power/sound output), as appropriate to the specific modeling assessment.

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 mitigation measures 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, but are not limited to:

- 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, but are not limited to:

- Access road upgrading and construction;
- Laydown area and turbine pad construction;
- Transportation of turbine components;
- Turbine assembly;
- 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 will be 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, but may not be limited to:

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

Access Road Construction
Approximately 924 m of new road construction off of Mullock Road will be required to provide direct access to the turbines. The access road is expected to be 10 m wide, including shoulders and ditching. In some instances, the construction right of way (ROW) width could temporarily be up to 20 m to accommodate cut and fill areas and/or wide turns. Minimal upgrades, if any, are expected for Leary Fraser Road, with some upgrades expected for Mullock Road.

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 (but is not limited to) during road 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, but are not limited to:

- 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; and
- Compaction of soils.

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.

During construction, the laydown area at each turbine location is expected to be approximately 1 ha in size. Following construction, much of this area will be reclaimed, such that the permanent area of disturbance at each turbine location will be approximately 0.14 ha (Drawing 2.1). 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.

Equipment expected to be used for laydown area and turbine pad construction includes but is not limited to:

- 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

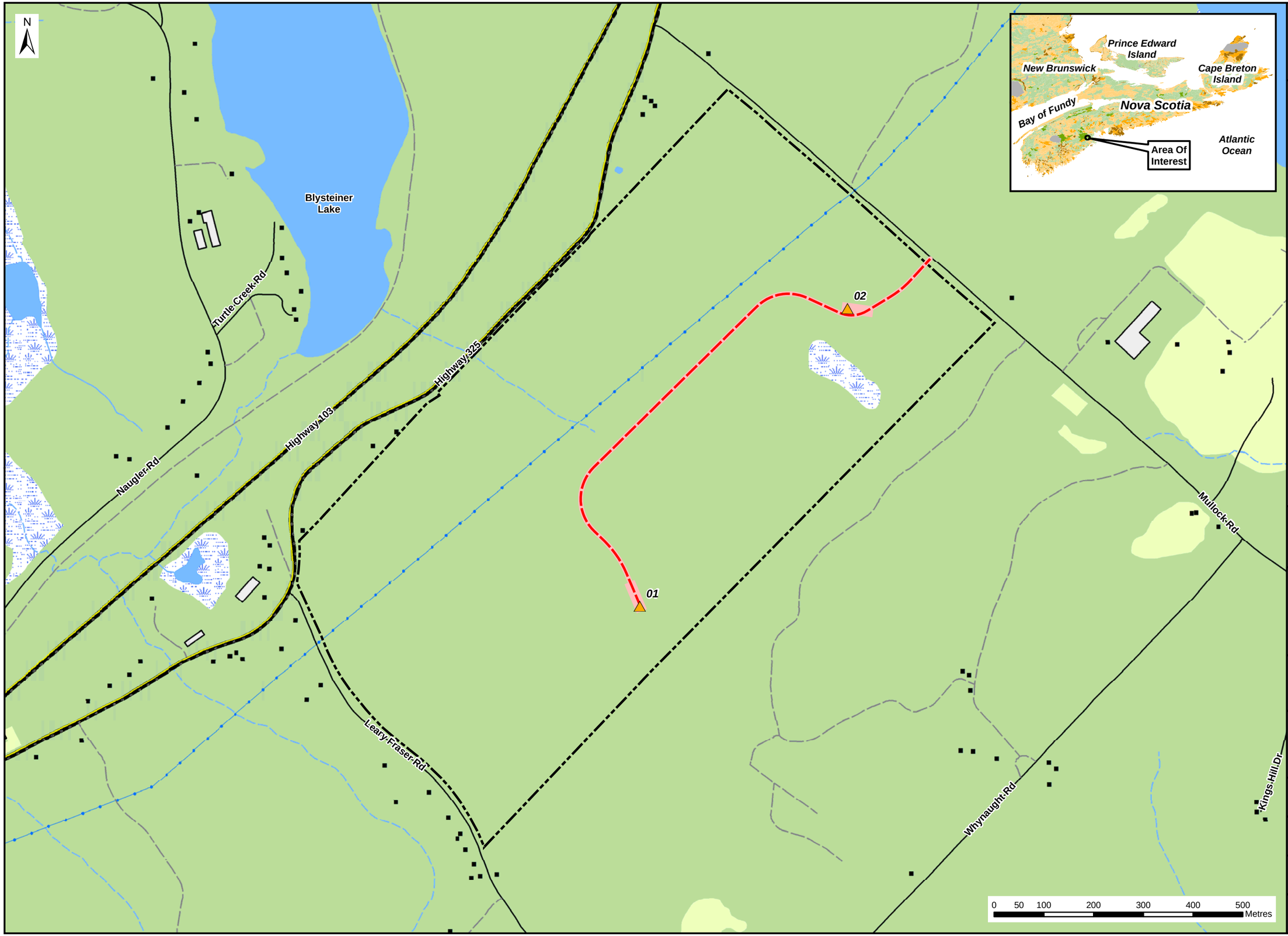
A preliminary Transportation and Access Evaluation was completed to determine appropriate routes and means for equipment and materials to be delivered to the Project site. At this time the exact turbine manufacturer and model have not been selected, so a typical 2.0 MW unit was assumed with all components delivered to the Port of Halifax.

A desktop review of possible routes was conducted and an appropriate route was selected and surveyed by field crews. The survey of routes from the Port of Halifax revealed the need for a few slight road modifications, typically involving the removal of signage and guardrails at various locations along the route. Modifications are required at the four way intersection of routes 324 and 325 to facilitate the transport of turbine materials through the intersection.

All transportation activities will adhere to provincial timing, size and weight restrictions. Transportation of heavier equipment and materials to the site will adhere to road weight restrictions, including all Spring Weight Restrictions. Access points will be designed with proper height and width to accommodate large trucks and will adhere to commercial stopping sight distances.

The following is the proposed route from the Port of Halifax to the Project site:

1. Truck traffic carrying turbine components will leave the Port of Halifax on Marginal Road and continue to Terminal Road.
2. Traffic will turn right from Terminal Road onto Lower Water Street and continue until Lower Water merges with Barrington Street.
3. Trucks will travel on Barrington Street until the Windsor Street Exchange, where they will continue to the Bedford Highway. Once on the Bedford Highway, truck traffic will continue north until reaching the Hammonds Plains Road
4. Traffic will turn left and head west on Hammonds Plains Road toward the 102 Highway.
5. Traffic will cross beneath Highway 102 at Hammonds Plains Road and turn left onto the southbound on-ramp.
6. Truck traffic will travel southbound on Highway 102 until reaching Exit 1A where it will exit to Highway 103 westbound.
7. Traffic will travel approximately 80 km on Highway 103 before taking Exit 11 onto Route 324 near Blockhouse.
8. After exiting Highway 103, traffic will travel southeast on Route 324 for approximately 1 km.
9. Truck traffic will turn right at the four-way intersection of Route 324 and Route 325 heading southwest and continue southwest on Route 325 for approximately 2.5 km.
10. Traffic will turn left onto to Mullock Road. The Project will be accessed via Mullock Road.



Notes:

1. Reference: Digital Topographic Mapping By Nova Scotia Geomatics Centre.
2. Projection: WGS84, UTM Zone 20 North.

Legend:

- Proposed Turbine
- Proposed Access Road
- Permanent Disturbance Area
- Project Site Boundary
- Building
- Major Roads and Highways
- Roads
- Access Roads / Trails
- Existing Transmission Lines
- Large Structure
- Mapped Stream
- Indefinite Stream
- Water Bodies
- Mapped Wet Area
- Cleared Area

Turbine and Road Layout

Kwilmu'kw Maw-klusuaqn Negotiation Office
Mi'kmaq Rights Initiative
Our Rights. Our Future.

Community Wind Farms Inc.

juwi

Strum CONSULTING

Date:	Project #:
April 2013	12-4329
Scale: 1:7000	Drawing #: **2.1**
Drawn By: H. Serhan	
Checked By: M. Smith	

Turbine Assembly
The wind turbine assembly includes tower sections, the nacelle, the hub, and three-blade rotors (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.

Grid Connection
Electricity produced from the turbine will be stepped up to 12.0 kV via a pad mounted transformer, located adjacent to each turbine. The adjacent pad mounted transformers may or may not be required depending on the final turbine model. A power line will connect the turbines, and a line extension from the first turbine will extend the circuit to interconnect with distribution lines owned by Nova Scotia Power Inc. (NSPI) at Mullock Road.

Equipment expected to be used for this process includes but is not limited to:

- 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.

Equipment expected to be used for this process includes but is not limited to:

- 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. The performance tests will be completed by qualified wind power technicians and NSPI employees.

Additional testing may also be required for transformers and power lines, 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 BMPs, and standard operating procedures.

The life span of the Project is estimated to be a minimum of 25 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 (e.g. ice throw, high voltage). 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 25 years. Prior to year 25, 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.
- Removal of the turbine foundations to 3 feet below grade and reinstatement with top soil to ensure stabilization of the land.
- Removal, recycling (where possible), and disposal of conductor, poles and other equipment; and
- Reinstatement and stabilization of land.

3.0 PROJECT SCHEDULE

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

Table 3.1: Project Schedule

Project Activity	Timeline
Pre-EA Submission Studies	2012 to 2013
EA Approval	Summer 2013
Follow-up Environmental Studies	2013/2014
Finalized Layout	Spring 2013
Geotechnical Assessment	Spring 2013
Engineering Design	Winter 2013 - Summer 2014
Power Purchase Agreement	Early 2014
Clearing	Winter 2014
Construction	Spring-Fall 2014
Commissioning	Fall 2014
Operation	2014-2039
Decommissioning	Expected 2040

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 14.

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.
- All clearing and grubbing activities will adhere to provincial timing requirements, as well as those required under the *Migratory Birds Convention Act* (*MBCA*) to avoid key nesting periods for migratory birds.

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 will 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 (e.g., pre-blast survey, acid rock drainage (ARD)).
- 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.

- Where blasting is planned within 500 m of residences, activities will comply with the requirements of any applicable existing by-laws.
- 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 2010); 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 Route 325 and 324 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 impacts to road-way flow and impacts on 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

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 8am – 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.
- Construction and decommissioning will be scheduled in consultation with Community Liaison Committee (CLC) to minimise noise impacts.
- 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

- No alterations to wetlands are expected based on the current Project layout. Where unavoidable, wetland crossings 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.
- 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, wetlands, and private wells.
- Refueling in the field will not occur within 30 m of watercourses, water bodies and wetlands.
- Storage of all hazardous materials will comply with Workplace Hazardous Materials Information System (WHMIS) requirements. Appropriate material safety data sheets (MSDS) will be located at the storage site.
- Transportation of dangerous goods will comply with the *Transportation of Dangerous Goods Act*.
- 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

- All required watercourse crossings will comply with existing regulatory requirements including the "Nova Scotia Watercourse Alteration Specifications" (NSE 2010).
- 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

The EPP will be submitted 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 A.

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 N*SEA.*

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:

- Canadian Wildlife Service (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 two turbines, it is considered a small project. Based on the known existence of three bird species considered to be 'At Risk' or 'Maybe At Risk' (Section 8.7) ; and the presence of a bat hibernacula less than 25 km from the Project site (Section 8.8), the Project is classified as having a 'Very High' potential sensitivity. Overall, the Project 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 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 MODL was considered. In addition, residences located within a 2 km radius of the Project site were assessed as potential receptors for the purposes of evaluating potential impacts from sound and shadow flicker.

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 and turbine model modifications were incorporated into the planning process in consideration of the following:

- Sighting within an optimal wind regime;
- Maintenance of a minimum 96 m 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 61 m buffer between turbine locations and field identified wetlands;
- 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, 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 per year and no more than 30 minutes of flicker on the worst day for dwellings, daycares, hospitals, and schools);
- Maintenance of 1.1 times the tower height setback from property boundaries,; and
- Maintenance of a 1.1 times the tower height setback from public roads.

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, (e.g., 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 14.0. 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	VEC 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 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 and likelihood of ARD. 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. On-site bedrock is likely to contain sulphide bearing minerals, thus increasing the potential for ARD impacts. Should blasting be required, on-site testing for ARD will be completed, and if present, handled in accordance with the *Sulphide Bearing Material Disposal Regulations* under the *Environment Act*. 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.	No	Section 8.2

Environmental Component	Description	VEC Assessed further?	Applicable Section in the Report
Freshwater Environment	Freshwater environments involve consideration of fish and fish habitat 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. It is expected that watercourse crossings will be required along access roads (refer to Section 8.3.3). All construction activities near watercourses will comply with the applicable regulations and guidelines. 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. 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 and no wetland alterations are expected to be required. Additional mitigative measures provided in Section 4 will also 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.	No	Section 8.4, 8.5, and 8.6

Environmental Component	Description	VEC Assessed further?	Applicable Section in the Report
	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 assessed 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, one plant SOCI, and eight fauna SOCI have potential to occur at the Project site. The plant SOCI, Halberd-leaf tearthumb (*Polygonum arifolium)* (yellow-listed species under the NSDNR status ranks), was identified over 100 m from the proposed access road and over 270 m from the proposed turbine locations. Therefore, no impacts to this species are expected. 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.	Yes	Sections 8.3, 8.5, 8.6 and 14.2.1
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:	Yes	Sections 8.7 and 14.2.2

Environmental Component	Description	VEC Assessed further?	Applicable Section in the Report
	• Mortality resulting from direct 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.		
Bats	The installation of wind turbines has the potential to impact bats both directly and indirectly. Concerns include: • Mortality resulting from direct 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 provide community sustainability fund, thereby resulting in a positive change for economy. 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. Therefore, impacts to the broad recreational/tourism community are not expected. 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	Sections 9.1, 9.2, and 9.3

Environmental Component	Description	VEC Assessed further?	Applicable Section in the Report
Cultural and Heritage Resources	Archaeological and heritage resources are defined as any physical remnants found on top of and/or below the surface of the ground, including on or below the sea floor, that inform us of past human use of, and interaction with, the physical environment. Archaeological and heritage resources noted for NS include areas of high archaeological potential, registered archaeological sites, and paleontological resources (e.g., fossils). Effects from the Project on this component include surface or subsurface disturbance during the construction and decommissioning activities. An effect from the operation and maintenance phase is not anticipated as those activities will take place where construction-related ground disturbance has already occurred. An Archaeological Resource Impact Assessment (ARIA) was performed for the site and indicated that no negative effects to cultural and heritage resources are expected. Effects to cultural and heritage resources are therefore considered to be non-existent. Procedures related to potential discovery of archaeological items or sites during construction/decommissioning will be described in the EPP.	No	Section 10
Mi'kmaq Resources	If present, traditional Mi'kmaq flora and fauna resources may be affected by ground disturbance during construction and decommissioning activities. A Mi'kmaq Ecological Knowledge Study (MEKS) was completed for the Project. The results of the consultation process show that there has been little recent harvesting activity by the Acadia First Nation in the area near the Project site. It should be noted that the current absence of Mi`kmaq from an area should not be mistaken for an absence of interest (current and future) in the area and local resources. The workshop held with the Millbrook First Nation identified the Whynotts Settlement study area as a particularly good fishing area due to the density of rivers, streams, lakes and ponds. The region was also noted as having higher than average deer populations. Vegetation and habitat surveys associated with the study will be completed in June 2013. The final report will provide complete analysis and presentation of field data. Based on these preliminary results, future planning and collaboration between the proponent and local Mi'kmaq communities will be maintained through the application of Mi'kmaq Ecological Knowledge.	No	Section 11
Human Health	The public is often concerned about the potential for impacts to human health from wind turbines. Concerns include: • Sound. • Shadow flicker. • Infrasound. • Electromagnetic fields (EMF). • Effects to air quality from dust and air emissions.	No	Appendix B

Environmental Component	Description	VEC Assessed further?	Applicable Section in the Report
	• Risk of ice throw. A literature review regarding the potential for effects to human health from wind turbines was completed (Appendix B). 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 (additional information regarding air quality is provided 'Atmospheric Environment', above). - Setbacks and safety awareness measures minimize any potential risk from ice throw (additional information regarding safety measures, including ice throw, are provided in Section 15). *(Note: Shadow flicker and sound have been considered separately).* Effects to human health are considered minimal or non-existent due to the size and location of the wind farm, mitigation, and setback distances. Measureable changes to human health are not expected.		
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 12.1
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. Construction and decommissioning will be scheduled in consultation with the CLC to minimize noise impacts. Measurable changes to sound during construction and decommissioning are not expected. A study was carried out of the existing ambient sound levels near the Project site. Average existing sound levels at two locations near the Project site boundaries were observed to be 50.7 and 56.0 dBA during the monitoring program.	No	Section 12.4

Environmental Component	Description	VEC Assessed further?	Applicable Section in the Report
	Modeling results for wind farm operation indicate that all non-participating 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.		
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 indicated that there were no objections regarding EMI effects associated with the Project provided to date.	No	Section 12.2
Visual Landscape	Wind farms create 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 12.3. Effects to the visual landscape are considered minimal to non-existent due to the size and location of the wind farm, setback distances, and the significant tree cover in the vicinity of the Project site.	No	Section 12.3

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 & Browne 1996). The Project site (centered at 44°24'20"N, 64°28'11"W) lies within the Lahave Drumlins Ecodistrict of Nova Scotia, which encompasses an area from New Ross in the east to Kejimukujik National Park in the west (Neily et al. 2003). This area of Nova Scotia has perhaps the most pleasant climate of the province with early, warm springs and a long growing season, followed by a relatively mild winter. Mean annual temperature for the area is 6.6°C, with summer and winter temperatures averaging 17.4°C and -4.4°C, respectively (Webb & Marshall 1999). The typical growing season in the area of the Project site is 204 days (Webb & Marshall 1999).

Local temperature and precipitation data were obtained from the Bridgewater meteorological station (44°24'00N, 64°33'00.00W) located approximately 6.5 km southwest of the Project site. For the

period from 1971-2000, the mean annual temperature was 6.8°C, with a mean daily high of 12.6°C and a mean daily low of 1.1°C (EC 2011a). January and February were the coldest months (-5.1 °C and -4.7°C, respectively), while the warmest months were July and August (18.9 °C and 18.6°C, respectively) (EC 2011a).
From 1971-2000, mean annual snowfall was 199.8 cm and rainfall was 1,323.1 mm (EC 2011a). Most snowfall is received in January and February (54.0 cm and 47.2 cm, respectively), while the rainiest months are October and November (132.4 mm and 151.2 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 Lunenburg station which is located approximately 13 km southeast of the Project site. Data collected at this station is based over the last 30 years and indicate a mean hourly wind speed of 16 km/h throughout the year, with a mean hourly wind speed ranging from 12 km/h (July and August) to 19 km/h (December and January) (The Weather Network 2012). According to the Nova Scotia Wind Atlas (NSDE 2007), average wind speeds at 30 m above the ground at the Project site range from 16.2-19.8 km/h, 18-19.8 km/h at 50 m above the ground, and 19.8-21.6 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 megawatt 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 2011b). 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 Halifax, approximately 75 km northeast of the Project site. The AQHI at this site is usually low at all times of the year (EC 2011b).

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 Lahave Drumlins Ecodistrict which is characterized by a drumlinized till plain, sloping southeast towards the Atlantic Ocean. This drumlin field exhibits the classic streamlined, tear-drop shaped deposits of glacial till, with the tapered or narrow end pointing in the direction of glacier movement (Neily *et al*. 2003). Shallow, stony glacial till derived from the underlying Cambrian slates dominates the ecodistrict (Webb &Marshall 1999; Neily et al. 2003). The Project site is located on a slope, with elevations ranging from 110 m in the northeast to 65 m in the southwest, as it slopes towards the Lahave River Valley.

8.2.2 Surficial Geology

The surficial material at the Project site is a stony till plain with sandy matrix, derived from local bedrock sources (Drawing 8.1). The ecodistrict is typified by well drained, shallow, stony sandy loam Bridgewater soils (Orthic Humo-Ferric Podzols) developed on slate-derived till (Webb & Marshall 1999).

8.2.3 Bedrock Geology

Bedrock geology across the Project site consists of Cambrian – Ordovician aged metamorphic rocks of the Meguma Group's Halifax Formation (Keppie 2000) (Drawing 8.2). The bedrock is typically composed of slate, quartzite and greywacke.

According to the NSE Well Log Database (NSE 2011a), there are two drilled wells within a 250 m radius of the Project site. However, there are at least six drilled wells located within 1 km and 42 drilled wells within 2 km of the Project site. Well depths range from 15.2 m to 114.2 m, with bedrock encountered at 0.6 m to 37.2 m. Geology is consistent throughout all well logs indicating the surficial material consists of boulders and clay overlying slate bedrock.

Bedrock containing sulphide bearing minerals (e.g., pyrite, pyrrhotite) can potentially generate acid run-off if fresh surfaces are exposed to oxygen and water. The physical disruption of such bedrock leads to oxidation of iron-sulphide minerals and the generation of ARD (Fox *et al*. 1997). Construction activities in the presence of ARD can result in the acidification of surface and groundwater and promote the mobilization and leaching of toxic contaminants into the environment, including heavy metals. The likelihood of ARD to occur will be determined following the results of the geotechnical evaluation.

N

Lake Road Number 3 Rd

Blysteiner Lake Lane

Blysteiner Lake

Turtle Creek Rd

Naugler Rd

Highway 103

Highway 325

Grayson Dr

Spruce St

Millock Rd

02

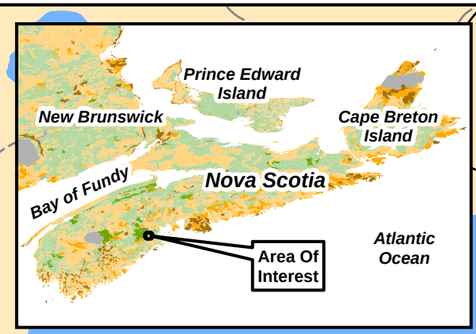
01

Kings Hill Dr

Leary Fraser Rd

Whynaught Rd

Covey Lake



0 50 100 200 300 400 500 Metres

Notes:

1. Reference: Nova Scotia Department Of Natural Resources Map ME 1992-3, Surficual Geology Map Of The Province Of Nova Scotia, 1:500,000, by R. R. Stea, H. Conley and Y. Brown, 1992. Digital Product Compiled by R. R. Stea and B. E. Fisher.
2. Projection: NAD83(CSRS), UTM Zone 20 North.

Legend:

- Proposed Turbine
- Proposed Access Road
- Permanent Disturbance Area
- Project Site Boundary
- Major Roads and Highways
- Roads
- Access Roads / Trails
- Water Bodies

Surficial Geology By Unit

- Silty Drumlin
- Silty Till Plain
- Stony Till Plain

Surficial Geology

Kwilmu'kw Maw-klusuaqn Negotiation Office
Mi'kmaq Rights Initiative
Our Rights. Our Future.

Community Wind Farms Inc.

juwi

Strum CONSULTING

Date:	Project #:
April 2013	12-4329
Scale: 1:10,000	Drawing #: **8.1**
Drawn By: H. Serhan	
Checked By: M. Smith	