

CHEBUCTO POCKWOCK COMMUNITY WIND PROJECT



ENVIRONMENTAL ASSESSMENT REGISTRATION DOCUMENT

Proponent

Pockwock Wind Limited Partnership

Document Prepared By

Strum Consulting

May 2013

May 6, 2013

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

Dear Mr. Sanford,

Re: Environmental Assessment Registration
Chebucto Pockwock Community Wind Project

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

Contact information is provided as follows:

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

EXECUTIVE SUMMARY

Pockwock Wind Limited Partnership has proposed to develop a 10.0 megawatt project in the community of Upper Hammonds Plains, Nova Scotia. The proposed Project location is approximately 25 km northwest of Halifax, Nova Scotia in the Halifax Regional Municipality (44°46'7.88"N, 63°50'10.87"W), and will consist of approximately 286 ha of leased land owned by the Halifax Regional Water Commission (PIDs 330985, 423657, and 425348).

The Chebucto Pockwock 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 five turbines, it is considered a small project. Based on the known existence of five 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. Overall, the Project has therefore been determined to be a Category 4.

A portion of the Project site lies within the boundaries of the Pockwock Lake Protected Water Area, as designated under the Pockwock Lake Watershed Protected Water Area Regulations (NS Reg 12/95) of the NS *Environment Act*. None of the watercourses within the Project site drain into Pockwock Lake. All drainage from the northern and western portions of the Project site is intercepted by the drainage ditch associated with the road to the J.D. Klein Water Treatment Plant, which is subsequently directed into Little Pockwock Lake via Watercourse 1 and Hamilton's Pond.

The remaining portions of the Project site form part of the Pockwock unprotected watershed area (approximately 25%) and the Tomahawk Lake unprotected watershed area (close to 50%). Special consideration has been given to the protection of source water within the Pockwock Protected Water Area, and within the Pockwock and Tomahawk Lake watersheds.

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.

The potential for accidents and malfunctions was also considered for each Project phase. 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 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 the province of Nova Scotia, the Halifax Regional Municipality, First Nations community representatives from across the province, 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
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
CPL	Chebucto Pockwock Lake Wind Field Limited
CSA	Canadian Standards Association
CTB	Chebucto Terrence Bay Wind Field Limited
CWS	Canadian Wildlife Service
CWF	Community Wind Farms Inc.
dBA	Decibel
DEM	Digital Elevation Model

DFO	Fisheries and Oceans Canada
DND	Department of National Defense
EA	Environmental Assessment
EC	Environment Canada
EMF	Electromagnetic Field
EPP	Environmental Protection Plan
ESCP	Erosion and Sediment Control Plan
GHG	Greenhouse Gas
GIS	Geographical Information System
HC	Health Canada
HRM	Halifax Regional Municipality
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
MORI	Market & Opinion Research International
MSDS	Material Safety Data Sheet
MTO	Ministry of Transportation of Ontario
MW	Megawatt
NOAA	National Oceanic and Atmospheric Administration
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
NSMNH	Nova Scotia Museum of Natural History
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
REMO	Regional Emergency Management Organization
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

Pockwock Wind Limited Partnership intends to construct and operate a 10 megawatt (MW) wind project (the Project) at a site in the community of Upper Hammonds Plains, 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 the province 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 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) provided 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 MW of wind energy generated reducing greenhouse gas (GHG) 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; 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 Chebucto Pockwock Community Wind Project will contribute to meeting Nova Scotia's renewable energy goals by producing enough green energy to provide approximately 3,300 NS homes with stable, locally-produced, and partially locally owned renewable energy.

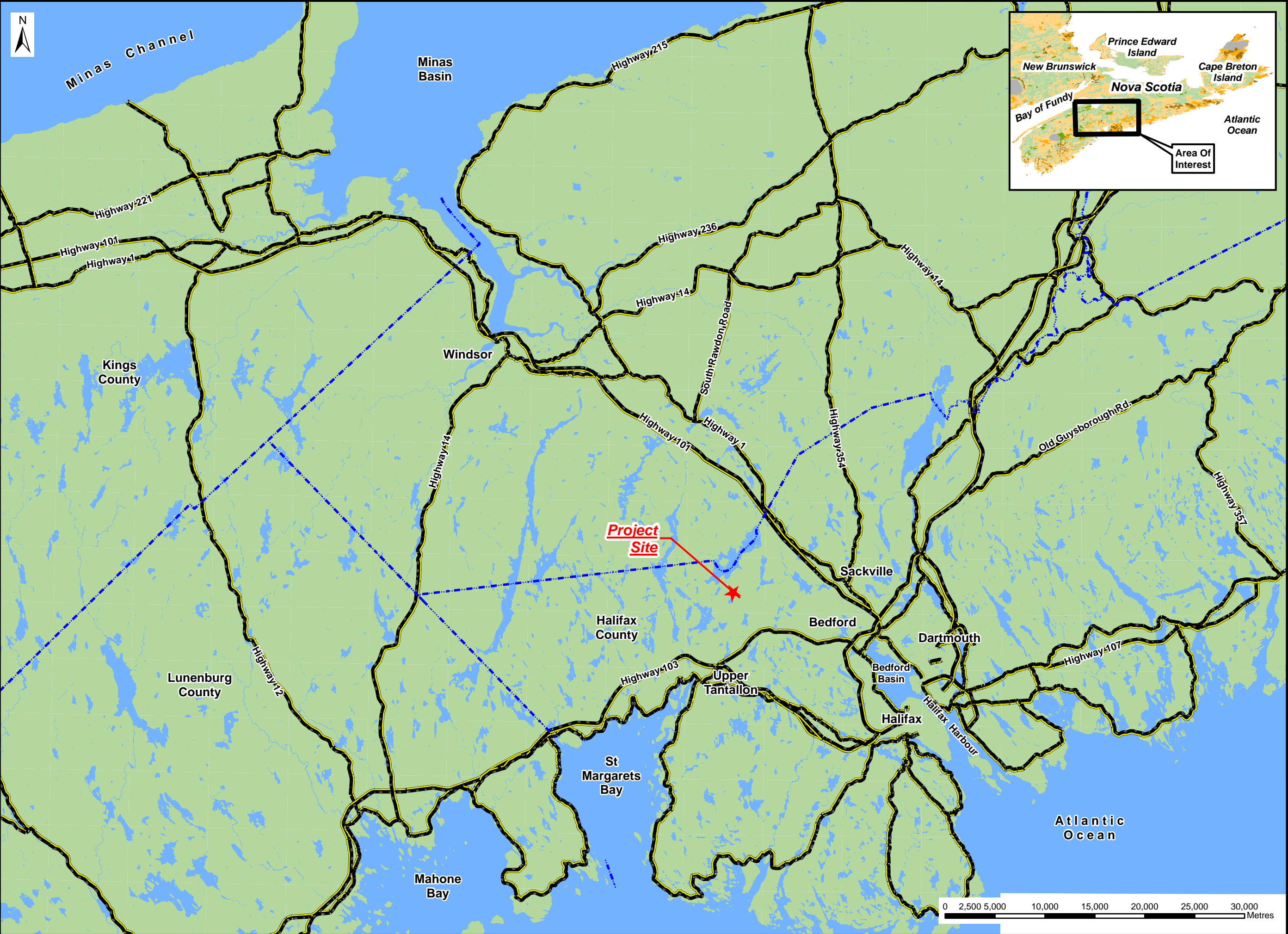
The Project is committed to sharing economic opportunities with the local community, throughout the development and life-span of the Project via job creation, tax revenue, local investment opportunities, and the creation of a community sustainability fund. No public funding is required for this Project.

1.2 Project Summary

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

Table 1.1: Project Summary

General Project Information	Pockwock Wind Limited Partnership intends to construct and operate a 10 megawatt (MW) wind project at a site near the community of Upper Hammonds Plains, Nova Scotia.
Project Name	Chebucto Pockwock Community Wind Project
Proponent Name	Pockwock 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	<ul style="list-style-type: none">• The Project site is located in the community of Upper Hammonds Plains, approximately 25 km northwest of Halifax, Nova Scotia (Drawing 1.1);• The approximate center of the Project site is located at 44°46'7.88"N, 63°50'10.87"W;• Project lands include Property Identification Numbers (PIDs) 330985, 423657, and 425348.
Landowner(s)	Halifax Regional Water Commission (Halifax Water)
Closest distance from a turbine to a residence	1, 200 m (Turbine 3) 1,012 m (Alternative Turbine 02)
Expected rated capacity of proposed project in MW	10 MW
Project Website	www.pockwockwindfarm.ca



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

- Legend:**
- County Boundary
 - Major Roads and Highways

Site Location



Date: April 2013	Project #: 12-4326
Scale: 1:350,000	Drawing #: 1.1
Drawn By: H. Serhan	
Checked By: M. Smith	

1.3 Proponent Description

The proponent is Pockwock Wind Limited Partnership, a partnership that is being formed between Chebucto Pockwock Lake Wind Field Limited (CPL) and juwi Wind Canada Ltd. (juwi). The partnership is also utilizing Community Wind Farms Inc. (CWFI) to lead aspects of local development services and community engagement.

CPL was formed in 2012 as a wholly-owned subsidiary of Chebucto Wind Field Inc. (CWF). CWF was formed in 2002 along with seven other community wind field companies that are located in different regions across Nova Scotia. Since 2006, CWF has invested over \$495,000 on behalf of shareholders in independent renewable energy companies in Nova Scotia including Scotian WindFields Inc. and Renewable Energy Services Ltd. In 2012, CWF also incorporated and invested in Chebucto Terence Bay Wind Field Limited (CTB). In 2012, CTB obtained COMFIT approval for a 6 MW wind energy project in Terence Bay. It is intended that both CPL and CTB will become project specific Community Economic Development Corporations (CEDCs) upon approval of Offering Documents by the Nova Scotia Securities Commission.

In accordance with COMFIT rules, CPL will be the majority owner of the Project. Additionally, CPL will be instrumental in ensuring the Project integrates smoothly with the local community and cultural surroundings. CPL will also help the team maximize local economic benefits to the community through job creation and utilization of local contractors.

CLP's mandate is to raise capital for the Project through the sale of shares to local investors and to invest this money directly into the partnership. CPL's strength in part lies in the extensive and broad based experience of CWF. Similarly, CPL's board of directors is a well-rounded group of professionals with experience in business, economics, investment, environmental management and financial administration. The board is comprised of and elected by the shareholders at the CPL Annual General Meeting (AGM) which is held in Halifax. More information about CWF may be found on its website at:
<http://www.chebuctowindfield.ca>.

juwi is the Canadian subsidiary of the juwi Group: an experienced renewable energy project developer with more than 2,600 MW of 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 turnkey 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 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 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, which could 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 introduced by the Nova Scotia Department of Energy. For more information about CWFI please visit: <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 nor is it 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.

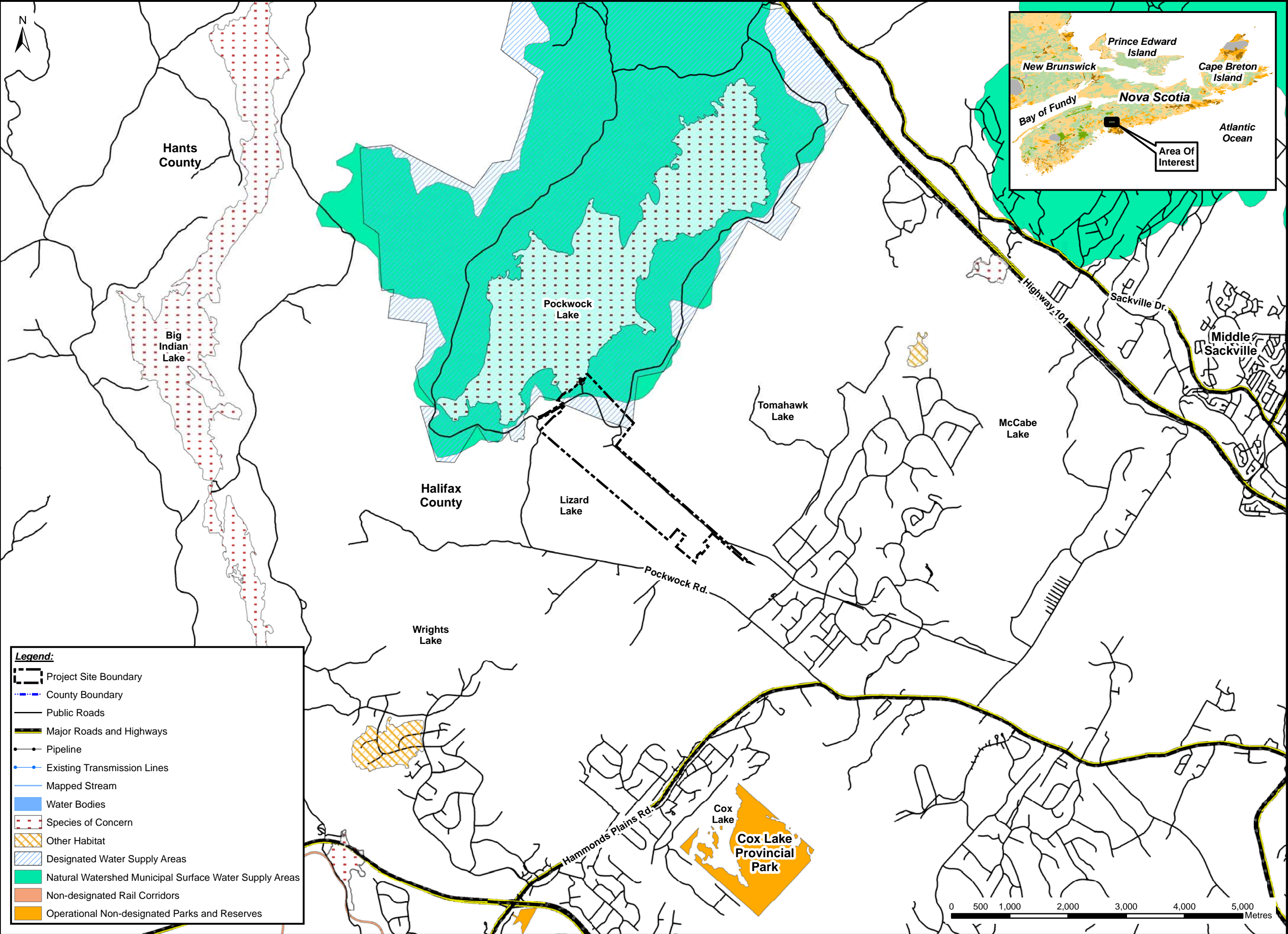
1.4.2 Provincial

The Project is subject to a Class I EA as defined by the Environmental Assessment Regulations under the Nova Scotia *Environment Act* (NSEA) (1994-95). 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).

Pockwock Lake is the public water supply for Halifax, Bedford, Sackville, Timberlea, Fall River, and Waverly. Designated as a Protected Water Area (PWA) (Drawing 1.2) in 1995, approximately 86% the Pockwock watershed is protected under the Pockwock Lake Watershed Protected Water Area Regulations (NS Reg 12/95) of the NSEA. These regulations set restrictions on all activities within the PWA such as recreational activities, vehicles/vessels, fishing, forestry, chemical application, landfills, construction of corridors, soil erosion and sedimentation controls, and road building and maintenance. The northern portion (<25%) of the Project site falls within the Pockwock PWA. None of the watercourses within the Project site drain into Pockwock Lake, as water from the northern and western portions of the Project site is intercepted by drainage associated with the road to the J.D. Klein Water Treatment Plant. Nonetheless, Project-related activities that fall within the PWA boundary are subject to the PWA regulations cited above. Approximately 1.1 ha of construction-related disturbance, and 0.27 ha of permanent disturbance is expected within the PWA boundaries as a result of Project activities.

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

Additional provincial permits will be required and are listed in this report in Section 17.



- Notes:**
- Reference: Digital Topographic Mapping By Nova Scotia Geomatics Centre. Nova Scotia Department of Natural Resources (NS DNR) Significant Habitat And Restricted And Limited Land Use Database.
 - Projection: NAD83(CSRS), UTM Zone 20 North.

Ristricted and Limited Use Lands



Date:	April 2013	Project #:	12-4326
Scale:	1:60,000	Drawing #:	1.2
Drawn By:	H. Serhan		
Checked By:	M. Smith		

1.4.3 Municipal

The HRM has adopted a Regional Plan and Community Energy Functional Plan, recognizing the need for alternative sustainable energy and more specifically, the creation of new policies for the siting of wind energy facilities in HRM (HRM 2012). Three energy overlay zones have been created to reflect how wind energy facilities should be treated differently between the urban and rural areas of HRM. Based on the document "Beaver Bank, Hammonds Plains, and Upper Sackville Land Use By-law" (HRM 2011) the proposed Project would be considered a "Large Wind Energy Facility". The Project site is situated within the Rural Wind Zone (RW-2) and is therefore subject to the requirements of Section 4.32 of the by-law which allows all wind energy facilities, subject to a Development Permit and as long as the facility adheres to several setbacks and guidelines, as outlined in Appendix A.

The portions of the Project site that do not fall within the Pockwock PWA boundaries form part of the Pockwock Lake unprotected watershed area (approximately 25%) and the Tomahawk Lake unprotected watershed area (close to 50%). All lands within the Project site are owned and managed by Halifax Water.

The portions of the Project site that fall under the Pockwock Lake and Tomahawk Lake unprotected watershed areas do not have the same provincial regulations in place, and are instead subject to the *Halifax Regional Water Commission Act* (2007). Halifax Water has its own restrictions and best management practices (BMPs) in place to protect the portion of the Pockwock unprotected watershed that lies within Halifax Water controlled lands. Tomahawk Lake watershed is the secondary (future) drinking water supply for the area. Halifax Water manages the Tomahawk Lake watershed area as part of the current Pockwock system by following the same BMPs and watershed protection practices.

All activities, restrictions, and BMPs within the Pockwock Lake and Tomahawk Lake watersheds are managed by the Watershed Management Committee, led by Halifax Water, as outlined in the "Pockwock Lake and Tomahawk Lake Watersheds Source Water Protection Plan (SWPP)" (Halifax Water 2009). Ultimately, Halifax Water is responsible for monitoring and managing all activities within the two watersheds that may impact source water quality. Restrictions, regulations, and BMPs applicable to the Project have been included in the General Mitigation and Best Practices outlined in this report in Section 4.8.

All required municipal permits and approvals (Section 17) will be obtained prior to construction.

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	Content
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

1.6 Authors 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:

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

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 and Layout

The Project will be powered by five wind turbines, each rated at 2.0 MW, for a nominal capacity of 10.0 MW 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, multiple turbine manufacturers and 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, highest noise output, most sound output, as appropriate to the specific modeling assessment).

The final Project layout is still under evaluation. As such, seven possible locations for the five turbines are presented in the EA and to be conservative, assessment for sound and shadow flicker was completed in consideration of all seven locations.

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;
- 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 and 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 Roads Construction

There are approximately 3.5 km of proposed roads (including approximately 1 km of new road construction) required to access the turbine locations (Drawing 2.1). The existing road within the J. Douglas Kline Water Supply Plant will be upgraded and used as a starting point for site access. All roads (existing and new construction) are 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.

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:

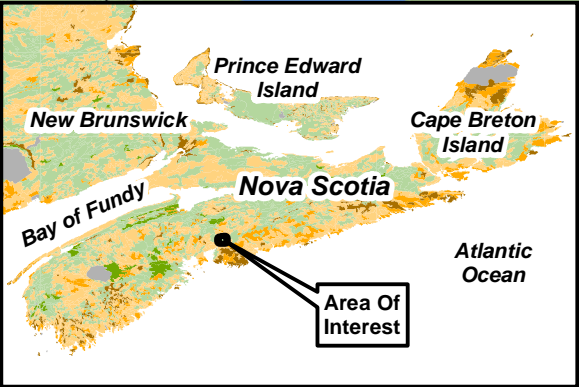
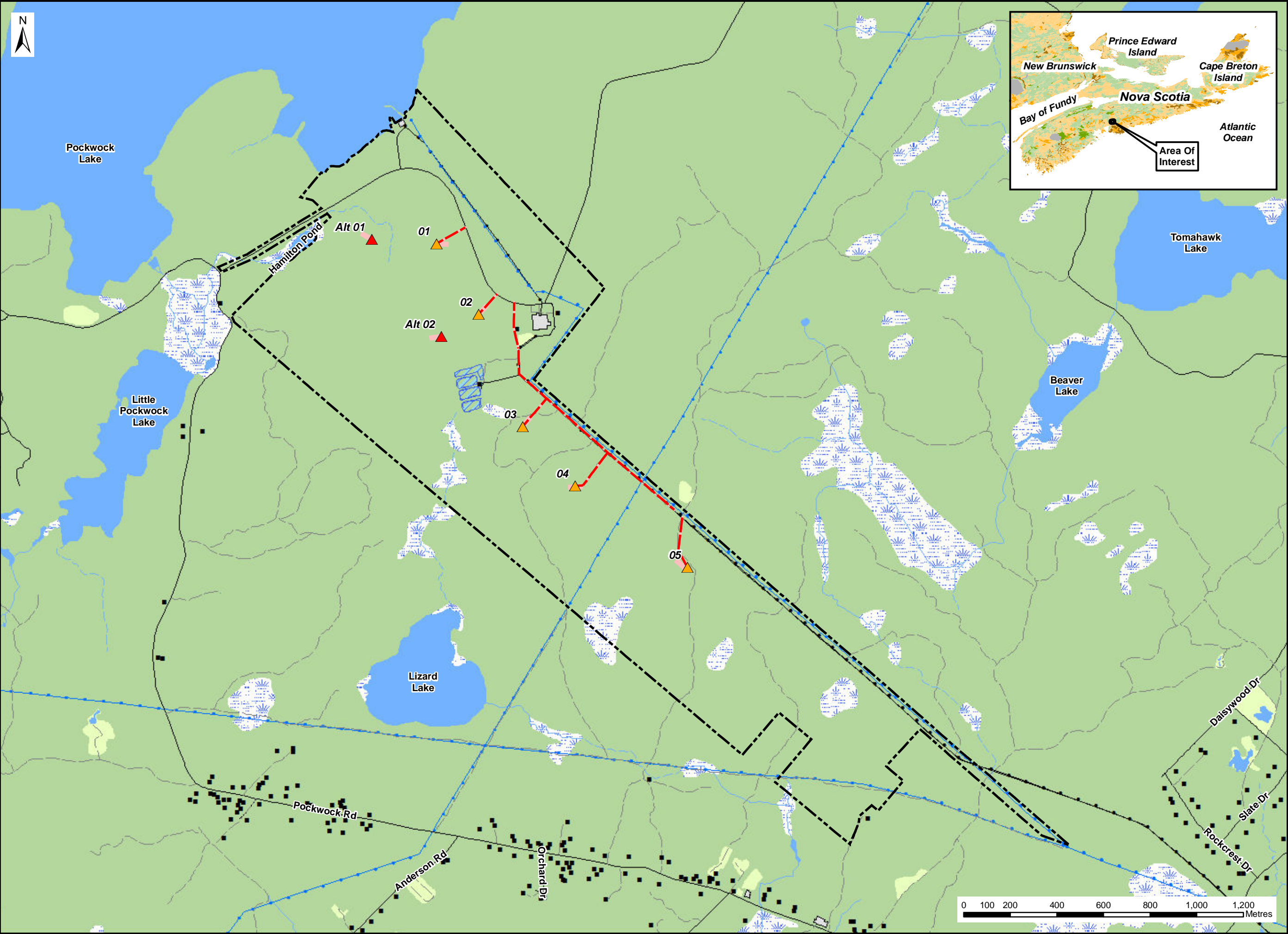
- Excavators;
- Dump trucks;
- Bull dozers;
- Rollers;
- Graders;
- Crusher; and
- Light trucks.

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.



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

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

Turbine and Road Layout



Date: April 2013	Project #: 12-4326
Scale: 1:15,000	Drawing #:
Drawn By: H. Serhan	2.1
Checked By: M. Smith	

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. Of the possible conflicts identified, the overpass at the Hammonds Plains Road and 102 Highway poses the largest potential for conflicts. If wind turbine components are too large to fit under the overpass an alternate route will need to be chosen.

Culvert crossings typically do not require upgrades before transporting oversized components, however, there were two wooden box culverts noted: one at 2120 Hammonds Plains Road, close to Hammonds Plains Consolidated School; and on Pockwock Road near the Upper Hammonds Plains Community Centre at 711 Pockwock Road. It is recommended that these culvert crossings be identified during the permitting process with Nova Scotia Transportation Infrastructure and Renewal (NSTIR) so staff can conduct structural reviews prior to transport. Structural deficiencies for all watercourse crossings are typically identified and addressed during the NSTIR permitting process.

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.
4. Once on the Bedford Highway, truck traffic will continue until reaching the Hammonds Plains Road where they will turn left and head west toward the 102 Highway.
5. Traffic will continue on the Hammonds Plains Road crossing under the 102 Highway and heading towards Upper Hammonds Plains.
6. Truck traffic will turn right at the intersection of the Hammonds Plains Road and Pockwock Road.
7. Truck traffic will continue on the Pockwock Road until reaching the site access road at the J. Douglas Kline Water Supply Plant, located at 1749 Pockwock Road.

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. Specialized equipment may be required for the safe and efficient handling of wind turbine components.

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.

Equipment expected to be used for turbine assembly includes but is not limited to:

- 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 25.0 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 0.9 km 336ASC line extension from the first turbine will extend Nova Scotia Power (NSPI) circuit 137H-413 to the generator site from Pockwock Road.

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.

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 and sanded, as required for safe driving and to ensure access in the event of an emergency. All roads within the Pockwock Watershed are maintained with sand only, aside from Hwy 101 and a small portion of the water supply plant access road, which are salted.

A vegetation management plan will be initiated to ensure that access roads and turbine locations remain clear of vegetation. Vegetation management will include mechanical removal and pruning as the application of chemical herbicides is restricted within the PWA and on all Halifax Water-controlled lands. Timing of vegetation management will depend on site specific conditions.

Public access to the wind farm will be restricted to vehicular traffic, as the treatment plant access road is gated to restrict traffic to the facility. The site can still be accessed on foot or via all-terrain vehicles (ATV) on trails and a gated gravel road to the north of the site. 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 and 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 Project facilities to 3 feet below grade, and reinstatement with top soil to ensure stabilization of the land;
- Removal, recycling (where possible), and disposal of Project-related debris, equipment and materials;
- Restoration of the property, including soil, to a condition reasonably similar to its original condition.

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	Fall 2011-Spring 2013
EA Approval	Summer 2013
Follow-up Environmental Studies	2013/2014
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 (e.g., watercourses and wetlands).
- The Halifax Water forestry BMPs for the Pockwock Lake and Tomahawk Lake watersheds and the Pockwock Lake PWA will be adhered to during all clearing activities.
- All clearing activities will comply with the Forest Fire Protection Regulations (NS Reg 82/2011) made under Chapter 179 of the *Forests Act* (1989).
- 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 and Halifax Water in advance of blasting activities.
- Landowners will be notified of any blasting activities.
- Where blasting is required, all blasting activities will comply with the requirements of any applicable existing HRM 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* 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 addressed 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 NSEA), and in consultation with relevant regulatory departments.

4.3 Transportation

- 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 public safety.
- Upgrades will also be made to roads and overhead wires, branches, and signs if conflicts arise.
- For areas requiring modifications and reinstatement, these will be completed to NSTIR specifications.
- Road construction and upgrades will be completed in consideration of restrictions, regulations and BMPs related to the Pockwock Lake and Tomahawk Lake watersheds, and the Pockwock Lake PWA.
- Road construction and upgrades will only be completed between June 1 and September 30 of any year.
- At any given time, no more than 1,900 m² of roadway sub-base will be exposed within the Pockwock PWA.
- To the extent possible, transportation 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. It is recommended that consideration 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.
- No vehicle of any kind will be operated on or over any wetland, watercourse or waterbody within the Pockwock Lake and Tomahawk Lake watersheds without prior authorization from NSE and/or Halifax Water.

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.
- Special consideration will be taken for the Pockwock Lake and Tomahawk Lake watersheds by developing and/or implementing existing BMPs for dust management in consultation with NSE and Halifax Water.
- 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.
- Noise-generating construction activities will comply with the requirements of existing by-laws (where applicable).
- 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 minimize 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 (ESCP) will be developed during the design phase of the Project, and will include a storm water management plan. The ESCP will be designed with consultation from Halifax Water and approved by NSE to ensure all Pockwock Lake and Tomahawk Lake watershed restrictions and BMPs are followed.
- 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, authorization from NSE and/or Halifax Water will be sought and 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.
- No water which has a suspended solid concentration greater than 50 mg/L will be discharged from any area located within the PWA, Pockwock Lake, or Tomahawk Lake watershed boundaries.
- 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 Watercourse Crossings

- Any required watercourse crossings will comply with existing regulatory requirements including the “Nova Scotia Watercourse Alteration Specifications” (NSE 2010), the Pockwock Lake Watershed Protected Water Area (PWA) Regulations (NS Reg 12/95), and the “Pockwock Lake and Tomahawk Lake Watersheds Source Water Protection Plan” (Halifax Water 2009).
- 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.
- All crossing structures will be added to Halifax Water's existing Pockwock and Tomahawk Watersheds Bridge and Culvert Inventory to ensure ongoing monitoring and maintenance of crossing structures is achieved.
- Removal of crossing structures during decommissioning will also follow applicable watershed regulations and restrictions.
- Additional mitigation strategies specific to the protection of fish and fish habitat are outlined in Section 14.2.1.

4.8 Source Water Protection

Though none of the watercourses within the Project site drain directly to Pockwock Lake, special consideration has been given to source water protection within the Pockwock Lake and Tomahawk Lake watersheds, including the Pockwock Lake PWA.

- A site-specific EPP and ESCP will be developed and implemented in consultation with NSE and Halifax Water to mitigate risks to surface water quality. Existing regulations, restrictions and BMPs will be incorporated into the EPP, where applicable to Project activities. The Project EPP will be designed to draw upon and complement the existing SWPP (Halifax Water 2009).
- No petroleum products, soaps, detergents, chemicals, solid or liquid waste, or any other matter or substance that may cause an adverse effect will be disposed of or discharged to a watercourse or any other area within the Pockwock or Tomahawk watersheds, including the Pockwock Lake PWA.
- No roads or transmission lines will be constructed or easements granted on, over or across the Pockwock Lake PWA without written approval by the NSE following consultation with the Watershed Management Committee.
- 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 in consultation with Halifax Water, with specific consideration for the protection of the Pockwock Lake and Tomahawk Lake watersheds (including the Pockwock Lake PWA).
- Cleaning of construction vehicles will take place off-site, outside of the Pockwock Lake and Tomahawk Lake watershed boundaries.
- Additional source water protection measures will be developed through consultation with Halifax Water, to ensure all watershed BMPs are met.

4.9 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.
- Run-off from construction activities will be directed away from wetlands.
- Work near wetlands will not result in permanent diversion, restriction, or blockage of natural flow.
- Hydrologic function of wetlands will be maintained.

- Wetland alterations will not take place within the Pockwock Lake PWA, without explicit authorization from NSE and Halifax Water.
- Work vehicles and/or heavy equipment will be cleaned off site, (outside of Pockwock Lake and Tomahawk Lake watershed boundaries) and inspected prior to use to prevent the introduction of weed/invasive/non-native species to sensitive habitats such as wetlands.

4.10 Dangerous Goods Management

- All fuels and lubricants used during construction will be stored according to containment methods in designated areas, located a minimum 60 m from surface waters, wetlands, water supplies, and private wells.
- Refuelling in the field will not occur within 60 m of watercourses and water bodies.
- 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* (1992).
- Equipment will be kept in good working order, will be inspected regularly, and any observed leaks will be repaired.
- Any machinery leaking fuel, oil or other fluids will not be operated until properly repaired.

4.11 Waste

- Solid wastes, including waste construction material, will be disposed of off-site at approved facilities.
- Temporary storage of waste materials on-site will be located at least 60 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 to provincial waste regulations. All applicable materials will be stored as per WHMIS requirements and transported as per the requirements of the *Transportation of Dangerous Goods Act* (1992).

4.12 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.

5.0 ENVIRONMENTAL MANAGEMENT

5.1 Environmental Protection Plan

The EPP will be submitted following approval of the Project with special consideration given to source water protection within the Pockwock Lake and Tomahawk Lake watersheds, including the Pockwock Lake PWA. The final EPP will be approved by NSE and Halifax Water 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 effects. The EPP will be developed in consultation with NSE and Halifax Water to ensure all existing restrictions and BMPs related to source water protection are included.

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 NSEA.

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

- "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 the “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 five turbines, it is considered a small project. Based on the known existence of five 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 of potential interactions, identification off 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 HRM 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 effects 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;
- Where possible, avoidance of field identified watercourses, and maintenance of a vegetated buffer;
- Avoidance of lakes, or other visible open water bodies as identified in 1:50,000 provincial mapping;
- Where possible, avoidance of field identified wetlands, and maintenance of a vegetated buffer;
- 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 1,000 m setback (HRM setback) 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 1.0 times the tower height setback from property boundaries, in accordance with HRM by-laws ; and
- Maintenance of a 1.1 times the tower height setback from public roads.

The 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 EA METHODOLOGY

The methodological framework used in this EA has been developed to meet the requirements of the NSEA. 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 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 components, additional information has been provided in the report. Many of the interactions can be addressed using industry BMPs, restrictions and regulations associated with the Pockwock PWA, and/or restrictions related to land controlled by Halifax Water 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	<p>Atmospheric environment includes consideration of air quality and climate conditions. Concerns include:</p> <ul style="list-style-type: none"> - 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. <p>Only minimal amounts of dust and air emissions are expected. Mitigation for these effects is provided in Section 4.</p> <p>Project-related emissions are anticipated to be temporary, localized, and minor in nature. Measurable changes to the atmospheric environment are not expected.</p>	No	Section 8.1
Geophysical Environment	<p>Geophysical components include consideration of hydrogeology, groundwater, and bedrock and surficial geology. Concerns include:</p> <ul style="list-style-type: none"> - Damage from blasting to domestic water sources. - Localized disturbances to surface soils and shallow bedrock. <p>Once the location of any required blasting is confirmed and the geotechnical investigation is completed, the need</p>	No	Section 8.2

Environmental Component	Description	VEC Assessed further?	Applicable Section in the Report
	<p>to implement mitigation measures or monitoring programs will be evaluated.</p> <p>The likelihood of ARD to occur at the site will be determined following the results of the geotechnical evaluation. Mitigation for the effects of ARD is provided in Section 4.</p> <p>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.</p>		
Freshwater Environment	<p>Freshwater environments involve consideration of fish and fish habitat and the Pockwock Lake Watershed PWA. Concerns include:</p> <ul style="list-style-type: none"> - Loss or damage of fish habitat. - Decreased water quality. - Mortality of aquatic species. - Effects on municipal source (drinking) water quality. <p>It is expected that five 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 4.</p> <p>Additional protection for freshwater environments includes:</p> <ul style="list-style-type: none"> - Refuelling in the field will not occur within 60 m of watercourses/water body. - Washing of vehicles will be done off-site, outside of the boundaries of the Pockwock PWA and the Pockwock and Tomahawk watersheds. - Temporary storage of waste materials on-site will be located 60 m from watercourses/water body. - A site specific EPP and ESCP will be developed in consultation with Halifax Water with specific consideration for the Pockwock PWA and the Pockwock and Tomahawk watersheds. Existing regulations, restrictions and BMPs will be incorporated into these plans. <p>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.</p>	No	Section 8.3
Terrestrial Habitat, Flora and Fauna (including wetlands)	<p>Terrestrial habitat involves consideration of general and specialized terrestrial habitats, such as wetlands, as well as terrestrial flora and fauna. Concerns include:</p> <ul style="list-style-type: none"> - Habitat fragmentation. - Introduction of invasive species. - Damage to wetland ecosystems. 	No	Sections 8.4 and 8.5 and 8.6

Environmental Component	Description	VEC Assessed further?	Applicable Section in the Report
	<ul style="list-style-type: none"> - Mortality of some smaller faunal species due to clearing activities. - Loss of vegetation and effects to fauna and flora species due to clearing and construction as well as vegetation management. - Sensory disturbance to terrestrial fauna. <p>Habitat fragmentation is considered to be minimal due to the small-scale clearing required.</p> <p>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.</p> <p>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 and micro siting will be completed, as necessary, prior to construction.</p> <p>Environmental protection practices will be incorporated into clearing and grubbing activities (Section 4).</p> <p>Project-related effects on the terrestrial environment are anticipated to be temporary, localized, and minor in nature. Measurable changes to the terrestrial habitat, flora, and fauna are not expected.</p>		
Species of Conservation Interest (SOI)	<p>SOI are those species assessed as being at risk or sensitive to some degree. For the purposes of this EA, SOI include those species assessed as:</p> <ul style="list-style-type: none"> • “Endangered”, “Threatened”, or “Special Concern” under SARA; and • “Endangered”, “Threatened” or “Vulnerable” under the Nova Scotia <i>Endangered Species Act</i> (NSES) <p>Consideration is also given to species:</p> <ul style="list-style-type: none"> • 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). <p>Based on the above criteria, one aquatic SOI, and four terrestrial fauna SOI have potential to occur at the Project site.</p> <p>No plant SOI were identified at the Project site during field surveys.</p>	Yes	Sections 8.3, 8.5, 8.6 and 14.2.1

Environmental Component	Description	VEC Assessed further?	Applicable Section in the Report
	<p>Concerns include:</p> <ul style="list-style-type: none"> - Sensory disturbance. - Direct and indirect adverse environmental effects to habitat (loss or alteration). - Effects on passage/migration. - Direct mortality of individuals. <p>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, terrestrial and aquatic fauna SOCI are considered further in the assessment.</p>		
Avifauna	<p>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:</p> <ul style="list-style-type: none"> - Mortality resulting from direct collision. - Habitat alteration. - Sensory disturbance. <p>The requirements as set out in the <i>MBCA</i> will be adhered to for clearing activities (Section 4).</p> <p>Due to the potential effects of wind turbines on avifauna, this component is considered for further assessment.</p>	Yes	Sections 8.7 and 14.2.2
Bats	<p>The installation of wind turbines has the potential to impact bats both directly and indirectly. Concerns include:</p> <ul style="list-style-type: none"> - Mortality resulting from direct collision and/or barotrauma. - Habitat alteration. - Sensory disturbance. <p>The significance of these effects 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.</p> <p>Due to the potential effects of wind turbines on bat populations, this component is considered for further assessment.</p>	Yes	Sections 8.8 and 14.2.3
Local Economy/ Recreation and Tourism	<p>The socio-economic aspects such as economy, land use/value, and recreation and tourism maybe affected by the Project.</p> <p>The Project will likely create more local jobs, increase municipal tax revenues, and provide a community sustainability fund, thereby resulting in a positive change for economy.</p>	No	Section 9.1, 9.2 and 9.3

Environmental Component	Description	VEC Assessed further?	Applicable Section in the Report
	<p>Effects on land use are not expected in the area since the Project is located away from other economic activities. 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.</p> <p>The Project site is owned by Halifax Water and forms part of the Pockwock Lake and Tomahawk Lake watersheds, which are subject to varying levels of protection to maintain source drinking water quality. The Project site slightly overlaps with the Pockwock PWA, a designated area protected under provincial legislation. To ensure the protection of the public drinking water supply, public access is restricted.</p> <p>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.</p>		
Cultural and Heritage Resources	<p>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).</p> <p>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.</p> <p>An Archaeological Resource Impact Assessment (ARIA) was performed for the site and indicated that no negative effects to cultural and heritage resources are expected.</p> <p>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.</p>	No	Section 10
Mi'kmaq Resources	<p>If present, traditional Mi'kmaq flora and fauna resources may be affected by ground disturbance during construction and decommissioning activities.</p> <p>A Mi'kmaq Ecological Knowledge Study (MEKS) was</p>	No	Section 11

Environmental Component	Description	VEC Assessed further?	Applicable Section in the Report
	<p>completed for the Project. The results of the consultation process show that there has been little recent harvesting activity in the area near the Project site, though the current absence of Mi'kmaq from an area should not be mistaken for an absence of interest (current and future) of the area and its resources.</p> <p>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.</p> <p>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.</p>		
Human Health	<p>The public is often concerned about the potential for effects to human health from wind turbines. Concerns include:</p> <ul style="list-style-type: none"> - Sound. - Shadow flicker. - Infrasound. - Electromagnetic fields (EMF). - Effects to air quality from dust and air emissions. - Risk of ice throw. <p>A literature review regarding the potential for effects to human health from wind turbines was completed (Appendix C). The main findings from this review are as follows:</p> <ul style="list-style-type: none"> - 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). <p><i>(Note: Shadow flicker and sound have been considered separately).</i></p> <p>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.</p>	No	Section 12, Appendix C

Environmental Component	Description	VEC Assessed further?	Applicable Section in the Report
Shadow Flicker	<p>Shadow flicker can occur when rotating blades cast flickering shadows during times of direct sunlight.</p> <p>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.</p> <p>Shadow flicker, therefore, is not expected to be an issue at any existing residence/dwelling in the vicinity of the Project.</p>	No	Section 12.1
Sound	<p>Sound is generated during all phases of the wind farm. Concerns include:</p> <ul style="list-style-type: none"> - Noise during construction and decommissioning phases. - Annoyance and unpleasantness, for local residents in close vicinity, from turbine blades during operation. <p>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.</p> <p>A study was carried out of the existing ambient sound levels near the Project site. Average existing ambient sound levels at two locations near the Project site boundaries were observed to be 38.7 and 43.3 dBA during the monitoring program.</p> <p>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).</p> <p>□ 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 during operation will be completed, as required.</p>	No	Section 12.4
Electromagnetic interference (EMI)	<p>The rotating blades and support structures of wind turbines can interfere with various types of electromagnetic signals emitted from telecommunication and radar systems.</p> <p>An EMI study completed for this Project indicated that there were no objections regarding EMI effects associated with the Project provided to date.</p>	No	Section 12.2