

## 6.0 Analysis

### 6.1 Interaction of the Project and the Environment

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

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

**Table 6.1 Potential Linkages of Project and the Environment**

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

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

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

## 6.2 Assessment of Physical VECs

### **Ground and Surface Water**

Maintenance of ground and surface water regimes is important to support ecological systems. It is also directly related to human health as a portion of the Project site is within Zone 2 of the Forbes Lake Protected Water Area. Ground and surface waters interface on the site in the flow accumulation channels as shown in Figure 4.3. Accordingly, quality and quantity of both ground and surface water have been identified as a VEC.

A significant environmental effect would result if a substantive change attributable to the Project could be identified in water quality or quantity in tributaries that lead to Forbes Lake to the west, in the tributaries that drain from the site toward McLellans Brook to the east, or in groundwater immediate to the site.

- *Boundaries* – Spatial bounds include the local area, i.e., watercourses within the Project site and down gradient toward Forbes Lake and McLellans Brook, as well as groundwater local to the site. The temporal boundary focuses on Project construction but includes all phases of the Project with respect to unplanned releases.
- *Potential Project Impacts* – Pathways that may adversely affect surface quality include disturbance of sediments during the construction of the WTGs, the access road and the utility line, and potential for accidental release of hazardous materials such as fuels, oils and lubricants during all phases of the Project. Also during construction of utility line, an upgrade of existing culvert is required.
- *Proposed Mitigative Measures* – Related to erosion and sedimentation, these mitigations include:
  - Prepare an erosion and sedimentation control plan as part of final Project design and in consideration of additional field work in Spring 2013;
  - Install and maintain temporary erosion control measures as per plan, e.g., sediment fences, rock check dam, mulch, etc., prior to grubbing;
  - Responsible storage and handling of excavated materials to avoid erosion;
  - Define limits of work associated with construction activities which maintains the proposed 50m buffer zone to watercourses and wetlands;
  - Exception to 50m buffer is the culvert upgrade that is required as part of road improvement along proposed utility route; complete work between June and September in accordance with applicable Provincial regulations, including *Wildlife Habitat and Watercourses Protection Regulations*;
  - Visual monitoring and sampling, and analysis if appropriate, to ensure the suspended solids concentration in surface waters draining from construction in the Protected Water Area is less than 25 mg/L;
  - Immediate notification of the Water Works Operator if sedimentation appears to have occurred in a watercourse in the Protected Water Area above this level;
  - Timely re-vegetation of disturbed areas after construction; and

- Compliance with the EPP and pertinent legislation, including the *Forbes Lake Watershed Protected Water Area Regulations*.

Related to accidental release, these mitigations include:

- All hazardous materials to be used at the site will be labeled and contained according to applicable regulations;
- No hazardous materials will be stored within 100m of a wetland or watercourse;
- Frequent inspection and maintenance of equipment will be undertaken to identify and repair any fuel leaks;
- Used oil, filters and other products associated with equipment maintenance shall be collected and disposed of in accordance with regulatory requirements; and
- Spills shall be immediately reported as per legislation and as identified in the EPP.
- *Cumulative Effects* – There is ongoing forestry taking place in and around the Project site; this work is assumed to be in compliance with legislation, including the Wildlife Habitat and Watercourses Protection Regulations. With mitigative measures in place in accordance with legislation, it is very unlikely that a significant adverse residual environmental effect on surface water and ground water would result from these activities acting cumulatively..
- *Significance of Residual Effects* – Erosion and sedimentation, if they occur, will be temporary, since all areas to be disturbed by construction will be stabilized both during and after construction. The likelihood of an accident or malfunction resulting in a release is quite low; should it occur, the volume is anticipated to be very small, i.e., below reportable levels.
  - The Project is not anticipated to have a significant residual environmental effect on the local ground and surface water. While any effect will be negative, it will be small in magnitude, reversible, short duration, and local. The environmental effect on ground and surface water is predicted to be negligible.

### ***Radar and radio signals***

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

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

- *Boundaries* – Spatial bounds consist of the local area, i.e., potential area of influence of the WTGs to interfere with communications. The temporal boundary is Project operation.
- *Potential Project Impacts* – Pathways that may adversely affect radar and radio communications are limited to interference from WTG operation. Consultation was completed as recommended within the document, *Technical Information and Guidelines on the Assessment of the Potential Impact of Wind Turbines on Radio Communication, Radar and Seismoacoustic Systems* (CanWEA,

2007). Responses to date have not found any concerns associated with interference given the size and location of the Project. While the RCMP has not yet responded, no concern is expected.

- *Proposed Mitigative Measures* – No effect is predicted on radio and radar. Accordingly, no specific mitigations are recommended.
- *Cumulative Effects* – As no effect is predicted, by definition, there cannot be other activities acting cumulatively.
- *Significance of Residual Effects* – Interference with radar and radio systems is not expected to occur.
  - The Project is anticipated to have no environmental effect on communications via interference with radar or radio signals.

### **Ambient noise**

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

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

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

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

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

- *Boundaries* – The spatial boundary is the local area, i.e., neighbouring properties within 2km radius. The temporal boundary is all Project activities.
- *Potential Project Impacts* – Pathways that may adversely affect ambient noise levels include sound pressure that will be generated during site preparation and construction, as well as

decommissioning activities, i.e., trucks, equipment. There is also a potential for blasting during construction if required to construct the WTG foundations. As distance from the site increases, noise levels will be attenuated. Nevertheless noise from construction activities may be heard by the nearby residents; certainly vibrations from blasting will be observed by nearby residents. Construction noise may also temporarily disrupt the short term activities of fauna and birds at or in the vicinity of the Project site. In summary, noise resulting from construction activities may cause some temporary inconvenience.

During operation, sound pressure is emitted from the nacelle, i.e., the hub of the turbine, as well as the spinning blades. In order to predict the resulting sound pressure at the nearby residences, noise modeling was completed as presented in Section 4.2.4 and Figure 4.5. The modeling was completed with very conservative assumptions, including an assumption of no vegetation layer in the model calculations. Further, the modeling was completed based on 5 WTGs, i.e., proposed Project plus the potential expansion, and used the highest SPL of the WTGs under consideration. The result of this conservative modeling exercise shows the attenuation of SPLs as distance increases from the WTGs such that all of the nearby residences are below the 40dBA guideline. One residence (Residence 5, a seasonal camp) is very near the conservatively predicted isoline of 40dBA based on these conservative assumptions, i.e., predicted effect of 39.8 dBA as per Table 4.5. As explained in Section 4.2.4, the model was also run with the addition of a representative vegetation layer; this resulted in a decrease in predicted SPL at Residence 5 by about one decibel.

- *Proposed Mitigative Measures* – Related to effect on ambient noise levels during construction, the mitigations include:
  - Adherence to EPP related to timing of construction activities in daytime hours wherever possible to minimize nuisance to nearby properties;
  - Communication of construction plan with nearby residents in terms of construction activities and schedule, as well as contact information should residents have concerns;
  - Preparation of a blasting plan and notification system in the event that blasting is required to build WTG foundations; and
  - Maintenance of construction equipment and vehicles to reduce noise emissions.

Related to WTG operation, the mitigations include:

- As already completed, siting of WTGs beyond separation distances as per Municipal bylaw and completing predictive modeling to verify that the SPLs resulting from WTGs is under 40dBA based on conservative assumptions;
  - Ongoing consultation with community including nearby residences on Project as a whole, as well as sharing contact information should residents have concerns; and
  - As per the EPP, a conflict resolution plan will be in place should nearby residents have concerns about ambient noise levels.
- *Cumulative Effects* – There are known works taking place in the vicinity of the site, such as a proposed single turbine installation as described in Section 2.10. Given relative scale of the Project and the other proposed activity, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on ambient noise levels in the local area.

- *Significance of Residual Effects* – Annoyance caused by noise during construction, if it occurs, will be temporary and short term. Concerns of residents over noise during Project operation is expected to be minor, if it occurs, based on predicted SPL levels below 40dBA at residences and the Proponent’s early and ongoing Project consultation.
  - The Project is not anticipated to have a significant residual environmental effect on the ambient noise levels. While any effect will be negative, it will be small in magnitude, reversible, and local; however, relative to the operating WTGs, any effect will be long in duration, i.e., operational Project phase. The environmental effect on ambient noise is predicted to be minor.

### **Ambient light**

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

- *Boundaries* – The assessment is within the local area, i.e., the five neighbouring properties, as well as radius that may influence migratory birds and wildlife due to effect of lighting. The temporal boundary is all Project activities.
- *Potential Project Impacts* – Pathways that may adversely affect ambient light levels include lighting from and for equipment and vehicles during site preparation and construction, as well as decommissioning activities. Light from construction activities may be observed by the nearby residents and may cause some temporary, short term inconvenience.
 

During operation, lighting of the WTGs is required for aviation safety as regulated by Transport Canada. This has the ability to affect migratory birds, other wildlife and be observed by nearby residents.
- *Proposed Mitigative Measures* – Related to effect on ambient light levels during construction, the mitigations include:
  - Adherence to EPP related to timing of construction activities in daytime hours wherever possible to minimize nuisance to nearby properties;
  - Use of only necessary lighting to support construction activities; and
  - Communication of construction plan with nearby residents in terms of types of construction activities and schedule, as well as sharing contact information should residents have concerns.

Related to WTG operation, the mitigations include:

- As already completed, siting of WTGs beyond separation distances as per Municipal bylaws will minimize visibility of WTG lighting by nearby residents;

- Further, retaining forest cover wherever possible, i.e., minimize clearing as part of the Project, may reduce visibility of WTG lighting for some nearby residents;
  - Consideration of lighting approaches that meet Transport Canada requirements but also minimize potential to impact nearby residents, birds or wildlife will be undertaken as part of WTG specification, including use of a LED based technology;
  - Ongoing consultation with community including nearby residences on the Project as a whole, as well as sharing contact information should residents have concerns; and
  - As per the EPP, turbine lighting plan will be prepared in consultation with CWS and Transport Canada.
- *Cumulative Effects* – There are known works taking place in the vicinity of the site, such as a proposed single turbine installation and some harvesting. Given relative scale of the Project and the other proposed activities, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on ambient light levels in the local area.
  - *Significance of Residual Effects* – Annoyance caused by lighting during construction, if it occurs, will be temporary and short term. Concerns of residents over lighting during Project operation is expected to be limited, if it occurs.
    - The Project is not anticipated to have a significant residual environmental effect on the ambient light levels. While any effect will be negative, it will be very small in magnitude, reversible, and local. Relative to construction, any effect is short term; however, relative to the operating WTGs, any effect will be long in duration, i.e., operational Project phase. The environmental effect on ambient noise is predicted to be negligible.

### 6.3 Assessment of Ecological VECs

#### ***Wetlands and watercourses***

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

Wetlands and watercourses are both protected by Provincial legislation and are valued by society due to their ecological function. Watercourses themselves hold ecological value by providing habitat for fish and aquatic flora and fauna. Wetlands provide or support a wide range of important ecological, social and economic functions and services in our watersheds. This value is the underlying principle for NSE's Nova Scotia Wetland Conservation Policy (Government of Nova Scotia, 2011b). Alteration of watercourses or wetlands requires the approval of the Province unless works fall within a few specific circumstances identified as exceptions by NSE.

Within the area of the WTGs, wetlands and watercourses have been identified as part of the desktop and field work completed; these are shown in Figure 4.3. Wetlands and watercourses have been identified via only desktop in relation to the proposed access road and utility line; spring field work of

qualified wetland delineators is planned to assist the Project team in detailed design of the access road and utility line. In addition, additional field work is planned to delineate the wetlands near the WTGs if the ability to maintain 50m buffer zone is in question. Based on desktop review and field reconnaissance to date, maintaining the 50m buffer zone to watercourses and wetlands will be maintained for this Project; however, should additional field work show otherwise, NSE will be consulted. No direct alteration will be completed without the necessary approvals from NSE.

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

- *Boundaries* – Spatial bounds are the limits of work associated with the Project, i.e., watercourses and wetlands within the Project site. The temporal boundary is focused on Project construction activities.
- *Potential Project Impacts* – Pathways that may adversely affect ecological function of wetlands and watercourses are primarily related to their physical alteration during site preparation and construction, though the same effect could occur during decommissioning activities. Both quality and quantity of ground and surface water were assessed separately and residual effect is predicted to be negligible; therefore, this pathway is not included in the assessment of wetlands and watercourses.

Physical alteration would include, but is not limited to, fording watercourses with vehicles or equipment, excavating wetlands, and infilling wetlands and watercourses with materials such as gravel or excavated material from the site. Alterations to wetlands and watercourses require an approval as defined in the Province's Activities Designation Regulations.

- *Proposed Mitigative Measures* – Related to effect on wetlands and watercourses during construction, the mitigations include:
  - Siting of the Project (WTGs, laydown areas, access road and utility line) a suitable distance from watercourses and wetlands, i.e., >50m, with an exception of a necessary culvert upgrade along utility line that follows an existing woods road;
    - To accommodate passage of vehicles for utility line construction, an existing culvert will be upgraded;
    - This work will occur from June to September during low flow conditions;
    - If there is flow in the watercourse, isolation and pumping will be used as necessary to keep the in stream work in the dry;
    - Mitigations will include sediment and erosion control and water handling as necessary to protect downgradient water quality;
    - Work will be in compliance with Nova Scotia Watercourse Alteration Specification (Nova Scotia Environment, 2006);
    - All necessary notification and any approvals necessary will be sought from NSE;
  - Should the proposed buffer zone of 50m not be maintained based on the Project design and additional spring field work, NSE will be consulted and the EPP updated to ensure

that all work will be in compliance with applicable Provincial policy, specifications and regulations;

- Limits of work will be defined (including flagging of wetlands) to assist the Contractor to avoid sensitive areas; and
  - Education of the Contractor via the EPP on importance of maintaining the protective 50m buffer and necessary measures to avoid alteration of watercourses and wetlands, as well as other mitigative measures to protect ground and surface waters as noted in Section 6.2.
- *Cumulative Effects* – There is ongoing forestry taking place in and around the Project site, as well as a single turbine installation proposed; this work is assumed to be in compliance with legislation, including the Wildlife Habitat and Watercourses Protection Regulations. With mitigative measures in place in accordance with legislation, it is very unlikely that a significant adverse residual environmental effect on ecological function of wetlands and watercourses would result from these activities acting cumulatively.
  - *Significance of Residual Effects* – Project planning has aimed to avoid direct alteration of wetlands and watercourses. Alteration of wetlands and watercourses as part of this Project is expected to be limited to alteration of one existing culvert during summer low flow period. Detailed project design and additional field work is planned in spring of 2013; where possible, the 50m buffer will be maintained. Should avoidance of watercourses and wetlands not be as presented in the project description in this EA, NSE will be provided with additional detail and all work will be completed as per Provincial requirements. Any necessary direct alteration will be very small and may fall under the Wetland Conservation Policy exemption.
    - The Project is not anticipated to have a significant residual environmental effect on the ecological function of watercourses and wetlands. While any effect will be negative, it will be very small in magnitude, reversible, short term, and local. The environmental effect on wetlands and watercourses is predicted to be negligible.

### ***Fish habitat***

The Project site is within a watershed containing robust fish habitat as the Project site ultimately drains to Pictou Harbour via McLellans Brook to the East River of Pictou. The watercourses on the Project site itself provide poor fish habitat and seasonal water flow; yet the Project site is in the headwater of watercourses containing fish habitat. Fish habitat is protected under the Federal *Fisheries Act*. Accordingly, fish habitat has been identified as a VEC. A significant environmental effect would result if a substantive change in fish and their habitat could be attributed to the Project downgradient of the Project site.

- *Boundaries* – Spatial bounds include the watershed draining into East River of Pictou. The temporal boundary is primarily during construction.
- *Potential Project Impacts* – Pathways that may adversely affect fish habitat include release of sedimentation or hazardous materials, and physical alteration of watercourses during site

preparation and construction, as well as to a much lesser extent operational and decommissioning activities.

Both pathways were assessed as other VECs, i.e., ground and surface water (physical) and wetlands and watercourses (ecological). Residual effects on both VECs were predicted to be negligible; therefore, these pathways are not included in the assessment of fish habitat. No other pathways exist to affect fish habitat from this Project.

- *Proposed Mitigative Measures* – No effect is predicted on fish habitat. Accordingly, no specific mitigations are recommended outside of mitigative measures as proposed for the VECs of ground and surface water and wetlands and watercourses.
- *Cumulative Effects* – As no effect is predicted, by definition, there cannot be other activities acting cumulatively.
- *Significance of Residual Effects* – Effect on fish habitat is not expected to occur.
  - The Project is anticipated to have no environmental effect on fish habitat.

### ***Migratory and breeding birds***

While no high sensitivity factors for migrating or breeding birds was observed during field work, many species of breeding birds were noted in the area and during fall migration surveys, some of the birds noted were possible migrants (as discussed in Section 4.1.4). Environment Canada is responsible for implementing the *Migratory Birds Convention Act* (MBCA), which provides for the protection of migratory birds, their eggs and nests through the Migratory Birds Regulations.

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

- *Boundaries* – The spatial bounds include the area where the WTGs are proposed to be located and extends to include the areas that are frequented by birds that may be impacted by the Project. The temporal boundary is all Project activities.
- *Potential Project Impacts* – Pathways that may adversely affect birds during construction include disturbance from clearing activities: direct effects, such as tree removal, and indirect effects, such as noise and lighting. Residual environmental effects of noise and light from construction were predicted to be negligible; therefore, it is not included for additional assessment on birds. During operation, the rotation of the blades may cause individual fatalities. Operation of the WTGs has the ability to affect migratory birds in terms of direct effects, such as collisions, and indirect effects such as noise and lighting. Residual effect of lighting was predicted to be negligible; therefore, it is not considered in the assessment on birds.
- *Proposed Mitigative Measures* – Related to effect on migratory and breeding birds during construction, the mitigations related to clearing include:
  - As already completed, siting and design of the Project to limit areas disturbed to 5.5ha within a mixed forest habitat that is typical in the area and in some areas, it has already been disturbed by harvesting;

- Undertaking a nesting survey prior to clearing activities to ensure compliance with the *MBCA*, i.e., no disturbance of nest until fledglings have left; and
- Adherence to EPP related limits on area of work to minimize the cleared area.

Related to WTG operation, the mitigations include:

- As already completed, siting of WTGs in an area without high sensitivity factors, such as colonies, staging areas, important bird areas, etc., will minimize potential effect (this was confirmed by the field studies completed);
  - Design a monitoring plan and carcass survey methodology in accordance with Environment Canada and CWS, and implement the plan including completion of annual reporting; and
  - Notification of the Project Manager if carcasses are found by site personnel during regular site visits as defined in EPP, including logging information and notification of CWS by the Project Manager.
- *Cumulative Effects* – There are known works taking place in the vicinity of the site, such as minor harvesting and a proposed single turbine installation. Given relative scale of the Project and these other activities, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on migratory and breeding birds.
  - *Significance of Residual Effects* – Disturbance of birds during construction, if it occurs, will be temporary and short term; no disturbance of nests will occur. Effect on birds during Project operation via mortality from collisions is expected to be low in number, if they occur; monitoring will verify the effect in accordance with regulatory requirements.
    - The Project is not anticipated to have a significant residual environmental effect on migratory and breeding birds. While any effect will be negative, it will be small in magnitude, reversible, and local; however, relative to the operating WTGs, any effect will be long in duration, i.e., operational Project phase. The environmental effect on migratory and breeding birds is predicted to be minor.

### ***Flora and fauna***

As discussed in Section 4.1.5, the Project site is located within an upland deciduous forest area with some coniferous trees and open areas that are being regenerated after harvesting activities. While the habitat is not particularly unique, the area does host flora and fauna that are of value in Nova Scotia (e.g., sugar maples, deer, etc.). Accordingly, flora and fauna has been identified as a VEC. A significant environmental effect would result if a substantive change could be identified in population of a flora or fauna species that was attributable to the Project. Species of flora and fauna that are identified as at risk or of special concern are assessed as a separate VEC.

- *Boundaries* – The spatial bounds includes the area where the WTGs, access road and other ancillary features are proposed, and for fauna, extending to include the areas that are frequented by fauna that may be impacted by the Project. The temporal boundary focuses on Project construction.

- *Potential Project Impacts* – Pathways that may adversely affect flora and fauna primarily include clearing of land during construction; however, this area is relatively small (i.e., about 5.5 ha) in relation to similar habitat in local area. Fauna in immediate area of the cleared area may relocate to avoid impact though habitat that will be lost – again a small area relative to local habitat.  
During operation, noise from the WTGs may affect fauna that use the area as part of their habitat. Given the predicted residual significant effect on ambient noise levels as minor in relation to residents, the parallel effect on fauna is expected to be negligible given the adaptability of fauna and the extent of similar habitat; therefore, this pathway is not further considered in this assessment.
- *Proposed Mitigative Measures* – Related to effect on flora and fauna during construction, the mitigations include:
  - Adherence to EPP related to minimizing disturbance of wildlife, including no tolerance for harassing wildlife; and
  - Limitation on areas cleared as already noted in this document and in the EPP.
- *Cumulative Effects* – There are known works taking place in the vicinity of the site, such as minor harvesting and a proposed single turbine installation. Given relative scale of the Project and these other activities, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on flora and fauna.
- *Significance of Residual Effects* – Annoyance of fauna caused during Project construction, if it occurs, will be temporary and short term. Effect on habitat due to the clearing required for this Project is extremely small relative to similar habitat on the Project site and in the local area in general.
  - The Project is not anticipated to have a significant residual environmental effect on flora and fauna. While any effect will be negative, it will be very small in magnitude, reversible, local, and short term. The environmental effect on flora and fauna is predicted to be negligible.

### ***Species at risk and of concern***

Listed species at risk receive legal protection (i.e., Federal *Species at Risk Act* and Provincial *Nova Scotia Endangered Species Act*), and species of concern are valued and a focus of sustainable project planning within an EA. The potential for species at risk and of concern was scoped initially via desktop surveys, including the observations reported by ACCDC and general knowledge of habitat on and near the site. This assisted in defining the field studies for species at risk and of concern along with consultation with regulators as appropriate. The results of the field studies are presented in Section 4.1.7.

A listed species at risk with a potential to use the Project site as habitat is the Wood Turtle. The Wood Turtle is known in the watershed as per DNR, and may be in the local area. With respect to the Project site, it would likely not find habitat for nesting on the site near the WTGs; however, the watercourse near the proposed access road, as well as banks of Brookville Road, are a moderate potential habitat during nesting season (i.e., late May - early July).

While no evidence was found for Eastern Moose (mainland population) during the pellet survey, the ACCDC data reports 16 observations under a 20km radius. The habitat and location of the Project site indicate a moderate potential for Mainland Moose in the local area.

Some species of concern, e.g., as identified by ACCDC or the DNR General Status Ranks of Wild Species, have been identified on or near the Project site. As per Section 4.1.7, these include the following DNR Yellow Ranked species:

- Tender Sedge was found in a vernal pool which is proposed as an avoidance area with a minimum buffer of 50m;
- One Canada Warbler was detected about 300m south of the site;
- Olive-Sided Flycatchers and Canada Warblers breeding over 2km south of the site;
- One Common Loon detected flying over the site; and
- Presence of Little Brown Bat and Northern Long-eared Bat were noted.

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

- *Boundaries* – The spatial boundary includes the area where the WTGs are proposed to be located and the Project’s ancillary features extending to include the areas that are frequented by species at risk or of concern that may be impacted by the Project. Temporal boundary includes all Project activities.
- *Potential Project Impacts* – Pathways that may adversely affect species at risk and of concern include habitat disruption during site preparation and construction and direct effects of operation of the WTGs.

Specifically, several species of concern have been noted during the desktop review and field work as moderately likely to interact with the proposed Project. These interactions are as follows:

- *Plants*: The Tender Sedge was identified on site and will be avoided by a minimum buffer zone of 50m; no impact will occur.
- *Birds*: The construction activities are not expected to interact due to nesting survey proposed prior to clearing; however, there are potential interactions during Project operation, i.e., direct effect of collisions.
- *Mammals*: If Mainland Moose do use the Project site, there is some potential disturbance during all Project phases. In terms of bats, there is a similar potential as with birds, i.e., direct effect of collisions.
- *Reptiles*: The potential interaction exists during construction of access road; however, this has been delayed until after the Wood Turtle nesting season, i.e., not before mid-July.
- *Proposed Mitigative Measures* – Related to effect on species at risk and of concern during Project construction, the mitigations include:
  - Undertaking a nesting survey prior to clearing activities as already noted in this document and in the EPP;
  - Limitation on areas cleared as already noted in this document and in the EPP;

- As per the EPP, notification of the Project Manager if Mainland Moose are observed during site works who will notify DNR;
- Schedule works to avoid civil works during Wood Turtle nesting period; and
- As per the EPP, education of the Project Contractor on the importance and the potential presence of Wood Turtle.

Related to WTG operation, the mitigations include:

- Bird and bat carcass searches as already committed as per the EC / CWS approved plan;
- Notification of DNR and CWS as applicable via the Project Manager of bird and bat carcasses found outside of searches as per EPP; and
- Notification of DNR of moose observations via the Project Manager as per EPP.

While no post-construction surveys are proposed for Mainland Moose, the Proponent will work with DNR if additional studies are recommended post-construction.

- *Cumulative Effects* – There are known works taking place in the vicinity of the site, such as minor harvesting and a proposed single turbine installation. Given relative scale of the Project and these other activities, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on species of risk and of concern.
- *Significance of Residual Effects* – Effects on species at risk and of concern has largely been avoided by appropriate siting and design of the Project.
  - The Project is not anticipated to have a significant residual environmental effect on species at risk or of concern. While any effect will be negative, it will be very small in magnitude, local and generally short term in potential interaction (i.e., construction). While the effect could be irreversible, this is extremely unlikely based on desktop, field work and this assessment. Hence the residual environmental effect on species at risk and of concern is predicted to be negligible.

## 6.4 Assessment of Socio-economic Aspects

### ***Land use***

The proposed Project is set in the rural community of McLellans Brook with ribbon residential development and resource based activities, such as forestry. The existing land uses of the Project site include harvesting of fire wood for use by land owner and maple syrup extraction by the land owner. The continued use of the land on the Project site is being discussed with the private land owner and continued use has been ensured by the Proponent.

The development density is quite low in keeping with the rural character of the area .There are five residential properties within about 1km of the proposed WTGs, and approximately 30 are within 2km as presented in Section 4.2.1. In terms of the local community, there is a reasonable expectation of enjoyment of property on surrounding land; this is valued by the community.

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

- *Boundaries* – The Project site where the WTGs are proposed to be located and ancillary features, as well as surrounding properties to a 2km radius, define the spatial boundaries related to land use assessment. The temporal boundaries include all Project activities.
- *Potential Project Impacts* – Pathways that may adversely affect land use during construction may include any temporary disturbance associated with noise and light, especially blasting if that occurs. Changes to land use via construction activities on the Project site will occur but will be confined to the footprint of the site; appropriately maintaining existing use of land by property owner is under discussion as part of private agreement to lease the land and is not further considered as part of this assessment.  
During operation, pathways that may adversely affect land use include effects from operation of the WTGs relating to human perception of changes to land use, such as sound, light, aesthetics, health and safety, etc.; these are distinct aspects that are assessed separately in this document.
- *Proposed Mitigative Measures* – Related to effect on land use, the mitigations are those proposed for the VECs and socio-economic aspects that relate to land use as explained above; they are not repeated here.
- *Cumulative Effects* – There are known works taking place in the vicinity of the site, such as minor harvesting and a proposed single turbine installation. Given relative scale of the Project and these other activities, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on land use in the local area.
- *Significance of Residual Effects* – Pathways to impact land use relate to other VECs and socio-economic aspects that are assessed separately; these were determined to have negligible or minor residual environmental effects.
  - The Project is not anticipated to have a significant residual environmental effect on the land use in the local area. While any effect will be negative, it will be very small in magnitude, reversible, and local; however, where the effect relates to the operating WTGs, it will be long in duration. The environmental effect on land use is predicted to be negligible.

### ***Aboriginal resources / uses***

Based on the archaeological study completed, the Project site and nearby area are considered to exhibit low potential for encountering Mi'kmaq resources as described in Section 4.2.3. As described in Section 5.2, the Proponent engaged the Mi'kmaq at early Project stages and has continued to share information. This is in keeping with the Province's requirement to meaningfully consult with the Mi'kmaq on decisions that impact natural resources. The Project does not use Crown land and is considered a relatively low impact activity.

Accordingly, Mi'kmaq resources and traditional uses by the Mi'kmaq have been identified as a VEC. A significant environmental effect would result if a substantive change occurred in Mi'kmaq access to

traditionally used land, if the availability of traditional resources substantively declined or if a loss or destruction occurred of an artefact of Pre-Contact origin.

- *Boundaries* – The area where the WTGs are proposed to be located, and their ancillary features, could impact aboriginal resources or uses; hence, this defines the spatial boundary. The temporal boundary is all Project activities.
- *Potential Project Impacts* – Pathways that may adversely affect traditional Mi'kmaq uses and resources are primarily based upon those ecological VECs including wetlands and watercourses, fish habitat, migratory and breeding birds, flora and fauna, and species at risk or of concern, as well as the socio-economic aspect of land use; of these, all effects were predicted to be negligible, whereas no effect was predicted on fish habitat while the effect on migratory and breeding birds was predicted to be minor. Also in terms of construction, direct impact to Pre-Contact artefacts is a potential effect.
- *Proposed Mitigative Measures* – Related to effect on Mi'kmaq resources and traditional uses by the Mi'kmaq, the mitigations are those proposed for the ecological VECs and land use as explained above; they are not repeated here. Further, follow up consultation is planned with the nearby First Nations of Paq'nkek and Pictou Landing as well as the KMK as per Section 5.2. In addition, the EPP includes protocols should artefacts or human remains be discovered during construction, including contact information for the KMK in the unlikely event that the discovery is considered to potentially be of Pre-Contact significance.
- *Cumulative Effects* – There are known works taking place in the vicinity of the site; however, given relative scale of the Project and these other activities, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on Mi'kmaq resources and traditional uses by Mi'kmaq.
- *Significance of Residual Effects* – Pathways to impact Mi'kmaq resources and traditional uses by Mi'kmaq primarily relate to ecological VECs and land use that are assessed separately and determined to have no impact or negligible or minor residual environmental effects. The potential to discover a Pre-Contact artefact is very unlikely given the low potential identified in the archaeological assessment.
  - The Project is not anticipated to have a significant residual environmental effect on the Mi'kmaq resources and traditional uses by Mi'kmaq. While any effect will be negative, it will be very small in magnitude, reversible, and local; however, relative to the operating WTGs, any effect will be long in duration. The environmental effect on Mi'kmaq resources and traditional uses by the Mi'kmaq is predicted to be negligible.

### **Archaeological resources**

Based on the archaeological study completed, the Project has low risk to impact archaeological resources as described in Section 4.2.3. Protection of cultural resources is required by Provincial legislation, e.g., *Special Places Protection Act*. Accordingly, archaeological resources have been identified as a VEC. A significant environmental effect would result if an irreversible loss or destruction of an archaeological resource that resulted from Project activities.

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

### **Recreation**

The Project is proposed on private land that is now being used, in part, for harvesting of fire wood for private use of the land owner and maple syrup extraction by the land owner. There are no trails on or near the Project site for public use. Recreational activities do exist in the broader area, i.e., on a watershed scale, as briefly described in Section 4.2.7. Accordingly, recreation has been identified as a VEC. A significant environmental effect would result if a substantive change in recreation occurred that was attributable to the Project.

- *Boundaries* – The area where the WTGs are proposed to be located, and its ancillary features, as well as immediately surrounding properties, define the spatial boundaries related to assessment of recreation. The temporal boundaries include all Project activities.

- *Potential Project Impacts* – Pathways that may adversely affect recreation during construction may include any temporary disturbance associated with noise and light, especially blasting if that occurs, as well as effect on land use and fish habitat; these are distinct and are assessed separately in this document.  
During operation, pathways that may adversely affect recreation include effects from operation of the WTGs relating to human perception of changes to land use, such as sound, light, aesthetics, health and safety, etc. as well as effect on land use itself; these are distinct aspects that are assessed separately in this document.
- *Proposed Mitigative Measures* – Related to effect on recreation, the mitigations are those proposed for the VECs and socio-economic aspects that relate to recreation as explained above; they are not repeated here.
- *Cumulative Effects* – There are known works taking place in the vicinity of the site, such as minor harvesting and a proposed single turbine installation. Given relative scale of the Project and these other activities, it is very unlikely that these might act cumulatively to increase the likelihood of a significant adverse environmental effect on recreation in the area.
- *Significance of Residual Effects* – Pathways to impact recreation relate to other VECs and socio-economic aspects that are assessed separately and determined to have negligible or minor residual environmental effects, or no predict effect in the case of fish habitat.
  - The Project is not anticipated to have a significant residual environmental effect on the recreation in the local area. While any effect will be negative, it will be very small in magnitude, reversible, and local; however, relative to the operating WTGs, any effect will be long in duration. The environmental effect on recreation is predicted to be negligible.

### ***Vehicular traffic***

The Project site is over 5km south of Highway 104 and proximate rural roadways. Movement of concrete, gravels and turbine components is part of the construction phase as described in Section 2.5. All roads that will be used to transport the turbine components will be reviewed with TIR to ensure the ability to handle the movement of the large loads. In terms of WTG and crane component delivery to the Project site, approximately 55 flatbed truck loads are expected on average along this route.

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

- *Boundaries* – The spatial boundaries are those roads that will be used through the construction phase of the Project. The temporal boundaries are those associated with Project construction, as well as decommissioning Project phase.

- *Potential Project Impacts* – Pathways that may adversely affect traffic include transportation of turbine components and construction materials, such as concrete for turbine foundations, as well as removal of turbine components during decommissioning activities.
- *Proposed Mitigative Measures* – The Proponent will work closely with TIR, the Municipality and the community to evaluate the most practical approach to ensure road and bridge integrity, the safety of the travelling public, and minimal inconvenience to travellers.
- *Cumulative Effects* – The other known works taking place in the area, or in the vicinity of the site, are not expected to occur simultaneously, and therefore, they will not act cumulatively to increase the likelihood of a significant adverse environmental effect on vehicular traffic at the nearby residents.
- *Significance of Residual Effects* – Annoyance caused by delay in road traffic during construction, if it occurs, will be temporary and short term. By working with TIR, work will be completed to ensure integrity of road structures remains intact.
  - The Project is not anticipated to have a significant residual environmental effect on vehicular traffic patterns. While any effect will be negative, it will be small in magnitude, reversible, short term and local. The environmental effect on vehicular traffic is predicted to be negligible.

### ***Landscape aesthetics***

The proposed Project is set near the rural community of McLellans Brook up on a ridge known as Irish Mountain with an approximate maximum elevation of 215m asl. While the area can be described as an aesthetically pleasing landscape, it is very typical of the regional area; it has not been identified as a highly valued view plane nor known for its uniqueness. The only Provincially noted scenic viewplane in the areas is located at Blue Mountain which is about 12km east of the site as noted in Section 4.2.7.

It is important for members of the community to visualize the potential impact to landscape aesthetics. View planes were assessed as described in Section 4.2.6. This included selecting three locations to analyze as shown on Figure 3.1. The first vantage point is approximately 2km north of the site, while the other two were taken closer to the site, i.e., from Brookville Road near adjacent properties. The three existing and predicted view planes are shown in Section 4.2.6.

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

- *Boundaries* – The area surrounding the propose Project where the WTGs are visible defines the spatial boundaries related to assessment of landscape aesthetics. The temporal boundaries include Project operation.
- *Potential Project Impacts* – Pathways that may adversely affect landscape aesthetics simply relates to visibility of WTGs. Visibility decreases with distance and relates to relative topography and ground cover which may act as obstructions to visibility.

Members of the community and the public at large have varying opinions on the visual impact of WTGs. To some they represent progress of renewable energy, to others they represent large industrial installations that create a negative effect on the landscape, and some are indifferent. They do represent change in the landscape which can cause short term reactions (positive or negative); these reactions often decrease over time.

Of the five closest residents, Resident 1 and Resident 2 have the most unobstructed views of the proposed Project, whereas Residents 3 to 5 have denser forest cover immediately surrounding their residences which helps to impede view of the turbines (see Figure 3.1). No specific concerns have been shared with the Proponent to date on visibility of turbines.

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

### **Tourism**

There is a tourism industry along the Northumberland Shore, including recreation, cultural attractions, shopping and dining. The Project is proposed on a site approximately 10km south of New Glasgow. In the local area of the Project site, no specific attractions were identified online by the Pictou County Tourism Association. As identified in Section 4.2.8, the site is located between two larger wind energy projects, i.e., Glen Dhu and Dalhousie Mountain. The effect of wind energy projects on tourism – both positive and negative – is often discussed by the community. Accordingly, tourism has been identified as a socio-economic aspect. A significant environmental effect would result if a substantive change in levels of tourism in the local area that could be attributable to the Project.

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

In terms of a negative effect on tourism during Project operation, these socio-economic aspects, e.g., landscape aesthetics, are also assessed separately and determined to be negligible. Hence these pathways are not included in the assessment on tourism.

Respecting the potential positive effect on tourism due to interest in viewing the turbines in operation, the Project is not expected to attract much tourism attention given its relative proximity to two of the Province’s largest wind installations. There may be some attention during construction, i.e., transportation and erection of the WTGs.

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

### ***Health and safety***

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

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

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

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

The pathways of impact related to operation are discussed below:

- *Noise and low frequency vibration*: The guidelines for 40dBA at the outside of residential dwellings is considered protective of health in terms of audible noise and its potential effect on stress levels and sleep; this was addressed as a separate VEC in Section 6.2. Project design to limit exposure to SPLs at these levels is also considered protective in terms of low frequency vibration. Hence this pathway is not assessed specifically here as it was addressed in a separate VEC; residual environmental effect was predicted to be minor.
- *Ice throw*: A guideline for a safe distance with respect to ice throw is  $1.5(2R + H)$  where R is rotor (blade) radius and H is hub height. Hence for a typical WTG under consideration with a hub height of 80m and a blade length of 40m, the maximum distance of ice throw is 240m. Ice throw will only occur in specific climatic circumstances.
- *Shadow flicker*: As described in Section 4.2.6 and as shown in Figure 4.6, shadow flicker was modeled and the boundary was mapped of the maximum exposure guideline for 30 minutes per day and 30 hours per year. This boundary is well distant from the nearby residences even with the conservative assumptions used in the model.
- *Proposed Mitigative Measures* – Related to effect on health and safety during operation, the mitigations for ice throw and shadow flicker include:
  - Potential effects of shadow flicker have been considered as part of the Project siting, hence the predicted effects are within guidelines and no specific mitigation in operation is required;
  - Educate site personnel and land owner on risk of ice throw under certain climatic conditions;
  - Restrict personnel in the immediate area of the WTGs following an icing event, wherever practical; and

- Post signage at Project site gate to identify potential concerns with ice throw in the radius of potential interaction from the WTGs.
- *Cumulative Effects* – There are known other works taking place in the vicinity of the site; however, due to the nature, location and size, these are not expected to act cumulatively to increase the likelihood of a significant adverse environmental effect on health and safety.
- *Significance of Residual Effects* – Based on Project planning and design, potential effects of shadow flicker are below guidelines to protect human health. Safety risk due to ice throw is not a concern on residential properties and appropriate signage will educate site personnel and visitors on the potential risk of ice throw. Noise was assessed separately and the effect predicted to be minor.
  - The Project is not anticipated to have a significant residual environmental effect on human health and safety. While any effect will be negative, an unplanned interaction via ice throw is very unlikely and possible timeframe of occurrence very short term. The interaction due to shadow flicker will be very small in magnitude, reversible, and local; however, as it relates to the operating WTGs, it will be long in duration. The environmental effect on health and safety is predicted to be negligible.

### **Local economy**

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

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

- *Boundaries* – The spatial boundary is the Municipality to which taxes are paid and where the local businesses and workers primarily reside. The temporal boundary is all Project activities.
- *Potential Project Impacts* – Predicted impacts are positive in terms of the local economy. Pathways that may benefit the local economy include local contracts and short term employment during site preparation and construction, as well as decommissioning activities. Outside of direct contracts or employment, economic spin off is expected in the local area during construction (e.g., accommodation, gasoline, dining, etc.). During operation, pathways are primarily related to ongoing taxes paid to the Municipality with some ongoing contracts or employment related to the operating wind farm. In terms of potential investment, members of the community have the opportunity to make use of the CEDIF structure to invest in a local project and receive tax benefits.
- *Proposed Mitigative Measures* – Where practical, the Proponent will utilize local labour and businesses. This is often cost-effective for the Proponent but it also roots the development in the community; indeed it is a community-owned Project.

- *Cumulative Effects* – There are known other works taking place in the vicinity of the site that might act cumulatively to increase the likelihood of a positive effect on the local economy; however, cumulative effects are unlikely to be significant.
- *Significance of Residual Effects* – Local economy is predicted to be positively affected due to Project activities over the life of the Project.
  - The Project is anticipated to have a significant residual environmental benefit on the local economy; however, it will be small in magnitude, reversible, and local; however, relative to the operating stage, i.e., Municipal taxes, the effect will be long in duration. The benefit on local economy is predicted to be minor.

## 6.5 Effect of the Environment on the Project

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

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

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

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

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

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

## 6.6 Summary of Residual Environmental Effects

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

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

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

**Table 6.2: Summary of Residual Environmental Effects**

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

<b>Recreation</b>	-	Small	REV	Short	Local	Negligible
<b>Vehicular traffic</b>	-	Small	REV	Short	Local	Negligible
<b>Tourism</b>	-	Small	REV	Long	Local	Negligible
<b>Landscape aesthetics</b>	-	Small	REV	Long	Local	Negligible
<b>Health and safety</b>	-	Small	REV	Long	Local	Negligible
<b>Local economy</b>	+	Moderate / Small	REV	Llong	Regional	Minor

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

## 7.0 Mitigative Measures, Follow-up and Monitoring

The Proponent is committed to planning and executing the MBWF in a sustainable manner – this includes fulfilling its environmental, social and economic responsibilities. The Proponent will honour the commitments made in this EA and will comply with all applicable laws and regulations.

To ensure these commitments are transferred to the contractors, employees and other site personnel, a draft EPP has been developed for the construction and operation phases of the Project (Appendix 3); this will be updated to address comments from regulators, other stakeholders and the public on this EA as well as results of additional field work and final design. Watts Wind is committed to training contractors, employees and other site personnel on the requirements of the EPP in relation to their responsibilities. The main commitments for mitigative measures, follow up and monitoring include but are not limited to:

- Installation of sediment and erosion control measures prior to earth works and maintained during construction, and visual monitoring of receiving water as appropriate until site is stabilized, as well as communicated with the Water Works Operator as appropriate related to works in the Forbes Lake Protected Water Area;
- Limits of work to protect wetlands and watercourses on the property with a proposed 50m boundary pending additional delineation of wetlands next spring, communication of any changes to this proposed buffer zone to NSE and other stakeholders as appropriate, and obtaining any requisite approvals from NSE if required;
- One exception to above is the upgrade of one existing culvert in watercourse which will be completed between June and September in accordance with pertinent regulations;
- Nesting bird survey to be completed prior to clearing in spring / summer 2013;
- Preparation of a plan for bird monitoring and bird and bat carcasses searches and implementation of the plan once approved by EC and CWS;
- Approaches to protecting species at risk and of concern identified or having potential to be on or near the Project site as identified in this EA and the EPP;
- Proper handling, storage and disposal of hazardous and non-hazardous wastes including compliance with special provisions in the Forbes Lake Watershed Protected Water Area Regulations;
- Implementation of protocols should an unplanned event occur, such as discovery of suspected artifacts, structures of cultural significance or human remains, unplanned release of deleterious material;
- Continued consultation with the community, the Mi'kmaq and regulators to maintain information flow and open dialogue, especially with the five nearby residents to ensure that

questions or concerns with respect the Project construction and operation are understood and addressed; and

- If necessary, development of plans to monitor noise and / or shadow flicker to the satisfaction of NSE if requested by NSE should complaints occur and monitoring be an appropriate component of approach to complaint resolution.

As this is a locally owned and operated project organized as a CEDIF, community outreach is uniquely integrated into the Project. Beyond the consultation already completed and ongoing consultation, i.e., open houses and mail outs, a Project website and signage will be implemented and maintained as part of project construction and operation. This will facilitate communications and provide community members with contact information is questions or concerns arise. Ongoing consultation will occur with other stakeholders, including but not limited to, the Forbes Lake Watershed Advisory Board. In addition, the Proponent will continue to review the interest from members of the community in forming a CLC to assist with community engagement.

## 8.0 Closure

The McLellans Brook Wind Farm is a community-based project which will provide distributed renewable energy to the grid and local economic benefit with minimal impact to the environment. Upfront planning has minimized environmental effects while maximizing distance from residences while retaining excellent wind regime and moderate construction costs.

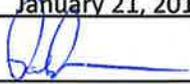
Typical construction mitigative measures will result in minimal adverse impact to the environment. Operational impacts are expected to be minimal and follow up and monitoring measures will occur as indicated. A draft EPP has been developed for construction and operation of the Project to ensure the appropriate mitigative measures, monitoring and follow up; this will be finalized prior to construction and submitted to NSE.

As outlined in this EA document, the Project can be executed without significant adverse effects on biophysical VECs and socio-economic aspects. The Proponent is committed to undertaking the Project to the mutual benefit of the investors, the community and the Province while eliminating or minimizing environment effects to the extent possible. This is achievable by adhering to the commitments as laid out in this document, including the EPP, and all pertinent legislation, as well as the future requirements of NSE's conditions of approval and other approvals and permits.

The contents of this McLellans Brook Wind Farm Environmental Assessment document are the responsibility of the Proponent. They have been prepared in accordance with the *Environment Act* and its associated regulations.

Name of Proponent: Watts Wind Energy Inc.

Date: January 21, 2013

Signature: 

Name: Paul Pynn

Title: Vice President

Proponent Phone: 902-482-8687

Proponent Email: ppynn@wattswind.com

Proponent Address: 300 Prince Albert Road  
Dartmouth, NS, B2Y4J2

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## **Appendix 1: COMFIT Approval Document**



**NOVA SCOTIA**  
**Energy**  
**Office of the Minister**

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Suite 400, 5151 George Street, PO Box 2664, Halifax, Nova Scotia, Canada B3J 3P7 • Telephone 902 424-7793 Fax 902 424-3265 • [www.gov.ns.ca/energy](http://www.gov.ns.ca/energy)

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April 13<sup>th</sup> 2012

Paul Pynn  
300 Prince Albert Road  
Dartmouth, Nova Scotia  
B2Y 4J2

Dear Watts Wind Energy:

**Re: Community Feed-In Tariff Approval**

On behalf of the Nova Scotia Department of Energy, I am pleased to present you with your Community Feed-In Tariff (COMFIT) approval for your large wind facility in New Glasgow, Nova Scotia (Project Number 84). Attached to this letter is a certificate indicating your approval.

In order to maintain your COMFIT approval, you must comply with:

- (1) The specifications of the proposed project as outlined in your COMFIT application dated September 19, 2011; any alterations to your proposal (e.g., technology type, ownership structure, specifications, etc.) requires prior approval by the Department. Alterations must be submitted in writing for approval.
- (2) The Electricity Act and the Renewable Electricity Regulations. Amongst other things, section 34 of the Renewable Energy Regulations requires you to submit a report to the Department of 30 days of your project's connection to the distribution grid. Failure to do so may result in revocation of your COMFIT approval.

As a condition of your approval, you must comply with any conditions set by Nova Scotia Power Incorporated.

As a further condition of approval, you must complete:

- An Environmental Assessment
- 25 Community Members: As per the *Renewable Electricity Act Regulations* S.20 (2) (e), your Community Economic Development Fund is required to have 25 community members. COMFIT directive 006 establishes a timeline of one year from approval to achieve this.

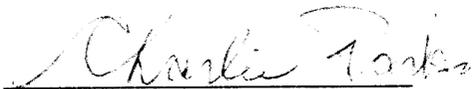
- **Community Consultation:** Two public information sessions must be held prior to the construction of the project. Results of the information sessions must be submitted to the Department of Energy, outlining any community concerns with the proposed project. If there are community concerns, additional consultation may be required.
- **Project Time Line and Milestones:** As per S. 30 of the *Renewable Electricity Act and Regulations*, a detailed project schedule including timelines and key milestones must be submitted to the Department of Energy within 60 days of approval. You will be required to report on the progress of the project, in accordance with your submission.
- **Wind Energy Mapping:** The Department of Energy and Department of Natural Resources are endeavoring to map wind development within the province. All approved projects are required to submit the appropriate geographic information system data, and work collaboratively to address any recommendations emerging from an assessment of the cumulative impact of wind energy in the province. More information is provided in the guidance note.

These conditions are not an exhaustive list of the permits and approvals needed for your project. COMFIT approval does not supersede any additional regulations, permits or approval required by other government (or agency) authorities as your project unfolds. Projects must still comply with all other conditions and milestones as set by government entities (or agencies) and Nova Scotia Power Inc. Failure to meet additional requirements may result in revocation of your COMFIT approval, even though they may not be an explicit condition at this time.

A COMFIT guidance note is attached with information pertaining to the implementation of your project. The guidance note is not a condition of approval, but information that may be useful to you as you implement your project. As per Directive 004: Annual Progress reports, the Department looks forward to receiving your annual reports on how COMFIT proceeds have assisted in meeting community sustainability goals.

If you have any questions about your approval, or if we can be of further assistance to you, please call COMFIT Clerk at (902) 424-5293 and a representative will be happy to assist you.

Yours Sincerely,



**Charlie Parker**  
**Minister**

Enclosure

No. Project 84

## Community Feed-In Tariff Approval

This certifies that *Watts Wind Energy* has received Community Feed-In Tariff Approval by the Nova Scotia Department of Energy for a 6MW large wind project near New Glasgow, Nova Scotia. Approval may be revoked should a project not meet the requirements of the Community Feed-In Tariff program or deviate from details specified in its Community Feed-In Tariff application.



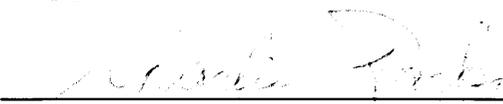
  
\_\_\_\_\_  
Charlie Parker  
Minister

No. Project 84

## Community Feed-In Tariff Approval

This certifies that *Watts Wind Energy* has received Community Feed-In Tariff Approval by the Nova Scotia Department of Energy for a 6MW large wind project near New Glasgow, Nova Scotia. Approval may be revoked should a project not meet the requirements of the Community Feed-In Tariff program or deviate from details specified in its Community Feed-In Tariff application.



  
\_\_\_\_\_  
Charlie Parker  
Minister

Paul Pynn  
300 Prince Albert Road  
Dartmouth, Nova Scotia  
B2Y-4J2

Re: COMFIT Guidance Note

Dear Watts Wind Energy:

A substantive review of your COMFIT application has been completed by the Department of Energy, in consultation with relevant government departments. During this review, factors have been identified that you should be aware of as your project proceeds. These are **not** conditions of approval, but guidance to assist you in the successful implementation of your COMFIT project.

Nova Scotia Environment has noted that there is presently a joint federal-provincial-territorial initiative to develop national guidelines for wind turbine noise. The guidelines are currently in draft format and are expected to be released for public consultation in early 2012. The guidelines are expected to pertain to:

1. large land-based (hub height of 60 meters or higher, blades larger than 30 meters and electrical output greater than one megawatt) and
2. land-based commercial scale turbines with a name plate capacity of greater than or equal to 50 kilowatts and a maximum sound power level of greater than or equal to 102 A-weighted decibels (dBA).

The proposed guidelines recommend limits ranging from 40-50 dba for sound, and a 550 meter setback from nearest noise receptor for turbines with a name plate capacity greater than or equal to 50kw and sound level greater than or equal to 102 dba. These guidelines will not be finalized until after public consultation has been undertaken. Thus, these recommendations are subject to change. Please contact the Environmental Assessment Branch of the Department of Environment for any updates to these proposed Guidelines.

All approved COMFIT projects are required to submit geographic information system data in the form of a shape file. Furthermore, the Department of Energy and the Department of Natural Resources are currently endeavoring to map all wind energy development within the province. The aim of this exercise is to assess the potential cumulative impact of wind development on various wildlife, in particular migratory species. The results of this study may have potential impacts on the siting of projects, however this will be determined as the results of the study progress and impacts discussed in collaboration with applicants.

If you have any questions about your approval, or if we can be of further assistance to you, please call COMFIT Clerk at (902) 424-5293 and a representative will be happy to assist you.

Sincerely,

---

Krystal Therien  
COMFIT Administrator  
Nova Scotia Department of Energy

## **Appendix 2: Federal Approvals**



Andrew Arbuckle &lt;aarbuckle@eonwind.com&gt;

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## MacLellans Brook Wind Farm

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**Weather Radars Contact,National Radar Program [Ontario]**

Fri, Dec 14, 2012 at 1:11

&lt;weatherradars@ec.gc.ca&gt;

PM

To: Andrew Arbuckle &lt;aarbuckle@eonwind.com&gt;, "Weather Radars Contact,National Radar Program [Ontario]" &lt;weatherradars@ec.gc.ca&gt;

Dear Mr. Andrew Arbuckle,

Thank you for contacting the Meteorological Service of Canada, a branch of Environment Canada, regarding your wind energy intentions.

Our preliminary assessment of the information provided to us via e-mail on December 4, 2012 indicates that any potential interference that may be created by the MacLellan's Brook Wind Farm near New Glasgow, NS will not be severe. Although we would prefer our radar view to be interference free, this is not always reasonable. As a consequence, we do not have strong objections to the current proposal.

If your plans are modified in any manner (e.g. number of turbines, height, placement or materials) this analysis would no longer be valid. An updated analysis must be conducted.

Please contact us at: [weatherradars@ec.gc.ca](mailto:weatherradars@ec.gc.ca).

Thank you for your ongoing cooperation and we wish you success.

Best Regards,

Carolyn Rennie

---

**Carolyn Rennie**  
National Radar Program  
Meteorological Service of Canada  
Environment Canada  
4905 Dufferin Street  
Toronto, Ontario M3H 5T4

14/12/2012

Office : 3N-WS12  
Carolyn.Rennie@ec.gc.ca  
Phone : 416-739-4931

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**Carolyn Rennie**

Le Programme Nationale de Radar  
Service météorologique du Canada  
Environnement Canada  
4905, rue Dufferin  
Toronto, Ontario M3H 5T4  
Bureau : 3N-WS12  
Carolyn.Rennie@ec.gc.ca  
Téléphone : 416-739-4931

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**From:** Andrew Arbuckle [mailto:[aarbuckle@eonwind.com](mailto:aarbuckle@eonwind.com)]  
**Sent:** Tuesday, December 04, 2012 9:44 AM  
**To:** Weather Radars Contact,National Radar Program [Ontario]  
**Subject:** Re: MacLellans Brook Wind Farm

[Quoted text hidden]



RECEIVED / REÇU  
 AUG 07 2012  
 MAM

TC File No/Ref No / N° du Dossier/No de réf.  
 TC2012-416  
 Applicant File No/Ref No / N° du dossier/No de réf.

**AERONAUTICAL ASSESSMENT FORM FOR OBSTRUCTION MARKING AND LIGHTING**  
**FORMULAIRE D'ÉVALUATION AÉRONAUTIQUE POUR LE BALISAGE ET L'ÉCLAIRAGE D'UN OBSTACLE**

General Information / Renseignements personnels	
1. Owner's Name / Nom du propriétaire Watts Wind Energy Inc	Contact Person / Personne ressource Andrew Arbuckle
Address / Adresse 300 Prince Albert Road	
City / Ville Dartmouth	Prov Nova Scotia
Postal Code / Code postal B2Y4J2	
Telephone No. / N° de téléphone 902-482-8687	Fax No. / N° de télécopieur 1-866-314-5349
Email Address / Courriel aarbuckle@eonwind.com	
2. Applicant's Name / Nom du requérant See above	Contact Person / Personne ressource
Address / Adresse	
City / Ville	Prov
Postal Code / Code postal	
Telephone No. / N° de téléphone	Fax No. / N° de télécopieur
Email Address / Courriel	
3. Description of Proposal (or as attached) / Description de la proposition (ou pièce jointe) Wind Farm	
4. Geographic Coordinates / Coordonnées géographiques <input checked="" type="checkbox"/> NAD83 <input type="checkbox"/> NAD27 <input type="checkbox"/> WGS84 N Latitude / Latitude N    deg    min    sec    W Latitude / Latitude O    deg    min    sec Please see the attached notepad file for turbine locations and elevations	
5. Nearest / Plus proche Community / Collectivité MacLellans Brook	Province Nova Scotia
6. Nearest Aerodrome / Plus proche aéroport Unsure	
7. Have you contacted the aerodrome? / Avez-vous contacté l'aéroport? <input type="checkbox"/> Yes / Oui <input checked="" type="checkbox"/> No / Non	
8. Notice of / Avis de <input checked="" type="checkbox"/> New Construction / Nouvelle construction <input type="checkbox"/> Change to existing structure / modification à une structure existante	
9. Duration / Durée <input checked="" type="checkbox"/> Permanent / Permanente <input type="checkbox"/> Temporary / Temporaire	
10. Proposed Construction Date Beginning (yyyy-mm-dd) / Date de construction proposée à partir de (aaaa-mm-jj) September 2013	
11. Temporary Structure / Structure temporaire From (yyyy-mm-dd) / Du (aaaa-mm-jj)    To (yyyy-mm-dd) / Au (aaaa-mm-jj)	

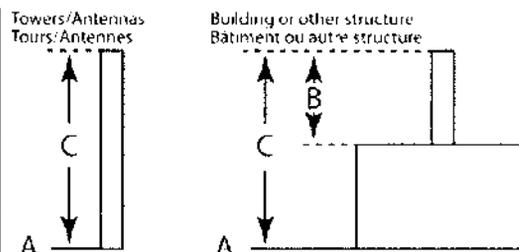
12. Marking and Lighting Proposed (refer to Standard 621) / Balisage et éclairage proposés (voir Norme 621)

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Red lights and paint<br>Feux et peinture rouges           | <input type="checkbox"/> Red and M.I. white lights<br>Feux rouges et blancs à M.I. | <input type="checkbox"/> White M.I. lights<br>Feux blancs à M.I.                        |
| <input type="checkbox"/> Red and H.I. white lights<br>Feux rouges et blancs à H.I. | <input type="checkbox"/> White H.I. lights<br>Feux blancs à H.I.                   | <input type="checkbox"/> No painting<br>Aucun peinture                                  |
| <input type="checkbox"/> No lighting<br>Aucun éclairage                            | <input type="checkbox"/> Paint marking only<br>Balisage peint seulement            | <input type="checkbox"/> Other (provide description)<br>Autre (fournir une description) |

13. Catenary/Cable Crossing / Fils/câbles caténares

- |  |   |  |
|--|---|--|
| <input type="checkbox"/> Paint support ng structures<br>Structure portante peinte  | <input type="checkbox"/> Cable marker spheres<br>Balises sphériques de f s/câbles | <input type="checkbox"/> Shore markers<br>Balises côtières |
| <input type="checkbox"/> Support structure lighting<br>Structure portante éclairée | <input type="checkbox"/> Cable marker lights<br>Balises lumineuses de fils/câbles |  |

14. <b>A</b>	Ground Elevation (AMSL) Hauteur du sol (AMSL)	Feet / Pieds	Metres / Mètres
15. <b>B</b>	Height of an addition to an existing structure Hauteur d'un ajout à une structure existante	Please see the attached notepad file for tower heights and elevations	
16. <b>C</b>	Total structure height including #15 (AGL) Hauteur totale de la structure y compris n°15 (AGL)	130m	
17.	Overall height (#14 plus #16) (AMSL) Hauteur hors tout (n°14 plus n°16) (AMSL)		



18. Does the proposal comply with Airport Zoning Regulations?  
La proposition est-elle conforme aux Règlements de zonage aux aéroports?
- Yes / Oui       No / Non       N/A / S/O

I hereby certify that all the above statements made by me are true, complete and correct to the best of my knowledge. Also, I agree to mark and/or light and maintain the structure with established marking and lighting standards as necessary.

J'atteste par la présente que tous les renseignements que j'ai fournis ci-dessus sont exhaustifs et exacts au meilleure de mes connaissances. De plus, j'accepte de baliser et/ou d'éclairer la structure et de l'entretenir conformément aux normes de balisage et d'éclairage, au besoin.

Date (yyyy-mm-dd) Date (aaaa-mm-jj) August 8, 2012	Name of person filing notice Nom de la personne qui dépose l'avis Andrew Arbuckle	Signature
--	---	-----------

Transport Canada Assessment  
Évaluation de Transports Canada

Marking and lighting required (as per Standard 621) / Balisage et éclairage requis (conf. à la Norme 621)

- Lighting Required / Balisage lumineux requis       Paint Required / Balisage peint requis       Temporary Lighting Required / Balisage lumineux temporaire requis       No Lighting or Painting required / Aucun éclairage ou peinture requis

Comments (Transport Canada use Only) / Commentaires (à l'usage de Transports Canada)

All 4 turbines must be lighted

Civil Aviation Inspector / Inspecteur de l'Aviation civile	Signature 	Date (yyyy-mm-dd) / Date (aaaa-mm-jj) 2012-08-21
--	---------------	---

Note 1: This assessment is only valid for one year from the date of assessment and applicable to the proposal as submitted.

Remarque 1: Cette évaluation n'est valide que pour une année seulement à compter de la date de l'évaluation, et ne s'applique qu'à la proposition telle qu'elle a été soumise.

Note 2: If there is a change to the intended installation, a new submission is required.

Remarque 2: En cas de changement, il faut présenter une nouvelle demande.

043

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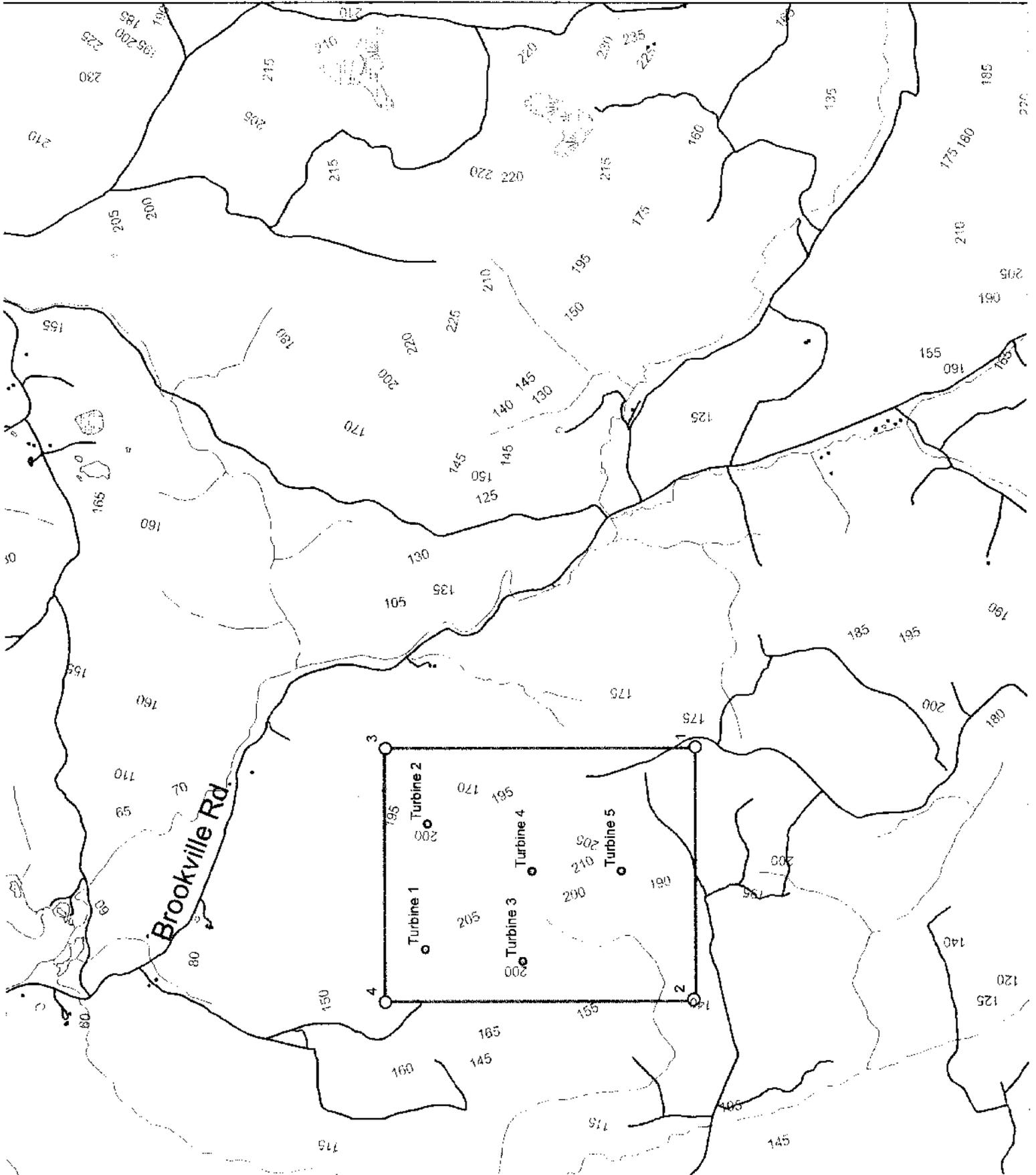
— Roa

Con

Me

UTM/

Pl



043 - 17-07-12 - aviation box

Pnt No.	Deg. / Minute / Second	Deg. / Minute / Second	Elevation (m)
1	45 29 50.90497	62 35 55.21785	192
2	45 29 51.40841	62 36 41.63852	137.5
3	45 30 30.82335	62 35 55.12933	150
4	45 30 31.12136	62 36 41.65804	180



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## RE: MacLellans Brook Wind Farm + Barrington Wind Farm

---

XNCR, Windfarm Coordinator <Windfarm.Coordinator@dfo-mpo.gc.ca>

Fri, Dec 7, 2012 at 3:20 PM

To: Andrew Arbuckle <aarbuckle@eonwind.com>

Hello,

Here is my assessment of possible interference issues for the 2 proposed areas:

### MacLellans Brook:

There is no CCG communication or radar site in the vicinity of the proposed wind farm. Therefore, no interference issues are anticipated.

### Barrington:

There is no CCG communication or radar site in the vicinity of the proposed wind farm. Therefore, no interference issues are anticipated.

Regards,

Martin Grégoire, P. Eng  
Canadian Coast Guard

---

**From:** Andrew Arbuckle [mailto:[aarbuckle@eonwind.com](mailto:aarbuckle@eonwind.com)]

**Sent:** December 4, 2012 9:43 AM

**To:** XNCR, Windfarm Coordinator

**Subject:** Re: MacLellans Brook Wind Farm

My apologies. See revised WTG1 coordinates for Barrington.

Andrew

On Mon, Dec 3, 2012 at 9:15 AM, Andrew Arbuckle <[aarbuckle@eonwind.com](mailto:aarbuckle@eonwind.com)> wrote:

Hello,

I would like to submit the following points indicating the location of our proposed wind projects in Barrington and MacLellans Brook, Nova Scotia.

MacLellans Brook (LAT/LONG WGS84)

WTG 1 - 45°30'28.74"N, 62°36'21.26"W Elevation - 188m

WTG 2 - 45°30'22.26"N, 62°36'40.20"W Elevation - 194m

WTG 3 - 45°30'24.49"N, 62°36'8.00"W Elevation - 201m

WTG 4 - 45°30'14.57"N, 62°36'27.31"W Elevation - 201m

Barrington (LAT/LONG WGS84)

WTG 1 - 43°31'10.59"N, 65°39'44.87"W Elevation - 26m

WTG 2 - 43°31'18.92"N, 65°39'54.55"W Elevation - 32m

Both sites will be using wind turbine generators (WTGs) with base to tip heights of 135m a.g.l. and rotor diameters of 87 meters.

I am not sure if you have standardized forms for the purpose of this assessment, if so, please send along.

Thank you,

--

Andrew Arbuckle

**B. Eng, Eon WindElectric**

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*Mobile: +1 902 401 1076*

*Fax: +1 866 314 5349*

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Andrew Arbuckle <aarbuckle@eonwind.com>

---

## Initial analysis no impact - outside consultation zone(s) - New Glasgow WTA-1160

---

ADIN.SWITZER@forces.gc.ca  
<ADIN.SWITZER@forces.gc.ca>  
To: aarbuckle@eonwind.com

Mon, Jul 25, 2011 at 4:28 PM

Andrew,

We have completed the initial analysis of the proposed wind farm under the project name New Glasgow near New Glasgow NS. We have assigned a DND case number of WTA-1160, please include this number in any future requests related to this site.

The results of our analysis have shown that in relation to the Department of National Defence (DND) consultation zones outlined on our website [ <http://www.airforce.forces.gc.ca/8w-8e/units-unites/page-eng.asp?id=692> ] and in the RABC/CanWEA document Technical Information and Coordination Process Between Wind Turbines and Radio Communication and Radar Systems the site will have no or minimal impact to DND Operations. As such, with respect to the Department of National Defence; Air Traffic Control, Air Defence Radars and DND airports and NAVAIDS we have no objections with your project as submitted.

If however, the layout were to change/move, please re-submit that proposal for another assessment using the assigned WTA number listed above. The concurrence for this site is valid for 24 months from date of this email. If the project should be cancelled or delayed during this timeframe please advise this office accordingly.

It should be noted that our office looks at each submission on a case by case basis and as such, concurrence on this submission in no way constitutes a concurrence for similar projects in the same area, nor does it indicate that similar concurrence might be offered in another region.

Finally, the concurrence offered in this email extends only to the subject projects and current proponent. Should the project or any part of it be altered, or be sold to another developer, this office must be notified and we reserve the right to reassess the project.

Thank you for your patience on this matter and for considering DND radar and airport facilities in your project development process.

If you have any questions feel free to contact me.

Thanks.

Switzer, Adin B.

- > Capt
- > AEC Liaison Officer
- > CCISF/ESICC
- > ATESS/ESTTMA
- > Défense nationale | National Defence

- > 8 Wing Trenton, Astra, ON K0K 3W0
  - > TEL: [613 392-2811](tel:6133922811) [Ext4834](tel:6133922811) (CSN: 827-4834)
  - > FAX: [613 965-3200](tel:6139653200)
  - > Gouvernement du Canada | Government of Canada
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  - >
  - >
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-



January 8, 2013

Your file  
043 MacLellans Brook  
Our file  
12-2938

Mr. Andrew Arbuckle  
Eon WindElectric Inc.  
200-300 Prince Albert Road  
Dartmouth, NS  
B2Y 4J2

**RE: Wind Farm: Preliminary Study Area - MacLellans Brook, NS**

Mr. Arbuckle,

We have completed a preliminary evaluation of the captioned proposal and NAV CANADA foresees no objection to the project as submitted. Let me emphasize however that our assessment is limited to the impact of the proposed physical structure on the air navigation systems and installations. The area we have evaluated consists of the following parameters:

- 1 N45° 29' 50.9050" W62° 35' 55.2179"
- 2 N45° 29' 51.4084" W62° 36' 41.6385"
- 3 N45° 30' 30.8234" W62° 35' 55.1293"
- 4 N45° 30' 31.1214" W62° 36' 41.6580"
  
- Maximum Turbine Height Including the Blade at 12 O'clock position : 426.5092'
- Maximum Ground Elevation (above sea level): 750'

As soon as a final layout becomes available a new Land Use Proposal is required to be submitted to NAV CANADA with the specifics of all the turbines to be erected at this site (locations, ground elevations, number and dimensions of turbines).

Our analysis also indicates the close proximity to the two airports: Thorburn (CCZ5) and Trenton (CYTN) and the operators of these airports should be consulted regarding this proposal.

The nature and magnitude of electronic interference to NAV CANADA ground-based navigation aids, including RADAR, due to wind turbines depends on the location, configuration, number, and size of turbines; all turbines must be considered together for analysis. The interference of wind turbines to certain navigation aids is cumulative and while initial turbines may be approved, continued development may not always be possible.

If you have any questions, contact the Land Use Department by telephone at 1-866-577-0247 or e-mail at [landuse@navcanada.ca](mailto:landuse@navcanada.ca).

NAV CANADA's land use evaluation is valid for a period of 12 months. Our assessment is limited to the impact of the proposed physical structure on the air navigation system and installations; it neither constitutes nor replaces any approvals or permits required by Transport Canada, Industry Canada, other Federal Government departments, Provincial or Municipal land use authorities or any other agency from which approval is required. Industry Canada addresses any spectrum management issues that may arise from your proposal and consults with NAV CANADA engineering as deemed necessary.

Yours truly,

A handwritten signature in black ink, appearing to read "Aleksandar Trandafilovski".

Aleksandar Trandafilovski  
for  
David Legault



Andrew Arbuckle &lt;aarbuckle@eonwind.com&gt;

---

## MacLellans Brook Wind Farm

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Andrew Arbuckle &lt;aarbuckle@eonwind.com&gt;

Tue, Jan 8, 2013 at 1:56 PM

To: bruce.paige@sobeys.com

Bcc: "Trandafilovski, Aleksandar" &lt;Aleksandar.Trandafilovski@navcanada.ca&gt;

Hi Bruce,

Please see the attached map and letter of response from NAV Canada.

What we have done is submit an area of probable turbine locations (i.e. 4 geographic coordinates), for assessment with NAV Canada. At this point in time we are proposing the installation of 4 wind turbines, and there is the possibility for the installation of a 5th. When we have completed what we call micrositing, which includes optimizing for wind energy capture and environmental sensitivities, we will forward you the geographic coordinates, ground elevations and total heights above sea level. The time period for completion of micrositing will be within the next two months.

On another note, would you be able to forward the contact information for the operator of the Thorburn airport? I tried the number a couple of times, without a response.

Please do not hesitate to contact me with any questions or concerns.

Regards,

Andrew

—  
Andrew Arbuckle**B. Eng, Eon WindElectric***Office: +1 902 482 8687**Mobile: +1 902 401 1076**Fax: +1 866 314 5349**200-300 Prince Albert Rd.**Dartmouth, NS B2Y 4J2*[www.eonwind.com](http://www.eonwind.com)

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### 2 attachments

**12-2938 Letter to proponent - NAV Canada.pdf**

94K

**043 EA 11 20121219 site layout.pdf**

4355K

## **Appendix 3: Environmental Protection Plan**

# **McLellans Brook Wind Farm (6MW)**

## **DRAFT Environmental Protection Plan**

**McLellans Brook Wind Project  
1573 Brookville Road  
Brookville, Nova Scotia**

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DRAFT

## **Section A – Introduction**

### **1.0 General**

The McLellans Brook Wind Farm (Project) is proposed as a six megawatts (MW) wind energy installation about 10 kilometers (km) south of New Glasgow in Pictou County. The site is located in the community of McLellans Brook which is approximately 2km east of Forbes Lake, which is a Protected Water Area under Nova Scotian legislation.

Figures of the site can be found in Appendix A. Watercourses and wetlands have been preliminarily identified on or near the site as shown in Appendix A; generally the site is high and dry though it is within headwaters of small tributaries that drain to Forbes Lake to the west and McLellans Brook to the east. Alterations to watercourses and wetlands will be avoided. Similarly rare flora and fauna have been identified and will be avoided by the Project.

### **2.0 Environmental Protection Plan**

This Environmental Protection Plan (EPP) describes protection measures that will limit the environmental effects associated with construction and operation of the Project. The EPP identifies Project mitigation measures to support Project planning, construction and operation.

The EPP is a guide for contractors, sub-contractors and site personnel associated with the Project. It includes commitments made in the Nova Scotia Environmental Assessment (EA) Registration Document. The guide should be adhered to accordingly.

This draft version of the EPP is being submitted with the Provincial EA registration document. This allows public and regulator comments on the EA and this draft EPP to be reflected in the final EPP. Further this EPP will be updated as necessary subsequent to additional wetland field work on Project site and associated final design of the Project. The final EPP will be shared with Contractor and regulators such as Nova Scotia Environment (NSE) and Nova Scotia Department of Natural Resources (DNR).

### **3.0 Objective**

The purpose of the EPP is to provide guidelines and protocol regarding environmental protection measures relating to the Project. The EPP will also provide emergency

information in the event of an incident on site. It is intended to direct the work completed by the contractors, sub-contractors and site personnel to ensure environmental protection.

#### **4.0 Training**

The Project Manger is responsible for ensuring that all personnel on site have a level of training that is commensurate with their responsibilities.

### **Section B – Erosion and Sediment Control**

#### **1.0 General**

Construction and large scale earth-moving projects have the potential to speed up erosion when large areas of soil are exposed to rain and stormwater runoff. The runoff must be properly handled to avoid siltation in nearby watercourses. The Project site is partially located within the boundaries of Zone 2 Protected Water Area according to the Forbes Lake Watershed Protected Water Area Regulations (Regulations).

The Proponent and its contractors are responsible for erosion and sediment control specific to their activities within the Project site. This section details protocols and procedures for effective sediment and erosion control measures in accordance with the Erosion and Sediment Control Handbook for Construction Sites, 1988 (ESCH) and the Regulations. The Proponent will conform to both sets of regulations and guidelines, conforming to the most stringent when applicable.

The Project footprint was delineated with input from the results of wetland identification and botanical surveys. Direct alteration to watercourses and wetlands is avoided and a 50m buffer is proposed with the exception of upgrade of one existing culvert in low flow season. The limits of work was designed in part to minimize potential of sedimentation of watercourses and wetlands; however, as with an earth work activity, there remains some potential for sedimentation if erosion and sediment control measures are not well managed during or after heavy storm events. Hence erosion and sedimentation control is essential to this Project.

#### **2.0 Protocol**

- a) The Proponent must consult with the Water Works Operator (Operator) and NSE prior to any road construction, watercourse alteration, or tree harvesting. Refer to Appendix B: Forbes Lake Watershed Protected Water Area Regulations.

- b) The Contractor must prepare a sediment and erosion plan and establish erosion and sediment control measures prior to construction activities.
- c) Earth works should be avoided during heavy rainfalls or periods of high runoff. Where extreme events are forecast, the site shall be temporarily stabilized where possible.
- d) The Contractor will avoid areas subject to flooding, including defined watercourses and wetlands. While the Project footprint avoids these locations, the lay down areas must be selected to avoid natural drainage and preserve existing runoff channels, e.g., ditching.
- e) Sedimentation fencing and vegetative filters (e.g., hay bales) will be installed as needed, i.e., downgradient of exposed soil areas. Detail on proper installation of such measures can be found in the ESCH, e.g., keying in of sedimentation fencing.
- f) As per Section 17(3) of the Regulations, water must not be released that has a suspected solids concentration greater than 25 mg/L within the Protected Water Area. The Project Manager will take samples and submit for analysis should visible sedimentation of surface water exiting the constructed site be noted, or at the request of the Water Works Operator or NSE.
- g) Notify the Water Works Operator immediately if a release of sediment has been observed in the tributaries to Forbes Lake as per the Regulations.
- h) Extent and duration of exposed soil will be minimized as much as possible, i.e., expose the smallest feasible area and only areas that are being actively developed.
- i) Care will be taken to minimize tracking of sediment from vehicles on Brookville Rd. from the access road. This area will be checked daily by the Contractor and swept as needed.
- j) After grading is completed, the Contractor will stabilize exposed soils as soon as reasonably possible, including placing gravels and establishing permanent vegetation.
- k) Sediment and erosion control measures will be monitored daily during active construction by the Project Manager or designate. Monitoring will continue post construction after excessive precipitation events until the site is stabilized.

## **Section C – Wetlands and Watercourses**

### **1.0 General**

It is imperative that all contractors and on-site personal understand the importance of avoiding watercourses and wetlands. Small (<100m<sup>2</sup>) wetlands were identified within the Project boundary, as well as linear wetlands along linear features defined by ridge slopes on either side. The Project was planned to avoid direct alteration on all wetlands and watercourses, and by use of a minimum 50m buffer, the Project activities will minimize potential indirect impact.

There is one location where an existing culvert will be upgraded. This will be done in accordance with NSE and DNR requirements and during the summer low flow period and in compliance with the Nova Scotia Watercourse Alteration Specification (2006). Accordingly no effect on fish or fish habitat is expected from the Project.

As the Project avoids fresh water habitat and marine environs, the Department of Fisheries and Oceans (DFO) does not have a direct interest in this Project; however, should the Contractor not follow the site plan and this EPP and negatively impact fish or fish habitat, the Fisheries Act could be invoked by DFO. Accordingly, the Contractor must conduct on-site operations in a manner that causes minimal disturbance to receiving waters, e.g., no releases of heavily sediment laden water or hazardous materials, e.g., fuel.

If additional wetland field work and final design do not allow a 50m buffer zone, NSE and DNR will be contacted. Work will be completed in accordance with the Nova Scotia Wetland Conservation Policy, and appropriate approvals will be sought, if necessary, from NSE under the Activity Designation Regulations, including wetland compensation if required.

This EPP will be updated accordingly pending additional work and final design in spring of 2013.

### **2.0 Protocol**

- a) Road construction and watercourse alteration will comply with Section 10 of the Regulations.
- b) The Project site is a suitable distance (i.e., beyond 50m) from wetlands and watercourses with one exception. Work areas, including lay down locations, will include this buffer zone as per the McLellans Brook EA. There shall be no

- fording of watercourses nor will there be excavating or infilling of watercourses or wetlands.
- c) The one exception is the need to upgrade the existing wood roads watercourse crossing for the construction of the electrical distribution line from Irish Mountain Road; this work requires a culvert upgrade and will be completed between June 1 and September 30 in accordance with NSE and DNR regulatory requirements. Work will be in compliance with the Nova Scotia Watercourse Alteration Specification (2006).. DNR and NSE will be consulted; specific mitigations for this work will be included in the final EPP.
  - d) The Project Manager will define the limits of site work as it relates to wetlands by flagging boundaries and defining appropriate buffers. All on-site personal will be informed of these sensitive areas as identified on mapping in Appendix A.
  - e) The disposal of any substance into a watercourse, directly or indirectly, is strictly prohibited during all phases of the Project.
  - f) As per Section B, erosion and sediment control measures must be accurately followed to preserve the highest degree of water quality protection.
  - g) Temporary work spaces, e.g., laydown areas, are not permitted within 50m of a watercourse or wetland.
  - h) All refueling activities must take place with a 100m setback from all watercourses and wetland areas (see Section E for additional detail on hazardous materials).
  - i) All on-site equipment must be mechanically sound. No fuel or hydraulic leaks are permitted; accordingly, equipment must be inspected daily (see Section F for additional detail on equipment maintenance).
  - j) Any potential pollutants are to be stored above flood limits and 100m minimum from watercourses and wetlands for this Project as per the Regulations and within appropriate containment. Storage and transport of gasoline or oil within the Project boundaries will conform to Section 13(2) of the Regulations.

## **Section D – Wildlife**

### **1.0 General**

The Project Manager is responsible for ensuring all contractors and on-site personnel are provided with appropriate information and protocols in the event of a wildlife encounter and potential to encounter species at risk or of concern. Wildlife sightings should be

reported to the Project Manager. All reasonable action will be taken to avoid disruption and injury to any wildlife encountered.

## **2.0 Protocol for Wildlife Encounters**

- a) Harassing wildlife in any manner is strictly prohibited on site.
- b) There will be no interaction or feeding of wildlife on site.
- c) To minimize the potential for attracting wildlife, all on-site personnel must use the garbage disposal units provided.
- d) Equipment and vehicles will yield to wildlife.
- e) Injured or deceased wildlife should be reported to the Project Manager who will then contact a Provincial Wildlife Officer to aid or remove the animal. Personnel are prohibited from making direct contact with the animal.
- f) Any unlawful or accidental killing of wildlife must be reported to the Project Manager as soon as reasonably possible.
- g) The possession or use of firearms on site is strictly prohibited.

## **3.0 Protocol for Nesting Birds**

- a) Site clearing is scheduled to take place during nesting bird season (i.e., April 1 to August 31 for most birds). An experienced ornithologist will be commissioned to complete a nesting bird survey prior to site clearing. The survey results will be issued to DNR and Canadian Wildlife Service (CWS).
- b) If nesting birds are encountered during construction, the Contractor will not disturb the nest. The sighting must be reported to the Project Manager immediately for direction.
- c) If the Project Manager requires advice in avoiding the nest, a Regional Biologist at the DNR and the CWS may be contacted. The nest will not be disturbed until the fledglings have left the nest.

## **4.0 Monitoring for Bird and Bat Carcasses**

- a) As per the requirements of CWS and Environment Canada (EC), follow up and monitoring plan will be developed for the site and implemented once approved by

CWS and EC. This work will be in accordance with the two 2007 guidance documents from EC: Wind Turbines and Birds: A Guidance Document for Environmental Assessment and Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds. Results will be communicated in an annual report to NSE, CWS and EC.

- b) The Project Manager will be notified of any bird or bat carcasses that are found on the site during regular maintenance checks, e.g., within the area of the turbine pad.
- c) The Project Manager will log the discovery of a bird or bat carcass found during routine inspections. The information logged should include: species; date and time the carcass; state of decomposition; estimated number of days the bird has been deceased; and injury sustained (if identifiable). The Project Manager will contact CWS for advice on subsequent actions, such as potentially freezing the carcass to send to CWS. Any discovery outside of the formal carcass surveys will be included in the formal annual report.

#### **5.0 Protecting Species at Risk and of Concern**

- a) The Tender Sedge has been identified in the field as part of rare plant surveys; this is noted in Appendix A. While not a provincially or federally listed species, it is a DNR Yellow Ranked species. This colony (approximately 2m by 1m) was found within a vernal pool that has been identified as an area to avoid with a minimum of 50m buffer. The Project Manager will ensure that this area is appropriately delineated and that the Contractor is aware of its location (45.504399N, 62.604104W).
- b) There is moderate potential for Wood Turtle to be present in the local area of the Project site. Wood Turtle are a provincially and federally listed species, i.e., Threatened (Canada) & Vulnerable (NS). There is potential for potential for Wood Turtles to nest in stream beds or in road shoulder, i.e., sandy/graveling substrate. during late May - early July. Accordingly the site personnel will be educated by the Project Manager on the potential presence of the Wood Turtle; DNR education materials will support this training. If any site personnel identify a Wood Turtle or the potential of a nest, the Project Manager will be notified immediately. The Project Manager will contact DNR with any questions and to share findings.
- c) Surveys have been completed for Mainland Moose; while no evidence was found of Mainland Moose in the local area based on the survey, observations within 10km have been made in the past. Should the any personnel observe a Moose in

the Project area or immediate environs of the Project, they will notify the Project Manager immediately. The Project Manager will notify DNR of these findings.

## **Section E – Hazardous Waste Management Including Spills**

### **1.0 General**

As per Section 13(1) of the Regulations, no person is permitted to release or cause or permit the release of oil, petroleum products, soap, detergent, toxic chemicals, pest control product waste, garbage, litter, solid or liquid waste, or any other material that causes or may cause an adverse effect within the Protected Water Area. In the event of an accidental spill or hazardous waste incident, the primary concern is preventing the spill from entering a watercourse or wetland. Responding to the incident as quickly as possible will ensure a minimized risk of adverse environmental impact. At all times when hazardous materials are on-site, there must be operational personnel on site that are trained to handle, store, and dispose of hazardous materials.

### **2.0 Protocol**

- a) Spills or releases that are contained within the site will be the responsibility of the Project Manger; further assistance will be needed to respond to larger or more serious spills. See Appendix B for emergency contact table.
- b) For a spill of greater than 100L of fuel, oil, paints or sealants, the Project Manager will report to Nova Scotia Environment (1-800-565-1633) and the Operator (902-755-2237).
- c) If the spill has, or may enter, any watercourse or wetland, or the spill cannot be removed safely, the 24-hour spill reporting number (1-800-565-1633) will be called regardless of the estimated size of the spill.
- d) Should any release of hazardous materials occur in the Protected Water Area, the Project Manager will notify the Water Works Operator.
- e) The Contractor will be equipped with an emergency spill containment kit that will adequately control the loss of fuel or lubricant.
- f) Only personnel with specific training in spill containment may attempt to respond to a release of a hazardous material.

- g) A common method for controlling and containing spills is through the use of absorbents. Common materials used are: sand, dirt, gravel and wood chips. If used, the contaminated absorbent must be collected and placed in appropriate containers with proper labeling.
- h) Fuel, fuel storage, lubrication and equipment maintenance will be done at a designated site away from watercourses or wetlands. The area must be on level terrain, and ideally have an impermeable surface and containment system. The area must not be within 100m of the ordinary high water mark of a body of water.
- i) All dangerous goods must be transported in accordance with federal and provincial legislation.
- j) All hazardous material must be stored in an approved container in accordance with federal and provincial legislation.
- k) All hazardous materials must be disposed of at an approved facility in accordance with provincial and federal legislation.
- l) Products must be properly labeled and handled only by trained on-site personnel.
- m) A Material Safety Data Sheet (MSDS) will be kept on site to record all hazardous material inventory stored on site. The MSDS will be kept on file for emergency response teams in the event of a fire or explosion.

## **Section F – Use and Maintenance of Equipment and Vehicles**

### **1.0 General**

The Contractor is responsible for appropriate use and maintenance of equipment such that safety is considered at all times. Air emissions and noise will be minimized, as will be the potential for leaks and spills.

### **2.0 Protocol**

- a) All on-site personnel must comply with provincial and federal restrictions as it relates to transportation and vehicle management, specifically sections 13 and 19 of the Regulations.
- b) All drivers will obey local traffic laws, including speed limits, and practice safe, defensive driving.

- c) The Project Manager will coordinate with the RCMP and Nova Scotia Transportation and Infrastructure Renewal (NSTIR) to ensure proper permitting and safe transport of wide or heavy loads.
- d) All construction equipment and vehicles must be suitably clear of debris and cleaned / pressure washed if necessary before being brought to the site to reduce transport of invasive species.
- e) Equipment must undergo routine maintenance to minimize noise impacts. See Section I, 3.0 for a discussion on noise.

## **Section G – Waste Management**

### **1.0 General**

Wastes created during construction of the Project are the responsibility of the Contractor completing the construction activities. In terms of operation, wastes again are responsibility of the party completing the activity, e.g., regularly scheduled turbine maintenance. Hazardous waste management was addressed in Section E.

### **2.0 Protocol**

- a) Section 14 of the Regulations states that no person is permitted to establish a dump, landfill or waste disposal site within the Protected Water Area. Waste disposal will be carried out off Protected Water Area lands.
- b) Recycle and re-use solid and liquid (e.g., fuel, oil, solvents) waste, where possible; dispose of all remaining waste as per provincial and federal guidelines.
- c) Sewage and grey wastewater collected on site should be disposed of according to provincial standards and according to Section 12 of the Regulations.
- d) Proper garbage disposal units must be provided on site. All litter and site waste should be collected daily and disposed of at an approved facility.
- e) Burning any products is strictly prohibited.
- f) Merchantable timber shall be cut into lengths for salvage at discretion of Contractor with non-merchantable timber chipped and disposed of according to provincial standards. Section 7 of the Regulations will be applied when harvesting wood for the construction of roads and laydown areas.

## **Section H – Contingency and Emergency Response**

### **1.0 General**

All reasonable precautions will be taken by the Project Manager and on-site personnel to avoid an accident or injury. In the event of an accident or injury, preparation and quick response is crucial in minimizing adverse effects to on-site personnel and the environment. This section outlines plans and protocols for reasonably conceivable emergencies that could take place on site. The Emergency Responses Table is Appendix C with relevant contact information beyond calling 911.

### **2.0 Explosion or Fire**

Explosion or fire may occur on site as a result of many different factors, some of which include: vehicle accidents, combustion of spilled material, negligent handling of flammable materials or vandalism.

The Project Manager is responsible for having appropriate fire fighting equipment on site and available to respond to minor fires, if it is safe to do so. There must be personnel on site at all times that are trained to use this fire protective equipment, such as fire extinguishers.

In the event of a fire:

- a) Contact 911 Emergency Services for assistance.
- b) If the fire is minor and it is safe and feasible to do so, a trained member of staff may attempt to extinguish the fire. Only individuals trained in the proper use of fire extinguishers may attempt to extinguish the fire.
- c) Personal protective equipment will be used by all responding personnel to ensure protection from the fire and other hazardous materials potentially emitted in the process.
- d) The area will be carefully monitored to ensure the fire has been completely extinguished.

As a preventative measure against fire, smoking is allowed in designated smoking areas only as defined by the Project Manager. These areas must be greater than 50m away from all flammable or hazardous materials.

### **3.0 Personal Injury or Fatality**

If an accident or fatality does occur on site, the following actions will be taken immediately:

- a) All personal injuries and accidents will be responded to immediately. Appropriate first aid measures will be employed provided the measures will not further aggravate the victim.
- b) Only individuals with current First Aid Certification will perform the first aid. The severity of the injury should be assessed; 911 Emergency Services will be contacted if additional medical attention is required.
- c) In the event of a fatality, contact 911 immediately and respond as further directed.
- d) In the event of injury or fatality, the Project Manager will be informed as soon as possible.

### **4.0 Discovery of Human Remains**

In the event suspected human remains are encountered on site, the following action will be taken:

- a) Cease all work related activities and secure the site to avoid further disturbance.
- b) Contact 911 services for further assessment of the remains.
- c) If it is determined that the remains are human, representatives of the Nova Scotia Department of Communities, Culture and Heritage will be contact as soon as reasonably possible. If the remains or arte
- d) facts discovered are potentially of Mi'kmaq significance, KMK will also be notified.

### **5.0 Cultural Artefacts**

If a suspected cultural artefact is found:

- a) The Project Manger will stop all work in the vicinity of the artefact and secure the site to avoid further disturbance.

- b) The Department of Communities, Culture and Heritage and the KMK will be contacted for advice and further assessment as appropriate.

## **6.0 Emergency Response Table**

In the event of any emergency where police (RCMP Stellarton Office), fire (New Glasgow), or ambulance is required for response as soon as possible, call 911. Otherwise, the emergency response table in Appendix C has additional contacts related to the Project.

## **Section I – Site Management**

### **1.0 General**

During the Project construction and operations phases, the Project Manager is responsible for appropriate site management. In addition to the various aspects of site management already addressed in the EPP, site access and signage, noise and light management and monitoring are key to minimizing impact on the environment and human receptors, such as neighbours.

Associated requirements for community liaison and resolution in the event of complaints are addressed in Section J.

### **2.0 Site Access and Signage**

- a) Public access to the Project site is prohibited. “Restricted Access” signs will be posted at the entrance to the access road.
- b) A gate will be installed at the entrance road to the Project site to prevent unauthorized site access.
- c) Appropriate signs will be placed on site during operation indicating the danger of falling ice, e.g., ice throw potential from the turbine blades or flying debris.
- d) As defined in Section J, signage will contain contact information of the Proponent.

### **3.0 Noise**

During construction, noise will be generated from vehicles and equipment and related activities. The closest residence is greater than 600m from the Project site; it is anticipated that any inconvenience caused by construction is a temporary, short term nuisance. Should any public annoyance result from construction of the Project, it is expected to be very low and will be mitigated via the Contractor measures as noted below and community liaison as per Section J of this EPP.

To mitigate construction noise, the following will be adhered to by the Contractor.

- a) Ensure that all vehicles are maintained properly and have appropriate noise suppression equipment.
- b) Where possible, use rubber tire equipment.
- c) Reduce idling, where practical.
- d) Minimizing noise by training of employees on management practices such as avoiding use of loud radios, shouting excessively, slamming of equipment doors, etc.

Blasting may be required as part of this work; if so, a protocol will be included in the final EPP. Work will be in accordance with regulatory requirements.

If noise complaints are made by community residents, a complaint resolution procedure is followed. Where possible, the Project Manager will alter the construction planning to accommodate concerns (see Section J).

The Project will use commercially reasonable efforts to limit construction activities to the daytime. Should the Project Manager require work to be completed during nighttime hours, the Project Manager will use the community liaison protocols outlined in Section J.

During operation of the wind turbine, there will be turbine noises that may be audible in terms of low-level continuous or intermittent swooshing, as well as low level frequencies. While noise is expected to be at very low levels at these distances from the turbines (greater than 600m from closest residence), it is important that neighbours are informed that some increase to baseline sound pressure level is expected though it is expected to be inaudible under most conditions. Further, the community has been provided with contact information to share any questions or concerns with the Proponent. Community consultation and complaint resolution is discussed in Section J.

While no follow up monitoring of noise is proposed for this Project, it may be an outcome of the complaint resolution procedure (Section J) if concerns exist.

#### **4.0 Lighting**

Lighting can impact birds as well as neighbours. Like noise, consultation and complaint resolution should address issues respecting lighting with neighbours (see Section J).

Primary aspects in lighting as applied to this Project are:

- a) Lighting on the turbines is required to comply with aviation legislation (Transport Canada).
- b) Preparation of a lighting plan in consultation with Canadian Wildlife Service and Transport Canada.
- c) Proponent will review use of LED lighting that has a definite on/off setting as recommended by Environment Canada.
- d) Any required lighting on ancillary buildings will be shielded to shine down.

#### **5.0 Project Monitoring Requirements**

- a) During active construction, ongoing monitoring will occur by the Contractor. Primarily this will involve erosion, site stabilization, and equipment maintenance including checking for leaks. The Project Manager will perform intermittent inspection of the Contractor's activities respecting compliance with Contract documents including this EPP.
- b) Operation and maintenance will be coordinated by the Project Manager. The staff and contractors will report issues to the Project Manager as identified in this EPP, including but not limited to destabilized surfaces (i.e., exposed soil), bird or bat carcass discovery, as well as vandalism and other issues.
- c) Malfunctions and parts replacement will be assessed on an ongoing basis during operation and are subject to calendar maintenance and regular inspection schedules.
- d) As defined in Section D, 4.0, ongoing inspections during maintenance visits will include a review of area around wind turbine pad for bird / bat carcasses with notification of the Project Manager if any are found. Post construction requirements as per CWS and the Department mandates will also be followed, including design, implementation and annual reporting of the bird and bat follow up program.
- e) Given the scope of this Project, no noise monitoring is required; however, noise monitoring will be considered in the event of public complaints (see Section J).

## **Section J – Community Liaison**

### **1.0 General**

The Project Manager will ensure that the community is updated on project planning, construction activities and commissioning of the wind turbine. As this is a community energy project, liaison with the community is integral in the planning. This also ensures that any neighbours or other interested community members with questions or concerns will have Proponent contact information such that their questions or concerns can be promptly addressed.

In the event of public complaints, the Project Manager will ensure that the complaints are addressed via respectful communication, including joint fact finding, and review and implementation of mitigation measures as appropriate.

### **2.0 Communication and Notification**

- a) The Project Manager will provide advance notice to neighbours concerning construction and operational phases via mail outs. Information will include construction schedule, defined activities that are expected to create noise and their expected duration, mitigation measures that are being used and noise respite periods, i.e., quiet times. Expectations in terms of potential noise and lighting during operation of the turbine will also be conveyed in the information prior to commissioning.
- b) A website is constructed for communication with stakeholders, including neighbours (<http://wattswind.com>). This will be updated with construction schedule and other announcements.
- c) Site information signage will be present at gated entry to site with Proponent contact details for stakeholders to gather more information.
- d) Both signage and mail outs will have Proponent contact information such that all comments or complaints will be forward to the Proponent contact for review. See Appendix C for contact information; this list will be updated as appropriate.
- e) The Proponent contact information and copies of the Environmental Assessment should be made available via the Stellarton Public Library and at The Pictou County Chamber of Commerce, as well as on the Department's website.

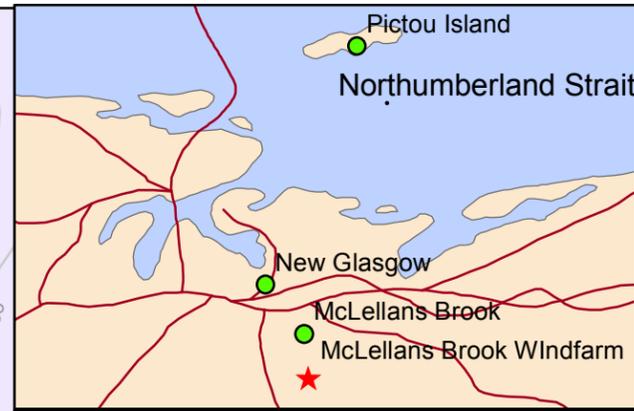
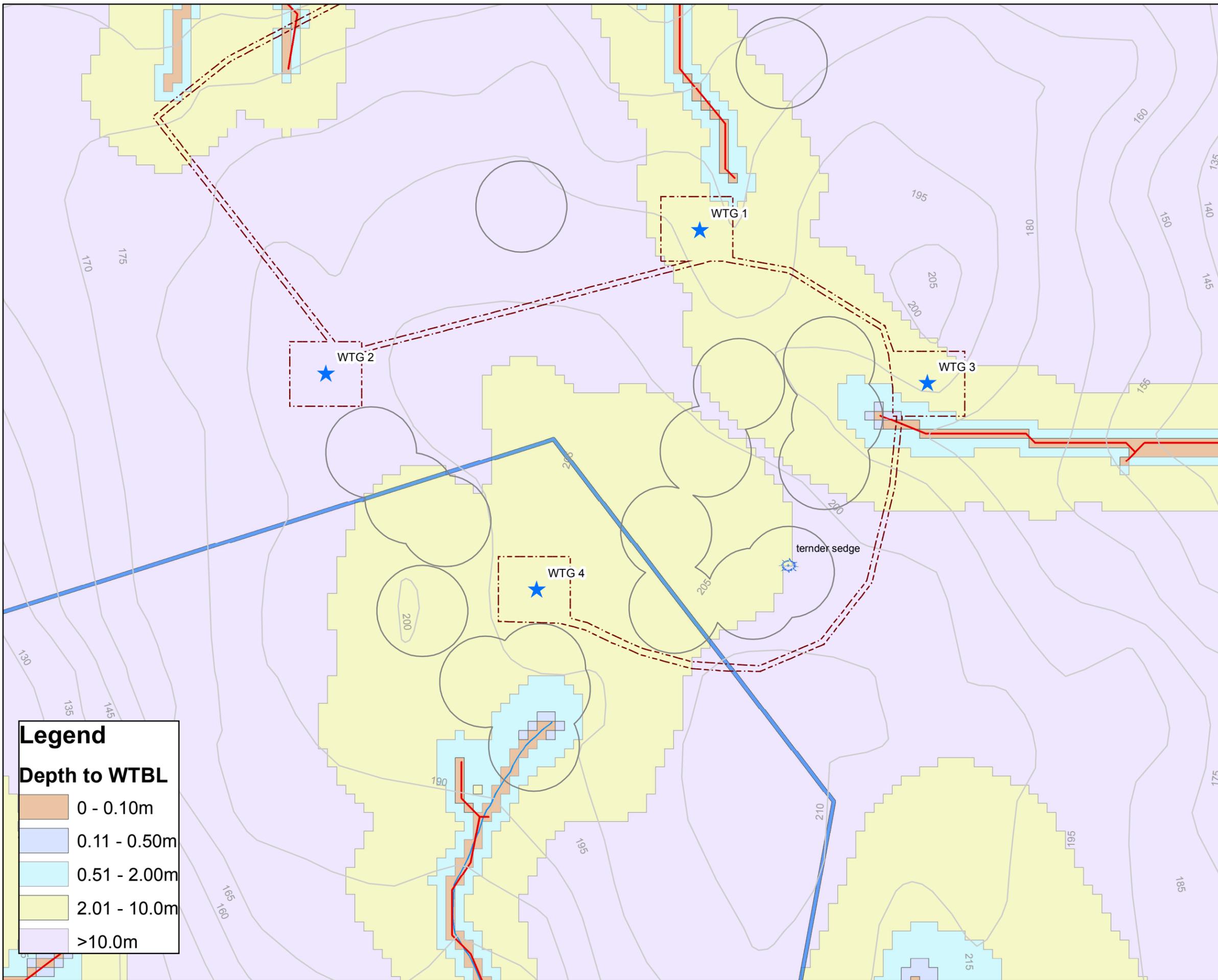
- f) Comment forms will be made available in the mail out to facilitate communication of concerns or questions with the Proponent.

### **3.0 Complaint Resolution Protocol**

- a) Complaints or comments will be reviewed by the Project Manager or designate.
- b) Within a maximum of one week from receiving the communication, the Project Manager or designate will provide an initial response to the question or concern.
- c) Where a member of public expresses a concern, the Proponent will seek to better understand the perspective of the community member and the specifics of the complaint. The Proponent and community member will embark on joint fact finding to identify the source of the complaint and possible mitigative measures.
- d) The Project Manager will review possible mitigations available in consultation with the Proponent management team. These options will be discussed openly with the community member. Efforts will be made to contact a member of the Watershed Advisory Committee, where concern relates to Forbes Lake Protected Water Area, or a member of the Community Liaison Committee (CLC) should a CLC be formed for the Project.
- e) Appropriate and reasonable action will be taken to mitigate impacts caused by the Project, including noise monitoring, landscaping, etc.
- f) In the unlikely event that complaints cannot be resolved directly with the community member, the Proponent will seek review options in a form of alternate dispute resolution as defined under the *Nova Scotia Environment Act*, including but not limited to conciliation, negotiation, mediation or arbitration. It is expected that most if not all concerns can be addressed directly with the resident or other stakeholder.

**Appendix A – Site Plan**

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### Legend

- ★ WTG
- ⊙ Tender Sedge
- Watercourse
- Flow Channel
- Contour Lines (5m)
- Road/Laydown area
- 50m wetland buffer
- Watershed Zone 2

**Legend**

**Depth to WTBL**

- 0 - 0.10m
- 0.11 - 0.50m
- 0.51 - 2.00m
- 2.01 - 10.0m
- >10.0m

FIGURE 4.3

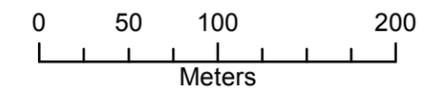
Groundwater/Surface Water/Wetlands

Drawn by: AWA

Date: 2013/01/02

Project #: 2012043

Scale @ 11"x17"



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



**Appendix B – Forbes Lake Watershed Protected Water Area  
Regulations**

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This consolidation is unofficial and is for reference only. For the official version of the regulations, consult the original documents on file with the [Registry of Regulations](#), or refer to the [Royal Gazette Part II](#).

Regulations are amended frequently. Please check the list of [Regulations by Act](#) to see if there are any recent amendments to these regulations filed with the Registry that are not yet included in this consolidation.

Although every effort has been made to ensure the accuracy of this electronic version, the Registry of Regulations assumes no responsibility for any discrepancies that may have resulted from reformatting.

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## Forbes Lake Watershed Protected Water Area Regulations

made under Section 106 of the  
*Environment Act*  
S.N.S. 1994-95, c. 1  
N.S. Reg. 107/2003 (May 22, 2003)

### Citation

**1** These regulations may be cited as the *Forbes Lake Watershed Protected Water Area Regulations*.

### Interpretation

**2** In these regulations,

- (a) "Act" means the *Environment Act*;
- (b) "agricultural operation" means a farming unit that
  - (i) houses livestock or where livestock graze or are pastured,
  - (ii) has greater than 5 ha of land in forage production, or
  - (iii) has greater than 5 ha of land in annual crop production,or to which any combination of subclauses (i) to (iii) applies;
- (c) "Committee" means the Forbes Lake Watershed Management Committee;
- (d) "Department" means the Department of Environment;
- (e) "forestry operation" means any activity related to the use of a forest for producing timber, wood fiber or Christmas trees, including but not limited to the following activities:
  - (i) forest management planning,
  - (ii) silviculture,
  - (iii) harvesting,
  - (iv) protection,
  - (v) road construction,

(vi) operation, storage and use of equipment and supplies used in any aspect of the activity;

(f) "Minister" means the Minister of Environment;

(g) "nutrient management plan" means a plan for collecting, storing, handling, transporting, applying, treating, using and disposing of agricultural fertilizer, compost, manure and other materials containing nutrients that may be applied to lands, in a manner that prevents the impairment of the quality of the water in the Protected Water Area;

(h) "pesticide" or "pest control product" has the same meaning as set out in clause 2(q) of the *Pesticide Regulations* made under the Act;

(i) "professional forester" means a graduate of a recognized Canadian university with at least a bachelor's degree in forestry;

(j) "Protected Water Area" means the land and water designated by the Minister pursuant to subsection 106(1) of the Act as the Forbes Lake Watershed Protected Water Area, as described in Schedule "A" to the designation;

(k) "release" means to spill, discharge, dispose of, spray, inject, inoculate, abandon, deposit, leak, seep, pour, emit, empty, throw, dump, place, drain, pump or exhaust;

(l) "total degradation time" means the time for the initial concentration of toxic components to biodegrade to the maximum acceptable level permitted in the latest edition of the "Guidelines for Canadian Drinking Water Quality" published by Health Canada;

(m) "Water Works Operator" means the New Glasgow Water Utility, operator of the Forbes Lake Municipal Water Works;

(n) "Zone 1" means the area of land situated within the Protected Water Area and designated as Zone 1, as described in Schedule "A" to the designation;

(o) "Zone 2" means the area of land situated within the Protected Water Area and designated as Zone 2, as described in Schedule "A" to the designation.

**[Note: the references to the Department in clauses (d) and (f) have been updated in accordance with Order in Council 2008-161 under the *Public Service Act*, R.S.N.S. 1989, c. 376, effective April 1, 2008.]**

### **Application**

3 Unless otherwise stated, these regulations apply to both Zone 1 and Zone 2.

### **Restricted activities**

4 (1) No person is permitted to swim, bathe, wash, or cut ice at any time in Forbes Lake or any other watercourse within Zone 1.

(2) No person is permitted to fish from the shoreline or bank of Forbes Lake within 100 m of the intake for the water supply.

(3) No person is permitted to wash a vehicle in any watercourse or within 60 m of the shoreline or bank of any watercourse within Zone 1.

(4) No person is permitted to, at any time, operate a vessel of any kind, on, through or over Forbes Lake or any watercourse in Zone 1, other than for the protection of the Protected Water Area and unless authorized by the Water Works Operator.

(5) No person is permitted to fill a gasoline tank or transfer any liquid fuel from tank to tank on or within 100 m of the shoreline or bank of Forbes Lake or any watercourse within the Protected Water Area, except for the purpose of operating the Forbes Lake Water Treatment Facility or a purpose reasonably incidental to the maintenance of private property.

### **Posting of signs**

5 (1) The Water Works Operator must post signs around the perimeter of the Protected Water Area to provide notice to the general public of the designation of the Protected Water Area.

(2) The Water Works Operator must replace any signs posted under subsection (1) that have been damaged or removed.

(3) The Water Works Operator must take reasonable measures to advertise and provide notice to the general public of these regulations.

(4) No person is permitted to remove or alter any sign, notice or advertisement posted pursuant to this Section.

#### **Fire restrictions**

**6 (1)** No person is permitted to set, start, maintain or be responsible for an open fire in the Protected Water Area except for an open fire in a barbecue or fireplace designed for cooking purposes at a residential dwelling in the Protected Water Area.

(2) Despite subsection (1), during the period from April 15 to October 15 of each year, a person may set, start, maintain or be responsible for a fire in the Protected Water Area if

(a) the person has a valid permit to burn issued pursuant to the *Forest Fire Protection Regulations* made under the *Forests Act*; and

(b) the person complies with the permit to burn and the *Forest Fire Protection Regulations*.

#### **Forestry operations**

**7 (1)** No person owning property in excess of 5 ha is permitted to undertake a forestry operation within the Protected Water Area unless the operation is conducted pursuant to a forest management plan that is

(a) prepared by a professional forester in accordance with the objectives and policies approved by the Committee; and

(b) approved in advance by the Water Works Operator.

(2) Despite subsection (1), a person who owns or occupies property in the Protected Water Area may harvest from the property

(a) less than 20 cords of wood in any one year; or

(b) any amount of wood, so long as it is for their own use.

(3) A forestry operation within the Protected Water Area must be conducted in accordance with the *Wildlife Habitat and Watercourses Protection Regulations* made under the *Forests Act* and the "Forest/Wildlife Guidelines and Standards for Nova Scotia" issued by the Department of Natural Resources, or its successor document or code of practice, as amended from time to time.

#### **Road construction and watercourse alteration**

**8 (1)** No person is permitted to construct a forest access or wood lot road within the Protected Water Area without first obtaining the written approval of the route location from the Water Works Operator.

(2) A person who is responsible for a forest access or wood lot road constructed under subsection (1) must maintain and repair the road.

**9 (1)** No person is permitted to construct a bridge or culvert or otherwise alter a watercourse within the Protected Water Area without first obtaining

(a) the written approval from the Water Works Operator; and

(b) an approval from the Department.

(2) An owner, operator or person responsible for a bridge or culvert approved under subsection (1)(a) must maintain and repair the bridge or culvert; and

(b) is not permitted to remove the bridge or culvert without first obtaining an approval from the Department.

**10** The construction of a forest access or wood lot road, stream crossing, culvert or other watercourse alteration within the Protected Water Area must be in accordance with the *Wildlife Habitat and Watercourses Protection Regulations* made under the *Forests Act* and the publication "Wood Lot Roads, Stream Crossings" issued by the Department of Natural Resources, or its successor document or code of practice, as amended from time to time.

#### **Pest control products**

**11 (1)** No person is permitted to use a pest control product within Zone 1 except with prior written permission from the Water Works Operator.

**(2)** No person is permitted to use a pest control product within Zone 2 that contains toxic components having a total degradation time in water exceeding 1 year, except with the prior written permission of the Water Works Operator.

**(3)** A pest control product used in an agricultural operation within Zone 1 must be applied only by a certified applicator and only if recommended for use by a professional agrologist and approved under subsection (1).

#### **On-site sewage disposal systems**

**12 (1)** No person is permitted to install an on-site sewage disposal system within the Protected Water Area without first obtaining an approval from the Department.

**(2)** No person is permitted to construct or install or cause the construction or installation of an on-site sewage disposal system contrary to the *On-site Sewage Disposal Systems Regulations* and the terms and conditions of an approval issued by the Department.

**(3)** An on-site sewage disposal system in Zone 1 must be pumped and inspected every 4 years according to the policy described in the "Forbes Lake Watershed Management and Protection Strategy" established by the Committee.

#### **Prohibition on release of substance**

**13 (1)** No person is permitted to release or cause or permit the release of oil, petroleum products, soap, detergent, toxic chemicals, pest control product waste, garbage, litter, solid or liquid waste, or any other material that causes or may cause an adverse effect within the Protected Water Area.

**(2)** A person who is using mechanical equipment or transporting gasoline or oil within the Protected Water Area is not permitted to release, and must take precautions to prevent the release of, a petroleum product onto the ground or into a watercourse or the runoff from the area.

#### **Prohibition on landfills**

**14** No person is permitted to establish a dump, landfill or waste disposal site within the Protected Water Area.

#### **Agricultural restrictions**

**15 (1)** An agricultural operation undertaken within the Protected Water Area must be conducted according to a nutrient management plan prepared by a qualified person in consultation with the Water Works Operator.

**(2)** No person is permitted to pasture livestock within Zone 1 at stocking rates in excess of the carrying capacity of the pasture, as determined in the nutrient management plan for the person's agricultural operation.

**(3)** No person is permitted to stockpile or accumulate manure in Zone 1

**(a)** within 100 m of any watercourse, well, or drainage ditch, including a public highway ditch; or

**(b)** anywhere within Zone 1 where the slope of the land exceeds 5%.

**(4)** No person is permitted to apply manure to land in Zone 1 during the period from October 1 in each year to April 30 in the next year.

**(5)** No person is permitted to apply manure to land in Zone 1 during the period from May 1 to September 30 in each year unless

- (a) the application is approved in advance by the Water Works Operator;
- (b) the application complies with requirements respecting separation distances from watercourses, wells, and drainage ditches, as determined by the Water Works Operator in consultation with the owners of land in Zone 1; and
- (c) the application rate does not exceed the rate specified in the nutrient management plan for the person's agricultural operation.

#### **Easement restriction**

**16** No person is permitted to construct a road, pipeline, railway, telephone line, power line or other similar development or grant an easement on, over or across the Protected Water Area, without first obtaining the written approval of the Water Works Operator.

#### **Erosion and sediment control**

**17 (1)** No person is permitted to authorize or commence an operation to extract peat, gravel, rock or minerals within the Protected Water Area.

(2) No owner, occupier, contractor or person responsible for a construction operation or an activity within Zone 1 requiring grubbing or earth moving that would expose more than 250 m<sup>2</sup> of subbase at any time is permitted to proceed unless they have

(a) developed an erosion and sedimentation control plan as described in the "Erosion and Sedimentation Control Handbook for Construction Sites", published by the Department; and

(b) obtained the prior written approval of the Water Works Operator.

(3) No person is permitted to release water that has a suspended solid concentration greater than 25 mg/L from a construction site within the Protected Water Area.

**18** If sedimentation occurs in a watercourse within the Protected Water Area, an operator or person responsible for the sedimentation must undertake immediate action to install erosion and sediment control measures, and immediately notify the Water Works Operator.

#### **Home heating oil tanks and fuel storage tanks**

**19 (1)** No person is permitted to install a home heating oil tank, a gasoline fuel storage tank, or a diesel fuel storage tank within the Protected Water Area unless the tank is supported by concrete footings and has a leak detection device and is

(a) made of stainless steel double wall construction;

(b) made of fibreglass; or

(c) approved prior to installation in writing by the Water Works Operator.

(2) A home heating oil tank, a gasoline fuel storage tank, or a diesel fuel storage tank within the Protected Water Area that is not located inside a dwelling or other building must be equipped with a fuel line guard.

(3) A gasoline fuel storage tank or a diesel fuel storage tank within the Protected Water Area must be surrounded with a concrete containment capable of holding 110% of the volume of the tank.

(4) No person is permitted to install or construct a home heating oil tank, a gasoline fuel storage tank, or a diesel fuel storage tank within the Protected Water Area that

(a) holds more than 1136 L; or

(b) is located underground.

**Consultation with the Committee**

**20** The Water Works Operator shall consult with the Committee before granting any authorization or approval required by these regulations.

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Last updated: 28-10-2011

**Appendix C – Emergency and Project Contact Information**

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<i>Organization</i>	<i>Contact Name/ Service</i>	<i>Address</i>	<i>Phone Number</i>
Plymouth Volunteer Fire Department	Mike Conway	R.R. 2 New Glasgow B2H 5C5 <a href="mailto:mikeconway@eastlink.ca">mikeconway@eastlink.ca</a>	(902) 755-3229
Stellarton RCMP Detachment		177 North Foord St. P.O. Box 1389, Stellarton, NS B0K 1S0	T: (902)755-4141 F: (902)755-2691
Poison Control	NS Poison Information Centre		1(800) 565-8161
CANUTEC	Dangerous Goods Emergencies		1 (613) 996-6666 (collect) *666 (cellular)
Regional Spill Reporting Number	24 hour Emergency and Environmental Response		1 (800) 565-1633 or (902) 426 –6030
Hospital	Aberdeen Regional Hospital	835 East River Road New Glasgow, Nova Scotia B2H 3S6	(902) 752-7600
Nova Scotia Power Inc.	Report Power Interruption		1 (877) 428-6004
Watts Wind Energy Inc.	Stan Mason, President	200- 300 Prince Albert Road, Dartmouth	1 (902) 482-8687
Eon WindElectric Inc.	Paul Pynn, President	200- 300 Prince Albert Road, Dartmouth	1 (902) 430-0819
Eon WindElectric Inc.	Trevor Hennigar, Project Engineer		1 (902) 719-7691
Nova Scotia Department of Labour	Occupation Health & Safety Division		1 (800) 952-2687
Nova Scotia Department of Transportation & Public Works	24 Hour Service		1 (902) 742-4612
<u>Kwilmu'kw Maw-klusuaqn Negotiation Office</u>	Eric Christmas	851 Willow Street, Truro, NS B2N 6N8	(902) 843 3880

<i>Organization</i>	<i>Contact Name/ Service</i>	<i>Address</i>	<i>Phone Number</i>
Pictou Landing First Nation	Chief Andrea Paul	6537 Pictou Landing Road, Trenton, NS B0K 1X0	1-902-752-4912
Department of Tourism, Culture and Heritage	Laura Bennett Coordinator, Special Places		(902) 424-6475
Department of Natural Resources	Mark Pulsifer, Regional Wildlife Biologist	190 Beech Hill Road RR#6 Antigonish, B2G 0B4	1-902 863-7523 pulisfmd@gov.ns.ca

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## **Appendix 4: Municipal Development Permits**

# MUNICIPAL DEVELOPMENT PERMIT

PERMIT No.: 120246-159

DATE: October 18,2012

THIS PERMIT IS ISSUED TO: [REDACTED] – Owner &  
Watts Wind Inc. - Lessee

TO: erect two (2) Utility Scale Wind Turbines

AT: Brookville Road (P.I.D. #65204786), Pictou County, N.S.

AS STATED IN YOUR APPLICATION AND APPROVED BY THE MUNICIPAL DEVELOPMENT OFFICER OF THE PICTOU COUNTY SHARED SERVICES AUTHORITY. ALL WORK MUST BE CARRIED OUT IN ACCORDANCE WITH THE LAND-USE BY-LAW FOR THE MUNICIPALITY OF THE COUNTY OF PICTOU. ANY VIOLATION OF ANY OF THE TERMS OF THE ABOVE NOTED WORK SHALL BE CAUSE FOR IMMEDIATE REVOCATION OF THIS PERMIT.

**NOTE: THIS PERMIT MUST BE DISPLAYED IN A CONSPICUOUS PLACE ON THE PREMISES FOR THE ENTIRE PERIOD OF WORK ACTIVITY.**

  
SENIOR MUNICIPAL DEVELOPMENT OFFICER



Pictou County  
Shared Services  
Authority

P.O. Box 2500, Stellarton  
Nova Scotia B0K 1S0

# MUNICIPAL DEVELOPMENT PERMIT

PERMIT No.: 120245-158

DATE: October 18,2012

THIS PERMIT IS ISSUED TO: [REDACTED] – Owner &  
Watts Wind Inc. - Lessee

TO: erect two (2) Utility Scale Wind Turbines

AT: Brookville Road (P.I.D. #00889139), Pictou County, N.S.

AS STATED IN YOUR APPLICATION AND APPROVED BY THE MUNICIPAL DEVELOPMENT OFFICER OF THE PICTOU COUNTY SHARED SERVICES AUTHORITY. ALL WORK MUST BE CARRIED OUT IN ACCORDANCE WITH THE LAND-USE BY-LAW FOR THE MUNICIPALITY OF THE COUNTY OF PICTOU. ANY VIOLATION OF ANY OF THE TERMS OF THE ABOVE NOTED WORK SHALL BE CAUSE FOR IMMEDIATE REVOCATION OF THIS PERMIT.

**NOTE: THIS PERMIT MUST BE DISPLAYED IN A CONSPICUOUS PLACE ON THE PREMISES FOR THE ENTIRE PERIOD OF WORK ACTIVITY.**



SENIOR MUNICIPAL DEVELOPMENT OFFICER



**Pictou County  
Shared Services  
Authority**

P.O. Box 2500, Stellarton  
Nova Scotia B0K 1S0

## **Appendix 5: Avian Bird Reporting**

# **Pre-construction Baseline Fall Migration Surveys at the Proposed Forbes Lake Wind Development**

Andrew G. Horn

## **Summary**

This document summarizes the results of spring migration and breeding bird surveys at the proposed wind turbine project at Forbes Lake, near New Glasgow, Nova Scotia. These surveys consisted of 10 visits from 2 September to 7 November 2012, to conduct transects and passage migration watches.

The overall passage rate was 9 birds/h. Some of these birds were likely migrants, but no large movements or species at risk were seen. These results show that there is some migration through the site, but using the criteria of EC 2007b, together with earlier results from spring and summer surveys, suggest that the Site Sensitivity is Low

## **Background information**

Construction of up to 5 turbines (5-7 MW total) is planned for a site at Forbes Lake, near New Glasgow, Nova Scotia. An initial evaluation of the required preconstruction bird surveys (in consultation with EC 2007a, b) classed the site as having High Sensitivity, because it is near the north side of the Nova Scotia Uplands and thus on a landform that might concentrate birds. As a precautionary approach, the site was treated as having a Very High Site Sensitivity, pending the results of preconstruction surveys.

The size category of the project ( $\leq 5$  turbines) is Small, so the Level of Concern was initially judged to be at least Category 2. Given the uncertainties expressed above, and applying a precautionary approach, the site was treated as Category 4, until baseline surveys were completed.

## **Methods**

All fieldwork and data compilation was done by Ken McKenna.

The site was visited ten times during the autumn migration period from September 2 to November 7, with an attempt to visit on days with suitable tail winds (Table 1). Visits included 7 1-2 h passage counts from a vantage point with a full view of the turbine area (Figure 1) and 7 transect surveys along the transects described in Horn (2012), which also describes further details of the methods.

## **Results**

During transects, mostly summer or permanent resident species were encountered (Table 2). Species seen on few days but in high numbers, and thus likely migrants, included Cedar Waxwings, Common Grackles, and Evening

Grosbeaks, but were not particularly concentrated at the site (Table 1).

On passage counts, again some of the birds seen were presumably local residents, but some were likely migrants (Table 3), despite no strong directionality in flights through the area overall (Figure 2). The largest flocks were 35 Cedar Waxwings (2 Sep), 6 American Goldfinches (11 Sep), 25 gulls (2 flocks on 8 Oct), 20-25 finches (2 flocks on 7 Nov), and 6 Canada Geese (7 Nov). All other sightings were of 1-3 birds at a time. No species at risk or particularly rare species were seen.

Because Canada Geese had been noted during the surveys, on 7 November, the observer checked for waterfowl in the beaver pond in Churchville. There were 250 Black Ducks, 60 Green-winged Teal, 3 Mallards, 1 recognizable Mallard X Black Duck hybrid, 1 Northern Pintail, and 2 American Wigeon. There was also a large flock of Canada Geese in Forbes Lake.

In total, 217 birds were seen in 24 hours, yielding a pooled passage rate of 9 birds/h.

## **Conclusions**

The results do not suggest that the project area particularly concentrates migrants, consistent with similar findings of the spring survey. Similarly, the breeding bird survey did not reveal any particularly sensitive features within the project area. Overall, these results suggest that the Site Sensitivity (EC 2007b) is Low.

## **References**

Environment Canada, Canadian Wildlife Service (EC). 2007a. Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds.

Environment Canada, Canadian Wildlife Service (EC). 2007b. Wind Turbines and Birds, A Guidance Document for Environmental Assessment.

Horn, A.G. 2012. Pre-construction Baseline Spring Migration and Breeding Bird Surveys at the Proposed Forbes Lake Wind Development. Report for Eon WindElectric, August 2012.

**Table 1.** Sampling effort and weather conditions.

Date	Start	Length (min)	Method	Temp (°C)	Wind		Cloud cover
					speed (km/h)	direction	
2 Sep	11:10	60	passage	16	10	NE	40%
	12:53	167	transect	17	10	NE	60%
11 Sep	13:40	60	passage	16	30	NW	40%
12 Sep	8:15	155	transect	16	10	W	0%
	11:10	65	passage	18	10	NW	0%
24 Sep	8:00	127	transect	16	10	N	20%
	10:30	105	passage	16	10	NW	40%
28 Sep	8:15	85	transect	3	15	W	0%
	10:30	120	passage	10	15	NW	20%
6 Oct	9:10	100	transect	14	20	SW	0%
8 Oct	11:30	75	passage	11	30	WNW	50%
9 Oct	8:30	108	transect	4	20	NE	100%
14 Oct	8:45	90	transect	1	13	SW	100%
7 Nov	12:50	120	passage	2	15	NNE	0%

**Table 2.** Species detected during transects.

Species	Days found	Max. flock size	Total found	Total/day
Canada Goose	3	1	3	0.43
Ruffed Grouse	3	1	4	0.57
Yellow-bellied Sapsucker	3	3	6	0.86
Downy Woodpecker	2	1	2	0.29
Hairy Woodpecker	3	1	4	0.57
Northern Flicker	1	1	2	0.29
Pileated Woodpecker	1	1	1	0.14
Blue-headed Vireo	3	2	6	0.86
Red-eyed Vireo	2	5	13	1.86
Blue Jay	4	2	12	1.71
American Crow	5	2	8	1.14
Common Raven	4	2	7	1.00
Black-capped Chickadee	6	7	80	11.43
White-breasted Nuthatch	2	1	2	0.29
Brown Creeper	4	2	9	1.29
Golden-crowned Kinglet	5	3	23	3.29
Ruby-crowned Kinglet	2	1	2	0.29
Hermit Thrush	3	1	3	0.43
American Robin	4	5	14	2.00
Cedar Waxwing	1	10	10	1.43
Northern Parula	2	2	5	0.71
Chestnut-sided Warbler	1	1	1	0.14
Magnolia Warbler	2	2	5	0.71
Black-throated Blue Warbler	2	1	2	0.29
Yellow-rumped Warbler	4	2	12	1.71
Black-throated Green Warbler	3	2	13	1.86
Blackburnian Warbler	2	2	4	0.57
Blackpoll Warbler	2	2	4	0.57
Black-and-white Warbler	2	2	3	0.43
Ovenbird	3	3	6	0.86
Mourning Warbler	1	1	1	0.14
Common Yellowthroat	3	4	7	1.00
White-throated Sparrow	5	8	30	4.29
Dark-eyed Junco	6	7	27	3.86
Common Grackle	1	20	20	2.86
Purple Finch	3	2	8	1.14
Pine Siskin	3	1	3	0.43
American Goldfinch	4	2	5	0.71
Evening Grosbeak	5	4	18	2.57

**Table 3.** Species detected during passage counts. “Flocks” are separate detections of one or more individuals; “detections” is the sum of birds across all flocks. Median height above ground level was estimated as 0-10 m, 10-50 m, 50-100 m, or > 100 m; maximum values for each height class given here, with 150 m given for heights > 100 m.

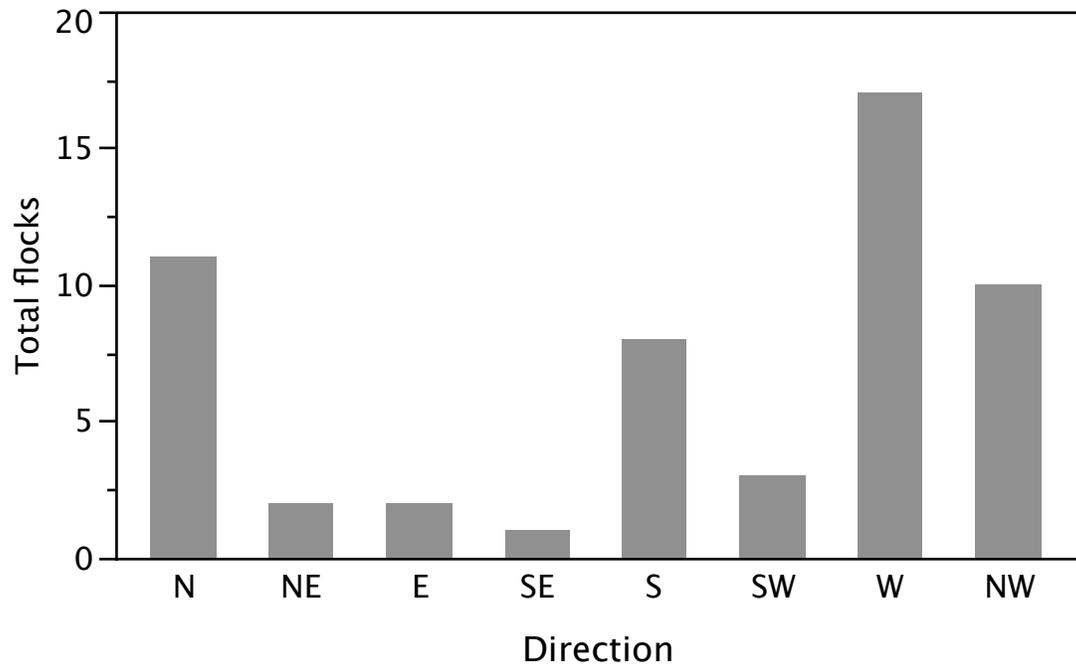
Species	Flocks	Detections	Median height (range)
Canada Goose	1	6	50
Bald Eagle*	12	19	150 (50-150)
Red-tailed Hawk	4	3	150
Unidentified Raptor	1	1	100
Gull sp.	3	51	150 (50-150)
Northern Flicker	3	2	50
Blue Jay	9	7	50 (50-100)
Common Raven	17	24	100 (50-150)
American Robin	5	1	50
Cedar Waxwing	2	37	30 (10-50)
Pine Grosbeak	1	2	
Purple Finch	4	2	30 (10-50)
White-winged Crossbill	1	2	
Pine Siskin	1	1	50
American Goldfinch	8	10	50 (10-50)
Evening Grosbeak	2	4	100
Finch sp.	2	45	30 (10-50)

\*7 of the “flocks” and 15 of the detections were on one day (7 Nov).

**Figure 1.** Vantage point for passage counts.



**Figure 2.** Flight direction of flocks (including flock size = 1) seen during passage counts.



# **Pre-construction Baseline Spring Migration and Breeding Bird Surveys at the Proposed Forbes Lake Wind Development**

Andrew G. Horn

## **Summary**

This document summarizes the results of spring migration and breeding bird surveys at the proposed wind turbine project at Forbes Lake, near New Glasgow, Nova Scotia. These surveys consisted of 21 visits from 14 April to 12 July 2012. Methods included point counts, transects, area searches, passage migration watches, and owling.

The surveys did not reveal any high sensitivity factors for migrating or breeding birds (e.g., colonies, staging area), nor any species at risk (except for one Canada Warbler 300m from the site), and few migrants were seen. The results suggest that the Site Sensitivity (EC 2007b) is Low, pending results of autumn migration surveys.

## **Background information**

Construction of up to 5 turbines (5-7 MW total) is planned for a site at Forbes Lake, near New Glasgow, Nova Scotia. An initial evaluation of the required preconstruction bird surveys (in consultation with EC 2007a, b) classed the site as having High Sensitivity, because it is near the north side of the Nova Scotia Uplands and thus on a landform that might concentrate birds. As a precautionary approach, the site was treated as having a Very High Site Sensitivity, pending the results of preconstruction surveys.

The size category of the project ( $\leq 5$  turbines) is Small, so the Level of Concern was initially judged to be at least Category 2. Given the uncertainties expressed above, the site was treated as Category 4, at least until spring and summer baseline surveys were completed.

## **Methods**

All fieldwork and data compilation was done by Ken McKenna.

### *Spring migration*

The site was visited during the main spring migration period, April 15 to May 31, with an effort to visit every three days during the peak migration period (May 1-21) and every five days outside that period. Most visits included a line transect and point counts between dawn and four hours after sunrise (Table 1). The line transect (the shortest line connecting all the point count stations) was initially planned to follow the methods in EC 2007a, but was found to detect the same birds as in the point counts, so after the first few visits it was only used to detect any species not detected during the point counts. Point counts were conducted approximately every 250m along each transect (Figure 1). Each lasted 5 minutes (initial trials showed that extending the time to 10 minutes gained few additional individuals). All detections were estimated as occurring within 50, 100, or >100 m from the observer. The line transect and point counts were accompanied by less

standardized area searches, focused on searching for species or habitats that are suspected of being present but missed by the other methods. Suitable days for daytime migration (i.e., those with no precipitation and light to moderate tail winds) included passage migration counts totaling 4 h and 40 min, following the methods in EC 2007a, noting flight heights, positions, and directions relative to the proposed turbines. One evening visit (29 April) searched for crepuscular species, such as American Woodcock, and owls (using playback).

### *Breeding season*

CWS protocols (EC 2007a) recommend that a breeding bird survey last at least 4-10 days between late May and July. The present site was small, so it presumably falls at the low end of that range. Given that it had already been visited throughout May as part of the migration surveys, only four additional visits were made, across at least two weeks as recommended in EC 2007a (Table 1). Methods were as described above, except the point counts were 10 min long and no passage counts were done.

### *Disposition of data*

All data were georeferenced and formatted to be compatible with the Wind Energy Bird & Bat Monitoring Database hosted on the website of Bird Studies Canada (<http://www.bsc-eoc.org/birdmon/wind/main.jsp>), for later uploading to that site.

## **Results**

### *Spring migration*

No obvious migrants (i.e., non-breeding species, mixed flocks, or birds passing through the entire site) were encountered during the spring transects and point counts. Passage counts detected 27 individuals of 13 identified species, none of which, based on species identity, flight height, or flight direction, could be definitively identified as migrants (Table 2). The overall passage rate was 5.8 birds/h (27 individuals in 4.7 h observation).

Flight paths lacked strong directionality overall, and most birds seen were flying well below turbine height (Table 2), suggesting local movements rather than migration.

### *Breeding bird survey*

Birds breeding at the site were widespread species typical of the habitats they were found in, although they do include several Partners in Flight Priority Species and species known to have flight displays (Table 3). No species at risk were found, although one Canada Warbler was detected 600 m from the nearest (southernmost) turbine site (Figure 1) and Olive-sided Flycatchers and Canada Warblers were found breeding just over 2 km south of the southernmost turbine site (Figure 1). The one provincially Yellow-listed species that was detected (a Common Loon) was flying over the site, and likely breeds on Forbes Lake.

Additional species seen within 2 km of the study area, and not listed in Table 3,

included Osprey, Broad-winged Hawk, Fox Sparrow, Grey Jay, Boreal Chickadee, Nashville Warbler, and Chestnut-sided Warbler.

## **Conclusions**

The spring survey results suggest that the project area does not concentrate migrants, and the breeding bird survey results did not reveal any particularly sensitive features within the project area. Overall, these results suggest that the Site Sensitivity (EC 2007b) is Low, pending results of autumn migration surveys.

## **References**

Environment Canada, Canadian Wildlife Service (EC). 2007a. Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds.

Environment Canada, Canadian Wildlife Service (EC). 2007b. Wind Turbines and Birds, A Guidance Document for Environmental Assessment.

Rosenberg, K. V., and T. P. Hodgman. 2000. Partners in Flight Bird Conservation Plan for Eastern Spruce-Hardwood Forest (Physiographic Area 28).

**Table 1.** Sampling effort. Each visit included area searches, point counts, transects, and passage counts, except as noted.

<b>Date</b>	<b>Time</b>	<b>Duration</b>	<b>Comments</b>
14-Apr	08:15-10:30	2:15	Area search only
17-Apr	16:30-18:30	2	Area search only
21-Apr	05:30-9:00	3:30	
25-Apr	05:20-12:00	6:40	
29-Apr	05:15-10:00	4:45	
29-Apr	20:30-22:15	1:45	Night visit (for crepuscular and nocturnal species)
02-May	05:22-11:15	5:53	
05-May	05:35-10:20	4:45	
08-May	05:32-13:00	7:28	
11-May	05:20-08:20	3	No passage count
14-May	05:00-0920	4:20	
15-May	13:30-15:30	2:00	Passage only
18-May	05:06-12:00	6:54	No passage count
21-May	05:01-11:45	6:44	
24-May	04:50-11:30	6:40	
28-May	05:10-09:10	4:00	No passage count
31-May	05:09-12:40	7:31	
11-Jun	0450-0944	4:56	
22-Jun	0830-1420	5:50	Area search only
25-Jun	0501-0915	4:14	
12-Jul	0630-1130	5:00	

**Table 2.** Species detected during passage counts, with median height above ground level (estimated to 5 m if  $\leq 20$  m, to 10 m if  $> 20$ ), and number flying in no particular direction (⊙) or flying in each cardinal direction. Total watch time was 4h, 40 min.

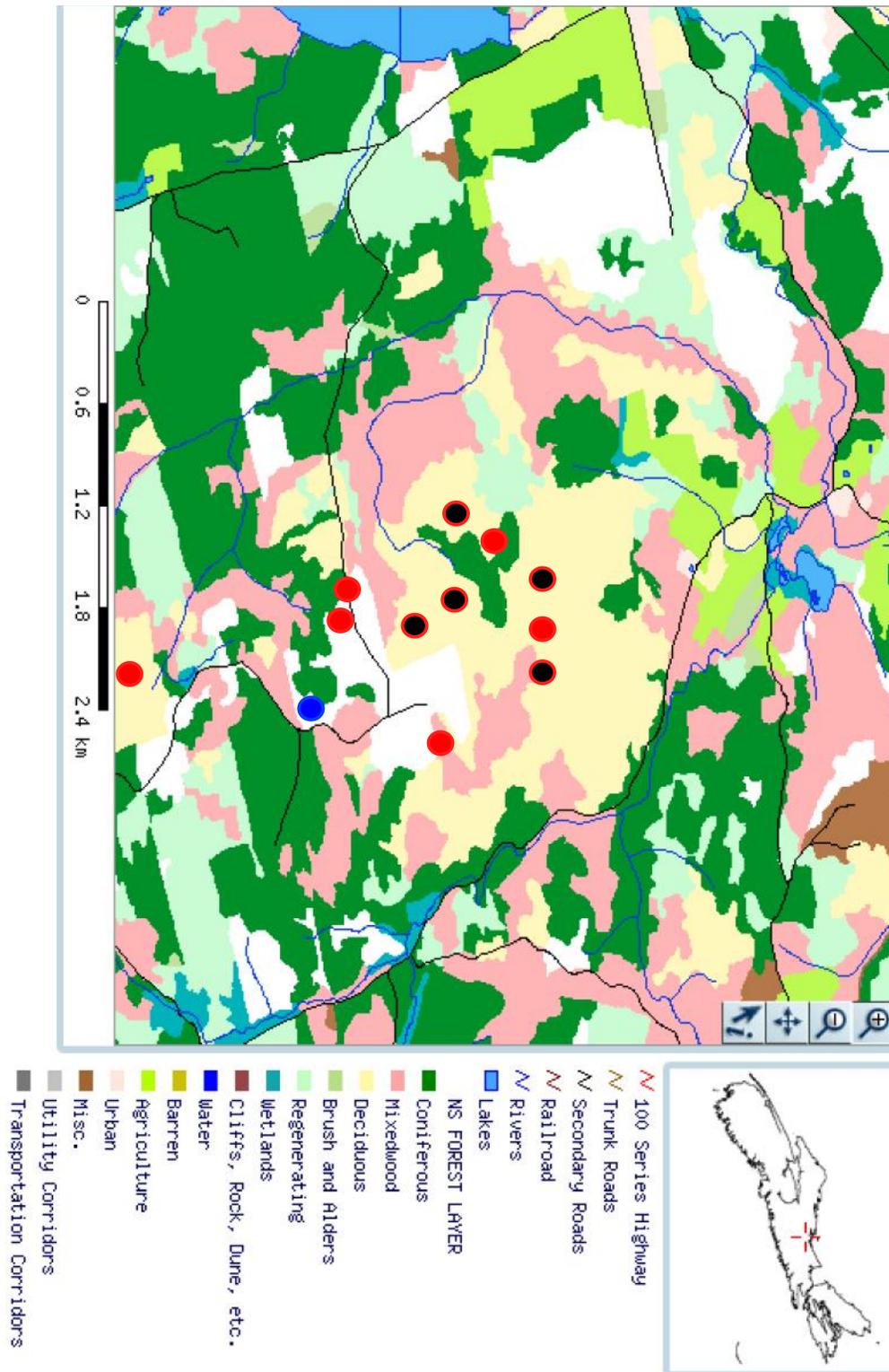
Species	Median height in m (range)	Flight direction					
		⊙	N	NE	E	S	W
Turkey Vulture	10				1		
Red-tailed Hawk	5 (5-5)		1		1		
American Kestrel	70		1				
Hairy Woodpecker	15	1					
Blue Jay	12.5 (12.5-5)	2					
Common Raven	50	1			1		
Tree Swallow	15 (15-15)				2		
American Robin	5				1		
Yellow-rumped Warbler	32.5 (32.5-15)	4				1	
Palm Warbler	15	1					
Unidentified Warbler	5					1	
Purple Finch	15 (15-15)				1		
Pine Siskin	7.5 (7.5-5)	3					
American Goldfinch	17.5 (17.5-5)	2			2		

**Table 3.** Breeding birds, with number per point count, breeding evidence, and Partners in Flight priority (Rosenberg and Hodgman 2000). Yellow-listed species in **bold**, species with flight display starred (\*).

Species	n/ count	Breeding code	PIF priority
Canada Goose	0.02	X	
Black Duck		X	
Ring-necked Pheasant	0.01	T	
Ruffed Grouse	0.25	T	PIF II
<b>Common Loon</b>	0.01	X	PIF IV
Pied-billed Grebe		X	
American Kestrel		H	
Red-tailed Hawk	0.02	T	
Wilson's Snipe*	0.01	X	
American Woodcock*	0.01	T	PIF I
Mourning Dove*	0.25	T	
Barred Owl	0.01	T	
Ruby-throated Hummingbird	0.01	H	
Belted Kingfisher	0.00	X	PIF II
Yellow-bellied Sapsucker	0.50	NY	PIF II
Downy Woodpecker	0.09	NY	
Hairy Woodpecker	0.12	NY	
Northern Flicker	0.23	T	
Pileated Woodpecker	0.07	T	
Unidentified Woodpecker	0.07	H	
Eastern Wood-Pewee	0.06	T	PIF II
Yellow-bellied Flycatcher		H	
Alder Flycatcher*	0.01	S	
Least Flycatcher	0.62	CF	PIF II
Blue-headed Vireo	0.47	CF	
Red-eyed Vireo	0.56	T	
Blue Jay	0.05	T	
American Crow	0.15	H	
Common Raven*	0.03	H	
Tree Swallow		H	
Black-capped Chickadee	0.66	NB	
Red-breasted Nuthatch	0.03	T	
White-breasted Nuthatch	0.01	H	
Brown Creeper	0.12	CF	
Winter Wren	0.05	T	
Golden-crowned Kinglet	0.06	CF	
Ruby-crowned Kinglet	0.13	T	
Veery	0.01	H	
Swainson's Thrush	0.23	CF	PIF II
Hermit Thrush	1.44	NE	
American Robin	1.20	FY	

Unidentified Thrush	0.00	S	
European Starling		X	
Cedar Waxwing	0.01	H	
Northern Parula	0.36	T	
Magnolia Warbler	0.22	T	
Cape May Warbler	0.01	X	PIF I
Blackpoll Warbler		X	PIF II
Black-throated Blue Warbler	0.21	NY	PIF II
Yellow-rumped Warbler	0.28	T	
Black-throated Green Warbler	0.44	T	PIF II
Blackburnian Warbler	0.06	T	PIF II
Bay-breasted Warbler	0.01	S	PIF I
Black-and-white Warbler	0.25	T	
American Redstart	0.08	T	
Ovenbird*	1.68	T	
Mourning Warbler	0.07	T	
Common Yellowthroat*	0.07	T	
White-throated Sparrow	1.04	T	
Dark-eyed Junco	0.29	NE	
Rose-breasted Grosbeak	0.01	S	
Red-winged Blackbird*	0.01	X	
Common Grackle	0.00	H	
Purple Finch*	0.41	D	PIF II
Pine Siskin	0.01	T	
American Goldfinch*	0.01	S	
Evening Grosbeak	0.10	T	

**Figure 1.** Approximate locations of proposed turbines (black), point counts (red), and Canada Warbler (blue) on forest cover map of site ([https://ca.nfis.org/provinces/ns/index\\_eng.html](https://ca.nfis.org/provinces/ns/index_eng.html)). Point counts were also conducted at each turbine location. The vantage point for migration watches was approximately 600m SE of the southernmost point count station.



## **Appendix 6: Bat Reporting**

**Pre-construction survey to determine bat species composition and activity  
at the proposed Forbes Lake Wind Project,  
Pictou County, Nova Scotia**

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## CONTEXT

Eon WindElectric, in association with Watts Wind Energy Inc., is proposing to install up to five electricity-generating wind turbines near Forbes Lake in Pictou County, Nova Scotia.

Industrial wind energy production is among the fastest growing sectors of the global energy industry, as the demand for renewable energy sources continues to increase (Nelson 2009). Advances in wind turbine technology have improved the cost-competitiveness of the wind energy sector, contributing to a significant increase in the number of wind energy installations around the globe during the last decade. In Canada, energy production and regulation falls under provincial jurisdiction, therefore most renewable energy targets are set at the provincial level. In the province's Renewable Electricity Plan, the Government of Nova Scotia sets an aggressive target of 40% of electricity needs met by renewable energy by the year 2020 (Nova Scotia Department of Energy 2010). Of this amount, 25% has been set as coming from made-in-Nova Scotia sources by 2015, and the wind energy sector is expected to be the largest contributor in meeting this goal (Nova Scotia Department of Energy 2010).

Despite the many environmental benefits of wind energy, the rapid growth of the wind energy sector around the globe has raised concerns regarding the impacts of these developments on both resident and migratory populations of wildlife (Arnett et al. 2008). Documentation of large numbers of bat fatalities at wind energy facilities has been a relatively recent development (Johnson 2005), gaining considerable attention. As a result, fatalities of bats have become a primary environmental concern associated with wind energy development.

Efforts to minimize conflicts between wildlife and wind energy have focused mainly on two areas: risk avoidance and impact mitigation (Weller and Baldwin 2012). Impact mitigation refers to those efforts focused on developing methods to reduce wildlife fatalities at operational wind facilities and does not apply to this project at this time. Risk avoidance involves conducting surveys prior to construction to avoid sites, or areas within sites, with high levels of usage by wildlife (Weller and Baldwin 2012). The assumption of this approach is that low indices of activity prior to construction should translate to low fatality rates post-construction (Baerwald and Barclay 2009). This report summarizes the methods and results of a pre-construction survey to assess the potential for the proposed Forbes Lake Wind Project to negatively impact local bat populations.

The objectives of this project were to:

- (1) Provide information on the occurrence and relative magnitude of bat activity in the proposed development area, based on analysis of capture and acoustic surveys;
- (2) Provide relevant information on the resource requirements of local bat species that may be useful for the decision-making process on the proposed development; and

- (3) Make relevant recommendations based on the results of this project and recent developments in the field of bats and wind energy.

This project is part of a large scale and ongoing research program titled “Characterization of bat movement patterns to inform the decision-making process about the potential risks of local wind energy developments on bat populations” that is co-funded by multiple industrial partners and the Natural Sciences and Engineering Research Council (NSERC). This report does not report on the larger program as the results are still pending, but is an interim report on the results of the 2012 field season at the specific study site.

## **BACKGROUND**

Currently in Nova Scotia there are >50 wind turbines in operation and, as of yet, we are not aware of any incidents of major mortality, though a number of bats have been killed. For context and qualification, most of these turbines have been in operation for only a short period of time (months to a few years) and it is not known how thoroughly existing operational turbines have been surveyed for bat fatalities and how well documented and reported the findings are. In the following sections we discuss the various means by which bats may be impacted by wind energy developments, including direct mortality, changes to habitat availability, and disruption of movement patterns (e.g., foraging, mating, migrations, or abandonment of sites).

### **Direct Mortality**

The proximate cause of bat fatalities at wind energy developments may be due to direct strike by the rotating turbine blades, collision with turbine towers, or by barotrauma, which involves tissue damage to the lungs due to rapid or excessive air-pressure reduction near moving turbine blades (Baerwald et al. 2008; Cryan and Barclay 2009), although the discussion as to the relative role of barotrauma in the death of bats is on-going (Capparella et al. 2012; Rollins et al. 2012). In North America, significant bat fatality events at wind energy developments occur primarily in the late summer and early fall, peaking during the period that coincides with fall migration (Arnett et al. 2008; Cryan and Brown 2007; Johnson 2005). These trends have led researchers to believe that migration plays a key role in the susceptibility of certain bat species to wind turbine fatalities (Cryan and Barclay 2009). Although some fatality has also been documented during the spring (Arnett et al. 2008; Brown and Hamilton 2006), numbers are much lower, thought to be a result of more scattered migratory behaviour, or possibly the use of different routes compared to fall migration.

The species most affected are the long-distance migratory bats, including the hoary bat (*Lasiurus cinereus*), the eastern red bat (*L. borealis*), and the silver-haired bat (*Lasionycteris noctivagans*). In North America, these species make up about 75-80% of the documented fatalities at wind energy developments, with the hoary bat alone comprising about half of all fatalities (Arnett et al. 2008; Kunz et al. 2007). The cumulative impacts of current mortality rates as a result of wind

turbines on these affected species could have long-term population effects (Kunz et al. 2007). Bat fatalities have also been reported in smaller numbers for resident hibernating bat species, including the big brown bat (*Eptesicus fuscus*), the little brown bat (*Myotis lucifugus*), the northern long-eared bat (*M. septentrionalis*), and the tri-colored bat (*Perimyotis subflavus*) (Arnett et al. 2008; Jain et al. 2007; Johnson 2005; Nicholson 2003). At some sites in the eastern United States high numbers of fatalities of these resident, hibernating species have been reported (Kunz et al. 2007).

Various explanations for the high incidence of bat fatalities at wind energy developments have been proposed (Arnett et al. 2008; Cryan and Barclay 2009; Johnson 2005; Kunz et al. 2007). Estimates of the number of bat fatalities vary widely from less than 3 bats/turbine/year (Johnson et al. 2003; Johnson et al. 2004) to upwards of 50 bats/turbine/year (Jain et al. 2007; Kerns et al. 2005; Nicholson 2003). Given the considerable variability in species composition and rates of bat fatalities among wind energy facilities, it is likely that location-specific qualities of individual facilities are important (e.g., located along migration routes or other flight corridors). It has also been proposed that the use of turbines with increasing height has extended developments further into the flight space used by migrating bats (Barclay et al. 2007). However, behavioural observations of bats displaying flight patterns typical of foraging activity prior to collisions with turbines puts the migration hypothesis to question (Horn et al. 2008). Others have hypothesized that collisions may result from bats being attracted to turbines out of curiosity, misperception, or as potential feeding, roosting, and mating opportunities (reviewed in Cryan and Barclay 2009). To date, the cause(s) of bat fatalities at turbines remains unclear and is an active area of research.

As mortalities may be the result of site-specific and design-specific characteristics and conditions, it is important to conduct site-specific monitoring studies to make reliable inferences on the potential impacts of a wind energy development on local bat populations (American Society of Mammalogists 2008).

### **Habitat Availability**

In forested landscapes, habitat availability for bats may be impacted by the alteration or removal of vegetation to accommodate roads and wind turbine installations. This may include the direct loss of resources (e.g., roost trees), fragmentation of habitat components (e.g., foraging and roosting areas), or other disturbance that may cause bats to vacate certain areas, likely acting to degrade the local environment for bat colonies/populations that reside in the area during the summer. This negative impact of new wind energy developments is likely to occur, and will contribute to the cumulative effect of habitat loss that is occurring throughout the range of most bat species.

At the site level, small-scale clearings in forested landscapes have been shown to attract certain bat species, which utilize these areas for foraging (Grindal and Brigham 1998; Hayes and Loeb 2007). Removal of vegetation can create edge habitat or small clearings which can act to

concentrate prey for bats. The extent to which this loss of vegetation can be perceived to be beneficial to bats is not known and will vary from site to site, as there must be a balance between the availability of suitable roosting resources with the availability of suitable foraging areas within commuting distance to provide conditions that favour the occupancy of resident bat species (Henderson and Broders 2008).

### **Movement Patterns**

From the perspective of bat movement, resident bats may be affected by wind energy developments through alterations to foraging areas and possible disruption of commuting movements between roosting and foraging areas. There is some genetic evidence to suggest that bat movements can be impeded by fragmentation of habitat, which can scale up to population or distributional level effects (Kerth and Petit 2005). However, this is not well understood for most species.

Little is known about the dynamics of movement (e.g., altitude and travel routes) of resident, hibernating bats to and from hibernation sites. Anecdotal evidence suggests that bats likely use ridges and other linear landscape elements (e.g., riparian corridors) as travel routes, depending on the landscape (Arnett 2005; Lausen 2007). In the late summer and early autumn large numbers of bats congregate at the entrances to underground hibernacula in an activity referred to as ‘swarming’ (Davis and Hitchcock 1965; Fenton 1969; Glover and Altringham 2008; Thomas and Fenton 1979). During the swarming period bats do not roost in hibernacula; research being conducted in Nova Scotia indicates that resident bats are ‘on the move’, roosting transiently on the landscape, though we do not have a full understanding of the dynamics of these behaviours. Swarming may serve several functions, including courtship, copulation, and orienting young-of-the-year to over-wintering sites (Fenton 1969; Thomas and Fenton 1979).

Movement data from Ontario and Manitoba suggests that resident bats may move up to at least 120 km between hibernacula within a year, and up to at least 500 km between years (Fenton 1969; Craig Willis, Pers. Comm.). In New England, there are records of bats moving 214 km between hibernacula within one year, with one female moving 128 km in only three nights during spring emergence from hibernation (Davis and Hitchcock 1965). Obviously these resident hibernating species are at least capable of large scale migratory movements. It is not known whether flight behaviour (e.g., height, routes, etc.) during this time differs from when resident species are in their summering area; the paucity of information on this aspect of their biology would appear to be one of the largest impediments in accurately predicting the impact of wind energy developments on local bat populations (Weller et al. 2009).

## **Nova Scotia Bats**

In Nova Scotia there are occurrence records for seven species of bats (Table 1; Broders et al. 2003; van Zyll de Jong 1985), and each have been documented to have experienced fatalities at wind turbine sites (Arnett et al. 2008). There are three species of long-distance migratory bats recorded in the province, the hoary bat, the eastern red bat, and the silver-haired bat. These three species have extensive distributional ranges throughout North America, with Nova Scotia at or near their northern range limit (van Zyll de Jong 1985). Low numbers of echolocation recordings of the long-distance migratory species in Nova Scotia by Broders (2003) and other unpublished work suggests that there are no significant populations or migratory movements of these species in the province, but they do occur regularly. Two species of bats in the genus *Myotis*, the little brown bat and the northern long-eared bat, are the only abundant and widely distributed bats in Nova Scotia (Broders et al. 2003; Henderson et al. 2009). These 5–8g insectivorous bats are sympatric over much of their range (Caceres and Barclay 2000; Fenton and Barclay 1980; van Zyll de Jong 1985). A third species, the tri-coloured bat, has a significant population in the province, however they are likely restricted to southwest Nova Scotia (Broders et al. 2003; Farrow and Broders 2011; Rockwell 2005). These three species are gregarious species that over-winter in caves and abandoned mines in the region (Moseley 2007; Randall 2011). There is only one unconfirmed observation of the big brown bat, also a gregarious species, hibernating at a cave in central Nova Scotia (Taylor 1997).

### **Ecology of Resident Species**

Northern long-eared and little brown bats are expected to be the most likely species to occupy the proposed development area. The life history of both of these species is typical for temperate, insectivorous bats. Their annual cycle consists of a period of activity (reproduction) in the summer, and a hibernation period in the winter. Females of the two species bear the full cost of reproduction in the summer, from pregnancy to providing sole parental care to juveniles (Barclay 1991; Broders 2003; Hamilton and Barclay 1994).

The northern long-eared bat is a forest interior species that primarily roosts and forages in the interior of forests (Broders 2003; Henderson and Broders 2008; Jung et al. 2004). Females form maternity colonies, roosting in coniferous or deciduous trees, depending on availability (Broders et al. 2006; Foster and Kurta 1999; Garroway and Broders 2008). Males typically roost solitarily in either deciduous or coniferous trees (Ford et al. 2006; Jung et al. 2004; Lacki and Schwierjohann 2001). The little brown bat is a generalist species that is associated with forests, as well as human-dominated environments (Barclay 1982; Jung et al. 1999). This species has been found to forage over water and in forests (Anthony and Kunz 1977; Fenton and Barclay 1980), and both males and females (i.e. maternity colonies) have been documented roosting in both buildings and trees (Broders and Forbes 2004; Crampton and Barclay 1998). During the summer, it appears that most of the commuting and foraging activity of northern long-eared and

little brown bats occurs close to the ground (Broders 2003). Nonetheless, our ability to survey bat activity at high altitudes is extremely limited, and therefore our ability to make inference on the vertical distribution of bats is also limited.

A third species that occurs in significant numbers in Nova Scotia, the tri-colored bat, is not likely to occur in the proposed development area (Farrow and Broders 2011). In Nova Scotia, work that we have done in Kejimikujik National Park suggests that this species roost in *Usnea* spp. lichen and forages over waterways (Poissant et al. 2010).

### **White Nose Syndrome**

In 2012, three species of bats found in Nova Scotia were listed by COSEWIC as Endangered, primarily due to the spread of an emerging infectious disease known as White Nose Syndrome (WNS) that is responsible for unprecedented mortality in hibernating bats through much of eastern North America (Blehert et al. 2009; United States Fish & Wildlife Service 2012). The condition is caused by *Geomyces destructans*, a cold-loving fungus that thrives in cave conditions and as such, impacts bat population directly during the winter hibernation period (Blehert 2012; Lorch et al. 2011). It is thought to disrupt patterns of torpor and possibly result in death by starvation or dehydration (Cryan et al. 2010; Reeder et al. 2012). First documented in New York State in 2006 (Blehert et al. 2009), WNS spread rapidly to 19 states and four Canadian provinces by 2011 and is thought to be responsible for the death of more than 5.5 million bats (United States Fish & Wildlife Service 2012). White Nose Syndrome has been confirmed among populations of seven species of bats; the little brown bat, the most abundant species in the region currently affected by WNS, has experienced the most dramatic population declines (Frick et al. 2010). Some hibernacula have seen mortality rates of 90 to 100 percent of resident hibernating bats as a result of infection with WNS (United States Fish & Wildlife Service 2012), leading researchers to believe that WNS could lead to local extinctions of the little brown bat, as well as other species (Frick et al. 2010).

White Nose Syndrome was first documented in Nova Scotia in April 2011. It is not known to what extent bats in the province will be impacted, though all three of the resident hibernating bat species found in the province have been affected by WNS elsewhere in their range. Therefore it would be prudent to protect any surviving animals which may be genetically predisposed to surviving the infection. Even prior to WNS, bats were increasingly recognized as a conservation priority in North America. Now, in consideration of the sharp declines and rapid spread of WNS, serious concerns have been raised about the impact of WNS on the population viability of affected bat species, consequently impacting the conservation status of bat species at the local, national and global level (Table 1). Given that hibernacula represent one of the more critical resources for bats, as they allow successful over-wintering, they are important to protect.

## Potential for Hibernacula

The Nova Scotia Proponent's Guide to Wind Power Projects (Nova Scotia Environment 2012) states that wind farm sites within 25 km of a known bat hibernacula have a 'very high' site sensitivity. There are three known underground sites within 25 km of the proposed development area that have records of late summer bat activity around their entrances. In the late summer and early autumn large numbers of bats congregate at the entrances to underground hibernacula in an activity referred to as 'swarming' (Davis and Hitchcock 1965; Fenton 1969; Glover and Altringham 2008; Thomas and Fenton 1979). Swarming may serve several functions, including courtship, copulation, and orienting young-of-the-year to over-wintering sites (Fenton 1969; Thomas and Fenton 1979). Late summer swarming activity may be used to gauge whether a site is used for hibernation, since most swarming sites are also used as hibernacula (Fenton 1969; Glover and Altringham 2008; Ingersoll et al. 2010). The sites are McLellan's Brook Cave, a dissolution cave in limestone with a surveyed length of 85 m, and two small, abandoned copper mine adits at New Laing (Moseley 2007). In 2010, Randall (2011) conducted ultrasonic monitoring at each of these sites and a third abandoned adit located at New Laing. She did not find evidence to suggest that these sites were significant fall swarming sites for bats, although they could be used as hibernacula by some bats.

According to the Nova Scotia Abandoned Mine Openings Database (Fisher and Hennick 2009), there are more than 300 underground mine openings within 25 km of the proposed development area, the majority of these within the town of Stellarton. Stellarton, which is located less than 10 km from the proposed development area, was established in the 1790s as a result of valuable underground coal resources. In the past coal was extracted mostly by underground mining methods, though today coal is extracted from open pits. Only 48 of the greater than 300 documented abandoned mine openings had original depths greater than 50 m, and at least 10 of these have been backfilled (Fisher and Hennick 2009). Apart from the abandoned mine openings at New Laing that were ultrasonically monitored for bat activity in 2010, there are no records of bat activity at any other abandoned mine openings, though the majority have not been surveyed for bats.

**Table 1.** Over-wintering strategy and conservation status of bat species recorded in Nova Scotia.

Species	Over-wintering Strategy	Global Ranking <sup>1</sup>	COSEWIC Status	ACCDA Status <sup>2</sup>	GSRWSNS <sup>4</sup>
Little brown bat	Resident hibernator (NS and NB)	G3	Endangered <sup>3</sup>	S1	Yellow
Northern long-eared bat	Resident hibernator (NS and NB)	G2	Endangered <sup>3</sup>	S1	Yellow
Tri-colored bat	Resident hibernator (NS and NB)	G3	Endangered <sup>3</sup>	S1	Yellow
Big brown bat	Resident hibernator (NB)	G5	Not assessed	N/A	Undetermined
Hoary bat	Migratory	G5	Not assessed	S1	Undetermined
Silver-haired bat	Migratory	G5	Not assessed	S1	Undetermined
Eastern red bat	Migratory	G5	Not assessed	S1	Undetermined

<sup>1</sup> Global Ranking based on the NatureServe Explorer: G1 = Critically Imperiled, G2 = Imperiled, G3 = Vulnerable, G4 = Apparently Secure, G5 = Secure. All the above species were reassessed in July 2012.

<sup>2</sup> Atlantic Canada Conservation Data Centre ranking, based on occurrence records from NB and NS: S1 = Extremely rare: May be especially vulnerable to extirpation (typically five or fewer occurrences or very few individuals).

<sup>3</sup> Assessed by COSEWIC and designated in an emergency assessment on February 3, 2012.

<sup>4</sup> General Status Ranks of Wild Species in Nova Scotia based on published scientific literature, wildlife atlas projects, unpublished data, and expert opinion, providing an overall indication of a species' status in Nova Scotia. Yellow = Sensitive to human activities or natural events; Undetermined = Insufficient data exists to assess status.

## **METHODS**

### **Study Area**

The project area is located approximately 7 km southeast of the town of Stellarton, Pictou County, Nova Scotia. This area is located within the Hills and Valleys District of the Carboniferous Lowlands Region of Nova Scotia, which is characterized by hilly terrain, forming the foothills of the Pictou-Antigonish Highlands to the east (Davis and Browne 1996). The climate is typical of inland lowland areas, characterized by cold winters and warm summers (Davis and Browne 1996). White spruce and balsam fir are common in old fields and pastures, whereas sugar maple, yellow birch, and American beech are commonly found on slopes, with shade-intolerant birches, red maple, and aspen (Davis and Browne 1996).

### **Acoustic Surveys**

We used an Anabat II detector (Titley Electronics, Ballina, NSW, Australia) to passively record the echolocation calls of bats at a location (530604 E 5039202 N, NAD83, UTM Zone 20T) within the clearing where the meteorological tower for the proposed development is located, oriented parallel to the tree line at 260°. The clearing is surrounded by mature forest dominated by sugar maple, red maple, yellow birch, and American beech, with some balsam fir and a canopy height of approximately 8.5 m. The seasonal timing of sampling likely corresponded to the end of the summer residency period, movement of resident species to local hibernacula, and to fall migration by migratory species.

Identification of many bat species is possible because of the distinctive nature of their echolocation calls (Fenton and Bell 1981; O'Farrell et al. 1999). Species were qualitatively identified from recorded echolocation call sequences by comparison with known echolocation sequences recorded in this and other geographic regions using frequency-time graphs in ANALOOK software (C. Corben, [www.hoarybat.com](http://www.hoarybat.com)). In the case of species in the genus *Myotis* (northern long-eared and little brown bat), we did not identify sequences to the species level as their calls are too similar to be reliably separated. Call sequences that were clearly bat generated ultrasound, but could not be confidently classified due to poor quality of the recordings were classified as 'unknown'.

As the unit of activity, we used the number of recorded echolocation files, which approximate an echolocation call sequence, defined as a continuous series of greater than two calls (Johnson et al. 2004). Because an individual bat may be recorded making multiple passes, the data presented represent a measure of bat activity, and cannot be used as a direct measure of the number of bats within or passing through an area.

## Harp Trap Surveys

Two harp traps (Ausbat Research Equipment, Lower Plenty, Victoria, Australia) were used to capture bats on wooded trails within the study area. Species, body mass, and age were recorded for captures. Tissue samples were collected from the plagiopatagium of captured bats (4-6 mm diameter sample from each wing; Sullivan et al. 2006), and placed individually in 1.5 ml polypropylene microcentrifuge tubes. All capture and handling protocols in place during this research followed guidelines of the American Society of Mammalogists (Sikes et al. 2011), with the approval of the Saint Mary's University Animal Care Committee, and under authority of a permit from the Nova Scotia Department of Natural Resources.

## RESULTS

### Acoustic Surveys

The bat detector was deployed from July 8 to September 18, 2012, however, there was a technical error with the equipment that occurred on August 9; therefore the equipment did not record data for a period from August 9 to September 8. On September 8 the unit was checked and re-deployed (Table 2).

In total there were 1872 acoustic files recorded, however only 1713 of these were bat-generated ultrasound, the remaining 159 being classified as 'extraneous noise'. Approximately 6.8% of the echolocation files were classified as 'unknown'. Otherwise, all of the recorded sequences were attributable to *Myotis* bats (i.e., the little brown bat and the northern long-eared bat); there were no recorded calls with characteristics of the calls of any of the other bat species recorded in Nova Scotia. As stated, there was no attempt to identify the species of those call sequences classified as *Myotis*, given the similarity of their echolocation calls and the difficulty in achieving defensible identifications.

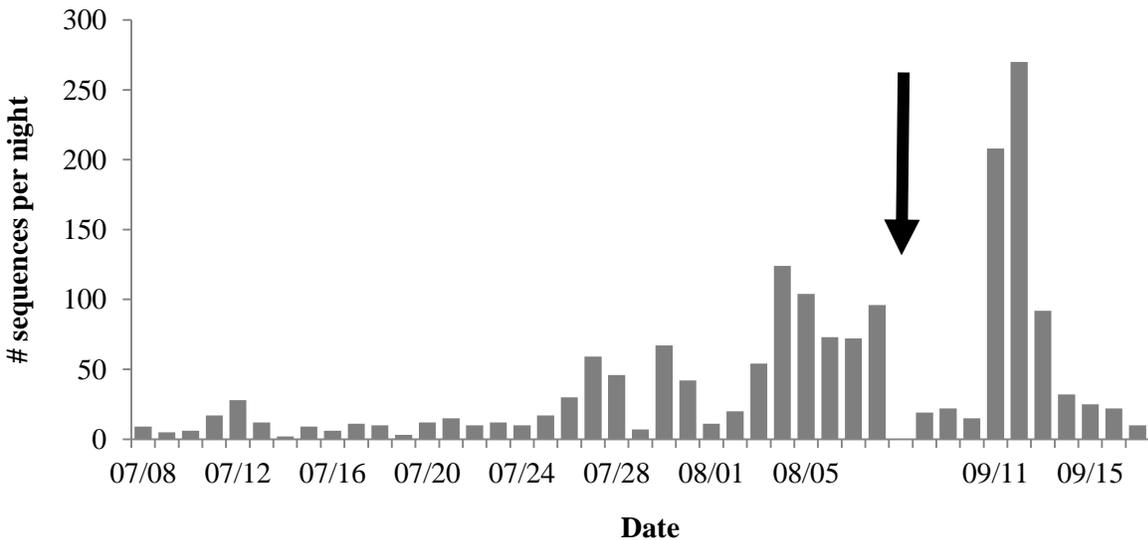
Activity levels were relatively low in early July, and began to increase in late July and early August. Although there was no data recorded for the period from August 9 to September 8 so we cannot comment on that period, there appears to be a peak in activity levels around September 12, after which activity levels drop off markedly. The average number of recorded sequences per night during the sampling period was 40.8 (SD = 54.7). To place the relative magnitude of activity recorded in the study area into context, in 129 nights of monitoring along five forested edges in the Greater Fundy National Park Ecosystem from June to August 1999, the average number of sequences per night was 27 (SD = 44; Broders unpublished data). In 650 nights of monitoring at river sites in forested landscapes in southwest Nova Scotia from June to August of 2005-2006, the average number of sequences per night was 128 (SD = 232; Farrow unpublished data), though note that rivers act to concentrate bat activity, as they are used as foraging and commuting corridors (Fenton and Barclay 1980; Fujita and Kunz 1984; Krusic et al. 1996; Lacki et al. 2007; Laval et al. 1977; Zimmerman and Glanz 2000).

**Table 2.** Number of echolocation files recorded per night for the 2012 pre-construction survey of bat activity at the proposed Forbes Lake Wind Project, Pictou County, Nova Scotia.

<b>Night of</b>	<b>Myotis</b>	<b>Unknown</b>	<b>Nightly Total</b>
8-Jul-12	9	0	9
9-Jul-12	5	0	5
10-Jul-12	6	0	6
11-Jul-12	17	0	17
12-Jul-12	22	6	28
13-Jul-12	11	1	12
14-Jul-12	1	1	2
15-Jul-12	9	0	9
16-Jul-12	5	1	6
17-Jul-12	11	0	11
18-Jul-12	9	1	10
19-Jul-12	3	0	3
20-Jul-12	12	0	12
21-Jul-12	13	2	15
22-Jul-12	9	1	10
23-Jul-12	12	0	12
24-Jul-12	7	3	10
25-Jul-12	17	0	17
26-Jul-12	25	5	30
27-Jul-12	54	5	59
28-Jul-12	45	1	46
29-Jul-12	7	0	7
30-Jul-12	62	5	67
31-Jul-12	42	0	42
1-Aug-12	10	1	11
2-Aug-12	18	2	20
3-Aug-12	45	9	54
4-Aug-12	115	9	124
5-Aug-12	90	14	104
6-Aug-12	60	13	73
7-Aug-12	59	13	72
8-Aug-12	89	7	96
*			
8-Sep-12	19	0	19

Night of	Myotis	Unknown	Nightly Total
9-Sep-12	22	0	22
10-Sep-12	15	0	15
11-Sep-12	205	3	208
12-Sep-12	263	7	270
13-Sep-12	89	3	92
14-Sep-12	30	2	32
15-Sep-12	24	1	25
16-Sep-12	22	0	22
17-Sep-12	10	0	10
<b>Total</b>	<b>1598</b>	<b>116</b>	<b>1714</b>

\* Data was not recorded from August 9 to September 8 due to a technical error with the equipment.



**Figure 1.** Number of echolocation sequences recorded per night for the 2012 pre-construction survey of bat activity at the proposed Forbes Lake Wind Project, Pictou County, Nova Scotia. The arrow indicates a break in the data series; there was no data recorded from August 9 to September 8 due to a technical error with the equipment.

### Harp Trap Surveys

Harp trap surveys were conducted over three nights from July 5 to July 7, 2012 (Table 5). A total of 16 hours of trapping using two harp traps resulted in one capture of a male northern long-eared bat on the evening of July 9.

**Table 3.** Harp trap survey effort for the 2012 pre-construction survey of bat activity at the proposed Forbes Lake Wind Project, Pictou County, Nova Scotia. Coordinates are NAD83 UTM Zone 20T. MYSE = *Myotis septentrionalis*.

Site	Date	Conditions	Coordinates	Traps Up/Down	Captures
1	July 8	Warm, humid	530196 E 5039539 N	21:00/00:30	None
2	July 8	Warm, humid	530635 E 5039236 N	21:00/00:30	None
3	July 9	Warm, humid	530738 E 5038225 N	20:00/00:30	None
4	July 9	Warm, humid	531138 E 5038503 N	20:00/00:30	MYSE

## DISCUSSION

There was no acoustic evidence of a significant movement or concentration of bats through the area investigated during this pre-construction survey of bat activity. The magnitude of activity recorded was comparable to baseline levels expected in a forested ecosystem in the region, and there were only a single capture of a male northern long-eared bat as a result of trapping effort for this project. Although we cannot rule out the possibility that mortality events associated with this development will occur, we have found no evidence to suggest that the proposed project will cause significant direct mortality of bats.

All of the identified echolocation call sequences recorded for this project were attributable to the two species of *Myotis* bats known to occur in Nova Scotia, the little brown bat and the northern long-eared bat. This was expected as they are the only abundant and widely-distributed species in the province, and are two of only three species with significant populations in the province (Broders et al. 2003). Although we did not distinguish the calls of *Myotis* species, the majority of the recorded sequences likely represent the little brown bat, as this species is known to forage in open areas and over water. The northern long-eared bat is a recognized forest interior species (Henderson and Broders 2008; Jung et al. 1999), and is less likely to use open areas for foraging and commuting (Henderson and Broders 2008). Additionally, the northern long-eared bat has lower intensity echolocation calls and is thus not recorded as well as the little brown bat (Broders et al. 2004; Miller and Treat 1993).

The one capture for this project was a male northern long-eared bat on a forested trail. Males of this species typically roost solitarily in either deciduous or coniferous trees, depending on availability (Ford et al. 2006; Jung et al. 2004; Lacki and Schwierjohann 2001). Given that females bear the full costs associated with reproduction, population persistence is likely most limited by the ability of reproductively active colonies of females to locate suitable roosting areas within commuting distance of foraging areas. The presence of a single, male capture does

not suggest that the study area is important for reproductively active females, though it does not rule it out.

*Myotis* bats are relatively new to the list of species among fatalities at wind turbines sites. This may be due to the fact that the first large scale wind developments were located primarily in western North America, typically in agricultural and open prairie landscapes (reviewed in Johnson 2005). Fatalities of these resident, non-migratory species were largely absent from these sites, likely due to the association of these species with forested landscapes. More recently, evidence of *Myotis* fatalities resulting from collisions with wind turbines have been noted at sites in eastern North America (reviewed in Arnett et al. 2008; Jain et al. 2007; Johnson 2005). Although there are fewer documented fatalities of *Myotis* bats compared to long-distance migratory species, there is still a risk of direct mortality.

Other than direct bat mortality as a result of collisions with turbines, there is also the potential that disruption of the forest structure (e.g., removal of trees and fragmentation of forest stands for roads and clearings) will degrade the local environment for colonies/populations of *Myotis* bats that reside in the area during the summer. This can occur by the elimination of existing roost trees, the isolation of trees left standing, as well as the elimination or degradation of foraging areas for bats. These negative impacts will almost certainly occur and will add to the cumulative impact of habitat loss that is occurring throughout the ranges of these species. Additionally, these resident bat species make what are generally considered to be short distance migrations, in comparison to long-distance migratory behaviour by other bats species, from their summering areas to underground sites where they hibernate. Little is known about the flight behaviour and dynamics of these movements (i.e., height of travel, and routes); therefore, it is difficult to predict the specific effects that wind developments will have on the movements of local populations of bats.

There were no call sequences recorded for any of the long-distance migratory bat species known to occur in Nova Scotia. Overall data suggests that there are no large populations or migratory movements of these species in or through the province, but they do occur regularly and are especially vulnerable to wind facilities. The eastern red, hoary, and silver-haired bats, are non-gregarious, tree-roosting bats with extensive distributional ranges throughout North America (van Zyll de Jong 1985). These species have received the greatest attention with regards to wind energy developments because they make up the large majority of documented fatalities at existing wind energy developments in North America. Significant bat fatality events at wind energy developments occur primarily in the late summer and early fall, peaking during the period that coincides with the long-distance fall migration of these species (Arnett et al. 2008; Cryan and Brown 2007; Johnson 2005), leading researchers to believe that migration plays a key role in the susceptibility of certain bat species to wind turbine fatalities (Cryan and Barclay 2009). It has been proposed that this may be because these species travel at a height that puts them at increased risk of collisions with rotating turbine blades (Arnett et al. 2008; Barclay et al. 2007).

For this study, acoustic sampling took place at ground-level, which may have an affect on our ability to detect the calls of high-flying species. Therefore, it is possible that our sampling regime underestimated the activity of these species in the area. Though we did not record these species during the survey period, we cannot conclude that they do not occur in the study area.

### **Recommendations**

1. Additional pre-construction monitoring – If possible, monitoring should be done from meteorological towers to gauge the magnitude of activity of long-distance migratory species through the area, and the extent to which other species occur at the height at which the turbines will be rotating.
2. Post-construction monitoring – A rigorous post-construction monitoring program, appropriately designed to account for searcher efficiency and scavenger rates, needs to be established to quantify bat fatality rates. These surveys should be conducted over an entire season (April to October), but especially during the fall migration period (mid-August to late-September) for at least two years. Should fatalities occur, they should be investigated with respect to their spatial distribution relative to wind turbines, turbine lighting, weather conditions, and other site specific factors, and should trends be identified, operations should be adjusted in an adaptive management framework. In this manner, mitigation can be focused on any identified high risk areas/infrastructure to minimize future fatalities. These data are essential for assessing potential risks at future developments in the region; therefore it is critical that the results of these surveys be appropriately reported.
3. Retain key bat habitat – Key bat habitat should be identified and retained in the project area to continue to support existing summer colonies/populations of bats. Retention of these bat habitat resources should be in a spatial manner that provides connectivity in the project area and with the larger landscape to ensure foraging and roosting areas remain well connected. Consideration of the potential for fragmentation of bat habitat resources should also be taken with regards to the development of road networks and transmission lines in the project area.
4. Minimize project footprint – To the extent possible, minimize the direct loss of bat habitat resources (e.g., wetlands, riparian areas, mature deciduous-dominated forest stands), and minimize the extent of bat habitat impacted by the development.
5. Return to pre-project state upon decommissioning – The project area should be returned to the state that existed prior to the development of the site once the project is decommissioned. This should include planning to ensure the continuity of forest stand succession to provide and maintain appropriate roosting areas well into the future as

existing roost trees die off. Retention of forest stands of a range of ages will provide mature trees for bat roosting resources in the future.

6. Remain up to date with current research – In addition to the Industry-NSERC-SMU partnership project, there is presently an abundance of on-going research aimed at determining the impacts of wind energy developments on populations of bats. Other studies are focusing on investigating the efficacy of potential mitigation measures, including the effects of weather on bat activity patterns and collisions with wind turbines, and possible bat deterrents (including acoustic and radar emissions). As these are active areas of research, it is essential that the most current studies and guidelines are used to guide management decisions and development plans for wind energy projects.

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