AULDS MOUNTAIN WIND FARM

ENVIRONMENTAL ASSESSMENT – OCTOBER 2013

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Executive Summary

This Environmental Assessment has been prepared for the proposed Aulds Mountain Wind Farm by Natural Forces Wind Inc. in accordance with the Nova Scotia Department of Environment guidelines entitled *A Proponents Guide to Environmental Assessment* (NSE, 2009) and the Nova Scotia Department of Environment guidelines entitled *Proponents Guide to Wind Power Projects: Guide for preparing an Environmental Assessment Registration Document* (NSE, 2012)

Work completed as part of this Environmental Assessment includes desktop and field studies to gather background information and to identify biophysical, physical and socio-economic valued environmental components; consultation with federal, provincial, municipal, local resident stakeholders and Mi'kmaq right–holders also took place as part of the assessment. The significance of residual effect due to project activities was studied for the Valued Environmental Components identified in the background studies based on potential impacts after employing the proposed mitigative measures. Finally, appropriate follow up measures were proposed based on the Valued Environmental Component analysis.

It has been determined from this Environmental Assessment that there are no expected significant residual environmental effects for the proposed Aulds Mountain Wind Farm on the Valued Environmental Components. This project promotes responsible renewable energy development in Nova Scotia and will help Nova Scotia meet the provincial requirement of 25% renewable energy by 2015 and the further target of 40% renewable energy by 2020 set by the Department of Energy.

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*Please note that within the appendices Natural Forces Wind Inc. may be referred to as Wind Prospect Inc. or Natural Forces Technologies.

List of Acronyms

ACCDC	Atlantic Canada Conservation Data Center
AMEC	AMEC Environmental & Infrastructure
CBC	Christmas Bird Count
CEDC	Community Economic Development Corporation
CEDIF	Community Economic Development Investment Fund
COMFIT	Community Feed In Tariff
COSEWIC	Committee of the Status of Endangered Wildlife in Canada
CWS	Canadian Wildlife Study
dB(A)	Decibel A-weighting
DFO	Fisheries and Oceans Canada
EA	Environmental Assessment
EMP	Environmental Management Plan
AMWF	Aulds Mountain Wind Farm
IBA	Important Bird Area
km	Kilometer
MEKS	Mi'kmaq Ecological Knowledge Study
MBBA	Maritime Breeding Bird Atlas
MoPC	Municipality of Pictou County
MW	Megawatt
NSDNR	Nova Scotia's Department of Natural Resources
NSESA	Nova Scotia Endangered Species Act
NSPI	Nova Scotia Power Inc.
PGI	Pellet Group Inventory
PPA	Power Purchase Agreement
Project	Aulds Mountain Wind Farm
Proponent	Natural Forces Wind Inc.
SARA	Species at Risk Act
SCADA	Supervisory Control and Data Acquisition
SODAR	Sonic Detection And Ranging
Strum	Strum Environmental
SPL	Sound Pressure Level
VEC	Valued Environmental Component
W4All	Wind4All Communities Inc.
WAM	Wet Area Mapping
WTG	Wind Turbine Generator

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1 Introduction

1.1 Overview

The Aulds Mountain Wind Farm (Project or AMWF) as proposed is a 4.6 megawatt (MW) two wind turbine generator (WTG) project. The Project is located in the Municipality of Pictou County (MoPC), near the community of Piedmont on the north eastern shore of Nova Scotia.

Natural Forces Wind Inc. (Proponent) is proposing to develop the Project near the community of Piedmont under the Nova Scotia Department of Energy Community Feed in Tariff (COMFIT) program. The proposed WTG location is situated on existing privately owned land located approximately 12 km east of New Glasgow and 15 km west of Antigonish. Currently, construction activities are expected to begin in the winter of 2013, and Project completion is expected in late 2014. The Project will have an operational phase of 20 years.

The Nova Scotia *Renewable Electricity Plan* sets out clear legal requirements in regards to the source of electricity supplied; that is, 25 percent must be from renewable sources by 2015 and a further target of 40 percent renewable by 2020. The Project will help meet the provincially mandated targets outlined in the Renewable Electricity Plan, while at the same time enabling local ownership and community economic development; both of the initiatives are supported by the Province of Nova Scotia.

The COMFIT program is part of the Nova Scotia 2010 *Renewable Electricity* Plan and is designed to introduce locally-based renewable electricity projects that are majority owned by residents from communities throughout the province. The Proponent will use a Community Economic Development Investment Fund (CEDIF) to enable local investment and ownership in the Project.

The COMFIT program is integral to Nova Scotia's 2010 *Renewable Electricity Plan* and is designed to promote locally-based renewable electricity projects that are majority owned by one of six qualifying eligible entities. The following entities are eligible to participate in the COMFIT program:

- Community Economic Development Investment Funds;
- Co-operatives;
- Mi'kmaq band councils;
- Municipalities or their wholly-owned subsidiaries;
- Not-for-Profit Organizations; and
- Universities.

COMFIT approval for the proposed AMWF was awarded to the Community Economic Development Corporation Wind4All Communities Inc. (W4All) in the spring of 2012. W4All was created and sponsored by the Proponent. The Proponent will not be using any source of public funding for the purpose of this project.

It typically takes approximately three years to develop and construct a wind farm. Although, the proposed AMWF is still in the development phase, public consultation began in late 2011 with a public open house, meetings with community members, the municipalities and stakeholders.

1.2 Proponent

Natural Forces Wind Inc. is a company that was established in 2001 based in Halifax, Nova Scotia and entirely Maritime owned. Composed of a small team, the Proponent has over 30 years of international (Canada, USA, Europe and Australia) experience in the wind industry. The Proponent is a wind farm developer, constructor, operator and asset owner.

The Proponent has two operational wind farms in the Maritime Provinces; Kent Hills Wind Farm and Fairmont Wind Farm. Kent Hills Wind Farm is a 150 MW wind farm in New Brunswick constructed in 2008. The Fairmont Wind Farm is a 4.6 MW wind farm near Antigonish, Nova Scotia, which became energized at the end of 2012.

The Proponent is currently working on developing projects in Nova Scotia and British Columbia.

In the next few years, the Proponent aims to develop five projects in Nova Scotia with a total approximate capacity of 21 MW. The five proposed wind projects are detailed in Table 1-1.

Table 1-1: Proposed wind energy projects

Project Name	Number of WTGs	Rated Capacity
Hillside Boularderie Wind Farm	2	4 MW
Gaetz Brook Wind Farm	1	2.3 MW
Barrachois Wind Farm	2	4 MW
Aulds Mountain Wind Farm	**2**	**4.6 MW**
Amherst Wind Farm	3	6 MW

1.3 Regulatory Framework

1.3.1 Federal

Federal environmental approvals are not required for the proposed project. The Project is not expected to require permitting through harmful alteration, disruption or destruction of fish habitat or have an impact to navigable waters.

Consultation with Federal authorities has been ongoing with Navigation Canada, Transport Canada, the Department of National Defence, and the Canadian Wildlife Service (CWS).

1.3.2 Provincial

The Environmental Assessment process, as required under the provincial *Environmental Assessment Act* is a Proponent-driven, self-assessment process. The Proponent is responsible for determining if the

Environmental Assessment (EA) process applies to the Project, what category the Project belongs to and when the EA process should be initiated.

Under Section 49 of *the Environmental Assessment Act*, new electricity Projects or 'Undertakings' can be classified under one of two categories, Class 1 undertakings or Class 2 Undertakings (EAR, 1995). Wind farms with a rated capacity of 2 MW or greater are considered Class 1 undertakings. It is anticipated that the rated capacity for the AMWF is 4.6 MW and therefore is a Class 1 undertaking.

Three guidance documents were used in the preparation of this EA for the AMWF Project, they are:

1. *A Proponent's Guide to Environmental Assessment*, published by the Environment Assessment Branch of the Nova Scotia Department of Environment (NSE, 2009);
2. *Proponent's Guide to Wind Power Projects: Guide for preparing an Environmental Assessment Registration Document*, also published by the Environment Assessment Branch of the Nova Scotia Department of Environment (NSE, 2012); and
3. *Guide to Addressing Wildlife Species and Habitat in an EA Registration Document,* published by the Environment Assessment Branch of the Nova Scotia Department of Environment (NSE, 2005).

1.3.3 Permitting

At the provincial level, a number of permits are required to progress the various stages of development and construction of a wind farm. A list of the required provincial permits is shown in Table 1-2, although additional permits may be required following continued stakeholder consultation.

Table 1-2: Federal and Provincial permitting requirements.

Permit Required	Permitting Authority	Status
Heritage Research Permit	NS Department of Tourism, Culture and Heritage	Issued
Special Move Permit	NS Transportation and Infrastructure Renewal	Not issued
Transportation Plan	NS Transportation and Infrastructure Renewal	Not issued
Environmental Assessment Approval	NS Environmental Assessment Branch	Under review

Additional municipal permits and authorizations are required. Table 1-3 lists the municipal permits and authorizations required. Again, additional permits may be required following further consultation with municipal stakeholders.

Table 1-3: Municipal permitting requirements.

Permit Required	Permitting Authority	Status
Development Approval	Municipality of Pictou County	Not Issued

1.4 Development and Structure of Document

This EA was prepared by Natural Forces Wind Inc. based on high level advice from Verterra Group Environmental Strategies Ltd. as our consultant. Verterra Group's knowledge of scoping and EA structure development supported the expertise of AMWF's Project Manager and Vice President of Developments Andy MacCallum, and Development Officer Chris Veinot, who compiled primary and secondary data sources to draft this EA document. The EA document will follow the structure as represented below in Figure 1-1.

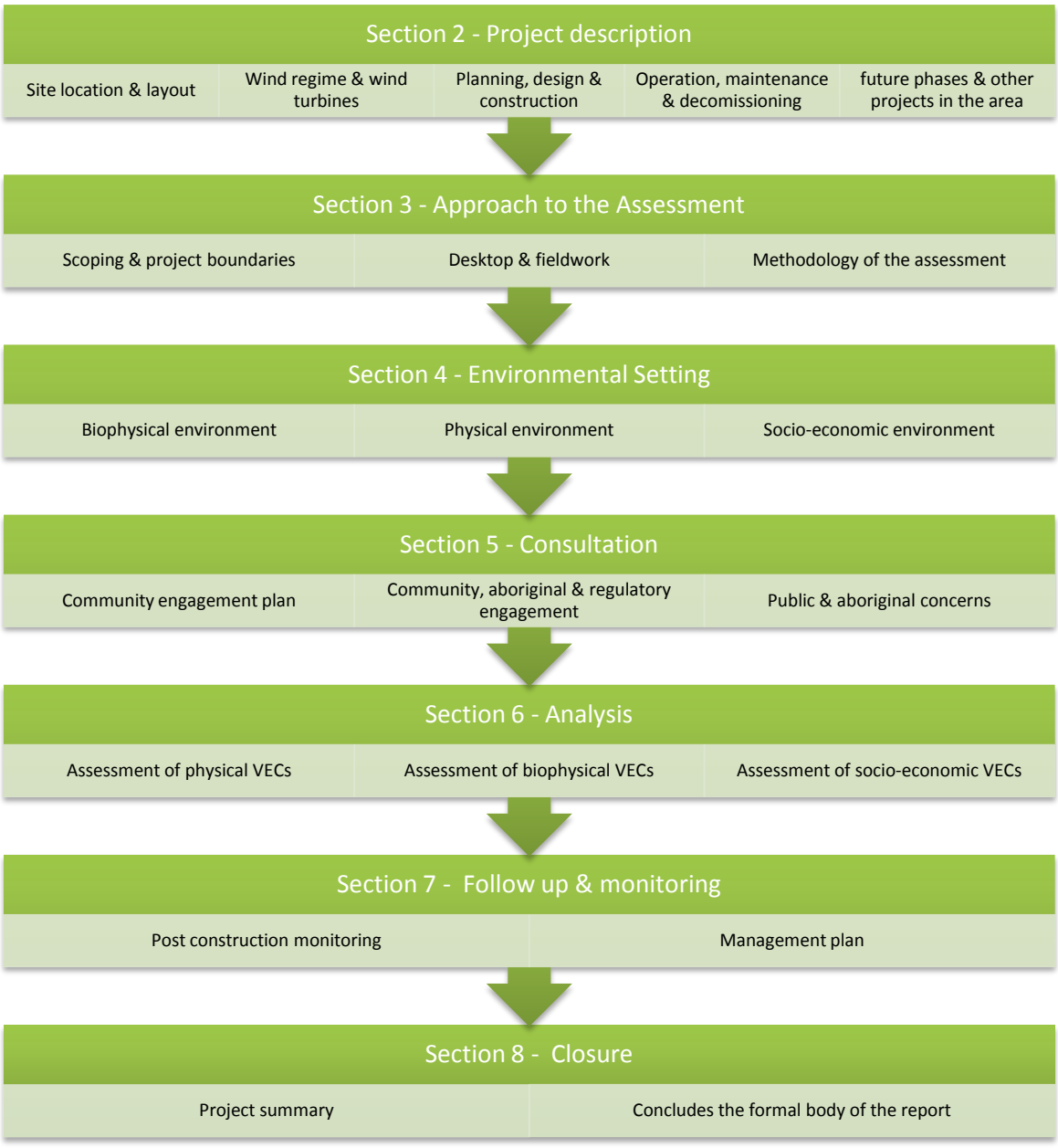


Figure 1-1: Structure of document.

2 Project Description

2.1 Site Location and Layout

The AMWF is located on privately owned land in the Municipality of Pictou County in the community of Piedmont, located approximately 12 km east of New Glasgow. The Proponent plans to construct and operate a 2 WTG, 4.6 MW wind farm; the proposed locations for the WTG 1 and 2 can be seen in Figure 2-1 and Figure 2-2 respectively. Figure 2-3 shows a general overview of the project location. The WTG coordinates are presented below in Table 2-1.

Table 2-1: Turbine coordinates in UTM Zone 20.

	Easting	Northing
Wind Turbine 1	548,803 m	5,049,223 m
Wind Turbine 2	549,031 m	5,048,771 m

Figure 2-1: Proposed location for WTG 1 (Photo courtesy Davis MacIntyre & Associates Ltd.).

Figure 2-2: Proposed location for WTG 2 (Photo courtesy Davis MacIntyre & Associates Ltd.).

Setback distances from residential dwellings to the WTGs are greater than 600 m as required by the Municipality of Pictou County.

The AMWF will connect to the Nova Scotia Power Inc's (NSPI) distribution grid via an existing 3-phase distribution line originating from the Trenton substation (substation ID: 50N) located approximately 22 km west of the Project site. The point of interconnection to existing NSPI infrastructure is located adjacent to the Project site on Piedmont Valley Road.

The lands under option consist of three commercial forestry land parcels owned by Atlantic Star Forestry Ltd. The three land parcels cover a total of 340 acres; WTG 1 will be located on a 134 acre land parcel while WTG 2 will be located on a 105 acre land parcel. The proposed Project will have a total footprint of approximately 1.6 Hectares.

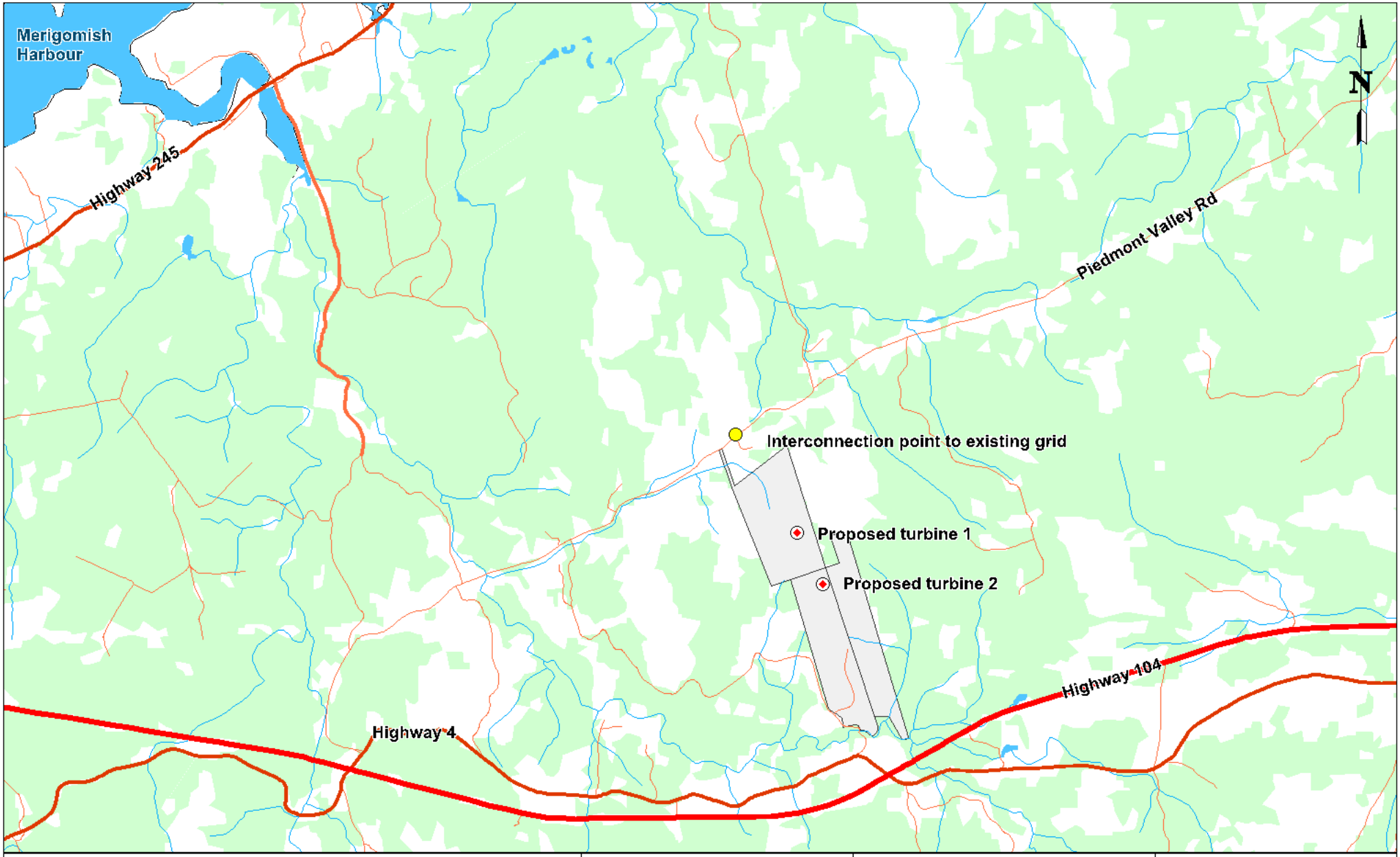
The Project land is located in General Development Zone, in which the MoPC permits the development of utility scale wind turbines. Utility scale wind turbines are permitting when in compliance with the following by-laws:

- Minimum setback from residences, except residences located on the same lot as the wind turbine, shall be 600 meters. There is no setback requirement from residences located on the same lot;

- Minimum setback from all property lines shall be one times the height of the turbine; and
- Minimum setback from the boundary of a public road shall be 300 meters.

The access road will be constructed by entering the Project site from Piedmont Valley Road. The proposed access road will make use of an existing unpaved road historically used for forestry and will be upgraded to accommodate the wind farm equipment. By making use of previously existing roads the Proponent aims to minimize the overall environmental impact of the Project.

The Proponent has extensive knowledge in site finding and development of community based wind farms. There are three main factors to consider during the site finding phase of the development of a wind farm. These factors include wind regime, local power grid infrastructure and environmental/ socio-economic concerns. Detailed assessment of these three factors have led the Proponent to determine that the location of the AMWF presents the best opportunity to capture the wind regime in an effort provide efficient wind energy to the local community given the environmental, socio-economic, regulatory and technical factors.



LEGEND

- Project land
- Proposed turbines
- Proposed point of interconnection to existing NSPI grid
- Highway
- Arterial & minor road
- Watercourse

Source: Nova Scotia Department of Natural Resources

SCALE

0 0.75 1.5
kilometres

1:45,000

KEY MAP

PROJECT
Aulds Mountain Wind Farm

FIGURE
Figure 2.3

TITLE
General Project Overview

DATE
October 9th 2013

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2.2 Wind Turbine Generator

Two Enercon E92 WTGs will be used on site for the duration of the Project. The Enercon E92 has a total rated capacity of 2.3 MW, a turbine tower height range of 78 – 98 m and rotor blade diameter of approximately 92 m. From base to blade tip the WTG will have a maximum height of 144 m.

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

This IEC standard utilizes assumptions and conditions that are used to define the load cases that the WTG must endure. The safety system of the Enercon WTG features various control sensors that protect the turbine and its components from damage. This includes, among other things, high and low temperatures, vibrations, oscillations and strain. In the case that one or more of these sensors detect conditions outside the design limits, the main control of the WTG will take the appropriate measures, which range from small power limitations to complete stop of the turbines (Enercon, 2012).

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

Additional WTG specifications are presented in Table 2-2 as well as in Appendix A.

Table 2-2: Enercon E92 specifications (Enercon, 2012).

Characteristic	Value
Rotor diameter	92 m
Swept area	6648 m^2
Rotations per minute	5 – 16 min^{-1}
Cut out wind speed	28 – 49 m/s (Enercon storm control)
Hub height	85 – 138 m
Max sound pressure level	105 dB(A)

2.3 Wind Regime

The Nova Scotia wind atlas was used in preliminary site finding and indicates an approximate wind speed of 7.5 – 8.0 m/s at 80 m (NS Wind Atlas, 2013).

A detailed wind resource assessment at the AMWF site was initiated in July 2012 with the installation of a 60 m meteorological mast (met mast) containing anemometers at 40 m, 50 m and 60 m above ground level. A SODAR wind profiler was installed in July 2013, which measures wind speed and direction at heights of 50 m, 60 m, 80 m and 100m. The wind resource assessment studies wind direction, wind speed, temperature, relative humidity and atmospheric pressure. A collective assessment of these parameters will be used to determine the feasibility of harnessing the wind regime; and to determine

optimized WTG micro-siting. A long-term wind resource assessment is currently being conducted with the data collected from the meteorological mast and Triton.

Based on Natural Forces' independent Wind Resource Assessment a wind rose found in Figure 4-1 indicates the prevailing wind at the Project site location. The Nova Scotia Wind Atlas indicates an average wind speed of 7.5 - 8.0 meters per second at a height of 80m.

2.4 Planning and Design

The planning and design phases are crucial steps of the Project that can set the stage for following project activities and help avoid issues that may be encountered in future project phases. Specifically, the AMWF site is an attractive site due to the wind resource, distance from dwellings, capacity of the distribution grid and minimal ecological concerns.

A variety of criteria has been considered in the site selection of the AMWF. The criteria include technical, environmental and land use consideration. The following is a list of the criteria considered:

- Technical Considerations;
    - Sufficient wind resource;
    - Proximity to electrical distribution network; and
    - Capacity of the local electrical distribution network.
- Environmental Considerations;
    - Sufficient setback distance from known wetlands
    - Sufficient setback distance from known bat hibernacula
    - Proximity to provincial parks and protected areas s; and
    - Sensitivity of flora & fauna.
- Land use considerations;
    - Available access to the land and suitable ground conditions; and
    - Proximity to residential properties, communities and towns.
- Planning Considerations.
    - County or Municipal zoning by-law regulations.

Technical Considerations

The AMWF is located approximately 10 km from the Northumberland Straight between Nova Scotia and Prince Edward Island. The Project site is approximately 240 m above sea level on top of a significant hill. Typically at exposed elevations, similar to the Project site, uninterrupted laminar wind flow can provide an optimal wind resource.

A Distribution System Impact Study conducted by Nova Scotia Power Inc. (NSPI) on behalf of the proponent indicates the Project can be connected to the nearby local electrical distribution system. Through an agreement with NSPI, the Project will be connected to the 50N-410 circuit of the Trenton substation, which provides electricity to Trenton, New Glasgow and surrounding communities. The

proximity of the AMWF to a high electrical load center such as Trenton and New Glasgow is a key determinate in securing a feasible grid connection to the existing NSPI distribution system. Projects located further from load centers and substations tend to be less feasible in terms of securing a successful grid connection.

There are existing communications tower located approximately 16 km west of the Project site, 1.4 km east and 20 km east of the Project site.

Environmental Considerations

The landscape of the AMWF site lies on previously clear cut areas interspersed with windthrow and mid-aged to mature soft wood forest.

The Project site is located approximately 10 km south of the Northumberland Strait with an elevation range of 70 – 240 m above sea level. The proposed turbine locations are approximately 230 m above sea level.

Land Use Considerations

The closest local communities are Piedmont, in which the Project site is located and Broadway, located directly south of the Project. These communities consist of sparsely spaced rural dwellings. The Project site is bound by Piedmont Valley Road to the north and other land parcels to the east, west and south.

The landowner has made the land available for the installation two WTGs and ancillary infrastructure on the land. An existing access road will be upgraded to gain access to the proposed WTG locations.

2.5 Construction

Construction of the AMWF is proposed to take approximately six months and will include the following main construction activities:

- Clearing and grubbing of Project area;
- Construction of access road, lay down area and crane pads;
- Construction of turbine foundation;
- Construction of power pole, power lines and underground electrical;
- Turbine installation;
- Commissioning of the WTG; and
- Removal of all temporary works and restoration of the site.

The proposed schedule for these construction activities is presented in Table 2-3.

Table 2-3: Schedule of construction activities.

Construction Activity	Typical Distribution (months)					
	1	2	3	4	5	6
Surveying and siting activities	■					
Construction of access road and crane pad		■	■			
Construction of crane pad & turbine foundation			■	■		
Construction of electrical works				■	■	
Wind turbine assembly and installation				■	■	
Removal of temporary works and site restoration						■

2.5.1 Surveying, Siting and Logistic Activities

Prior to the commencement of access road upgrade, foundation construction and turbine installation, a number of enabling works need to be undertaken. These will include:

- Engineering site visits to evaluate the Project land and soils conditions;
- Boring of holes and/or excavation pits for geotechnical investigations;
- Improvement of land drainage as required to facilitate construction;
- Widening and improvement of the site entrance for safe vehicle access.

The Proponent and the turbine manufacturer will coordinate transportation of the turbine components which will require overweight special move permits. Service Nova Scotia and Municipal Relations officers will be consulted to ensure any other potential permits (ie. over-dimensional and overweight vehicle permits) are obtained and transportation regulations are followed. Although the WTG transportation route has yet to be planned, the Proponent is aware of certain road weight restrictions. Roads used for the construction phase of the Project will comply with intermediate and maximum weight road restriction lists (Road designation, 2012).

2.5.2 Access Road

Access roads required for the development are typically 5 – 6 m wide with a maximum width of 12 m in certain areas to facilitate moving a fully assembled crane. The access road will be used to move workers and equipment about the site during construction, operation and decommissioning phases.

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

The removed topsoil would be stored in accordance with best practice guidance, and later used for site restoration. Soils needed for backfill would be stored temporarily in bunds adjacent to the excavations until needed. Any remaining excavated material would be shaped into fill slopes in the road bed, or removed from site to an approved landfill. The proposed access road designs can be seen in Figure 2.4. This figure demonstrates where existing road will be used to help reduce the footprint of the project that will require clearing. The road shown in yellow is the existing road and therefore should not require further clearing. The road that is indicated by blue has not been cleared or constructed. By making use of the existing road the total footprint of the project requiring clearing is reduced from 2.8 hectares to 1.6 hectares.

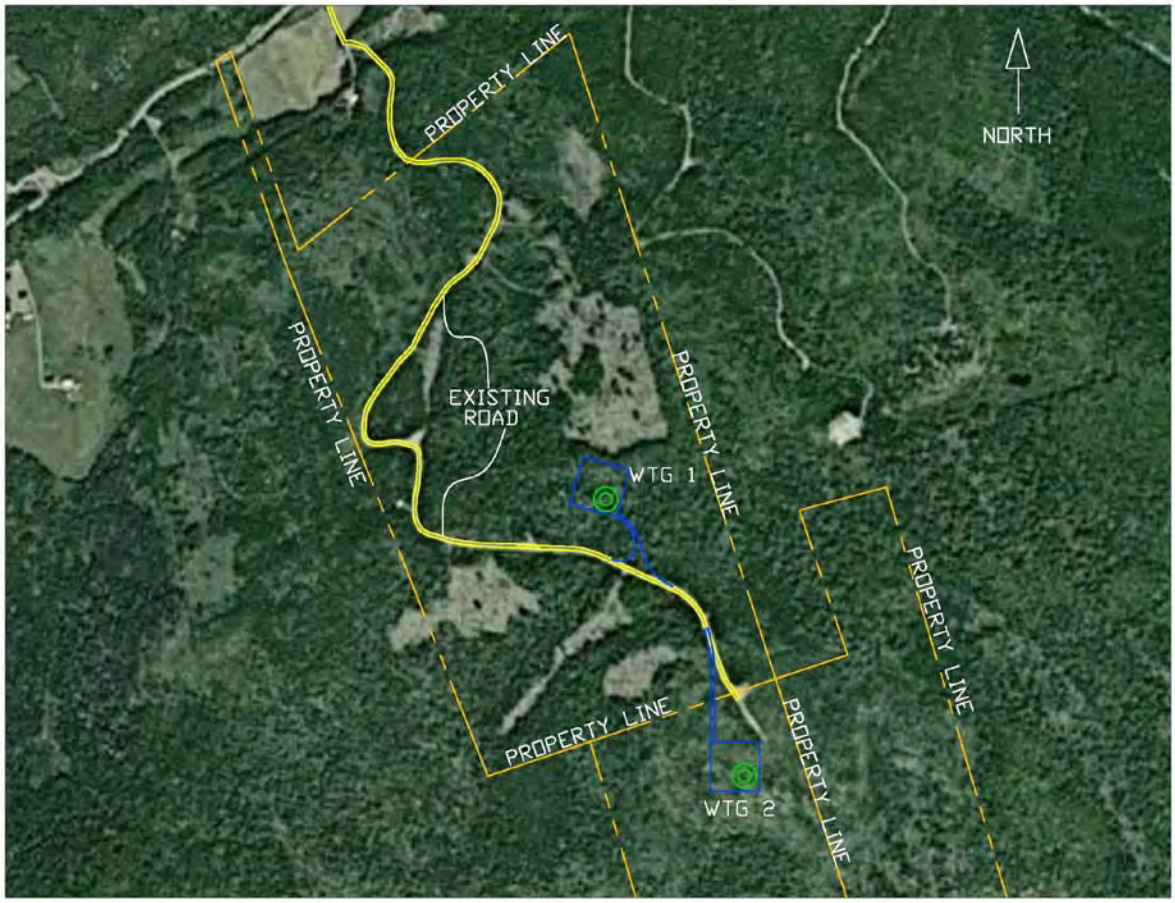

Figure 2-4: Proposed access road showing existing road in yellow.

2.5.3 Crane Pad & Turbine Foundation

Crane Pads

The Enercon E92s will both require a crane pad that will be approximately 50 m by 25 m. Its purpose is to safely accommodate the weight of the large crane necessary for turbine installation and maintenance. The exact arrangement of the crane pads would be designed to suit the specific requirement of the turbines and the surrounding topography of the Project site.

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

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

Turbine Foundations

A concrete foundation approximately 20 m in diameter will be required for each WTG. A detailed geotechnical investigation will be undertaken to establish the nature of the soil at each identified WTG locations. A registered Civil Engineer will design the foundations to match the soil conditions. Foundations will most likely be a gravity (inverted "T") design, designed by Enercon.

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

The soils removed would be stored in accordance with provincial regulations and best practice guidelines, and replaced during the restoration phase in consultation with the landowner. Soil material needed for backfill would be stored temporarily in a designated area adjacent to the excavations until needed. Any remaining excavated material will be recycled to another site needing clean fill material or removed from site and sent to an approved landfill.

2.5.4 Civil and Electrical Works

The electricity produced from the WTGs will be transformed to 25 kV by a transformer located in the base of each of the WTGs. The electricity will then be conducted via insulated electrical cables through cable ducts cast into the WTG foundations and routed out to new power poles on site, and then to the new point of connection to the existing NSPI distribution system.

A bare copper earthing (grounding) cable will be laid alongside the WTG foundations for lightning protection of the WTGs; grounding will also be installed at other areas as determined by the electrical design.

The electrical, communications and grounding cables will leave the WTG foundations below grade via cable ducts cast into the WTG foundation. Where the cables are to cross the site roads and crane bases, they may be located in cable ducts surrounded by 0.15 m of concrete to ensure the integrity of the cable is maintained independent of the vehicle site crossings above. The overhead cabling configuration will be similar to the standard 12 m wooden utility poles found throughout the surrounding area. Any buried electrical cable will likely be marked with permanent safety signs to warn of potential hazards from excavation. The size, type and location of the marker signs will be determined in consultation with the landowner and be in accordance with applicable safety standards.

2.5.5 Interconnection to Grid

The connection point to the NSPI electrical distribution system will be located on the Project site. The AMWF will connect to the NSPI distribution grid via 3-phase distribution line originating from the Trenton substation (substation ID: 50N) located approximately 22 km west of the Project site. The point of interconnection to existing NSPI infrastructure is located adjacent to the Project site on Piedmont Valley Road. Figure 2.3 indicates the proposed location of the interconnection to the NSPI grid.

2.5.6 WTG assembly and installation

The main WTG components include the tower sections, nacelle, hub and blades. Towers are normally delivered in four sections. The overall erection process for the WTG will take approximately one to four days, depending on the wind conditions, and would not start until suitable wind conditions prevail.

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

For the nacelle and blades, the assembly will involve the use of a small 135 tonne rough-terrain crane for vehicle off-loading, a 150 tonne tailing crane for preliminary assembly, and a main erection crane of approximately 800-1000 tonnes for the main lift.

The blades are attached to the hub on the ground. The hub and blades are then lifted as one unit, called the rotor. The tailing crane helps to control the orientation.

2.5.7 Site Restoration

After construction, erection and commissioning are completed and the Project is in the operation phase, all temporary works will be removed and the land re-graded. The stored topsoil will be replaced and fine graded, and the site will be dressed to restore maximum tillable area and a pleasing appearance.

2.5.8 Other

Entry to the Project site will be adjacent to Piedmont Valley Road. This will be the entry point for all workers, construction equipment and WTG components for the duration of the construction phase. Minor, temporary road widening may be required along specific portions of the road.

During upgrade construction of the access road and the WTG foundations, there will be an increase in truck traffic on the roads leading to and from the Project site. Increased dust is possible, although water trucks will dampen the roads and excavation area when necessary to control fugitive dust.

During delivery of the WTG components, delivery of oversized loads may slow traffic flow. Every effort will be made to ensure that oversized loads are delivered during times of lowest area traffic. Pilot vehicles and licensed flaggers will be provided to coordinate traffic flow and ensure public safety.

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

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

Of these predicted vehicle movements, approximately 25 will be oversized loads associated with the delivery of WTG component parts (towers, blades, and nacelles) and the cranes required for erection. These deliveries are anticipated within months 4 through 6 of the schedule and subject to movement orders as agreed upon with governing authorities.

2.6 Operation and Maintenance

2.6.1 Site Access and Traffic

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

2.6.2 Project Safety Signs

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

2.6.3 Maintenance Plans

Scheduled maintenance work will be carried out several times each year throughout the operational phase. Unscheduled maintenance is minimal, as the SCADA system provides 24-hour monitoring of the turbine. Maintenances procedures may require the use of small or large cranes for brief periods of time, for replacement of blades or other turbine components.

2.6.4 VEC Monitoring

Birds, bats and mainland moose will likely be monitored for a period of time during the first few years of the operational phase.

2.7 Decommissioning

The Aulds Mountain Wind Farm Project will be in operation for approximately 20 years. The lifetime is based on the duration of the Power Purchase Agreement (PPA) signed between NSPI and the Proponent. This is also consistent with the length of the land lease that will be signed by participating land owners.

Decommissioning will commence within six months after the license has been terminated. The decommissioning phase will be completed within six months after its commencement.

The WTG components will be dismantled and removed from the site. Similar traffic movements to those experienced during the delivery of the turbine components are anticipated. The decommissioning phase will require considerably lower vehicular support than during the construction phase. The following four steps are anticipated in the decommissioning phase:

1. The WTGs will be dismantled and removed from the site for scrap or resale. The base will be removed to below plough depth, and the top soil will be reinstated so that the land may be returned to its former use.
2. The internal site roads and site entrance, if not required may be removed. After removal, the land will be reinstated to its former use.
3. The underground cables will be below plough depth and contain no harmful substances. They may be recovered if economically attractive or left in the ground. Terminal connections will be cut back below plough depth.
4. All other equipment will be dismantled and removed, and the land will be returned to its former use.

2.8 Future Phases of the Project

There are no future phases planned for the AMWF Project. There are three contributing factors that have been considered in determining the 20 year project duration.

1. The current land lease agreement details that the duration of the lease once the Project has been commissioned will be 20 years.
2. The Proponent has agreed upon a 20 year fixed rate power purchase agreement with NSPI.
3. The WTGs have a life expectancy of 22 years.

Based on these three factors, at this time the has no further plans to develop this Project after the proposed 20 year Project life has elapsed.

2.9 Other Projects in Area

There is only one wind farm within a 10 km radius of the AMWF. The Glen Dhu wind farm owned by Shear Wind Inc. is approximately 6 km northwest of the Project site. The Glen Dhu wind farm consists of 27 Enercon E-82 2.3 MW wind turbines with a total capacity of 62.1 MW. The wind farm has been in operation since March 2011 and will remain in operation until 2031.

3 Approach to the Assessment

3.1 Scoping and Bounding

The scoping process identifies the physical, biophysical and socio-economic Valued Environmental Components (VEC) that may be subject to impact given the works proposed as described previously in Section 2. The proposed work is composed of the construction, operation and maintenance phases of the Project conducted by the Proponent including any accidents and malfunctions that may occur. The decommissioning of the AMWF is also included as part of the assessment. The identification of the VECs is based on the potential interaction of the Project within the environmental and socio-economic settings described in Section 4. Additionally, any concerns from stakeholders and the general public as identified through the consultation process described in Section 5 are taken into great consideration when identifying the VECs to be assessed.

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

The Proponent has identified the physical, biophysical and socio-economic aspects that will be subject to assessment based on its knowledge and experience, review of the regulatory requirements, as well as feedback from the community, First Nations, regulatory authorities and other stakeholders. This process has identified the physical, biophysical and socio-economic VECs to be evaluated for the Project; these VECs are listed in Table 3-1.

Table 3-1: Identified Valued Environmental Components.

Physical	Biophysical	Socio-economic
Ambient Air	Wetlands / Watercourses	Land Use
Ground & Surface Water	Fish and Fish Habitat	Aboriginal/Archaeological Resources
Ambient Noise	Migratory and Breeding Birds	Vehicular Traffic
Ambient Light	Flora	Telecommunications
	Fauna	Landscape Aesthetics
		Health and Safety
		Local Economy

Spatial and temporal boundaries must be determined in the assessment process to properly evaluate the Projects impacts on the aforementioned VECs. Spatial boundary is the physical bounds in which the Project facilities and activities are located as well as zones affected by project activities, i.e. discharge

and emissions. Temporal boundary is the time frame in which the activities within the spatial boundary overlap with the presence of identified VECs.

Based on the *Proponent's Guide to Wind Power Projects'* it has been determined that the Project site sensitivity is classed as very high, which classifies the AMWF as a category 4 on the level of concern category matrix due to the presence of a known bat hibernacula within 25km of the project site Projects in this category present a high level of risk to wild species and/or their habitat, and require comprehensive surveys, spread over a one year period, to obtain quantitative information on wild species and habitats on the site (NSE, 2012). The proponent has engaged the services of external consultants to provide these surveys, and will be discussed throughout this EA.

The study area includes a spatial boundary that encompasses the footprint of all activities associated with the construction, operation and decommissioning of the proposed Project. Further, the study area also includes all areas of interactions between the project and environment could be reasonably expected to occur. The spatial boundary will be defined for each separate VEC assessment since it is not reasonably possible to define a single spatial boundary to encompass all project activities and VECs.

The temporal boundaries include, but are not limited to the timeline for short term construction activities, as a long term temporal boundary includes the 20 year operation of the project as well as its decommissioning. The temporal and spatial boundaries are identified in the VEC analysis in Section 6.

3.2 Desktop and Field Work Completed

3.2.1 Wetland and Watercourse

The Proponent has engaged the services of Strum Consulting (Strum) in providing a wetland assessment of the Project site, focusing on the proposed project footprint. The objective of the assessment was to identify and characterize areas of wetland habitat and watercourses on the Project site in the areas around the proposed locations of WTG infrastructure and along the associated proposed access road, then relocate any infrastructure away from the known wetland habitat.

The scope of the assessment involved completing a desktop review to create mapping that would identify the potential for wetland habitat and watercourses. The following local databases, maps and background information were reviewed prior to completing the field survey, to identify potential wetlands and watercourse:

- NS Department of Natural Resources Significant Species and Habitat Database;
- NS Geomatics Center;
- NSDNR Wet Areas Mapping (WAM);
- Aerial Photography; and
- Topographical Maps.

Field Survey

The desktop review was followed by a field survey to confirm, flag and characterize wetland habitat, and to characterize watercourses within the assessment area. The assessment area was walked to assess for potential wetlands and the presence of watercourses. Wetland boundaries were delineated based on the methodology set out by the US Corps of Engineers Wetland Delineation Manual (1987). The wetland boundaries were flagged using pink flagging tape marked 'wetland delineation'. The boundaries were documented by recording the position of each flag using the track function on a GPS receiver capable of sub- 5m accuracy. As a part of the survey, a general characterization of the wetlands and watercourses identified in the study area was also completed.

3.2.2 Avian Study

The Proponent has engaged the services of Strum to provide an assessment of potential effects of the proposed Project on local and migratory bird populations. All surveys were conducted by an expert birder and were designed in consultation with officials from Nova Scotia Department of Natural Resources (NSDNR) and Canadian Wildlife Services (CWS) while conforming to protocols outlined in the CWS document *Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds*.

The avian study conducted by Strum consisted of the following surveys:

1. Breeding season survey;
2. Fall migration survey;
3. Winter survey; and
4. Spring migration survey.

In each season, species observed during the surveys were screened against the criteria outlined in the NSE document *A Guide to Addressing Wildlife Species and Habitats in an EA Registration Document* to develop a list of priority species. Priority species include those species with the following considerations:

- Listed under Species at Risk Act (SARA) as "Endangered", "Threatened" or "Special Concern";
- Listed under Nova Scotia Endangered Species Act as "Endangered", "Threatened", or "Vulnerable";
- Assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as "Endangered", Threatened", or "Special Concern"; and/or
- Assessed by NSDNR as "Red" (at risk or may be at risk) or "Yellow" (sensitive).

Fall Migration Surveys

Fall surveys were completed on September 26 and October 27, 2012, and September 19, 2013. Surveys were timed to coincide with the peak of insect-eating and seed-eating passerine migrations. Use of the Project area by migratory birds in the fall season was evaluated using two survey types: stopover counts to assess the use of the Project area as a stopover site (conducted within 3 hours of sunrise to

encompass the periods of highest bird activity); and diurnal passage counts to assess use of the Project area by migrating birds of prey and other diurnal migrants (conducted in late morning and early afternoon)

Please see Appendix B – Drawing 2 for locations of fall migration surveys.

Winter Surveys

Winter bird surveys were completed on February 21, 2013 and were timed to evaluate the representative bird community during the winter months. Use of the Project area by birds in the winter season was evaluated using the area search methodology. Each survey was conducted within four hours of sunrise to encompass the periods of highest bird activity, particularly for resident passerines.

Please see Appendix B – Drawing 2 for locations of winter surveys.

Spring Migration Surveys

Spring migration surveys were completed on May 6 and May 28, 2013 and were timed to coincide with the main waves of spring migrant arrivals in Nova Scotia. Use of the Project area by spring migrants was evaluated using the stopover count methodology. Each survey was conducted within four hours of sunrise to encompass the periods of highest bird activity, particularly for migrant passerines.

Please see Appendix B – Drawing 2 for locations of spring migrant surveys.

Breeding Season Surveys

Use of the project site by breeding birds was evaluated using the point count methodology. This method consists of establishing survey locations in areas of interest, with considerations for habitat types and species of conservation concern, and counting all birds observed/heard during a 10 minute period. Surveys were conducted within four hours of sunrise, to encompass the periods of highest bird activity, during site visits on June 12 and June 22, 2013.

Identified species were assigned one of the three breeding classifications as per the criteria outlined in the Maritimes Breeding Bird Atlast Guide for Atlassers (MBBA, 2006). In this classification shceme, species are designated as “Possible”, “Probably”, or “Confirmed” breeders on the basis of behavioural observations.

Please see Appendix B – Drawing 2 for locations of breeding season surveys.

3.2.1 Flora

The Proponent has engaged the services of Sean Blaney of Atlantic Canada Conservation Data Center (ACCDC) to conduct a vascular plant inventory and plant community assessment of the Project site. Fieldwork was completed at the Project site on June 15, 2013 and focused on covering the proposed access road, WTG sites and surrounding areas. Controlled meanders were recorded with a GPS unit and

a full vascular plant list was recorded including community types and species composition. Figure 3.1 shows the GPS track that was recorded during Sean Blaney's vascular plant field survey of the Project site.

Figure 3-1: Track of site survey completed by Sean Blaney shown in Blue (Blaney, 2013).

3.2.2 Fauna

Bat Monitoring

The Proponent has engaged the services of Strum for the 2012 season and AMEC Earth and Environmental for the 2013 season to conduct a study of the bat community and to provide an assessment of potential effects of the proposed Project on bat species. Study methodology includes a

desktop review of available information on the ecology of bat species in Nova Scotia and the general Project area, as well as field surveys. The full AMEC Bat Impact Assessment can be found in Appendix C.

Desktop Study

The baseline bat monitoring survey began with a detailed desktop review of existing data. As the NSE regards wind farm sites within 25 km of a known bat hibernaculum as having 'very high' site sensitivity (NSE, 2009), it is imperative to determine whether the bat hibernacula are known to occur within this radius.

A review of geological mapping of the area was conducted to determine the likelihood of possible bat hibernacula, in the form of natural caves. NSDNR's Abandoned Mine Openings database was consulted to determine if there are abandoned mines in the area, which could also serve as a hibernaculum. As many parts of Nova Scotia have historically supported various types of mining activities, a review of the geology and/or mining history of the site can be beneficial in determining the likely presence of natural caves and/ or abandoned mines.

Bat species occurring in the surrounding Pictou/Antigonish area were discussed with NSDNR's Biologists. Local naturalists were also consulted.

Anabat Detector

Electronic detection of bats has advanced considerably in recent years, enabling researchers to detect and monitor bats without capturing bats with mist nets. The Anabat SD2 detector, manufactured by Titley Scientific, is a well known monitoring system used throughout North America to identify and survey bats by detecting and analyzing their echolocation calls. The Anabat system is a passive detection system that monitors bat activity without human presence and intervention. It consists of a bat detector, a ZCAIM (Zero-Crossings Analysis Interface Module) and software. The Anabat detector unit contains an ultrasonic microphone, electronic amplifier and a digital signal divider. The detector will, if desired, produce an output audible to humans from the inaudible ultrasonic echolocation signals produced by the bats. The ZCAIM is an interface that is used to read the Anabat recorded data on a computer, and the software is used to present the data in a useable format. In the Anabat SD2 system used in this study, the ZCAIM records data directly onto a flash card, which is then used to transfer data to a computer.

Based on research it was determined that multiple bat detectors should be deployed. While two detectors may record the same individuals, the redundancy will enable continued detection in the event one system fails due to batter depletion, weather events, or animal disturbance. Efforts must be made to ensure continuous detection for a complete picture of the potential bat activity.

Based on previous acoustic bat surveys and literature reviews conducted by AMEC, it was decided that an aerial detector elevated 10 m above ground surface would be set to detect bats along the tree line at the edge of the cleared site, to permit detection of bats foraging near the tree canopy at the edge of the

clearing and detect bats that may be migrating above the canopy. A second ground-based system was set to detect bats that forage on low flying insects in cleared areas. Use of the dual acoustic systems with a combination of ground and aerial orientation would provide effective cross coverage and ensure redundancy in the event one system failed due to batter failure or disturbance.

Aerial Systems

On August 23, 2013 a 10 m portable weather tower was erected on the Project site to enable acoustic bat monitoring at that height. The microphone assembly pointed to the southwest, and parallel to the tree line to allow sampling of the forest edge. A high-sensitivity Anabat microphone was attached to an extension cable and placed within a tubular waterproof plastic housing that was sealed around the cable at the base. This housing was secured to the uppermost section of the tower. The microphone faced downwards within the housing, and a Lexan plate angled at 45 degrees from horizontal reflected incoming sounds into the waterproof housing. This allowed sampling of a horizontal section of the sky at treetop height. The tower was constructed with a cantilevered base, allowing it to be raised and lowered as needed. The microphone extension cable ran down the pole to the main body of the detector, which was placed in locked, waterproof fibreglass housing at the base of the pole, along with the power supply.

This system remained in operation until October 3, 2013 and was frequently checked (approximately weekly) to download data, check batteries, and verify that the system was intact and functioning properly. The detector was programmed to record all ultrasonic sounds between 7 pm and 7 am.

Ground Systems

On August 8, 2013 two Anabat bat detectors were deployed at the Project site in three different locations. Initially, two ground detectors were deployed in a waterproof housing fitted with a microphone tube, which allowed sampling of a section of the sky approximately 45 degrees from horizontal. The detectors were programmed to record all ultrasonic sounds between 7 pm and 7 am. This setup was placed within 5 m of the tree line on the site in each location, with the microphone tube pointing parallel to the tree line (northeast) to allow sampling of the forest edge. The waterproof housings were covered in brush to minimize visibility and potential vandalism.

During a routine maintenance visit on August 24 it was discovered that Unit 1 had been damaged by what appeared to be a coyote or a black bear based on the teeth marks. Unit 1 was abandoned and the ground survey focused on Unit 2, which was then redeployed in a more sturdy waterproof housing. Unfortunately, this housing was also damaged by wildlife and found torn apart on September 9. Again tooth marks were evident in the plastic housing. This unit was again redeployed and tucked under a fallen tree a few meters from the original Unit 2 location. This unit had been disturbed by the next site visit on September 16 and found lying on its side with some protective housing damaged. The Anabat SD2 however, was undamaged and no data was lost.

The continual flipping of the unit by wildlife led to the construction of a more robust ground mount, which was then deployed from September 16 to October 3. The unit remained undisturbed for this period and all data was successfully collected.

On August 16 a third ground unit was deployed near the future location of the aerial tower. This unit was deployed in a sturdy waterproof housing, which remained undisturbed until it was retrieved on August 24.

Moose

In consultation with NSDNR's species at risk biologist and large mammal biologist mainland moose *Alces alces americana* were identified as a species at risk which may be inhabiting the general Project area. Since 2003 the native population of moose in Nova Scotia has been listed as endangered and is limited to approximately 1000 individuals in isolated sub-populations across mainland Nova Scotia. The decline is not fully understood but involves multiple threats such as over harvesting, illegal hunting, climate change, parasitic brainworm, increased road access to moose habitat, spread of white-tailed deer, high levels of cadmium, deficiencies in cobalt and potentially unknown viral disease (NSDNR, 2013).

As a result of the provincial status of mainland moose and through consultation with NSDNR, mainland moose surveys were conducted during the winter/spring 2013. The surveys consisted of three winter track surveys, conducted in January and two in February, as well as two pellet group inventory (PGI) surveys in April.

Each winter track survey consisted of walking 8 defined transects spanning the Project site to search for moose tracks and encompassed all stand types from cutovers to over mature hardwood/softwood. Each transect ranged from 1,000 m to 2,000 m in length with an observation width of 2 m.

A spring PGI survey was conducted on two occasions in April 2013 along the same transects that were surveyed during the winter track surveys. Surveys were conducted on April 13/14 and April 27/28.

Wood Turtles

Wood turtles, considered a species at risk in Nova Soctia are known to inhabit the watershed overlying the Project site. A desktop review was conducted, and in consultation with NSDNR the Proponent decided not to conduct field surveys due to the lack of adequate wood turtle habitat at the Project site.

3.2.1 Archaeological Resource Impact Assessment

An archaeological resource impact assessment was conducted by Davis MacIntyre & Associates Limited in April 2013. The purpose of the assessment was to determine the potential for archaeological resources within the impact zone and to provide the recommendations for further mitigation if deemed necessary. This assessment included consultation of the Maritime Archaeological Resource Inventory in the Department of Communities, Culture and Heritage as well as historic maps, manuscripts and

published resources. A preliminary reconnaissance of the Project site was also conducted. Findings and results of the archaeological resource impact assessment are presented in Section 4.

3.3 Methodology of Assessment

The assessment focuses on the evaluation of potential interactions between the VECs and socio-economic aspects with the various Project activities as described in Section 2.

As defined in the Nova Scotia Environment Act:

"Environment" means the components of the earth and includes

(i) air, land and water;
(ii) the layers of the atmosphere; organic and inorganic matter and living organisms;
(iii) the interacting systems that include components referred to in sub clause (i) to (iii); and
(iv) for the purpose of Part IV, the socio-economic, environmental health, cultural and other items referred to in the definition of environmental effect.

"*Environmental Effect" means in respect of an undertaking*

(i) any change, whether positive or negative, that the undertaking may cause in the environment, including any effect on socio-economic conditions, 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 cause by the environment, whether that change occurs inside or outside the Province.

The assessment is designed to focus on the evaluation of the potential interactions between the VECs and the various Project activities that have been previously outlined in Section 2. The residual environmental effects are those that remain after mitigation and control measures have been applied. The prediction of residual environmental effects follows three general steps.

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

The analysis evaluates the interactions between the Project activities and the VECs, and determines the significance of any residual adverse environmental effects, i.e., effects that may persist after all mitigation strategies have been implemented. To determine and appreciate the relevance of residual effects following mitigation, the following definitions of impact have been adhered to:

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

Further, a review of the effect of the environment on the Project is included in the assessment. This includes climate impact and extreme events.

4 Environmental Setting

4.1 Biophysical

4.1.1 Geophysical

The proposed AMWF is located in the French River Dissected Margin district plateau of the Avalon Uplands region in Nova Scotia. This region boasts one of the harshest climates in Nova Scotia outside of the Cape Breton Highlands. Elevation is a significant factor in the climate's severity. Soils in the area are well-drained by the steep terrain, and more acidic at higher elevations. The soils are typically shallow, and of differing types of stony, sandy loams. The soil south of Piedmont in Barney's River is shale loam derived from Silurian shale. Mixed forest covers the area with hardwood stands growing on well-drained ridges.

4.1.2 Atmospheric

Climate data was taken from an Environment Canada weather station located Lyons Brook, NS, approximately 33 km west of the Project site. The data collected from Environment Canada representing climate averages and extremes are shown in Table 4-1.

Table 4-1: Lyons Brook, Nova Scotia Atmospheric Conditions (Environment Canada, 2012).

Parameter	Time Period	Value
Average Daily Temperature (°C)	Yearly Average (1971-2000)	6.5
Extreme Maximum Temperature (°C)	August 10, 2001	36
Extreme Minimum Temperature (°C)	February 8, 1994	-32.5
Average Total Rainfall (mm)	Yearly Average (1971-2000)	1254.3
Maximum Daily Rainfall (mm)	September 14, 1996	83
Average Total Snowfall (cm)	Yearly Average (1971-2000)	276.2
Maximum Snow Depth (cm)	February 26, 1986	95
Prevailing Wind Direction	Yearly Average (1971-2000)	West
Average Wind Speed (km/h)	Yearly Average (1971-2000)	15.1
Maximum Gust Speed (km/h)	December 1, 1964	150.0

Wind Regime

Based on Natural Forces' independent Wind Resource Assessment a wind rose found in Figure 4-1 indicates the prevailing wind at the Project site location. The wind speed and direction was measured with a pair of anemometers mounted on a meteorological mast at a height of 60 m for a period from September 2012 to October 2013. The Nova Scotia Wind Atlas indicates an average wind speed of 7.5 - 8.0 meters per second at a height of 80m.

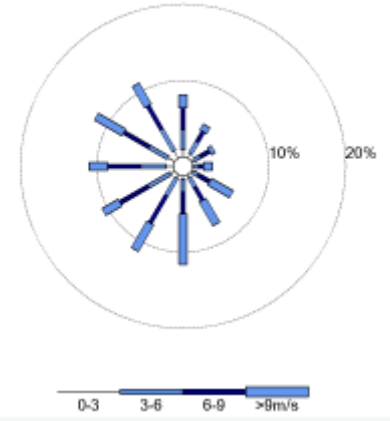

Figure 4-1: Meteorological mast average wind rose.

4.1.3 Wetlands and Watercourses

Desktop Review

Information from the data sources was compiled to create digital mapping layers to review the potential for wetland habitat and watercourses at the assessment area.

No wetland habitat was identified by the NS Geomatics Center or the NS Significant Species and Habitats databases within the assessment area. The closest wetland habitat (a marsh) identified by the NS Significant Species and Habitats is database approximately 1 km west of the assessment area boundary, abutting the Piedmont Valley Road (Figure 4-2). The WAM database presented in Figure 4-2 shows potential for wet areas (as indicated by a dept to water table of 0.5 m or less) in several areas along the access road at the northern extent of the assessment area, as well as an isolated narrow feature in southern portions of the assessment area.

The NS Geomatics Centre also identified one mapped watercourse that originates adjacent to Piedmont Valley Road and crosses beneath the existing access road in northern portions of the assessment area, shown in Figure 4-2.

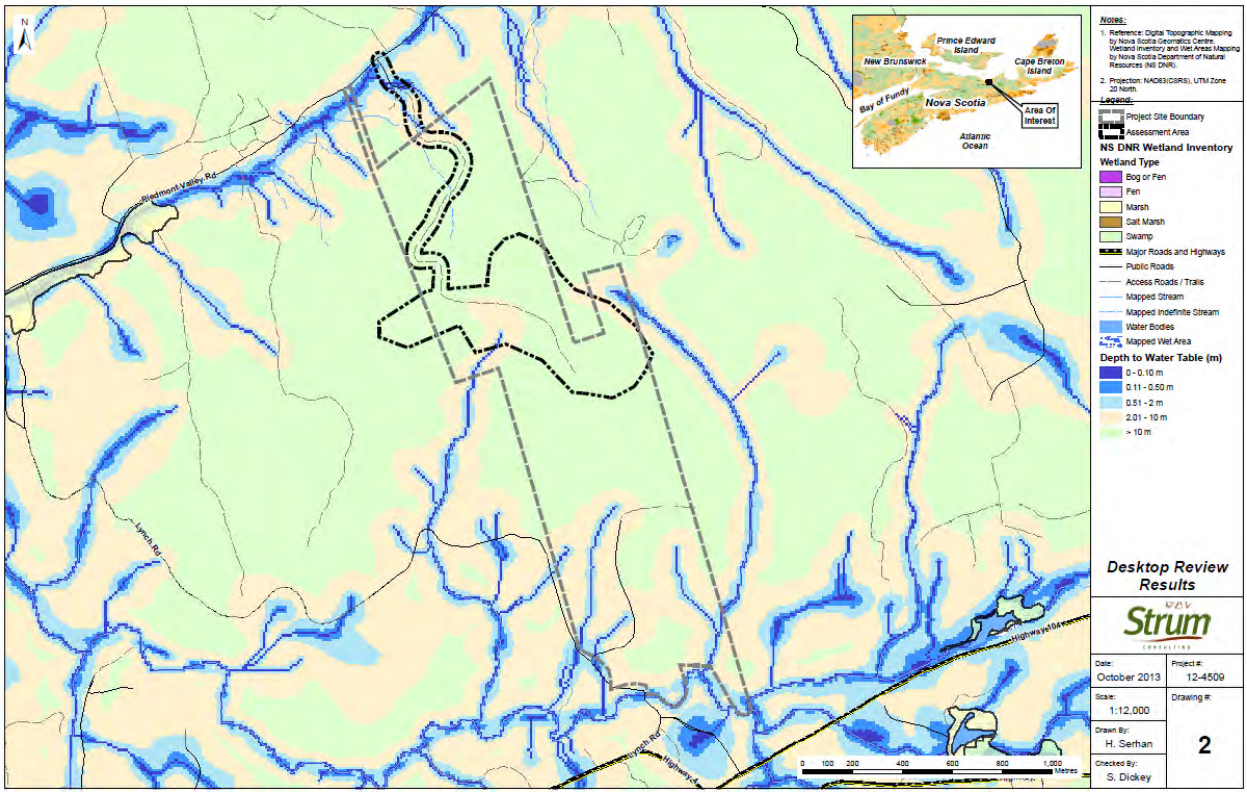

Figure 4-2: WAM database and existing identified wet areas (NSDNR, 2012).

Field Survey

The wetland survey resulted in the identification of several small wetlands and watercourses within the assessment area shown in Appendix F – Drawings 3A & 3B. The wetlands on site are mostly hardwood or mixed wood treed or shrub swamps in sandy/mucky modified soils or organic soils. Wetlands found along the road are treed or shrub swamps located in small topographic basins sourced by watercourses or ephemeral drainage features that are sufficient to maintain wetland hydrology. One wet meadow (Wetland 1) exists at the northern extent of the proposed access road where it meets the Piedmont Valley Road. This wetland comprises poorly drained land located adjacent to an agricultural field, which sources the wetland water via surface runoff.

In southern portions of the assessment area, which encompass the proposed WTG locations, several mixed wood treed swamps exist. Conditions in these wetlands exhibit thin organic soils on a restrictive rock surface. These swamps typically source ephemeral drainage features or watercourses, which drain downhill beyond the assessment area. One marsh (Wetland 12) exists in the eastern extent of the assessment area in a shallow basin. This marsh appears to have formed by the detainment of surface water in rutting associated with historic logging activities.

Several small watercourses (ie. bank full width less than 2 m) were also confirmed at the Project site. Most of these watercourses arise from ephemeral drainage features that are often sourced by wetlands, and become more channelized as they drain downhill.

Proximity to WTGs

Consultation with NSDNR has led the proponent to apply a minimum 30 m buffer from the tip of WTG blades to the nearest wetland. Figure 4.3 shows the proposed WTG locations along with a 76 m radius buffer (blade length + 30 m) with no impedance on the delineated wetlands. The original turbine locations chosen prior to wetland delineation have been moved to new existing locations such that they now comply with the recommendations made by NSDNR.

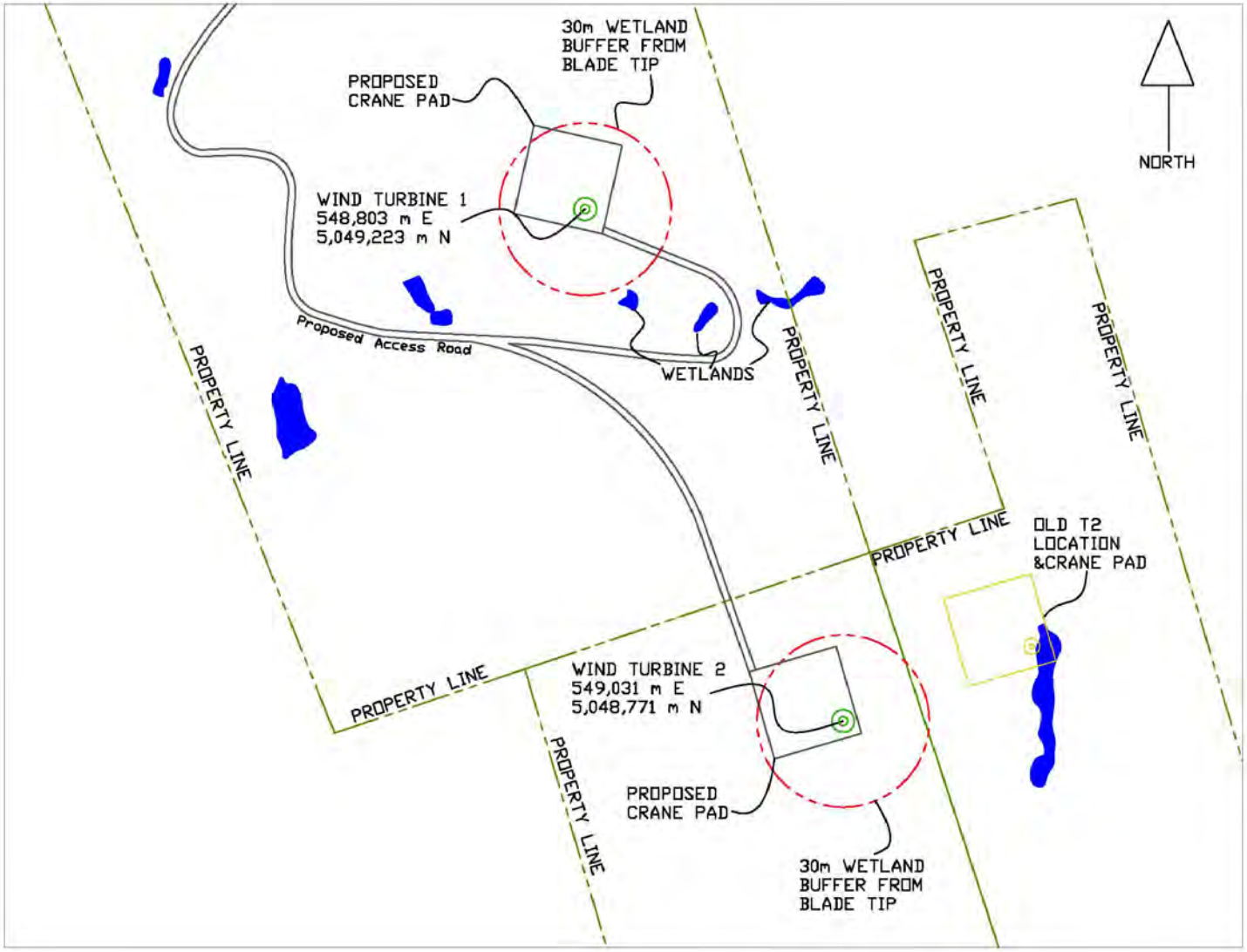

Figure 4-3: 30 m + WTG blade length buffer from wetlands.

Access Road

The proposed access road layout has been designed to minimize disturbance to existing conditions, primarily by making use of an existing road on the Project land. The proposed access road follows the access road shown in Figure 4-4, and may require modification to allow for project infrastructure to be transported to the WTG locations. All efforts will be made to minimize impacts to wetlands and will be done in accordance with provincial and municipal regulations.

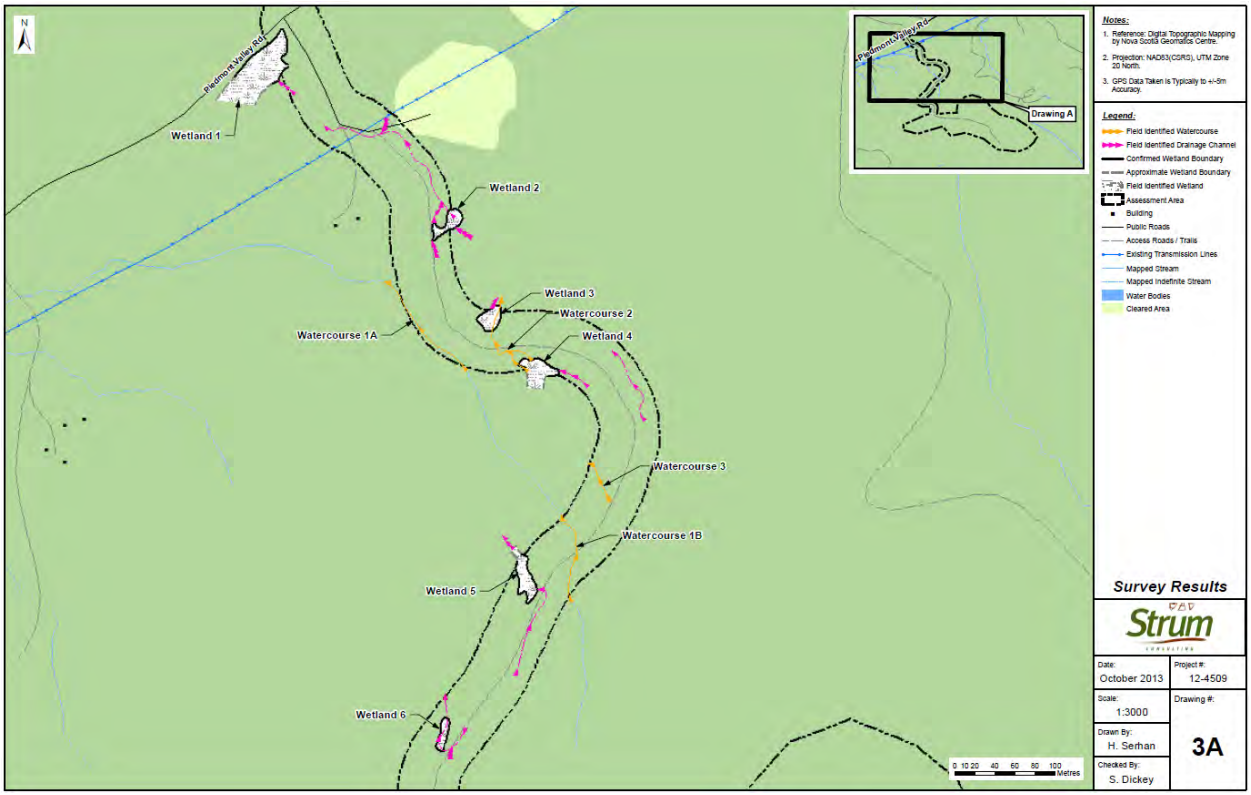

Figure 4-4: Northern Project site wetland delineation (Strum, 2013).

Provincial and Municipal Regulations

The Proponent is aware of the Nova Scotia Wetland Alteration Approval process and that it defines the following four activities as wetland alteration:

1. Filling;
2. Draining;
3. Flooding; and
4. Excavating.

In the event that a watercourse alteration is required, the Proponent will follow the provincial permitting requirements and will acquire the necessary permits in advance.

The full wetlands and watercourse assessment can be found in Appendix F.

4.1.4 Fish and Fish Habitat

Based on the wetland and watercourse assessment conducted by Strum all of the wetlands have been identified as a marsh or swamp. These swamps and marshes do not provide an adequate environment for fish to use as habitat. Other than the wetlands and watercourses identified by Strum there are no other water bodies on the Project site. No impact to fish and fish habitat is expected.

The closest rivers that the Proponent expects to see fish habitats are French River 4.5 km to the west and Barneys River 7.5 km to the East. The Project is not expected to have any impact on these two rivers.

4.1.5 Avian Study

Four avian surveys were completed by Strum; these consisted of fall migration, winter resident, spring migration surveys and a summer breeding survey. The detailed results from the Avian Survey can be found in Appendix B.

Fall Migration Surveys

Fall surveys consisted of 28 stopover count surveys at 10 locations, while 5 diurnal passage counts were performed across 3 locations (Appendix B – Drawing 2). A total of 49 species, consisting of 331 individual bird observations were recorded during fall migration surveys.

Golden-crowned Kinglet (*Regulus satrapa*), Black-capped Chickadee (*Poecile atricapillus*), Common Raven (*Covus coraxI), White-throated Sparrow (*Zonotrichia alicollis) and American Crow (*Corvus brachyrhynchos*) were the most abundant and most frequently observed species. Sixty-seven percent of bird species observed are Passerines including 11 species of warblers and 3 species of sparrows.

Non-passerine species observed include: water birds (American Black Duck (*Anas rubripes*) Common Loon (*Gavia immer*), American Woodcock (*Scolopax minor*), Herring Gull (*Larus argentatus*) and Ring-billed Gull (*Larus delawarensis*)), birds of prey (Bald Eagle (*Haliaeetus leucocephalus*), Red-tailed Hawk (*Buteo jamaicensis*), Osprey (*Pandion haliaetus*), Northern Harrier (*Circus cyaneus*), Broad-winged Hawk (*Buteo platypterus*)), upland game birds (Ruffed Grouse (*Bonasa umbrellas*), and wood peckers (Downy Woodpecker (*Picoides pubescens*), Hairy Woodpecker (*Picoides villosus*); Northern Flicker (*Colaptes auratus*) and Pileated Woodpecker (*Dryocopus pileatus*)).

The priority species observed during the fall migrations surveys at the Project site are presented in Table 4-2: Priority species observed during fall migration surveys. and locations of observation are presented in Figure 4-5: Fall migration priority species locations (Strum, 2013).

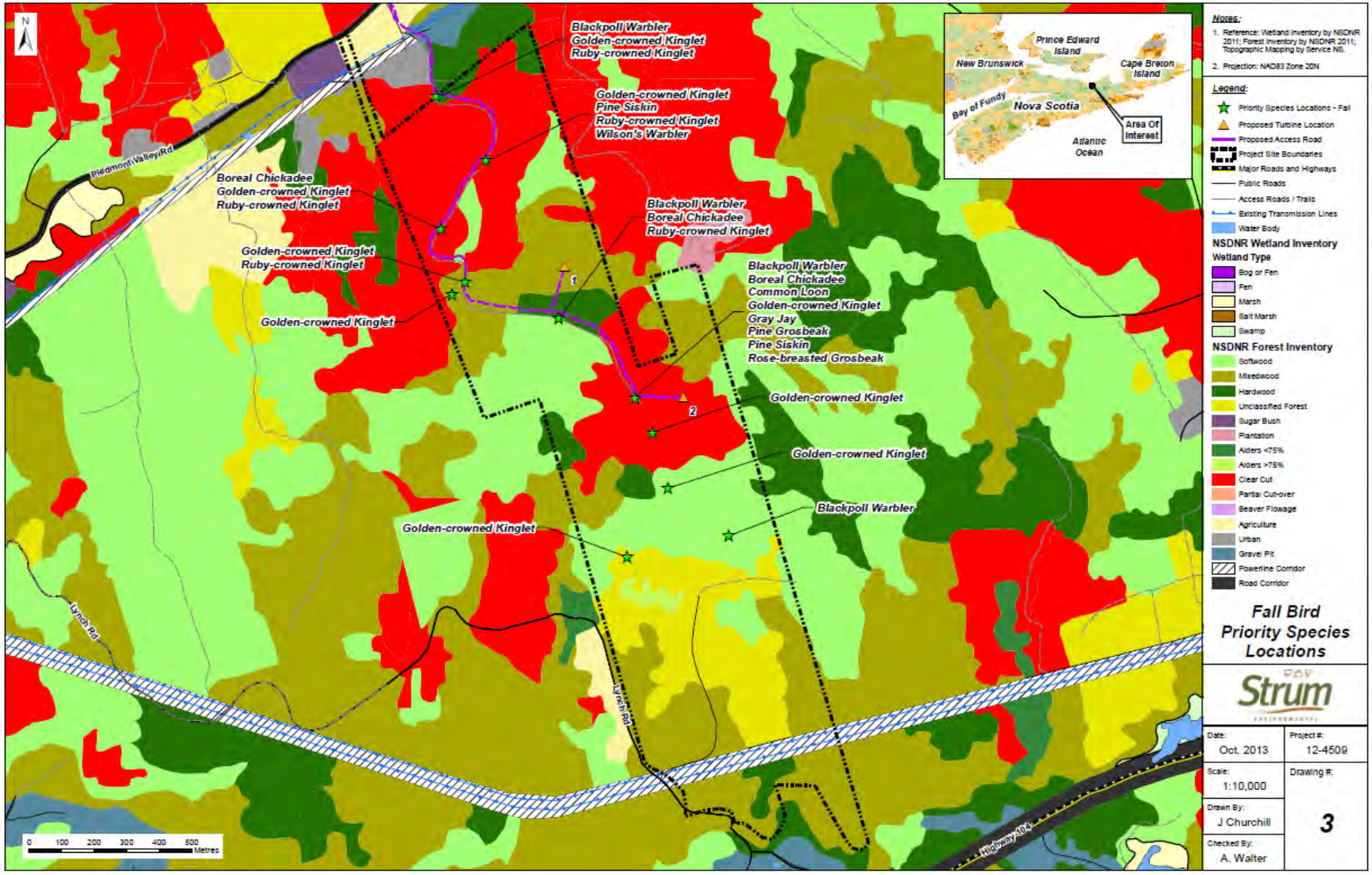

Figure 4-5: Fall migration priority species locations (Strum, 2013).

Table 4-2: Priority species observed during fall migration surveys.

Common Name	Scientific Name	NSDNR Rank (NSDNR, 2010)
Blackpoll Warbler	*Dendroica striata*	Yellow
Boreal Chickadee	*Poecile hudsonicus*	Yellow
Common Loon	*Gavia immer*	Red
Golden-crowned Kinglet	*Regulus satrapa*	Yellow
Gray Jay	*Perisoreus canadensis*	Yellow
Pine Grosbeak	*Pinicola enucleator*	Red
Pine Siskin	*Spinus pinus*	Yellow
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	Yellow
Ruby-crowned Kinglet	*Regulus calendula*	Yellow

No species with legal protection under SARA or the Nova Scotia Endangered Species Act (NSESA) were recorded.

Winter Survey

Winter bird surveys consisted of 12 area search surveys, conducted at 12 separate locations within the Project site. Nine species, consisting of 32 individual birds, were recorded during the winter surveys. Black-capped Chickadee, American Crow and Common Raven (*Corvus corax*) were the most abundant and most frequently observed species. Common Redpoll (*Acanthis flammea*) and Blue Jay (*Cyanocitta cristata*) were other passerine species observed; otherwise, the winter bird community consisted of woodpecker and upland game species. Overall, there were approximately 3 birds and 2 species observed per survey location during the winter surveys.

No priority species were observed during winter bird surveys at the Project site. Similarly, no species with legal protection under SARA or the NSESA were recorded during these surveys.

Spring Migration Surveys

Spring migration surveys consisted of a total of 23 stopover count surveys, completed at the same 12 locations that were surveyed during the winter season survey. A total of 377 birds, representing 48 species were observed during the spring migration surveys. White-throated Sparrow (*Zonotrichia albicollis*), Magnolia Warbler (*Dendroica magnolia*) and American Robin (*Turdus migratorius*) were the most abundant species, while Purple Finch (*Carpodacus purpureus*) and Yellow-rumped Warbler (*Dendroica coronate*) were also regularly observed. Overall, there were approximately 16 birds and 10 species observed per survey location during the spring migration period.

Waterfowl were not observed at the site directly, although Common Merganser (*Mergus merganser*), Canada Goose (*Branta Canadensis*) and Common Loon were either observed flying over the Project site in small numbers or were heard calling in the distance.

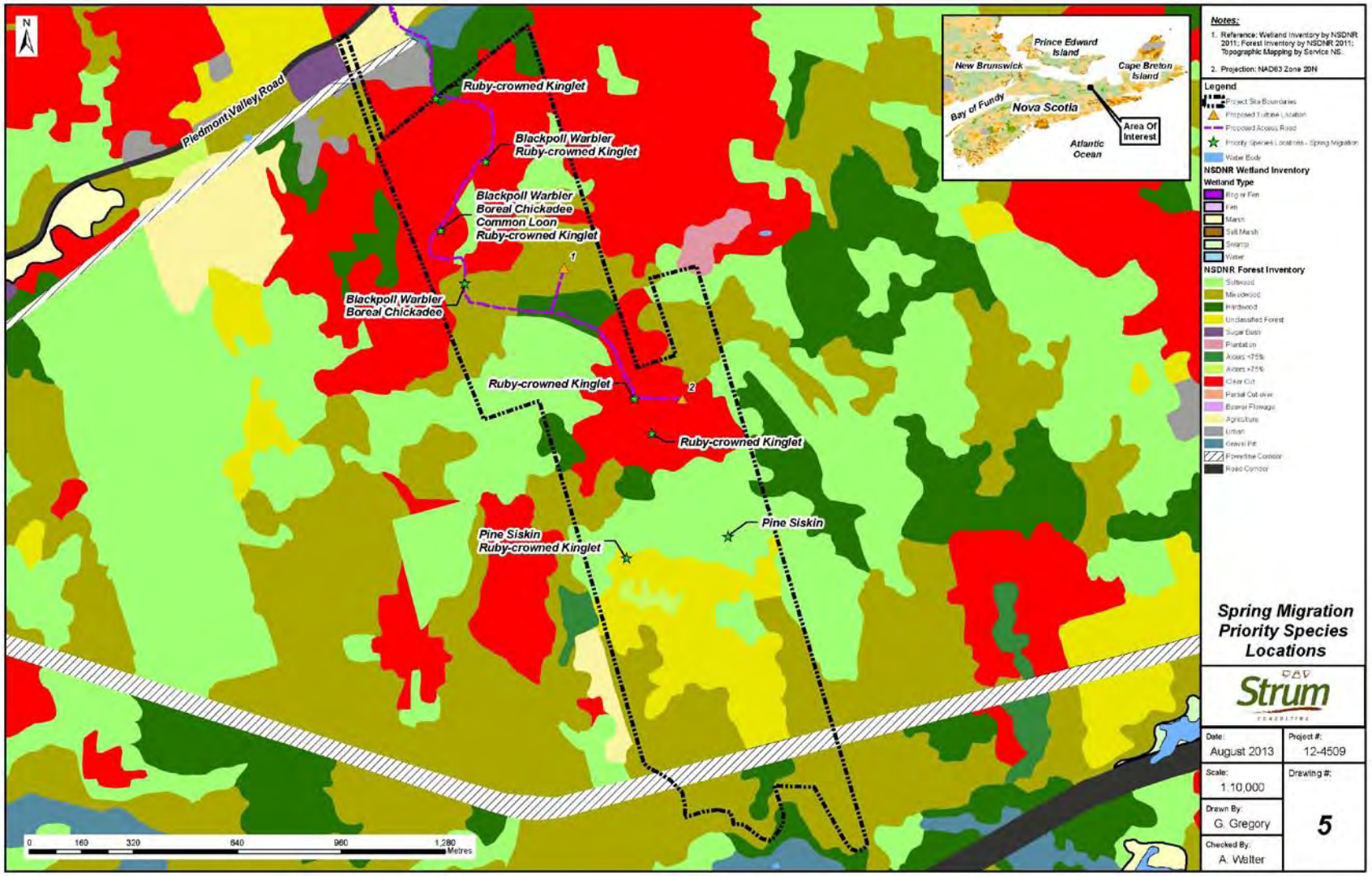

Figure 4-6: Spring migration priority species locations (Strum, 2013).

Birds of prey observed during the spring surveys were Bald Eagle and Sharp-spinned Hawk (*Accipiter striatus*), which were observed soaring above/travelling through the valley to the south of the Project site.

The priority species observed during the spring migrations surveys at the Project site are presented in Table 4-3 and locations of observations are presented in Figure 4-6.

Table 4-3: Priority species observed during spring migration surveys.

Common Name	Scientific Name	NSDNR Rank (NSDNR, 2010)
Blackpoll Warbler	*Dendroica striata*	Yellow
Boreal Chickadee	*Poecile hudsonicus*	Yellow
Common Loon	*Gavia immer*	Red
Pine Siskin	*Spinus pinus*	Yellow
Ruby-crowned Kinglet	*Regulus calendula*	Yellow

No species with legal protection under SARA or the NSESA were recorded during these surveys.

Breeding Season Surveys

The breeding season surveys consisted of a total of 24 point count surveys conducted at 12 locations. There were a total of 43 species, consisting of 418 individual bird observations, recorded during the breeding season surveys. One of the species (American Robin) was considered a "Confirmed Breeder". 28 were considered "Probable" breeders and 14 were considered "Possible" breeders. An average of 17 birds was detected per survey location, with an average of 12 species detected per survey location.

White-throated Sparrow, Magnolia Warbler and Alder Flycatcher (*Empidonax alnorum*) were the most frequently observed and most abundant species counted during these surveys. Passerines were the dominant group on the Project site representing 86% of the species observed.

Non-passerine species observed during the breeding bird surveys include: Common Loon, Common Merganser (*Mergus merganser*), Hair Woodpecker (*Picoides villosus*), Northern Flicker (*Colaptes auratus*), Yellow-bellied Sapsucker (*Sphyrapicus varius*), Pileated Woodpecker (*Dryocopus pileatus*) and Belted Kingfisher (*Megaceryle alcyon*).

The priority species observed during the breeding season surveys at the Project site are presented in Table 4-4 and locations of observations are presented in Figure 4-7.

Table 4-4: Priority species observed during breeding season surveys.

Common Name	Scientific Name	NSDNR Rank (NSDNR, 2010)
Eastern Wood-Pewee	*Contopus virens*	Yellow

Common Name	Scientific Name	NSDNR Rank (NSDNR, 2010)
Common Loon	*Gavia immer*	Red
Golden-crowned Kinglet	*Regulus satrapa*	Yellow
Ruby-crowned Kinglet	*Regulus calendula*	Yellow

Eastern Wood-pewee is the only species with legal protection under either SARA or NSESA observed during breeding season bird surveys at the Project site. This species was only observed during one breeding bird survey conducted by Strum on June 22nd and also observed on June 18th during a vascular plant survey approximately 200m north east of the proposed turbine 1 location, and is considered a "Possible" breeder at the Project site.

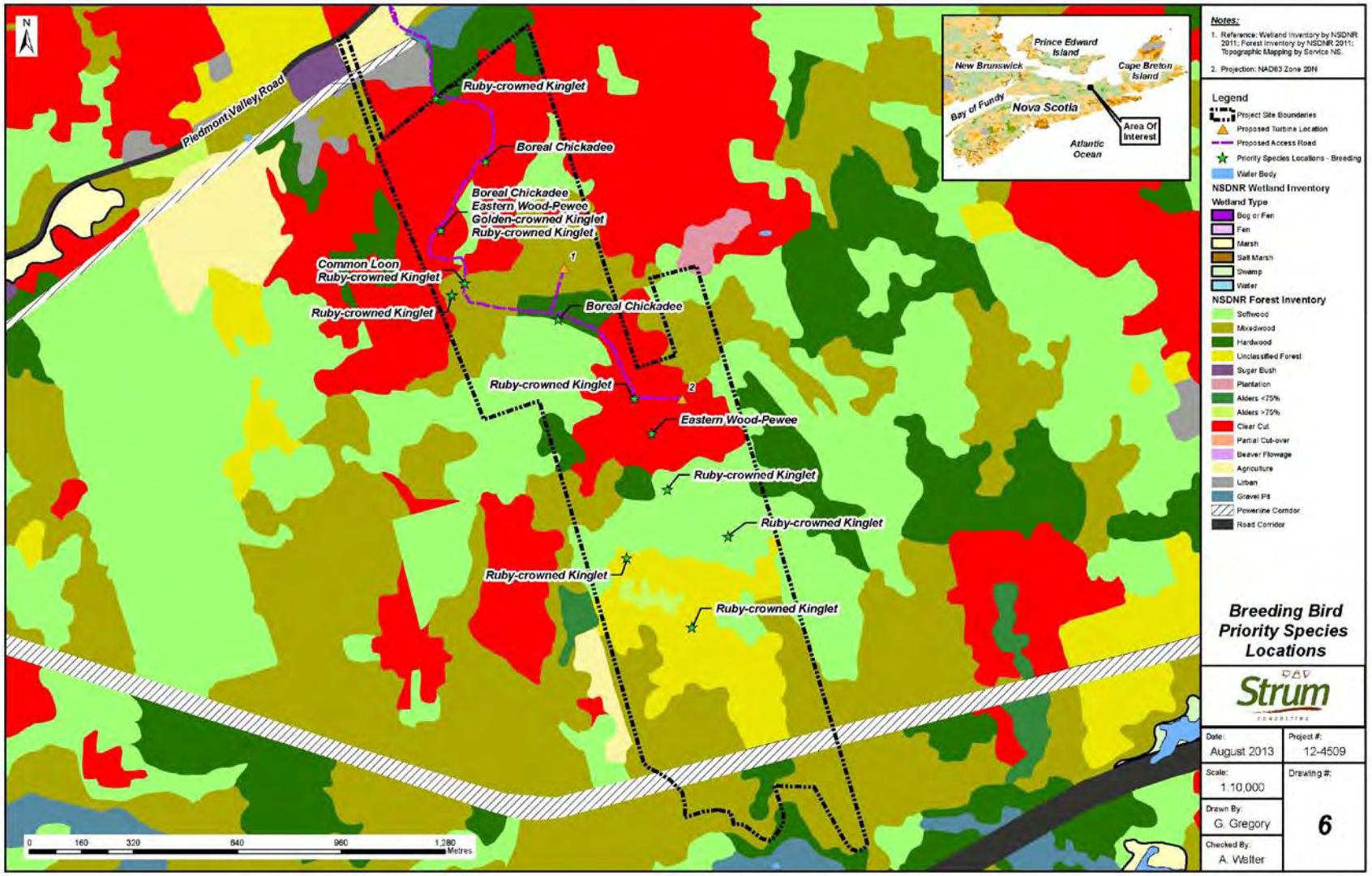

Figure 4-7: Breeding bird priority species locations (Strum, 2013).

Summary of Surveys

A total of 66 species were observed to be using the Project site during the study period: 43 during the breeding period, 48 during spring migration, 49 during fall migration and 9 during the winter.

Eastern Wood-Pewee was the only species observed that has legal protection under the NSESA ('Vulnerable'). The species has also been assessed and ranked as "Special Concern" by COSEWIC. Specific mitigative measures for the Eastern Wood-Pewee have been proposed in Section 6.2.

Table 4-5 presents a summary of the priority species that have been observed using the Project site.

Table 4-5: Avian species of conservation interest at the Project site.

Common Name	Season Observed	Description of Site Usage
Eastern Wood-Pewee	Breeding	Observed during two breeding bird surveys; considered a "Possible" breeder at Project site. Observed at Project site in deciduous forest.
Blackpoll Warbler	Fall, Spring	Commonly found in coniferous or conifer-dominated forest types in Nova Scotia. Likely use the Project site as a migration stopover.
Boreal Chickadee	Fall, Spring	Commonly found in coniferous or conifer-dominated forest types in Nova Scotia. Likely a year round resident at the Project site.
Common Loon	Fall, Spring, Breeding	Observations at the Project site (more than 100 m from point count locations) suggest local landscape may be important for loon breeding and movement.
Golden-crowned Kinglet	Fall, Breeding	Commonly found in coniferous or conifer-dominated forest types in Nova Scotia. Likely a year round resident at the Project site.
Gray Jay	Fall	Commonly found in coniferous or conifer-dominated forest types in Nova Scotia. Likely a year round resident at the Project site.
Pine Grosbeak	Fall	Commonly found in coniferous or conifer-dominated forest types in Nova Scotia. Less predictable inter-annual distribution across their range due to fluctuations of food availability.
Pine Siskin	Fall, Spring	Commonly found in coniferous or conifer-dominated forest types in Nova Scotia. Less predictable inter-annual distribution across their range due to fluctuations of food availability.
Rose-breasted Grosbeak	Fall	Observed at Project site in deciduous forest.

Common Name	Season Observed	Description of Site Usage
Ruby-crowned Kinglet	Fall, Spring, Breeding	Commonly found in coniferous or conifer-dominated forest types in Nova Scotia. Likely use the Project site as a migration stopover.
Wilson`s Warbler	Fall	Commonly found in deciduous vegetation.

4.1.6 Flora

During the field work completed by Sean Blaney of Atlantic Canada Conservation Data Centre (ACCDC) a total of 225 vascular plant species were recorded (173 native and 52 exotic). The full list of species is given in Table 1 of Appendix G, only one taxon is potentially of conservation concern.

One patch of polypody fern (*Polypodium sp.*) species that exhibited some characteristics of Appalachian Polypody (*Polypodium appalachianum*) was found approximately 110 m southeast of the proposed location for WTG 1. The fronds of this fern had the relatively pointed pinnae tips of Appalachian Polypody but lacked the typical broad triangular frond shape of the species. The fern was determined to be infertile and could not be determined to species with certainty. It is possible that the observed fern may represent a hybrid Appalachian x Common Polypody (*P. Appalachianum x virgininianum*) or slightly atypical Appalachian Polypody. The fern will be treated as Appalachian Polypody for the purpose of this EA, which is provincially listed as uncommon. Disturbance to this area will be avoided during construction and clearing activities.

The natural heritage value of the Project site is limited due to past agricultural use and extensive recent disturbance from forestry. Table 4-6 provides a description of the plant communities present at the proposed WTG locations. The full vascular plant survey can be found in Appendix G.

Table 4-6: Plant descriptions of proposed turbine locations.

Location	Plant Description
Turbine 1	*White Spruce plantation over old field.* 20 year old white spruce (70%) - balsam fir (20%) - (gray birch - red maple - white ash - 10%); 60% tree cover overall (patchy); limited shrub cover. Herb dominants: Danthonia spicata; Pteridium aquilinum; Solidago rugosa; Hieracium spp.
Turbine 2	*Deciduous forest clearcut at edge of remnant 80 year old stand (sugar maple 100%, a few dead white ash*); 80-90% shrub/sapling cover - *Rubus idaeus* ssp*. strigosus; White Ash; Sugar Maple.* Herbaceous dominants: *Dryopteris campyloptera; Carex brunnescens* ssp*. sphaerostachya; Carex gynandra; Carex debilis* var*. rudgei; Doellingeria umbellata; Dennstaedtia punctilobula*

4.1.7 Fauna

Moose

The proposed wind turbine locations overlap the Pictou/Antigonish/Guysborough County Significant Mainland Moose Concentration Area polygon shown in the Special Management Practices document published by NSDNR in July 2012.

In consultation with NSDNR it was determined necessary to conduct both winter track and pellet group inventory (PGI) moose surveys to identify the presence of mainland moose in the Project area. Surveys were conducted by Forest Technician Jody Hamper and consisted of three winter track surveys and two PGI surveys in the 2013 season.

The winter moose track survey results are as follows:

Table 4-7: Summary of winter moose track surveys.

Survey	Observed Moose Tracks
January	Moose track was observed outside of the Project site approximately 2 km southeast of the closest WTG location. The coordinates for the moose track are UTM Zone 20 – 550,566 m E 5,047,920 m N. The location can be seen on the January survey map in Appendix E.
February (Survey 1)	No moose tracks observed
February (Survey 2)	Moose track was observed outside of the Project site approximately 1 km southeast of the closest WTG location. The coordinates for the moose track are UTM Zone 20 – 549,708 m E 5,048,422 m N. The location can be seen on the February survey #2 map in Appendix E.

Spring PGIs were conducted on April 13/14 and April 27/28. During both PGI surveys there was no recorded evidence of moose pellets along any of the 8 transects. The full moose survey can be found in Appendix E.

The proponent has also relied on both the Mainland Moose Recovery Plan and the Special Management Practices documents published by NSDNR in order to better assess and attempt to mitigate the potential impact the project may have on Mainland Moose populations in the surrounding area.

The impact wind farm developments have on moose populations is still widely unknown and will require considerably more research and data collection. It is for this reason that the Proponent in consultation with NSDNR is committing to conducting moose surveys during 2014 clearing and construction activities, as well as two further annual post construction surveys in 2015 and 2016.

Bats

Bat surveys were conducted in 2012 and 2013 on the project site. The 2013 desktop study completed by AMEC identified 269 known abandoned mine openings within 25 km of the Project site according to

the Nova Scotia Abandoned Mine Openings (AMO) database. None of these mine openings appear to correspond to caves known to support bats in Nova Scotia, as summarized by Moseley (2007a and 2007b). Total measured depths of most of the mine openings are not provided; however, one opening is reported to have a depth of approximately 10 m. The original depths of some of these openings were much greater, but according to the records, the majority have been filled or sealed for public safety. A single AMO occurs within 10 km of the Project site, McLaurin's iron mine shaft, which is located near Telford.

The 2012 bat survey missed the critical bat activity weeks at the end of August and beginning of September although did pick up bat presence later in Septmeber. The 2012 report prepared by Strum Consulting stated that there is one known bat hibernaculum within 25 km of the Project. MacLellan's Brook Cave located 20km southwest of the Projects site is a dissolution stream cave, which is considered a minor hibernaculum (Mosely, 2007), however the actual number of bats hibernating in this cave have not been confirmed.

Aerial System

The aerial system that was deployed from August 24 to October 13, 2013, recorded bat activity during 14 of the 40 deployment nights. The average was 1.72 calls per night (minimum 0, maximum 12). The majority of the calls were *Myotis* species, though one on August 24 appears to be an Eastern Red bat. While it is difficult to confidently assign *Myotis* echolocation sequences to a particular species, the calls recorded show characteristics of both *M. Lucifugus* and *M. Septentrionalis*, and it is assumed that both species are present on the site.

Overall, the aerial unit recorded a rather small number of echolocation files. The majority of the aerial files appear to be "feeding buzzes", indicating that bats recorded by the aerial system were foraging. A compact flash card deployed from August 24 to September 8 appears to have been corrupted, resulting in a huge number of files being recorded; however the vast majority are unexplained noise. Very few (<0.1%) of the sounds recorded during this period were attributed to bats. This period is not plotted in Figure 4-8, which represents the number of bat echolocation sequences recorded by the aerial Anabat unit as well as the temperature data from Tracadie and precipitation from Caribou Point, the nearest relevant weather stations.

Ground System

A total of three ground systems were deployed at the Project site covering different time periods and locations. The main ground system, Unit 2 was deployed from August 8 to October 3, 2013 and recorded bats on 36 of the 57 deployment nights shown in Figure 4-8. The average number of echolocation calls recorded per night was 12.8 (minimum 0, maximum 77). The data recorded by the ground system shows many feeding buzzes, indicating the bats are foraging in the area.

The second ground system, Unit 1, was deployed from August 8 and recorded until it was damaged on August 21, 2013, recording bats on 13 of the 14 deployment nights (Figure 4-8). The average number of

echolocation calls recorded per night was 6.07 (minimum 0, maximum 19). The data recorded by the ground system Unit 1 shows many feeding buzzes, indicating the bats are foraging in the area.

The third ground system, Unit 3, was deployed near the aerial survey location from August 16 to August 23, 2013 and recorded bats on 5 of the 7 deployment nights (Figure 4-8). The average number of echolocation calls recorded per night was 3.7 (minimum 0, maximum 7). Again, many of these calls were feeding buzzes.

Discussion

While it is difficult to confidently assign *Myotis* echolocation sequences to a particular species, the calls recorded by both the aerial and ground units show characteristics of both *M. Lucifugus* and *M. Septentrionalis*, and it is therefore assumed that both species are present at the Project site. Two calls, on August 15 and 20, appear to be from an Easter Red bat (*Lasiurus borealis*).

The decrease in bat echolocation sequences as the fall season progressed is consistent with the seasonal behaviour of *Myotis* species in NS.

Overall, the review of the data from the 2013 monitoring program suggests a low level of bat activity at the Project site. Whether this is due to naturally low levels in the area or if the local population has been significantly impacted by White-nose syndrome is indeterminable without further research and analysis.

The full bat monitoring report can be found in Appendix C.

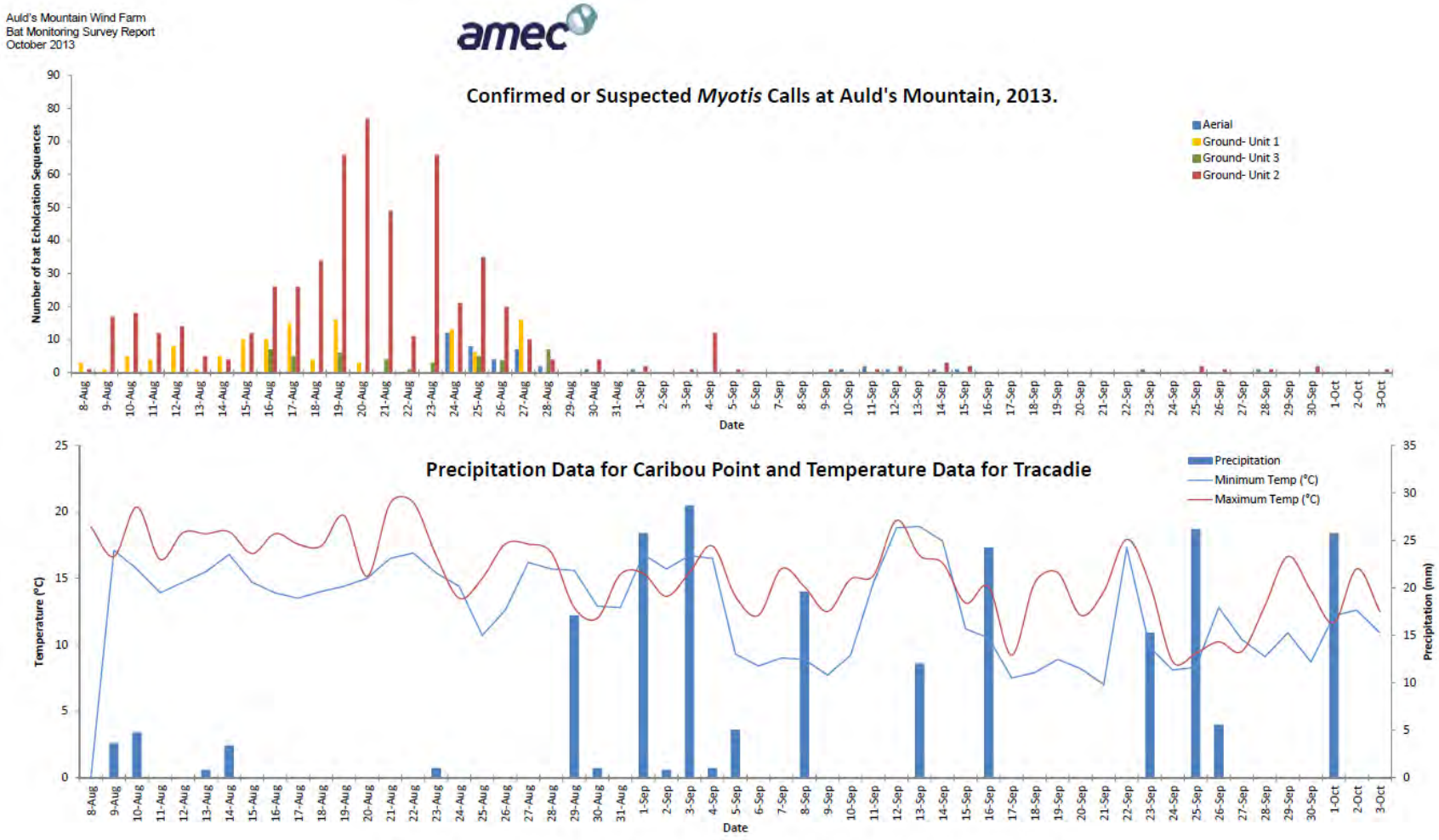

Figure 4-8: Confirmed or suspected Myotis calls and precipitation/temperature data (AMEC, 2013).

Wood Turtles

Wood turtles, considered a species at risk in Nova Soctia are known to inhabit the watershed overlying the Project site. A desktop review was conducted, and in consultation with NSDNR the Proponent decided not to conduct field surveys due to the lack of adequate wood turtle habitat at the Project site. The wood turtle Special Management Practices document was reviewed to guide the Proponent in determining appropriate mitigation measures to utilize. Details on mitigation measures the Proponent will utilize is shown in Section 6.2.

4.2 Socio-economic

4.2.1 Community

The community of Piedmont is located 6.5 km southeast of Merigomish and is part of the Municipality of Pictou County. Neighbouring communities include French River, Broadway, Kenzieville, Avondale and Merigomish. Land in the community of Piedmont is mainly used for agricultural purposes, being either farming or forestry. There are also a few small businesses located within the community and neighbouring communities.

The community remains rural and residences are located along the roadways such as Piedmont Valley Road, Browns Mill Road and Fraser Crossing Road. There are 71 residences within 2,000 m of the Project site and 20 are within 1,500 m of the closest WTG.

Community meetings were held at the Glasgow Square Theatre and the Merigomish Fire Hall. Details from the community consultation are presented in Section 5.

4.2.2 Archaeological Resource Impact Assessment

A historic background study was conducted by Davis MacIntyre & Associates in May 2013. Historical maps, manuscripts, and published literature were consulted at Nova Scotia Archives and Records Management in Halifax. The Maritime Archeological Resource Inventory, held at the Nova Scotia Museum's Heritage Division, was searched to understand prior archaeological research and known archeological resources neighbouring the Project site. A field reconnaissance was conducted in May 2013.

The historical background study indicates Pictou County, Barney's River and French River were occupied and used by the Mi'kmaq and their ancestors prior to European contact. Aulds Mountain may have been visited for hunting and gathering, but the potential is low for finding any archaeological evidence of this activity. They study area appears to offer little in terms of long-term settlement and subsistence such as navigable waterways and fishing sites.

James Haggart and subsequent Scottish immigrants from areas such as Blair Athole settled in the valley of Piedmont as early as 1810. Historical maps record land settlement in the study area as early as 1849 and Meacham's map indicates there was substantial settlement in the area to warrant a schoolhouse and mill on the southern portion of land granted at one point to Donald McGlashan.

Field reconnaissance revealed settlement in the area would have been "back" land, which is land granted to later waves of immigrants after much of the more productive "front" lands had been already granted. The existence of apple trees, relatively level woodlands, and two stone features appear to agree with the historic background research that there was settlement in the area. The linear stone features, if they are mine tailings, would suggest that in addition to agriculture the study area was also a site of extraction activities.

The proposed WTG sites were of higher elevation than the discovered features, which were discovered in the northern half of the roadway, and there were no signs of pre-contact or historic cultural activity, besides logging. The lack of navigable waterways and a landscape unsuitable to agriculture and settlement significantly diminish the likelihood of archaeological resources at the Project site.

The full archaeological resource impact assessment can be found in Appendix D.

4.2.3 Noise

Sound pressure level (SPL) is the force of sound on a surface area. This is measured in dB(A); dB or decibels is a logarithmic unit that is used to measure SPL and (A) is the weighting applied to denote, as perceived by humans. Nova Scotia does not currently have any regulations pertaining to maximum sound pressure levels (SPL) required at receptor locations near wind farms. As a best practice effort, the Proponent has followed the *Ontario Noise Guidelines for Wind Farms* as a guideline regarding acceptable noise emission from the AMWF. The Ontario guidelines present a 40 dB(A) SPL as the maximum exposure level for a noise receptor (Ministry of the Environment, 2008). Through

consultation with Nova Scotia Environment and Health Canada it has been determined that a 40 dB(A) is an acceptable worst case scenario maximum SPL at any receptor.

A noise assessment was completed for the AMWF using WindPRO software; the software uses ISO 9613-2: Acoustics – Attenuation of sound during propagation outdoors standards. By making conservative estimates of factors contributing the SPLs of the WTGs, the model yields results that represent a worst case scenario. A WTG hub height of 98 m was used with a SPL of 105 dB(A) being produced from the turbine nacelle, located at the hub height. A total of 71 receptor points were used to represent 71 dwellings within a 2,000 m range of the proposed turbine locations. The model was run using two turbines with no added vegetation layer and continuous downwind propogation for conservative results. The closest receptor was subjected to a maximum SPL of 37.6 dB(A). Table 4-8 presents a summary of the SPL at all 71 receptors and their compliance with the Ontario guidelines and 40 dB(A) noise level limit. The full noise impact assessment can be found in Appendix H.

Table 4-8: SPL from WTG at receptor locations

Point of Reception ID letter	Distance from Receptor to nearest wind turbine (m)	Max Sound Level from wind farm for all wind speeds dB(A)	Compliance with Ontario Guidelines (Yes/No)	Compliance with 40 dB(A) Noise Level (Yes/No)
A	2104	27.9	Yes	Yes
B	1455	31.5	Yes	Yes
C	1609	30.6	Yes	Yes
D	1851	29.1	Yes	Yes
E	1864	29.2	Yes	Yes
F	2181	27.2	Yes	Yes
G	1113	34.4	Yes	Yes
H	2287	27.1	Yes	Yes
I	1189	33.8	Yes	Yes
J	1995	28.4	Yes	Yes
K	1647	30.3	Yes	Yes
L	1184	33.8	Yes	Yes
M	2012	28.5	Yes	Yes
N	1573	30.8	Yes	Yes
O	2010	28.3	Yes	Yes
P	1890	28.8	Yes	Yes
Q	2448	25.9	Yes	Yes
R	2336	26.8	Yes	Yes
S	1989	28.4	Yes	Yes
T	1324	32.6	Yes	Yes
U	1613	30.5	Yes	Yes
V	2664	25.4	Yes	Yes

Point of Reception ID letter	Distance from Receptor to nearest wind turbine (m)	Max Sound Level from wind farm for all wind speeds dB(A)	Compliance with Ontario Guidelines (Yes/No)	Compliance with 40 dB(A) Noise Level (Yes/No)
W	2179	27.6	Yes	Yes
X	2233	27.1	Yes	Yes
Y	2377	26.6	Yes	Yes
Z	2505	26.1	Yes	Yes
AA	2122	27.8	Yes	Yes
AB	1316	32.8	Yes	Yes
AC	2280	26.8	Yes	Yes
AD	1825	29.1	Yes	Yes
AE	1460	31.6	Yes	Yes
AF	2190	27.5	Yes	Yes
AG	2008	28.1	Yes	Yes
AH	1927	28.5	Yes	Yes
AI	2068	28.3	Yes	Yes
AJ	1069	34.6	Yes	Yes
AK	1963	28.7	Yes	Yes
AL	2040	27.9	Yes	Yes
AM	1079	34.7	Yes	Yes
AN	1506	31.2	Yes	Yes
AO	2037	28	Yes	Yes
AP	2254	27.2	Yes	Yes
AQ	2239	27.3	Yes	Yes
AR	2178	27.5	Yes	Yes
AS	1391	32.1	Yes	Yes
AT	1109	34.5	Yes	Yes
AU	1003	35.5	Yes	Yes
AV	970	35.8	Yes	Yes
AW	2189	27.5	Yes	Yes
AX	1477	31.6	Yes	Yes
AY	847	36.9	Yes	Yes
AZ	1582	30.8	Yes	Yes
BA	2027	28.3	Yes	Yes
BB	3069	23.3	Yes	Yes
BC	1786	29.5	Yes	Yes
BD	2042	27.9	Yes	Yes
BE	772	37.6	Yes	Yes
BF	2098	27.9	Yes	Yes
BG	2048	28.4	Yes	Yes
BH	1844	29.4	Yes	Yes
BI	1233	33.3	Yes	Yes

Point of Reception ID letter	Distance from Receptor to nearest wind turbine (m)	Max Sound Level from wind farm for all wind speeds dB(A)	Compliance with Ontario Guidelines (Yes/No)	Compliance with 40 dB(A) Noise Level (Yes/No)
BJ	1365	32.4	Yes	Yes
BK	1421	32.1	Yes	Yes
BL	1414	32	Yes	Yes
BM	2372	26.7	Yes	Yes
BN	2566	25.9	Yes	Yes
BO	2452	26.3	Yes	Yes
BP	1716	30	Yes	Yes
BQ	1615	30.5	Yes	Yes
BR	1859	28.9	Yes	Yes
BS	2232	26.9	Yes	Yes

4.2.4 Visual

ReSoft Ltd WindFarm software was used to create a photomontage of the AMWF. Two locations were chosen to present a predicted view of the wind farm using a 98 m hub height; Figure 4-9 taken from Highway 4 looking northeast at the Project site and Figure 4-10 taken from Highway 104 Looking northeast towards the Project site.

Figure 4-9: Predicted view from Highway 4 looking northeast approximately 3.1 km from the proposed Project location.

Figure 4-10: Predicted view from Highway 104 looking northeast approximately 3.3 km from the proposed Project site.

4.2.5 Shadow Flicker

The Proponent has undertaken a shadow flicker impact assessment for the AMWF to assess the potential impact of shadow flicker on the surrounding shadow receptors. Shadow flicker is the change in light received by a receptor due to a WTG blade impeding the light path between the sun and the receptor. As there are few federal, provincial or municipal guidelines or policies for governing or quantifying what is an acceptable amount of shadow flicker, the German standards, *Hinweise zur Ermittlung und Beurteilung der optischen Immissionen von Windenergianlagen* have been adopted for the purpose of this study and are generally used within the wind energy industry as standard guidelines. These guidelines, based on astronomic worst case scenario suggest that acceptable levels at each shadow receptors are:

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

The guidelines also specify two factors that limit the shadow flicker effect, due to optic conditions in the atmosphere:

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

Receptors not exposed to more than 30 minutes per day on the worst affected day or a total of 30 hours per year from all surrounding wind turbines are considered unlikely to require technical mitigation.

Receptors used in the shadow flicker assessment are at the same locations used for the noise assessment; this being a total of 71 receptors representing 71 dwellings. The model was run with WindPRO software to predict astronomical worst case shadow flicker at each receptor in terms of total hours per year, days per year, and maximum minutes per day. Table 4-9 presents a summary of the

results; receptors may not experience any shadow flicker at all as the model uses conservative assumptions, which is described in detail in the full shadow flicker impact assessment in Appendix I.

Table 4-9: Predicted maximum worst case shadow flicker results summary.

Point of Reception ID letter	Shadow flicker		
	Shadow hours per year (hr/year)	Shadow days per year (days/year)	Shadow hours per day (hours/day)
A	0:00	0	0:00
B	0:00	0	0:00
C	0:00	0	0:00
D	0:00	0	0:00
E	0:00	0	0:00
F	0:00	0	0:00
G	10:02	45	0:19
H	0:00	0	0:00
I	9:03	42	0:18
J	0:00	0	0:00
K	0:00	0	0:00
L	10:05	48	0:19
M	0:00	0	0:00
N	0:00	0	0:00
O	0:00	0	0:00
P	0:00	0	0:00
Q	0:00	0	0:00
R	0:00	0	0:00
S	0:00	0	0:00
T	0:00	0	0:00
U	0:00	0	0:00
V	0:00	0	0:00
W	0:00	0	0:00
X	0:00	0	0:00
Y	0:00	0	0:00
Z	0:00	0	0:00
AA	0:00	0	0:00
AB	4:27	21	0:17
AC	0:00	0	0:00
AD	0:00	0	0:00
AE	0:00	0	0:00
AF	0:00	0	0:00
AG	0:00	0	0:00
AH	0:00	0	0:00
AI	0:00	0	0:00
AJ	0:00	0	0:00
AK	0:00	0	0:00

Point of Reception ID letter	Shadow flicker		
	Shadow hours per year (hr/year)	Shadow days per year (days/year)	Shadow hours per day (hours/day)
AL	0:00	0	0:00
AM	10:34	47	0:20
AN	0:00	0	0:00
AO	0:00	0	0:00
AP	0:00	0	0:00
AQ	0:00	0	0:00
AR	0:00	0	0:00
AS	0:00	0	0:00
AT	10:13	45	0:19
AU	12:07	50	0:21
AV	12:47	52	0:22
AW	0:00	0	0:00
AX	0:00	0	0:00
AY	19:04	69	0:25
AZ	0:00	0	0:00
BA	0:00	0	0:00
BB	0:00	0	0:00
BC	0:00	0	0:00
BD	0:00	0	0:00
BE	22:31	62	0:29
BF	0:00	0	0:00
BG	0:00	0	0:00
BH	0:00	0	0:00
BI	6:08	26	0:18
BJ	4:11	20	0:16
BK	3:46	19	0:15
BL	0:00	0	0:00
BM	0:00	0	0:00
BN	0:00	0	0:00
BO	0:00	0	0:00
BP	0:00	0	0:00
BQ	0:00	0	0:00
BR	0:00	0	0:00
BS	0:00	0	0:00

5 Consultation

5.1 Community Engagement Plan

Open, transparent and comprehensive community engagement is crucial to the success of any development. Community engagement forms an integral part of the proposed AMWF development and consists of various engagement activities the Proponent will undertake throughout the development, construction, and operation of the wind farm. The Proponent is committed to addressing, to the best of their abilities, all concerns pertaining to this proposed development raised by local residents and community members.

The numerous engagement activities described in the following section will provide an opportunity to facilitate meaningful dialogue between various stakeholders and the Project Proponent; as well as provide true and accurate information pertaining to the Project in an open and transparent fashion. A comprehensive stakeholder engagement list has been formed, and will be kept up to date as further stakeholders express their interest in the Project.

5.2 Community

First Public Meeting

An open house was held on December 13, 2011 at the Glasgow Square Theatre from 5:00 pm – 8:00pm. The meeting was advertised via Canada Post Admail, a service offered that facilitates the distribution of invitations/ flyers to a defined geographic location. The open house was attended by approximately 20 community members and the meeting lasted three hours.

The Proponent handed out questionnaires to attendees of the first public meeting. The questionnaire was designed to gather contact information so interested persons could be provided with up to date information. The questionnaire was also designed to learn about the public's interest in having a wind farm in their community as well as provide an opportunity for the public to express any concerns they had regarding the AMWF Project. The open house format was held as an open discussion where Project information posters were displayed presenting Project information with Proponent representatives were present to answer questions.

Following the meeting, the proponent addressed any questions or concerns submitted via the questionnaires by writing personal letters addressing the specific concern of the stakeholder.

Second Public Meeting

A second public open house was held on September 19, 2013 at the Merigomish Fire Hall from 5:00pm – 8:00pm. The open house was advertised via Canada Post Admail as described above approximately 750 invitations were sent out. An advertisement was published in The Pictou Advocate advertising details regarding the open house. Stakeholders who expressed interest in the project were personally contacted and invited to attend the second open house. Finally, personal invitations were sent to Government stakeholders and First Nations right-holders inviting them to participate in the open house.

Again, the proponent handed out questionnaires as described above in an effort to collect valuable public feedback. The open house was held as an open discussion with Proponent representatives engaging in conversation with the attendees to address any issues or concern.

Website

The Proponent has set up a Project website for the AMWF. The website: www.auldsmountainwindfarm.ca will be updated periodically and used to inform the general public right-holders and stakeholders about all aspects of the proposed development. Website content and updates will include some or all of the following items:

- Notices for public information sessions;
- Photos of the Project location and turbine types;
- Progress reports on the Environmental Assessment;
- Environmental Assessment;
- Construction activity notifications;
- Online questionnaire and comment form (Have Your Say); and
- Media and PR related material.

Newsletters

Previous wind farms developed by the Proponent included newsletters as a key engagement tool to update and inform the local community on recent Project activities. The Proponent may circulate newsletters via email, website and Canada Post to the community throughout the 2013 and 2014 calendar years.

Issues Resolution

The Proponent has drafted a Complaint Resolution Plan, which the process community members should follow should there be negative impacts affecting the community members or the environment caused by the AMWF development. The Complaint Resolution Plan can be found in Appendix K.

5.3 Aboriginal Peoples

The aboriginal population has been contacted through right-holder update letters throughout the development process. Most recent efforts include letters mailed to First Nation Chief's in the region providing an update of the Project status, as well as providing the Proponents contact info in an effort to engage First Nations.

The Office of Aboriginal Affairs and the Pictou Landing First Nation Office have both been contacted via telephone to engage the First Nations community. This effort was to provide information regarding the public meetings that would be taking place and to extend a personal invite to the Chief of the Pictou Landing First Nation. Table 5-1 presents a log of communications activities between the Proponent and various Aboriginal groups relative to the AMWF.

Table 5-1: Communication activities with First Nations.

Date	Person Contacted	Band/Organization	Method of Communication	Content
December 4, 2011	Chief Aileen Francis	Pictou Landing First Nation	Letter	Invitation to the First Public Meeting
August 29, 2012	Office Receptionist	Office of Aboriginal Affairs	Phone Call	Engagement effort with the Mi'Kmaq community
September 6, 2013	Chief Aileen Francis	Pictou Landing First Nation	Letter	Invitation to the Second Public Meeting
September 9, 2013	Chief Aileen Francis	Pictou Landing First Nation	Phone Call	Invitation to the Second Public Meeting
August 19, 2013	Twila Gaudet, Consultation Liaison Officer	Kwilmu'kw Maw-Klusuaqn Negotiation Office	Letter	Wind Farm Update

5.4 Regulatory

The Proponent has engaged in consultation with Municipal, Provincial and Federal Government bodies regarding the proposed AMWF Project.

Municipal Consultation

The Proponent has engaged members of the MoPC planning department to discuss the planning regime such as permitting requirements on numerous occasions. Consultation provided the Proponent with detail regarding regional by-laws, land use and other policies within the MoPC that would relate to the proposed development of the AMWF.

Appendix L presents a log of communication between the Proponent and members of the MoPC and council member throughout the duration of the Project thus far.

As a continuous effort, the Proponent will be in constant consultation with the municipality and council members throughout the duration of the Project.

Provincial Consultation

The Proponent has met with various provincial organizations regarding the development of the AMWF.

The scoping of this Environmental Assessment document was discussed with the Nova Scotia Department of Environment – Environmental Assessment branch (EA branch). The consultation provided valuable information regarding the EA process, document formatting and relevant Health

Canada studies to review. Project scoping was also determined through consultation with the EA branch regarding the construction of new transmission lines.

Consultation topics with DNR included:

- Surveys and studies to conduct as part of the AMWF Environmental Assessment;
- Ideal dates to conduct effective bat monitoring surveys (last week of August to second week of September);
- Potential for bat hibernacula in the region;
- Background for further investigating the potential impact the WTG may have on bird and bat species.
- Discussion on mainland moose monitoring program
- Provide insight on proper course of action to take in effectively avoiding wetlands, mitigating impacts on wetlands and compensation that is required when direct wetland alteration is required; and
- Other species at risk to consider such as avifauna and amphibians.

As a continuous effort, the Proponent will be in constant consultation with the appropriate provincial departments throughout the duration of the Project.

Federal Consultation

The Proponent has consulted with various Federal Government entities regarding the construction of the AMWF. Environment Canada, NAV Canada, Transport Canada and the Department of National Defence were all contacted regarding the development of the AMWF.

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

5.5 Public and Aboriginal Concern

Based on the public meeting questionnaires, individual discussion and aboriginal consultation, local residents and aboriginal people have raised concerns relating to the Project and project activities. These concerns have been addressed in this EA. All issues raised have been identified in Table 5-2; included in this table is the section(s) that the public and aboriginal issues have been addressed. As previously mentioned in Section 5.1 the Proponent is committed to addressing, to the best of their abilities, all concerns pertaining to this proposed development raised by local residents and community members.

Table 5-2: Summary of issues raised.

Issues Raised	Section(s)
Noise generated by WTG	4.2.3, 6.3, Appendix H
Shadow Flicker Effect	4.2.5, 6.3, Appendix I
Impact on birds	4.1.5, 6.2, Appendix B
Impact on bats	4.1.7, 6.2, Appendix C
Impact on flora	4.1.6, 6.2, Appendix G

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6 Analysis

The construction, operation and decommissioning phases of the AMWF Project have the potential to affect physical, biophysical, and socio-economic environment. Identifying the VECs is an important part of the EA process. Following the presentation of the Project's activities in Section 2, the Environmental Setting in Section 4 and the review of issues identified from consultation in Section 5, the interaction of the Project activities with the VECs can be completed.

An interaction matrix in Table 6-1 presents the potential interactions between Project activities and each identified VEC. These VECs are presented in the following sub-sections in terms of potential environmental effects of Project activities including accidents and malfunctions, as well as proposed mitigation strategy, cumulative effects and finally, the level of significance of the residual effects. This VEC assessment is completed as outlined in the methodology as presented in Section 3.

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	Commissioning	Accidents and Malfunctions	Turbine Operation	Inspection and Maintenance	Accidents and Malfunctions	Infrastructure Demolition	Site Reclamation	Accidents and Malfunctions
Physical VECs														
Ambient air	•							•				•		•
Ground and Surface Water	•	•	•	•				•			•	•	•	•
Ambient noise	•	•	•	•	•		•		•			•	•	
Ambient light						•			•					
Biophysical VECs														
Wetlands / watercourses	•	•						•						
Fish and Fish Habitat	•	•						•			•			•
Migratory and breeding birds	•	•			•				•				•	

	Site Preparation and Construction								Operation and Maintenance			Decommissioning		
Flora	•	•			•								•	
Fauna	•	•			•				•		•		•	
Socio-economic VECs														
Land use	•								•					
Aboriginal resources / uses	•	•	•	•										
Archaeological	•	•	•	•									•	
Vehicular traffic			•	•	•	•								
Telecommunications & Radar									•					
Landscape aesthetics									•					
Health and safety								•			•			•
Local economy	•	•	•	•	•	•	•		•	•		•	•	

6.1 Assessment of Physical VECs

Ambient Air

Control and monitoring of ambient air quality is important in maintaining a healthy work, recreation and living environment. Based on the nature of activities that will take place at the Project site, ambient air quality has been identified as a VEC.

A significant environmental effect would result if a significant increase in contaminant concentration was determined a result of Project activities.

Boundaries – Spatial boundaries include the Project site for over all vehicular emissions but also focusing on gravel access roads up to the WTG for fugitive dust. The temporal boundary focuses on the Project construction and decommissioning phases during high vehicular traffic activities from machinery and trucks.

Table 6-2: Potential impacts and proposed mitigative measures for ambient air.

Potential Impacts on Ambient Air	Proposed Mitigative Measures
Local air quality may be affected through fugitive dust from access roads during construction and decommissioning	• Fugitive dust during dry weather conditions may be controlled with the application of water.
Local air quality may be affected through tailpipe emissions from construction vehicles and machinery	• All vehicles and machinery will comply with current emission standards and will be used efficiently, minimizing distances travelled whenever possible.

Cumulative Effects – As described in Section 2.9 the Glen Dhu wind farm approximately 6 km northwest Project site. Since ambient air was identified as a VEC mainly due to fugitive dust during construction, it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant environmental effect.

Significance of Residual Effects – A decrease in ambient air quality is determined to be negligible; fugitive dust will be eliminated through mitigative measures and vehicle emissions will comply with current emission standards. Therefore, the significance of residual effects on ambient air is to be considered negligible.

Ground and Surface Water

Management of ground and surface water quality is important as they are an integral aspect of a diverse ecosystem and functional ecology. Dwellings in this area rely on well water; therefore ground and surface water are also directly related to human health for this Project. A total of seven small wetlands and two minor watercourses have been identified at the Project site and are assessed in detail in Section 6.2 under wetlands and watercourses. As a result, ground and surface water quality and quantity have been identified as a VEC.

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

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

Table 6-3: Potential impacts and proposed mitigative measures for ground and surface water.

Potential Impacts on Ground and Surface Water	Proposed Mitigative Measures
Vegetation clearing, grubbing, ground stripping, excavation and machinery traffic during the construction of the WTG pads and access road might induce a change in hydrology or sediment input into ground and surface water.	• Efforts will be made to design the access road such that it does not interfere with a watercourse, water body or drainage channel; • Where possible, clearing shall take place in the winter months on frozen ground; • Erosion control strategies (ie. Straw bales and geo-textiles) outlined in the Erosion and Sedimentation Control Plan hopes to maintain baseline water quality conditions in the watercourses and wetlands at the site; and • Where water must be pumped out of excavation pits, there will not be a discharge into a wetland, watercourse or defined channel. If pumped water contains total suspended solids (TSS) the water will be pumped to vegetated land with gentle slope to allow sediment to filter, or filtered before release with a filter bag.
Exposure or accidental spillage of hazardous materials such as fuel, oils and hydraulic fluids has potential to contaminate ground water supplies during construction, operation and decommissioning phases.	• Equipment shall be in good working order and maintained so as to reduce risk of spill/leaks and avoid water contamination; • Spill response kits will be provided on site to ensure immediate response to a potential waste release; and • Routine maintenance, refuelling and inspection of machinery will be performed off-site whenever possible.
Vehicular traffic during decommissioning might induce a change in hydrology or sediment input into ground and surface water.	• WTG access road will be designed such that it will minimize interference with watercourse, water body or drainage channels; and • Used oil filters, grease cartridge containers and other products associated with equipment maintenance shall be collected and disposed of in accordance with regulatory guidelines.

Cumulative Effects – As described in Section 2.9 the Glen Dhu wind farm approximately 6 km northwest Project site. It is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

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

Ambient Noise

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

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

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

Table 6-4: Potential impacts and proposed mitigative measures for ambient noise.

Potential Impacts on Ambient Noise	Proposed Mitigative Measures
During construction and decommissioning phases the ambient noise sound pressure levels will be affected as a result of the use of equipment and machinery such as excavators, dump trucks and bulldozers. Elevated noise levels can disturb fauna and local residents.	• Noise impact will be limited by restricting construction and decommissioning activities to daytime hours when appropriate; • Health Canada recommends the long-term average day-night sound level (Ldn) be below 57 db(A) at the closest residence. An Ldn of 57 db(A) is expected to be within the threshold for widespread complaints for construction noise. (USEPA, 1974).

Potential Impacts on Ambient Noise	Proposed Mitigative Measures
Elevated sound pressure levels will be observed during operation from the nacelle, which is 98 m above ground level.	• A noise impact assessment has been conducted to predict a 'worst case scenario' sound pressure level that can be expected at the surrounding dwellings, this was used to locate the turbines to reduce observed noise at dwellings; and • By minimizing grubbing and clearing, flora on the Project site will aid in attenuation of noise produced from the WTG as perceived by local receptors.

Cumulative Effects – As described in Section 2.9 the Glen Dhu wind farm approximately 6 km northwest Project site. Given the separation of approximately 6 km it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

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

Ambient Light

There are three attributes associated with the Project that have potential to cause an impact on ambient lighting; lighting during night time construction activities, WTG lighting, and shadow flicker are expected to contribute to ambient lighting. By employing the proposed mitigation strategy, the effect of the Project on ambient lighting can be considered negligible.

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

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

Table 6-5: Potential impacts and proposed mitigative measures for ambient light.

Potential Impacts on Ambient Light	Proposed Mitigative Measures
During the night time, lighting will be seen atop some of the WTGs, depending on the Project layout.	• LED lighting will be used to minimize light throw; • Only the minimum amount of pilot warning and obstruction avoidance lighting will be used; • Only lights with short flash durations and the ability to emit no light during the 'off phase' of the flash (i.e. as allowed by strobes and modern LED lights) will be installed on tall structures; and • Lights will operate at the minimum intensity and minimum number of flashes per minute (longest duration between flashes) allowable by Transport Canada
Shadow flicker may occur during certain weather conditions and times of the year.	• The potential negative effect of shadow flicker has been mitigated at the design stage through responsible turbine siting • Compliance with industry standard guidelines on shadow flicker. All dwellings will, in a worst case scenario experience less than 30 hours of shadow flicker per year and 30 minutes of shadow flicker on the worst day.
Lighting during night time construction activities such as turbine installation.	• Construction activities will be limited to the day time when possible. The turbines may be erected during the evening as the activity must be completed when the wind is less than 4 m/s. These conditions are commonly seen in the early evening.

Cumulative Effects – As described in Section 2.9 the Glen Dhu wind farm approximately 6 km northwest Project site. Given the separation of approximately 6 km it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – Annoyance during project construction from work lighting, if necessary, will be temporary and of short duration. Lighting concerns from residents during operations such as shadow flicker and WTG lighting is expected to be limited, as mitigation measures were employed during site design. Therefore, while any effect on ambient light will be negative, the significance of residual effects on ambient light is predicted to be negligible.

6.2 Assessment of Biophysical VECs

Wetlands / Watercourses

Management of wetlands and watercourses is an important and integral aspect of maintaining a diverse ecosystem. The Projects impact on ground and surface water quality and quantity as assessed in Section 6.1 was predicted to be negligible in terms of significance of environmental effect. While the quality and quantity of ground and surface water is important in terms ecological functionality of wetlands and watercourses the Project may also interact with wetlands and watercourses in terms of direct alteration or alteration to species which inhabit wetland ecosystems. It is for this reason the proponent has, in consultation with NSDNR utilized a minimum turbine setback distance from wetlands of 30m in addition to the length of the turbine blade.

As discussed in Section 4.1.3, construction of the proposed access road may require minimal alteration to the minor watercourses but not the wetlands. As a result wetlands and watercourses have been identified as a VEC. The mitigation sequence of avoidance, minimization of impact and compensation as detailed by NSE's Wetland Conservation Policy will be followed (NSE, 2011).

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

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

Table 6-6: Potential impacts and proposed mitigative measures for wetlands / watercourses.

Potential Impacts on Wetlands / Watercourses	Proposed Mitigative Measures
During the construction phase, possible impacts to wetlands may arise from clearing, grubbing, infilling and excavation of the soil needed for constructing the access road. Such activities might induce silt run-off, alter flow into the wetlands or see them become repositories of significantly increased water flow, nutrients or sediments.	• Avoidance of all wetlands by moving the turbines to new locations; • Wetland and watercourse field surveys have been completed; • In wetlands associated with sensitive water crossings, grubbing shall be minimized by the placement of geo-textile; • Construction of the access road will attempt to create a buffer surrounding the wetland; • NSE will be continually consulted throughout the wetland and watercourse alteration process if required; and • The EMP will include all Provincial and Municipal regulations as well as all conditions determined by the Nova Scotia Wetland Alteration approval if required.

Cumulative Effects – As described in Section 2.9 the Glen Dhu wind farm approximately 6 km northwest Project site. It is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – The Project will be continually optimized around the access road design constraints to avoid direct alteration of wetlands and watercourses. The WTG have been located such that a minimum 30 m in addition to the blade length buffer exists between the WTG and wetlands. Any direct alteration is expected to be small in magnitude and may fall under the Wetland Conservation Policy exemption. If required, compensation will be completed under the Nova Scotia Wetland Conservation Policy. The significance of residual effects on wetlands and watercourse is predicted to be minor.

Fish and Fish Habitat

Alteration of freshwater environments such as the potential watercourse alteration proposed for the proposed access road may be required; however it is not expected to impede any fish habitat on the Project site. The wetlands and watercourse survey identified all wetlands on the Project site as swamps or marshes, therefore not providing a suitable environment for fish habitat. The Proponent has identified two rivers within 10 km of the Project site that may be used for fishing. French River and Barneys River described in Section 4.1.4 are located 4.5 km west and 7.5 km east, respectively. The Proponent does not expect any impact to these rivers as a result of the Project, and expects the significance of residual effects on fish and fish habitat to be negligible.

Migratory and Breeding Birds

Throughout the construction operation and decommissioning of a wind farm the potential negative impacts can be classified into four categories: collision, displacement due to disturbance, barrier effects, and habitat loss. As a result, migratory and breeding birds have been identified as a VEC. The Proponent will comply with the *Migratory Bird Convention Act* at all times and for all project related activities.

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

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

Table 6-7: Potential impacts and proposed mitigative measures for migratory and breeding birds.

Potential Impacts on Migratory and Breeding Birds	Proposed Mitigative Measures
During construction (clearing/grubbing) some vegetation might be cleared that might be habitat to some migratory birds.	• The Proponent will endeavor to conduct construction activities such as clearing and grubbing during a time period that does not coincide with the time period in which migratory birds would possibly be in the area (i.e. May 1 – August 31).
During operation there is a possibility that migrating birds could collide with the WTG.	• A desktop and field study has been conducted to identify and assess the presence of migratory and breeding birds. The studies determined the Project site does not support a large number of migrating birds; and • A follow up avian mortality survey will be conducted after the WTGs have been commissioned and appropriate action will be taken in consultation with NSDNR and CWS when necessary.
Birds may alter their migration flyways and/or local flight paths to avoid WTG.	• Desktop and field studies conducted suggest that the Project site is not located within a major migratory pathway; and • A follow up avian mortality survey will be conducted after the WTGs have been commissioned.
Fog events can impair avian visibility, increasing the likelihood of mortality from collision with the WTGs	• Instructions will be given to wind farm maintenance staff to ensure all work lights are turned off upon leaving the site particularly during foul weather events.

Potential Impacts on Migratory and Breeding Birds	Proposed Mitigative Measures
The wind farm footprint will cause a loss of habitat for breeding and migratory birds.	• Desktop and field studies conducted suggest that approximately 1.6 Hectares will be considered a loss of habitat. This is considered to have no negative impact on migratory and breeding birds; and • Remnant mid-aged to mature softwood stands along the south facing slope to the south of Turbine 2 will be left intact in order to provide important breeding bird habitat, additionally, standing deadwood will be left intact throughout the site wherever possible. • Identified potential breeding habitat for the Eastern Wood-Pewee south of Turbine 2, including the small patches of mature hardwoods, will be left intact.
Lighting on turbines can result in adverse impacts on birds. The Proponent recognizes that nocturnal migrant and night-flying seabirds are the birds most at risk of attraction to lights.	• Only the minimum amount of pilot warning and obstruction avoidance lighting will be used; • Only lights with short flash durations and the ability to emit no light during the 'off phase' of the flash (i.e. as allowed by strobes and modern LED lights) will be installed on tall structures; • Lights will operate at the minimum intensity and minimum number of flashes per minute (longest duration between flashes) allowable by Transport Canada; • Instruction will be given to wind farm maintenance staff to ensure all work lights are turned off upon leaving the site particularly during foul weather events; and • A follow up avian mortality survey will be conducted after the WTGs have been commissioned.

Potential Impacts on Migratory and Breeding Birds	Proposed Mitigative Measures
The Eastern Wood-Pewee has been identified as a possible breeder and legally protected under NSESA.	• The Eastern Wood-Pewee has been identified as a potential breeding bird at the Project site, clearing and grubbing activities will not take place during breeding season (May 1 – August 31); an • Efforts will be made to avoid small patches of mature hardwood (identified as Eastern Wood-Pewee habitat) near WTG 2 location. • Utilizing existing access roads will minimize unnecessary tree felling as the Eastern Wood-Pewee is known to build open cup nests in trees.
There will be an increase in habitat when the Project site is reclaimed at the end of the 20 year project lifetime.	• N/A – no mitigation measures necessary for a positive potential impact.
When the WTGs are removed there will no longer be the potential barrier effect impeding flyways or local flight paths.	• N/A – no mitigation measures necessary for a positive potential impact.

Cumulative Effects – As described in Section 2.9 the Glen Dhu wind farm approximately 6 km northwest Project site. The Glen Dhu environmental assessment predicted a low level of residual impact on birds. As a result, it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – Disturbance of bird habitat during construction will be unlikely to occur by employing the proposed mitigation measures. It is expected that the mortality rate of birds from collision or habitat loss during Project operation, if at all, will be low. Monitoring for bird mortality during operation will verify the effect the Project has on migratory and breeding birds. While not all phases of the Project are negative, construction and operation phases pose potential for negative impact. Appropriate follow up actions will be taken in consultation with NSDNR and CWS when necessary. With the proposed mitigation measures employed, the significance of residual effects on migratory and breeding birds is predicted to be minor.

Flora

Controlled meanders recorded using GPS were conducted at the Project site, focusing on the proposed access road and WTG locations. The Project land is used by a forestry company; however a small fern colony potentially identified as Appalachian Polypody was found outside of the anticipated disturbance area of turbine 1, flora has therefore been identified as a VEC.

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

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

Table 6-8: Potential impacts and proposed mitigative measures for flora.

Potential Impacts on Flora	Proposed Mitigative Measures
Clearing and grubbing will result in the disturbance of flora.	• A colony of fern, potentially identified as *Appalachian Polypody* will be avoided. • There will be an approximate land/habitat loss of approximately 1.6 Hectares attributable to the construction phase as determined by desktop and field studies. This is considered to have a negligible impact on flora; • The access road will be optimized to make use of the current dirt road at the Project site to reduce the amount of flora to be cleared; and • Location of the access road will be optimized to reduce footprint and to avoid sensitive areas.
There is a risk of introducing invasive species through plant matter attached to construction equipment.	• Construction equipment will be cleaned prior to transportation and use to ensure that no plant matter is attached to the machinery.

Cumulative Effects – As described in Section 2.9 the Glen Dhu wind farm approximately 6 km northwest Project site. It is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – The Project will decrease the flora footprint by approximately 1.6 Hectares. While the construction phase presents potential for negative impact, once the decommissioning phase has started, land reclamation will allow for flora regeneration. With the

proposed mitigation measures employed, the significance of residual effects on flora is predicted to be negligible.

Fauna

Through consultation with NSDNR specific fauna was identified to frequent the Project site. Mainland moose and certain bat specie are both listed as endangered in Nova Scotia. Wood turtles are also listed as at risk in the province. As a result fauna has been identified as a VEC, focusing on mainland moose and bats.

A significant environmental effect would result if a considerable change to fauna species or their habitat, including mainland moose, bats, or wood turtles as a result of the project activities.

Boundaries – The Project boundary is the entire Project site. The temporal boundary includes the construction and operation phases.

Table 6-9: Potential impacts and proposed mitigative measures for fauna.

Potential Impacts on Fauna	Proposed Mitigative Measures
Mainland Moose habitat may be affected by Project foot print.	• Moose surveys have identified two moose tracks approximately 1km & 2km south of the Project site this area will be avoided during construction of the Project. • Utilizing the existing northern forest road as the site access road minimizes fragmentation of moose habitat. • Although not specifically a mitigation measure, the Proponent is committing to continue moose field surveys during the construction and operation phases of the project in recognition of the importance of data collection for this endangered species.
Bats are at risk for collision with WTGs	• Research and use best lighting equipment, placement and regime to minimize impacts to bats; and • Although not specifically a mitigation measure, the Proponent is committing to two years of post construction bat monitoring to augment the existing 2012 & 2013 datasets.
Wood turtles could be threatened by on site vehicular traffic	• The proponent will follow the wood turtle special management practices (SMPs) outlined by NSDNR and include site specific SMPs into its Environmental Management Plan in which all site contractors must comply to.

Cumulative Effects – As described in Section 2.9 the Glen Dhu wind farm approximately 6 km northwest Project site. The Glen Dhu environmental assessment predicted a low level of residual impact on species at risk. As a result, it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – Thorough desktop and field studies have been conducted to identify fauna that may be present at the Project site, specifically mainland moose and bats. Presence of moose and bats on the Project site is low; combined with the detailed mitigative measures, the significance of residual effects on fauna is predicted to be minor.

6.3 Assessment of Socio-economic VECs

Land Use

The proposed AMWF makes use of three commercial forestry land parcels in the community of Piedmont. The proposed Project land consists of 340 acres and is currently used for forestry. Land surrounding the Project land parcels to the north is primarily used as rural residential land.

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

Boundaries – The spatial boundary is defined as the Project site where the WTG are located and also consider a 2.0 km radius from the WTG proposed locations. The temporal boundary includes all phases of the Project including construction, operation and decommissioning.

Table 6-10: Potential impacts and proposed mitigative measures for land use.

Potential Impacts on Land Use	Proposed Mitigative Measures
Public concern that property value may decrease as a result of the Project	• Recent real estate value studies have consistently determined no correlation between proximity to wind farms and property devaluation (Canning et. al., 2010); and • Education through public consultation can be effective in providing factual, relevant information to alleviate the concerns of local residents.

Cumulative Effects – As described in Section 2.9 the Glen Dhu wind farm approximately 6 km northwest Project site. The Glen Dhu environmental assessment predicted a low level of residual impact on species at risk. As a result, it is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

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

Archaeological & Aboriginal Resources

The results of the archaeological resource impact assessment indicated that the lack of navigable waterways and a landscape unsuitable to agriculture and settlement significantly diminish the likelihood of archaeological resources at the Project site. As a result, it is not expected that a significant adverse environmental effect is to occur.

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

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

Table 6-11: Potential impacts and proposed mitigative measures for archaeological resources.

Potential Impacts on Archaeological Resources	Proposed Mitigative Measures
Direct impact to cultural resources during construction activities, such as blasting and excavation.	• The Archaeological resource impact study concludes the Project site is of low potential for significant archaeological resources for First Nations and Euro-Canadians; • Avoidance is the preferred method of mitigation in all instances where archaeological resources are present; and • Should an archeological resources be encountered, all activities are to stop and the Coordinator of Special Places will be contacted immediately to determine a suitable method of mitigation

Cumulative Effects – As described in Section 2.9 the Glen Dhu wind farm approximately 6 km northwest Project site. It is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – The significance of residual effects on archaeological and aboriginal resources is expected to be negligible.

Vehicular Traffic

The Project will be accessed via Piedmont Valley Road. During construction of the access road and WTG foundations, there will be an increase in truck traffic on the roads leading to and from the Project site. During delivery of the WTG components, delivery of oversized loads may slow traffic flow.

Of these predicted vehicle movements, approximately 24 will be oversized loads associated with the delivery of WTG component parts (towers, blades, and nacelles) and the cranes required for erection. These deliveries are anticipated within months 4 through 6 of the project construction schedule and subject to movement orders as agreed upon with governing authorities.

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

Table 6-12: Potential impacts and proposed mitigative measures for vehicular traffic.

Potential Impacts on Vehicular Traffic	Proposed Mitigative Measures
Vehicular traffic may increase as a result of construction activities and transportation of WTG components to the Project site.	• Every effort will be made to ensure that oversized loads are delivered during times of lowest traffic to mitigate traffic; and

Cumulative Effects – As described in Section 2.9 the Glen Dhu wind farm approximately 6 km northwest Project site. It is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

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

Telecommunication and Radar Communications

With the installation of a WTG there is the possibility that the turbine rotor may interfere with the transmission and receiving of telecommunication signals. The proponent has consulted with the Department of National Defence and the Transport Canada to mitigate potential negative impacts on telecommunications and radar communications. As a result, telecommunication and radar communication has been identified as a VEC.

A significant environmental effect would result if a considerable change to telecommunication and radar communications was the result of project activities.

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

Table 6-13: Potential impacts and proposed mitigative measures for telecommunications.

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

Cumulative Effects – As described in Section 2.9 the Glen Dhu wind farm approximately 6 km northwest Project site. It is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

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

Landscape Aesthetics

The proposed WTGs are located in the rural community of Piedmont on a hill with WTG pad elevations of approximately 230 m and 240 m above sea level. A visual impact assessment was completed by collecting photographs from high-traffic areas around the Project site. Photomontages were created at two high traffic areas using WindFarm software. These photomontages produce a realistic projection of what the WTG will look like superimposed on the Project landscape. Since the Project site is a rural,

scenic area landscape aesthetics has been identified as a VEC. The photomontages can be viewed in Section 4.2.4.

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

Boundaries – The spatial boundary is defined as the areas surrounding the Project site in which the WTGs are visible. The temporal boundary is the Project operation phase.

Table 6-14: Potential impacts and proposed mitigative measures for landscape aesthetics.

Potential Impacts on Landscape Aesthetics	Proposed Mitigative Measures
Community members may have a negative reaction towards the aesthetics of the WTG.	• The Proponent considered landscape aesthetics when deciding on specific siting of the WTGs; • The paint on the WTGs will be selected so that they do not contrast sharply with the environment; and • By-Laws regarding responsible siting of WTGs were followed to minimize the potential impact on the landscape aesthetics during WTG siting;

Cumulative Effects – As described in Section 2.9 the Glen Dhu wind farm approximately 6 km northwest Project site. It is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

Significance of Residual Effects – The perception of landscape aesthetics is a subjective matter. The Proponent recognizes that development of the proposed WTGs may have a negative effect in the perception of the community. It is possible that the negative reaction may be a result of a change in the landscape and may diminish over time. While landscape aesthetics will be altered with the development of the AMWF, the significance of residual effects on landscape aesthetics is expected to be negligible.

Health and Safety

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

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

Boundaries – The spatial boundary includes the Project site and for the sake of ambient noise and ambient light, a 2.0 km radius from the WTG. The temporal boundaries include all phases of the Project.

Table 6-15: Potential impacts and proposed mitigative measures for health and safety.

Potential Impacts on Health and Safety	Proposed Mitigative Measures
During extreme cold weather events there is the potential for ice to build up and ice throw from the WTG blades.	• WTGs are equipped with ice-detection systems on each blade; • WTGs are designed to shut down in the case of ice-buildup; and • When ice is detected the blade has a heating element that will effectively melt the ice to mitigate ice-throw; and • Personal Protection Equipment (ie. hard-hats) will be worn when near the WTG.
During extreme weather events, there is the potential for electrical fires within the turbine nacelle through lightning strikes.	• WTGs are equipped with lightning protection that, in the unlikely event of a lightning strike, will dissipate the lightning current to the ground.
Potential aviation hazard to low flying aircraft.	• Application process with NAV Canada's Land Use Proposal Submission Form to ensure that the Project does not pose any hazard to the navigational systems of NAV Canada.
Increase in vehicular traffic may have the potential to affect public safety.	• Every effort will be made to ensure that oversized loads are delivered during times of lowest traffic to mitigate road traffic.
Shadow flicker may affect human health.	• This potential impact has been addressed in the Ambient Light Section 6.1.
Noise impact may affect human health.	• This potential impact has been addressed in the Ambient Noise Section 6.1.
Potential for accidents and malfunctions pose a risk to workers and the public's health and safety;	• The OHS Act will be followed.

Cumulative Effects – As described in Section 2.9 the Glen Dhu wind farm approximately 6 km northwest Project site. It is very unlikely that these projects will act cumulatively to increase the likelihood of a significant adverse environmental effect.

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

Local Economy

During the Project phases, there will be a significant amount of money spent within the MoPC, Piedmont Valley, Merigomish and surrounding communities and Nova Scotia. During the development, the need for contractors and trades will be required and the Proponent will make every effort to utilize local companies to promote the local economy.

The COMFIT program will guarantee a "feed-in-tariff" that is a rate per kilowatt hour that the community owned Project is guaranteed for the 20 year power purchase agreement.

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

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

Potential Impacts and Proposed Mitigative Measures – Potential positive impacts during the development phase of the Project include:

- Hiring local consultants; and
- Use of local services such as accommodations, restaurant and fuel.

Potential positive impacts during the construction and decommissioning phase of the Project include:

- Contracting construction work to local businesses;
- Use of local services such as accommodations, restaurant and fuel; and
- Municipal taxes being paid to the MoPC.

Potential positive impacts during the operation phase of the Project include:

- Use of local services such as accommodations, restaurant and fuel;
- Involvement of local residents in the CEDIF to invest in the Project and as a result benefit from dividends produced through the power purchase agreement;
- Municipal taxes being paid to the MoPC; and
- Long term contracts may be used in the operation and maintenance of the Project.

Cumulative Effects – As described in Section 2.9 the Glen Dhu wind farm approximately 6 km northwest Project site. It can be expected that these two projects will have a positive effect on the provincial and municipal economy.

Significance of Residual Effects – The Proponent will, when appropriate make every effort to utilize local services and products, this promotes local economy, which is in line with the Proponents ideology of community based projects. The predicted effects of this Project on the local economy are positive and

as a result of the municipal taxes, CEDIF and economic spinoff, the significance of residual effects on local economy is expected to be beneficial.

6.3.1 Effect of Environment on Project

Extreme Weather

Severe weather events could potentially damage WTGs due to conditions exceeding the operational design of the WTG. High winds, extreme temperatures and icing on blades all have the potential to shut down the WTGs. Extreme weather events that could occur within the MoPC region are listed in Table 6-16.

Table 6-16: Extreme events, associated effects and mitigation.

Weather Event	Effect	Mitigation
Extreme wind	Damage to blades	Automated control system would initiate shut down
Hail	Damage to blades	Appropriate WTG maintenance
Heavy rain and flooding	None anticipated	None
Heavy snow	Damage to WTG components	Automated control system would initiate shut down
Ice storms	Icing on blades resulting in potential ice throw	Automated control system would initiate shut down and heating system
Lightning	Potential for fires within nacelle of WTG	Lightning protection system would conduct electrical surge away from nacelle
Seismic activity	None anticipated	None
Severe drought	None anticipated	None

Turbine Icing

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

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

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

- Rotor diameter of 80 m;
- Hub height of 80 m;
- Fixed rotor speed of 15 RPM;
- Ice fragment is equally likely to detach at any blade azimuth angle and 3 times more likely from the blade tip than the rotor;
- Ice fragments have a mass of 1 kg and frontal area 0.01 square ms;
- All wind directions are equally likely; and
- Ever-present individual between 50 m and 300 m (dounut shaped buffer around WTG), individual equally likely in any given 1 square m within that area.

The statistical analysis found that individual risk probability for an individual is 0.000000007 strikes per year or, 1 strike in 137,500,000 years. For an individual to be ever-present in the defined area, this assumes that the individual would be outside during the unpleasant weather necessary for icing conditions. This analysis does not take into account the presence of trees that could provide shelter from potential ice throw (Seifert, H. Et al., 2003). The Enercon E92 has slightly different specifications than used in this example; however this should be used as general example to understand the risk probability of an individual being struck by ice throw.

As with trees, power lines masts and buildings, ice can accumulate on a stationary WTG, and will be eventually be released and fall to the ground. Depending on the rotor position of the stationary rotor, different fall distances along the current prevailing wind will occur (Seifert, H. Et al., 2003). Maintenance crews will be required to wear appropriate safety equipment when on site.

Potential Surface Water Impacts

Activities associated with the Project that can impact surface water resources include the development of gravel pits, road construction, stream crossings, concrete use and disposal, and petroleum products from WTGs and heavy ground moving. To mitigate such impacts, a Spill Contingency Plan will be enforced, as well as the Environmental Management Plan.

6.3.2 Summary of Impacts

Based on the completed VEC analysis, it has been determined that the Project activities are only expected to have minor negative effects on wetlands/watercourses, ambient noise, bats and migratory and breeding birds, while the local economy will see a beneficial impact. All other VECs are predicted to observe a negligible residual effect from the Project. Where a minor effect is predicted, monitoring and follow up initiatives should be considered. A summary of the VEC assessment is presented in Table 6-17, in terms of the following assessment criteria:

- Nature – positive (+), negative (-), or No impact where no impact is predicted;
- Magnitude – order of magnitude of the potential impact: small, moderate, large;
- Reversibility – reversible (REV) or irreversible (IRR);
- Timing – duration of impact, short for construction or decommissioning and long for Project operation or longer;
- Extent – spatial extent of the impact, local, municipal, provincial etc.; and
- Residual Effect – negligible, minor, significant, beneficial or no impact as described in Section 3.3.

Table 6-17: Summary of identified VECs.

	Nature	Magnitude	Reversibility	Timing	Extent	Residual Effect
Ambient Air	-	small	REV	Short	Local	Negligible
Ground and Surface Water	-	small	REV	Short	Local	Negligible
Ambient Noise	-	small	REV	Long	Local	Minor
Ambient Light	-	small	REV	Long	Local	Negligible
Wetlands/ Watercourses	-	small	REV	short	Local	Minor
Fish and Fish Habitat	-	small	REV	short	Local	Negligible
Migratory and Breeding Birds	-	small	REV	Long	Local	Minor
Flora	-	small	REV	Short	Local	Negligible
Fauna	-	small	IRR	Long	Local	Minor
Land Use	-	small	REV	Long	Local	Negligible
Archaeological & Aboriginal Resource	-	small	IRR	Short	Local	Negligible

	Nature	Magnitude	Reversibility	Timing	Extent	Residual Effect
Vehicular Traffic	-	small	REV	Short	Local	Negligible
Telecommunications	-	small	REV	Short	Local	Negligible
Landscape Aesthetics	-	small	REV	Long	Local	Negligible
Health and Safety	-	small	IRR	Long	Local	Negligible
Local Economy	+	moderate	REV	Long	Provincial	Beneficial

7 Follow Up and Monitoring

The purpose of this section is to describe the potential follow-up programs and management plans required during the construction, operation and decommissioning phases of the Project.

7.1 Post-Construction Monitoring

7.1.1 Avian

Referring to the VEC assessment in Section 6.2 the Project was assessed as having a minor significance of residual effects on migratory and breeding birds. As a result, a post-construction monitoring plan will be implemented for a period of time. This monitoring program will be developed in consultation with the appropriate authorities.

7.1.2 Bats

Additional bat surveys have been initiated to commence during the second last week of August to encompass the ideal migration period of the last week in August to the second/ third week of September.

7.1.3 Moose

The proponent will continue to conduct Moose surveys, both winter track & PGI surveys through the construction of the wind farm and for a period of time during the wind farms operational period. All data collected will be summarized and forwarded onto NSDNR.

7.1.4 Ambient Noise

Referring to the VEC assessment in Section 6.1, the Project was assessed as having a minor significance of residual effects on ambient noise. As a result, a public input mechanism will be established to resolve issues pertaining to ambient noise levels.

7.2 Management Plan

Throughout the life of the Project, various management and contingency plans, as listed below, may be required to aid in the responsible development of the Project. These plans will be developed and implemented prior to construction of the AMWF and will explicitly outline the steps taken for different Project concerns.

It is anticipated that some or all of the following management plans will be required as the Project development matures.

Management Plan Requirements

- Environmental Management Plan;
- Erosion and Sedimentation Control Plan;
- Spill Contingency Plan;

- Decommissioning and Site Reclamation Plan; and
- Public Complaint Procedure.

A number of permits will be required during pre-construction, all of which are listed in Section 1.3.

8 Closure

Natural Forces Wind Inc. wishes to develop the proposed Aulds Mountain Wind Farm with the intent of helping Nova Scotia meet its renewable energy regulations and targets.

This EA has been prepared in accordance with the guidelines set out by the Environmental Assessment and Approval Branch of the Nova Scotia Department of Environment. The scope of the EA was discussed in advance with Nova Scotia Department of Environment Environmental Assessment branch. Consequently, it is anticipated that this EA meets all criteria outlined by the Nova Scotia Environmental Assessment Act.

A thorough analysis of the Project components and activities has been carried out for the construction, operation and decommissioning phases of the Project. Baseline environmental characteristics of the region have been documented and Valued Environmental Components have been identified. Consultation has been undertaken with a wide variety of local stakeholders, right-holders, and government stakeholders to gauge the full range of impacts and concerns with regards to the Project. The impact of the Project on the local environment has been evaluated based on all of these criteria. Mitigative measures have been presented and adopted in an effort to reduce the significance of residual impact as a result of the Project's activities. Cumulative effects of the Project on the environment due to other regional Projects and activities have also been identified and assessed.

The following benefits would result due to the AMWF and are considered as advantages of the Project, these include:

- Increased revenue for the MoPC through payment of annual property taxes by the Project Proponent;
- Increased revenue for local businesses due to activities surrounding the construction, operation and decommissioning phases of the Project;
- Creation of supplementary income and income diversity for local landowner;
- Creation of additional employment in the region during the entire Project life;
- Production of emission-free energy, which will displace energy produced from fossil fuels in Nova Scotia; and
- Help Nova Scotia meet its renewable energy regulations and targets for 2015 and 2020.

In conclusion, it is anticipated that through proposed mitigative measures the Aulds Mountain Wind Farm will have no significant residual effects on the physical, biophysical and socio-economic environment.

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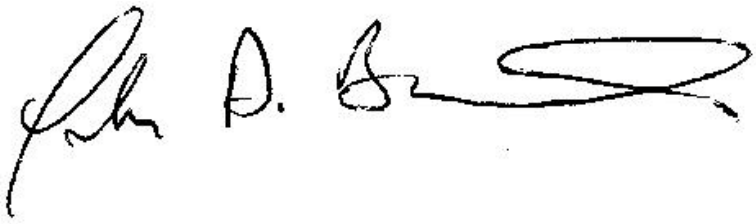
9 Company Signature

Table 9-1 below defines the concluding signature of this Environmental Assessment for Natural Forces Wind Inc.

Table 9-1: Signature Declaration

EA CONDUCTED BY:	Chris Veinot, Natural Forces Wind Inc. Email: cveinot@naturalforces.ca
PROPONENT:	Natural Forces Wind Inc. 1205 – 1801 Hollis Street Halifax, NS B3J 3N4
PROPONENT SIGNATURE:	 John Brereton, President
DATE:	October 18, 2013

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10 Works Cited

ACCDC, Species at risk. (2012, November 22). Retrieved from http://www.accdc.com/SAR/maritime.htm

Canning, Simmons, AACI, FRI, CMR, PLE (February 2010). Wind Energy Study – Effect on Real Estate Values in the Municipality of Chatham-Kent, Ontario.

CWS (Canadian Wildlife Service). 2007. Recommended protocols for monitoring impacts of wind turbines on birds. 33 pp.

DFO (Fisheries and Oceans Canada). 2010. *Blasting – Fish and Fish Habitat Protection.* Retrieved from: http://www.nfl.dfo-mpo.gc.ca/e0005469

Enercon, (2012). Design Basis E-92. Retrieved from website: http://www.enercon.de/en-en/

Environment act. *1994-95, c. 1, s. 1.*. (1994). Retrieved from Office of the Legislative Counsel, Nova Scotia House of Assembly, and © 2013 Crown in right of Nova Scotia website: http://nslegislature.ca/legc/statutes/envromnt.htm

Environment Canada, (2012). *National climate data and information archive: Canadian climate normals 1971-2000*. Retrieved from website: http://www.climate.weatheroffice.gc.ca/climate_normals/results_e.html?stnID=6486&autofwd=1

Department of Natural Resources, (2009). *Mainland moose frequently asked questions*. Retrieved from website: http://www.gov.ns.ca/natr/wildlife/large-mammals/mmoosefaq.asp

Environmental Assessment Regulations, (1995). Retrieved from: http://www.gov.ns.ca/just/regulations, REGS/envassmt.htm

Halifax Regional Municipality, (2011). *Land use by-law for planning districts 8 & 9*. Retrieved from website: http://www.halifax.ca/planning/documents/PlanningDistrict8and9_LUB.pdf

LeBlanc, Marc, Garrad Hassan. June 2007. Recommendations For Risk Assessments of Ice Throw and Rotor Blade Failure in Ontario; CanWEA Municipal issues and wind energy workshop.

MBBA (Maritime Breeding Bird Atlas). 2006. A guide to addressing wildlife species and habitats in an EA registration document. 8 pp.

Ministry of the Environment, (2008). *Noise guidelines for wind farms*. Retrieved from Queen's Printer for Ontario website: http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/std01_079435.pdf

Nova Scotia Environment(2005) Guide to Addressing Wildlife Species and Habitat in an EA Registration Document. Retrieved from: http://www.gov.ns.ca/nse/ea/docs/EA.Guide-AddressingWildSpecies.pdf

NOAA [National Oceanic and Atmospheric Administration], 1995: Surface weather observations and reports, Federal Meteorological Handbook No. 1, 94 p. [Available from Department of Commerce, NOAA, Office of the Federal Coordinator for Meteorological Services and Supporting Research, 8455 Colesville Road, Suite 1500, Silver Spring, MD, 20910.

NRCan, (2003). Environmental Impact Statement Guidelines for Screenings of Inland Wind Farms Under the Canadian Environmental Assessment Act.

NSDNR (Nova Scotia Department of Natural Resources). 2011. Nova Scotia Abandoned Mine Openings (AMO) Database: http://gov.ns.ca/natr/meb/links/amolinks.asp.

NSDNR (Nova Scotia Department of Natural Resources). 2012. Nova Scotia Significant Species and Habitats Database: http://gov.ns.ca/natr/wildlife/habitats/hab-data/.

NSDNR (Nova Scotia Department of Natural Resources). 2013. Species at Risk Overview. Retrieved from: http://novascotia.ca/natr/wildlife/biodiversity/species-list.asp

NSDoE (Nova Scotia Department of Energy) Approved ComFIT Projects. Accessed June 2013: http://nsrenewables.ca/approved-comfit-projects-0

NSE, (2009). A Proponents Guide to Environmental Assessment.

NSE, (2011). *Nova scotia wetland conservation policy*. Protected Areas and Wetlands Branch. Retrieved from website: http://www.gov.ns.ca/nse/wetland/docs/Nova.Scotia.Wetland.Conservation.Policy.pdf

NSE,(2012). Proponents guide to wind power Projects: Guide for preparing an environmental assessment registration document.

NS Fishing, (2013) Nova Scotia Fishing Lakes & Ponds. Retrieved from Website: http://novascotiafishing.com/forums/index.php?/forum/20-lakes-ponds/

NS Wind Atlas (2013). [Web Map]. Retrieved from http://www.nswindatlas.ca/

Road designation. (2012). Retrieved from http://novascotia.ca/tran/trucking/roaddesignation.asp

Statistics Canada, (2006). *Population and dwelling counts, for canada, provinces and territories, and designated places, 2006 and 2001 censuses - 100% data*. Retrieved from website: http://www12.statcan.ca/english/census06/data/popdwell/Table.cfm?T=1302&PR=12&S=0&O=A&RPP=25

Statistics Canada, (2011). Nova Scotia Community Counts web page - data modeled from Statistics Canada, Census of Population, 2001, 2006, 2011. Retrieved from website: http://www.gov.ns.ca/finance/communitycounts/profiles/community/default.asp?gnew=&table=&acctype=0&chartid=&mapid=&dcol=&sub=&ptype=geo&tid=&gview=6&glevel=com&yearid=2006&gnum=com936

Seifert, H., Richert, F. 6-9 Oct. 1997. Aerodynamics of Iced Airfoils and Their Influence on Loads and Power Production Presentation at the EWEC '97, Dublin, Ireland.

Seifert, H. Et al. April 9-11, 2003. Technical Requirements for Rotor Blades Operating in Cold Climate; BOREAS VI, Phya, Finland.

WEA-Schattenwurf-Hinweise (2002). *Hinweise zur Ermittlung und Beurteilung der optischen Immissionen von Windenergianlagen (Notes on the identification and assessment of the optical pollutions of Wind Turbines).*