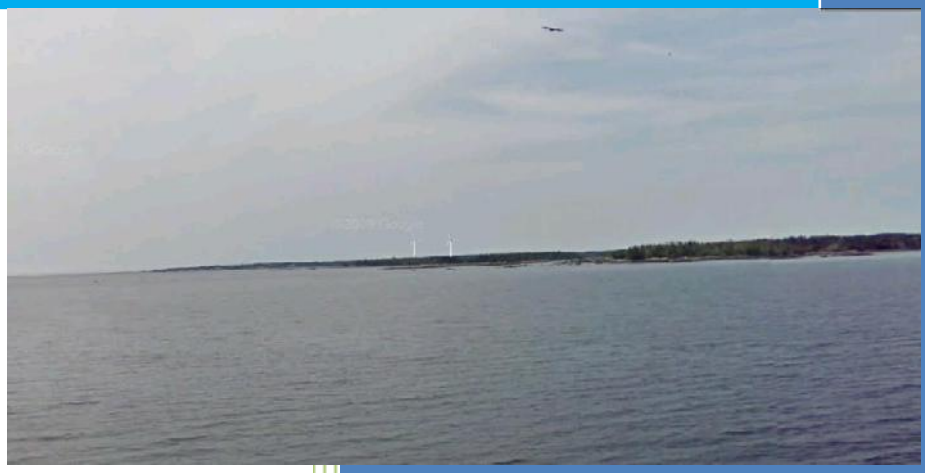
Wattswind
THE ENERGY TO LEAD

Barrington Wind Farm Environmental Assessment



Prepared for: Watts Wind Energy Inc.

Prepared by: Eon WindElectric

In Association with: Verterra Group

1/31/2013

Contents

List of Figures

List of Tables

List of Appendices

LIST OF ACRONYMS

ACCDC	Atlantic Canada Conservation Data Centre
AFN	Acadia First Nation
ARIA	Archaeological Resource Impact Assessment
asl	above sea level
BWF	Barrington Wind Farm
BOP	Balance of plant
CanWEA	Canadian Wind Energy Association
CAO	Chief Administrative Officer
CEDIF	Community Economic Development Investment Fund
CLC	Community Liaison Committee
cm	centimeter
COMFIT	Community Feed In Tariff
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWS	Canadian Wildlife Services
dBA	A-weighted decibel
DND	Department of National Defence
EA	Environmental Assessment
EC	Environment Canada
ELC	Ecological Land Classification
EPP	Environmental Protection Plan
GIS	Geographic Information Systems
GJ	Gigajoule
ha	Hectares
IBA	Important Bird Area
km	kilometer
KMK	Kwilmu'kw Maw-klusuaqn
kV	kilovolt
m	meter
m^2	square meter
m^3	cubic meter
MAPC	Maritime Aboriginal Peoples Council
MARI	Maritime Archaeological Resource Inventory
MBBA	Maritime Bird Breeding Atlas
MBCA	Migratory Bird Convention Act
MBR	Migratory Bird Regulations
MEKS	Mi'kmaq Ecological Knowledge Study
MFN	Millbrook First Nation
MW	Megawatts
NSDNR	Nova Scotia Department of Natural Resources
NSDOE	Nova Scotia Department of Energy
NSE	Nova Scotia Environment

NSM	Nova Scotia Museum
NSPI	Nova Scotia Power Inc.
NSTIR	Nova Scotia Department of Transportation and Infrastructure Renewal
OAA	Office of Aboriginal Affairs
PGI	Pellet Group Inventory
PPA	Power Purchase Agreement
RDA	Regional Development Agency
RABC	Radio Advisory Board Canada
RCMP	Royal Canadian Mounted Police
RFP	Request for Proposals
RRSP	Register Retirement Savings Plan
SARA	Species at Risk Act
SNSMR	Service Nova Scotia and Municipal Relations
SPL	Sound Power Level
VEC	Valued Environmental Component
WAM	Wet Area Mapping
WTBL	Water table
WTG	Wind Turbine Generator
^{o}C	degree Celcius

1.0 Introduction

1.1 Overview

The Barrington Wind Farm (Project; BWF) is proposed as a 3.2 megawatt (MW) wind energy project installation about four kilometers (km) southwest of Barrington Passage in the Municipality of the District of Barrington (Municipality; District of Barrington). The site is located in the community of Atwoods Brook.

Watts Wind Energy Inc. (Proponent; Watts Wind) is a Nova Scotia based company that has been given approval from the Nova Scotia Department of Energy (NSDOE) under the Community Feed-in-Tariff (COMFIT) program. This approval allows the Project to be part of the COMFIT program but it is pending other requisite approvals such as a release under the Nova Scotia Environmental Assessment Regulations. This document was prepared to satisfy the requirements for an environmental assessment (EA).

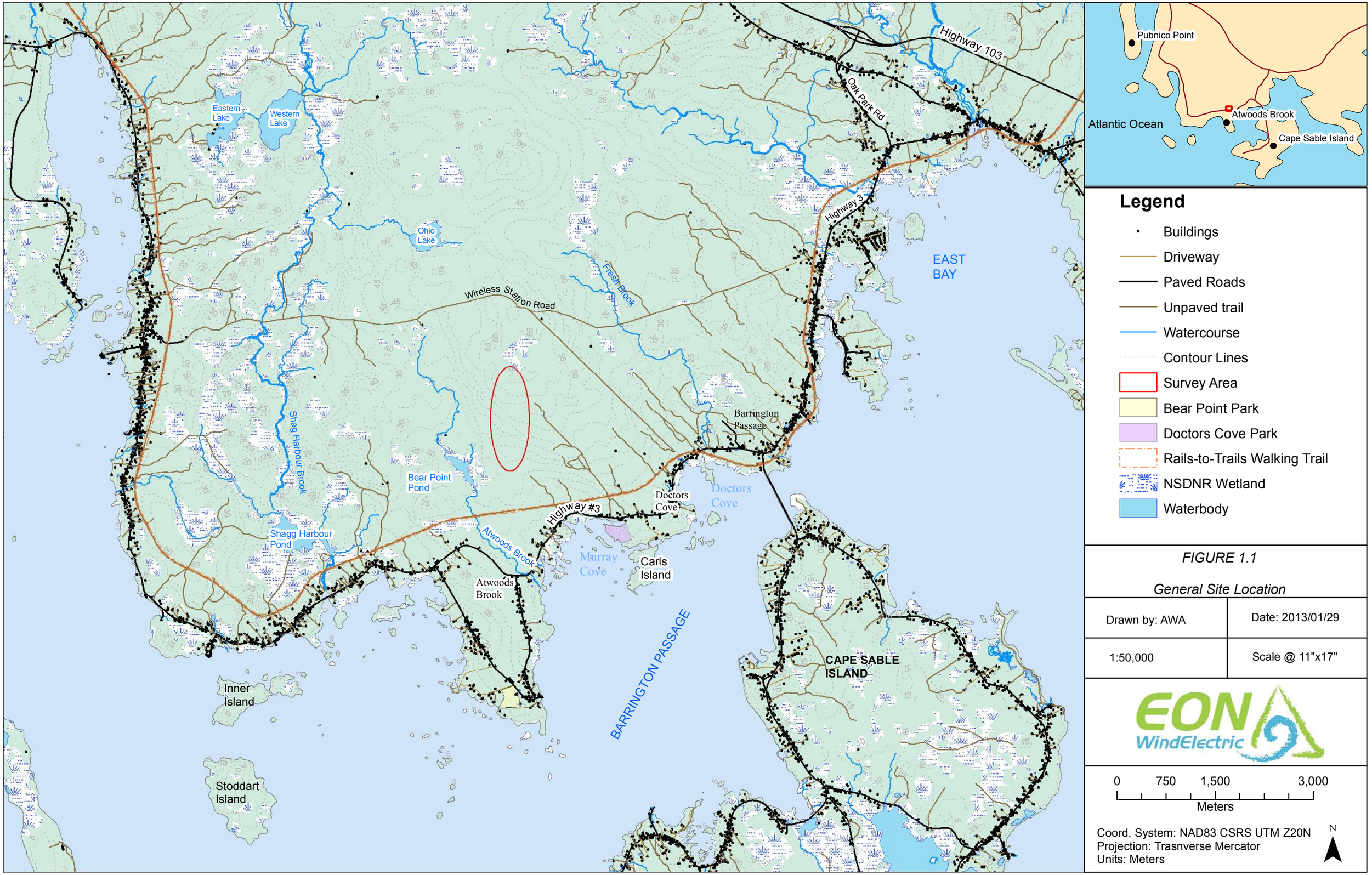
The Project is organized as a Community Economic Development Investment Fund (CEDIF) which is Registered Retirement Savings Plan (RRSP) eligible and provides additional tax benefits to eligible Nova Scotia investors. Nova Scotia residents, including residents of the District of Barrington, will have an opportunity to invest in the Project as part of the CEDIF structure. In addition, the Project is expected to create opportunities for construction, electrical and transportation contracts in nearby communities and the District of Barrington itself. The Project is funded privately; no government funding has been or will be provided.

The general site location and setting is shown on Figure 1.1. The area is rural in nature with some ribbon residential development along the roadways; the closest residence is more than 1000m distant from the nearest turbine. Watercourses and wetlands have been preliminarily identified in the study area; where direct alteration cannot be avoided by the Project, the impact will be minimized. All work associated with wetlands and watercourses will be in accordance with applicable regulations and any requisite approvals sought.

An equipment laydown area is required at each turbine site to facilitate the construction, including assembling and erecting the wind turbine generators (WTGs). An access road will be required from Highway 3 to deliver WTG components and for subsequent maintenance of the turbine. An electrical connection is needed from the WTGs; this will follow the access road routing from Highway 3. No maintenance buildings, fencing or a substation will be required. Extent of clearing required for Project construction will be well under 5 hectare (ha). More detail on location, site layout, wind regime, and proposed Project activities with a schedule can be found in Section 2.0.

1.2 Proponent

The Proponent is an independent power producer and has been awarded in excess of 20 MWs of wind power projects through the COMFIT program. The NSDOE COMFIT program is designed to encourage the development of community owned renewable energy projects across Nova Scotia. The program



Legend

- Buildings
- Driveway
- Paved Roads
- Unpaved trail
- Watercourse
- Contour Lines
- Survey Area
- Bear Point Park
- Doctors Cove Park
- Rails-to-Trails Walking Trail
- NSDNR Wetland
- Waterbody

FIGURE 1.1

General Site Location

Drawn by: AWA	Date: 2013/01/29
1:50,000	Scale @ 11"x17"

EON WindElectric

0 750 1,500 3,000
Meters

Coord. System: NAD83 CSRS UTM Z20N
Projection: Trasnverse Mercator
Units: Meters

N

offers a fixed price for the sale of qualifying renewable electricity to Nova Scotia Power Inc (NSPI), thus reducing the risk to the community entities by guaranteeing a market for the electricity.

The Proponent was awarded a COMFIT contract from the NSDOE on July 31st, 2012 for a total of 3.2MW at Barrington (Appendix 1). The company has an additional 14MWs of projects pending approval from the NSDOE at alternative locations across Nova Scotia. The company was formed in 2008 as a special purpose CEDIF to fund the development and construction of a 1.5MW wind power project in Watt Section, Nova Scotia. They were awarded a 20 year PPA for this eastern shore project from NSPI. This followed their response to a request for proposals (RFP) for distribution level wind power projects. This project was successfully funded by the community and commenced operation on March 30, 2011, following Federal EA approval. Since this time, Watts Wind has pursued many other opportunities for community wind energy projects under the COMFIT program.

Partners of Seaforth Engineering Group, Eon WindElectric Inc. and others came together to form Watts Wind. The principals in Watts Wind have extensive experience in all facets of renewable energy project development, operation and management, having collectively installed more than 200MWs of wind and hydro power projects and raised in excess of $50 million in public market equity and debt. Watts Wind Energy Inc. and its principals have been involved with several projects that required a provincial environmental assessment (Digby Wind Farm, Amherst Wind Farm, and Fermuse Wind Farm in Newfoundland). The principals are Watts Wind include:

- Stanley Mason, President of Watts Wind, is the co-founder of Seaforth Engineering Group Inc., Atlantic Orient Canada Inc. and Seaforth Energy Inc. He has over 20 years of marine engineering and project management experience in the provision of consulting engineering services to the renewable energy and marine industries**.**
- Paul Pynn, Vice President of Watts Wind, is the President and founder of Eon WindElectric Inc. Since its inception in 2006, Eon has provided engineering and project management services to more than 200MW of wind energy projects in Eastern Canada and abroad.
- David Regan, Chairman of Watts Wind, is Executive Vice President, Corporate Development of DHX Media Ltd. and previously worked in finance and consulting in New York and London.

1.3 Regulatory Framework

1.3.1 Federal

There are no environmental approvals expected to be required from Federal authorities for the Project. The Project is not expected to result in impacts such as a harmful alteration, disruption or destruction of fish habitat or impact to navigable waters. No work is proposed on Federal lands nor are Federal monies involved. Environment Canada (EC) / Canadian Wildlife Service (CWS) have been informally consulted with respect to migratory birds.

Aviation approvals are required for wind energy projects. The Proponent has made appropriate applications to NAV CANADA, Canadian Coast Guard, Transport Canada, and Department of National Defence (DND). Appendix 2 shows all responses and approvals from Federal aviation and navigation authorities.

For more information on consultation with Federal authorities, refer to Section 5.3.

1.3.2 Provincial

As the Project is a 3.2MW wind energy project, it is triggered for a Provincial EA as per the Environmental Assessment Regulations. For any wind energy project with a capacity exceeding 2MW, a Class 1 EA is required according to Schedule A of the Regulations.

The Proponent has identified wetlands on site and will implement the mitigation sequence of avoidance, minimization and compensation as per the Nova Scotia Wetland Conservation Policy (2011). Additional field work by certified wetland delineators is planned in Spring 2013 to follow up on wetland identification along the proposed access road route. Any change in proposed Project footprint will also be subject to additional work on wetlands. Avoidance of wetlands is ideal; however, it may not be feasible. Where avoidance is not feasible, the Proponent will apply for requisite approvals, i.e., Wetland Alteration Approval, and ensure these are in place before any alteration occurs.

As part of the proposed access road, up to five culverts are required to maintain the low flow and intermittent flow watercourses that generally drain southeast. As this work will be completed in a manner consistent with current applicable guidelines and standards issued by Nova Scotia Environment (NSE) and the culvert will be installed between June 1 and September 30, no approval is expected to be required though a Culvert Notification will be submitted to NSE (i.e., Category 1 Water Approval) as per Section 5(1)(d) of the Activities Designation Regulations (Government of Nova Scotia, 2011a).

The Proponent is working with NSDNR to obtain an easement across the existing rails-to-trails path at the entrance of the proposed access road.

As work will be completed at the intersection of Highway #3 and the access road, a Working Within Highway Right-of-Way will be required from Nova Scotia Transportation and Infrastructure Renewal (NSTIR). A Transportation Study and Traffic Management Plan, Sign Permit, and a Special Move: Over-Dimension Permit will all be required for the construction of the BWF from NSTIR or Service Nova Scotia Municipal Relations (SNSMR) as appropriate.

No other permits or approvals are expected to be required from the Province; however, should this change, the Proponent commits to obtaining all requisite approvals prior to work. For more information on consultation with Provincial authorities, refer to Section 5.3.

1.3.3 Municipal

The Project is located within the Municipality of the District of Barrington (Municipality; District of Barrington), and the development of wind power projects is guided by the Municipal Planning Strategy, effective March 2012 (Municipality of the District of Barrington, 2012). The Proponent is aware of the requirement for the completion of a development agreement with the Municipality. Setback regulations governing the installation of industrial (i.e. height above ground level greater than 60m) are as follows:

- *Minimum setback from habitable dwellings and WTG of 1 kilometer.*

o The minimum yard requirements for WTG in any zone shall not be less than one and a quarter (1.25) times the total height of a horizontal access rotor or vertical axis rotor. Such distance shall be measured from the base of the turbine to the nearest property line.

o It shall be the intention of Council to require that safety concerns are addressed both on site and off site for matters of ice throw, blade throw, turbine collapse and emergency response.

o It shall be the intention of Council to require that proof of compliance with all requirements of the Canadian Environmental Assessment Act and Nova Scotia Environment Act for the proposal is included in the documentation submitted by the developer to the Municipality.

o It shall be the intention of Council to require that proof of compliance of the development with all requirements of the Department of National Defence, Environment Canada, Navigation Canada, Canadian Coast Guard, Royal Canadian Mounted Police, and Nova Scotia Department of Natural Resources is included in the documentation submitted by the developer to the Municipality.

The Proponent has engaged with the District of Barrington planning and development officials on several occasions. Refer to Section 5.3 for a summary of consultation with the Municipality.

1.4 Structure of Document

This report documents the assessment of the environmental effects of the proposed construction, operation and decommissioning of the BWF. The EA has been completed based on potential for interaction of the proposed Project with the environmental and socio-economic setting. This report has been prepared in accordance with the Proponent's Guide to Wind Power Projects: Guide for Preparing an Environmental Assessment Registration Document (Nova Scotia Environment, 2012).

The document was prepared by Eon WindElectric in association with Ms. Janis Rod of Verterra Group Environmental Strategies Ltd. As an environmental consultant, Ms. Rod has completed numerous federal and provincial EAs within various industries, including the renewable energy industry. Her professional experience on scoping and reviewing the EA supported the expertise of Mr. Paul Pynn, President of Eon WindElectric, and Mr. Andrew Arbuckle, Project Engineer-in-training with Eon WindElectric, who compiled primary and secondary data sources and drafted the majority of the EA document. Other expertise was contracted externally as defined later in this report.

Following this introduction of the EA report, the Project is described in Section 2 in terms of location, wind regime, and the proposed WTGs. In addition, activities in major phases of the Project are described. The potential for accidents and malfunctions are also described, as well as a discussion on limitations for potential for future phases. Section 3 presents the scoping and methodology used in the EA. The environmental setting is presented in Section 4 including biophysical and socio-economic aspects. Section 5 describes the consultation program completed to date and ongoing plans within the community at Barrington, the Mi'kmaq, and regulators. The analysis of the interaction of the Project and the environmental setting is presented in Section 6 based on valued environmental components (VECs)

and socio-economic aspects. Section 7 presents the commitments of Watts Wind Energy Inc. to follow up and monitoring of the Project while the closure, including signature of the Proponent, is provided in Section 8. Following the bibliography, the appendices contain supporting information as referenced in this document including correspondence and reports completed for the Project.

2.0 Project Description

2.1 Site Location and Layout

The BWF is located on privately owned land at the location of 45°30'20.40"N, 62°36'24.13"W. The Proponent plans to construct and operate a 2 WTG, 3.2 MW wind farm near Atwoods Brook, in the Municipality of the District of Barrington (Figure 2.1). The nearest communities surrounding the site are Bear Point (3.5kms S), Doctors Cove (2.1km E), and Shag Harbour (3.9km E). The Town of Barrington Passage is located 4.1km east of the site, and Cape Sable Island is located 3.6km southeast of the Project works. Setback distances from the nearest receptors (i.e., habitable dwellings) are greater than 1000m.

The BWF will be connected to the distribution grid on Highway 3, which feeds the nearby Barrington substation via a 12.5 kilovolt (kV) distribution feeder emanating from the substation along Highway 3. The Project components include the WTGs (nacelle, blades, tower sections), access roads, medium voltage (12.5kV) power lines and pole infrastructure, laydown areas, concrete foundations, and pad mount transformers. The BWF will not require the construction of a substation because it will connect to the pre-existing distribution substation (i.e., 22W in Barrington).

The lands under option agreements encompass an area of 167 ha with mixed hardwood and softwood tree growth. All properties are zoned as Rural Development and allow for the installation of utility scale wind turbines. The site is mainly used for private landowner wood harvesting.

The access road will be constructed off Highway 3 and appropriate permits will be obtained from NSTIR prior to construction. Watercourse and wetlands have been identified in the areas of the Project; all work will be within applicable watercourse and wetland legislation. The proposed area of disturbance, which refers to turbine laydown areas, turbine foundations and crane pad construction, will equate to approximately 0.8 ha per turbine (see Figure 2.2). Total area of disturbance is approximately 3.1 ha, which includes access roads and utility routing.

Beginning with the 2008 RFP contract award, the Proponent has gained extensive expertise in the prospecting and development of community-owned, distribution level wind energy projects across Nova Scotia. The COMFIT program allows community entities to connect projects with a total capacity less than the minimum load on the local distribution substation. Numerous constraints limit the areas suitable for the development of a distribution level COMFIT project; these include NSPI infrastructure in the surrounding area, wind regime, socio-economic factors (e.g., property setbacks, regional park areas, etc.) and ecological concerns. Consideration of these key factors have led the Proponent to consider the BWF site as the best alternative given the regulatory, socio-economical, ecological and technical considerations.

2.2 Wind Turbine Generator

Selection of the WTG make and model is ongoing for the Project. The Proponent will select WTGs based on, but not limited to:

i – performance of the WTG with site wind regime
ii – economic considerations

Legend

- Buildings
- WTG
- MET tower location
- Driveway
- Paved Roads
- Unpaved trail
- Proposed Utility Routing
- Watercourse
- Contours (10m)
- Proposed Access Route
- Municipal Bounds
- Doctors Cove Park
- Rails-to-Trails Walking Trail

FIGURE 2.1

Site Layout

Drawn by: AWA	Date: 2013/01/29
1:12,000	Scale @ 11"x17"

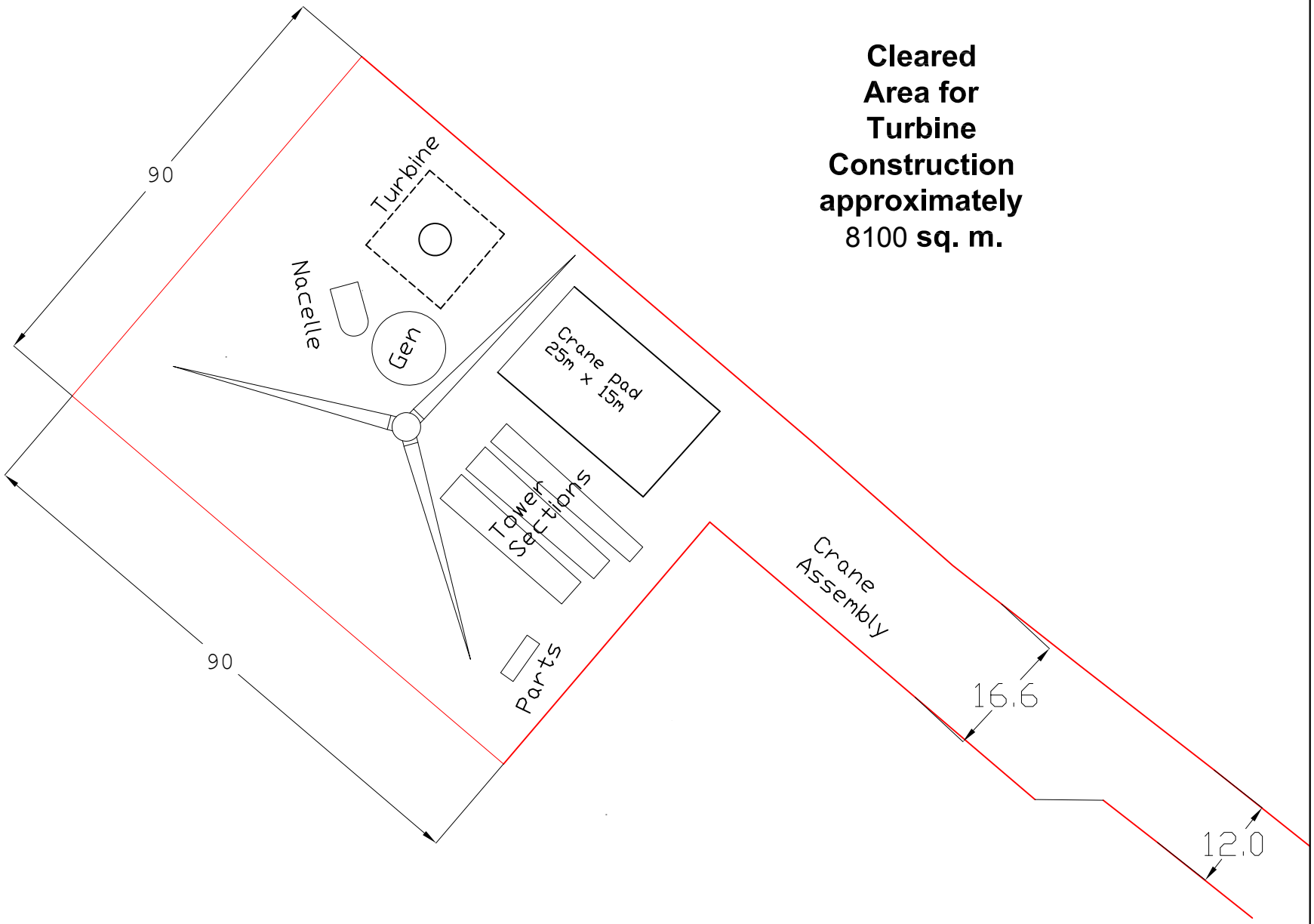
EON WindElectric

0 200 400 800

Meters

Coord. System: NAD83 CSRS UTM Z20N
Projection: Trasnverse Mercator
Units: Meters

N



Cleared Area for Turbine Construction approximately 8100 sq. m.

All Dimensions in m

Watts Wind Farm
Typical Turbine Laydown Area

Project Manager	Owner
EON WindElectric	Watts Wind Energy

Date:	September, 2012
Scale:	NTS
Revision:	0
Drawing No:	1000

iii – sound power level (SPL) at turbine hub height.

Final turbine selection will be made after the completion of supplier due diligence and additional technical studies. Individual turbine capacities will be in the range of 1.5-3MW, and tower heights will range from 78m to 98m. Total height (i.e., base to tip of turbine blade) will range from 117m to 144m. Lighting of wind turbine will conform to Transport Canada Standard 621. Correspondence on aviation approvals can be found in Appendix 2. Turbine coloring will be industry standard white or light coloring. An effort will be made by the Proponent to source WTG components (blades, towers, generators) domestically under commercially reasonable terms.

Each turbine will produce 60Hz, 3 phase power, and will be isolated and protected via a low voltage breaker located within the turbine. The turbine will be connected to the grid by low voltage cables that are connected to the system with a transformer either located outside of the turbine, or located in the basement of the foundation. A final pole mounted re-closer switch located on NSPI owned poles will further help to isolate and protect the turbine.

Maximum SPL at 95% of rated turbine capacity of 105.5 A-weighted decibel (dBA) has been used to conservatively model noise from the BWF. This is the highest SPL from the WTG types that are under consideration; hence a worst case scenario This was used in the predictive noise modeling as described in Section 4.2.4.

The Proponent will ensure final WTG selection and site layout will comply with Municipal setback requirements, and are not predicted to exceed 40dB(A) SPL at the nearest dwellings from Project operation. While not regulated in Nova Scotia, 40dBA is considered an acceptable noise level from community sources to protect sleep (e.g., Health Canada, Ontario provincial regulations, etc.); hence, it has been adopted by NSE as a guideline. Noise studies have been conducted using the turbines with the highest sound power levels in order to ensure conservative analysis results. Refer to Section 4.2.4 for a description of the noise evaluation completed for the Proponent.

2.3 Wind Regime

A detailed wind resource assessment at the BWF site commenced in August 2012 with the installation of a 60m meteorological tower. Wind direction, wind speed, atmospheric pressure and temperature are recorded and monitored on a daily basis. The wind turbine selected for the site will be based on International Electrotechnical Commission (IEC) standard 61400-1 for wind turbines among other technical and economic constraints listed in Section 2.2. The IEC 61400-1 is a set of international standards which are based on three wind regime characteristics which guide the selection process for wind turbines. The three characteristics of the wind regime are the 50 year gusts, turbulence intensity and annual average wind speeds. Meteorological tower data, correlated with nearby long term weather stations, will be used to determine the parameters outlined by IEC 61400-1, which will help guide the turbine selection process.

2.4 Planning and Design

Many of the impacts associated with projects can be avoided at the planning and design stage rather than relying on mitigation implemented only during construction and operational phases. In terms of the BWF, the site itself is an excellent candidate to locate WTGs due to its excellent wind resource, distance from residents, suitability of electrical connection, and minimal of ecological sensitivities.

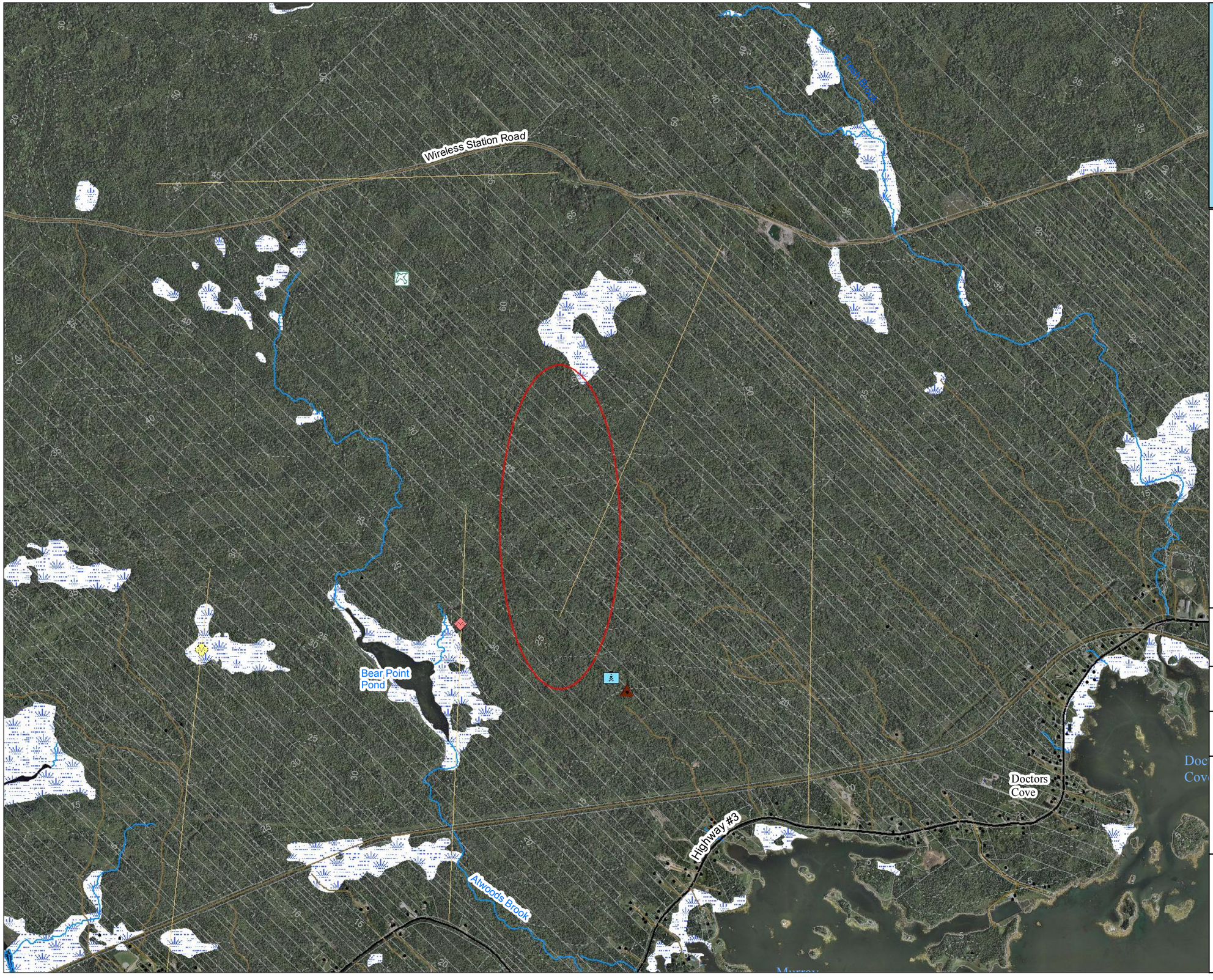
As part of work completed to plan and design the Project, a review of the site was completed from ecological and socio-economic perspectives. The proposed locations for the WTGs are located to avoid wetland and watercourses. The selection of locations also considered the distance from residential dwellings and visual impact. These types of considerations were combined with the assessment of wind resource to optimize the selected site. The final design of the necessary ancillary features, such as access road, is underway; its final design will where possible avoid and secondly minimize alteration of wetlands and watercourses. The approach is in line with Nova Scotia's Wetland Conservation Policy.

Final turbine micro-siting will be completed after a detailed wind resource assessment has been completed. Wetland delineation will also determine the most suitable location within the study area to site the WTGs, such that minimum wetland and watercourse alterations occur, if any. The site topography and surface water flow suggest that a more north-easterly access route and turbine siting may avoid wetlands identified in the original surveys. A possible alternate layout within the study area has been suggested by our field consultants; this alternate site is potentially higher in elevation and is under review. Turbine co-ordinates after final micrositing within the study area will be submitted to NSE.

The Proponent is continuing to assess ecological and technical considerations as Project planning proceeds. The commitments in this EA document to avoid and mitigate environmental impacts will define the final site layout. The potential alternatives are within the general study area as depicted in Figure 3.1 as is shown and described in the next section. Should either WTG locations or access road routing change as a result of this continued design, the Proponent will advise NSE and NSDNR as well as other stakeholders.

The alternative to the Project is electrical generation with fossil fuels or another renewable energy project. The 3.2MW wind energy capacity will provide approximately 40,000 gigajoules (GJ) of renewable energy, which will satisfy the energy needs of approximately 1300 Nova Scotian homes according to the Statistics Canada data on electricity consumption (Statistics Canada, 2007). The implementation of renewable energy such as the BWF is in line with Nova Scotia's Renewable Electricity Plan (Department of Energy, 2012). As a community energy project, it provides the renewable electricity locally, i.e., via the distribution grid, which also reduces losses of electricity that occurs in transmission lines. In addition, community members will be given the opportunity to share in ownership of the Project as investors in the CEDIF.

In summary, this is a small, community-based project which will provide distributed renewable energy to the grid and local economic benefit. Project design has and will be in consideration of technical,



Legend

- Buildings
- MET tower location
- Moose Scat
- Moose tracks
- Bat Survey Pnt
- Migration Vantage Pnt
- Moose Transects
- Driveway
- Paved Roads
- Unpaved trail
- Watercourse
- Contour Lines
- Survey Area
- NSDNR Wetland
- Municipal Bounds

FIGURE 3.1

Field Programmes

Drawn by: AWA	Date: 2013/01/29
1:18,000	Scale @ 11"x17"

EON WindElectric

0 250 500 1,000
Meters

Coord. System: NAD83 CSRS UTM Z20N
Projection: Trasnverse Mercator
Units: Meters

N

financial, social and ecological issues. Practical, mitigative measures have been included in the Project design to minimize residual environmental effects.

2.5 Construction

The construction phases deemed to be most relevant to the EA process are discussed in further detail: this includes site development; civil balance of plant (BOP) and electrical BOP Work, and turbine delivery, erection and assembly.

Table 2.1 outlines the proposed work schedule for the BWF. The schedule is subject to change, and proper notification will be given to the regulators and other stakeholders as appropriate.

Table 2.1: Project Schedule

Site Activity	Start Date (mm/yyyy)	Duration
Geotechnical Investigation-Site Survey	04/2013	2 weeks
Engineering Design and Procurement	04/2013	2 months
Clearing and Grubbing	08/2013	2 months
Civil/Electrical BOP Construction	09/2013	3 to 4 months
Turbine Installation	12/2013	1 to 2 months
Commissioning	01/2014	1 month
Commercial Operation Date	02/2014	N/A
Follow-up and Monitoring	02/2014	as required

The site development phase incorporates the activities needed to complete the design and tendering aspects of the BWF, as well as additional field work and final design of the Project. The major components include completion of land surveys for placement of roads and foundation pad, completion of geotechnical and engineering studies for foundation, road and electrical design, implementation of sediment and erosion control site clearing (i.e., trees, shrubs) and grubbing. The site development stage will require the use of light duty trucks, excavators and backhoes, forestry harvesting equipment and drill rigs.

The Proponent will complete a survey for breeding activity (i.e., nesting) prior to clearing. The Proponent is aware of the Migratory Bird Regulations (MBR), under the *Migratory Birds Convention Act* (MBCA), and the fact that Canadian Wildlife Service (CWS) cannot authorize incidental take of migratory bird nests or eggs for activities such as the construction of a wind farm and associated infrastructure. Therefore, trees will only be removed during bird nesting season pending outcome of the nesting survey. Site clearing will be completed with the use of standard forestry and road building equipment.

The construction phase activities include upgrading of existing woods road off Highway 3, new construction of access road to turbine pads, laydown area and crane pad construction, turbine delivery and assembly related activities, electrical infrastructure construction, temporary work structure installations, site restoration and remediation, and commissioning of site and turbines.

Environmental protection is a key part of construction. A draft EPP has been developed to communicate these protection mechanisms to the contractor, sub-contractors and site personnel (Appendix 3). This will be finalized based upon regulator comments, subsequent field work and final design of the Project. Wetland and watercourse identification occurred in summer and fall 2013, and final design is underway along with additional field work to ensure that where possible, alteration of wetlands and watercourses is avoided; where avoidance is not feasible, work will be limited to minimum alteration and be in accordance with regulatory requirements under requisite approvals if required. Archaeological studies have indicated there is a low likelihood for the presence of pre-Contact or European artifacts on site. Construction crews and site managers will be on alert for the presence of old foundations or artifacts with apparent archaeological significance. Erosion and sediment transport control will be followed according to the current version of the Province of NS Erosion and Sediment Control Handbook for Construction Sites (1988). Standard hazardous materials protocols will be followed during the project.

Turbine sites typically require construction of a level laydown area (typically 90m by 90m) for storage of turbine components and to create a safe and level working area. A crane pad (level, structurally sound area) typically 8m by 10m will be required at each turbine location as an operating platform for the main turbine erection crane. It is typically constructed using structural fill (surge and/or gravel).

The access roads will be upgraded and built to accommodate the size requirements of the crane and the load specifications to support the delivery of approximately 35 flatbed truck loads of turbine and crane components. The roads will be approximately 6-8m wide with ditches and culverts added where required to allow for proper drainage. Total length of access roads will be based on final road routing and turbine micro-siting. Refer to Figure 2.3 for a typical road cross section drawing. At present, approximately 1.1 km of new road is estimated to be required. Road routing based on a two WTG layout is shown in Figure 2.1.

Road grades will vary from 6%-8% depending on road curvature. Construction of new road will involve the removal of 0.5-1.5m of overburden and soil (depending on ground conditions) and will use NS Standards for Municipal Services as best practices for gravel based roads while accommodating for heavy truck and machinery transport. Geo-textile membrane may be used to reduce the amount of gravel required during construction of the access roads depending on soil conditions. Approximately 1 cubic meter (m^3) to $2m^3$ of gravel will be used for every meter of road construction.

The gravel used to supply the compacted surface will be obtained on site from borrow pits and/or along the side of the construction located within the Project boundary. Depending on soil conditions, some gravel may be obtained from approved gravel pits off site. The surface soil and grubbing will be re-located to borrow areas along the road side and graded to prevent erosion and sediment runoff. The ditches will be constructed along the road edge following provincial guidelines and procedures to control for surface water runoff.

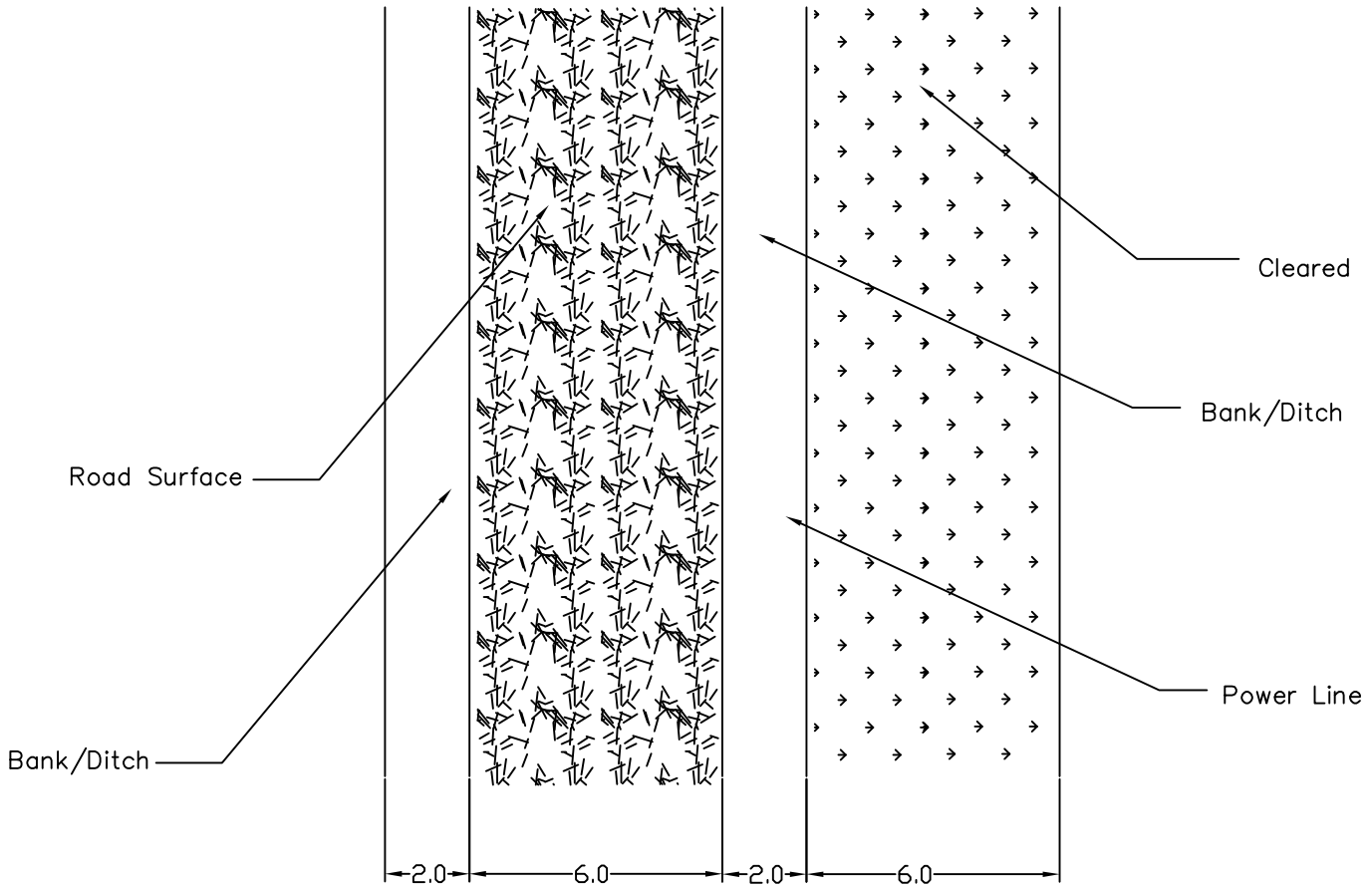
Following removal of any overburden vegetation, lands will be brushed with a bulldozer and backhoe to remove non-salvageable wood and brush. Scrub brush will be piled along disturbance boundaries and will have breaks installed to allow for water flow where necessary.

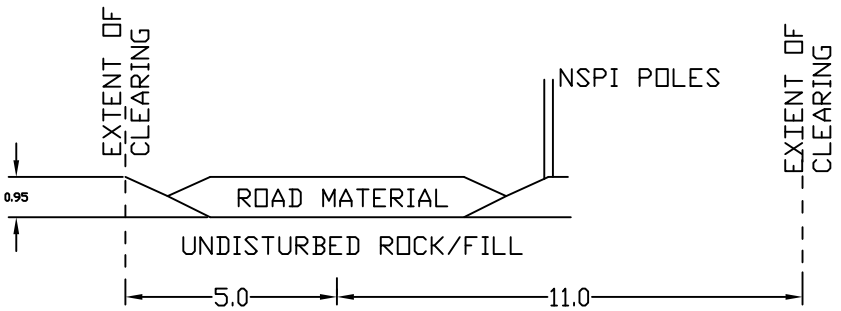
Notes:

1. All dimensions in meters (m)
2. All dimensions are approximate
3. Widths will vary on turns
4. Thicknesses will vary depending on grade

Key:

–





Title:

Figure 2.4
Road Cross Section

Project:

TYPICAL

Client:

Watts Wind Energy Inc.

Date: January 13, 2013

Scale: NA

Revision: 1a

Drawing No: NA

Following the completion of a wind resource assessment and geotechnical investigations (i.e., boreholes and core samples), turbine foundations will be designed and constructed. The activities associated with turbine foundation construction include: site clearing and grubbing, blasting of rock (if required), excavation of soils, building of forms and pouring of concrete pads, placement and compacting of backfill material to grade, trenching for electrical and communication conduit. Sediment control precautions and procedures will be implemented for the duration of foundation and crane pad construction. Turbine foundations will typically require approximately 300 m^3 of concrete which will be supplied from a redi-mix plant off site. Blasting Safety Regulations of Nova Scotia (2008) will be adhered to for any blasting required on site including the requirement for a pre-blast survey for water wells within 800m of the point of blast.

Electrical BOP construction will take place in conjunction with the civil BOP construction phase. The BWF is a distribution-connected wind power project, connecting to the local distribution infrastructure. Three phase 12.5kV power lines will be constructed along the access route. Substation construction will not be required for this project as it is connecting to the 12.5KV distribution system.

Wind turbine delivery will involve flatbed trucks and specialized trailers for delivery of the turbine towers, blades and nacelle. Access to the Project site for the construction of the WTGs will be via Highway 3 from Oak Park Road from Highway 103 off of Exit 30. NSTIR imposed spring weight restrictions will be incorporated by the Proponent when coordinating delivery of large and heavy components to the project site. The Proponent is aware of these delivery constraints and has engaged NSTIR to co-ordinate requirements. Turbine components will be delivered after civil and electrical BOP has been completed.

Crane and lifting contractors will build the WTGs. Tower components will be placed sequentially on the turbine foundation with the use of a large crane (up to about 120m). Assembly of the WTG components should take between 4-10 days depending on wind conditions.

Equipment used during the construction, delivery and assembly of the WTGs include dump trucks, excavators, concrete trucks, small, medium and large cranes, graders, rollers, bulldozers, flatbed trucks and specialized trailers, crushers (if material cannot be sourced locally), and light trucks. Local residents will be made aware of Project schedule and major construction activities (e.g., blasting – if required, turbine deliveries, etc.). During high traffic periods (e.g., concrete delivery during foundation pours), the Proponent will employ dust mitigation techniques, such as use of a water truck, as appropriate depending on weather.

Site restoration after completion of construction activities will include dispersing or removal of unused gravel and soil, grading of all areas, installation of permanent sediment and erosion controls, including stabilization, and removing construction materials from the site. Temporary shelters will be dismantled and removed from site. A gate will be installed at the entrance of the access road. Proper signage will be installed to notify wind turbine technicians and the general public of safety concerns onsite.

2.6 Operations and Maintenance

Operation and maintenance of the Barrington Wind Farm involve distinct activities. The operations side of the BWF will involve the following activities:

- ensuring compliance with environmental obligations and conditions;
- ensuring compliance with utility contracts and landowner commitments;
- monitoring of wind turbine performance;
- monitoring of grid or WTG faults;
- BOP maintenance (road maintenance and clearing, pad mount transformer inspection, site security); and
- dispatching of turbine technicians for scheduled and unscheduled maintenance.

The maintenance regime for the BWF will include the following activities:

- performance of regular maintenance; and
- performance of unscheduled service.

The Proponent will ensure their technicians handling of hazardous waste (i.e., oils and lubricants) will conform to applicable legislation and best practices throughout the maintenance life of the BWF. The Watts Wind Energy BWF EPP outlines how the Proponent will deal with hazardous material handling onsite (Appendix 3).

2.7 Decommissioning

The design life of a wind turbine is typically 20 to 30 years; capital improvement and replacement programs can extend safe and efficient operations well beyond 40 years. Decommissioning of both the WTGs and the site, when it is necessary or desirable, will be undertaken in accordance with the regulatory regime in place at the time. The District of Barrington Municipal Planning Strategy outlines the requirements for the decommissioning and reclamation of wind energy sites. As per the planning strategy the WTG must be removed from site, no later than two years after the cessation of electrical generation onsite, unless they are changed to a use permitted in the zone in which they are located.

At the end of their useful life, the WTGs will be decommissioned, and all equipment will be dismantled and disposed of in a manner that meets all regulatory requirements. Such activities would likely involve the preparation of the site, e.g., the establishment of access for construction equipment and the mobilization of that equipment including cranes. The sections of the towers would be taken apart and would be reused, recycled or disposed of in accordance with regulatory requirements. After the towers had been dismantled and removed from the site, the site itself would be restored to a state similar to that which currently exists through re-grading and re-vegetation. Foundation pedestals may be removed to approximately 0.3m below grade and re-filled with local soils.

2.8 Accidents and Malfunctions

Malfunctions and accidents that pose a risk to human health and safety and to the environment can occur during any activity. As such, the Proponent is committed to ensuring that protocols are in place to

minimize the risk to human health and safety and the environment during both construction and operation.

These protocols are identified in the EPP; they will ensure the application of environmental protection measures and good management practices through construction (draft EPP can be found in Appendix 3). The EPP includes an emergency response plan to address responses in the unlikely event of an accident during either construction or operation (e.g., key contacts information, etc.).

The construction and operation of wind turbines employs techniques and technologies that are familiar to the construction industry. The likelihood of serious malfunctions or accidents associated with their development and operation that would pose a risk to human health and safety, or the environment, are substantially less than those associated with many other forms of power generation. Further, the Proponent is very experienced in construction and operation of wind turbines.

2.9 Future Project Phases

The BWF has been approved from the NS Department of Energy's COMFIT program for a total of 3.2MW. The Proponent does not have the ability to increase the capacity of the BWF due to the limitations on the local distribution network.

2.10 Other Projects in Area

The Pubnico Point Wind Farm is located approximately 15km northwest of the BWF. The Pubnico Point wind farm consists of 17 x V-80 2MW Vestas wind turbines. The project was the first industrial scale wind farm to be connected to the NSPI grid, and the first wind farm to complete a provincial wind energy environmental assessment. Harvesting for local fire wood by private owner occurs on the Project site. Given the distance and scale respectively of these other works, they are not expected to interact with the BWF; however, possible cumulative effects are included in the EA where interactions may occur. This is discussed in Section 6 for each biophysical VECs and socio-economic aspect included in this EA.

3.0 Approach to the Assessment

3.1 Scoping and Bounding of the Assessment

The scoping process identifies those biophysical VECs or socio-economic aspects that are valued and that may be subject to impact given the works proposed as described in Section 2.These works are primarily the construction and operation / maintenance phases, including accidents and malfunctions, but decommissioning is included as part of the EA process. The identification of VECs is based upon the potential interaction of the Project within the environmental and socio-economic setting as described in Section 4. In addition, any stakeholder concerns identified in consultation as described in Section 5 are heavily weighted when identifying aspects or VECs to be assessed.

The potential interaction of Project activities with the VECs forms the scope of the assessment. Indeed this scoping was completed at a preliminary level to define the primary and secondary studies completed for the Project. Environmental assessment is an iterative process. The scoping is continually refined as the project is further developed, the environmental setting is studied and consultation is held. As it is impractical, if not impossible, to assess all potential effects of a project, the scoping of the assessment is key.

The study team has determined the biophysical VECs and socio-economic aspects that will be subject to assessment based upon its collective knowledge and experience, review of the regulatory requirements, and feedback from the community, First Nations, regulatory authorities and others as part of the consultation program and selected field programs. Based on this process, the biophysical VECs and socio-economic aspects that are evaluated for the Project are identified in Table 3.1.

Table 3.1 Identified VECs and Aspects

Physical Components	***Ecological Components***	***Socio-economic Aspects***
Ground and surface water quality and quantity	Wetlands & watercourses	Land use
Radar and radio signals	Fish habitat	Aboriginal resources / uses
Ambient noise	Migratory and breeding birds	Archaeological resources
Ambient light	Flora and fauna	Recreation
	Species of concern	Vehicular traffic
		Landscape aesthetics
		Tourism
		Health and safety
		Local economy

An important factor in the assessment process is the determination of spatial and temporal boundaries, i.e., those periods and areas within which the VECs are likely to interact with, or be influenced by, the Project. Temporal boundaries encompass the times that Project activities, and their effects, overlap with the presence of a VEC. Spatial boundaries are the areas within which the Project activities are undertaken and the facilities are located, and the zone of influence of effects of the Project, i.e., of emissions, effluents and discharges.

The study area itself includes a spatial bound which includes the footprint of all works associated with the construction and operation of the proposed Project and those areas within which most project-environment interactions could reasonably be expected to occur. It is not possible to establish a single study area boundary that accurately reflects the spatial characteristics of the potential project-environmental interactions. Temporal project boundaries include the timeline for the short term construction activities, as well as the long term operation of the facility of approximately thirty years and its eventual decommissioning. Such boundaries are identified for each VEC as an integral part of the analysis in Section 6.

3.2 Desktop and Field Work Completed

Ecological, social and geophysical desktop data was compiled and analysed with the intent to design targeted field investigations at the Project site. Data was compiled from the following sources:

- Nova Scotia Department of Natural Resources (NSDNR);
- Service Nova Scotia and Municipal Relations (SNSMR);
- Atlantic Canada Conservation Data Center (ACCDC) site specific information;
- Species at Risk Act (SARA);
- Committee on the Status of Endangered Wildlife in Canada (COSEWIC) listings;
- Maritime Breeding Bird Atlas (MBBA);
- NSDNR General Status Ranks of Wild Species; and
- Geobase, a database of Canadian GIS information.

Field programs commenced in April 2012 and concluded in November 2012. All consultants were familiar with documented protocols related to the completion of a Nova Scotia wind energy registration document. The lead proponents of the field consultants can be found in Table 3.2. Key locations executed during field work activities are displayed in Figure 3.1.

Table 3.2: Field Programme Consultants

Field Study	Field Program	Consultant
Bird Surveys	Spring, Fall migration counts and Summer breeding survey	Andy Horn (Dalhousie University) with Ronnie D'Entremont
Bat Monitoring	Acoustic surveys, trapping, tagging	Hugh Broders, St. Mary's University
Archaeology Investigation	Archaeology Screening and Reconnaissance	Bruce Stewart, CRM Group

Rare Plant Survey and Wetland Identification	Rare plant survey, wetland identification	Jim Jotcham (Marbicon) with Nick Hill
Moose Survey	Moose presence/absence survey, transects	Jody Hamper, independent consultant

Bird Surveys

Bird migration surveys, passage counts and breeding bird surveys were carried out by Ronnie D'Entremont, under the direction of Andy Horn. Ronnie has extensive knowledge of the bird populations in the Shelburne County area. The study was designed using Canadian Wildlife Services *Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds* (Environment Canada, 2007a).

The site was visited seven times during the spring migration period from May 15 to May 31. Most visits included a line transect and point counts between dawn and four hours after sunrise. The line transect (the shortest line connecting all the point count stations) was initially planned to follow the methods in (Environment Canada, 2007a), but was found to detect the same birds as in the point counts, so after the first few visits it was only used to detect any species not detected during the point counts. Point counts were conducted approximately every 250m along each transect. Each lasted 5 minutes (initial trials showed that extending the time to 10 minutes gained few additional individuals). All detections were estimated as occurring within 50, 100, or >100 m from the observer. The line transect and point counts were accompanied by less standardized area searches, focused on searching for species or habitats that are suspected of being present but missed by the other methods.

The site was visited ten times during the autumn migration period from September 6 to November 5, with an attempt to visit on days with suitable tail winds. Each visit consisted of a three-hour passage migration count, starting between 0635 and 0740, from the vantage point at N43 32'09 W65 40'27 which, although it did not provide a direct view of the turbine site, allowed a view of a approximately 400m^2 area as close as was possible to the turbine sites, given the dense cover in the area. The observer noted the species, number of individuals in each flock, flight heights, and directions (Environment Canada, 2007a).

CWS protocols (Environment Canada, 2007a) recommend that a breeding bird survey last at least 4-10 days between late May and July. The present site is small, so it presumably falls at the low end of that range. Given that it had already been visited throughout May as part of the migration surveys, only three additional visits were made, spread across at least two weeks as recommended in (Environment Canada, 2007a). Methods were as described above, except the point counts were 10 min long, no passage counts were done, and the third visit consisted only of an area search (including playback) of Bear Point Pond for species at risk (Olive-sided Flycatcher, Rusty Blackbird).

Location of survey points are shown on Figure 3.1. Interim and final reporting for the Spring, Summer and Fall surveys can be found in Appendix 4.

Bat Monitoring

Bat monitoring was completed by Hugh Broders, and involved acoustic surveys, and harp trap surveys. The acoustic surveys involved the use of the SM2BAT ultrasonic recorders to passively record the echolocation calls of bats at two locations within the clearing where the meteorological tower for the proposed development is located, oriented parallel to the tree line (location shown on Figure 3.1). The seasonal timing of sampling likely corresponded to the end of the summer residency period, movement of resident species to local hibernacula, and to fall migration by migratory species. Species were qualitatively identified from recorded echolocation call sequences by comparison with known echolocation sequences recorded in this and other geographic regions using frequency-time graphs in ANALOOK software. The harp trap surveys involved the use of two harp traps to capture bats in the wooded trails in the study area. Tissue samples from the bats were collected and analysed. With our permission, Dr. Broders is including the results of the Barrington survey results in the formulation of a broader, province wide study on wind farm impacts on bat populations. Appendix 5 includes the results and analysis of the field program in Dr. Broders' report.

Archeology Investigation

CRM Group was retained to undertake archaeological screening and reconnaissance of the proposed BWF. The objective of the archaeological assessment was to evaluate archaeological potential within the area that may be impacted by development of the wind farm project. CRM Group developed a work plan which consisted of the following components: a review of relevant site documentation to develop an archaeological potential model (screening); archaeological reconnaissance of the areas that may be impacted by development activities; and, a report summarizing the results of the background research and field survey, as well as providing cultural resource management recommendations. Final CRM Group reporting has been approved by the Nova Scotia Museum (NSM) (Appendix 6).

Rare Plant Survey/Wetland Identification

Jim Jotcham and Nick Hill were procured to perform rare plant inventory and wetland identification at the Project site. The surveys were designed based on knowledge of the specialists and the ACCDC report (Appendix 8). Jim performed the spring rare plant inventory and wetland identification on July 5, 2012. The summer survey was completed by Nick Hill on August 16, 2012 with an additional visit on November 6. The site visits included characterization of the ecological habitats, identification of all vascular plants and incidental identification of wetland locations. Geographic coordinates for each turbine and proposed access road routing was provided to each consultant prior to each site visit. Final reporting can be found in Appendix 7.

Moose

Jody Hamper performed a moose presence survey in the fall of 2012. Discussion with NSDNR staff officials prior to field investigations was completed to ensure compliance with field investigation protocols. The transects used by the independent consultant around the Project site can be seen in Figure 3.1.

3.3 Methodology of Assessment

The assessment focuses on evaluation of predicted environmental effects resulting from potential interactions between the biophysical VECs and socio-economic aspects and the Project activities (construction, operation and maintenance, and decommissioning).

An "environmental effect" is defined in Nova Scotia's *Environment Act* as:

> *(i) any change, whether negative or positive, that the undertaking may cause in the environment, including any effect on socio-economic conditions, on environmental health, physical and cultural heritage or on any structure, site or thing including those of historical, archaeological, paleontological or architectural significance, and*
>
> (ii) *any change to the undertaking that may be caused by the environment*.

To allow the Province to make a subsequent decision on the suitability of a project, the assessment needs to determine the significance of any residual adverse environmental effects. Residual environmental effects are those that remain after mitigation strategies are implemented. The prediction of residual environmental effects requires the determination that: the environmental effect is adverse; the adverse environmental effect is significant; and the significant adverse environmental effect is likely to occur.

Evaluation of environmental effects in this assessment uses the following definitions which consider the nature, magnitude, reversibility, duration and aerial extent of the effect:

- *Significant*: Potential effect could threaten sustainability of the resource in the study area and should be considered a management concern;
- *Minor*: Potential effect may result in a small decline of the quality of the resource in the study area during the life of the project, as such, research, monitoring and/or recovery initiatives should be considered;
- *Negligible*: Potential effect may result in a very slight decline of the quality of the resource in the study area during the life of the project, as such, research, monitoring and/or recovery initiatives would not normally be required; and
- *Beneficial*: Potential effect is expected to enhance the specific VEC or socio-economic aspect.

Where there is no predicted interaction of the Project and the biophysical VEC and socio-economic aspect prior to mitigative and control measures, there is no predicted effect and accordingly, it is not assessed. This is shown in Table 6.1.

To set the Project into its broader ecological and regional development context, the assessment considers how the proposed Project may interact with past, present or likely (i.e., approved) future projects within the spatial and temporal bounds identified. This evaluation of cumulative effects is completed for each VEC and socio-economic aspect in the assessment.

Further, a review of the effect of the environment on the Project is completed. This includes climatic fluctuations and extreme events, such as fire and spills.

4.0 Environmental Setting

4.1 Biophysical

4.1.1 Geophysical

The BWF site is located north of the community of Atwoods Brook, approximately 1km east of Bear Point Pond. The soil conditions are described by the NSDNR Ecological Land Classification (ELC) system as being thin and moderately coarse-textured with imperfect to poor drainage (Peter D. Neily, 2003). The 1961 soil survey of Shelburne County indicated that the soil found onsite is a Gleyed Humic Podzol. Surface drainage is usually fairly rapid, but the high organic matter content of the surface layer retains moisture over long periods. Internal drainage is also restricted by the strong cementing in the B horizon. The soils are imperfectly drained (MacDougall, 1961).

The bedrock along the South Shore is mostly greywacke and granite (Peter D. Neily, 2003). Review of digitally available data (NSDNR, 2012) indicates that the bedrock around the site is known as tonalite and the age class is known as Middle - Late Devonian. Tonalite is described as a coarse-grained plutonic rock consisting chiefly of sodic plagioclase, quartz, and hornblende or other mafic minerals, i.e., rich in magnesium and iron. The digital product was created by the NSDNR, Mineral Resources Branch staff. The original data was compiled and digitized from over 60 maps and sources of information that are noted on the map. The GIS databases were developed from the information contained on this map. The digital product contains layers for geological features such as: bedrock geologic units, faults, geological contacts, isotope ages, other geological features (NSDNR, 2012).

Installation of the meteorological tower at the site indicated that large granite boulders are abundant throughout the soil matrix. Bedrock was not encountered to a depth of two meters. Blasting is not expected for the construction of the foundations, however, geotechnical investigations will be performed prior to site works commencing. Blasting has been assumed as part of the Project for the purposes of this assessment.

In summary, the desktop review of geophysical conditions at or near the Project site determined that there is no risk of sulphide-bearing material in the rock but the soils themselves are generally thin and moderately coarse-textured with imperfect to poor drainage.

4.1.2 Atmospheric

The BWF site is located in what is known as the South Shore Ecodistrict. The climate of the South Shore is probably influenced by the warmer waters of the Gulf Stream more so than the Eastern Shore, which is cooled by the colder waters of the Labrador current before it deflects out into the Atlantic Ocean. The South Shore also shares the same topography and geology as the adjacent inland ecodistricts (720, 740, 750, 760) but is separated from them due to the impact of the coastal climate on biodiversity. Its location on the Atlantic coast means that the South Shore is cooler in summer and milder in winter than the adjacent inland ecodistricts, and fog is more common along the coast (Peter D. Neily, 2003). Climate data was taken from an Environment Canada weather station located near Bacarro Point approximately

17 km southeast of the site (Environment Canada, 2012). The climate averages, extremes and months of occurrences can be found in Table 4.2

Table 4.2: Site Atmospheric Conditions

Parameter	Time period	Data Source	Value
Average Daily Temperature (°C)	Yearly average (1971-2000)	Environment Canada	7.1
Extreme Maximum Temperature (°C)	August	Environment Canada	36
Extreme Minimum Temperature (°C)	December	Environment Canada	-24.6
Average Total Rainfall (mm)	Yearly average (1971-2000)	Environment Canada	1236.9
Average Snowfall (cm)	Yearly average (1971-2000)	Environment Canada	154
Extreme Daily Rainfall (mm)	1st August, 1985	Environment Canada	76.4
Extreme Daily Snowfall (cm)	26th January, 1987	Environment Canada	32.5
Extreme Snow Depth (cm)	18th January, 1981	Environment Canada	65
Predominant Wind direction	Yearly Average	Canadian Wind Atlas (confirmed with Watts MET tower readings)	SW

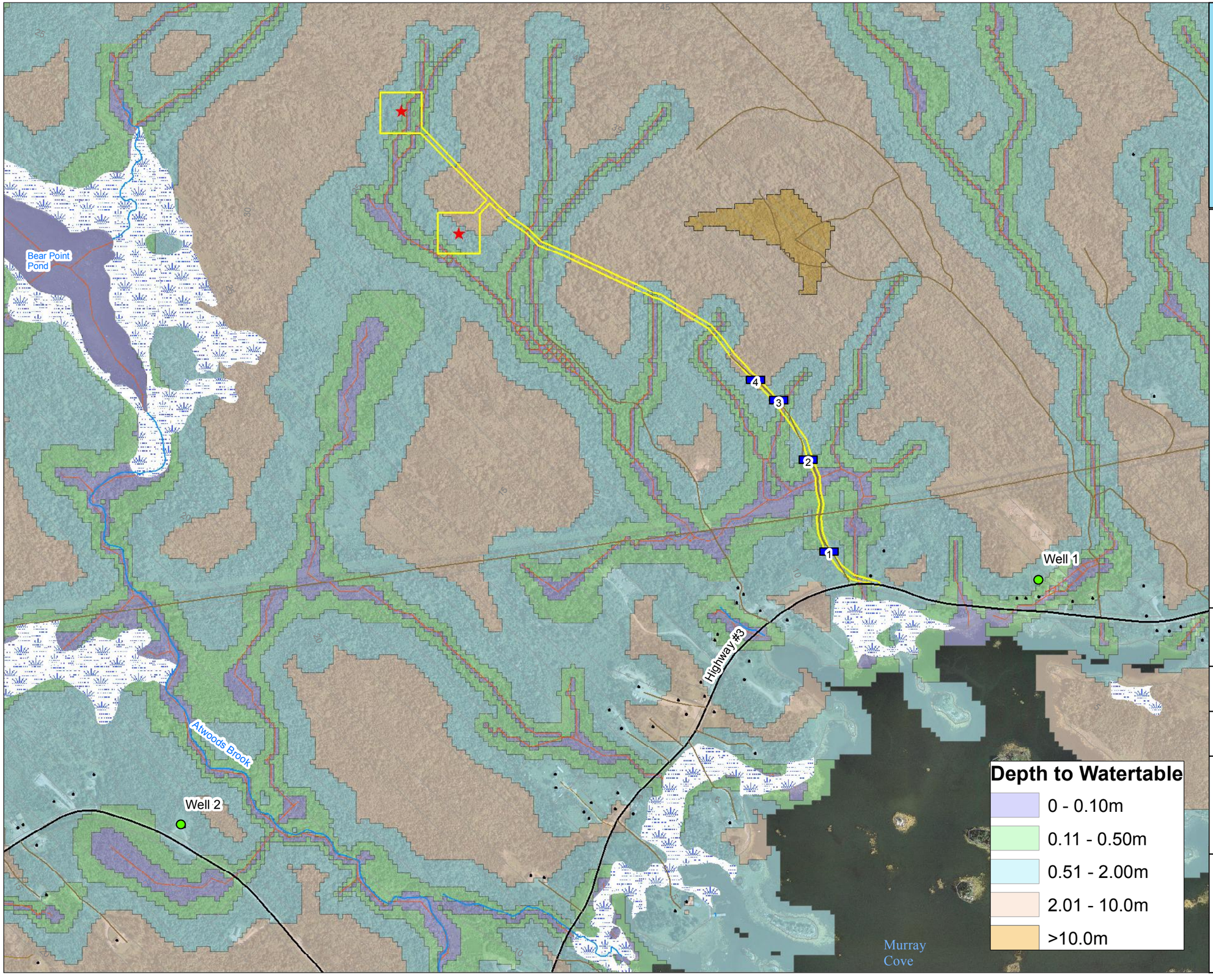
The setting is considered rural, with no to low presence of artificial lighting coming from streetlights or shops. The main source of noise in the community would come from traffic on Highway 3.

4.1.3 Groundwater, Surface Water and Wetlands

The Project site is not located within any municipally operated or regulated watershed, e.g., a protected watershed area. The site is located approximately 0.8km east of Bear Point Pond. Atwoods Brook drains Bear Point Pond into the Atlantic Ocean at Murray Cove.

Figure 4.1 displays several surface water, groundwater and wetland features based on NSDNR Wet Area Mapping (WAM) data (NSDNR, 1998b). The WAM mapping layer includes two features: depth to water table (WTBL) and flow channel layers. The WAM model predicts where water will naturally flow and/or accumulate in the landscape based on digital elevation data and the known location of surface water bodies and wetlands. In essence, WAM is a cartographically derived depth-to-water index.

Depth values listed do not represent predicted depth to a water table or ground water, rather they are a relative wetness index which can be related to the likelihood of there being natural water flows (above or below ground) and accumulation of water as reflected by on-site drainage conditions (well, moderately well, imperfect, poor, very poor). WAM does not take into account soil conditions that may further influence drainage conditions (such as soil texture), nor does it predict flows and accumulations that are the result of human disturbance or infrastructure. The WAM flow channel layer is a line layer that predicts the location of potential unmapped streams or below ground flow channels. For a



Legend

- Buildings
- Domestic Well
- Driveway
- Paved Roads
- Unpaved trail
- Watercourse
- Flow Channels
- Contours (10m)
- NSDNR Wetland
- Proposed Access Route
- Possible Culvert Locations

FIGURE 4.1

Groundwater / Surface Water

Drawn by: AWA	Date: 2013/01/29
1:8,000	Scale @ 11"x17"

EON WindElectric

0 150 300 600

Meters

Coord. System: NAD83 CSRS UTM Z20N
Projection: Trasnverse Mercator
Units: Meters

N

predicted flow channel to be shown, a minimum of 4 ha of land must contribute flow to that point. All predicted flow channels eventually connect to a mapped water body (NSDNR, 1998b). Soil conditions are described in Section 4.1.1.

Information from two nearby residential water wells was analysed to help assess distance to groundwater, and distance to bedrock at the Project site. Figure 4.1 displays the relative proximity of the water wells to the Project site. Well 1 had a depth-to-bedrock reading of 17 feet, and Well 2 depth-to-bedrock reading was 30 feet. Water bearing fractures were encountered at 25 and 340 feet for Wells 1 and 2, respectively. There are minor watercourses and intermittent drainage on the Project site; likely watercourse crossing locations are shown in Figure 4.1 based on proposed access road routing. The location is in a lowland area and wetlands have been identified along the proposed access route. Detailed observations about each wetland await wetland delineation, but generally speaking, the wetlands can be readily identified on site by deep black saturated soils, often with sphagnum moss under cinnamon fern. The surface water drainage on the site flows in a general north-east to south-west direction; towards Bear Point Pond, with the peak elevation (60m) occurring approximately 1.6km northeast of site.

Although no wetlands were indicated on site on the NSDNR wetland inventory map, there is one wetland south of the Project site that is DNR mapping and several small wetlands were identified within the Project boundaries. Based on the proposed WTG and access road locations and the summer / autumn 2012 wetland surveys, the Project will require the implementation of a mitigation sequence as outlined in the Nova Scotia Wetland Conservation Policy (2011) document, which states chiefly the avoidance of adverse effects, secondly the minimization of unavoidable adverse effects, and finally compensation for adverse effects that cannot be avoided. The field consultants have indicated a more north-easterly route could result in avoidance of many identified wetlands. The potential wetland alterations are associated with the access road as proposed, i.e., linear in nature; the wetlands that may be altered are primarily wooded swamps as per Appendix 7.

The Proponent will continue to finalize the Project design based upon recommendations as outlined in Appendix 7, including key areas to avoid and completion of additional field work on wetland identification and delineation if necessary.

4.1.4 Migratory and Breeding Birds

Data from ACCDC and MBBA were used to design and implement the migratory and breeding bird survey at the site, as well as reliance upon the pre-existing bird studies completed at a coastal area west of the Project site (as completed for the EA of Pubnico Wind Farm). In addition, these surveys were completed by two experienced birders, Andrew Horn (Halifax) and Ronnie D'Entremont (Pubnico).

Several considerations based on desktop review informed the field work program design, including:

- Species at Risk, notably Piping Plover (breeds on Cape Sable Island ~12 km away) and Roseate Tern (breeds on The Brothers islands ~7km away);
- Large colonies or staging areas (Cape Sable Island has tern colonies and heronries, and is a significant staging area for several species, notably Brant);

- Important Bird Areas (Cape Sable Island is recognized as an Important Bird Area, NS018);
- Migration corridors (the nearby peninsulas and islands such as Cape Sable Island, Pubnico Point, Baccaro (17km) and the Blanche Peninsula (21km) are known to concentrate migrants) .

Andy Horn prepared draft protocols for several possible community wind energy sites origianlly proposed by the Proponent, including the BWF. This general protocol was relayed to CWS who provided comments via email (B. Whittam, May 2, 2012). The refined protocols specific to the BWF site were implemented by Ronnie D'Entremont via spring and fall migration surveys and summer breeding bird surveys.

Refer to Appendix 4 for reports compiled by Andy Horn; however, the key findings are presented below:

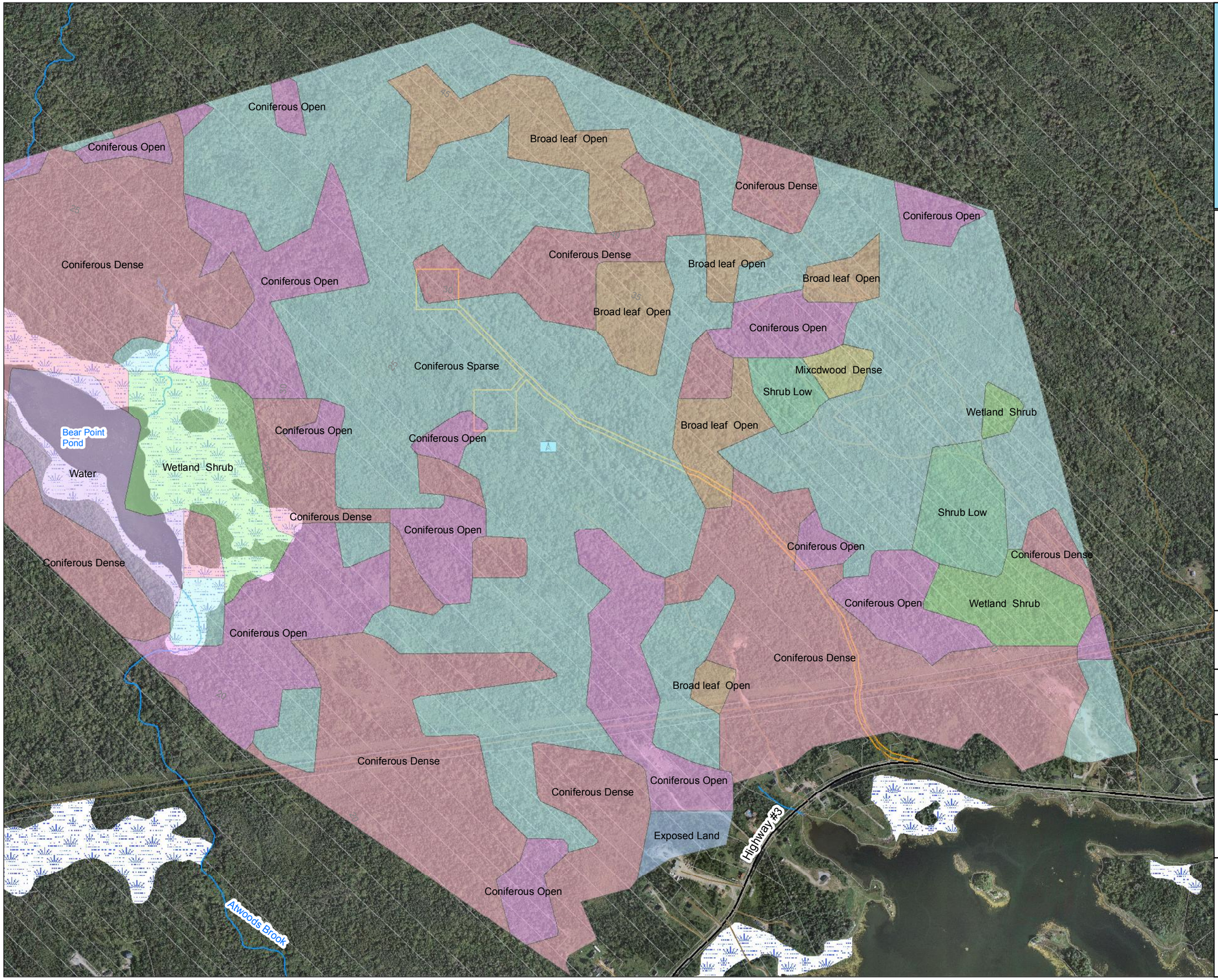
- During spring transects and point counts, no obvious migrants were encountered; the passage count detected seven individuals of four species, none of which, based on species identity, flight height, or flight direction, appeared to be a migrant.
- During breeding bird survey, species were typical of the habitats they were found in, although they do include several Partners in Flight Priority Species and species known to have flight displays.
- No species at risk (birds with COSEWIC status or elevated provincial rank or status) were found, other than one Common Loon detected flying over the site. Habitat at nearby Bear Point Pond appeared suitable for two species at risk (Olive-sided Flycatcher, Rusty Blackbird), so that area was searched, using playback for these species, but neither species was found.
- During fall transects, mostly summer or permanent resident species were encountered; however, species seen on few days but in high numbers, and thus likely migrants, included Warblers, American Robins, Mallards and White-winged crossbills, but were not particularly concentrated at the site.
- No listed species were identified.

.

An initial evaluation of the required pre-construction bird surveys (in consultation with (Environment Canada, 2007a) and (Environment Canada, 2007b)) classed site sensitivity as Very High using a precautionary approach due to desktop identified sensitivities; however, the survey results suggest that the site sensitivity is Low. The size category of the Project (< 10 turbines) is Small, so the level of concern is judged to be Category 1 though the pre-construction surveys were designed to treat the site as a Category 4 (Environment Canada, 2007b).

4.1.5 Flora and Fauna

Land cover data for preliminary desktop analysis was taken from online sources (Geobase, 2011) and is displayed in Figure 4.2. Land cover information is the result of vectorization of raster thematic data originating from classified Landsat 5 and Landsat 7 ortho-images, for agricultural and forest areas of Canada, and for Northern Territories (Geobase, 2011). According to (Peter D. Neily, 2003) black and white spruce predominate the coastal forest of the site area with scattered occurrences of balsam fir. The coastal headlands receive the brunt of the Atlantic winds, which creates coastal forests of spruce



Legend

- Driveway
- Paved Roads
- Unpaved trail
- Watercourse
- Contours (10m)
- NSDNR Wetland
- MET tower location
- Proposed Access Route
- Municipal Bounds

FIGURE 4.2

Land Cover

Drawn by: AWA	Date: 2013/01/29
1:8,000	Scale @ 11"x17"

EON WindElectric

0 125 250 500
Meters

Coord. System: NAD83 CSRS UTM Z20N
Projection: Trasnverse Mercator
Units: Meters

N

where the trees are severely stunted. However, once the impact of this exposure is diminished either by shelter from established spruce or distance from the coast, other tree species will establish in the ecodistrict although the thin soil can be a serious impediment.

The survey of plants in the area of the WTGs found a mixed forest. Common trees throughout were red maple (*Acer rubrum*), balsam fir (*Abied balsamea*) and black spruce (*Picea mariana*). The total list of vascular plants combining botanical finds of Jim Jotcham and N. Hill (July 5th, 2012) and of N. Hill (Aug. 16th and November 6th, 2012) is provided in Appendix 7. The plant species inventory of the site and surrounding area did not reveal any rare plants or unusual habitat. All native plants on site had an NSDNR Green status.

Table 4.3: Climate Data for Ecodistrict 830 (Peter D. Neily, 2003)

Ecoregion/Ecodistrict	Annual Precipitation (mm)	Growing Degree Days	Growing Season (days)	Mean Annual Temp (°C)	Mean Summer Temp (°C)	Mean Winter Temp (°C)
830 South Shore	1534	1827	205	5.6	17.4	-3.2

Mainland Moose populations persist in the Tobeatic Region, Chebucto Peninsula, Cobequid Mountains, Pictou-Antigonish highlands, and the interior of the eastern shore area from Tangier Grand through Guysborough (NSDRN, 2009b). A number of reasons are purported for the low number (1000 animals) of mainland moose populations, including disease (i.e. P. tenius (brainworm), illegal kill (i.e. poaching), calf predation by black bears, habitat alteration and increased access, disturbance and possibly climate change and acid rain (NSDRN, 2009b). A Mainland Moose survey was commissioned at the Project site as a result of the ACCDC finding. The moose survey consisted of 5 transects and was conducted in November 2012. The transects were set up by Jody Hamper with the use of Google Earth and Department of Natural Resources land classification maps. Each transect was roughly 2km in length and 1m on each side was observed. All habitats, including swamps, edge of lakes (Bear Point Pond), mature and over mature softwood and hardwood, were covered. Two locations surrounding the project site showed evidence of moose presence. Figure 3.1 displays the results of the moose survey and location of each transect. Communication with NSDNR field biologists indicated that the inopportune timing of the field surveys may warrant further investigation, such as moose Pellet Gathering Inventory surveys in the spring of the year. Refer to Section 6 for an analysis of the Project interaction with mainland moose populations.

Background research completed by Dr. Hugh Broders indicated there are no known hibernacula within 25 km of the BWF area, nor for most of southern mainland Nova Scotia. According to the Nova Scotia Abandoned Mine Openings Database, there are also no known underground mine openings within 25 km of the project area.

Acoustic and harp trap surveys were completed at the Project site resulting in the determination that there is no significant movement of bats through the study area. The average number of recorded sequences per night during the sampling period was 71.6. All of the identified echolocation call sequences recorded during the survey period were attributable to the two species of Myotis bats known to occur in Nova Scotia, the Little Brown Bat and the Northern Long-eared Bat. The harp trap survey resulted in the capture of one bat; one capture of a juvenile female northern long-eared bat on the evening of August 2, 2012. the capture of a juvenile female northern long-eared bat on a forested trail in early August for this project suggests that there is likely a maternity colony of female bats located close by and that the study area may be important for reproductively active females. Discussion of yellow ranked bat species is within Section 4.1.7.

4.1.6 Fish and Fish Habitat

In the Barrington/Clyde Watershed, typical freshwater fish species may include Brook Trout and Yellow Perch. No fish were noted in watercourses within the study area in the ecological field work completed. These watercourses are low flow or intermittent and provide poor fish habitat. The downgradient marine environment of Murray Cove and Barrington passage is host to robust marine life.

4.1.7 Species at Risk or of Concern

Desktop data on species at risk in the vicinity of the BWF was compiled and reviewed as collected from ACCDC. ACCDC is part of the NatureServe network and maintains data for the Atlantic Canadian Provinces. Data reflects known occurrences for rare and endangered flora or fauna. As per NSDNR requirements, data is presented within 100km radius and ACCDC cannot specify exact location for mapping; however, distances from known location to site are noted by ACCDC. In addition, Environment Canada's species at risk mapping for *Species at Risk Act* (*SARA*) Schedule 1 (Government of Canada, 2012b) species was accessed to support the ACCDC data. The typical habitat for the species was reviewed based on online information from Environment Canada and DNR.

25 species that are known to occur in the general proximity of the Project are designated under Schedule 1 of *SARA* and/or the *Nova Scotia Endangered Species Act* (Government of Nova Scotia, 2009). These are tabulated below with Federal and Provincial designations listed. From ACCDC data, observations and known distance from site are noted. Based on the specialists' site visits and the desktop review, a comparison was completed of the known habitat for the species at or near the Project works. This can assist in determining the likelihood of the species at risk being present at or near the Project works. The risk will be defined as either insignificant, low, moderate, or high. This is shown in Table 4.4.

Table 4.4: Potential Species at Risk							
Taxonomy	**Scientific name**	**common name**	**prov. status**	**COSEWIC**	**obs; dist(km)**	**Typical Species Habitat**	**Potential of Presence at or near Project works**
plant	Geum peckii	Eastern Mountain Avens	Endangered	Endangered	2; 98 ±0.1	Occurs in boggy terrain amongst shrub vegetation, but may be found in dryish depressions on mineral soil. Geographically restricted in Canada to three locations of open peatland habitat in Nova Scotia.	Insignificant
plant	Drosera filiformis	Thread-leaved Sundew	Endangered	Endangered	7; 11 ±10	Damp sands, sandy shores, and cedar swamps. In Nova Scotia it occurs only in raised (or plateau) bogs.	Low
plant	Coreopsis rosea	Pink Coreopsis	Endangered	Endangered	13; 44 ±10	Occurs on infertile, gently sloping sand, gravel or cobblestone lake shorelines.	Insignificant
plant	Sabatia kennedyana	Plymouth Gentian	Endangered	Endangered	21; 46 ±5	Occurs on broad, infertile, gently sloping lakeshores of sand, cobblestone or peat.	Insignificant
plant	Hydrocotyle umbellata	Water-pennywort	Endangered	Threatened	2; 49 ±0	The Water-pennywort is found primarily on sand or gravel substrate of lake shorelines in a narrow band	Insignificant

						above or below the waterline.	
plant	Lophiola aurea	Goldencrest	Threatened	Special Concern	4; 75 ±0.5	Member of the Atlantic Coastal Plains flora. It occurs in three types of habitat in Nova Scotia: cobble lakeshore, bay bog and fen.	Insignificant
plant	Eleocharis tuberculosa	Tubercled Spike-rush	Threatened	Special Concern	8; 12 ±0	Grows on sandy or stony lake shores, gravel bars and on the fringes of peat layers or mats that are either floating or have been washed up or pushed up by ice onto shorelines. It is also found on the edges of peaty wetlands bordering lakes.	Insignificant
plant	Clethra alnifolia	Sweet Pepperbush	Vulnerable	Special Concern	3; 43 ±10	Occurs on unshaded lake margins, particularly where the movement of winter ice has created slight gravel ridges along the lake shore.	Insignificant
plant	Lilaeopsis chinensis	Eastern Lilaeopsis	Vulnerable	Special Concern	4; 38 ±1	Grows in long, narrow estuaries at the mouths of large rivers that are separated from the open ocean.	Insignificant

plant	Scirpus longii	Long's Bulrush	Vulnerable	Special Concern	13; 16 ±10	Prefers peat wetlands where competition from shrubs is minimal. Favoured wetlands include peaty shores of high watershed lakes, small bogs associated with lakes or rivers, still-water meadows, and inland fens.	Insignificant
plant	Thuja occidentalis	Eastern White Cedar	Vulnerable		10; 60 ±10	Most often associated with cool, moist, nutrient-rich sites, particularly on organic soils near streams or other drainage-ways, or on calcareous mineral soils.	Low
animal	Emydoidea blandingii	Blanding's Turtle - Nova Scotia pop.	Endangered	Endangered	3; 79 ±10	Largely aquatic, found in a variety of freshwater habitats, including lakes, permanent ponds, temporary ponds, slow-flowing brooks, marshes and swamps. Prefer shallow, nutrient-rich waters with an organic substrate and dense vegetation.	Low
animal	Coregonus huntsmani	Atlantic Whitefish	Endangered	Endangered	3; 43 ±10	It is found only in the Tusket and Petite Riviere watersheds in southern	Insignificant

						Nova Scotia.	
animal	Sterna dougallii	Roseate Tern	Endangered	Endangered	18; 11 ±5	Nest in colonies almost exclusively on small coastal islands. Forage in shallow water close to shore near shoals and tide rips and will hunt for food as far as 20 km from their colony.	Low
animal	Charadrius melodus melodus	Piping Plover melodus ssp	Endangered	Endangered	51; 2 ±10	Nest above the normal high-water mark on exposed sandy or gravelly beaches.	Insignificant
animal	Calidris canutus rufa	Red Knot rufa ssp	Endangered	Endangered	16; 9 ±0.5	Forage in peat-rich banks, salt marshes, brackish lagoons, mangrove areas, and mussel beds.	Low
animal	Chaetura pelagica	Chimney Swift	Endangered	T	20; 15 ±5	The species is mainly associated with urban and rural areas where the birds can find chimneys to use as nesting and resting sites. Small portion of the population continue to use hollow trees.	Low
animal	Thamnophis sauritus pop. 3	Eastern Ribbonsnake -	Threatened	Threatened	25; 66 ±0	Semi-aquatic; most frequently found along the edges of shallow ponds,	Low

		Atlantic pop.				streams, marshes, swamps, or bogs bordered by dense vegetation that provides cover. Abundant exposure to sunlight is also required, and adjacent upland areas may be used for nesting.	
animal	Chordeiles minor	Common Nighthawk	Threatened	Threatened	29; 25 ±5	Nests in a wide range of open, vegetation-free habitats, including dunes, beaches, recently harvested forests, burnt-over areas, logged areas, rocky outcrops, rocky barrens, grasslands, pastures, peat bogs, marshes, lakeshores, and river banks. This species also inhabits mixed and coniferous forests.	Low
animal	Glyptemys insculpta	Wood Turtle	Vulnerable	Threatened	1; 45 ±10	Moderately moving rivers with sandy soils and along nearby roadbeds	Moderate
animal	Histrionicus histrionicus pop. 1	Harlequin Duck - Eastern pop.	Endangered	Species of Concern	4; 71 ±10	Wintering in Nova Scotia on offshore islands, headlands, and rocky coastlines.	Low
animal	Lynx canadensis	Canada Lynx	Endangered	Not at Risk	1; 14 ±1	Lynx live deep in coniferous	Low

						forests near rocky areas, bogs and swamps.	
animal	Alces americanus	Moose	Endangered		67; 12 ±10	Mixed wood forests with wetlands; typically in high elevations, e.g., along Cobequid Mountains.	Moderate
animal	Martes americana	American Marten	Endangered		13; 65 ±10	Lives in mature, dense conifer forests or mixed conifer-hardwood forests with a high percentage canopy cover and large amounts of coarse woody debris on the forest floor.	Low
lichen	Erioderma pedicellatum (Atlantic pop.)	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	8; 53 ±0.1	Northerly exposed forested slopes in mature forest sites which are also rich in moisture-loving species, such as sphagnum mosses and Cinnamon Fern.	Low

Plants

Three botanical surveys were completed (July 5, 2012; August 16, 2012; November 6, 2012) at the BWF study area by Maribon Inc. (J. Jotcham and N. Hill). The field studies were completed after the botanists reviewed the ACCDC listing (Appendix 8) for plants to ensure that they were aware of reports in the area to have minimum target species for searches, as well as to verify that timing of field visits were appropriately scheduled to identify the rare flora. The review of the ACCDC listing given the site characteristics is included in the reporting from our botanists (Appendix 8).

Based on two targeted searches by botanists, none of the Federal or Provincial listed flora species were found in the study area. Further wetland delineation will be completed onsite as part of final road and laydown area design.

Birds

During the pre-construction bird surveys (spring and fall migration and summer breeding), no listed species at risk were seen; however, there was one species of concern (DNR Yellow Ranking) identified, the Common Loon.

Impact assessment and mitigation and follow up measures related to birds are discussed in Section 6.2.

Mammals

During field work completed for moose in fall 2012, evidence of moose was found (pellets and evidence of browsing). Impact assessment, mitigative measures, and additional studies related to moose are discussed in Section 6.2.

Occurrence of Little Brown Bat (*Myotis lucifugus*) and Northern Long-eared Bat (*Myotis septentrionalis*) were recorded as part of the work completed by Dr. Broders; these are both yellow listed in Nova Scotia. Bat activity recorded at the Project site was dominated by Myotis species as is typical of many bat studies completed in Nova Scotia. Impact assessment and follow up measures related to bats are discussed in Section 6.2.

Reptiles

In terms of the Wood Turtle and Blandings Turtle, they are known in the Barrington-Clyde River Watershed (both occurrences were 45 and 80km distant from site respectively). While there are no moderately moving watercourses with sandy soils near the WTG sites, there is a watercourse draining Bear Point Pond 1km east of project site. Upon discussion with DNR (M. Pulsifer on April 4, 2012), it was determined that suitable mitigation (e.g., education and timing of work) would be appropriate and a targeted field study was not indicated for wood turtle for this Project. Impact assessment and mitigative measures related to Wood Turtle and Blanding Turtle are discussed in Section 6.2.

4.2 Socio-economic

4.2.1 Community

The community of Atwoods Brook is 5km east of Barrington, located within the jurisdiction of the District of Barrington (District 2), within the County of Shelburne. The District of Barrington is located within the Barrington-Clyde Watershed boundary, and is located approximately 100 southwest of the Kejimkujik Nation Park and the Tobeatic Wilderness Area and UNESCO Southwest Nova Biosphere Reserve. Biosphere Reserve sites are described by UNESCO as sites that are 'recognized under the UNESCO Man and the Biosphere Programme (MAB) to promote sustainable development based on local community efforts and sound science. The Southwest Nova Biosphere Reserve encompasses the 5 counties of Annapoils, Digby, Yarmouth, Shelburne and Queens, and their 16 Municipalities totalling 1,546,374 hectares. The Southwest Nova Biosphere Reserve was designated a UNESCO Biosphere Reserve in 2001 for its uniqueness and commitment to sustainable development and conservation. It is now one of 16 Biosphere Reserves in Canada and one of two sites with this special designation in Nova Scotia (Southwest Nova Biospere Reserve Association, 2011).

The community remains rural and residences are located along the roadway, e.g., Highway 3. Community meetings were hosted at the Barrington Lions hall, located approximately 2km from site. The site is located 2km southwest of a former military installation known as "His Majesty's Royal Naval Wireless Station" which was built during World War I. The proposed area for the BWF is known by local residents as *backwoods Barrington*. Within a 2km radius of the Project site, approximately 100 habitable dwellings are located, including houses, camps, cottages, and abandoned buildings.

4.2.2 Cultural Resources, Heritage Sites and Archaeological Sites

Cultural Resource Management Group (CRM) was retained to perform the Archaeological Screening and Reconnaissance for the BWF. CRM was issued a Heritage Research Permit A2012NS0146 from the Nova Scotia Museum. Field reconnaissance was conducted on the site on the 23rd of October 2012. Results of the desktop and field work concluded that there is a low risk for the BWF project and its Project components to impact archaeological resources. CRM made the recommendation to halt work if archaeological deposits or human remains are found within the BWF area and made immediate contact with the Coordinator of the Special Places Program, Laura Bennett.

In a letter from Nova Scotia Communities, Culture and Heritage dated January 14th, 2013, the staff agree with these recommendations and the study area as defined in the Archaeological Resource Impact Assessment (ARIA) is cleared of any requirement for future archaeological investigation. Refer to Appendix 6 for the CRM report and the letter from the Province.

4.2.3 Aboriginal Uses and Resources

The Project is located 50km southeast of Acadia First Nations (AFN). The Proponent has informed various aboriginal groups of Project specifics, including: Kwilmu'kw Maw-klusuaqn (KMK), Maritime Aboriginal Peoples Council (MAPC), and AFN. The Proponent has also communicated with the Office of

Aboriginal Affairs (OAA) on several different occasions. Refer to Section 5.2 for detailed communication references.

CRM performed desktop research and analysis into the potential for Precontact and historic Native, as well as early Euro-Canadian influences and installations, within the boundaries of the BWF site. Based on the various components of the background study, including environmental setting, Mi'kmaq land use and property history, the vicinity of the study area is considered to exhibit low potential for encountering Precontact and/or historic archaeological resources.

A review of the Maritime Archaeological Resource Inventory (MARI), a provincial archaeological site database maintained by the Nova Scotia Museum, determined that there are no registered Precontact or early historic Native archaeological resources located within the study area. The closest registered Precontact site is located approximately 4km east-southeast of the Project site. Archaeological site AjDj-10 is situated on the northern end of Cape Sable Island and is classified as a possible Ceramic Period site (3,000 – 500 BP) consisting of isolated finds (three projectile points). In addition, field work has been completed for moose which are of importance to First Nations.

Refer to Section 5.2 for a description of the correspondence and meetings with various First Nation stakeholders across Nova Scotia. The full report from CRM can be found in Appendix 7, which details the extensive background research and field reconnaissance completed as part of the archaeological investigation.

4.2.4 Noise

The Proponent has elected to implement conservative noise modelling tables developed by the Ontario Ministry of Environment. The general approach taken for the development of the noise modelling tables was to derive a setback using a conservative approach. This included utilizing the procedure for predicting the noise impact at Points of Reception described in the MOE "Noise Guidelines for Wind Farms – October 2008" (Ontario Ministry of Environment, 2008). Using one receptor relative to a selected array of wind turbines, the noise impact at the receptor was calculated by the standard method recommended in the International Standard ISO 9613-2. The separation distance required between a receptor and the closest turbine in the array that would satisfy the MOE noise limit (40dBA) was then determined. The result would be the minimum setback for the given set of variables (Ontario Ministry of Environment, 2009). The noise limit at the receptor was taken to be the same for all wind speeds and wind turbine operating conditions at 40 dBA. The proposed wind turbine for the BWF has a sound power level at 95% of the turbines rated output of 105.5 dBA. The nearest receptor (habitable dwelling) to the BWF is located 1000m distant from the nearest turbine. Table 4.5 displays the results of the setback – noise matrix developed by the Ontario Ministry of Environment.

Table 4.5: Noise – Setback Matrix

Number of Wind	Minimum Setback to Closest Wind Turbine per Group			
	107dBA	105dBA	103dBA	102dBA

Turbines				
25	1500m	1250m	850m	750m
10	1200m	1000m	700m	650m
5	950m	850m	600m	550m

Table 4.5 suggests a setback of greater than 850m for the installation of 5 or less wind turbines; with a sound power level (SPL) of 105dBA would be sufficient to achieve a sound pressure result of 40dBA or less at the nearest receptor. The proposed turbine for the BWF has a SPL of 105.5dBA. Assessing the project with turbine SPLs of 107dBA results in a minimum setback requirement of 950m. The District of Barrington wind turbine bylaws requires a minimum setback from habitable dwellings to be no less than 1km.

A second noise model was completed to augment the setback-noise matrix. The noise model results can be found in Figure 4.3. The noise model was completed for the BWF using the wind farm planning and design software, openWind. The openWind noise modelling software is based on ISO standard 9613-2 - Attenuation of sound during propagation outdoors. The noise modelling in openWind applies conservative estimates to factors contributing to the attenuation of noise in the environment. Such factors include: ground porosity, atmospheric attenuation, and geometric spreading. The model results indicate that the nearest resident (a seasonal camp) is greater than 400m from the 40dBA isoline; that is, no habitable dwelling is predicted to have a resulting SPL of 40dBA based on conservative modelling assumptions.

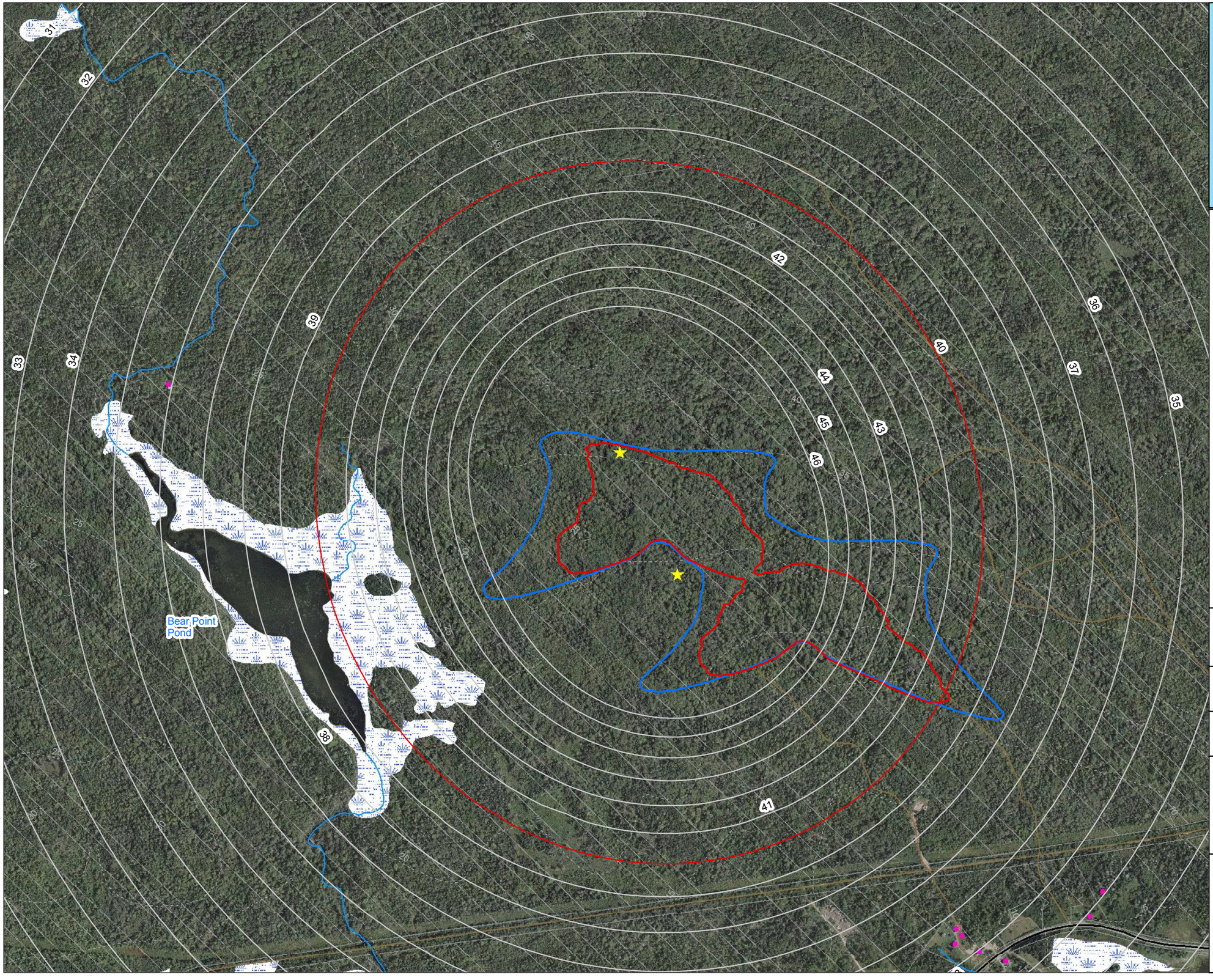
Should the turbine layout or proposed turbine model change appreciably, the Proponent commits to commissioning another noise analysis to verify compliance with the SPL of 40dBA at the nearest receptor. In this case, the proposed layout change and the corresponding predicted noise effect will be communicated to NSE and the nearest residents.

4.2.5 Radio and Radar Communication

The Proponent has contacted all mandatory stakeholders listed in the guidance document prepared by the Canadian Wind Energy Association (CanWEA) and the Radio Advisory Board of Canada (RABC) (CanWEA, 2007). Positive responses have been received from all agencies who replied to date; there has not been a response from the Royal Canadian Mounted Police (RCMP) or NAV Canada, but informal conversations indicate no issues expected. The Proponent will continue to engage with appropriate radio-communication, radar and aviation operators throughout the duration of the development, construction and operation of the BWF. Approvals and communication with mandatory agencies can be found in Appendix 2.

4.2.6 Shadow Flicker

The Proponent procured the expertise of Al-Pro Consulting Inc. to perform the shadow flicker assessment for the Project. Wind data from the meteorological tower installed onsite and weather (cloud cover) data from Shearwater, NS was used as model input parameters. The data from Shearwater was used by the independent consultant, and was deemed to be the most representative of the BWF



Legend

- Buildings
- WTG
- Noise Isolines (dBA)
- 40 dBA Isoline

Shadow Flicker

- 30 min/day isoline
- 30 day/year isoline
- Driveway
- Paved Roads
- Unpaved trail
- Watercourse
- Contour Lines
- NSDNR Wetland
- Municipal Bounds

FIGURE 4.3

Shadow Flicker - Noise

Drawn by: AWA	Date: 2013/01/29
1:8,000	Scale @ 11"x17"

EON WindElectric

0 125 250 500
Meters

Coord. System: NAD83 CSRS UTM Z20N
Projection: Trasnverse Mercator
Units: Meters

N

cloud cover data. The influence of flicker is limited to the distance at which it is still considered relevant, which in this case is dictated by the average blade width (3.99m), which equates to approximately 1.5km. Flicker is ignored if the sun is less than 3 degrees above the horizon. Flicker is only calculated if more than 20% of the sun is covered by a blade. Astronomical worse case assessments assume the sun shines every day of the year. Additionally, rotor blades are assumed to be constantly generating shadows as they are considered to be perpendicular to the sun angle. For the actual case scenarios, the assessments are based on real monthly sunshine probabilities and onsite wind data.

Figure 4.3 outlines the results of the assessment. For this site location, there are no Municipal, Provincial or Canadian flicker emission regulations at the time of submission for this document. A guiding restriction of 30 minutes per day and 30 hours per year based on the above actual case operating conditions was applied to the BWF. This is a well used guideline for protection of health. All residents are well outside of the areas that exceed the guidance of 30 minutes per day and 30 hours per year.

4.2.7 Visual

The openWind planning software was used to create a photomontage of the BWF. Two locations were chosen to perform the photomontage. While the general setting is considered scenic, the site does not have any registered scenic vantage points (Museum of Natural History, 2012a). The areas surrounding the BWF poses little relief (10m-65m asl) and are heavily wooded, providing few locations surrounding the Project site with a clear view of the WTGs. The majority of the population surrounding the BWF are also located along Highway 3, with the primary view of Cape Sable Island and the Atlantic Ocean. Cape Sable Island is the most populous town in the general vicinity of the BWF, and affords an excellent view of the BWF due to its distance and unobstructed view of the turbines.

Vantage Pnt 1 was taken from a bridge, which spans Barrington Passage, located en route to Cape Sable Island, and is located 3.9km from the BWF. Vantage Pnt 2 was taken from Cape Sable Island, approximately 5km from site.

Residences surrounding the BWF are generally surrounded by mature forests, limiting visual intrusion of turbines. Three separate vantage points were chosen within close proximity of the Project site; however, due to lack of topographic relief, height of vegetation and distance of WTG from the nearest residents, it was determined that visualization analysis from locations surrounding the nearest residents could not be performed.

Figure 4.4: Original Image – Vantage point 1

Figure 4.5: Photomontage Image – Vantage point 1

Figure 4.6: Original Image – Vantage point 2

Figure 4.7: Photomontage Image – Vantage point 2

Should the turbine location change, the Proponent will complete additional visualization studies to share with stakeholders.

4.2.8 Recreation

Regional recreational activities exist in the area, such as hunting, fishing hiking, swimming and other outdoor pursuits. Several seasonal hunting camps exist in the general vicinity; however, all camps are located outside of the 1km setback buffer. The Project site is currently used for the harvesting of firewood for home heating purposes by the landowner.

A public walking trail exists within the Project boundaries. The Proponent has engaged NSDNR regarding the crossing of the Non-Designated Rail Corridor with the section name *Granite Village/Lower East Pubnico*.

4.2.9 Economic Development

Based on the 2006 Census of Population, Barrington has a population of 3,857 which is 6.0% lower than in 1996. In comparison, Nova Scotia has a population of 913,465 which is 0.5% higher than in 1996 (Government of Nova Scotia, 2012). Agriculture and primary resource based jobs comprise 37% of the workforce in the District of Barrington with manufacturing jobs totaling 22% of the workforce (Statistics Canada, 2010). According to Statistics Canada, the unemployment rate is 16.6%. Several small businesses exist in or near the host community of Barrington, including retail and equipment operators.

The Proponent is committed to using local contractors whenever it is commercially reasonable to do so. For example, the construction of the single 1.5MW wind turbine in Sheet Harbour in 2011 by the Proponent involved half of the project costs being raised by Nova Scotian investors. In addition, the BOP design and construction contracts were issued to local firms, adding to the local economy and knowledge base.

5.0 Consultation

5.1 Community

The Proponent presented Project specific information to the Council of the District of Barrington (March 26th, 2012) and to the residents in the communities surrounding the BWF (April 19th, 2012). The community meetings were advertised by individual handouts to residents living along Highway 3. Individual presentations can be found in Appendix 9. Between the hours of 7 and 8pm on November 6, 2012, the Proponent engaged the nearest residents of the Barrington community to address any concerns or questions regarding the BWF via a door-to-door visit. Contact information was left for each resident and the Project was discussed with each household including: location of proposed project, number of turbines, the environmental assessment process, and how residents can view the completed registration document. A total of eight of the nearest residents were met with and two of the eight mentioned noise as a concern. Residents were eager to be kept apprised of Project schedule. The Proponent is committed to issuing a mailout, with a 2km buffer around the Project properties, to update the community.

The first community meeting was attended by 18 community members, and the meeting lasted one and a half hours. The Proponent provided preliminary project information explaining the proposed location of the BWF, the make and model of the proposed WTGs, the COMFIT program, and opportunities for local ownership and investment. The floor was opened to comments and questions on each topic discussed. The community meeting was an opportunity for members of the Barrington and surrounding area residents share their thoughts and concerns with the Proponent. The Proponent noted community concerns for incorporation in Project planning and site layout. The financing of the Project from community investors was the main concern of the meeting attendees. Avian mortality was also mentioned, given the projects relative proximity to of the Important Bird Area (IBA) at Cape Sable.

The Proponent is committed to continuing to engage the residents of the Barrington area, and will do so through specified mailouts and via the Proponent webpage (http://wattswind.com/portfolio/barrington/), in conjunction with further community meetings.

The Proponent is committed to open and transparent communication with residents and stakeholders affected by the operation of the BWF. A community liaison committee (CLC) will be formed if sufficient interest exists in the community.

Community engagement, including meetings, mailouts and use of the website, will continue as the Project proceeds. The Proponent expects to schedule another meeting prior to site work (i.e., clearing and grubbing) likely before April 2013. Refer to Appendix 11 for supporting materials of the community consultation details to date.

5.2 Aboriginal Peoples

The Proponent has engaged and continues to engage various aboriginal stakeholders in Nova Scotia including; KMK, AFN, MAPC, and the OAA. Table 5.1 outlines communications and meetings that were held between the Proponent and various First Nation representatives.

Table 5.1: Summary of Aboriginal Engagement Activities

First Nation Entity	Date	Action	Attendees	Meeting topic	Location
Maritime Aboriginal Peoples Council (MAPC)	Wednesday, April 13th, 2011	Formal Meeting	Josh McNeely, Roger Hunka (MAPC)	All COMFIT projects engagement protocols, MAPC roles	Truro, NS (MAPC Offices)
Kwilmu'kw Maw-klusuaqn (KMK)	Tuesday, May 10th, 2011	Formal Meeting	Eric Christmas, Twila Gaudet (KMK)	All COMFIT projects (mapping, Watts Wind CEDIF), Watts Wind Project, potential for partnerships with First Nations of NS	Truro, NS (KMK Offices)
Acadia First Nation	November 13th, 2012	Informational letter and documenta-tion sent to Band Chief	Addressed to Chief of Acadia First Nation, Deborah Robinson	see Appendix 10	N/A
Office of Aboriginal Affairs (OAA)	April 13th, 2012	Formal Meeting	Alvaro Loyola	Proponent discussed MEKS requiremen ts, BWF description	OAA offices
KMK	various	Phone calls and breakfast meetings Eric Christmas	Eric Christmas (Phone call to Twila Gaudet who suggested Eric was best point of contact for continuing discussions with KMK)	All ComFIT projects and also BWF in particular.	various
Office of Aboriginal Affairs (OAA)	November 21st, 2012	Informal Meeting	Justin Houston	Discussion regarding general Aboriginal engagement practises	Mi'kmaq Learning Seminar

Office of Aboriginal Affairs (OAA)	November 26th, 2012	Formal Meeting	Justin Houston, Beata Dera	Review of Project and engagement completed to date	OAA offices

Meeting with the KMK resulted in the understanding by the Proponent that further Project information should be made available to the KMK as development progressed. Communication with the KMK will be ongoing.

To date, no concerns have been shared with the Proponent on the Project as proposed or on the engagement approach used. The Proponent will continue to update the First Nations community as the Project proceeds.

5.3 Regulatory

The Proponent has consulted with numerous Municipal, Provincial and Federal representatives regarding the proposed BWF. Consultations to date and future plans are described below.

Municipal consultations

On March 27th, 2012, the Proponent met with the Mayor and Council of the District of Barrington. A formal presentation was made to council, which can be found in Appendix 9. The Proponent has also met with and communicated with the Development Officer for the District of Barrington. The meeting discussions were focused on the Municipal bylaws governing the installation of wind turbines in the Municipality of Barrington, and the completion of a development agreement.

The Proponent will continue to engage the Municipality as the Project progresses.

Provincial consultation

The Proponent has met with various Provincial regulators regarding the development and construction of the BWF project. The Proponent has either met or corresponded with NSDOE, NSE, OAA, NSDNR, and the Department of Communities Culture and Heritage. These interactions have assisted the Proponent in scoping the EA, including defining the appropriate field work and consultation activities, and in Project planning and design.

The Proponent will continue to engage Provincial regulators throughout the development, construction and operation of the BWF.

Federal consultation

The Proponent has consulted with various Federal entities regarding the construction of the BWF. Environment Canada (via CWS), the Canadian Coast Guard, NAV Canada, Transport Canada and DND

were all contacted regarding the development of the BWF. Like their Provincial counterparts, these have assisted in the preparation of this EA and Project planning and design.

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

6.0 Analysis

6.1 Interaction of the Project and the Environment

Identifying those VECs and socio-economic aspects that may be subject to environmental effect from Project activities is the keystone of the EA process. Following the presentation of the Project activities as described in Section 2, the environmental and socio-economic setting in Section 4, and the review of issues arising from consultation as per Section 5, the interaction of the project activities with the VECs can be completed.

The interaction matrix is presented in Table 6.1. This graphically shows the potential interaction between Project activities and each biophysical VEC or socio-economic aspect.

Table 6.1 Potential Linkages of Project and the Environment

	Site Preparation and Construction								Operation and Maintenance			Decommissioning		
	Clearing and Grubbing	Access Road and Laydown Area	Turbine Foundation	Power Pole and Line & U/G Electrical	Crane Pad Construction	Turbine Installation	Site Restoration & Commissioning	Accidents and Malfunctions	Turbine Operation	Inspection and Maintenance	Accidents and Malfunctions	Infrastructure Demolition	Site Reclamation	Accidents and Malfunctions
Physical Components														
Ground and surface water	●	●	●	●			●	●			●	●	●	●
Radar and radio signals									●					
Ambient noise	●	●	●	●	●		●		●			●	●	
Ambient light						●			●					
Ecological Components														
Wetlands and watercourses	●	●		●				●			●			●
Fish habitat		●						●			●			●

	Site Preparation and Construction								Operation and Maintenance			Decommissioning		
	Clearing and Grubbing	Access Road and Laydown Area	Turbine Foundation	Power Pole and Line & U/G Electrical	Crane Pad Construction	Turbine Installation	Site Restoration & Commissioning	Accidents and Malfunctions	Turbine Operation	Inspection and Maintenance	Accidents and Malfunctions	Infrastructure Demolition	Site Reclamation	Accidents and Malfunctions
Migratory and breeding birds	●								●					
Flora and fauna	●	●											●	
Species at risk & of concern	●	●							●					
Socio-economic Aspects														
Land use	●								●				●	
Aboriginal resources / uses	●	●	●	●										
Archaeological resource	●	●	●	●										
Recreation	●								●				●	
Vehicular traffic			●			●				●				
Landscape aesthetics	●					●			●					
Tourism	●													
Health and safety								●			●			●
Local economy	●	●	●	●	●	●	●		●	●		●	●	

Accordingly, eighteen VECs and socio-economic aspects have been identified as potentially being affected by the proposed Project. These interactions are presented in the following sub-sections in terms of potential environmental effects of Project activities including accidents and malfunctions, as well as proposed mitigations, cumulative effects, and finally the level of significance of residual effects. This assessment is completed in accordance with the methodology presented in Section 3.

6.2 Assessment of Physical VECs

Ground and Surface Water

Maintenance of ground and surface water regimes is important to support ecological systems. It is also directly related to human health if the groundwater was impacted as residents in the local area have private wells. Ground and surface waters interface on the site in the flow accumulation channels as shown in Figure 4.1 with flow generally in the southern direction toward Murray Cove about 1km downgradient. Accordingly, quality and quantity of both ground and surface water have been identified as a VEC.

A significant environmental effect would result if a substantive change attributable to the Project could be identified in water quality or quantity in tributaries that lead to Murray Cove, or in groundwater immediate to the site including the residential wells along Highway 3.

- *Boundaries* – Spatial bounds include the local area, i.e., watercourses within the Project site and down gradient toward Murray Cove, as well as groundwater local to the site. The temporal boundary focuses on Project construction but includes all phases of the Project with respect to unplanned releases.
- *Potential Project Impacts* – Pathways that may adversely affect surface quality include disturbance of sediments during the construction of the WTGs, the access road and the utility line, and potential for accidental release of hazardous materials such as fuels, oils and lubricants during all phases of the Project. Also during construction of access road, it is expected based on proposed site layout that four culvert installations are required.
- *Proposed Mitigative Measures* – Related to erosion and sedimentation, these mitigations include:
    - Prepare an erosion and sedimentation control plan as part of final Project design and in consideration of additional field work planned for Spring 2013, including incorporation of a 30m buffer to watercourse and wetlands wherever possible;
    - Install and maintain temporary erosion control measures as per plan, e.g., sediment fences, rock check dam, mulch, etc., prior to grubbing;
    - Responsible storage and handling of excavated materials to avoid erosion;
    - Define limits of work associated with construction activities which maintains a suitable buffer zone to watercourses and wetlands;
    - Complete work required for culvert installations between June and September in accordance with applicable Provincial regulations, including *Activity Designation Regulations* and *Wildlife Habitat and Watercourses Protection Regulations*, as well as the Nova Scotia Watercourse Alteration Specification (Nova Scotia Environment, 2006);
    - Both during construction and prior to site stabilization, complete visual monitoring to ensure that any resulting turbidity due to suspended solids in surface waters draining

from construction is minimal and to provide feedback into sediment and erosion control mechanisms upstream;
    - Timely re-vegetation of disturbed areas after construction; and
    - Compliance with the EPP and pertinent legislation.

  In term of potential blasting, the Proponent will:
    - abide by the Blasting Safety Regulations of Nova Scotia (2008).

  Related to accidental release, these mitigations include:
    - All hazardous materials to be used at the site will be labeled and contained according to applicable regulations;
    - No hazardous materials will be stored within 50m of a wetland or watercourse;
    - Frequent inspection and maintenance of equipment will be undertaken to identify and repair any fuel leaks;
    - Used oil, filters and other products associated with equipment maintenance shall be collected and disposed of in accordance with regulatory requirements; and
    - Spills shall be immediately reported as per legislation and as identified in the EPP.
- *Cumulative Effects* – There is ongoing harvesting of fire wood for private use of land owner taking place in and around the Project site; this work is assumed to be in compliance with legislation. Given the scale of this activity relative to the small scale of this construction and mitigative measures in place in accordance with legislation, it is very unlikely that a significant adverse residual environmental effect on surface water and ground water would result from these activities acting cumulatively.
- *Significance of Residual Effects* – Erosion and sedimentation, if they occur, will be temporary, since all areas to be disturbed by construction will be stabilized both during and after construction. The likelihood of an accident or malfunction resulting in a release is quite low; should it occur, the volume is anticipated to be very small, i.e., below reportable levels. Should blasting occur, the point of blast is not expected to be within 800m of a residential well.
    - The Project is not anticipated to have a significant residual environmental effect on the local ground and surface water. While any effect will be negative, it will be small in magnitude, reversible, short duration, and local. The environmental effect on ground and surface water is predicted to be negligible.

Radar and radio signals

Radar and radio signals are important in terms of communication and safety of navigation. Radio communication systems include cellular networks and point-to-point systems. Radar systems are used for several purposes including, but not limited to, weather prediction, Canadian Air Defence System, and air traffic control systems. Accordingly, maintenance of radio and radar communications has been identified as a VEC.

A significant environmental effect would result if a substantive interference attributable to the Project could be identified in radar and radio communication.

- *Boundaries* – Spatial bounds consist of the local area, i.e., potential area of influence of the WTGs to interfere with communications. The temporal boundary is Project operation.
- *Potential Project Impacts* – Pathways that may adversely affect radar and radio communications are limited to interference from WTG operation. Consultation was completed as recommended within the document, *Technical Information and Guidelines on the Assessment of the Potential Impact of Wind Turbines on Radio Communication, Radar and Seismoacoustic Systems* (CanWEA, 2007). Responses to date have not found any concerns associated with interference given the size and location of the Project. While NavCanada has not yet responded, no concern is expected based on informal communication to date.
- *Proposed Mitigative Measures* – No effect is predicted on radio and radar. Accordingly, no specific mitigations are recommended. Should the locations of the WTGs change, the new coordinates will be sent to the appropriate authorities for evaluation.
- *Cumulative Effects* – As no effect is predicted, by definition, there cannot be other activities acting cumulatively.
- *Significance of Residual Effects* – Interference with radar and radio systems is not expected to occur.
    - The Project is anticipated to have no environmental effect on communications via interference with radar or radio signals.

Ambient noise

Sound pressure is perceived via the vibrations transferred to the receptor in air or another medium. SPL is measured on the decibel scale which is logarithmic. Values are often presented as A-weighted to adjust for human perception, i.e., dBA.

The SPLs decrease with distance from source; however, this attenuation is a function of many factors including:

- climatic conditions, such as humidity, wind speed and direction, and temperature;
- frequency, where lower frequency sounds have less attenuation over distance;
- building materials which reduce interior SPLs, though this attenuation is less for lower frequency sounds;
- ground characteristics, where hard ground reflects sound and ground cover absorbs sound; and,
- terrain, where features may obstruct sound.

Noise is by definition unwanted sound. Perception of noise by a receptor is a function of many factors, including attitude toward to source of the sound. If a sound is a reminder of an unwanted activity or development, the perception of that sound will be influenced accordingly. Further, ambient sound levels at the Project site and nearby residential properties are expected to be fairly low in keeping with the rural character of the area. Accordingly, ambient noise has been identified as a VEC.

A significant environmental effect would result if a substantive change in SPL attributable to the Project could be identified at the nearby residential dwellings. A guideline 40dBA for the additional SPL at the outside of residential dwellings is widely adopted and has been shown as protective based on literature review (Rod & Heiger-Bernays, 2012); hence a predicted SPL from Project activities that is over 40dBA at residential dwellings would be considered a substantive change.

- *Boundaries* – The spatial boundary is the local area, i.e., neighbouring properties within 2km radius. The temporal boundary is all Project activities.
- *Potential Project Impacts* – Pathways that may adversely affect ambient noise levels include sound pressure that will be generated during site preparation and construction, as well as decommissioning activities, i.e., trucks, equipment. There is also a potential for blasting during construction if required to construct the WTG foundations. As distance from the site increases, noise levels will be attenuated. Nevertheless noise from construction activities may be heard by the nearby residents; certainly vibrations from blasting will be observed by nearby residents should blasting occur. Construction noise may also temporarily disrupt the short term activities of fauna and birds at or in the vicinity of the Project site. In summary, noise resulting from construction activities may cause some temporary inconvenience.
  During operation, sound pressure is emitted from the nacelle, i.e., the hub of the turbine, as well as the spinning blades. In order to predict the resulting sound pressure at the nearby residences, a desktop assessment of noise was completed as presented in Section 4.2.4. This desktop assessment was completed to determine if computational modeling was required for the 2 WTGs. Using the highest SPL of the WTGs under consideration, the matrix developed by Ontario Ministry of Environment shows the attenuation of SPLs as distance increases from the WTGs such that all of the nearby residences are below the 40dBA guideline as they are beyond 1000m as per the Municipal requirements. Noise modelling was also completed using wind energy planning software. Both methods of assessment of ambient noise from the WTG show that the noise from the WTG will be well under the 40dBA noise threshold.
- *Proposed Mitigative Measures* – Related to effect on ambient noise levels during construction, the mitigations include:
  - Adherence to EPP related to timing of construction activities in daytime hours wherever possible to minimize nuisance to nearby properties;
  - Communication of construction plan with nearby residents in terms of construction activities and schedule, as well as contact information should residents have concerns;
  - Preparation of a blasting plan and notification system in the event that blasting is required to build WTG foundations; and
  - Maintenance of construction equipment and vehicles to reduce noise emissions.

  Related to WTG operation, the mitigations include:
  - As already completed, siting of WTGs includes the minimum separation distances as per Municipal bylaw which can be conservatively shown to have SPLs resulting from WTGs is under 40dBA;
  - Ongoing consultation with community including nearby residences on Project as a whole, as well as sharing contact information should residents have concerns; and

    - As per the EPP, a conflict resolution plan will be in place should nearby residents have concerns about ambient noise levels.
- *Cumulative Effects* – There are known works taking place in the vicinity of the site, including some minor harvesting and a large wind farm some 15km distant as described in Section 2.10. Given relative scale of the Project or distance from the Project, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on ambient noise levels in the local area.
- *Significance of Residual Effects* – Annoyance caused by noise during construction, if it occurs, will be temporary and short term. Concerns of residents over noise during Project operation is expected to be minor, if it occurs, based on predicted SPL levels below 40dBA at residences and the Proponent's early and ongoing Project consultation.
    - The Project is not anticipated to have a significant residual environmental effect on the ambient noise levels. While any effect will be negative, it will be small in magnitude, reversible, and local; however, relative to the operating WTGs, any effect will be long in duration, i.e., operational Project phase. The environmental effect on ambient noise is predicted to be minor.

Ambient light

For aviation safety, the WTGs have to be marked in accordance with Standard 621 under the Canadian Aviation Regulations. Ambient light levels at the Project site and nearby residential properties are expected to be fairly low during nighttime hours in keeping with the rural character of the area. Accordingly, ambient light has been identified as a VEC. A significant environmental effect would result if a substantive change in lighting attributable to the Project could be identified at the nearby residential dwellings or if an appreciable change could be noted in migratory birds' flight patterns due to Project lighting.

- *Boundaries* – The assessment is within the local area, i.e., the neighbouring properties on Highway 3, as well as radius that may influence migratory birds and wildlife due to effect of lighting. The temporal boundary is all Project activities.
- *Potential Project Impacts* – Pathways that may adversely affect ambient light levels include lighting from and for equipment and vehicles during site preparation and construction, as well as decommissioning activities. Light from construction activities may be observed by the nearby residents and may cause some temporary, short term inconvenience.
  During operation, lighting of the WTGs is required for aviation safety as regulated by Transport Canada. This has the ability to affect migratory birds, other wildlife and be observed by nearby residents.
- *Proposed Mitigative Measures* – Related to effect on ambient light levels during construction, the mitigations include:
    - Adherence to EPP related to timing of construction activities in daytime hours wherever possible to minimize nuisance to nearby properties;
    - Use of only necessary lighting to support construction activities; and

- Communication of construction plan with nearby residents in terms of types of construction activities and schedule, as well as sharing contact information should residents have concerns.

Related to WTG operation, the mitigations include:

- As already completed, siting of WTGs beyond separation distances as per Municipal bylaws will minimize visibility of WTG lighting by nearby residents;
- Further, retaining forest cover wherever possible, i.e., minimize clearing as part of the Project, may reduce visibility of WTG lighting for some nearby residents;
- Consideration of lighting approaches that meet Transport Canada requirements but also minimize potential to impact nearby residents, birds or wildlife will be undertaken as part of WTG specification, including use of a LED based technology;
- Ongoing consultation with community including nearby residences on the Project as a whole, as well as sharing contact information should residents have concerns; and
- As per the EPP, turbine lighting plan will be prepared in consultation with CWS and Transport Canada.

- *Cumulative Effects* – There are known works taking place in the vicinity of the site, including some minor harvesting and a large wind farm some 15km distant as described in Section 2.10. Given relative scale of the Project or distance from the Project, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on ambient light levels in the local area.
- *Significance of Residual Effects* – Annoyance caused by lighting during construction, if it occurs, will be temporary and short term. Concerns of residents over lighting during Project operation is expected to be limited, if it occurs.
    - The Project is not anticipated to have a significant residual environmental effect on the ambient light levels. While any effect will be negative, it will be very small in magnitude, reversible, and local. Relative to construction, any effect is short term; however, relative to the operating WTGs, any effect will be long in duration, i.e., operational Project phase. The environmental effect on ambient noise is predicted to be negligible.

6.3 Assessment of Ecological VECs

Wetlands and watercourses

Maintaining ground and surface water quality and quantity has been analyzed in Section 6.2; the residual environmental effect was predicted to be negligible in terms of potential releases of sediment and hazardous materials. While maintaining ground and surface water quality and quantity is essential for the ecological function of wetlands and watercourses, the Project could also interact in terms of direct alteration wetlands and watercourses.

Wetlands and watercourses are both protected by Provincial legislation and are valued by society due to their ecological function. Watercourses themselves hold ecological value by providing habitat for fish and aquatic flora and fauna. Wetlands provide or support a wide range of important ecological, social and economic functions and services in our watersheds. This value is the underlying principle for NSE's

Nova Scotia Wetland Conservation Policy (Government of Nova Scotia, 2011b). Alteration of watercourses or wetlands requires the approval of the Province unless works fall within a few specific circumstances identified as exceptions by NSE.

Within the area of the WTGs and the access road, wetlands and watercourses have been preliminarily identified as part of the desktop and field work completed; this field work is further described in Section 4.1.3 and Appendix 7. The areas of the proposed WTGs are in exceedance of 50m from wetlands or watercourses. In terms of the access road, spring field work of qualified wetland delineators is planned to assist the Project team in detailed design. Based on the access road as proposed, there are five planned watercourse crossings; in these locations, culvert installations are required. Based on the proposed routing as shown on Figure 4.1, several small wetlands, primarily treed swamps, will likely need to be impacted by the linear development of the access road of width 6-8m. Necessary wetland alternations may not require an approval. Yet the Proponent is committed to avoiding impact to wetlands wherever feasible.

Another routing has been identified which may result in avoidance or minimization of impact to wetlands. As noted, additional design and field work is planned for Spring 2013. In any case, the mitigation sequence of avoidance, minimization and compensation will be implemented as per NSE's Wetland Conservation Policy. NSE will be kept informed of results of field work to delineate wetlands within 50m of the proposed access road. No direct alteration will be completed without the necessary approvals from NSE. Further liaison with NSE on mitigation of impact to wetlands will be held to ensure compliance with the Policy and the Activity Designation Regulations.

There is also a larger wetland mapped by DNR downgradient of the Project site; this approximate 4.5ha wetland is proximate to Murrays Cove just south of Highway 3, i.e., downgradient of the site. There are DNR mapped wetland areas about 800m west of the site, i.e., surrounding Bear Point Pond; there is no surface water pathway to affect this wetland based on the proposed Project location.

Accordingly, wetlands and watercourses have been identified as a VEC. A significant environmental effect would result if a substantive change in ecological function of watercourses or wetlands on the Project site could be identified and attributable to the Project.

- *Boundaries* – Spatial bounds are the limits of work associated with the Project, i.e., watercourses and wetlands within or downgradient of the the Project site. The temporal boundary is focused on Project construction activities.
- *Potential Project Impacts* – Pathways that may adversely affect ecological function of wetlands and watercourses are primarily related to their physical alteration during site preparation and construction, though the same effect could occur during decommissioning activities. Both quality and quantity of ground and surface water were assessed separately and residual effect is predicted to be negligible; therefore, this pathway is not included in the assessment of wetlands and watercourses. Hence no effect is predicted on the larger wetland proximate Murray Cove. Physical alteration would include, but is not limited to, fording watercourses with vehicles or equipment, excavating wetlands, and infilling wetlands and watercourses with materials such as

gravel or excavated material from the site. Alterations to wetlands and watercourses require an approval as defined in the Province's Activities Designation Regulations.

- *Proposed Mitigative Measures* – Related to effect on wetlands and watercourses during construction, the mitigations include:
    - Siting of the WTGs and laydown areas greater than 50m from watercourses and wetlands;
    - Completing additional design on the access road based upon field work results to minimize alteration of wetlands, or ideally avoidance where possible;
    - Complete culvert installations as necessary along access road as follows:
        - This work will occur from June to September during low flow conditions;
        - If there is flow in the watercourse, isolation and pumping will be used as necessary to keep the in stream work in the dry;
        - Mitigations will include sediment and erosion control and water handling as necessary to protect downgradient water quality;
        - Work will be in compliance with Nova Scotia Watercourse Alteration Specification (Nova Scotia Environment, 2006);
        - All necessary notification will be given to and any approvals necessary will be sought from NSE;
    - Based on the Project design and additional spring field work, NSE will be consulted accordingly on any necessary wetland alteration and the will be EPP updated to ensure that all work will be in compliance with applicable Provincial policy, specifications and regulations;
    - Limits of work will be defined (including flagging of wetlands) to assist the Contractor to avoid sensitive areas; and
    - Education of the Contractor via the EPP on importance of maintaining the protective 50m buffer from WTG sites and necessary measures to protect watercourses and wetlands during access road construction, as well as other mitigative measures to protect ground and surface waters as noted in Section 6.2.
- *Cumulative Effects* – There is minimal harvesting taking place in and around the Project site; this work is assumed to be in compliance with legislation, including the Wildlife Habitat and Watercourses Protection Regulations. With mitigative measures in place in accordance with legislation and given the small scale of this work, it is very unlikely that a significant adverse residual environmental effect on ecological function of wetlands and watercourses would result from these activities acting cumulatively.
- *Significance of Residual Effects* – Project planning has aimed to avoid direct alteration of wetlands and watercourses, this has been achieved with the siting of the WTGs themselves; yet culvert installations and likely some direct wetland alteration is required to construct the access road. Detailed project design and additional field work is planned in spring of 2013; to the extent possible, wetland alteration will be minimized or avoided if feasible. NSE will be provided with additional detail and all work will be completed as per Provincial requirements. Any

necessary direct alteration is expected to be very small to wooded swamps and may fall under the Wetland Conservation Policy exemption.

- The Project is not anticipated to have a significant residual environmental effect on the ecological function of watercourses and wetlands. While any effect will be negative, it will be very small in magnitude, short term, and local; while the effect is not reversible to that wetland itself should alteration occur, compensation will be completed as required under the NSE Wetland Conservation Policy. The environmental effect on wetlands and watercourses is predicted to be negligible.

Fish habitat

The Project site is within a watershed containing fish habitat in Atwoods Brook which drains to Murray Cove in Barrington Passage. The watercourses on the Project site itself do not drain to Atwoods Brook; these tributaries drain to Murray Cove though a wetland. These streams provide poor fish habitat and some are seasonal water flow. Murray Cove itself would have fish habitat as part of the Barrington Passage. Fish habitat is protected under the Federal *Fisheries Act*. Accordingly, fish habitat has been identified as a VEC. A significant environmental effect would result if a substantive change in fish and their habitat could be attributed to the Project downgradient of the Project site, including Murrays Cove.

- *Boundaries* – Spatial bounds include the catchment area draining into Murray Cove from the Project site. The temporal boundary is primarily during construction.
- *Potential Project Impacts* – Pathways that may adversely affect fish habitat include release of sedimentation or hazardous materials, and physical alteration of watercourses during site preparation and construction, as well as to a much lesser extent operational and decommissioning activities.
  Both pathways were assessed as other VECs, i.e., ground and surface water (physical) and wetlands and watercourses (ecological). Residual effects on both VECs were predicted to be negligible; therefore, these pathways are not included in the assessment of fish habitat. No other pathways exist to affect fish habitat from this Project.
- *Proposed Mitigative Measures* – No effect is predicted on fish habitat. Accordingly, no specific mitigations are recommended outside of mitigative measures as proposed for the VECs of ground and surface water and wetlands and watercourses.
- *Cumulative Effects* – As no effect is predicted, by definition, there cannot be other activities acting cumulatively.
- *Significance of Residual Effects* – Effect on fish habitat is not expected to occur.
  - The Project is anticipated to have no environmental effect on fish habitat.

Migratory and breeding birds

While no high sensitivity factors for migrating or breeding birds was observed during field work, many species of breeding birds were noted in the area and during fall migration surveys, some of the birds noted were likely migrants (as discussed in Section 4.1.4). Environment Canada is responsible for

implementing the *Migratory Birds Convention Act* (MBCA), which provides for the protection of migratory birds, their eggs and nests through the Migratory Birds Regulations. Further an Important Bird Area (IBA) is located some 4km east of the site, i.e., South Shore (Barrington Bay Sector) NS018. Yet based on results of spring and fall migration surveys and summer breeding bird survey, the site sensitivity is defined as Low and the project is Small, i.e., as per Environment Canada the resulting Level of Concern Category is 1 (see Appendix 4).

Accordingly, migratory and breeding birds have been identified as a VEC. A significant environmental effect would result if a substantive change could be identified in numbers of breeding or migratory birds or their habitat attributable to the Project. Species of birds that are identified as at risk or of special concern are assessed as a separate VEC.

- *Boundaries* – The spatial bounds include the area where the WTGs are proposed to be located and extending to include the areas that are frequented by birds that may be impacted by the Project. The temporal boundary is all Project activities.
- *Potential Project Impacts* – Pathways that may adversely affect birds during construction include disturbance from clearing activities: direct effects, such as tree removal, and indirect effects, such as noise and lighting. Residual environmental effects of noise and light from construction were predicted to be negligible; therefore, it is not included for additional assessment on birds. During operation, the rotation of the blades may cause individual fatalities. Operation of the WTGs has the ability to affect migratory birds in terms of direct effects, such as collisions, and indirect effects such as noise and lighting. Residual effect of lighting was predicted to be negligible; therefore, it is not considered in the assessment on birds.
- *Proposed Mitigative Measures* – Related to effect on migratory and breeding birds during construction, the mitigations related to clearing include:
    - As already completed, siting and design of the Project to limit areas disturbed to 3.1ha within a mixed forest habitat that is typical in the area and in some areas, young fir regeneration;
    - Undertaking a nesting survey prior to clearing activities to ensure compliance with the *MBCA*, i.e., no disturbance of nest until fledglings have left; and
    - Adherence to EPP related limits on area of work to minimize the cleared area.

  Related to WTG operation, the mitigations include:
    - While the siting of WTGs is within 5km of an IBA, the field studies completed in 2012 determined that the site sensitivity remains low, hence confirmatory studies confirm the acceptability of the Project siting;
    - Design a monitoring plan and carcass survey methodology in accordance with Environment Canada and CWS, and implement the plan including completion of annual reporting; and
    - Notification of the Project Manager if carcasses are found by site personnel during regular site visits as defined in EPP, including logging information and notification of CWS by the Project Manager.

- *Cumulative Effects* – There are known works taking place in the regional area, such as the Pubnico Point Wind Farm some 15km away from the BWF. Given relative distance of the Project and from this larger installation and the smaller size of the Project itself, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on migratory and breeding birds.
- *Significance of Residual Effects* – Disturbance of birds during construction, if it occurs, will be temporary and short term; no disturbance of nests will occur. Effect on birds during Project operation via mortality from collisions is expected to be low in number, if they occur; monitoring will verify the effect in accordance with regulatory requirements.
    - The Project is not anticipated to have a significant residual environmental effect on migratory and breeding birds. While any effect will be negative, it will be small in magnitude, reversible, and local; however, relative to the operating WTGs, any effect will be long in duration, i.e., operational Project phase. The environmental effect on migratory and breeding birds is predicted to be minor.

Flora and fauna

As discussed in Section 4.1.5, the Project site is located within a mixed forest area with red maple, balsam fir and black spruce. While the habitat is not particularly unique, the area does host flora and fauna that are of value in Nova Scotia (e.g., sugar maples, black bear, deer, etc.). Accordingly, flora and fauna has been identified as a VEC. A significant environmental effect would result if a substantive change could be identified in population of a flora or fauna species that was attributable to the Project. Species of flora and fauna that are identified as at risk or of special concern are assessed as a separate VEC.

- *Boundaries* – The spatial bounds includes the area where the WTGs and access road are proposed, and for fauna specifically, extending to include the areas that are frequented by fauna that may be impacted by the Project. The temporal boundary focuses on Project construction.
- *Potential Project Impacts* – Pathways that may adversely affect flora and fauna primarily include clearing of land during construction; however, this area is relatively small (i.e., about 3.1 ha) in relation to similar habitat in local area. Fauna in immediate area of the cleared area may relocate to avoid impact though habitat that will be lost – again a small area relative to local habitat.

  During operation, noise from the WTGs may affect fauna that use the area as part of their habitat. Given the predicted residual significant effect on ambient noise levels as minor in relation to residents, the parallel effect on fauna is expected to be negligible given the adaptability of fauna and the extent of similar habitat; therefore, this pathway is not further considered in this assessment.
- *Proposed Mitigative Measures* – Related to effect on flora and fauna during construction, the mitigations include:
    - Adherence to EPP related to minimizing disturbance of wildlife, including no tolerance for harassing wildlife; and

    - Limitation on areas cleared as already noted in this document and in the EPP.
- *Cumulative Effects* – There are known works taking place on the site and immediate area, such as minor harvesting. Given relative scale of the Project and these other activities, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on flora and fauna.
- *Significance of Residual Effects* – Annoyance of fauna caused during Project construction, if it occurs, will be temporary and short term. Effect on habitat due to the clearing required for this Project is extremely small relative to similar habitat on the Project site and in the local area in general.
    - The Project is not anticipated to have a significant residual environmental effect on flora and fauna. While any effect will be negative, it will be very small in magnitude, reversible, local, and short term. The environmental effect on flora and fauna is predicted to be negligible.

Species at risk and of concern

Listed species at risk receive legal protection (i.e., Federal *Species at Risk Act* and Provincial *Nova Scotia Endangered Species Act*), and species of concern are valued and a focus of sustainable project planning within an EA. The potential for species at risk and of concern was scoped initially via desktop surveys, including the observations reported by ACCDC and general knowledge of habitat on and near the site. This assisted in defining the field studies for species at risk and of concern along with consultation with regulators as appropriate. The results of the field studies are presented in Section 4.1.7.
A listed species at risk with a potential to use the Project site as habitat is the Wood Turtle. While the Wood Turtle is not well known to be in the area, one records of siting have been identified by ACCDC. Similarly, three records of sitings were found of the Blanding's Turtle. With respect to the Project site, neither species would likely not find habitat for nesting on the site near the WTGs or near the proposed access road. Yet the banks of Highway 3 and Atwood Brook are a moderate potential habitat during nesting season (i.e., late May - early July for Wood Turtle and June –July for Blanding's Turtle).
During fall 2012 survey, evidence was found for Eastern Moose (mainland population) via pellets and browsing. The ACCDC data reports 67 observations under a 20km radius. The habitat and location of the Project site indicate a moderate potential for Mainland Moose in the local area.
Some species of concern, e.g., as identified by ACCDC or the DNR General Status Ranks of Wild Species, have been identified on or near the Project site. As per Section 4.1.7, these include the following DNR Yellow Ranked species:

- One Common Loon detected flying over the site; and
- Presence of Little Brown Bat and Northern Long-eared Bat were noted.

Accordingly, species at risk and of concern has been identified as a VEC. A significant environmental effect would result if an identified species or their habitat was irreversibly harmed by an activity that was attributable to the Project.

- *Boundaries* – The spatial boundary includes the area where the WTGs are proposed to be located and the Project's ancillary features extending to include the areas that are frequented

by species at risk or of concern that may be impacted by the Project. Temporal boundary includes all Project activities.

- *Potential Project Impacts* – Pathways that may adversely affect species at risk and of concern include habitat disruption during site preparation and construction and direct effects of operation of the WTGs.
  Specifically, several species of concern have been noted during the desktop review and field work as moderately likely to interact with the proposed Project. These interactions are as follows:
    - *Plants*: No yellow ranked or listed plants were found on the site though two S3 or S3S4 species were noted (i.e., Nova Scotia Agalinis and Eastern blue-eyed grass) which are identified as Green-ranked by DNR; should the proposed Project footprint change appreciably, suitable field work for floral species at risk or of concern will be completed to the satisfaction of DNR.
    - *Birds*: The construction activities are not expected to interact due to nesting survey proposed prior to clearing; however, there are potential interactions during Project operation, i.e., direct effect of collisions, yet the only species of concern noted during field work was a Common Loon (Yellow Ranked).
    - *Mammals*: If Mainland Moose do indeed use the Project site, there is some potential disturbance during all Project phases. In terms of bats, there is a similar potential as with birds, i.e., direct effect of collisions.
    - *Reptiles*: The potential interaction exists during construction of access road; however, this has been delayed until after the Wood Turtle nesting season, i.e., not before mid-July.
- *Proposed Mitigative Measures* – Related to effect on species at risk and of concern during Project construction, the mitigations include:
    - Undertaking a nesting survey prior to clearing activities as already noted in this document and in the EPP;
    - Limitation on areas cleared as already noted in this document and in the EPP;
    - Additional moose surveys is proposed for spring of 2013 to gather additional baseline information; this will be designed and implemented to the satisfaction of DNR, and the need for any post-construction monitoring for moose will be determined in consultation with DNR following this additional baseline field work;
    - As per the EPP, notification of the Project Manager if Mainland Moose are observed during site works who will notify DNR;
    - Schedule works to avoid civil works during Wood Turtle and Blanding's Turtle nesting period;
    - As per the EPP, education of the Project Contractor on the importance and the potential presence of Wood Turtle and Blanding's Turtle; and
    - Should the proposed Project footprint change appreciably, suitable field work for floral species at risk or of concern will be completed to the satisfaction of DNR.

  Related to WTG operation, the mitigations include:
    - Bird and bat carcass searches as already committed as per the EC / CWS approved plan;

    - Notification of DNR and CWS as applicable via the Project Manager of bird and bat carcasses found outside of searches as per EPP; and
    - Notification of DNR of moose observations via the Project Manager as per EPP, as well as any follow up monitoring for moose as deemed appropriate in consultation with DNR.
- *Cumulative Effects* – There are known works taking place in the vicinity of the site, such as minor harvesting. Given relative scale of the Project and this other activity, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on species of risk and of concern.
- *Significance of Residual Effects* – Effects on species at risk and of concern has largely been avoided by appropriate siting and design of the Project.
    - The Project is not anticipated to have a significant residual environmental effect on species at risk or of concern. While any effect will be negative, it will be very small in magnitude, local and generally short term in potential interaction (i.e., construction). While the effect could be irreversible, this is extremely unlikely based on desktop, field work and this assessment. Hence the residual environmental effect on species at risk and of concern is predicted to be negligible.

6.4 Assessment of Socio-economic Aspects

Land use

The proposed Project is set in the rural community of Atwoods Brook with ribbon residential development and resource based activities, such as fishery. The existing land uses of the Project site include harvesting of fire wood for use by land owner. The development density is quite low in keeping with the rural character of the area .There are no residential properties within 1km of the proposed WTGs, and approximately 100 are within 2km as presented in Section 4.2.1. In terms of the local community, there is a reasonable expectation of enjoyment of property on surrounding land; this is valued by the community.

Accordingly, land use has been identified as a VEC. A significant environmental effect would result if a substantive change in current land uses and development trends in the local area that could be attributable to the Project.

- *Boundaries* – The Project site where the WTGs are proposed to be located and ancillary features, as well as surrounding properties to a 2km radius, define the spatial boundaries related to land use assessment. The temporal boundaries include all Project activities.
- *Potential Project Impacts* – Pathways that may adversely affect land use during construction may include any temporary disturbance associated with noise and light, especially blasting if that occurs. Changes to land use via construction activities on the Project site will occur but will be confined to the footprint of the site; appropriately maintaining existing uses of land by property owner is under discussion as part of private agreement to lease the land and is not further considered as part of this assessment. During operation, pathways that may adversely affect land use include effects from operation of the WTGs relating to human perception of

changes to land use, such as sound, light, aesthetics, health and safety, etc.; these are distinct aspects that are assessed separately in this document.
Potential effect of the Project on recreation is assessed separately, i.e., the rails-to-trails walking trail which must be crossed by the access road.

- *Proposed Mitigative Measures* – Related to effect on land use, the mitigations are those proposed for the VECs and socio-economic aspects that relate to land use as explained above, including maintaining 1km distance from habitable dwellings as per the bylaw requirements; the other Project mitigative measures are not repeated here.
- *Cumulative Effects* – There are known works taking place in the vicinity of the site, such as minor harvesting on site and a large wind energy project some 15km away. Given relative scale of the Project and these other activities in terms of scale and distance, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on land use in the local area.
- *Significance of Residual Effects* – Pathways to impact land use relate to other VECs and socio-economic aspects that are assessed separately; these were determined to have negligible or minor residual environmental effects.
    - The Project is not anticipated to have a significant residual environmental effect on the land use in the local area. While any effect will be negative, it will be very small in magnitude, reversible, and local; however, where the effect relates to the operating WTGs, it will be long in duration. The environmental effect on land use is predicted to be negligible.

Aboriginal resources / uses

Based on the archaeological study completed, the Project site and nearby area are considered to exhibit low potential for encountering Mi'kmaq resources as described in Section 4.2.3. As described in Section 5.2, the Proponent engaged the Mi'kmaq at early Project stages and has continued to share information. This is in keeping with the Province's requirement to meaningfully consult with the Mi'kmaq on decisions that impact natural resources. The Project does use Crown land however the activity is considered relatively low impact. Appropriate consultation has occurred between the Proponent and NSDNR for the negotiation of an easement agreement.

Accordingly, Mi'kmaq resources and traditional uses by the Mi'kmaq have been identified as a VEC. A significant environmental effect would result if a substantive change occurred in Mi'kmaq access to traditionally used land, if the availability of traditional resources substantively declined or if a loss or destruction occurred of an artefact of Pre-Contact origin.

- *Boundaries* – The area where the WTGs are proposed to be located, and their ancillary features, could impact aboriginal resources or uses; hence, this defines the spatial boundary. The temporal boundary is all Project activities.

- *Potential Project Impacts* – Pathways that may adversely affect traditional Mi'kmaq uses and resources are primarily based upon those ecological VECs including wetlands and watercourses,

fish habitat, migratory and breeding birds, flora and fauna, and species at risk or of concern, as well as the socio-economic aspect of land use; of these, all effects were predicted to be negligible, whereas no effect was predicted on fish habitat while the effect on migratory and breeding birds was predicted to be minor. Also in terms of construction, direct impact to Pre-Contact artefacts is a potential effect.

- *Proposed Mitigative Measures* – Related to effect on Mi'kmaq resources and traditional uses by the Mi'kmaq, the mitigations are those proposed for the ecological VECs and land use as explained above; they are not repeated here. Further, follow up consultation is planned with the nearby Acadia First Nation, as well as the KMK as per Section 5.2. In addition, the EPP includes protocols should artefacts or human remains be discovered during construction, including contact information for the KMK in the unlikely event that the discovery is considered to potentially be of Pre-Contact significance.

- *Cumulative Effects* – There are known works taking place in the vicinity of the site; however, given relative scale of the Project and these other activities, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on Mi'kmaq resources and traditional uses by Mi'kmaq.

- *Significance of Residual Effects* – Pathways to impact Mi'kmaq resources and traditional uses by Mi'kmaq primarily relate to ecological VECs and land use that are assessed separately and determined to have no impact or negligible or minor residual environmental effects. The potential to discover a Pre-Contact artefact is very unlikely given the low potential identified in the archaeological assessment.
    - The Project is not anticipated to have a significant residual environmental effect on the Mi'kmaq resources and traditional uses by Mi'kmaq. While any effect will be negative, it will be very small in magnitude, reversible, and local; however, relative to the operating WTGs, any effect will be long in duration. The environmental effect on Mi'kmaq resources and traditional uses by the Mi'kmaq is predicted to be negligible.

Archaeological resources

Based on the archaeological study completed, the Project has low risk to impact archaeological resources as described in Section 4.2.2. Protection of cultural resources is required by Provincial legislation, e.g., *Special Places Protection Act*. Accordingly, archaeological resources have been identified as a VEC. A significant environmental effect would result if an irreversible loss or destruction of an archaeological resource that resulted from Project activities.

- *Boundaries* – The area where the WTGs are proposed, and their ancillary features, could impact cultural resources; hence, this defines the spatial boundary. The temporal boundary is primarily the construction phase.

- *Potential Project Impacts* – A pathway that may adversely affect archaeological resources is direct impact to cultural resources during construction activities, such as earth works and excavation.
- *Proposed Mitigative Measures* – The EPP includes protocols should artefacts or human remains be discovered during construction, including contact information for the Province and the KMK in the unlikely event that a discovery is made.
- *Cumulative Effects* – There are known works taking place in the vicinity of the site; however, given relative scale of the Project and these other activities, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on archaeological resources.
- *Significance of Residual Effects* – The potential to discover an artefact is very unlikely given the low potential identified in the archaeological assessment.
    - The Project is not anticipated to have a significant residual environmental effect on the archaeological resources. While any effect will be negative and irreversible, it will be small in magnitude, short term, and local, as well as very unlikely. The environmental effect on archaeological resources is predicted to be negligible.

Recreation

The Project is proposed on private land that is now being used, in part, for harvesting of fire wood for private use of the land owner. There is a trail near the Project site for public use as described in Section 4.2.8; the Non-Designated Rail Corridor within the section named Granite Village / Lower East Pubnico will be crossed by the proposed access road. In addition, recreational activities do exist in the broader area, i.e., on a watershed scale, as briefly described in Section 4.2.8. Accordingly, recreation has been identified as a VEC. A significant environmental effect would result if a substantive change in recreation occurred that was attributable to the Project.

- *Boundaries* – The area where the WTGs and the access road are proposed to be located, as well as immediately surrounding properties, define the spatial boundaries related to assessment of recreation. The temporal boundaries include all Project activities.
- *Potential Project Impacts* – Pathways that may adversely affect recreation during construction may include any temporary disturbance associated with noise and light, especially blasting if that occurs, as well as effect on land use and fish habitat; these are distinct and are assessed separately in this document. In addition, the crossing of the rails-to-trails corridor as part of access road construction and use has potential to impact its use.
  During operation, pathways that may adversely affect recreation include effects from operation of the WTGs relating to human perception of changes to land use, such as sound, light, aesthetics, health and safety, etc. as well as effect on land use itself; these are distinct aspects that are assessed separately in this document.
- *Proposed Mitigative Measures* – Related to effect on recreation, the mitigations are those proposed for the VECs and socio-economic aspects that relate to recreation as explained above;

they are not repeated here. In terms of the rails-to-trails corridor crossing for the access road, the Proponent is actively engaging NSDNR and will work with the Province and any other stakeholders as appropriate to ensure that the effect on trail users is minimized.

- *Cumulative Effects* – There are known works taking place in the vicinity of the site as noted in Section 2.10. Given relative scale of the Project and location / size of other activities, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on recreation in the area.
- *Significance of Residual Effects* – Pathways to impact recreation often relate to other VECs and socio-economic aspects that are assessed separately and determined to have negligible or minor residual environmental effects, or no predict effect in the case of fish habitat. In terms of crossing the walking trail along the abandoned railway, any disruption will be short term and the Proponent is actively working to plan best approach to minimize this effect.
    - The Project is not anticipated to have a significant residual environmental effect on the recreation in the local area. While any effect will be negative, it will be very small in magnitude, reversible, and local; however, relative to the operating WTGs, any effect will be long in duration. The environmental effect on recreation is predicted to be negligible.

Vehicular traffic

The Project site is just north of Highway 3. Movement of concrete, gravels and turbine components is part of the construction phase as described in Section 2.5. All roads that will be used to transport the turbine components will be reviewed with TIR to ensure the ability to handle the movement of the large loads. In terms of WTG and crane component delivery to the Project site, approximately 35 flatbed truck loads are expected on average along this route.

Traffic can often be an issue of community concern. Accordingly, vehicular traffic has been identified as a socio-economic aspect. A significant environmental effect would result if either substantive damage to the existing road system occurred that was attributable to the Project or a substantial delay in traffic flow could be attributable to the Project.

- *Boundaries* – The spatial boundaries are those roads that will be used through the construction phase of the Project. The temporal boundaries are those associated with Project construction, as well as decommissioning Project phase.
- *Potential Project Impacts* – Pathways that may adversely affect traffic include transportation of turbine components and construction materials, such as concrete for turbine foundations, as well as removal of turbine components during decommissioning activities.
- *Proposed Mitigative Measures* – The Proponent will work closely with TIR, the District of Barrington and the community to evaluate the most practical approach to ensure road and bridge integrity, the safety of the travelling public, and minimal inconvenience to travellers. Indeed the Proponent must seek permits from TIR including Working Within Highway Right-of-

Way as well as a Transportation Study and Traffic Management Plan, Sign Permit, and a Special Move: Over-Dimension Permit.

- *Cumulative Effects* – The other known works taking place in the area, or in the vicinity of the site, are not expected to occur simultaneously, and therefore, they will not act cumulatively to increase the likelihood of a significant adverse environmental effect on vehicular traffic at the nearby residents.
- *Significance of Residual Effects* – Annoyance caused by delay in road traffic during construction, if it occurs, will be temporary and short term. By working with TIR, work will be completed to ensure integrity of road structures remains intact.
    - The Project is not anticipated to have a significant residual environmental effect on vehicular traffic patterns. While any effect will be negative, it will be small in magnitude, reversible, short term and local. The environmental effect on vehicular traffic is predicted to be negligible.

Landscape aesthetics

The proposed WTGs are set near the rural community of Atwoods Brook up on a knoll with an approximate maximum elevation of 60m asl. While the area can be described as an aesthetically pleasing landscape, it is very typical of the regional area; it has not been identified as a highly valued view plane nor known for its uniqueness looking northwards. There is no Provincially noted scenic viewplane in the area as noted in Section 4.2.7.

It is important for members of the community to visualize the potential impact to landscape aesthetics. View planes were assessed as described in Section 4.2.7. This included selecting two locations to analyze: the first vantage point is approximately 4km from the site on a bridge spanning Barrington Passage, while the other was taken from Cape Sable Island about 5km from the site. Due to the topography of the area and tree cover, there are minimal views from Highway 3. The two existing and predicted view planes are shown in Section 4.2.7.

Accordingly, landscape aesthetics has been identified as a socio-economic aspect. A significant environmental effect would result if a substantive change of a view plane that is highly valued for its contribution to economic value, e.g., tourism, or its uniqueness in the region.

- *Boundaries* – The area surrounding the propose Project where the WTGs are visible defines the spatial boundaries related to assessment of landscape aesthetics. The temporal boundaries include Project operation.
- *Potential Project Impacts* – Pathways that may adversely affect landscape aesthetics simply relates to visibility of WTGs. Visibility decreases with distance and relates to relative topography and ground cover which may act as obstructions to visibility.
  Members of the community and the public at large have varying opinions on the visual impact of WTGs. To some they represent progress of renewable energy, to others they represent large industrial installations that create a negative effect on the landscape, and some are indifferent.

They do represent change in the landscape which can cause short term reactions (positive or negative); these reactions often decrease over time.

No specific concerns have been shared with the Proponent to date on visibility of turbines.

- *Proposed Mitigative Measures* – The Proponent has carefully selected this Project site in consideration of a variety of constrains; community acceptance is one constraint which includes landscape aesthetics. The specific siting of WTGs has also taken into account the bylaw regarding separation distance and other considerations which minimize extent of visual impact on nearby residents. As described in Section 5.1, community consultation has and will continue to occur. No further mitigations are planned.
- *Cumulative Effects* – The larger wind energy project previously noted is at some distance and not within the same view shed. This project is therefore unlikely to act cumulatively on landscape aesthetics; therefore, there is an extremely low likelihood of a significant adverse environmental effect on landscape aesthetics in the local area due to cumulative effects.
- *Significance of Residual Effects* – The perspective on aesthetics of WTGs is subjective. In terms of this assessment, it has been determined that effects may be perceived by some as negative; however, these perceptions are often a response to change and often decrease over time, i.e., be temporary and short-term.
    - The Project is not anticipated to have a significant residual environmental effect on the landscape aesthetics. While the effect can be negative, it will be very small in magnitude, reversible, short term and local. The environmental effect on landscape aesthetics is predicted to be negligible.

Tourism

There is a tourism industry in Southwest Nova Scotia, including recreation, cultural attractions, shopping and dining. In particular, birding has become is large draw for tourists around Cape Sable, as well as lighthouse tours in the area. As previously noted, the site is located within 15km of a larger wind energy project, i.e., Pubnico Point. The effect of wind energy projects on tourism – both positive and negative – is often discussed by the community. Accordingly, tourism has been identified as a socio-economic aspect. A significant environmental effect would result if a substantive change in levels of tourism in the local area that could be attributable to the Project.

- *Boundaries* – The local area surrounding the Project site, primarily the areas of potential effect for landscape aesthetics, as well as vehicular traffic and ecological VECs, define the spatial boundaries related to assessment of tourism. The temporal boundaries include all Project activities.
- *Potential Project Impacts* – Pathways that may adversely affect tourism include effects on vehicular traffic during construction, as well as other potential effects on ecological VECs, such as fish habitat. As these predicted effects were assessed separately and determined to be negligible or no effect was predicted, these pathways are not included in the assessment on tourism.

In terms of a negative effect on tourism during Project operation, these socio-economic aspects, e.g., landscape aesthetics, are also assessed separately and determined to be negligible. Hence these pathways are not included in the assessment on tourism.
Respecting the potential positive effect on tourism due to interest in viewing the turbines in operation, the Project is not expected to attract much tourism attention given its relative proximity to one of the Province's largest wind installations. There may be some attention during construction, i.e., transportation and erection of the WTGs.

- *Proposed Mitigative Measures* – Related to effect on tourism, the mitigations are those proposed for the VECs and socio-economic aspects that relate to tourism as explained above; they are not repeated here. No additional mitigations are proposed.
- *Cumulative Effects* – There are known works taking place in the vicinity of the site. At a broader scale, larger wind energy projects already exist. Given relatively small scale of the Project, it is very unlikely that these might act cumulatively to increase the likelihood of a significant environmental effect – positive or negative – on tourism in the local area.
- *Significance of Residual Effects* – Pathways that may impact tourism primarily relate to other VECs and socio-economic aspects that are assessed separately and determined to have negligible or minor residual environmental effects. Any interest during construction is not expected to increase tourism noticeably; in any case, the benefit will be short term, reversible and temporary.
    - The Project is not anticipated to have a significant residual environmental effect on tourism in the area. Indeed based on the analysis, no adverse environmental effect on tourism is predicted and any positive effect is considered negligible.

Health and safety

The health and safety of the public are of utmost concern in any project. Related to operation of WTGs, there are specific aspects that are typically a concern to the community. As per the work completed by Rod and Heiger-Bernays (May 2011), these aspects of potential concern specifically include noise and low frequency vibration, ice throw and shadow flicker. The protection of workers and the public during construction and decommissioning activities is a core priority of the Proponent. Occupational health and safety is protected under Provincial legislation.

Accordingly, health and safety has been identified as a socio-economic aspect. A significant environmental effect would result if a substantive increase in risk to human health and safety could be attributable to Project activities.

- *Boundaries* – The spatial bounds include the immediate areas of the Project and the zone of influence of pathways for impact, including shadow flicker which is typically not an issue beyond about 800m (Rod and Heiger-Bernays, 2011). The temporal boundary is all Project activities.
- *Potential Project Impacts* – During any construction project, there are health and safety risks to site personnel. As this Project is not atypical in terms of occupational health and safety and as the Proponent has a health and safety plan and works in compliance with legislation, this specific pathway is not evaluated as part of this assessment.

Similarly, the very unlikely interaction of Project construction with the general public is not further considered in this assessment. By appropriately managing construction traffic and WTG transportation as well as limiting the public's access to the construction site, there is an extremely low level of risk to the public health and safety during the Project construction and decommissioning.

The pathways of impact related to operation are discussed below:

  - *Noise and low frequency vibration*: The guidelines for 40dBA at the outside of residential dwellings is considered protective of health in terms of audible noise and its potential effect on stress levels and sleep; this was addressed as a separate VEC in Section 6.2. Project design to limit exposure to SPLs at these levels is also considered protective in terms of low frequency vibration. Hence this pathway is not assessed specifically here as it was addressed in a separate VEC; residual environmental effect was predicted to be minor.
  - *Ice throw*: A guideline for a safe distance with respect to ice throw is 1.5 (2R + H) where R is rotor (blade) radius and H is hub height. Hence for a typical WTG under consideration with a hub height of 80m and a blade length of 40m, the maximum distance of ice throw is 240m. Ice throw will only occur in specific climatic circumstances.
  - *Shadow flicker*: As described in Section 4.2.6 and as shown in Figure 4.3, shadow flicker was modeled and the boundary was mapped of the maximum exposure guideline for 30 minutes per day and 30 hours per year. This boundary is well distant from the nearby residences even with the conservative assumptions used in the model.

- *Proposed Mitigative Measures* – Related to effect on health and safety during operation, the mitigations for ice throw and shadow flicker include:
  - Potential effects of shadow flicker have been considered as part of the Project siting, hence the predicted effects are within guidelines and no specific mitigation in operation is required;
  - Educate site personnel and land owner on risk of ice throw under certain climatic conditions;
  - Restrict personnel in the immediate area of the WTGs following an icing event, wherever practical; and
  - Post signage at Project site gate to identify potential concerns with ice throw in the radius of potential interaction from the WTGs.
- *Cumulative Effects* – There are known other works taking place in the vicinity of the site; however, due to the nature, location and size, these are not expected to act cumulatively to increase the likelihood of a significant adverse environmental effect on health and safety.
- *Significance of Residual Effects* – Based on Project planning and design, potential effects of shadow flicker are below guidelines to protect human health. Safety risk due to ice throw is not a concern on residential properties and appropriate signage will educate site personnel and visitors on the potential risk of ice throw. Noise was assessed separately and the effect predicted to be minor.

- The Project is not anticipated to have a significant residual environmental effect on human health and safety. While any effect will be negative, an unplanned interaction via ice throw is very unlikely and possible timeframe of occurrence very short term. The interaction due to shadow flicker will be very small in magnitude, reversible, and local; however, as it relates to the operating WTGs, it will be long in duration. The environmental effect on health and safety is predicted to be negligible.

Local economy

The proposed Project will contribute to the local tax base for the life of the Project, as well as the local economy primarily during the construction phase. As this Project is funded in part via a CEDIF as explained in Section 1.1, investment in this Project is open to members of the local community; investment is RRSP eligible and provides additional income tax benefits to eligible investors as it is registered as a CEDIF.

Accordingly, the local economy has been identified as a socio-economic aspect. A significant environmental effect would result if a substantive change employment levels or the local economic base could be attributable to the Project.

- *Boundaries* – The spatial boundary is the District of Barrington to which taxes are paid and where the local businesses and workers primarily reside. The temporal boundary is all Project activities.
- *Potential Project Impacts* – Predicted impacts are positive in terms of the local economy. Pathways that may benefit the local economy include local contracts and short term employment during site preparation and construction, as well as decommissioning activities. Outside of direct contracts or employment, economic spin off is expected in the local area during construction (e.g., accommodation, gasoline, dining, etc.).
  During operation, pathways are primarily related to ongoing taxes paid to the District of Barrington with some ongoing contracts or employment related to the operating wind farm. In terms of potential investment, members of the community have the opportunity to make use of the CEDIF structure to invest in a local project and receive tax benefits.
- *Proposed Mitigative Measures* – Where practical, the Proponent will utilize local labour and businesses. This is often cost-effective for the Proponent but it also roots the development in the community; indeed it is a community-owned Project.
- *Cumulative Effects* – There are known other works taking place in the vicinity of the site that might act cumulatively to increase the likelihood of a positive effect on the local economy; however, cumulative effects are unlikely to be significant.
- *Significance of Residual Effects* – Local economy is predicted to be positively affected due to Project activities over the life of the Project.
  - The Project is anticipated to have a significant residual environmental benefit on the local economy; however, it will be small in magnitude, reversible, and local; however, relative to the operating stage, i.e., municipal taxes, the effect will be long in duration. The benefit on local economy is predicted to be minor.

6.5 Effect of the Environment on the Project

Several environmental factors, e.g., fire, extreme weather, including climate change, could have an adverse effect on the Project. These factors have all influenced the design criteria for the WTGs under review for purchase.

Fire and extreme weather could adversely affect the proposed turbines as they could damage the installed facilities, reduce productivity and/or cause the turbines to be shut down. The spatial boundaries for these effects are restricted to the footprint of the proposed WTGs. Temporal boundaries include all Project phases: construction, operation and decommissioning.

Fire and extreme weather events could adversely impact the Project schedule, but such events are likely to be of short duration. The adverse effect is unlikely to be significant. During operation, a fire in the area could be instigated by both natural events, e.g., a lightning strike, or by humans. In addition to temperature related alarms on the turbines and transformers, there are fire watches during the most sensitive dry summer months in the region. It is therefore likely that any fire would be quickly detected and a prompt emergency response instigated. The turbine towers are also sufficiently high that damage to the nacelle is unlikely. Damage to power poles would be quickly repaired.

Extreme weather events, including any such events aggravated by global warming, including ice formation, hail or lightning strikes, could damage the turbines. Due to elevation of the site, sea level rise is not an issue. During extreme high winds, or ice formation, the design is such that the wind turbines will cut out. These factors have been taken into consideration and relatively small losses to productivity are not a concern to the Project. The turbine towers will be equipped with lightning protection, and damage to turbines from such an event is considered a very rare event. The turbines are also designed to withstand severe events including hurricanes. In conclusion, extreme weather events are unlikely to pose a significant adverse effect on Project operation.

The effects of fire and extreme weather events during project decommissioning are likely to be comparable to those described for Project construction. Such effects are unlikely to be significant.

In summary, extreme environmental events are not anticipated to have a significant residual environmental effect on the Project, i.e., the impact is predicted to be negligible.

6.6 Summary of Residual Environmental Effects

The following table, Table 6.1 Summary of Residual Environmental Effects, presents a qualitative summary of the effect of each VEC and socio-economic aspect that are affected with the following assessment criteria:

- nature of effect, i.e., positive (+), negative (-), or stated as “No impact" where none predicted;
- magnitude of effect on background levels, i.e., small, moderate or large;
- reversibility of the effect, i.e., reversible (REV) or irreversible (IRR);
- timing of effect, i.e., during construction (short) or operation (long) term; and,
- aerial extend of the effect, e.g., area of construction (local) or watershed (regional).

Based on the prior assessment, the residual environmental effects were predicted. As per below, two are predicted to not be affected (radar and radio signals and fish habitat), two are predicted to have minor effects (ambient noise and migratory and breeding birds), while the others are predicted to have negligible effects, of which one is positive (local economy). As described in Section 3.3, monitoring and follow up initiatives are normally not required where an effect is predicted to be negligible. Where a minor effect is predicted, monitoring and follow up initiatives should be considered.

Table 6.2: Summary of Residual Environmental Effects

	Nature	Magnitude	Reversibility	Timing	Extent	Predicted Residual Effect
Groundwater and surface water	-	Small	REV	Short	Local	Negligible
Radar and radio signals	No impact					None
Ambient noise	-	Small	REV	Long	Local	Minor
Ambient light	-	Small	REV	Long	Local	Negligible
Wetlands and watercourses	-	Small	REV	Short	Local	Negligible
Fish habitat	No impact					None
Migratory and breeding birds	-	Small	REV	Long	Local	Minor
Flora and fauna	-	Small	REV	Short	Local	Negligible
Species at risk and of concern	-	Small	IRR	Short	Local	Negligible
Land use	-	Small	REV	Long	Local	Negligible
Aboriginal resources / uses	-	Small	REV	Long	Local	Negligible
Archaeological resources	-	Small	IRR	Short	Local	Negligible
Recreation	-	Small	REV	Short	Local	Negligible
Vehicular traffic	-	Small	REV	Short	Local	Negligible
Tourism	-	Small	REV	Long	Local	Negligible
Landscape aesthetics	-	Small	REV	Long	Local	Negligible
Health and safety	-	Small	REV	Long	Local	Negligible
Local economy	+	Moderate / Small	REV	Long	Regional	Minor

In summary, it can be concluded from this EA that the Project can be implemented without significant long term adverse effects on valued physical and ecological components or valued socio-economic aspects of the environment.