Affinity Wind LP

Kemptown Wind Farm

Environmental Assessment Registration

October 2014

Kemptown COMFIT Wind Project: Environmental Assessment for Revised Project Location – Affinity Wind LP

Introduction

Affinity Wind LP (Affinity) is a company created by Reuben Burge, the Director of Sustainable Funding for the Society for the Prevention and Cruelty to Animals (SPCA). Affinity has been created to answer the Nova Scotia Government's call for Community Feed-in-tariff projects (COMFIT). As a not-for-profit, the SPCA qualifies under COMFIT regulations as an eligible entity "community" for gaining approval to build and own renewable energy projects. This project will be known as the Kemptown COMFIT Wind Project and will consist of three GE 1.6 MW series wind turbine generators with 82.5m rotor diameter and a 25 kVA collection system connected directly into the NSPI grid at interconnection point transformer 1N-T65. The proposed project will be located near the village of Kemptown in the municipality of Colchester. The project is referred to as the Kemptown COMFIT Wind Project ("Kemptown").

The Kemptown Project is a relocation of a previously registered project 'Kemptown'. The relocation of the three turbines is due to a number of factors that improve the project quality. After receiving EA approval in February 2014, the Proponent decided to relocate the project to an area that has a higher elevation, larger land area and no wetlands with more defined existing roads. The new location is approximately 3-4 kilometers north of the original proposal.

The 3 turbines proposed for Kemptown are the only turbines planned and will ultimately be at one location or another, but not at both. The maximum number of turbines at either location is three.

The Kemptown COMFIT Wind Project will provide renewable power sufficient for 2,000 homes annually and have a positive effect on the environment through displacement of burning fossil fuels. The power will be used locally as the turbines will feed directly into the distribution system. In light of both Canada's and Nova Scotia's commitment to reduce greenhouse gas emissions and invest in renewable energy, Kemptown will be an important component of Nova Scotia's energy mix.

Regulatory Approvals

The Project has a nameplate capacity exceeding 2 MW, which requires the Proponent to undergo environmental assessment as a Class I Undertaking pursuant to the Nova Scotia *Environment Act*. No federal triggers under the *Canadian Environmental Assessment Act* (*CEAA*) are anticipated at this time. This environmental assessment report (EA) is intended to meet the requirements of the provincial EA process. Additionally, this EA Report will provide support in seeking other environmental and planning approvals necessary for this Project.

The COMFIT program will require the Project to have EA approval in order to progress. As well, the Colchester Municipal Planning Director requires EA approval prior to issuing a Development License for a Large Scale Wind Turbine.

Project Description

The Project will consist of three GE 1.6 MW series 82.5m wind turbine generators. The generators come in varying power production capacities as well as blade lengths. The models can produce 1.62 MW, 1.68 MW and 1.85 MW. The blade lengths vary from 36.5m, 41.25m, and 50m. For Kemptown, the Proponent will be using the 1.68 MW machine with 41.25m blades. In addition, the following ancillary facilities are also considered part of the Project:

- 25 kVA collection lines to link the wind turbines to NSP's Distribution power grid;
- 690V – 25 kVA pad mounted step-up transformers located beside each turbine;
- access roads; and
- crane pads for assembly of wind turbines.

An existing maintenance shop/control building will be home base for maintenance and operations. This is located approximately 14km from Kemptown and was built for the Dalhousie Mountain Wind Project. The maintenance of both wind projects will be carried out by Rotor from this maintenance shop.

Project Activities

The development of the proposed Project will include several phases, including site preparation and construction, operations and maintenance, and decommissioning. Activities within these phases will include:

- surveying;
- developing access roads;
- clearing and grubbing;
- grading;
- foundation excavation;
- pouring turbine foundations;
- equipment lay-down and turbine assembly;
- tower, generator, and rotor assembly;
- collection system and transmission line/connection to grid;
- clean-up and reclamation;
- turbine commissioning;
- access and inspection;
- operation;
- rotor, generator and tower disassembly;

- decommissioning and removal of concrete foundation; and
- decommissioning of the distribution lines.

Project Location

Kemptown is located on privately owned land in Colchester County. The PID for the land parcels and UTM coordinates for the turbines are below.

Turbine	PID	Easting	Northing	elevation
1	20400230	490003	5037902	235m
2	20400230	490622	5037975	245m
3	20400230	491129	5038014	241m

Construction Schedule

The proposed construction schedule for the Project is presented in Table E.1. The Project is expected to be operational for at least 25 years. Decommissioning activities will last roughly the same amount of time as comparable construction activities (*i.e.*, six months).

Table E.1 Anticipated Project Activity Schedule

Project Activity	Proposed Schedule
Surveying	May 2012 to present
Clearing (primarily on existing roads requiring widening and brush clearing; includes laydown areas, collector circuits and all access roads)	December 2014
Development of access roads	December 2014 to January 2014
Excavation and installation of power poles	February to March 2015
Foundation excavation	March to June 2015
Foundation construction	May to June 2015
Delivery of equipment	June to July 2015
Wind turbine installation	July 2015
Stringing of wires for collector system	June 2015
Turbine commissioning	August 2015
In-service	August 2015
Site remediation, clean-up, mitigation measures and follow-up measures will be incorporated	Will start from day one construction and continue throughout operations as required

Environmental Management Strategy

The Proponent is committed to ensuring that the construction, operation, and decommissioning of the proposed Project are conducted in an environmentally responsible manner. The Proponent will successfully implement the recommended mitigation measures for the Project. To accomplish this objective, the following initiatives will be addressed: integration with the corporate environmental management framework; compliance with worker health and safety rules; emergency response planning; environmental protection planning; and environmental monitoring.

Stakeholder Consultation and Mi'kmaq Engagement

To date, the consultation activities for Kemptown have included meetings with the Municipality of Colchester, numerous meetings, site visit to Dalhousie Mountain Wind Farm by the Colchester Planning Advisory Committee, meetings with Colchester North MLA, Karen Casey, and correspondence with Mountain Golf and Country Club, meetings and tentative partnership discussions with the Valley/ Kemptown Volunteer Fire Department's Executive Board, the Gully Lake Trails Society, and various meetings with local area municipal councillor Ron Cavanaugh. The Proponent has met with local business owners to seek their input on the project and suggestions of areas of concern that may be present within the community in general. An open house meeting was held on January 9, 2014. Flyers were delivered to houses within 5km of the project (Appendix E). Turn-out for the meeting was approximately 22 individuals including business owners and the local area Municpal Councillor. A presentation was given and a question and answer period lasted about two hours. The Proponent has maintained a presence in the local community with door-to-door visits with local residents. The local community and other interested parties have had very positive feedback and support throughout the course of the development. Consultation is further detailed in Section 3.

Correspondence with regulatory agencies include: Nova Scotia Department of Energy's COMFIT Administrator, Krystal Therien and COMFIT Policy Analyst, Karen Daniels, and COMFIT Clerk, Sylvie Lepine; Nova Scotia Environment's Environmental Assessment Officer, Bridget Tutty; Department of Natural Resources' Species at Risk Biologist, Mark Elderkin; Transport Canada; NavCanada; Nova Scotia Department of Transportation and Infrastructure; Royal Canadian Mounted Police (RCMP); the Canadian Broadcasting Company (CBC); National Forces; Canadian Coast Guard; Department of National Defence (DND) and Environment Canada's Weather Radar Control Center. The Proponent has a commitment to all consultation parties to continue ongoing updates and progress reports. The Proponent has directly engaged the Mi'kmaq community, including the Pictou Landing First Nation, the Confederacy of Mainland Mi'kmaq (CMM), the Mi'kmaq Rights Initiative (KMK) and the Native Council of Nova Scotia/ Maritime Aboriginal Peoples' Council through information mailouts, face to face meetings and by commissioning AMEC Environmental to conduct a Mi'kmaq Ecological Knowledge Study (MEKS) (Appendix B). The Proponent is working very closely with NS First Nations at their combined COMFIT wind projects in Truro Height - Millbrook, Pockwock and Whynotts. In addition to this, the Proponent commissioned an MEKS for the Dalhousie

Mountain Wind Farm in 2008 which considers the Kemptown project area in its consultation zone.

The public and Mi'kmaq communities were invited to submit written comments on the proposed Project and information contained in the original EA document during the EA review process in December 2012-January 2013 and will be invited to do the same on this EA upon Registration in October 2014. Additional stakeholder and community outreach initiatives include the Proponent's website www.rmsenergy.ca with a dedicated Kemptown FAQ page, mailout of community newsletter, continued discussions with municipal council, the establishment of a Citizen's Monitoring Committee, if requested/required, for the Colchester Municipal By-law, door-to-door community outreach program and further public open house sessions. To date, letters have been issued to the local community members by the Colchester Municipality inviting citizens to be part of the Citizen's Monitoring Committee but have not yet received any offers of nomination.

The public and Mi'kmaq community will continue to be engaged in future phases of development. The Proponent will develop and implement a community liaison and issues resolution program for Project operations, where the public and Mi'kmaq will be invited to participate. The public has been very receptive of the existing Dalhousie Mountain Wind Farm since development began and has continued through the past 5 years of operations. Positive feedback has been received for the proposed Kemptown COMFIT Wind Project.

Impact Assessment

No significant adverse residual environmental effects of Kemptown are predicted, considering the existing conditions of the Project site, the design of the Project and mitigation measures to be implemented as part of the Project. A summary of the predicted environmental effects and mitigation measures for this Project is presented in Table E.2.

Table E.2 Summary of Impact Management and Proposed Mitigation Measures

Environmental Component	Project Activity	Potential Effects	Mitigation Measures
Birds and Other Wildlife	Construction & Decommissioning	Sensory disturbance	• Visitors will remain within relevant areas, both in-vehicle and on- foot and will aim to preserve the site's natural areas. • Overall disturbance will be limited to designated workspaces and performed in compliance with the *Migratory Birds Convention Act*. • Delivery vehicles will remain on designated roads.
		Habitat loss/alteration	• Habitat loss will be mitigated by only clearing the land necessary for construction activities and by limiting the overall land disturbance to within designated workspaces. • Upon completion of construction and/or decommissioning, habitat will be restored to the extent

Table E.2 Summary of Impact Management and Proposed Mitigation Measures

Environmental Component	Project Activity	Potential Effects	Mitigation Measures
			possible. • Areas of significance (*e.g.,* wetlands) will be avoided, to the extent possible.
		Mortality	• In order to reduce the potential of bird mortality, construction activities will be performed in compliance with the *Migratory Birds Convention Act (e.g.,* clearing outside the critical time periods for breeding birds). • The Proponent has participated in training of onsite personnel regarding how to identify and properly deal with any wood turtles that may enter a work site.
	Operation	Sensory disturbance	• Mainland Moose presence was not confirmed in the 2014 Spring PGI survey. (Appendix J) • Other forms of surveys may be requested by DNR and the Proponent is prepared to work within these recommendations. Details will be developed in consultation with NSDNR. • The Proponent is also committed to working with NSDNR and landowners to protect the mainland moose population, e.g., through initiatives in the Mainland Moose Recovery Program.
		Mortality	• To reduce the potential for increased bird fatalities due to collision with wind turbines, several decisions were made in the planning of the wind farm. The turbines to be used extend no higher than 121.5 m above the ground thus avoiding the flight height of nocturnally migrating landbirds (150m). Lighting will be the minimum allowed by Transport Canada for aeronautical safety, and red lights (CL-865) may be used with the minimum intensity and flashes per minute allowable. The turbines for this Project will be built using tubular steel towers, as data indicate that lattice towers encourage perching by songbirds and by raptors during hunting and, as a result, may put these birds at risk of collisions. Post-construction monitoring will direct the need and form of further post-construction mitigation measures. • A fall migration bat study has been conducted (Appendix I) to understand numbers and species of bats present/ migrating within the area. Results of that study indicate this area is not a significant bat migration route and not a significant resident bat usage area. • A bird and bat post-construction monitoring program will be developed in consultation with NSDNR and CWS. Based on the results of the program, necessary modifications to mitigation plans and/or wind farm

Table E.2 Summary of Impact Management and Proposed Mitigation Measures

Environmental Component	Project Activity	Potential Effects	Mitigation Measures
			operations will be undertaken.
Soils and Vegetation	Construction & Decommissioning	Soil erosion and compaction	• Access to the turbine sites will be limited to established access roads, where possible. • Size of access roads will be kept to the minimum required for the safe construction, operation and decommissioning of the equipment. • Whenever possible, clearing activities will be timed to periods when the ground surface is best able to support construction equipment (winter or dry season). • Compacted soil will be reclaimed as required. • Standard erosion and sediment control measures will be implemented as required. • Topsoil and subsurface soils will be separated and stored on-site to be replaced appropriately after the pouring of the concrete foundation. When the soils are stored they will be protected from erosion and runoff.
		Loss of plant species	• Rare plant surveys were conducted on June 20 (Sean Blaney) to assist with micro-siting of turbines and access roads and to ensure species of particular concern to the Mi'kmaq are inventoried. • Where Plant Species of Conservation Concern are encountered, avoidance to the extent possible will be considered, especially where there maybe be a threat to the regional population • Prior to construction, digital way-point files revealing the precise locations of all "Sensitive", "May be at Risk", "At Risk" and "Undetermined" listed species identified during field work within the area proposed for development will be provided to NSDNR (Appendix F).
Wetlands	Construction & Decommissioning	Loss of wetland area and/or function	• Wetlands will be avoided. • The nearest wetland is over 1000 metres from any impact area (roads, foundations and lay-up areas) • All activities, including equipment maintenance and refuelling, will be controlled, and/or will be done off-site, to prevent entry of petroleum products or other deleterious substances, including any debris, waste, rubble, stockpiled soils, or concrete material, into a wetland. • Construction material, excess material, construction debris, and empty containers will be stored away from wetlands. • Erosion and sediment control measures will be implemented to minimize interactions with wetlands. • Regulatory approval will be obtained (including compensation for no net loss of function) from NSE for

Table E.2 Summary of Impact Management and Proposed Mitigation Measures

Environmental Component	Project Activity	Potential Effects	Mitigation Measures
			wetland alteration as required. Turbines will not be constructed within 30 m of a wetland unless approved by NSE.
Water Quality/ Aquatic Environment	Construction & Decommissioning	Surface water contamination	• The nearest watercourse is over 500 metres from impact areas (roads, foundations and lay-up areas) • Watercourses will be avoided. • No watercourses will be affected by the roads and layout of the Kemptown Project • If alteration of watercourses is required, regulatory approval from NSE of the proposed alteration will be obtained prior to construction. • All activities, including equipment maintenance and refuelling, will be controlled, and/or will be done off-site, to prevent entry of petroleum products or other deleterious substances, including any debris, waste, rubble, stockpiled soils, or concrete material, into a watercourse. • Construction material, excess material, construction debris, and empty containers will be stored away from watercourses and watercourse banks. • An Environmental Protection Plan has been developed for the Project. • Turbines will not be constructed within 30 m of a watercourse unless approved by NSE.
		Sediment loading	• Watercourses will be avoided. • No watercourses will be affected by the Kemptown Project • General mitigation measures from the NSE Erosion and Sediment Control Handbook will be utilized to control surface water, reduce erosion and limit sedimentation. • If watercourse alterations are required, they will be done in consultation with NSE/DFO in accordance with regulatory requirements. • Land clearing and construction will not take place near watercourses. • Temporary erosion and sediment control measures, silt fence, straw bales (*etc.*) would be used and maintained until 100% of all work within or near a watercourse had been completed and stabilized. • Visual assessments will be completed both quarterly and after severe storm events to ensure the effectiveness of erosion and sedimentation controls. • Temporary sediment control measures will be removed at the completion of the work but not until permanent erosion control measures, if required, have been established.

Table E.2 Summary of Impact Management and Proposed Mitigation Measures

Environmental Component	Project Activity	Potential Effects	Mitigation Measures
		Surface water flow	• Watercourses will be avoided. • No watercourses will be affected by the impact area of the Kemptown Project • The nearest watercourse is over 500 metres from any impact areas, including roads.
		Loss of fish habitat	• No watercourses will be affected by the roads and layout of the Kemptown Project • Sedimentation and runoff from road construction activity will be done so following the Environmental Protection Plan for Affinity Wind LP. • Sedimentation and/or deleterious materials will not be allowed to enter into any watercourse
		Fish mortality	• No watercourses will be affected by the roads and layout of the Kemptown Project • Sedimentation and runoff from road construction activity will be done so following the Environmental Protection Plan for Affinity Wind LP. • Sedimentation and/or deleterious materials will not be allowed to enter into any watercourse
Sound	Construction & Decommissioning	Increases in sound levels due to the transportation and operation of clearing equipment	• Nearby residents will be advised of significant sound generating activities *i.e.,* using a hammer end on an excavator to remove material for road building/ foundations. Such instances will be scheduled to create the least disruption to receptors. • Heavy equipment will be operated between 7:00 a.m. and 10:00 p.m., avoiding Sundays and holidays unless absolutely necessary. • Construction equipment will have mufflers. • Noise abatement equipment, in good working order, will be used on all heavy machinery used on the Project.
	Operation	Increase sound levels	• Set turbines back far enough away from houses to meet the 36 dBA threshold imposed by Colchester County • Professional sound modelling shows that noise levels will not be of concern to nearby residents due to the distances from the nearest homes to the turbines. • There is no mitigation required.
Tourism	Construction & Decommissioning	Effect on tourism and recreation	• The Kemptown Project is not being constructed in an area where tourist traffic or activity will be affected. • There is no mitigation required.
	Operation	Effect on tourism and recreation	• The Kemptown Project is not being constructed in an area where tourist traffic or activity will be affected. • There is no mitigation required.
Visual	Operation	Change to	• The construction of the turbines will not significantly alter

Table E.2 Summary of Impact Management and Proposed Mitigation Measures

Environmental Component	Project Activity	Potential Effects	Mitigation Measures
		visual landscape	the surrounding landscape *i.e.*remove large amounts of earth or trees • Turbines will be all of the same type and model, and will be painted light grey to reduce reflection. • Screening opportunities for adjacent residences through tree planting or other measures may be considered where post-construction evaluation indicates a legitimate concern.
		Lighting	• Lighting will be the minimum allowed by Transport Canada to ensure the appropriate level of aeronautical safety. • Lights will be on top of the nacelle. • No outdoor lights will be on at the entrance of the turbine unless maintenance is required after dark.
		Shadow flicker	• The turbines will be set back farther away from homes than shadow flicker can travel. There is no mitigation required.
Archaeological and Cultural Resources	Construction	Disturbance	• An archaeological field survey has been conducted, no impact is predicted (Appendix H). • An MEKS has been conducted, no impact is predicted (Appendix B) • Upon discovery of an artifact, work will be stopped in the area and the appropriate authorities will be contacted.
Land Use	Construction	Reduction of forested land	• Existing right-of-ways (RoWs) (*e.g.*, woods roads) will be used to the greatest extent possible to minimize the Project footprint. • Turbines, with their relatively small footprint on the land, have been sited with consideration for the potential impact to existing land uses. • The land where the turbines will be built is owned by a private logging company and has a significant road system in place that can handle the weight of the the deliveries required for the wind project. Some portions may require widening at corners or new ditching for proper sedimentation control. • Existing logging and access roads built earlier in the construction schedule will be used to install the collection system. • The Project does not require a substation.
	Operation	Disruption to undeveloped woodlands or infrastructure	• The existence of the three wind turbines in Kemptown will not have an effect on undeveloped woodlands or infrastructure. • No mitigation is required.

Table E.2 Summary of Impact Management and Proposed Mitigation Measures

Environmental Component	Project Activity	Potential Effects	Mitigation Measures
Health and Safety	Operation	Electromagnetic Fields (EMFs)	• EMF from wind turbines is not a concern at the distance the turbines will be placed away from homes. • No mitigation is required.
		Infrasound energy	• Infrasound energy from wind turbines is not a concern at the distance the turbines will be placed away from homes. • No mitigation is required.
		Ice throw	• During construction and operation activities, access to the wind turbine facility will be restricted to authorized personnel wearing proper personal protective equipment and who have had appropriate safety training. • During site visits, vehicles will be parked up-wind of the turbines. • Warning signs will be posted at the perimeter of the Project Study Area, discouraging trespassing on private lands. • During operation, access to the wind turbine sites will be restricted to authorized personnel only (gated access) with signs posted warning of the potential for ice throw while trespassing.
Local Community	Construction	Hazards and/or inconveniences to forestry operation	• Road construction schedule will consider planned forestry and quarrying operations in the area to ensure required access is maintained. • No modification to existing roads is expected. • A Special Move Permit and any associated approvals will be obtained through the Department of Transportation and Infrastructure Renewal for heavy load transport.
	Operation	Effect on local economy	• Local residents will be employed to the extent possible during the construction, operation and decommissioning of the Project. • Municipal taxes will be remunerated, thus increasing the local tax base, which could be used to increase funding of local municipal initiatives. • A % of the revenue created by the Project will go directly to the provincial SPCA where they will delegate funds to, as an example, the special Abuse Investigations Unit. This unit investigates abused and neglected animals province wide – local community inclusive. • A % of the revenue will go to a Community Benefits Package managed by the Valley-Kemptown Fire Department's Executive Board. This money will go to: the local cemetaries and community halls as needed; the Cobequid Eco-trails Society and other established charitable organizations chosen by the Fire Department; and to local families/ groups as various extraordinary

Table E.2 Summary of Impact Management and Proposed Mitigation Measures

Environmental Component	Project Activity	Potential Effects	Mitigation Measures
			circumstances could occur (fire, sickness, accidents). Instances such as benefit dances will receive donations from the Project's proceeds. • Both the revenue streams, to the SPCA and local community, will be ongoing during the 20 year COMFIT contract Affinity has with the Department of Energy.
		Effect on property values	• The Kemptown Project will have no effect on property values. • No mitigation is required.

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1.0 Project Summary

Affinity Wind (Affinity) is a company created by Reuben Burge, the Director of Sustainable Funding for the Society for the Prevention and Cruelty to Animals (SPCA). Affinity has been created to answer the Nova Scotia Government's call for Community Feed-in-tariff projects (COMFIT). As a not-for-profit, the SPCA qualifies under COMFIT regulations as an eligible entity "community" for gaining approval to build and own renewable energy projects. This project will be known as the Kemptown COMFIT Wind Project and will consist of three GE 1.6 MW series wind turbine generators with 82.5m rotor diameter and a 25 kVA collection system connected directly into the NSPI grid at interconnection point transformer 1N-T65. The proposed project will be located in Kemptown in the municipality of Colchester. The project is referred to as the Kemptown COMFIT Wind Project ("Kemptown").

Affinity Wind will become a limited partner in the ownership of the proposed wind project and earn annual income from shares in the facility for the 20 year term of the Power Purchase Agreement (PPA). The SPCA, will share in the income benefits when the project becomes operational without sharing risk during any part of the pre-development, permitting, financing, or operational stages. Affinity Wind LP will finance the entire portion of the SPCA's ownership in order to ensure that the Not For Profit's income from donations will not be required at any stage of development or operation. Affinity will rely entirely on Rotor Mechanical Services (Rotor) to develop and operate the facility, as an Affiliate to RMSenergy Dalhousie Mountain LP (Dalhousie Mountain), Rotor has extensive experience by developing and operating Dalhousie Mountain's 34 turbine 51 megawatt (MW) facility in Mount Thom, Nova Scotia (Dalhousie).

The Proponent is responding to a provincial and federal strategy to provide approximately 25% renewable power to the provincial grid by 2015. Affinity will enter into a Power Purchase Agreement (PPA) with Nova Scotia Power Inc. (NSPI) for 4.99 MW of electrical power from the proposed Kemptown Project.

Application was made to Nova Scotia Department of Energy (DOE) on September 19, 2011 to develop a 6.4 MW wind project to feed power to transformer 1N-T65 in Colchester County. On June 12, 2012, the Proponent was awarded a 4.8 MW COMFIT certificate and on March 12, 2013, the Proponent's COMFIT Certification was updated to be 5.4 MW (Appendix K).

This proposed Project is subject to provincial environmental registration requirements as a Class I Undertaking pursuant to the Nova Scotia *Environment Act*. "The Proponent's Guide to Wind Power Projects: Guide to Preparing an Environmental Assessment Registration Document" (NSE 2007, updated 2012) was used to ensure provincial requirements for registration are met. No federal triggers under the *Canadian Environmental Assessment Act* (*CEAA*) are anticipated at this time.

This project was subjected to an Environmental Assessment that was registered in December 2013 and given approval in February 2014. Since that time, material changes to the layout have occurred and therefore, an updated document with new site-specific studies has been completed. This document includes the new site-specific study results as well as the original descriptions including:

- a description of the Project, including its location and details regarding its construction, operation and decommissioning;
- a summary of the existing biophysical and socioeconomic features of the area which may be subject to Project-related adverse environmental effects;
- a summary of specific environmental concerns, identified through data collection, consultation with agencies and the public, and/or based on professional judgement;
- an assessment of the positive and/or adverse effects associated with this Project;
- an assessment of cumulative environmental effects of this Project;
- an assessment of the effect of the environment on the Project;
- a summary of mitigation, impact management and monitoring measures of this Project; and
- a summary of the advantages and disadvantages of the Project taking the foregoing into account.

1.1 PROJECT PROPONENT

The Proponent is Affinity Wind LP, a partnership between Affinity Renewables Inc., a Nova Scotia owned and operated corporation, and Dream Alternatives Inc., a renewable energy investment firm. The head office of the proposed Kemptown Project will be located at the existing Dalhousie Operations and Maintenance building. The primary contact for the Proponent is:

Mr. Reuben Burge
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1.2 TITLE OF THE PROJECT

The Project is referred to as the Kemptown COMFIT Wind Project.

1.3 PROJECT LOCATION

The proposed Project is located in Kemptown, Colchester County, Nova Scotia. It is accessible by a large truck-worthy dirt road off of the Kemptown Road. The Project site sits on privately owned land in Colchester County (Figure 1.1) north of the Balefill Facility. The wind energy facility will be constructed on land that has previously been cleared for logging activities and will utilize existing roads with improvements. A Project Study Area (Figure 1.2) was delineated around the three proposed turbine locations and the roads required for access/ power collection. The Project Study Area is considered the area within which direct Project interactions with the natural environment could occur and formed the basis for field studies. More information on site selection and design of the wind farm is provided in Section 2.4.

The wind energy facility will be constructed on previously cleared woodlands generally bounded to the north, east and west by undeveloped land and some sparsely populated rural areas, and to the south by the municipal balefill facility. The Gully Lake Wilderness Area is located east of the Study Area. The land required to install Kemptown is privately owned. Private long term leases and easements are in place to permit the entire installation of this Project.

1.4 ESTIMATED CAPACITY OF FACILITY

The proposed Project will consist of three wind turbine generators and ancillary facilities. The energy produced by the Project will be linked to the Nova Scotia electrical distribution system. Each turbine will have a nameplate capacity of 1.68 MW, with a total output capacity of 4.99 MW. This will generate renewable power sufficient for approximately 2,000 homes annually. The electricity will be supplied directly to the NSPI electric grid under a Power Purchase Agreement (PPA).

1.5 PROJECT SCHEDULE

The proposed construction schedule and major events for the Project are presented in Tables 1.1 and 1.2. The lifespan of the proposed Project is a minimum of 25 years. Decommissioning activities will last roughly the same amount of time as comparable construction activities (*e.g.*, less than six months).

Table 1.1 Proposed Project Activity Schedule

Project Activity	Proposed Schedule
Surveying	May 2012 to present
Clearing (primarily on existing roads requiring widening and brush clearing). Includes laydown areas, collector circuits and all access roads.	December 2014 to January 2015
Development of access roads	December 2014 to January 2015
Excavation and installation of power poles	February - March 2015

Table 1.1 Proposed Project Activity Schedule

Project Activity	Proposed Schedule
Foundation excavation	March – May 2015
Foundation construction	March – May 2015
Delivery of equipment	June 2015
Wind turbine installation	July 2015
Stringing of wires for collector system	June 2015
Turbine commissioning	August 2015
In-service	August 2015
Site remediation, clean-up, mitigation measures and follow-up measures will be incorporated	Will start from day one construction and continue throughout operations as required

The construction schedule has been designed to account for minor delays that could result from delayed equipment arrival and adverse weather conditions.

1.6 REGULATORY CONTEXT

1.6.1 Environmental Assessment

Pursuant to the Nova Scotia *Environment Act*, environmental registration with Nova Scotia Environment (NSE) is required for an electric generating facility which has a production rating of 2 MW or more derived from wind energy.

Kemptown will have a capacity exceeding 2 MW and is therefore subject to environmental registration. This EA satisfies the requirements outlined for provincial environmental registration as a Class I Undertaking and was prepared following guidance from "The Proponent's Guide to Wind Power Projects: Guide to Preparing an Environmental Assessment Registration Document" (NSE 2007, updated 2012). A Draft EA Report is not required for the project as advised by NSE. An earlier EA was registered for this project in a location 3-4 km south-south-west of this project location in December 2013 and granted approval in February 2014.

To date, the Project has no known triggers under *CEAA*.

1.6.2 Environmental and Land Use Approvals

In addition to EA requirements, federal, provincial and municipal environmental and land use permits, licenses and approvals may be required for this Project. Table 1.2 summarizes approvals and authorizations likely to be required for the Project; this list is intended to be illustrative for EA purposes only.

Affinity Wind LP

Kemptown Wind Farm

Figure 1.1

Project Location

Legend:

- Proposed Turbine
- Project Property
- Road to be Upgraded
- New Road Construction
- Local Road
- Woods Road
- Trail
- Lake
- Wetland
- Stream
- Contour
- Building
- Transmission Line

Scale 1:25,000

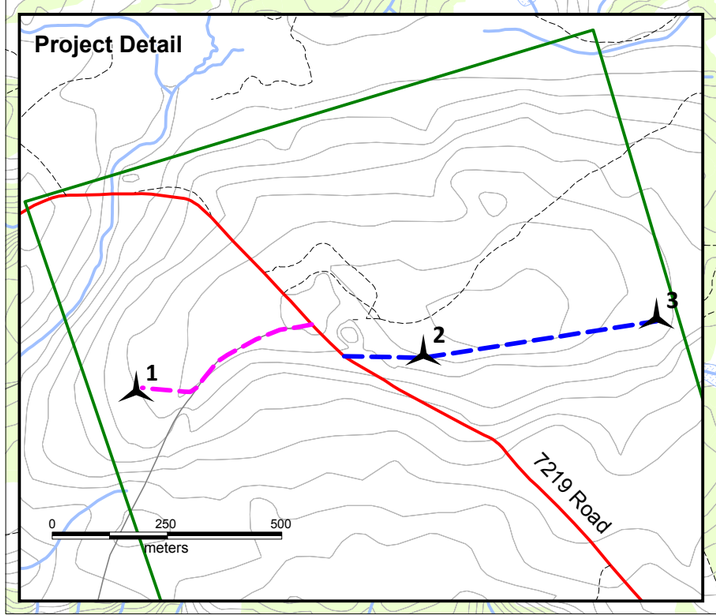
Turbine Model: GE 1.6 82.5
Hub Height: 80 m
Rotor Diameter: 82.5
Rated Power: 1680 kW

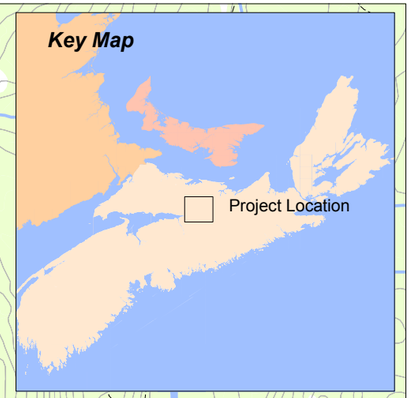
Date: July 29, 2014	UTM, NAD83, Zone 20	Version 1.0

Turbine	Easting	Northing
1	489,997	5,037,881
2	490,622	5,037,960
3	491,130	5,038,040

0 1 2
kilometers

Project Detail





1
2
3

PID: 20400230
Northern Resources

Kemptown Road

7219 Road

Pictou Road

Highway 104

Colchester Balefill Facility

Affinity Wind LP

Kemptown Wind Farm

Figure 1.2

Project Study Area

Legend:

- Proposed Turbine
- Project Property
- Study Area
- Road to be Upgraded
- New Road Construction
- Local Road
- Woods Road
- Trail
- Lake
- Wetland
- Stream
- Contour
- Building
- Transmission Line

Scale 1:25,000

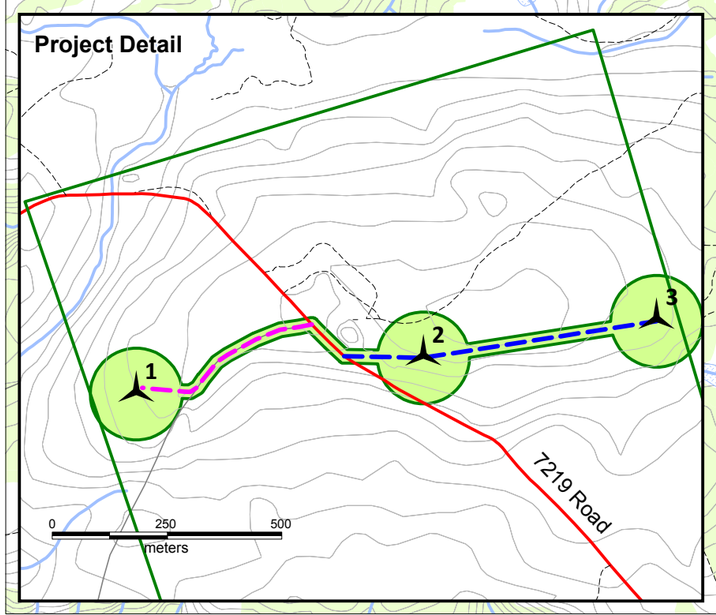
Turbine Model: GE 1.6 82.5
Hub Height: 80 m
Rotor Diameter: 82.5
Rated Power: 1680 kW

Date: July 29, 2014	UTM, NAD83, Zone 20	Version 1.0

Turbine	Easting	Northing
1	489,997	5,037,881
2	490,622	5,037,960
3	491,130	5,038,040

0 1 2
kilometers

Project Detail



Key Map

Big Lake

1
2
3

PID: 20400230
Northern Resources

Kemptown Road

7219 Road

Pictou Road

Highway 104

Colchester Balefill Facility

Table 1.2 Required Environmental and Land Use Approvals

Approvals Required	Summary
Federal	
Canadian Aviation Regulations Standard 621.19	Section 5.9 of these regulations state that a wind turbine should have a flashing red or white beacon mounted on the highest practical point of the turbine if the structure is taller than 90 m. Lighting requirements have been determined in consultation with Transport Canada. Consultation is required with the appropriate regional Civil Aviation authority, providing information on the planned obstruction using the Aeronautical Obstruction Clearance Form. Approval (2011-541) for the Lighting Plan was received from Transport Canada on December 22, 2011. Land Use Submission Form was submitted to NavCanada on January 4, 2012. Approval (12-0114) was received July, 2012; extended Approval for updated turbine locations (13-4049) was received November 25, 2013 (Appendix A). Updated NavCanada Land Use (14-2411) was received July 26, 2014.
CBC, DND and RCMP	Nortek Resources has been contracted to complete the RABC Report on the potential effects the Project may have on CBC, RCMP, Department of National Defense, and other radio/ radar frequency users. The correspondance was sent out to the appropriate authorities on August 01, 2014. (Appendix A).
Provincial	
Water Approval for Watercourse Alteration (Activities Designation Regulations)	Alteration of any watercourse will require authorization from NSE under the Activities Designation Regulations. Affinity proposes to avoid watercourses during detailed design. Based on the current proposed road layout, it is not anticipated that any watercourse crossings will be required for access roads. Drainage or cross-flow diversion may be required. All alterations will be in compliance with NSE Regulations however; the nearest watercourse is over 500m from any impacted area.
Water Approval for Wetland Alteration (Activities Designation Regulations)	Alterations of a wetland will require authorization from NSE under the Activities Designation Regulations. Affinity proposes to avoid wetlands through turbine siting and road layout design. If however, it is not possible to avoid a wetland, a functional analysis will be conducted and an application will be submitted for approval of the proposed alteration. No wetlands are closer than 1000m of any impacted areas.
Working within Highway Right-of-Way (*Public Highways Act*)	The proposed transmission line may disturb the surface, soil, or any structure within a highway right-of-way (including the road surface). In Nova Scotia this requires a Working within Highway Right-of-Way Permit from Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR). This approval is not anticipated to be required at this time.
Use of Right-of-Way for Pole Lines Permit (*Public Highways Act*)	Approval from NSTIR may be required for installation of distribution line upgrades. Application will be made to Colchester County Area Manager if electrical drawings and survey mapping indicate it is necessary.
Driveway Construction Permit (*Public Highways Act)*	Approval from NSTIR is required to construct a driveway however, the existing driveway from project lands onto the Kemptown Road is existing so a new permit will not likely be required.

Table 1.2 Required Environmental and Land Use Approvals

Approvals Required	Summary
Special Move Permit with Department of Transportation and Infrastructure Renewal (*Public Highways Act*)	A Special Move Permit and any associated approvals will be obtained for heavy or oversized load transport as required.
Municipal	
Municipality of the County of Colchester	The Proponent will make application to the Development Officer for Colchester County, Colin Forsyth, for a Development License specific to the construction of a wind turbine generator. The turbine dimensions, including foundation and manufacturer information, as well as distances to houses, property lines and roadways, sound pressure levels and public consultation fall within the regulations as required of the Municipality. Specified distances from proposed turbines to homes and propery lines are regulated in terms of notifications to landowners, as well as timing and information contained.

1.7 REPORT ORGANIZATION

This report is intended to meet provincial EA requirements, in accordance with the Nova Scotia *Environment Act*.

The following outlines the structure of the Report:

- Section 1 introduces the Project and summarizes the key elements of the Project and the regulatory regime.
- Section 2 provides additional Project detail on components and activities required to support this EA.
- Section 3 describes the stakeholder consultation and Mi'kmaq engagement program undertaken for this Project.
- Section 4 describes the assessment method and scope of the assessment.
- Section 5 describes the existing environment of the Project site, including both biophysical and socioeconomic elements.
- Section 6 presents the assessment of potential environmental effects for each component of the Project, including accidents and malfunctions, and discusses the potential cumulative effects of the Project in association with other existing and planned projects.
- Section 7 identifies follow-up measures that are intended to be implemented for the Project.
- The conclusion of this EA is presented in Section 8.
- Section 9 presents the signature page followed by a list of supporting documents used to prepare the report in Section 10.
- Technical reports and supporting information are presented in appendices at the end of this document.

1.8 EA AUTHORSHIP

This EA was completed in-house by staff with extensive experience in undertaking EAs specific to wind farms in Nova Scotia. All expert studies were conducted by third party professionals in their designated fields and submitted to Ms. Fulton for direct inclusion into this document. Specifically, and on behalf of Affinity, the report was prepared and reviewed by the following:

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Environmental Lead and Project Coordinator
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2.0 PROJECT DESCRIPTION

The following describes the Proponent, background and location of the Project, and detailed Project activities.

2.1 PRESENTATION OF THE PROPONENT

Affinity Renewables Inc. is a company created by Reuben Burge, the Director of Sustainable Funding for the Society for the Prevention and Cruelty to Animals (SPCA). Affinity Renewables Inc. (Affinity) was created to answer the Nova Scotia Government's call for Community Feed-in-tariff projects (COMFIT). As a not-for-profit, the SPCA qualifies under COMFIT regulations as an eligible entity "community" for gaining approval to build and own renewable energy projects. This project will be known as the Kemptown COMFIT Wind Project and will consist of three GE 1.68 MW series wind turbine generators with 82.5m rotor diameter and a 25 kVA collection system connected directly into the NSPI grid at interconnection point transformer 1N-T65. The proposed project will be located in Kemptown in the municipality of Colchester.

Affinity Renewables Inc. will become a limited partner in the ownership of the proposed wind project and earn annual income from shares in the facility for the 20 year term of the Power Purchase Agreement (PPA). The SPCA, will share in the income benefits when the project becomes operational without sharing risk during any part of the pre-development, permitting, financing, or operational stages. Affinity Wind LP will finance the entire portion of the SPCA's ownership in order to ensure that the Not For Profit's income from donations will not be required at any stage of development or operation. Affinity will rely entirely on Rotor Mechanical Services (Rotor) to develop and operate the facility, as an affiliate to RMSenergy Dalhousie Mountain LP (Dalhousie Mountain), Rotor has extensive experience by developing and operating Dalhousie Mountain's 34 turbine 51 megawatt (MW) facility in Mount Thom, Nova Scotia (Dalhousie).

A Limited Partnership, Affinity Wind LP has been created to own and operate all of Affinity's COMFIT projects..

2.2 PROJECT BACKGROUND

Affinity is proposing to construct and operate a wind energy facility*, Kemptown*, in Kemptown, Nova Scotia. The Project will have a nameplate capacity of 4.99 MW. The Project is planned to connect into the Nova Scotia electrical distribution grid.

Several years of wind data has been gathered from the site from six nearby meteorological stations. A met tower located where the original Kemptown project was proposed has gathered wind data since June 21, 2013. A combination of consistent wind, previous land use, local benefits and community desire to develop the wind potential make the revised location an ideal site for wind development (refer to Section 2.5 for more information on Project siting).

2.3 PURPOSE OF PROJECT

The Project has been proposed in response to the opening of application to Nova Scotia Department of Energy for the Community Feed-in-Tarrif program for a total of 100 MW of distribution projects across the province. This Project will have the capacity to contribute up to 4.99 MW of clean, renewable energy to the local distribution grid, producing energy sufficient to power 2,000 homes annually. The Kemptown Project is a key part of the Nova Scotia Government's plan to integrate renewable assets into its energy mix and will assist the Province to meet its 2015 renewable energy targets.

2.4 SITE SELECTION AND DESIGN

The selection of the Kemptown site was based on a number of factors including:

- Open capacity/ need for local power supply
- proximity to the Proponent's headquarters at the existing Dalhousie Mountain Wind Farm;
- preliminary wind resource assessment;
- review of terrain and topography with an altitude above sea level of around 200 m;
- access to power grid interconnection;
- site access;
- presence of existing logging roads;
- existing land use;
- distance to houses; and,
- community support.

The location of the turbines is shown in Figure 1.1. This current site configuration is based on a variety of factors. The locations selected for turbines are a critical element of power generation efficiency and optimal Project economics. The selection of locations is also conditional on the absence of significant ecological or heritage features of the Project Study Area. Site selection, therefore, must consider both of these elements, as well as residential set-backs, in order to have a successful Project with minimal social and environmental effects.

When siting the turbines, the applicable land use by-law setbacks (1000 metres from dwellings in Colchester County; see Section 3.3) were used by the Proponent as a starting point for exclusion zones. The Proponent has conducted each expert study in a manner through which the turbines may be adjusted within a 100 metre radius of the mapped locations (Figure 1.2). The Proponent has been in consultation with the municipality's planning department since 2011 and is confident the Project exceeds all requirements.

The Proponent has installed a meteorological tower, leased land and completed extensive expert studies since April 2011. The planning and selection process for Kemptown turbine locations followed an iterative approach where each site was assessed both for its energy

capacity and the presence of sensitive ecological or heritage resources. Sites, which were considered at early stages in the Project, have now been scrutinized from an ecological perspective and locations adjusted to mitigate potential environmental impacts. The same level of scrutiny has been applied to the location of access roads in order to minimize adverse effects on plant communities and aquatic habitat. Access roads follow high ground with the route selected to eliminate any water crossing. The site locations, shown on Figure 1.1 with the access road layout, have been derived using this careful selection process.

The layout focuses on the higher dry ground to avoid impinging on wetland habitat. The project covers less than 3 ha in total, leaving habitat around the site for wildlife to concentrate in. The area is in an existing developed area with a landfill to the south, woodlands to the west, a quarry to the north and woodlands and sparsely populated rural setting to the east. The original three sites were on more commercially developed land 3-4 km south of the revised locations. However, upon receiving Environmental Approval with Conditions from the Minister of Environment in February 2014, land constraints previously not present were pushing the project closer to wet areas. This is one of the main reasons that the Proponent chose a revised location and is undergoing a second EA for the three turbines 3-4 km from the original.

Figure 2.1 Technicians having just completed met tower construction at Kemptown, June 2013

Figure 2.2 Met tower with measuring equipment at Kemptown

The Project Study Area used for bird monitoring and wildlife surveys is comprised of not only the turbine locations and access roads, but the areas surrounding and in between, as birds and wildlife are not static. However the actual footprint of the tower structures and ancillary facilities for the proposed wind farm will occupy only a small fraction of the land base within the Project Study Area (cleared turbine area and area for the access road between turbines). When considering all turbines, the Project is predicted to result in physical disturbance of approximately 3 ha of land, including development and upgrading of access roads and turbine

foundations. It is expected that the actual development will be constructed to result in a smaller footprint with less disturbance than the study area.

As detailed design and planning progresses (including, but not limited to, community consultation, site specific geotechnical tests, archaeolocigal and Mi'kmaq significance, municipal by-law amendments, and biological surveys), the Proponent continued the optimization of site layout to minimize biophysical and socioeconomic effects while improving Project efficiencies. A considerable amount of micrositing has been conducted, with the proponent revising turbine sites in the field with biologists to avoid, to the extent possible, sensitive features, including wetlands and rare plants.

A description of the biophysical and socio-economic features of the Project Study Area is provided in Section 4.0.

2.5 PROJECT COMPONENTS

The Project will consist of three, GE 1.68 MW series 82.5 m wind turbine generators. In addition, the following ancillary facilities are also considered part of the Project:

- 25 kVA collection lines (to link the wind turbines to the distribution);
- 690V – 25 kVA pad mounted step-up transformers located beside each turbine;
- access roads; and
- crane pads for assembly of wind turbines.

No substation is required for this project. An existing maintenance shop/control building is located approximately 14km east of the Project and will be used for all Affinity Wind's projects, as well as for the Dalhousie Mountain Wind Farm.

2.5.1 Wind Turbine Generators

The Proponent intends to use General Electric (GE) turbines (GE 1.68 MW series 82.5m turbines) for this Project.

Table 2.1 includes a summary of the technical specifications for this Project's turbine model.

Table 2.1 Technical Specifications: GE 1.68MW 82.5m Turbine

Turbine Component	Specifications
Rated capacity	1.6 to 1.85 MW
Rated sound power level	106 dB
Cut-in wind speed	3.5 m/sec
Cut-out wind speed	25 m/sec (1 minute)
Rated wind speed	12 m/sec
Number of blades	3

Table 2.1 Technical Specifications: GE 1.68MW 82.5m Turbine

Turbine Component	Specifications
Blade Diameter	82.5 m
Swept area	5345 - 7853 m^2
Rotor speed (variable)	20.4 rpm
Tower (hub) height	80 m
Gearbox	Three-step planetary spur gear system
Generator	Double-fed three-phase asynchronous generator
Yaw system	Electromechanical driven with wind direction sensor and automatic cable unwind
Control system	Programmable logic controller (PLC)/ remote and monitoring system
Tower design lightning protection	Lighting receptors installed on blade tips / surge protection in electrical components

The GE 1.68MW 82.5 m 60 Hz unit is a three bladed, upwind, horizontal-axis wind turbine with a rotor diameter of 82.5 m. The turbine rotor and nacelle are mounted on top of a tubular tower giving a rotor hub height of 80 m. The components and dimensions of the turbines are illustrated in Figures 2.4 and 2.5. Interior service platforms are provided. The tubular tower is tapered and manufactured in three sections from steel plates. Access to the turbine is through a lockable steel door at the base of the tower. Access to the nacelle is provided by an interior ladder with a fall arresting safety system (Figure 2.3). Interior lights are installed at critical points from the base to the top of the tower.

The machine employs: active yaw control (designed to steer the machine with respect to the wind direction); active blade pitch control (designed to regulate turbine rotor speed); and generator/power electronic converter system from the speed variable drive train concept (designed to produce nominal 60 Hz, 690V electric power).

The generator is a doubly fed induction-generator with wound rotor and slip rings. Nominal speed at 1.6 MW power output series is 1550 rpm. The generator is mounted to the bedplate on elastomeric foundations to reduce vibration and associated sound.

Temperature sensors are built into the generator windings to provide a temperature reading to the wind turbine controller. In the event the generator temperature is outside of the normal operating range, an automatic shutdown of the turbine is initiated.

The electrically actuated individual blade pitch systems act as the main braking system for the wind turbine. Braking under normal operating conditions is accomplished by feathering the blades out of the wind. Any single feathered rotor blade is designed to slow the rotor, and each rotor blade has its own back-up battery bank to provide power to the electric drive in the event of a grid line loss.

Figure 2.3 Employee in safety harness climbing down the ladder in GE turbine

Figure 2.4 GE Energy 1.6 MW series 82.5m 60 Hz Wind Turbine Generator: Internal Components

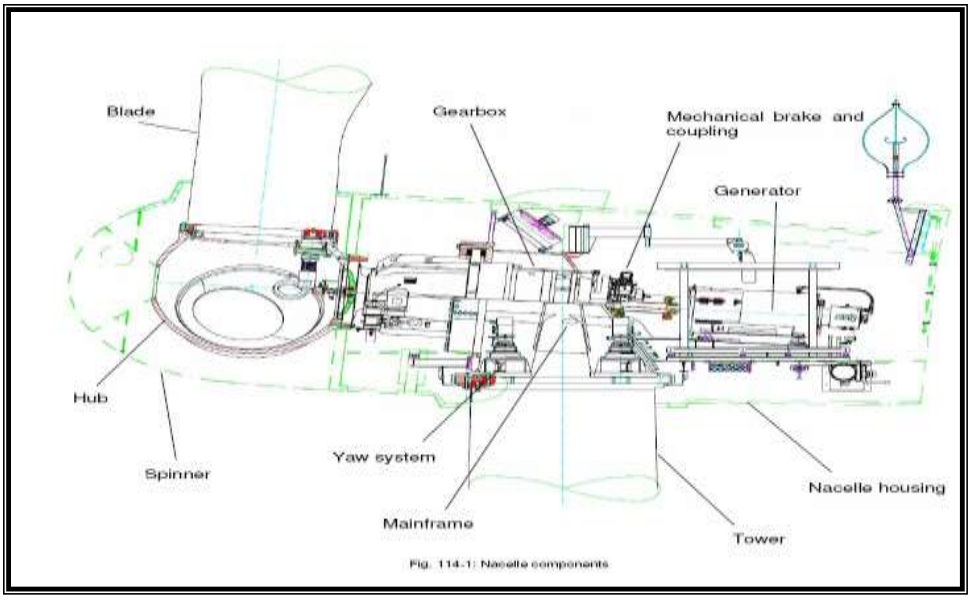
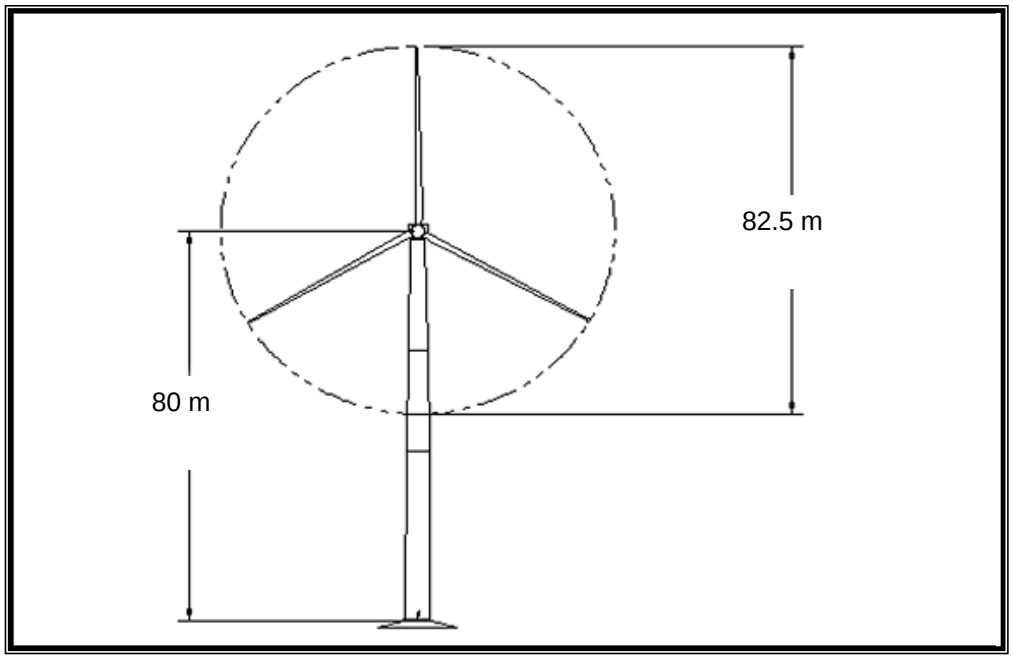


Figure 2.5 GE Energy 1.6 MW 82.5m 60 Hz Wind Turbine Generator: External Dimensions



The turbine is also equipped with a mechanical brake located at the output (high-speed) shaft of the gearbox. This brake is only applied immediately on certain emergency stops (E-stops). This brake also prevents rotation of the machinery as required by certain service activities.

The rotor blades are equipped with a strike sensor mounted in the blade tip. Additionally, a solid copper conductor from the blade tip to root provides a grounding path that leads to the grounding system at the base of the tower foundation.

Service switches at the tower top prevent service personnel at the bottom of the tower from operating certain turbine systems while service personnel are in the nacelle. To override any machine operation, E-stop buttons located in the tower base and in the nacelle can be activated to stop the turbine in the event of an emergency.

The wind turbine can be controlled automatically or manually from either the control panel located inside the nacelle or from a personal computer (PC) located in a control box at the bottom of the tower, or from a PC located offsite through internet-enabled control.

Turbine installation is completed by the mounting of the three-bladed rotor hub to the main shaft after the nacelle assembly has been mounted to the top of the tower. The nacelle of the turbine is constructed of fibreglass and lined with sound insulating foam. This sound insulating foam helps reduce acoustic emissions from the wind turbine.

2.5.2 Electrical Components

The interconnection point is located on NSPI Distribution line 1N-T65.

A two-month construction period is anticipated to complete the main components and a two week commissioning period will be required after individual turbine commissioning is completed. The wind turbine itself produces 690V, 3 phase power and is sent via underground cables through the foundation base to a transformer pad outside the turbine. The power will be converted here by a small pad mounted step-up transformer (Figure 2.6) to convert 690V from each turbine to line voltage on the above-ground collector lines.

Figure 2.6 Pad mounted step-up transformer to convert 690V from turbines to collector lines

It will be feeding 25 kVA directly into the distribution system through a meter bank and a cut-off switch.

The overhead electrical collector lines will follow the access road system close to the ditch to provide reliable ongoing maintenance access. The poles will be placed by an excavator crew using standard methods (*e.g.*, drilling and/or jackhammer). Poles will be approximately 75 m apart. The collector line circuits will be completed within a two month period. Installation of the electrical components will be conducted simultaneously and in conjunction with the turbine erection crew (Table 1.1).

2.5.3 Additional Components

Delivery roads are currently in place from previous land uses and some new road construction between turbine locations will be required. Figure 1.2 shows the turbine layout and Project access roads along with other site features. To the extent possible, existing access roads will be used, with appropriate upgrades to meet the load requirements for trucks transporting materials to the turbine sites.

No bridges or culverts are required for the access and construction of the Kemptown Project.

2.6 PROJECT ACTIVITIES

The following section provides details on the planning, construction, operation, maintenance and decommissioning of the Project. Activities that have the potential for environmental effects in the Study Area are addressed in Section 5.0.

The development of the proposed Project will include several phases: site preparation and construction; operations and maintenance; and decommissioning (Table 2.2).

Table 2.2 Typical Project Activities

Site Preparation and Construction	
Surveying	Activities include staking the boundaries of the construction area, temporary workspace, aboveground collector lines and transmission lines, as well as marking the location of any existing underground pipelines and cables, or any biological or archaeologically significant areas.
development of access roads	Access roads will be surveyed and staked/flagged. To access the turbines, approximately 500m of new road construction will be required and approximately 1000m of existing roads previously built to support logging activities will be upgraded. Roads on the site will be up to 10m wide. Ditches and widened corners will be added where required during construction to accommodate crane movements for installation, trailers for transportation of heavy and oversized turbine equipment, maintenance vehicles and equipment for repairs/replacements. Construction roads will be designed to accommodate the crane types that will be required to erect the generators and towers. The surface soil and grubbing will be re-located in borrow areas along the road side and graded to prevent erosion and sediment runoff. Wetlands and watercourses will be avoided in designing access roads. Water Approvals will be sought from NSE for wetland/watercourse alterations if these features are unavoidable. Based on the current proposed road layout it is anticipated no potential watercourse crossing installations will be required. The ditches will be constructed along the road edge following provincial guidelines and procedures to control for surface water runoff. Cross-culverts will be installed under the roads where necessary for cross drainage as well as installing check dams and take offs on slopes to guide run-off from any watercourses or wetlands.
Clearing and grubbing	The Project Study Area generally consists of previously disturbed woodland which will require clearing and grubbing in some areas. Approximately 1 ha of land is required for the construction of each turbine (including averaging cleared land for access roads per turbine), within which turbine foundations and crane pads will be located. After construction and installation, a much smaller pad for service and maintenance vehicles will remain.
Grading	Grading will be necessary to finish the access roads and pad construction to compact and level stockpiles and will follow provincial guidelines and procedures.
Soil stockpiling	Some soil will be stockpiled on site during construction to be used in re-vegetation and reclamation of the site once the turbines are erected. Stockpiles will be located away from watercourses and wetlands.
Foundation excavation	The turbine foundation specifications will be determined by the final geotechnical report and structural engineering at each turbine site, as is necessary to properly support the loads. The turbine foundations are designed and approved by GE and certified in Nova Scotia as required. The sand, aggregate and concrete will be prepared in a certified portable batch plant in accordance with NSE standards. Excavation for the turbine foundations will begin by removing compacted sediment/ topsoil and placing it in a dry pile, covered with plastic and will be re-placed over the area to provide a natural soil base for regeneration of indigenous plant species. The foundation requires digging to a depth where the ground has an impact measurement of 450 kpa. An engineered layer can be built if the soil bears no hard surfaces within a few meters The diameter requiring excavation will be approximately 17m wide. Blasting is not anticipated, but if required, it would be local blasting not exceeding 2 m in depth, and would not be strong enough to break up the bedrock below the foundation. Working down to this depth with a jackhammer is the preferred method, and blasting would only occur for extremely compacted bedrock above the 2m required depth.

Table 2.2 Typical Project Activities

Site Preparation and Construction	
Pouring turbine foundation	After excavation, the bedrock surface will be levelled, compacted and covered with a 10cm thick levelling layer of concrete to allow an engineered surface to install the bolt ring section and the reinforced concrete structure. The foundation forms and rebar will be installed. Concrete will be poured into the forms continuously. When the foundation construction is complete, the topsoil and gravel mixture will be replaced and compacted in accordance with the engineering requirements for soil density.
Equipment lay-down and turbine assembly	All machinery and turbine components will use existing and/or proposed roads or crane pads for parking and lay-down areas. The sites will be complete prior to accepting delivery to allow delivery of the components directly to the individual sites, preventing unnecessary extra movement, lay-down areas, delays and cost. Each of the turbines and generators will be trucked on a flat-deck trailer to the site and assembled.
Delivery to site	Delivery of the tower sections and main turbine components will commence as early as March 2015 as described in Table 1.1 Proposed Project Activity Schedule. This date will ensure that all road restrictions imposed by TIR are not exceeded resulting in construction delays. Typically in April and May, when the frost recedes, heavy vehicles may cause damage and erosion problems. When this occurs, the shoulders of the road become unpredictable and can lead to vehicle rollover. For safety reasons and logistics, delivery will take place only when safe road conditions are met. The benefits of a clean, gravelled road surface will reduce the environmental impact of: dust and airborne pollutants; mud on the employees work boots causing a slip or fall; truck tires transferring mud to Kemptown Road; and cranes driving in between turbine sites and possibly sliding off the roads. The transportation of wind tower components to the site will include approximately 8 trucks per turbine. The transportation of the 300 ton erection crane and the crane components will require up to four flatbed trucks. The 75 ton and 150 ton hydraulic wheeled cranes will unload the trucks and place each turbine on the setup pad located at each individual turbine location. The first tower section may be placed during unloading for convenience and to minimize the size of the layup area. The erection crane will use a tailing crane to erect the two top tower sections, the nacelle, then the hub and blades will be placed last to complete major construction.
Tower, generator, and rotor assembly	The tower will be transported in three sections that will be assembled on site. The blade system, consisting of three blades and a hub, will also be assembled on site, attached to the generator and lifted into place at the top of the tower by a crane.
Collection system and transmission line/connection to grid	The 25 kVA electrical collection system will consist of aboveground electrical poles between turbines, distributing power from each turbine to the distribution line. Aerial cabling is installed by first drilling and placing poles, then stringing each phase of wire.

Table 2.2 Typical Project Activities

Site Preparation and Construction	
Clean-up and reclamation	Construction waste will be removed and disposed of at an approved location in accordance with local and provincial waste management requirements. A waste control operator will be hired locally to ensure proper waste management procedures are in place throughout all stages of development, construction and operations of the Kemptown Project. The temporary lay-down areas and disturbed areas around the foundation of each turbine will be replaced with the previously excavated and stockpiled topsoil. The disturbed areas will be re-seeded. High voltage signage will be installed as necessary.
Turbine commissioning	Turbine commissioning can occur once the wind turbines have been fully installed and when NSPI is ready to accept grid interconnection. Commissioning involves testing and inspection of electrical, mechanical, and communications operability. A detailed set of operating instructions must be followed in order to connect with the electrical grid.
Operation and Maintenance	
Access and inspection	Maintenance inspections will be required for routine servicing. Light 4 x 4 trucks, vehicles, and ATVs may be used to access the towers. Larger trucks and cranes may be required periodically for larger repairs, but this is expected to occur infrequently. In addition, throughout the lifetime of the Kemptown Project, access to the turbines as part of regular non-scheduled maintenance activities will be required for resetting faults, minor component replacement and related activities. New and used lubricants, cleaning supplies and other controlled substances will be delivered, stored, handled and disposed of according to local regulations. All sediment control and watercourse alterations will be inspected while service personnel are on site.
Decommissioning and Abandonment	
Rotor, generator and tower disassembly	The rotor, generator and towers would be disassembled using a crane and removed from the site for re-use, reconditioning or disposal using a flatbed truck.
Access roads	Access roads will be removed where appropriate and in consultation with landowners.
Removal of concrete foundation	Decommissioning and reclamation will be done in accordance with landowner agreements, as approved by the County of Colchester. In some cases, foundations will be removed to a depth of approximately one meter below original ground level and filled with subsoil to rebuild the grade. The concrete foundation below one meter can remain in place. Stockpiled topsoil will be placed over the area to approximate depth of adjacent ground, depending on the land use at the time and the preference of the landowner. In some cases, depending on landowner agreements, concrete pads may stay in place.
Decommissioning of distribution lines	Above ground power-lines will be removed from the ground during decommissioning, or as determined necessary by NSPI.

2.6.1 Construction Phase

Clearing activities will be scheduled outside of the breeding bird season (May to August). However, in the remote possibility that clearing activities will need to take place during the breeding bird season, an adequately trained specialist will be required to inspect the proposed work area for nesting birds prior to any site clearing. In addition, any clearing and disturbance within 50m of identified nesting or breeding areas will be avoided. Current forest roads have been considered to the extent possible as access roads to turbine locations. Compaction of soil will be minimized to the extent possible with compacted soil recovered following turbine

installation. In addition, silt fencing will be erected, if required, to help prevent erosion of bare lands caused by construction activities.

Watercourses and wetlands will be avoided. If applicable, wetland functional analyses will be conducted for unavoidable wetlands and Water Approvals for watercourse and/or wetland alterations will be obtained from NSE. If construction is necessary in or near watercourses or wetlands, erosion and sediment control measures will be put in place for the duration of construction in those areas. Based on the current proposed road layout, it is anticipated that no watercourse crossings will be required. Additional information on watercourse crossings, including descriptions of drainage areas, and proposed mitigation measures, are provided in Section 5.2 (Aquatic Environment).

Information and warning signs will be erected adjacent to the Project site at the start of construction to provide public information about the facility and to discourage trespassing on private lands. This signage will be maintained and updated as necessary.

Equipment on site during construction could include hydraulic fluid, brake fluid, transmission fluid, and oil from the wind turbine generator. Any refilling activities will take place either off site or in designated areas and at a minimum of 100m from wetlands or watercourses.

The turbine nacelles (which house the gearbox and the generator) and hubs will be delivered directly to the Project site. Equipment delivery is anticipated to be as early as December 2014 and therefore will avoid the spring season where weight restrictions are in place. It is anticipated that the current road network (outside of onsite turbine access roads) will not require upgrades to accommodate construction traffic. The same travel routes that were used for Dalhousie will be used for the proposed Kemptown Project. Implementing good transportation planning and safety measures during construction will minimize the potential for traffic related safety concerns. Public safety has been and will continue to be incorporated into the Project design. As stated above, land access to the construction site will be controlled through signage and restricted to authorized personnel only.

Approvals for transporting these materials will be sought from the provincial transportation departments. As the turbine components are oversized, a Special Move Permit and any associated approvals will be obtained through Nova Scotia Department of Transportation and Infrastructure Renewal (TIR) for heavy load transport.

2.6.2 Operation and Maintenance Activities

Activities associated with the operation and maintenance of Kemptown will not be as extensive as during the construction phase. The wind turbines do not generate emissions. Maintenance inspections are required approximately four times per year per turbine for routine servicing and lubricant replacement. Malfunctions and parts replacement will be assessed on an individual basis. A spares inventory will be provided by the manufacturer at the maintenance facility, and will be available for the recovery of unexpected breakdowns. Light-duty 4x4 trucks, vehicles, and ATVs may be used to access the wind turbines. For maintenance planning, access to the

site will be controlled and managed through private land under the terms of the individual site agreements and easements. Site access will be carried out on routes pre-planned to reduce excess travel and impact on existing use. Larger trucks and cranes may be required infrequently for larger repairs.

Aside from normal recovery of lubricants from the gearbox and yaw mechanism, operation activities do not generate waste. Lubricants will not contain any PCBs. New and used lubricants, cleaning supplies and other controlled substances will be delivered, stored, handled and disposed of according to local regulations. Vehicle emissions will be reduced by pre-planned maintenance activities and pre-planned access routes.

Each turbine houses a sophisticated Supervisory Control and Data Acquisition (SCADA) which continuously monitors equipment performance and instantly detects any faults to be addressed. This system will determine the frequency of regular and non-scheduled maintenance activities onsite. This system can be reached remotely, eliminating unnecessary travel to and from the site.

2.6.3 Aeronautical Obstruction Lighting

The proposed Aeronautical Obstruction lighting will be installed in compliance with Part VI of the Canadian Aviation Regulations 2007-2 Standard 6321.19 as administered by Transport Canada. This complies with CL-864 in Appendix B of the Standard. Additional information is provided in Appendix A of this EA, including the Aeronautical Lighting Plan. The Plan is that all three turbines will be lit, as required by Transport Canada.

2.6.4 Decommissioning

Kemptown is expected to be operational for at least 25 years. In the event that decommissioning and abandonment is necessary, the activities associated with the Project include:

- rotor, generator and tower disassembly;
- decommissioning of access roadways, where necessary;
- removal of concrete foundation;
- removal of distribution and transmission lines;
- removal of pad mount transformers; and

Well-designed and constructed wind energy facilities may be operated for decades. Individual wind turbines are expected to perform for up to 35 years without significant repair or replacement. Transformer facilities and underground wiring are designed for at least a 50 year life span. Individual wind turbines may be replaced or repaired as their useful life comes to an end, or if more efficient and cost-effective technology becomes available.

Upon a decision to decommission a single wind turbine or all three, all equipment above ground, including towers, nacelles, transformers and controllers will be removed. Wind turbines that are operational and have market value would be carefully removed using a crane, essentially in a reverse process to assembly and installation. The resale value of such equipment would cover the cost of removal in such a case. A market for good, used wind turbines has developed in North America, and a number of wind turbines installed in Alberta in the early 1990s originated from the U.S. used wind turbine market.

Other above-ground equipment in the wind farm, including transformers and wiring, has a ready market in either used equipment sales or in salvage. Transformers will be simply removed and sold. Wiring will be removed and sold to metal salvage companies.

As discussed above, wind energy facilities do not use or produce harmful waste products and therefore aside from normal recovery of lubricants from the gearbox and yaw mechanism, there are no requirements for harmful waste handling during decommissioning.

Wind energy facilities removed from undeveloped woodlands will require minimal remediation; native seed mixtures will be used to re-vegetate the area. Where necessary, topsoil and re-grading of access roads will occur as per the landowners' preference.

All decommissioning activities will be conducted in accordance with landowner agreements and applicable regulations and agreements at that time. It is not anticipated that watercourse crossings would be removed during decommissioning, as properly installed and maintained crossings are a benefit to the watercourse and the aquatic wildlife it contains.

As documented throughout this EA, the Project has been designed to minimize the risk of contamination during its operational lifespan. Containment and storage areas will limit contamination. Any remedial clean-up during the decommissioning or asset transfer will therefore also be limited. Provided the Project is operated and maintained in-line with industry best practices, there should be no significant environmental liabilities associated with clean-up or remediation. Regardless of the ultimate outcome, all decommissioning activities will be performed in compliance with the applicable regulations in force at that time.

2.7 FUNDING

The Project will be 100% privately funded.

3.0 STAKEHOLDER CONSULTATION AND MI'KMAQ ENGAGEMENT

Public consultation is an integral part of the environmental planning process and plays a key role in addressing potential public concerns identified in early stages of the Project. Public consultation is a requirement under NSE's "Proponent's Guide to Wind Power Projects: Guide to Preparing an Environmental Assessment Registration Document" (NSE 2007, updated 2012) and is a step in the environmental registration process. Public consultation is also required to maintain COMFIT certification. In Colchester County, public consultation for wind projects is required to be approved for a Development Licence. Ongoing consultation with the public and neighbours of the Project is an important aspect of development and operations.

Consultation activities have included meetings with stakeholders such as local landowners, municipal and provincial representatives, public meeting and various informal meetings, phone calls and letters. The Proponent has visited homes surrounding the Kemptown Project to engage homeowners in conversation about any concerns or questions they may have. A flyer was delivered to houses surrounding the Project area for a public meeting to be held in the Kemptown Community Center. Although many homeowners called the Proponent for discussions, only about 22 showed up for the meeting. The Proponent has directly engaged the Mi'Kmaq community through information mailouts, face to face meetings, scheduled phone meetings, digital file sharing, and the commissioning of a Mi'Kmaq Ecological Knowledge Study (MEKS) in 2013. (Appendix B)

The following sections present further details on those opportunities given to the public and reviewing agencies for comment. Supporting documentation is provided in Appendix E. The Proponent will continue to communicate with the public and Mi'kmaq. During the EA review process, additional issues may be raised by the public and the Mi'kmaq who will be invited to submit written comments on the proposed Project and information contained in the EA document during the EA registration phase.

3.1 REGULATORY CONSULTATION

Various regulatory and other agencies were consulted early in the planning process to provide input into the Project and the process, and advise in terms of likely approvals and considerations for environmental assessment.

To date, the following agencies have been contacted by Affinity:

- Environment Canada - Canadian Wildlife Service (CWS);
- Environment Canada – Meteorological Service of Canada;
- Department of National Defense (DND);
- Transport Canada;

- NAV Canada;
- Royal Canadian Mounted Police (RCMP);
- Canadian Coast Guard;
- Canadian Broadcasting Corporation (CBC);
- Radio Canada;
- Province of Nova Scotia Integrated Mobile Radio System;
- Nova Scotia Environment (NSE);
- Nova Scotia Department of Natural Resources (NSDNR) Species at Risk;
- Nova Scotia Transportation and Infrastructure Renewal (NSTIR);
- Municipality of the County of Colchester (including local representative councilors, Development Officer and Planning Advisory Committee).
- Local Member of Legislative Assembly

Comments received during consultation were taken into consideration in preparing the Final EA Registration document. The Proponent will continue to work with regulatory agencies to develop appropriate follow-up measures (*e.g.*, post-construction monitoring) and submit applicable permit applications.

3.2 PUBLIC CONSULTATION

The Proponent has conducted various levels of public consultation since 2011. Informal meetings include: door to door visits and information sharing with local homeowners; attendance to council chambers to hear any concerns raised by the local community during advertised wind turbine specific meetings; visits and correspondence with community members such as the Executive Board of the Valley/ Kemptown Volunteer Fire Department, curators of the local cemetaries and local charitable organizations (*i.e.,* Cobequid Eco-Trails Society) (Appendix E).

The Valley/ Kemptown Volunteer Fire Department has agreed to delegate donated funds raised from the Kemptown Project. A percentage of annual income will be donated to the community and, through the Executive Board, will be given to various chosen charitable funds. The benefit recipients range from local community centers needing a new roof, to victims of house fires, to children who need special medical care, to the Canadian Cancer Society, to annual fundraising events. The Chief of the department has written a Letter of Support on behalf of the department for the Kemptown Project (Appendix E).

The Cobequid Eco-Trails Society is a charitable organization who maintain and build walking/ hiking trails throughout Colchester County (and beyond). They are responsible for upkeep and watch for the Gully Lake Trails System, which is located less than 10km from the Kemptown Project. The Proponent supports outdoor activities and the trails system is a prime example of the type of local activity in need of financial support. The Proponent has committed to donating

to this group. The Society wrote a Letter of Support to the Proponent for the Kemptown Project (Appendix E).

Neighbours have had the opportunity to review Project information and mapping. Public Open House sessions were/ will be held on January 9 and October 20, 2014.

The intent of the Public Open House sessions is to:

- encourage dialogue between members of the Project team in attendance and the general public and stakeholders;
- enable the public and stakeholders to obtain Project information;
- view information on the proposed site and turbine locations;
- invite the public and stakeholders to join a tour of the existing Dalhousie Mountain Wind Farm (at a later date); and
- participate in the environmental and socio-economic assessment process.

Advertisements for the Open House were delivered as invitation flyers to mailboxes of houses surrounding the proposed Project within 2-3km.

During the Open Houses, representatives from Affinity were present to answer questions and to document any issues related to the Project. Attendees were encouraged to sign-in and take a project overview handout as well as corporate information and general information on wind energy. These sessions are usually fairly informal and consist of a small presentation and a series of posters and handouts which include information on:

- maps of the proposed Project Study Area with turbine layout;
- specifications of the proposed wind turbines;
- information on the construction and installation process;
- Project schedule;
- Sound modeling study results;
- visual impact study results;
- corporate information on the Proponent; and
- information on the EA and regulatory approval process.

Few issues of concern were raised during the door to door campaign and the open house sessions.

Additional stakeholder and community outreach initiatives include or will include individual meetings with any concerned citizens, facilitated meetings with citizen/ council group throughout construction and operations, company/ project website (www.rmsenergy.ca), mailout of

community newsletter, meetings with municipal council, continued door-to-door community outreach program and, as described above, public open house sessions.

Public open houses will be scheduled to continue throughout the development process.

Upon submission of this EA, the Proponent will notify neighbouring property owners of the registration of this EA and direct them to either the Municipal office, Scott's Bakery, or the Nova Scotia Environment website to review the study results. During that time, notices will be available informing the general public that there is a 30 day public comment period for this EA.

The Proponent has developed and implemented an issues resolution program for Project construction and operation. This program includes company contacts as well as an issues resolution procedure for community members to identify issues of concern. The procedure will document the issue and action taken to resolve and/or improve the situation.

3.3 MUNICIPAL PLANNING PROCESS

The Proponent has consulted with the Municipality of the County of Colchester on various occasions during Project planning since November 2011 (Appendix E).

The Project is located within the Municipality of the County of Colchester planning district. Aside from the Wind Energy Bylaw which applies to the entire county, there are no other land use zoning bylaws within the Project Study Area as it is located in the 'Rural General Zone'. The Project is located in District 8. The councillor for this area is Ron Cavanaugh.

The Project Study Area is located in designated Provincial District Colchester North. The Member of Legislative Assembly for this area has been consulted regarding the planned Project. The MLA is Karen Casey. The Proponent first met with Ms Casey regarding the Kemptown Project in February 2012. Shortly after that the Proponent received a Letter of Support (Appendix E). Since that time, the Proponent and the MLA have met to discuss updates/ status of the Project.

The Municipality of Colchester developed a Wind Turbine Development Bylaw in 2009 which applied to all lands within the Municipality of the County of Colchester. Setbacks had been developed for large scale (greater than 100 kW) and small scale (equal to or less than 100 kW but not less than 1 kW) wind turbines. The original setback distances are listed in Table 3.1. In addition to the setback bylaw, the County of Colchester regulates the finish of the wind turbine, lettering and signage, tower accessibility and safety, lighting, test towers and outdoor storage.

Table 3.1 shows the 2009 setback parameters for the County of Colchester.

Table 3.1 Municipality of the County of Colchester 2009 Bylaw Setbacks

Scale	Boundary	Distance
Large	Setback from an external property line	One times the total height of the turbine with blades in vertical

Table 3.1 Municipality of the County of Colchester 2009 Bylaw Setbacks

Scale	Boundary	Distance
	and public roads	position – does not apply where the adjoining property is part of the wind power project
Large	Setback from existing dwelling on a neighbouring property	700 m*
Small	Setback from an external property line	two times the height of the turbine – does not apply where the adjoining property is part of the wind power project

*May request a reduction of the 700 m setback down to a minimum 500 m with written permission from the neighbouring property owner.

When siting the turbines, the original by-law distances above were used by the Proponent as a starting point for exclusion zones.

In August 2012, the Colchester Municipal Council requested that the Planning Advisory Committee re-visit the turbine bylaw and adjust for various factors. In September 2013 the PAC recommended a new version of the bylaw, which was approved by municipal council. On September 26, 2013 the bylaw passed first reading. On October 30, 2013 the new bylaw passed second reading.

On September 25, 2013, the Proponent received a hard copy of the draft bylaw from the County. The setback distance from homes was increased from 700m (with option to reduce to 500m) to 1000m (with option to reduce to 700m). A sound limit was added which limits the maximum sound output from a wind turbine at a house to 36 dBA. Public consultation with the creation of a Citizen's Monitoring Committee to be chaired by the 'local councillor' was added. Various specific topics to be addressed by the Proponent include notification, information mail-outs, and information meetings. Specifications on timing, placement, and content are included in the new bylaw. Decommissioning planning and proof of acceptance by the landowner was added. Penalties for offences are laid out.

Table 3.2 Municipality of the County of Colchester 2013 Bylaw Setbacks

Scale	Boundary	Distance
Large	Setback from an external property line and public roads	One times the total height of the turbine with blades in vertical position – does not apply where the adjoining property is part of the wind power project
Large	Setback from existing dwelling on a neighboring property	1000 m*
Small	Setback from an external property line	two times the height of the turbine – does not apply where the adjoining property is part of the wind power project

*May request a reduction of the 1000 m setback down to a minimum 700 m with written permission from the neighboring property owner.

The development licences for Kemptown require approval of an environment assessment, amongst other things, in order to have the application considered complete.

3.4 MI'KMAQ ENGAGEMENT

During 2011 and 2012, the Proponent communicated with representatives from the Mi'kmaq Rights Initiative (KMK) as well as the Confederacy of Mainland Mi'kmaq (CMM), and the Native Council of Nova Scotia (NCNS) to facilitate early, meaningful consultation with the Nova Scotia Mi'kmaq.

The Confederacy of Mainland Mi'kmaq (CMM) was commissioned to conduct a Mi'kmaq Ecological Knowledge Study (MEKS) for Dalhousie in 2008 and the Proponent has engaged AMEC Environmental to complete an MEKS for the Kemptown Project (Appendix B). The Kemptown MEKS identified land and resource use which is of particular importance to the Mi'kmaq people with respect to the Kemptown Project as well as identified and documented ecological knowledge which may be significant to the Project. As part of the EA review process, NSE will invite various Mi'kmaq organizations to review and comment on the EA document. Although the Project Study Area in the MEKS for Dalhousie includes the Kemptown Study Area in general, updated site specific studies, as well as improved knowledge gathering techniques have been applied for the new survey.

3.5 SUMMARY OF CONSULTATION AND MI'KMAQ ENGAGEMENT

Tables 3.3 and 3.4 summarize the various consultation and Mi'kmaq engagement efforts, respectively, conducted in support of the Kemptown Project.

Table 3.3 Consultation Efforts Conducted in Support of Kemptown

Association/Contact	Dates	Topic	Comments
Government Stakeholders			
Transport Canada	November – December 2011, June 2013 July 2013	Regulatory approval process	• Submitted Aeronautical Obstruction Clearance Forms and received approval of lighting plan as well as Aeronautical Obstruction Clearance (Appendix A). Updated approval was received for turbine location changes made during the development phase • Updated coordinates and mapping were sent in July 2014
NAV Canada	December 2011- May 2012 October 2013 July 2014	Email and telephone correspondence with respect to civilian radar and air navigation equipment	• Submitted application to NAV Canada (Land Use Submission Form) and received approval on May 4, 2012. • Received Land Use Approval extension November 25, 2013 (Appendix A) • Updated coordinates and mapping were sent in July 2014
DND	September - October 2013	Email correspondence with respect to existing	• Project layout and coordinates sent for review and comment

Table 3.3 Consultation Efforts Conducted in Support of Kemptown

Association/Contact	Dates	Topic	Comments
	July 2014	radiocommunication systems	• DND responded in late October that they do not anticipate any interference with the Project (it is outside of the 100km consultation zone) (Appendix A) • Updated coordinates and mapping were sent in July 2014
RCMP	September - October 2013 July 2014	Email correspondence with respect to existing radiocommunication systems	• Project layout and coordinates sent for review and comment (Appendix A) • Updated coordinates and mapping were sent in July 2014
Environment Canada	September - October 2013 July 2014	Email correspondence with respect to weather radar interference	• Project layout and coordinates sent for review and comment • Environment Canada (Meteorological Service of Canada) responded in early October that any potential interference created by the Project, based on the current plans, would be manageable and therefore they do not have any strong objections to the Project. (Appendix A) • Updated coordinates and mapping were sent in July 2014
Canadian Coast Guard	September - October 2013 July 2014	Email correspondence with respect to vessel traffic systems radars	• Project layout and coordinates sent for review and comment • Response received stating that the Canadian Coast Guard does not have any communications or radar sites in the vicinity of the proposed location of the Kemptown Project and therefore they do not expect any interference issues. (Appendix A) • Updated coordinates and mapping were sent in July 2014
Province of Nova Scotia Integrated Mobile Radio System	September - October 2013	Email correspondence with respect to existing radiocommunication systems	• Project layout and coordinates sent for review and comment (Appendix A) • Updated coordinates and mapping were sent in July 2014
Nova Scotia Environment Nova Scotia Department of Natural Resources, Species at Risk Biologist	February, March, April and May 2013 July 2014	Meeting with NSE in Halifax	• Meeting to introduce the Project and seek input for scope and any potential issues. Discussion re: VEC scoping, Project siting,

Table 3.3 Consultation Efforts Conducted in Support of Kemptown

Association/Contact	Dates	Topic	Comments
			mainland moose, bat study necessity, bird studies, wetland avoidance • Conversation at length about bats, birds and provincial wind energy
Nova Scotia Transportation and Infrastructure Renewal (TIR) (*Colchester County)*	Ongoing	Regulatory approval process	• N/A
Colchester County Municipal Development Officer and Chief Administrative Officer	November and December 2011 July 2014 and on-going	Regulatory approval process	• Development permits for the turbines discussed • Scheduled presentation to Council on January 26, 2012, July 31, 2013 and September 26, 2013. • Numerous phone, in person conversations, attendance to meetings about bylaw and potential amendments • Updated coordinates and mapping given to begin bylaw process of notification of landowners within 2.2km of each turbine, as well as other bylaw specific topics
Public Consultation			
Cobequid Eco-Trails Society	December 2010, January 2011, April 2011, December 2011, February 2012 July 2014	New parking lot entrance to the Gully lake Wilderness Trail constructed by RMSenergy Ltd., discussion of general support of Affinity Renewables's operations and proposal	• RMSenergy donated volunteers, excavator and man hours to construct a parking lot at the entrance to the Gully Lake Wilderness Trail located off the Glenn Road • Donations from Kemptown to be made to Eco-Trails Society • Letter of Support from Society President (Appendix E)
Local Landowners	December 2011 and ongoing	Visits to homes by Proponent	• Inquiries into locations, local usage and capacity, revenue streams, fire department involvement, SPCA involvement, sound modelling, shadow flicker, construction schedule, and more.
Local Interest Groups	Ongoing	Local interests	• During the operations phase of the existing Dalhousie facility, numerous field trips and site visits/ tours have taken place for local public schools, TUNS engineering department, NSCC classes and other organizations. This trend will continue with the

Table 3.3 Consultation Efforts Conducted in Support of Kemptown

Association/Contact	Dates	Topic	Comments
			development and operations phases of Kemptown. • Having the Proponent as a local homeowner, farmer, and landowner maintains the local aspect of approachability by certain groups interested in visiting the wind farm. • The Proponent has spoken at several dozen local schools, business groups, organizations and conferences about the existing and proposed wind farms and the wind energy industry and will continue to do so into the future. • The Proponent resides in a home located 175m, 225m, 500m and 700m from turbines and is asked to speak to and allow groups to visit to understand facts
Valley/ Kemptown Volunteer Fire Department	2012-ongoing	Community benefits, safety	• One of the Proponent's roles in the community will be to provide monetary support to organizations and charities that are within the vicinity of the Project area. The fire department has been tasked with helping the Proponent delegate the annual funds to better serve the members of the community. • The Proponent has an Emergency Response Plan that has been implemented and practiced at the Dalhousie facility. The same plan will be in place for Kemptown Project and the fire department will be educated on the practises and contacts necessary for keeping the wind project operating safely if malfunctions or accidents occur.
Truro Daily News	May, June 2013 April, July 2014, October 2014	Community concerns	• The Proponent has been interviewed several times to provide answers to gain insight into potential risks and benefits associated with the construction and operations of wind turbines

Table 3.4 Mi'kmaq Engagement Efforts Conducted in Support of Kemptown

Association/Contact	Dates	Topic	Comments
Mi'kmaq Rights Initiative (KMK)	September and December 2011, May and June 2012, June, July, October 2013 April 2014	Mi'kmaq interests	• In person conversation with KMK discussing COMFIT projects and up to date consultation with CMM, MAPC • Provide detailed discussion regarding MEKS for Kemptown, results and timing of surveys, interviews and general information • Members part of tour/meeting at Dalhousie Mountian wind farm.
Confederacy of Mainland Mi'kmaq (CMM)	December 2011, May and November 2012, February, March 2013 December 2013	MEKS	• Proponent engaged CMM in November 2012 for a proposal to conduct MEKS • Proponent had MEKS conducted by AMEC with active participation from all Nova Scotia First Nations, including CMM • CMM commented on original EA for Kemptown
Maritime Aboriginal People's Council (MAPC)/ Native Council of Nova Scotia (NCNS)	May 2012, March 2013	Mi'kmaq interests	• Met with Roger Hunka and discussed vegetation and wildlife survey results • Will provide Mr. Hunka and staff of construction timelines and results of studies to ensure any harvesters are aware of the Proponents activities.
Local Band Council (Millbrook First Nation)	October 2011 to November 2012 April 2014	Mi'kmaq interests	• Proponent sent detailed project description to KMK for distribution to local council (KMK requests info go to them, not directly to local council) • Local council aware of Proponent's COMFIT projects • Millbrook Council members took tour of Dalhousie Facility

3.6 SUMMARY OF EMI STUDY

The table below summarizes the consultation timing and responses for the RABC Study for the Kemptown Project. All correspondence is available in Appendix A.

Table 3.5 EMI Summary Table

Agency	System	Notification Sent		Response Received	Issues
DND	Communication	01-Aug-14	Kirk	25-Aug-14	No Issues

	Radar	01-Aug-14	Kirk	25-Aug-14	No Issues
RCMP	Communication	01-Aug-14	Kirk		
Canadian Coast Guard	Communication	01-Aug-14	Kirk		
Environment Canada	Radar	01-Aug-14	Kirk	07-Aug-14	No Issues
NAV Canada	Radar	06-Jan-12	Lisa	22-May-12	Land use approval (and extension of approval November 2013, and extension again July 2014)
NS Transporation	Communication	01-Aug-14	Kirk		No Issues
CBC	Communication	01-Aug-14	Kirk	04-Aug-14	No issues
Aeronautical Lighting	Navigation	16-Nov-11	Lisa	22-Dec-11	Lighting Plan approval (continued approval for updated locations in June 2013 and for updated locations again in July 2014)

4.0 SCOPE OF THE ASSESSMENT

The following section provides the scope of the Project to be assessed as well as the factors and scope of factors to be assessed. The methods used for the EA are also described.

4.1 SCOPE

The scope of the Project to be assessed includes:

- surveying activities, such as identifying locations of wind turbines;
- clearing of vegetation;
- constructing and upgrading access roads, including installation of culverts as required;
- delivery of equipment and materials including the wind turbines, foundation materials, electrical cables and other ancillary equipment;
- foundation construction;
- wind turbine installation;
- electrical cabling installation (*i.e.,* installation of 25 kVA above ground collection system);
- operation and maintenance of the Project; and
- decommissioning of the turbines and the overall Project.

The potential effects of accidents and malfunctions are also considered within this EA, as are the potential cumulative effects of this Project in relation to other projects/activities in the regional area. The potential effects of the environment on the Project are also addressed.

Environmental assessments are typically organized and focused according to Valued Environmental Components (VECs) which are those biophysical and socioeconomic elements that are of particular importance to the Proponent, as well as public and regulatory stakeholders involved in the assessment process. This EA evaluates the potential environmental effects of the proposed Project elements and activities, for all Project phases, with regard to each VEC. By assessing potential impacts on VECs within the study boundaries, a meaningful evaluation of Project effects on relevant environmental aspects is achieved. VECs evaluated for this assessment include:

- soil;
- surface water quality;
- aquatic environment;
- terrestrial vegetation;
- wildlife (including birds, mammals, reptiles and amphibians);

- archaeological and heritage resources (including Aboriginal interests);
- existing and planned land use;
- local community (including recreational usage and tourism);
- visual aesthetics;
- sound;
- permits and other approvals, and;
- public health and safety

4.2 METHODS

The EA is structured to include proposed mitigation to reduce or eliminate potential adverse environmental effects. The determination of significance of adverse environmental effects is based on post-mitigation (residual or net) effects, rather than unmitigated potential effects. The significance of residual or net effects of the Project was determined using the following criteria, based on federal and provincial EA guidance:

- value of the resource affected;
- magnitude of the effect;
- geographic extent of the effect;
- duration and frequency of the effect;
- reversibility of the effect; and
- ecological and/or social context.

A significant adverse effect is defined as a permanent change in the quality or condition of a component of the environment. It must be spatially and temporally extensive and not within acceptable limits in terms of magnitude or nature based on guidelines, standards and professional judgement. The potential level of impact (*i.e.,*adverse environmental effect) after mitigation measures (*i.e.,* net or residual effects) are identified based on NRCan's criteria and definitions provided in "Environmental Impact Statement Guidelines for Screenings of Inland Wind Farms Under the *Canadian Environmental Assessment Act*" (NRCan 2003), presented below in Table 4.1.

Table 4.1 Definitions for the Level of Impact After Mitigation Measures

Level	Definition
High	Potential impact could threaten sustainability of the resource and should be considered a management concern. Research, monitoring and/or recovery initiatives should be considered.
Medium	Potential impact could result in a decline in resource to lower-than baseline but stable levels in the study area after Project closure and into the foreseeable future. Regional management actions such as research, monitoring and/or recovery initiatives may be required.
Low	Potential impact may result in a slight decline in resource in study area during the life of the Project. Research, monitoring and/or recovery initiatives would not normally be required.
Minimal	Potential impact may result in a slight decline in resource in study area during construction phase, but the resource should return to baseline levels.
N/A	There is no interaction possible between the Project activity in question and the associated potential adverse effect.

Source: *Environmental Impact Statement Guidelines for Screenings of Inland Wind Farms Under the Canadian Environmental Assessment Act* (NRCan 2003)

Issues scoping is a critical first step in the EA process to ensure completeness and focus for the EA process. The issues scoping process included the following activities:

- review of regulatory guidelines;
- public and agency consultation;
- literature and background information review;
- field studies; and
- professional judgment of the Study Team.

The following sections discuss these activities in more detail.

4.2.1 Regulatory Guidelines

As an energy generating facility that has a production rating of at least 2 MW derived from wind, this Project is a Class I Undertaking as defined in Schedule A of the Nova Scotia Environmental Assessment Regulations and as such requires an EA registration. The Proponent's Guide to Wind Power Projects: Guide for Preparing an Environmental Assessment Registration Document (NSEL 2007, updated 2012) provides guidance on EA approach and issues scoping and was used extensively to guide the EA for this Project. Additional provincial legislation and policies that influenced this EA include the *Endangered Species Act,* Activities Designation Regulations, Nova Scotia *Wetlands Conservation Policy* (NSE 2011a), *Mi'kmaq Ecological Knowledge Study Protocol* (November 2007), *Nova Scotia Sediment and Erosion Control Handbook,* and the *Operational Bulletin Respecting the Alterations of Wetlands* (NSE 2006).

Regulatory guidance for this Project was also obtained from several federal documents, including:

- *Environmental Impact Statement Guidelines for Screenings of Inland Wind Farms Under the Canadian Environmental Assessment Act* (NRCan 2003).
- *Wind Turbines and Birds – A Guidance Document for Environmental Assessment* (Environment Canada 2007a).
- *Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds* (Environment Canada 2007b)
- *Cumulative Effects Assessment Practitioners Guide* (Canadian Environmental Assessment Agency 1999)
- *The Responsible Authority's Guide* (Canadian Environmental Assessment Agency 2003).

In addition to these regulatory guidelines, federal legislation has also been used to guide the EA in terms of issues scoping, effects assessment and mitigation requirements, including, but not limited to the *Species at Risk Act* (*SARA*) and *Migratory Birds Convention Act, 1994*.

4.2.2 Literature Review

For this EA, existing information was collected from a number of sources including, but not limited to:

- municipal documentation from the Municipality of the District of Colchester;
- 1:20,000 aerial photos;
- 1:10,000 Nova Scotia Base Mapping;
- NSDNR wetland inventory mapping;
- Atlantic Canada Conservation Data Centre (ACCDC);
- Nova Scotia Department of Tourism and Culture; Heritage Division
- reports, books and other materials on the area's natural history and geology (Section 10);
- reports, books and other materials relative to wind turbine developments and environmental effects (Section 10); and
- information available at selected websites (*e.g.*, Statistics Canada, Bird Studies Canada, Canadian Wildlife Services, Nova Scotia Government: Abandoned Mines and Shafts Inventory, *Species at Risk Act* registry).

4.2.3 Field Studies

Field studies are aimed at characterizing the natural and social-economic environment of the Study Area. This work included:

- Winter, spring, summer avian monitoring (2014) (fall monitoring to take place as this EA is being reviewed);
- bat monitoring (August and September 2013);
- vegetation surveys (June 2014);

- site visit to support the visual impact assessment and characterization of socio-economic environment (November 2011, June 2012, October 2013, January, March, June, July 2014);
- rare plant surveys within planned turbine footprints during detailed planning and design (including Aboriginal traditional plant survey) (June 2014);
- aquatic surveys not necessary as nearest watercourse found during ground and desktop search to be over 500m, wetlands approximately 1000m from impact areas; and
- archaeological survey (including Aboriginal significance).

4.2.4 Professional Judgment

Project personnel involved in the completion of this EA are trained, professional biologists, scientists, planners, wind generation developers and operators, and/or EA practitioners. Professional judgment was exercised through the selection of environmental components and in the evaluation of environmental effects in this report. The use of professional judgment in EA practice is widely accepted and complements the aforementioned scoping techniques.

4.3 SPATIAL AND TEMPORAL BOUNDARIES OF THE ASSESSMENT

For this Project, the assessment of effects was undertaken for the area identified as the Project Study Area (see Figures 1.1 and 1.2), unless otherwise identified. Use of the term “Project Study Area” is meant to signify site development areas for the wind farm that will be physically impacted/ altered for the construction and/or operation of the wind farm (roads and turbine layout areas). For the avian monitoring, biologists selected a much larger spatial boundary to monitor. For the purpose of data collection of the socio-economic environment, the Municipality of the District of Colchester was also considered. The temporal scope of this assessment covers the construction, operation and decommissioning phases of the Project, which is expected to extend over the next 25 years.

5.0 DESCRIPTION OF THE EXISTING ENVIRONMENT

5.1 GEOPHYSICAL ENVIRONMENT

The following sections outline the geophysical environment of the Study Area including the physiography and topography, surficial geology, bedrock geology, and hydrogeology of the area. These observations are based solely on a review of publically-available regional resource mapping as well as multiply site reconnaissance is required to identify specific issues at the individual turbine sites. Detailed geotechnical investigations will be conducted at each turbine site prior to construction and cannot be done prior to EA submission as construction cannot begin until this process has been completed and the Proponent has received Ministerial Approval.

5.1.1 Physiography and Topography

The Project is located roughly 7.5km west of the Colchester County line and 5km North of Trans Canada Highway 104. The municipal Balefill is 3km south of the Project. The proposed turbines take up approximately 1-1.5 ha each (including access roads) and with the Project containing just 3 machines and less than 500 metres of new road construction, the footprint of disturbed area is roughly 3 hectares.

The Kemptown site is within the Central Uplands Ecodistrict of Nova Scotia. This ecodistrict occupies the gently rolling uplands of central Nova Scotia with elevations up to 300m. Red spruce is the dominant forest softwood species in the ecodistrict. Pure stands of tolerant hardwoods are present on the crests and upper slopes of hills and steeper hummocks. Hemlock prefers the sheltered moist sites of lower slopes along streams and rivers and white pine is scattered on the better drained, coarse textured soils.

More specifically, land elevation where the three turbines are planned for the Kemptown site is 245m. The pad or footprint of each turbine may occupy and displace 0.5 hectare of forest area. The first and second turbine locations are accessed by an existing woods road and the locations for the foundations of turbine one and two are on previously disturbed areas. These areas were used as borrow pits by the landowner (commercial logging company) to keep the access roads in good condition to get large trucks in and out. To reach the third turbine, a newly constructed access road must be built and 0.5 ha cleared for the crane-pad/ lay-up area/ foundation.

Big Lake is located over 650m to the east of the nearest turbine, and Little Lake is located over 1550m to the south of the nearest turbine.

5.1.2 Surficial Geology

The Project Study Area is situated within the gently rolling uplands of central Nova Scotia and is classified by Neily et al (2006) as the Central Ecodistict (380). Partially wedged between the Cobequid Hills (340) to the north and the Pictou Antigonish Highlands (330) to the east, this ecodistrict occupies the gently rolling uplands of central Nova Scotia. Sloping easterly upwards from the St. Mary's River Ecodistrict (370), elevations average 300 m above sea level. This area contains the headwaters of the Stewiacke and Calvary Rivers, which eventually make their way to Cobequid Bay. The total area of the Ecodistrict is 1,329 km2 or 13.5% of the Ecoregion The geology is somewhat similar to that of the St. Mary's River (370) and Cobequid Slopes (350) Ecodistricts. Soils are predominantly well drained to moderately well drained with mottling, an indication of restricted drainage during the growing season, present in many of the finer textured soils. First, second and third order streams with a trellised drainage pattern and a few small shallow lakes cover only 0.75% of the Ecodistrict.

5.1.3 Bedrock Geology

The specific bedrock geology of the individual turbine sites and access roads will be determined upon excavation and/or drilling for foundation design. Due to the very small impact area of the Project, assessing the bedrock geology based on available literature can only be estimated and is not useful in the Project Study Area description.

5.1.4 Hydrogeology/Groundwater

The project is located over 1700m from the nearest in-use residential water well. The foundations for the turbines will be no deeper than 2.4m from ground elevation. The hydrogeology/groundwater for this area does not have the potential to be adversely affected.

5.2 AQUATIC ENVIRONMENT

The Kemptown Project is located within the North River watershed in Colchester County and this watershed flows eastward and southerly to join the Salmon River near Truro.

There are no watercourses or wetlands within the immediate Project footprint.

The project study will require no water crossings. A watercourse, the South Branch of the North River, passes to the west of Turbine 1 with closest distance 250m. All new construction will occur east of this watercourse and no access roads (existing or new construction) will pass over this watercourse. Big Lake is 800 m southwest from Turbine 1 but no construction will occur in that direction. There are wetlands of an open and a treed bog nature and are at distances in a southwest direction beyond 500 m of the impacted areas (turbines and/or roads). At this distance, the construction activity and operation of the Project will not impact the wetlands.

5.2.1 Surface Water

The Project is situated on a height of land, situated for maximum wind strength. Consequently wetlands and streams are all found at lower elevations at safe distances from the nearest turbine footprint or new road construction. The Project is unlikely to result in an interaction with surface water levels; nor is the Project likely to result in an alteration of surface water regimes within the Project Study Area or watershed. Therefore, existing water withdrawal permits in the watershed were not addressed.

Water quality within the Project Study Area can be described as temperate and slightly acidic with low conductivity, based on conditions observed during the field assessments. These conditions are typical to Nova Scotia. Since the Project Study Area is underlain by the Graham Hill Formation bedrock and not Halifax formation slates, acid generating rock is not anticipated to be a risk during the construction activities.

5.2.2 Watercourse Crossings Summary

There are no watercourse crossings present or required for the Kemptown Project.

5.2.3 Navigable Waters

The Navigable Waters Protection Program (NWPP) ensures the public's right to navigate Canada's waters without obstruction. This is accomplished through the administration of the *Navigable Waters Protection Act (NWPA)*. The *NWPA* is a federal law designed to protect the public right of navigation. In order to minimize the impact to navigation, the NWPP ensures that works constructed in navigable waterways are reviewed and regulated. There is not any navigable watercourse identified in the Project Study Area. Therefore, no authorization is required under *NWPA* for any of the watercourses in Kemptown Study Area.

5.3 TERRESTRIAL ENVIRONMENT

In a broad habitat description the Kemptown site is within the Central Uplands Ecodistrict of Nova Scotia. This ecodistrict occupies the gently rolling uplands of central Nova Scotia with elevations up to 300 m. Red spruce is the dominant forest species in this ecodistrict. Pure stands of tolerant hardwoods are present on the crests and upper slopes of hills and steeper hummocks. Hemlock prefers the sheltered moist sites of lower slopes along streams and rivers and white pine is scattered on the better drained, coarse textured soils.

At the study area much of the forest is young, succession forest stands after extensive commercial forest harvest. Red Spruce and Balsam Fir are the predominant softwood species in plantations. On poorer drained areas Black Spruce occurs. Yellow Birch and Sugar Maple occur both as regenerating stands and a few mature stands. Mature Red Spruce, Yellow Maple and Sugar Maple occur along the South Branch of the North River.

Three turbines are planned for the Kemptown site. Land elevation here is approximately 241 metres. The pad or footprint of each turbine will occupy and displace 0.5 hectare of young forest and/or cleared area. Two turbines are within existing borrow pits that have been previously disturbed and forested areas previously cleared. The third location, more to the west is within a harvested area but with natural regeneration.

The first and second turbine locations are accessed by an existing woods road but the third location requires the construction of a new access road. To reach the third turbine, the access road must travel west through the regenerated forest.

Approximately 2.5 km south east of the turbines is the Municipality of Colchester Balefill site. Open compost here attracts numbers of scavenging birds such as Herring Gulls, Common Raven and Bald Eagles. Westerly and to the north are uninhabited woodlands with various streams and rivers and wet areas. Also to the north are commercial blueberry fields. To the east is the village of Kemptown and rural homes along the Kemptown to Earltown Road.

The three turbines that will be constructed on the Project lands will utilize previously disturbed areas to the extent possible. The Proponent and construction team will work together with the environmental team to minimize any impacts to the terrestrial habitat within the Study Area.

A detailed description of the flora and forest community close to the turbine sites is provided in Section 5.4.2 Flora.

5.4 SIGNIFICANT WILDLIFE AND HABITATS

5.4.1 Desktop Review

Any industrial development, including an undertaking for a wind turbine, has a potential in some way to affect flora or fauna, yet it is essential to keep any impact as very minimal and that no impact occur for species that are considered endangered, threatened, or of special concern. The document Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (Nova Scotia Environment November 2005, Revised September 2009) provides guidance for safe guarding sensitive wildlife and habitat.

A key message contained within this guide is that the focus for EA documents is to be on priority species and habitats.

The Guide requires a Desktop Review to identify priority species within a 100 km radius of the proposed development area. Information sources for this are the NS Dept. of Natural Resources Significant Habitat (SigHab) database, contact with the Nova Scotia Museum of Natural History, the Atlantic Canada Conservation Data Center (ACCDC), and other possible

sources such as universities or local naturalists. The ACCDC incorporates the NS SigHab into their database.

The ACCDC has provided a Data Report of Rare and Endangered Taxa and Special Areas at a 100 km radius from the proposed development area (Appendix C). The NS Museum of Natural History (NS Communities, Culture and Heritage) also has provided a list of plant and animal species-at-risk. (Appendix C)

By examination and comparison of the habitat requirements of each of these proximity species to the habitats occurring within the development area, a shortlist of priority species for different wildlife taxum is developed. The short-list prioritizes species that may require further population study and avoidance measures.

Results of the ACCDC search of a 100 km buffer around the study area contained 5566 records of 466 vascular, 624 records of 88 nonvascular flora. The buffer also contained 20,020 records of 141 vertebrate, and 1,345 records of 98 invertebrate fauna.

Results of the ACCDC data search for a 5 km buffer around the study area contained considerably fewer records. There are18 records of 9 vascular flora and no records of nonvascular flora. The 5 km buffer contained 10 records of 6 vertebrate fauna and no records of invertebrate fauna. (Appendix C)

Priority Species

Priority species to consider are (1) Species considered Endangered, Threatened, or of Special Concern by the Committee on the Endangered Wildlife of Canada (COSEWIC) and the Federal Species-at Risk Act (SARA 2003); (2) Species listed as Endangered, Threatened, or Vulnerable by the Nova Scotia Endangered Species Act (NSESA 1999); Species of Conservation Concern identified in Nova Scotia General Status of Wildlife Species (NSGSWS). (Note: Mark Elderkin, DNR Species at Risk Biologist provides a link to a more up-to-date NSGSWS. This is *Wild Species - General Status of Species in Canada.* The Wild Species report provides an overview of the status of Canada's species. It brings the results of provincial, territorial, and federal monitoring efforts onto a single platform for the first time. http://www.wildspecies.ca/. An appendix found on that site explains these status rankings).

Significant Habitats

Wildlife species are dependent on habitat. Each wildlife species has behavioral and physical adaptations that are a reflection of the habitat that it exploits. Some species live within specialized habitats and, especially for these; loss of habitat is a major reason why some species have become Species at Risk or Species of Conservation Concern. During an undertaking it is essential to identify and protect significant habitats.

Significant Habitats include:

1. Sites where species of risk or other species of conservation concern can be found and/or;
2. Sites where unusually large concentrations of wildlife occur and/or;
3. Habitats rare in the province.

Managed Areas

Managed areas include such areas as Provincial Parks or Wildlife Management Areas and usually have a legal designation. The ACCDC search identified 1 Managed Area and 1 biologically Significant Area within a 5 km buffer of the project site.

Aquatic Habitats

Many Aquatic Habitats are Significant Habitats for the reasons described above; and additionally all aquatic habitats are sensitive habitats. Lakes, watercourses and wetlands provide habitat for many water adapted and water dependent species. Aquatic habitats are easily degraded and require special attention during an Environmental Assessment. The wildlife that lives and is constrained within aquatic environments is vulnerable. Additionally, there is wildlife that has both a terrestrial and an aquatic life history. Hence wildlife richness is proportionally greater on the borders of aquatic habitats. Besides their value to wildlife, wetlands provide a diversity of other ecosystem services.

5.4.2 Flora

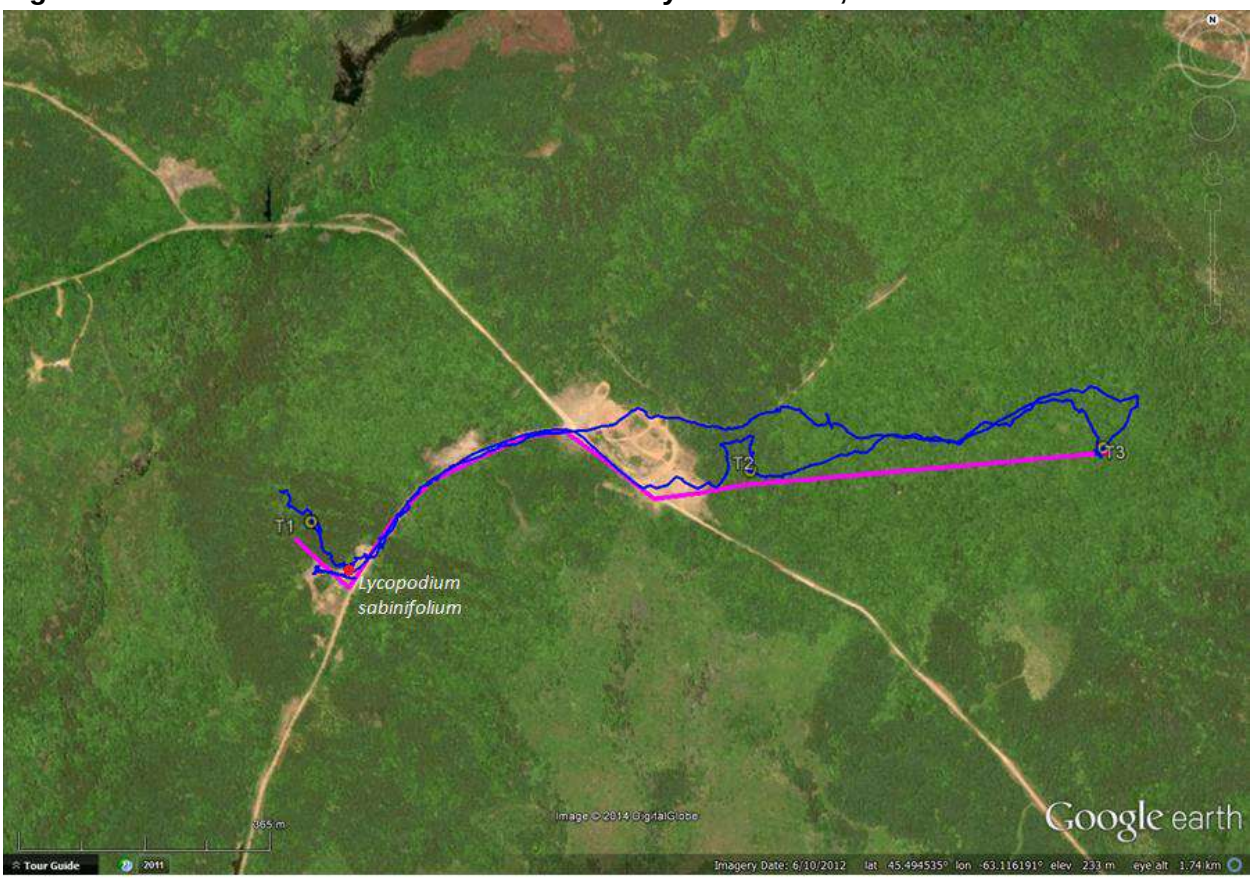
Priority plants make up the larger portion of the rare and endangered wildlife as identified by ACCDC within the 100 km radius buffer. Sean Blaney, a respected botanist, was entrusted to examine the study area for rare and endangered flora. The methods used for the botanical survey and the results and discussion are presented here. The full botany report is found in Appendix F.

The following is taken directly from the botany report prepared for the Kemptown Project EA.

Method

“ACCDC botanist Sean Blaney (herein “I”) conducted two hours of fieldwork on foot at the Upper Kemptown Community Feed-in Tariff (COMFIT) project site in Colchester County, Nova Scotia on June 20, 2014, walking 3.56 km. GPS tracks of site coverage are mapped in Figure 1. Site planning was in an early stage, with turbine sites and road locations not yet finalized, so Reuben Burge and Lisa Fulton of Affinity accompanied Sean Blaney to direct field survey toward the areas most suited to final turbine and road construction.

Figure 5.1 GPS Tracks for Vascular Plant Survey on June 20, 2014



GPS tracks (blue line) of area covered by Sean Blaney on June 20, 2014 at the proposed Upper Kemptown COMFIT site, Colchester County, Nova Scotia. Sites T1, T2 and T3 are proposed turbine locations, as determined in the field by Reuben Burge, and the magenta lines represent potential road locations between turbine sites. Ground-Fir Clubmoss (*Lycopodium sabinifolium*, S3? - Sensitive) site is indicated by the red dot.

I documented full lists of vascular plant and bird species observed while on site with locations documented for the first observation of each species. For provincially rare species (those ranked S3S4 or lower by AC CDC, see Appendix 1), I recorded location by GPS and noted abundance, extent of occurrence and habitat. Breeding evidence for birds was recorded using the categories of the Maritimes Breeding Bird Atlas. In addition, I documented plant communities present within the turbine construction footprints, recording dominant species in the canopy, sapling, low shrub/tree seedling and herbaceous strata, as well as approximating total percentage cover for each strata and individual species' percentage cover for tree species.

Figure 5.2 Ground-Fir Clubmoss (*Lycopodium sabinifolium,* S3? – Sensitive)

Results and Discussion

I. Vascular Plant Species

The following is taken from Sean Blaney's 2014 Botany report, found in Appendix F.

I recorded 82 vascular plant taxa (71 native, 11 exotic; Table 1), one of which is of some conservation significance (Figure 1, mapped in Figure 2). Ground-Fir Clubmoss (*Lycopodium sabinifolium*, S3? – Secure; see Appendix 1 for definitions) occurred in small numbers at one site (45.4905N, 63.12712W) on an anthropogenic open gravelly bank along a forest margin, within an area potentially subject to turbine construction impacts through road widening and upgrading. This species is of northern affinity, most frequently occurring in exposed areas along the coast or at higher elevations, and it is known from about 15 different locations in Nova Scotia. The species is uncommon throughout the Maritimes (S3 – Secure in New Brunswick, S1S2 – May Be At Risk in Prince Edward Island).

Further visits to the site, especially with greater focus on the heavily disturbed roadside locations which were not sampled thoroughly, would yield additional species to those recorded. However, based on the nature and condition of the plant communities present, it is unlikely that many additional provincially rare plant species would be found in the project footprint.

Figure 5.3 Site of Turbine 1

Figure 5.4 Site for Turbine 2

Table 5.1. Vascular plants recorded in the Kemptown COMFIT project footprint, with Nova Scotia S-ranks and General Status (GS) ranks (defined in Appendix 1 of Appendix F). Taxonomy follows Kartesz (1999) – *Synthesis of the North American Flora*, CD-ROM.

Species / Family	Common Name	S-rank	GS Rank
Lycopodiaceae		**Clubmoss Family**	
Lycopodium annotinum	Stiff Clubmoss	S5	4 Secure
Lycopodium digitatum	Southern Clubmoss	S5	4 Secure
Lycopodium hickeyi	Hickey's Tree-clubmoss	S4?	4 Secure
Lycopodium obscurum	Flat-branched Tree-clubmoss	S4S5	4 Secure
Lycopodium sabinifolium	Ground-Fir	S3?	4 Secure
Dennstaedtiaceae		**Hay-Scented Fern Family**	

Dennstaedtia punctilobula	Eastern Hay-Scented Fern	S5	4 Secure
Thelypteridaceae		**Marsh Fern Family**	
Thelypteris noveboracensis	New York Fern	S5	4 Secure
Dryopteridaceae		**Wood Fern Family**	
Dryopteris campyloptera	Mountain Wood Fern	S5	4 Secure
Dryopteris intermedia	Evergreen Wood Fern	S5	4 Secure
Pinaceae		**Pine Family**	
Abies balsamea	Balsam Fir	S5	4 Secure
Picea mariana	Black Spruce	S5	4 Secure
Picea rubens	Red Spruce	S5	4 Secure
Fagaceae		**Beech Family**	
Fagus grandifolia	American Beech	S5	4 Secure
Betulaceae		**Birch Family**	
Betula alleghaniensis	Yellow Birch	S5	4 Secure
Betula papyrifera var. papyrifera	Heart-leaved Birch	S5	4 Secure
Polygonaceae		**Smartweed Family**	
Polygonum cilinode	Fringed Black Bindweed	S5	4 Secure
Clusiaceae		**St. John's-wort Family**	
Hypericum perforatum	Common St. John's-wort	SNA	7 Exotic
Violaceae		**Violet Family**	
Viola blanda var. palustriformis	Sweet White Violet	S5	4 Secure
Viola sororia	Woolly Blue Violet	S5	4 Secure
Salicaceae		**Willow Family**	
Populus tremuloides	Trembling Aspen	S5	4 Secure
Salix bebbiana	Bebb's Willow	S5	4 Secure
Salix humilis	Upland Willow	S5	4 Secure
Ericaceae		**Heath Family**	
Vaccinium angustifolium	Late Lowbush Blueberry	S5	4 Secure
Vaccinium myrtilloides	Velvet-leaved Blueberry	S5	4 Secure
Monotropaceae		**Indian Pipe Family**	

Species / Family	**Common Name**	**S-rank**	**GS Rank**
Monotropa uniflora	Indian Pipe	S5	4 Secure

Primulaceae		**Primrose Family**	
Trientalis borealis	Northern Starflower	S5	4 Secure
Rosaceae		**Rose Family**	
Amelanchier sp.	serviceberry species	[native]	[native]
Fragaria virginiana	Wild Strawberry	S5	4 Secure
Potentilla simplex	Old Field Cinquefoil	S5	4 Secure
Rubus canadensis	Smooth Blackberry	S5	4 Secure
Rubus idaeus ssp. strigosus	Red Raspberry	S5	4 Secure
Rubus vermontanus	Vermont Blackberry	SNR	5 Undetermined
Fabaceae		**Bean Family**	
Trifolium repens	White Clover	SNA	7 Exotic
Onagraceae		**Evening-Primrose Family**	
Chamerion angustifolium	Fireweed	S5	4 Secure
Aquifoliaceae		**Holly Family**	
Nemopanthus mucronatus	Mountain Holly	S5	4 Secure
Aceraceae		**Maple Family**	
Acer saccharum	Sugar Maple	S5	4 Secure
Acer spicatum	Mountain Maple	S5	4 Secure
Araliaceae		**Sarsaparilla Family**	
Aralia nudicaulis	Wild Sarsaparilla	S5	4 Secure
Lamiaceae		**Mint Family**	
Galeopsis tetrahit	Common Hemp-nettle	SNA	7 Exotic
Plantaginaceae		**Plantain Family**	
Plantago major	Common Plantain	SNA	7 Exotic
Scrophulariaceae		**Figwort Family**	
Veronica officinalis	Common Speedwell	S5	7 Exotic
Orobanchaceae		**Broomrape Family**	
Epifagus virginiana	Beechdrops	S4	4 Secure
Rubiaceae		**Bedstraw Family**	
Houstonia caerulea	Azure Bluet	S5	4 Secure
Caprifoliaceae		**Honeysuckle Family**	
Lonicera canadensis	Canada Fly Honeysuckle	S5	4 Secure
Sambucus	Red Elderberry	S5	4 Secure

racemosa			
Asteraceae		**Aster Family**	
Anaphalis margaritacea	Pearly Everlasting	S5	4 Secure
Doellingeria umbellata	Hairy Flat-top White Aster	S5	4 Secure
Euthamia graminifolia	Grass-leaved Goldenrod	S5	4 Secure
Hieracium caespitosum/aurantiacum	Orange or Field Hawkweed	[SNA]	[7 Exotic]
Hieracium lachenalii/umbellatum	Common or Umbellate Hawkweed	[SNA]	[7 Exotic]

Species / Family	**Common Name**	**S-rank**	**GS Rank**
Hieracium pilosella	Mouse-ear Hawkweed	SNA	7 Exotic
Lactuca canadensis	Canada Lettuce	S5	4 Secure
Oclemena acuminata	Whorled Wood Aster	S5	4 Secure
Prenanthes trifoliolata	Three-leaved Rattlesnakeroot	S5	4 Secure
Solidago canadensis	Canada Goldenrod	S5	4 Secure
Solidago puberula	Downy Goldenrod	S5	4 Secure
Solidago rugosa	Rough-stemmed Goldenrod	S5	4 Secure
Symphyotrichum lateriflorum	Calico Aster	S5	4 Secure
Taraxacum officinale	Common Dandelion	SNA	7 Exotic
Juncaceae		**Rush Family**	
Juncus tenuis	Slender Rush	S5	4 Secure
Luzula multiflora	Common Woodrush	S5	4 Secure
Cyperaceae		**Sedge Family**	
Carex brunnescens ssp. sphaerostachya	Brownish Sedge	S5	4 Secure
Carex communis	Fibrous-Root Sedge	S5	4 Secure
Carex debilis var. rudgei	White-edged Sedge	S5	4 Secure
Carex	Bladder Sedge	S5	4 Secure

intumescens			
Carex novae-angliae	New England Sedge	S5	4 Secure
Carex scoparia	Broom Sedge	S5	4 Secure
Scirpus atrocinctus	Black-girdled Bulrush	S5	4 Secure
Scirpus hattorianus	Mosquito Bulrush	S5	4 Secure
Poaceae		**Grass Family**	
Agrostis capillaris	Colonial Bent Grass	SNA	7 Exotic
Anthoxanthum odoratum	Large Sweet Vernal Grass	SNA	7 Exotic
Brachyelytrum septentrionale	Northern Shorthusk	S5	4 Secure
Cinna latifolia	Drooping Wood Reed Grass	S5	4 Secure
Danthonia compressa	Flattened Oat Grass	S5	4 Secure
Danthonia spicata	Poverty Oat Grass	S5	4 Secure
Dichanthelium acuminatum	Woolly Panic Grass	S5	4 Secure
Dichanthelium boreale	Northern Panic Grass	S5	4 Secure
Poa pratensis	Kentucky Blue Grass	S5	4 Secure
Poa saltuensis	Weak Blue Grass	S5	4 Secure
Liliaceae		**Lily Family**	
Erythronium americanum	Yellow Trout Lily	S4S5	4 Secure
Maianthemum canadense	Wild Lily-of-The-Valley	S5	4 Secure
Trillium cernuum	Nodding Trillium	S4	4 Secure

Figure 5.5 Site of Turbine 3

III. Plant Communities

Notes on plant communities at the proposed turbine construction sites are given in Table 3 and photographs of the proposed turbine sites are given in Figures 3 to 5. None of the plant communities documented within the turbine or road construction footprints are considered provincially rare (AC CDC data, S. Blaney, pers. obs.). The proposed project footprint falls within three major habitat groups: 1) disturbed, gravelly, open and semi-open upland, including existing gravelly roadways, the roadside – forest transition zone, and open gravel pit; 2) young to intermediate-aged (40 to 60 years, with thinly scattered larger trees) deciduous forest dominated by Sugar Maple (the area around and between turbines 2 and 3); and 3) approximately 15 year old thinly planted Black Spruce plantation within former Sugar Maple-dominated forest, where Balsam Fir, Sugar Maple and Yellow Birch regeneration is dense in areas not planted with Black Spruce (the area around turbine 1 and between that turbine and the existing road).

5.4.3 Fish

The ACCDC has listed 4 fish species within 100km with a potential for impact. Two are marine species and are not considered. The NSDNR lists 3 additional fish species with a sensitive status,

American eel (*Anguilla rostrata*) was recently assessed as Threatened by COSEWIC. While this species is not currently afforded the additional protection of a *SARA* designation, there is potential in the future for the species to be listed by the Act. Adult American eel normally inhabit mud bottomed lakes and rivers. The occurrence of this species at Kemptown is likely in Big Lake. However, because of the distance from the Project area the aquatic environment of Big Lake is not impacted.

Before the drastic decline Bay of Fundy Atlantic Salmon (*Salmo solar*) the South Branch of North River perhaps provided spawning and rearing habitat for Atlantic Salmon life stages. Again the distance of the Project from the stream will result in no impact.

Brook Trout (*Salvelinus fontinalis*), particularly those of younger year age classes, do occur in considerable numbers within the South Branch of the North River as evidenced by a NSDNR electroseine many years ago (Hall, personal observation). Again the distance of the Project from the stream will result in no impact.

Gaspereaux (*Alosa pseudoharengus*) possibly reach Big Lake and Little Lake to spawn. Because of the distance of the lakes from the Project no potential impact is anticipated.

Table 5.2 Priority Fish Species Listed within 100 km. NS status (2010) as determined from Wild Species - General Status of Species in Canada. Also listed NSESA, COSEWIC, SARA status.

Common Name	Scientific Name	NSGSWS 2010	Habitat	Occurrence
Atlantic Salmon (Inner Bay of Fundy)	*Salmo salar*	May Be At Risk COSEWIC: Endangered (2010) NSESA: SARA: Endangered (2010)	Has a complex life cycle requiring shallow, rapidly-flowing water of streams with gravel substrates for spawning and for growth of parr. Parr can move into smaller stream tributaries during their 2-3 years in fresh water.	Possible
Brook Stickleback	*Culaea inconstans*	Sensitive	Lives in the weedy or grassy portions of steams or small bog lakes. Only one NS record in Cumb. Co. (Gilhen, 1974).	Unlikely
Pearl Dace	*Marganiscus margarita*	Sensitive	Inhabits boggy lakes and streams. Known only Cumb., Pictou, and Lake Ainslie, CB (Gilhen, 1974).	Unlikely
Brook Trout	*Salvelinus fontinalis*	Sensitive	Occurs in well-oxygenated waters of lakes, and streams. Often seeks pools during season of warm and low water.	Possible
Gaspereau	*Alosa pseudoharengus*	Sensitive	Enter freshwater in lakes and quiet stretches of streams to spawn in June. Adults move back to sea. Young move into brackish water during August and September.	Possible

American Eel	*Anguilla rostrata*	Secure(2005) COSEWIC: Special Concern(2006) Threatened (2012)	This catadromous fish spawns at sea. Larval stage or elvers migrate into freshwater streams, transform to adult shape, and grow up to a lengths of 1 metre. Mature eels return to the sea to spawn. In freshwater inhabit mud-bottomed lakes and rivers.	Possible

5.4.4 Freshwater Mussels

The ACCDC lists 5 species of freshwater mussel for consideration as priority species. NSDNR also lists the Eastern Pearlshell (*Margaritifera margaritifera*) as sensitive. Since the Project will have no impact on streams or lakes no freshwater mussel species is impacted. Eastern Pearlshell within lower and deeper waters of the South Branch of the North River is a possible occurrence but in the shallower water in the head waters near the project, its presence here is unlikely. Incidental observations did see Eastern Floater (*Pyganodon cataracta*), a secure species, in muskrat middens at Big and Little Lakes.

5.5 BIRDS

The Project Study Area has few land features that might cause a concentration of birds. It is not near coastal habitats or large wetlands where shorebirds and waterfowl might concentrate. The forest community is not extraordinary with the majority of young forest being regenerating softwood plantations. Gravel roads and a gravel pit occur close to the Project. One feature that does concentrate birds is the Colchester Bale Fill site that attracts scavenging birds such as European Starling, American Crow, Raven and Bald Eagle. There is perhaps some migration movement of birds over land between the Northumberland Strait and the Bay of Fundy. There are no steep ridges that might provide thermal updrafts for soaring birds.

The desktop review considers 50 priority bird species (Table 5.3) as having records within 100 km of the Project site. Bird species with only a coastal occurrence (example Roseate Tern and Red Knot) are not considered. Of the 50 species listed by ACCDC 35 species are a more possible occurrence at the study area.

ACCDC records within a 5 km radius lists only 6 bird species. These are Olive-sided Flycatcher, Rusty Blackbird, Eastern Wood-Peewee, Boreal Chickadee, Black-backed Woodpecker and Yellow-bellied Flycatcher.

Table 5.3 Priority Bird Species within 100km. NS status (2010) as determined from Wild Species - General Status of Species in Canada. Also listed NSESA, COSEWIC, SARA status. Bird species with only coastal occurrence are not listed.

Common Name	Scientific Name	NSGSWS 2010	COSEWIC Status	NSESA Status	SARA	Occurrence
Olive-sided Flycatcher	*Contopus cooperi*	At Risk	Threatened (2007)	Threatened (2013)	Threatened	Possible
Common Nighthawk	*Chordeiles minor*	At Risk	Threatened (2007)	Threatened (2007)	Threatened	Possible
Bobolink	*Dolichonyx oryzivorus*	Sensitive	Threatened (2010)	Vulnerable (2013)		Possible
Killdeer	*Charadrius vociferus*	Sensitive				Possible
Blue-winged Teal	*Anas dicors*	May Be At Risk				Unlikely

Peregrine Falcon	*Falco peregrinus*	Sensitive	Special Concern (2007	Vulnerable (2007)	Special Concern	Unlikely
Rusty Blackbird	*Euphagus carolinus*	May Be At Risk	Special Concern (2006)	Endangered (2013)	Special Concern	Possible
Short-eared owl	*Asio flammeus*	May Be At Risk	Special Concern (2008)		Special Concern	Unlikely
Barn Swallow	*Hirundo rustica*	Sensitive	Threatened (2011)	Threatened (2013)		Possible
Bay-breasted Warbler	*Dendroica castanea*	Sensitive				Possible
Black-backed Woodpecker	*Picoides arcticus*	Sensitive				Possible
Spotted Sandpiper	*Actitis macularius*	Sensitive				Possible
Wilson's Snipe	*Gallinago delicata*	Sensitive				Possible
Tennessee Warbler	*Vermivora peregrina*	Sensitive				Possible
Bank Swallow	*Riparia riparia*	May Be At Risk				Possible
Pine Grosbeak	*Pinicola enucleator*	May Be At Risk				Possible
Northern Pintail	*Anas acuta*	May Be At Risk				Unlikely
Common Loon	*Gavia immer*	May Be At Risk				Possible
Northern Shoveller	*Anas clypeata*	May Be At Risk				Unlikely
American Bittern	*Botaurus lentiginosus*	Sensitive				Unlikely
Cape May warbler	*Dendroica tigrina*	Sensitive				Possible
Gray Jay	*Perisoreus canadensis*	Sensitive				Possible
Blackpoll Warbler	*Dendroica striata*	Sensitive				Possible
Wilson's Warbler	*Wilsonia pusilla*	Sensitive				Possible
Pine Siskin	*Spinus pinus*	Sensitive				Possible
Tree Swallow	*Tachycineta bicolor*	Sensitive				Possible
Ruby-crowned Kinglet	*Regulus calendula*	Sensitive				Possible
Golden-crowned Kinglet	*Regulus satrapa*	Sensitive				Possible
Yellow-bellied Flycatcher	*Empidonax flaviventris*	Sensitive				Possible
Boreal Chickadee	*Poecile hudsonicus*	Sensitive				Possible
Canada Warbler	*Wilsonia canadensis*	At Risk	Threatened (2008)	Endangered (2013)	Threatened	Possible
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	Sensitive				Possible
Gadwall	*Anas strepera*	May Be At Risk				Unlikely
Gray Catbird	*Dumetella carolinensis*	May Be At Risk				Possible
Pied-billed Grebe	*Podilymbus podiceps*	Sensitive				Unlikely
Vesper Sparrow	*Pooecetes gramineus*	May Be At Risk				Possible
Cliff Swallow	*Petrochelidon pyrrhonota*	May Be At Risk				Possible
Baltimore Oriole	*Icterus galbula*	May Be At Risk				Unlikely
Long-eared Owl	*Asio otus*	May Be At Risk				Possible
Black-billed Cuckoo	*Coccyzus erythropthalmus*	May Be At Risk				Possible

Eastern Wood-pewee	*Contopus virens*	Sensitive	Special Concern (2013)	Vulnerable (2013)		Possible
Great-crested Flycatcher	*Myiarchus crinitus*	May Be At Risk				Possible
Chimney Swift	*Chaetura pelagica*	At Risk	Threatened (2007)	Endangered (2013)	Threatened	Possible
Purple Martin	*Progne subis*	At Risk				Unlikely
Eastern Meadowlark	*Sturnella magna*	Sensitive	Threatened (2011)			Unlikely
Eastern Phoebe	*Sayornis phoebe*	Sensitive				Possible
Eastern Bluebird	*Sialia sialis*	Sensitive	NAR (1996)			Unlikely
Whip-poor-will	*Caprimulgus vociferus*	At Risk	Threatened (2009)	Endangered (2013)	Threatened	Unlikely
Bicknell's Thrush	*Catharus bicknelli*	At Risk	Threatened (2009)	Endangered (2013)	Threatened	Unlikely
Willow flycatcher	*Empidonax traillii*	Sensitive				Unlikely

5.5.1 Field Surveys

The scope of the monitoring program and the survey protocol used is based on Environment Canada's Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds (Environment Canada 2007).

A second year long pre-construction bird monitoring program will have the fifth and final fall migration survey take place around October 25. Up until now, all other surveys as required in the methodology (Appendix G) have been completed.

A first 52 week survey was conducted between April 2012 and April 2013 and was completed 2km south of the second year long survey. That data was submitted with the original EA for Kemptown that got approval in February 2014. The original data is included in Appendix G. For this EA, the 2014 (Ken McKenna) survey is referred to in the body of the document.

5.5.1.1 Winter Survey

The Winter survey was completed March 1, 2014 by retired DNR Regional Biologist, Ross Hall and in the company of Rueben Burge. Eleven Stopover locations were chosen along roads near the Project and sampling habitat types. Snow was still quite deep on the ground and a snow-capable side by side machine was used to navigate the Study Area. Stopover counts were timed for 10 minutes each. Chickadee taped mobbing call was used sparingly.

Table 5.4 Results of the Winter Bird Survey

Date	Stop	Time	Habitat	Coordinates (UTM NAD83)	Wind	Temperature	Sky	Percipitation	Common Name	Number Observed	Distance to Observer
Mar 1/2014	1	8:07	Mature Hardwood	20T 491608 5036650	Calm	minus 20 C	Clear	None	Raven	1	100 M+
									Crow	2	100 M+
									Black-capped Chickadee	1	50-100 M
									Black-capped Chickadee	1	0-50 M
	2	8:19	Mature Hardwood	20T 491470 5037019	Calm	minus 20 C	Clear	None	Raven	1	100 M+
									Crow	1	100M+
									Boreal Chickadee	2	0-50 M
	3	8:28	Immature Softwood	20T 491149 5037372	Calm	minus 18 C	Clear	None			
	4	8:50	Immature Hardwood	20T 490758 5037793	Calm	minus 18 C	Clear	None	Black-capped Chickadee	1	0-50 M
	5	9:03	Immature Softwood	20T 490641 5038057	Calm	minus 15 C	Clear	None			
	6	9:20	Riparian, Mature Softwood	20T 489944 5038320	Calm	minus 12 C	Clear	None	Raven	2	FO
									Black-capped Chickadee	4	0-50 M
									Boreal Chickadee	5	0-50 M
									Downy Woodpecker	1	0-50 M
									Hairy Woodpecker	1	0-50 M
	7	9:32	Immature Mixedwood	20T 489625 5038233	Calm	minus 12 C	Clear	None	Black-capped Chickadee	6	0-50 M
	8	9:45	Immature Softwood	20T 489994 5037653	Calm	minus 12 C	Clear	None	Raven	1	100 M+
									Crow	1	100 M+
	9	9:53	Low area. Black Spruce	20T 489824 5036954	Calm	minus 12 C	Clear	None	Crow	1	100 M+
									Black-capped Chickadee	3	0-50 M
	10	10:07	Immature Softwood	20T 490273 5036892	5k/h w	minus 10 C	Clear	None	Raven	1	100 M+
									Crow	1	100 M+
									Black-capped Chickadee	2	0-50 M
									Boreal Chickadee	1	0-50 M
	11	10:20	Immature Softwood	20T 490412 5036730	5k/h w	minus 10 C	Clear	None	Raven	1	100 M+
									Black-capped Chickadee	2	0-50 M
									Boreal Chickadee	1	0-50 M
									Pileated Woodpecker	1	FO

While the Winter survey is a good measure of winter bird species, subsequent surveys were modified somewhat to reflect spacing from anticipated turbine locations. The remainder of the surveys are done by Ken McKenna. The scope of the monitoring program and the survey protocol used was based on Environment Canada's Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds (Environment Canada 2007).

In Figure 5.B, Bird Survey Locations, there are four locations titled W1, W2, W3 and W4. These four point counts were done only on the winter survey and were modified to reflect better habitat

dispursement and proximity to the project once snow melted and the turbine locations were closer to final. The map shows the remaining locations in red, as well as the two transect lines that were surveyed on route. See Figure 5.B

Methodology for the Spring, Summer and Fall surveys are found in Appendix G.

5.5.1.2 Avain Survey Summary

The Spring, Summer, and Fall surveys consisted of ten minute stopover or point counts at 13 locations. Since it was necessary to walk between some off road points, bird data was also collected along walked transects. A crepuscular and a nocturnal bird survey also took place April 30 to sample for owls and crepuscular species such as American Woodcock. Passage counts were done April 30 and May 14 following morning stopover counts.

Results and Discussion

The Winter survey recorded 7 species of birds. One priority species with sensitive status was found: nine individual Boreal Chickadee were found at 4 stops. Winter Bird Survey results are found in Table 5.4.

Table 5.5 lists the species of birds heard or seen by Ken McKenna within 1km of the Kemptown Wind Project from the Spring, Breeding, Noctornal, and Fall Migration surveys.

Common name	code	mbba	scientific name	srank	grank	COSEWIC
Canada Goose	CAGO	T	*Branta canadensis*	S4N	4 Secure	
American Black Duck	ABDU	H	*Anas rubripes*	S5	4 Secure	
Mallard	MALL	FY	*Anas platyrhynchos*	S5	4 Secure	
Green-winged Teal	GWTE	H	*Anas crecca*	S4S5B	4 Secure	
Ring-necked Duck	RNDU	P	*Aythya collaris*	S5B	4 Secure	
Surf Scoter	SUSC	X	*Melanitta perspicillata*	S5N	4 Secure	
Ring-necked Pheasant	RNPH	T	*Phasianus colchicus*	SNA	7 Exotic	
Ruffed Grouse	RUGR	T	*Bonasa umbellus*	S4S5	4 Secure	
Common Loon	COLO	H	*Gavia immer*	S3B, S4N	4 Secure	Not At Risk
Double-crested Cormorant	DCCO	X	*Phalacrocorax auritus*	S5B	4 Secure	
Bald Eagle	BAEA	T	*Haliaeetus leucocephalus*	S4	4 Secure	Not At Risk
Northern Harrier	NOHA	T	*Circus cyaneus*	S5B	4 Secure	Not At Risk
Red-tailed Hawk	RTHA	H	*Buteo jamaicensis*	S5	4 Secure	Not At Risk
Wilson's Snipe	WISN	H	*Gallinago delicata*	S3S4B	4 Secure	
American Woodcock	AMWO	H	*Scolopax minor*	S4S5B	4 Secure	
Mourning Dove	MODO	S	*Zenaida macroura*	S5	4 Secure	
Barred Owl	BDOW	T	*Strix varia*	S5	4 Secure	
Northern Saw-whet Owl	NSOW	S	*Aegolius acadicus*	S4	4 Secure	Threatened (April 2006)
Ruby-throated hummingbird	RTHU	T	*Archilochus colubris*	S5B	4 Secure	

Belted Kingfisher	BEKI	H	*Megaceryle alcyon*	S5B	4 Secure	
Yellow-bellied Sapsucker	YBSA	T	*Sphyrapicus varius*	S4S5B	4 Secure	
Downy Woodpecker	DOWO	H	*Picoides pubescens*	S5	4 Secure	
Hairy Woodpecker	HAWO	T	*Picoides villosus*	S5	4 Secure	
Northern Flicker	NOFL	T	*Colaptes auratus*	S5B	4 Secure	
Pileated Woodpecker	PIWO	T	*Dryocopus pileatus*	S5	4 Secure	
Olive-sided flycatcher	OSFL	S	*Contopus cooperi*	S3B	1 At Risk	Threatened (November 2007)
Eastern Wood-Pewee	EAWP	T	*Contopus virens*	S3S4B	3 Sensitive	
Yellow-bellied Flycatcher	YBFL	T	*Empidonax flaviventris*	S3S4B	3 Sensitive	
Alder Flycatcher	ALFL	T	*Empidonax alnorum*	S5B	4 Secure	
Least Flycatcher	LEFL	T	*Empidonax minimus*	S4B	4 Secure	
Blue-headed Vireo	BHVI	T	*Vireo solitarius*	S5B	4 Secure	
Red-eyed Vireo	REVI	T	*Vireo olivaceus*	S5B	4 Secure	
Gray Jay	GRJA	T	*Perisoreus canadensis*	S3S4	3 Sensitive	
Blue Jay	BLJA	T	*Cyanocitta cristata*	S5	4 Secure	
American Crow	AMCR	T	*Corvus brachyrhynchos*	S5	4 Secure	
Common Raven	CORA	T	*Corvus corax*	S5	4 Secure	
Tree Swallow	TRSW	H	*Tachycineta bicolor*	S4B	3 Sensitive	
Barn Swallow	BARS	H	*Hirundo rustica*	S3B	1 At Risk	Threatened (May 2011)
Black-capped Chickade	BCCH	T	*Poecile atricapilla*	S5	4 Secure	
Boreal Chickadee	BOCH	T	*Poecile hudsonica*	S3	3 Sensitive	
Red-breasted Nuthatch	RBNU	T	*Sitta canadensis*	S4S5	4 Secure	
Brown Creeper	BRCR	T	*Certhia americana*	S5	4 Secure	
Winter Wren	WIWR	T	*Troglodytes troglodytes*	S5B	4 Secure	
Golden-crowned Kinglet	GCKI	T	*Regulus satrapa*	S4	3 Sensitive	
Ruby-crowned Kinglet	RCKI	T	*Regulus calendula*	S4B	3 Sensitive	
Swainson's Thrush	SWTH	T	*Catharus ustulatus*	S4S5B	4 Secure	
Hermit Thrush	HETH	T	*Catharus guttatus*	S5B	4 Secure	
American Robin	AMRO	T	*Turdus migratorius*	S5B	4 Secure	
Cedar Waxwing	CEDW	T	*Bombycilla cedrorum*	S5B	4 Secure	
Ovenbird	OVEN	A	*Seiurus aurocapilla*	S5B	4 Secure	
Northern Waterthrush	NOWA	T	*Seiurus noveboracensis*	S4B	4 Secure	
Black-and-White Warbler	BAWW	T	*Mniotilta varia*	S4S5B	4 Secure	
Nashville Warbler	NAWA	T	*Vermivora ruficapilla*	S5B	4 Secure	
Mourning Warbler	MOWA	T	*Oporornis philadelphia*	S4B	4 Secure	
Common Yellowthroat	COYE	T	*Geothlypis trichas*	S5B	4 Secure	
American Redstart	AMRE	T	*Setophaga ruticilla*	S5B	4 Secure	
Northern Parula	NOPA	T	*Parula americana*	S5B	4 Secure	
Magnolia Warbler	MAWA	T	*Dendroica magnolia*	S5B	4 Secure	
Bay-breasted Warbler	BBWA	T	*Dendroica castanea*	S3S4B	3 Sensitive	
Blackburnian Warbler	BLBW	T	*Dendroica fusca*	S4B	4 Secure	
Chestnut-sided Warbler	CSWA	T	*Dendroica pensylvanica*	S5B	4 Secure	
Blackpoll Warbler	BLPW	X	*Dendroica striata*	S3S4B	3 Sensitive	
Black-throated Blue Warbler	BTBW	T	*Dendroica caerulescens*	S5B	4 Secure	

Palm Warbler	PAWA	T	*Dendroica palmarum*	S5B	4 Secure	
Yellow-rumped Warbler	YRWA	T	*Dendroica coronata*	S5B	4 Secure	
Black-throated Green Warbler	BTNW	CF	*Dendroica virens*	S4S5B	4 Secure	
Canada Warbler	CAWA	T	*Wilsonia canadensis*	S3B	1 At Risk	Threatened (April 2008)
Savannah Sparrow	SAVS	T	*Passerculus sandwichensis*	S4B	4 Secure	Special Concern (November 200
Song Sparrow	SPSP	T	*Melospiza melodia*	S5B	4 Secure	
Lincoln's Sparrow	LISP	T	*Melospiza lincolnii*	S4B	4 Secure	
Swamp Sparrow	SWSP	T	*Melospiza georgiana*	S5B	4 Secure	
White-throated Sparrow	WTSP	T	*Zonotrichia albicollis*	S5B	4 Secure	
Dark-eyed Junco	DEJU	CF	*Junco hyemalis*	S4S5	4 Secure	
Red-winged Blackbird	RWBL	T	*Agelaius phoeniceus*	S4S5B	4 Secure	
Rusty Blackbird	RUBL	S	*Euphagus carolinus*	S2S3B	2 May Be At Risk	Special Concern (April 2006)
Common Grackle	COGR	T	*Quiscalus quiscula*	S5B	4 Secure	
Purple Finch	PUFI	T	*Carpodacus purpureus*	S4S5	4 Secure	
Pine Siskin	PISI	T	*Carduelis pinus*	S3S4B, S5N	3 Sensitive	
American Goldfinch	AMGO	T	*Carduelis tristis*	S5	4 Secure	
Evening Grosbeak	EVGR	T	*Coccothraustes vespertinus*	S4B, S5N	4 Secure	

Other birds seen in driving from MacKenzie Settlement site to Upper Kemptown Cross Road site

Killdeer	KILL	H	*Charadrius vociferus*	S3S4B	3 Sensitive	
American Kestrel	AMKE	H	*Falco sparverius*	S5B	4 Secure	
Northern Shrike	NOSH	X	*Lanius excubitor*	S4S5N	4 Secure	
European Starling	EUST	NY	*Sturnus vulgaris*	SNA	7 Exotic	

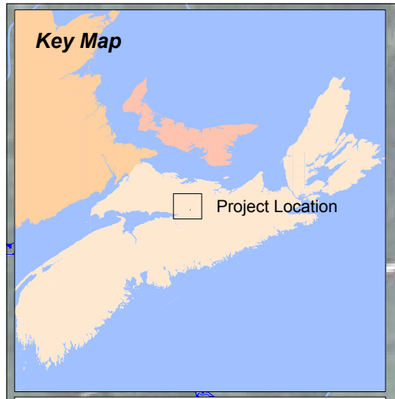
Other codes used

Unknown Duck	UNDU
Unknown Raptor	UNRA
Unknown Woodpecker	UNWO

Table 5.6 Lists the species that are listed under COSEWIC that were heard at Kemptown

Common name	**code**	**mbba**	**scientific name**	**srank**	**grank**	**COSEWIC**
Northern Saw-whet Owl	NSOW	S	*Aegolius acadicus*	S4	4 Secure	Threatened (April 2006)
Olive-sided flycatcher	OSFL	S	*Contopus cooperi*	S3B	1 At Risk	Threatened (November 2007)
Barn Swallow	BARS	H	*Hirundo rustica*	S3B	1 At Risk	Threatened (May 2011)
Canada Warbler	CAWA	T	*Wilsonia canadensis*	S3B	1 At Risk	Threatened (April 2008)
Savannah Sparrow	SAVS	T	*Passerculus sandwichensis*	S4B	4 Secure	Special Concern (November 2009)
Rusty Blackbird	RUBL	S	*Euphagus carolinus*	S2S3B	2 May Be At Risk	Special Concern (April 2006)

Turbine	Easting	Northing
1	489,997	5,037,881
2	490,622	5,037,960
3	491,130	5,038,040



Affinity Wind LP

Kemptown Wind Project

Figure 5.B

Bird Survey Locations

Legend:

- Proposed Turbine
- Winter Only Point Counts
- All Season Point Counts
- Transect Survey
- Stream
- Lake
- Wetland

TN

Turbine Model: GE 1.6 82.5
Hub Height: 80 m
Rotor Diameter: 82.5
Rated Power: 1680 kW

Scale 1:10,000

Date: Oct 2, 2014	UTM, NAD83, Zone 20	Version 1.0

0 375 750
meters

There were four species heard that are listed as 'Threatened' by COSEWIC and two listed as 'Special Concern'. The Northern Saw-whet Owl, Olive-sided Flycatcher, Barn Swallow and Canada Warbler are all listed as Threatened. The Savannah Sparrow and Rusty Blackbird are listed as Special Concern.

Six species of waterfowl were noted. All but Surf Scoter could nest in the vicinity with only Mallard confirmed. The presence of Surf Scoter in the Big Lake might indicate the lakes in the area might be used by migrating waterfowl shortly after ice thaw. Double-crested Cormorant presence would be in a similar category with this species using the lake during migration. Common Loon was seen only once but the lake seems large enough to have a nesting pair.

Three species of raptor were noted – Bald eagle near Big Lake and Northern Harrier and Red-tailed Hawk near blueberry fields off Upper Kempton Cross Road. Both American Woodcock and Wilson's Snipe were detected on the nocturnal survey and likely common breeders. Both do aerial displays near nesting areas. Killdeer was noted in the quarry off Upper Kemptown Cross Road and was found breeding there during the last Maritime Breeding Bird Atlas.

Barred Owl and Northern Saw-whet Owl likely nest in the area and although not detected; Great Horned Owl would also likely use the habitat for breeding.

Five woodpecker species were detected with all likely breeding in the area. Black-backed Woodpecker was not detected.

Five species of flycatcher were detected and were a little late arriving this year. Olive-sided Flycatcher normally arrives third week of May, but Ken did not detect any until June 28th visit when three were heard. One was in the vicinity of Big Lake and two were calling from the area near the quarry near the blueberry field. Both areas represent good breeding area for this species which is listed by COSEWIC as "threatened" in NS. Both areas are over 500 m from the nearest turbine footprint. Eastern Wood-Pewee also was found in both dates of the breeding survey, likely nests and is a COSEWIC species of special concern.

For the Corvidae family, both Gray and Blue Jays were present and crows in small numbers. Common Ravens were very common and constantly flying about or in the blueberry fields or Cross Road quarry. On May 21, 30 Ravens were flushed by Ken from the Cross Road quarry and these were probably part of the flock of 105 in the blueberry field. Most days flocks of 10-30 ravens were noted. Common Ravens were the vast majority of the birds noted from the passage counts. Most were in the distance near the Colchester Balefill. Also from the passage counts, flocks of gulls were seen around the balefill, but no gulls were noted in the study area.

Although both Tree and Barn Swallow were sighted on one day each, they do not appear to be in any number in the study area. Boreal Chickadees were found in small numbers on three

days but also more than 500 meters from the proposed sites. Winter Wren was more common than at most locations surveyed by the birder.

There were three species of thrush. Good numbers of Hermit Thrush and American Robin were noted in migration in late April. The robins seem to favour the blueberry fields and were there in significant numbers in spring migration.

Eighteen species of wood warbler were noted with all but Blackpoll Warbler likely breeding. Black-throated Green Warbler was especially abundant. Often hard to find in many locations, Bay-breasted Warbler was seen on four of the study days from a couple of locations. Canada Warbler on the COSEWIC status as "threatened" was noted on both June dates and can be assumed to be probably breeding in 2-3 areas of the study territory.

Six species of sparrow were noted. Fox Sparrow was not detected, but may have passed through in migration earlier than the study dates. No Vesper Sparrows were detected in either of the sections of the blueberry fields.

Rusty Blackbird was one of three species of blackbird noted. This is a species of special concern (COSEWIC) and a single male was found singing in a damp area on the transect between the two blueberry fields. There is good habitat for this species here or around either Big or Little Lakes (all locations are over 500 m from the nearest turbine footprint).

Four species of finch were present and although not found, in this part of the study, both crossbill species might be found at times when conifers are supporting good cone crops. This was not the case for spring/summer 2014.

Throughout the study of the Kemptown survey location, a total of 80 different bird species were recorded.

Sean Blaney, a respected botanist and birder, recorded his incidental bird observations during his 2014 survey. Below is taken from his report.

II. Breeding Birds

I recorded 15 species of breeding birds (Table 5.8) through incidental observations during plant fieldwork. The mid-morning fieldwork meant that bird activity was reduced relative to its maximum around daybreak and thus only a small proportion of the species actually breeding on the site were documented.

Three bird species of conservation significance were noted: Bay-breasted Warbler (S3S4 – Sensitive, Golden-crowned Kinglet (S4 – Sensitive), and Ruby-crowned Kinglet (S4 –

Sensitive). All were singing males noted in young Black Spruce plantation within what had once been Sugar Maple-dominated forest. The Bay-breasted Warbler and Golden-crowned Kinglet were within the construction footprint for Turbine 1, and the Ruby-crowned Kinglet was just outside the likely construction footprint in forest near a road. All these species, especially the two species of kinglets, are still fairly common to common in Nova Scotia but are of concern because of major population declines. None have legal conservation status.

Table 5.7. List of birds recorded incidentally by Sean Blaney on June 20, 2014 at the Upper Kemptown COMFIT site, with breeding evidence recorded following the methods of the Maritimes Breeding Bird Atlas. Breeding evidence with codes are: H = adult in suitable nesting habitat; S = singing male in suitable nesting habitat, NE = Nest with eggs, X = observed without evidence of breeding (heard overhead in this case).

Species	Common Name	S-rank	GS Rank	Breeding Evidence
Dryocopus pileatus	Pileated Woodpecker	S5	4 Secure	H
Regulus satrapa	Golden-crowned Kinglet	S4	3 Sensitive	S
Regulus calendula	Ruby-crowned Kinglet	S4B	3 Sensitive	S
Catharus ustulatus	Swainson's Thrush	S4S5B	4 Secure	S
Catharus guttatus	Hermit Thrush	S5B	4 Secure	S
Vireo olivaceus	Red-eyed Vireo	S5B	4 Secure	NE
Dendroica magnolia	Magnolia Warbler	S5B	4 Secure	S
Dendroica virens	Black-throated Green Warbler	S4S5B	4 Secure	S
Dendroica castanea	Bay-breasted Warbler	S3S4B	3 Sensitive	S
Setophaga ruticilla	American Redstart	S5B	4 Secure	S
Seiurus aurocapilla	Ovenbird	S5B	4 Secure	S
Geothlypis trichas	Common Yellowthroat	S5B	4 Secure	S
Carpodacus purpureus	Purple Finch	S4S5	4 Secure	S
Loxia curvirostra	Red Crossbill	S4?	4 Secure	X

type of monitoring	date	time start	time finish	observer	start temp C	end temp C	start wind speed	wind direction	cloud cover percent	visibility m	comments	pre post	signif_weather
Area search	26/04/2014	1345	1500	Ken McKenna/ Ross Hall	9		20	N					
Spring migration	30/04/2014	520	1015	Ken McKenna	-2		10	N	100% CLOUD				
Passage Count	30/04/2014	1030	1100	Ken McKenna	4		10	N	20% CLOUD				
Nocturnal count	30/04/2014	2045	2220	Ken McKenna/ Ross Hall	-2		5	N					
spring migration	14/05/2014	510	1030	Ken McKenna	-4	8	5	NE	clear				
Passage Count	14/05/2014	1100	1200	Ken McKenna	-2	0	12	SW	clear				
spring migration	21/05/2014	502	1030	Ken McKenna	5	17	3	SSE	slight fog	100			
spring migration	29/05/2014	450	945	Ken McKenna	1	7	3	NW	clear				
Breeding bird	09/06/2014	445	945	Ken McKenna	3	13	3	S	clear				
Breeding bird	28/06/2014	450	930	Ken McKenna	4	14	2	NW	clear				
Fall Migration	08/09/2014	650	1120	Ken McKenna	3	14	5	N	clear			pre	
Passage Count	08/09/2014	1130	1305	Ken McKenna	14	17	15	N	clear			pre	
Passage Count	13/09/2014	1020	1150	Ken McKenna	14	21	10	E	20% cloud			pre	10% cloud on leaving
Passage Count	19/09/2014	1000	1140	Ken McKenna	6	10	25	N	clear			pre	40% cloud at end with heavy clouds approaching from north
Fall Migration	24/09/2014	705	1150	Ken McKenna	5	11	15	NW	clear			pre	
Passage Count	24/09/2014	1220	1250	Ken McKenna	11	11	10	W	clear			pre	
Fall Migration	06/10/2014	717	1125	Ken McKenna	10	14	5	WSW	100 cloud			pre	skies cleared 20 min after start of survey
Passage Count	06/10/2014	1144	1215	Ken McKenna	14	15	15	WNW	40% cloud			pre	

5.6 MAMMALS

Table 5.8 Nine Mammals Species are identified in the 100 km ACCDC search.

Table 5.8 Priority Mammal Species Listed within 100 km. NS status (2010) as determined from Wild Species - General Status of Species in Canada. Also listed NSESA, COSEWIC, SARA status.

Common Name	Scientific Name	NSGSWS 2010	Habitat	100Km Radius
Mainland Moose	*Alces alces*	At Risk NSESA: Endangered (2003)	Forest, especially those with intermediate stages of forest succession interspersed with lakes and streams. Thrives best in absence of white-tailed Deer.	Possible
Fisher	*Martes pennanti*	Sensitive	Seems to prefer heavy mixed forests and rarely ventures far into large open areas.	Possible
Long-tailed Shrew	*Sorex dispar*	Sensitive COSEWIC: Not At Risk(2006)	Prefers moist conditions in coniferous forests especially talus slopes overgrown with moss.	Unlikely
Eastern Pipistrelle	*Pipistrellus subflatus*	Sensitive(2010) NSESA: Endangered(2013) COSEWIC: Endangered(2012)	Congregatory hibernation in caves. (Likely at risk from White-nose-Syndrome.)	Possible
Northern Long-eared Bat	*Myotis septentrionalis*	Sensitive NSESA: Endangered(2013) COSEWIC: Endangered(2012)	Congregatory hibernation in caves. (Population decline due to White-nose-Syndrome.)	Possible
Little Brown Bat	*Myotis lucifugus*	Sensitive NSESA: Endangered(2013) COSEWIC: Endangered(2012)	Congregatory hibernation in caves. (90% population decline in 3 years due to White-nose-Syndrome.)	Possible
Hoary Bat	*Lasiurus cinereus*	Undetermined	Migratory. A tree bat.	Possible
Red Bat	*Lasiurus borealis*	Undetermined	Migratory. A tree bat.	Possible
Silver-haired Bat	*Lasionycteris noctivagans*	Undetermined	Migratory. A tree bat.	Possible

5.6.1 Mainland Moose

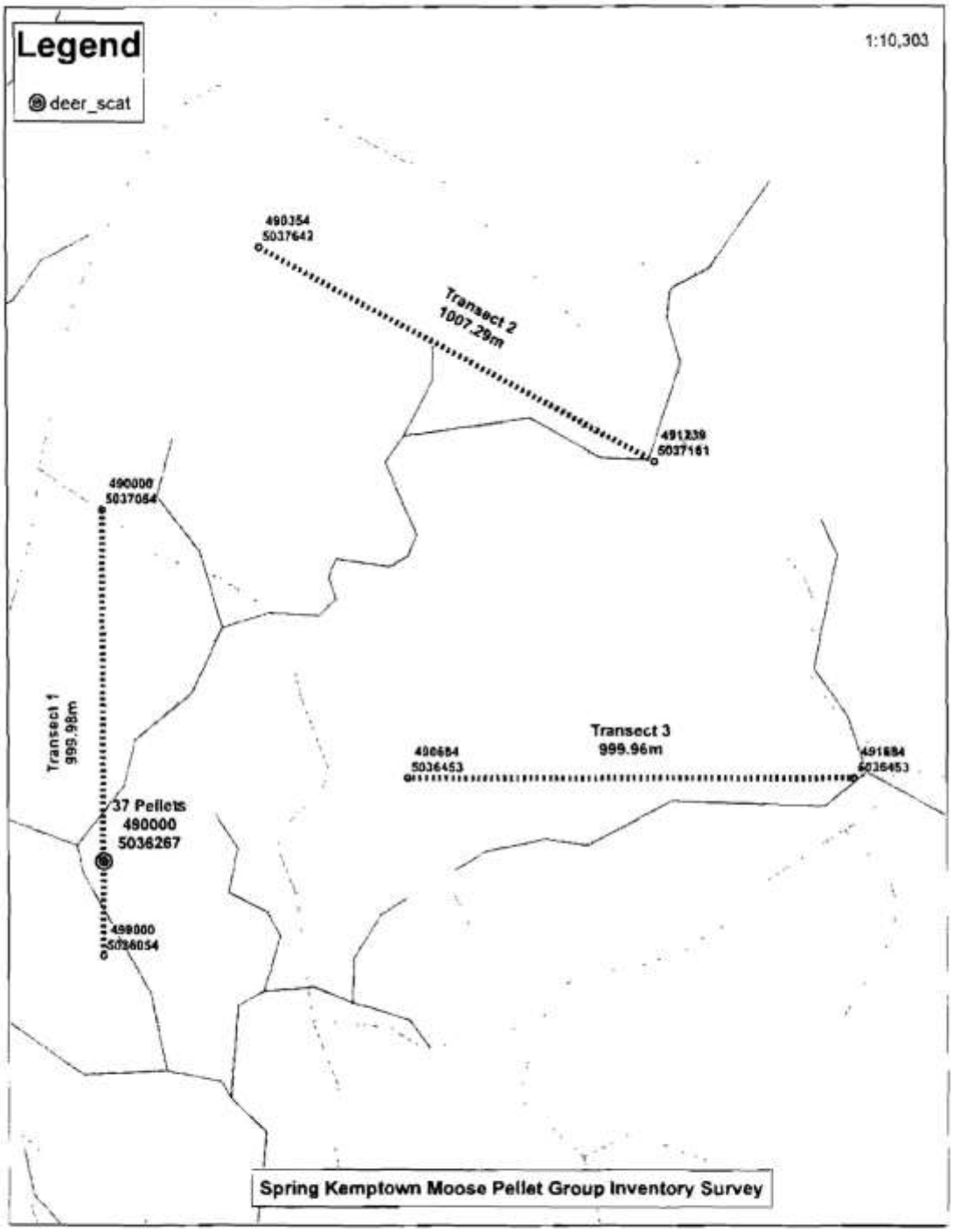
There is potential for Mainland Moose to occur near the Project site. There are good habitat features including wetlands, forest cover and early to middle succession forest. However there also are occurrences that discourage moose. The relocated Kemptown site is further from

major highways than the original but still possesses various human activities that fragment the landscape. There are area commercial blueberry fields and residential homes on a road between Kemptown and Earltown. All tertiary roads near the site are very active with snowmobile and all terrain vehicle traffic. These roads are groomed by organized snowmobile clubs in winter. The Colchester Bale-fill site operates 2.6 km to the southwest. White-tailed Deer do occur here and deer transmit a deadly disease (P. tenuis) to moose. It is outside the core area of moose distribution, mapped by the Nova Scotia of Natural Resources (2007). Further evidence of the absence of moose is that since 1978, NSDNR has surveyed moose and deer populations with a method of counting fecal pellet groups in the spring of a year along 1000 x 2 metre plots (Basquill et al., 2011). It is referred to as a Pellet Group Inventory (PGI). Across the province there are 689 plot locations. Basquill et al. (2011) has mapped these plot locations and has indicated at each plot whether moose fecal pellet groups were found in *multiple years, only once, or never found*. This map illustrates no moose pellet groups found over several years near the proposed turbine site. However there are *only once* occurrences to the east near Nuttby Mountain.

To further determine for the presence or absence of moose population three PGI plots in habitats were situated and completed near the proposed turbine sites. Methodology followed the protocol used by NSDNR for completion of provincial surveys. A string is laid 1000 metres through the forest. On the observers return along this string, the observer looks for and counts all moose and deer pellet group piles within 1 metre each side of the string. The plots locations were mapped by a Wildlife Biologist, Ross Hall, who chose more favourable potential moose habitats near the turbine site to better test the absence or presence of moose during the past winter. The three plots sample edges of wetlands and riparian zones, mature softwood stands and regenerating forest. From the end of leaf fall in November to the time of PGI implementation in spring, moose have an approximate 200 day deposition period for fecal pellet groups that are visible on leaf litter. Over this time one moose has the potential to deposit 2600 pellet groups and the PGI survey technique has a good likelihood of finding moose evidence if any is present.

This survey was conducted April 12, 2014. The survey was not done until all snow had melted from the forest floor. The field work was done by Jody Hamper. There was only a small indication of White-tail Deer winter presence with only one pile of deer pellets found on transect one. The land elevation near the Project is elevated. In winters of deeper snow deer vacate this area and move to lower valleys. Hamper found no moose pellet groups or other sign of mainland moose.

Incidental observations during 2014 substantiate the absence here of Mainland Moose. On March 1 during a winter bird survey Ross Hall travelled 7 km of snow covered road. No moose tracks were seen. This was not unexpected since there was very heavy snowmobile traffic. On August 27 Ross Hall made incidental observations along the shoreline of Little Lake. Little lake is shallow and has abundant aquatic vegetation on which any resident moose would feed on


Legend
deer_scat
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490354
5037642
Transect 2
1007.29m
491239
5037161
490000
5037084
Transect 1
999.98m
Transect 3
999.96m
490684
5036453
491684
5036453
37 Pellets
490000
5036267
490000
5036054
Spring Kemptown Moose Pellet Group Inventory Survey

this time of year. No moose tracks were seen in surrounding mud shoreline. Ken McKenna while doing bird surveys encountered no moose or moose sign.

The locations of the three 1 km long GGI transect are illustrated above in Figure 5.6

5.6.2 Fisher

Fisher is likely to occur near the proposed wind turbine site. Central Nova Scotia has a relatively stable fisher population. A cause for downfall in fisher population and a principal reason for their sensitive status is their vulnerability to trapping. In Nova Scotia fur harvesters are permitted to retain one (1) accidentally caught fisher. Fisher trapping is discouraged yet several are taken. The total Nova Scotia harvest of "mistake" fisher in 2011-2012 was 192 animals. Colchester and Pictou Counties accounted for 25 and 36 of these animals, respectively. The construction of each wind turbine will displace about 0.5 hectare of forestland per turbine yet the effect of the placement of wind turbines to fisher population is minimal.

5.6.3 Long-tailed Shrews

COSEWIC now lists Short-tailed Shrew as Not at Risk (2006). Since an early discovery of Short-tailed Shrew in the Wentworth Valley, Cumberland County, Nova Scotia, subsequent studies by Woolaver et al. (1998) and Shafer and Stewart (2006) have shown a wider distribution of this animal. Also the talus habitat in which this shrew lives is not present near the proposed wind turbine sites. The proposed wind turbine undertaking will not affect Short-tailed shrew

5.6.4 Bats

Pre-construction bat surveys were undertaken at the original Kemptown 1 during August and September 2013 by Hugh Broders and his team of researchers. Three bat echolocation detectors were deployed at the site on July 30. The first detector was put at 40m on the met tower at the original Project location. This was done by attaching the microphone apparatus to the previously placed rope system attached to a pulley. The equipment was hoisted and fit under a weather housing designed for this exercise specifically and held in place by tying it. The second detector was placed at the base of the met tower at approximately 2 meters. The third dectector was put at the forest/ non-forest boundary where the previous layout saw the most westerly location. The microphone was installed at 2 meters. A fourth detector was deployed later on in August near an entrance to a known mine. The results of the bat study can be found in Appendix I. Because of a close proximity to the alternative site and correspondence with NSDNR Species at Risk Biologist, the 2013 data from the original EA has been applied to the revised Kemptown Project.

The Proponent reviewed the Summary for Abandoned Mine Opening database provided on the Nova Scotia provincial website including all known abandoned and existing mines or shafts within 5km of the site. Consultation with Department of Natural Resources and Nova Scotia Environment resulted in the Proponent undertaking the 2013 bat study for Kemptown. The nearest known hibernaculum is over 25km from the Project site.

Below is a description of the existing environment, as it pertains to bats, for Kemptown taken directly from the report submitted by Broders and Burns, 2013. Note all references are noted in Appendix I.

Bats in Nova Scotia

Nova Scotia Bat species

In Nova Scotia there are occurrence records for seven species of bats (Table 1; van Zyll de Jong 1985, Broders et al. 2003, Segers et al. 2013), and each have been documented to have experienced fatalities at wind turbine sites (Arnett et al. 2008a). 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 large scale migratory movements of these species in the province, but they do occur regularly and are often associated with coastal or off-shore occurrences (Cryan and Brown 2007, Czenze et al. 2011, Segers et al. 2013). 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 (Fenton and Barclay 1980, van Zyll de Jong 1985, Caceres and Barclay 2000). 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, Rockwell 2005, Farrow and Broders 2011). 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 mainland 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, Hamilton and Barclay 1994, Broders 2003).

The northern long-eared bat is a forest interior species that primarily roosts and forages in the interior of forests (Broders 2003, Jung et al. 2004, Henderson and Broders 2008). Females form maternity colonies, roosting in coniferous or deciduous trees, depending on availability (Foster and Kurta 1999, Broders et al. 2006, Garroway and Broders 2008). Males typically roost solitarily in either deciduous or coniferous trees (Lacki and Schwierjohann 2001, Jung et al.

2004, Ford et al. 2006). 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 (Crampton and Barclay 1998, Broders and Forbes 2004). 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 Kejimkujik National Park suggests that this species roost in Usnea lichen species 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, and in 2013 were listed as Endangered by the Province of Nova Scotia. This is 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 *Pseudogymnoascus destructans* (formerly *Geomyces destructans)*, a cold-loving fungus that thrives in cave conditions and as such, impacts bat population directly during the winter hibernation period (Lorch et al. 2011, Blehert 2012, Minnis and Lindner 2013). It is thought to disrupt patterns of torpor which results in death by starvation or dehydration (Cryan et al. 2010, Reeder et al. 2012, Warnecke et al. 2013). 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 and declines of 80% to 99% have since been recorded in winter populations (Broders and Burns, unpublished data). Therefore it would be prudent to protect any surviving animals that 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 no major hibernacula within 25 km of the Kemptown Wind Energy Project area (Moseley 2007). Abandoned mine adits at New Lairg, Pictou County, are within 25 km although no overwintering count data exists for these (Moseley 2007) and recent acoustic surveys in 2010 by Randall suggest they are not significant autumn swarming sites (Randall 2011). In other ultrasonic monitoring by Randall in 2010, at two other sites in the vicinity of the proposed development area, McLellan's Brook Cave, Pictou County and at Natural Bridge Cave, Colchester County she concluded that neither of these exhibited strong evidence of fall swarming activity by bats although there were captures of bats at Natural Bridge Cave on one sampling night. The nearest known major bat hibernaculum to the Kemptown project is Hayes Cave, the largest known hibernaculum in NS, which is located in Maple Grove approximately 40 km from the proposed development area. At approximately 42 km away is Lear Shaft, located in Londonderry in an area with extensive underground mine workings and a number of mine openings. There are no underground records of hibernating bats from this site (owing to the structure of the site, a now-gated vertical shaft). In sampling on 7 nights in the autumns of 2009 and 2010, bat captures using harp traps resulted in an average of 8 bats captured per sampling hour indicating this is a fall swarming site (Burns unpublished data). Overwinter surveys for white-nose syndrome monitoring in 2012 yielded the collection of bat carcasses around the mine opening in winter demonstrating this site is a hibernaculum.

According to the Nova Scotia Abandoned Mine Openings Database (Fisher and Hennick 2009), there are 33 underground abandoned mine opening records in the vicinity of the Kemptown project (within 25km). Of these, the records suggest that 25 of the records have original depths of 30 m or less and/or were filled in or are flooded suggesting they would be unsuitable as hibernacula. Of the remaining 8 sites, 4 have been filled in (KPT-1-025, EMM-1-001, LCU-1-003,SPB-1-006) and 1 is one of the New Lairg sites investigated by Randall in 2010 (LCU-1-004; 2011) was not found to have high autumn bat activity levels. This leaves three openings to be potentially explored for bat activity.

Table 5.9 Over-wintering strategy and conservation status of bat species recorded in Nova Scotia

Species	Overwintering Strategy	Global Ranking[1]	COSEWIC Status	ACCDC status[3]	NSESA4
Little brown bat	Resident hibernator	G5	Endangered2	S1	Endangered
Northern long-eared bat	Resident hibernator	G4	Endangered2	S1	Endangered
Tri-coloured bat	Resident hibernator	G5	Endangered2	S1	Endangered
Big brown bat	Resident hibernator	G5	Not assessed	N/A	Not listed
Hoary bat	Migratory	G5	Not assessed	S1	Not listed
Silver-haired bat	Migratory	G5	Not assessed	S1	Not listed
Eastern red bat	Migratory	G5	Not assessed	S1	Not listed

All bat species native to Nova Scotia are considered to be sensitive to anthropogenic disturbance. However, the risk of bat collision with wind turbines is generally greater for migrating bats than for resident breeding, commuting or foraging bats, which generally forage between 1-10 m above ground level and seldom above 25 m, thus avoiding turbine blades (Erickson *et al.* 2002). Migratory bat species such as the hoary bat (*Lasiurus cinereus*), the red bat (*Lasiurus borealis*), and silver haired bat (*Lasionycteris noctivagans*) may be present in low numbers in the Study Area. These migratory bats are found across North America, but there have been few accounts of these species in the province.

Bats are cryptic, nocturnal animals that are difficult to study, and the technology that allows researchers to effectively study bats is relatively new. In the Maritimes, intensive research into bats and bat populations has only begun within the last 15 years. In that time, studies employing a broad range of techniques and tools including acoustic monitoring, netting, radio-tracking, DNA analysis, stable isotopes, and transponder (PIT) tags, have been undertaken. Seven species are known to occur in Nova Scotia including hoary bats, silver-haired bats, eastern red bats, big brown bats (*Eptesicus fuscus*), tricolored bat (*Perimyotis subflavus*), northern long-eared (*Myotis septentrionalis*) and little brown myotis (*Myotis lucifugus*) (Broders *et al.* 2003; Van Zyll de Jong 1985), although only the latter three species have confirmed populations within Nova Scotia (Broders *et al* 2003; Burns and Broders 2010; Randall 2011). None of these three are considered migratory species or are typically at high risk of interaction with wind farms, with the possible exception of the tri-colored bat, which comprised 24% of bat mortality at a small wind development at Buffalo Mountain in eastern Tennessee where tri-colored bats are the most common local species. However, the distribution of tri-colored bats in Nova Scotia appears to be limited to the southwestern portion of the province (Farrow and Broders 2010).

To date, there have been few records of migratory bat species in Nova Scotia. The Nova Scotia Natural History Collections contain eight records of hoary bats and two records of silver-haired bats, although there are multiple records from ships and Cape Cod that suggest these species do migrate north across the Gulf of Maine (Brown 1953; Miller 1897; Norton 1930; Peterson 1970). However, in the course of more recent systematic surveys of bats in Nova Scotia suggest that these species rarely occur (Farrow 2007; Rockwell 2005). In 2001, Broders *et al.* (2003) recorded more than 30,000 echolocation sequences during migration periods in Kejimkujik National Park and Brier Island, of which less than 0.001% were attributable to migratory species. During the course of this study the first breeding record for red bat was incidentally recorded in Yarmouth, NS.

Likewise, there are very few records of big brown bats in Nova Scotia. They are known to occur in low numbers in New Brunswick, likely associated with human occupied buildings (McAlpine *et al.* 2002). In Nova Scotia, Taylor (1997) found three hibernating big brown bats, suggesting that there may be year round residents in the Province, although subsequent work at Nova Scotia hibernacula has provided no additional evidence of their overwintering presence (Randall 2011).

The Proponent reviewed the Summary for Abandoned Mine Opening database provided on the Nova Scotia provincial website including all known abandoned and existing mines or shafts within 5km of the site. Consultation with Department of Natural Resources and Nova Scotia Environment resulted in the Proponent undertaking the 2013 bat study for Kemptown.

Post-construction monitoring efforts from the adjacent Dalhousie Mountain wind development have identified only one bat carcass, which was found on July 3, 2010 but was not identifiable (Dalhousie Mountain Wind Farm personnel, pers. comm. 2011). While this carcass survey study was not specifically targeting bats, it is likely that if there was significant mortality, more carcasses would have been found.

Landscape and site level features identified as indicators for increased likelihood of presence of bats, have been assessed for the proposed Project Study Area. These features, as outlined by NBDNR (2009) include:

- Known hibernacula or potential caves or mines within 5 km of the site;
- Coastline, or major water bodies within 500 m; or
- Forested ridge habitat on or near the site.

Additionally, a standard level review of the Project Study Area was conducted to assess potential for summer maternity colonies for local bats species, and potentially heavy foraging areas.

Major Water Bodies

There are no major water bodies within 5 km of the Project Study Area. The nearest major feature is the inlet of the Bay of Fundy that is met by the Salmon River in Truro. The nearest coastline is the Northumberland Strait to the North which is more than 15 km away.

Forested Ridge Habitat

Most wind developments on eastern North America are located along forested ridgelines due to the geography of the region, and the wind speeds that can be found along these features. Wind developments along these features may experience elevated mortality levels when migrating bats exploit favorable air currents associated with the features, or use them as navigational markers. *Myotis* species mortality has been found at forested ridge wind development areas in eastern North America to a lesser extent that migratory bats, probably due to their tendency to fly close to the ground (Broders 2003). The nature and cause of mortality of non-migratory bats at wind developments is poorly understood, but research is currently underway in Nova Scotia to better understand the movements of bats to/from and between hibernacula in the fall and spring which may help to better predict the risk factors associated with placement of wind developments.

The proposed Project is not located along a predominantly forested ridge rather located along a level, elevated previously cleared parcel of land located between a large power line corridor and a TransCanada highway.

Roosting and Foraging Habitat

Assuming that little brown and northern long-eared myotis are present, it is possible that maternity colonies may occur near the site which may be sensitive to construction activities, operational disturbance, or direct mortality from collisions with turbines. While male northern long eared and little brown myotis have less specific or limiting roosting requirements, maternity colonies of the local *Myotis* species are typically found in hollow, tolerant hardwood trees, or in the case of reproductive little brown myotis, in man-made structure where available (Broders and Forbes 2004). There are no buildings located within the Study Area, but there is mature hardwood forest habitat that may contain suitable trees for maternity colonies. However, within the Study Area, 68% of the area is non-forested and immature forested land. Only 20% of the Study Area is in mature hardwood stands with an additional 6% in mature mixedwood. This compares to the greater landscape, of which 37% falls within mature hardwood or mixedwood. While these figures do not indicate the actual presence of maternity colonies on the site, they suggest that relative to the surrounding landscape, the siting of the turbines has less potential for interaction with reproductive bats than other locations in the landscape might.

While the potential for direct interaction with breeding and Myotis species is anticipated to be low, their recently updated COSEWIC status warrants precautions to avoid direct interaction with breeding Myotis bats. Clearing and other construction activities that produce high noise levels such as jack-hammering will be conducted outside the active season for bats.

5.6.5 Reptiles and Amphibians

All amphibian species in Nova Scotia are considered secure. The Nova Scotia Museum of Natural History (Nova Scotia Community, Culture & Heritage) does list popyploid populations of Blue-spotted Salmamader (Ambystoma laterale) and *erethrystic forma* of Eastern Red-backed Salamander (*Plethodon cinereus*) as species of significance. Gilhen (1984) writes that the erythristic phase of the Eastern-red Backed Salamander might be 15 percent or less of the population in localities where it does occur. In Blue-spotted Salamander some females have three sets of chromosomes rather than pairs and are referred to as triploid. Neither of these rarer forms of salamander, while of biological interest, is known to have an elevated level of conservation concern.

The desktop review of ACCDA data only identifies two reptile species, the Wood Turtle and the Snapping Turtle, as possible priority species.

Table 5.10 Priority Reptiles and Amphibians Species Listed within 100 km. NS status (2010) as determined from Wild Species - General Status of Species in Canada. Also listed NSESA, COSEWIC, SARA status.

Common Name	Scientific Name	NSGSWS 2010	Habitat	Occurrence
Wood Turtle	*Clemmys insculpta*	Sensitive COSEWIC: Threatened (2007) NSESA: Threatened (2013) SARA: Threatened (2010)	Wood turtles are generally found in riparian areas or flood plains. Wood turtles need three habitat components: a stream or river, a sandy nesting substrate and a forested area.	Low possibility
Snapping Turtle	*Chelydra serpentina*	Secure (2010) COSEWIC: Special Concern (2008) NSESA: Vulnerable (2013) SARA: Special Concern	Vegetated shallows of lakes and streams. Mature females leave the water for a brief period to lay eggs. Underwater hibernation.	Unlikely

5.6.5.1 Wood Turtle

The Wood Turtle in year 2000 was listed Vulnerable and protected under the NSESA. In year 2013 the NSESA status for Wood turtle was upgraded to Threatened and this indicates a concern for a continued declining Wood Turtle population in Nova Scotia. Wood Turtle in year 2010 received threatened status and protection under SARA.

A tributary, the South River of the North River, is located about 250m from the nearest turbine at the Kemptown site. The North River watershed that enters Cobequid Bay has records of 1-2 Wood Turtles by ACDCC and NSDNR (MacGregor and Elderkin, 2003). The South Branch of the North River is a relatively sizeable watershed, 1-3 metres wide and has good riparian habitat. There is a low potential for Wood Turtle occurrence in this watercourse but because any development activity will occur beyond a distance of 250 m, it is believed that no impact will affect Wood Turtle.

Affinity staff are knowledgeable regarding Wood Turtle requirements. The Proponent in 2012 commissioned a highly qualified biologist (Travis White) to brief staff for the Dalhousie Mountain Wind Farm Project on Wood Turtles in a two-day interactive workshop. The turtle workshop, held in May 2012, demonstrated actual species (found well outside of the Project Study Area - >100 km away at East River Saint Mary's). The workshop consisted of a power-point presentation and general Q & A session followed by field visit to the turtle study area. This interactive training ensures that should the wood turtle be recorded or encountered within work activities (construction, operations, decommissioning) that proper precautions will take place on behalf of on-site staff.

5.6.5.2 Snapping Turtle

In 2013, Snapping Turtle was given Vulnerable status through the NSESA. On a national level SARA lists it as a species of Special Concern.

Snapping Turtle is known on the Salmon River in Colchester County. Individuals or evidence of their nesting are sometimes seen (Hall personal observation) along the lower reaches of the Salmon River. The North River and the Salmon River are closely allied as watersheds and Snapping Turtle could occur in the South Branch of the North River. Yet an essential part of a Snapping Turtle's habitat is waters of sufficient depth for the turtle to be submerged. While a Snapping Turtle might occur in the lower reaches of the North River it is unlikely to occur in the smaller and shallower stream near the proposed turbine site. No construction activity will affect the watercourse. Nevertheless during the construction and operation of the wind turbine site personal will be instructed to report any turtle observation.

5.6.6 Dragonflies and Damselflies (Odonta)

An essential and the most sensitive habitat component for Odonta to complete their life cycles are the aquatic environments for their nymphal life style. The proposed Kemptown development affects no wetlands or watercourses and therefore, no surveys were done for these Taxa.

5.6.7 Butterflies

The placement of all turbines will occur on already cleared gravel borrow-pits or harvested type forest. This is a common habitat type in the area and the turbine pads only displace a small portion of this type of forest cover. It is believed that the wind turbine development will have a minimum effect on butterfly habitat or population
Incidental butterfly observations made by Ken McKenna during his bird surveys are:

- Dreamy Duskywing;
- Brown Elfin;
- Mourning Cloak;
- Arctic Skipper;
- Hobomok Skipper;
- Long-dash Skipper;
- Northern Spring Azure;
- Canadian Tiger Swallowtail;
- Harris Checkerspot;
- Northern Crescent;
- Clouded Sulphur; and
- Silver-bordered Fritillary

5.7 SIGNIFICANT HABITATS (SigHab)

The ACCDC GIS scan identified one Managed Area and one Significant Habitat within 5km of the Kemptown Study Area.

The Managed Area is the Gully Lake Wilderness Area which is designated under the Nova Scotia Wilderness Areas Protection Act. The Gully Lake Wilderness Area protects 3,810 hectares of north-central Nova Scotia native forest. Hardwood and mixed forest hills rise more than 300 metres above sea level, and drain through tributary streams into Truro's Salmon River. Small flood plains host a rich association of plants and some rarities. Wetlands and small lakes add to habitat and scenic variety. The southwest corner of the Gully Lake WA is 3 km northeast of the Project site.

The Manganese Mine Wildlife Management Area (WMA) is 8 km south of the Upper Kemptown Project. The Manganese WMA is an outdoor learning centre established on private land in 1969 by the NS Teachers College and given WMA status by Natural Resources in 1973. The purpose of WMA status is to prohibit hunting and trapping for the safety of students at the centre. The WMA status was not based on any significant wildlife habitats or species occurrence.

The identified Significant Habitat is an interval area along the Salmon River at Kemptown. The area has rare interval flora and was recognized by an International Biological Program (IBP Site) in the 1960's. The Salmon River Interval site accounts for 8 of the 9 May Be At Risk and Sensitive vascular plant species identified by ACCDC within 5 km of the proposed turbine site. The other Sensitive plant identified has a record within the Gully Lake WA. All these rare plants are greater than 4 km distant. Also the rich interval habitat where these plants are found is absent at the elevated Project site.

None of the three areas is close to the proposed Kemptown site and will not be affected by the proposed wind turbine development.

5.8 ATMOSPHERIC ENVIRONMENT

The following section describes the climate and air quality of the site.

5.8.1 Climate

Weather data was acquired from the Truro meteorological station, which is located approximately 17 km east of the Project site. Based on Environment Canada climate normals or averages for the period of 1971-2000, the average annual temperature in the region is 5.8ºC, with the average daily maximum and minimum being 11.1ºC and 0.5ºC, respectively (Environment Canada 2011). The warmest period during the year is typically from June to August (daily mean of 17.0ºC), while the coldest period is between December and February (daily mean of -5.6ºC) (Environment Canada 2011).

According to 1971-2000 precipitation data at the Truro station, precipitation occurs approximately 174.7 days per year and averages approximately 1,202 mm of precipitation throughout the year, where 83% is rain and the remainder is snow (Environment Canada 2008).

5.8.2 Air Quality

A network of ambient air monitoring stations is set up throughout the province to measure ambient concentrations of various air contaminants. The closest air quality monitoring station to the Project Study Area is located in Pictou. However, only ozone and PM is monitored at this location. The next closest ambient air quality monitoring stations to the Project Study Area are the Halifax and Port Hawkesbury monitoring stations. A list of the contaminants monitored at both of these locations, their distance to the Project Study Area, and annual averages is presented in Table 5.11.

Table 5.11 Various Ambient Air Monitoring Stations Located Near the Study Area

Monitoring Station	Contaminant	Approximate Distance from Project (km)	Annual Averages	
			2005	2006

Pictou	O_3 (ppb)	25	22.6*(7 months)	27.7*(10 months)
	PM_{25} ($\mu g/m^3$) (BAM)		7	7.7*(9 months)
Halifax	SO_2 (ppb)	100	6	6
	CO (ppm)		0.5*(10 months)	0
	NO_2 (ppb)		16*(7 months)	16
	O_3 (ppb)		13	21
	$PM_{2.5}$ ($\mu g/m^3$)(TEOM)		5*(9 months)	4*(9 months)
	$PM_{2.5}$ ($\mu g/m^3$) (BAM)		NA	7*(6 months)
	$PM_{2.5}$ ($\mu g/m^3$)(Dichot)		NA	8*(9 months)
	PM_{10} ($\mu g/m^3$)(Dichot)		NA	14*(9 months)
Port Hawkesbury	SO_2 (ppb)	125	2.8*(10 months)	2

* - Annual mean calculated over the number of months indicated.
NA - Data Not Available
Reference: Environment Canada, 2008

Based on monitoring results from the most recently published National Air Pollution Surveillance (NAPS) Network ambient air quality monitoring reports for 2005 and 2006 (Environment Canada 2008), the following general conclusions can be made:

- The monitored concentrations of particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) at the Halifax monitoring station have generally been low;
- None of the monitored concentrations of carbon monoxide exceeded the 1-hour or 8-hour objectives (35,000 $\mu g/m^3$ and 15,000 $\mu g/m^3$, respectively);
- None of the monitored concentrations of nitrogen dioxide exceeded the 1-hour or Annual objectives (400 $\mu g/m^3$ and 100 $\mu g/m^3$, respectively);
- None of the monitored concentrations of sulphur dioxide exceeded the 1-hour or 24-hour objectives (900 $\mu g/m^3$ and 300 $\mu g/m^3$, respectively);
- In 2005 and 2006 the ambient air quality 1-hour objective for ozone of 82 ppb was not exceeded at any of the monitoring stations.

Given the fact that there is no ambient air monitoring station located on or in the immediate vicinity of the Project Study Area, that there is limited data available from the ambient air monitoring station in Pictou, and that the Halifax ambient air monitoring stations include emissions from industrial activities (which is not characteristic of the Project Study Area), it can be reasonably estimated that the Project Study Area is representative of a rural environment where all contaminant concentrations would meet the Ambient Air Quality Objectives.

5.9 SOCIO-ECONOMIC CONDITIONS

5.9.1 Population

The Project Study Area is located near Kemptown in Colchester County, Nova Scotia. Nearby communities include East Mountain, Earltown, Mangenese Mines, Mount Thom, Upper

Kemptown, and Riversdale. Population statistics for Colchester County from the 2006 census are summarized in Table 5.12 below.

Table 5.12 Population Statistics for the County of Colchester from 2006 Census

Population and Dwelling Counts	County of Colchester
Population in 2006	50,023
Population in 2001	49,307
2001 to 2006 population change (%)	1.5
Total private dwellings	22,951
Population density per square kilometer	13.8
Land area (square km)	3,627.69

Source: Statistics Canada 2006 Census

Colchester County experienced an increase in population from 2006 to 2011 of 1.9%. The age groups with the age ranges 40-44 and 45-49 years had population increases higher than the other age ranges with the median age of the population being 44.5. Approximately 16.7% of the population was over the age of 65, higher than the province's statistic. Approximately 4.3% of the population identified as Aboriginal, while 3.9% identified as foreign-born (Statistics Canada 2011).

5.9.2 Health, Industry, and Employment

Table 5.13 lists the participation in local industry for Colchester County. Tourism likely falls into the category of "Other Services", as it is not specifically listed by Statistics Canada. The largest industry for Colchester County is the business services and manufacturing industries.

Table 5.13 Employment by Industry in Colchester County

Industry	Colchester County		
	Total Employed	Total Males Employed	Total Females Employed
Total – Experienced Labour Force 15 Years and Over	25,160	13,245	11,915
Agriculture and Other Resource-Based Industries	1,460	1,135	325
Construction	1,685	1,510	165
Manufacturing	3,575	2,310	1,270
Wholesale Trade	1,470	1,120	345
Retail Trade	3,285	1,455	1,825
Finance and Real Estate	740	340	400
Health Care and Social Services	2,365	340	2,025
Educational Services	1,875	670	1,205
Business Services	3,905	2,265	1,645

Table 5.13 Employment by Industry in Colchester County

Industry	Colchester County		
	Total Employed	Total Males Employed	Total Females Employed
Other Services	4,790	2,085	2,705

Source: Statistics Canada 2011

In 2005, 27,370 residents of Colchester County, 15 years of age or more, earned an income (from either full time or part time jobs). The median income for all persons working in and Colchester County was $21,018, which is below the provincial median of $22,608. For those in Colchester who had full-time work all year-round, median earnings were $33,030, which is still well below the provincial average of $36,917 (Statistics Canada 2011).

Based on the 2006 census, the unemployment rate for Colchester County is 7.9%, which is lower than the provincial unemployment rate of 9.1%.

5.9.3 Recreation and Tourism

Colchester County is bounded on the west by the Fundy Shore and on the northeast by the Northumberland Shore providing scenic views, warm waters and the world's highest tides from the Bay of Fundy. Colchester offers a variety of accommodations, parks, dining, museums, exhibits and over 25 registered heritage sites. Some notable heritage sites located within 50km of the Project include: the Dominion Chair Company General Store, Bass River; Isgonish Marsh Burying Grounds, Belmont; Yuill Barn, Old Barns; numerous sites in both Tatamagouche and Great Village; and the Molsem Cemetary – the first Islamic cemetery in North America, built in 1944.

The Gully Lake Wilderness Area is 3,810 ha located to the west from the Project Study Area. Gully Lake Wilderness Area is a protected area just north of Mount Thom consisting of hardwood and mixed forest hills and small flood plains which host a rich association of plants and some rarities (Nova Scotia Environment 2009). There is an old network of cart tracks and old woods roads which are now used for hiking, camping, cross-country skiing, and other low-impact recreation. Winter snow cover in this region is among the best in mainland Nova Scotia, allowing for excellent winter recreation (Nova Scotia Environment 2009). The Gully Lake Area consists of several trails, including MacIntosh Lake, Gully Lake, Salmon River, Juniper Brook, and Connector trail systems. The Cobequid Eco-trails Society is a non-profit organization that maintains the trail system in the Gully Lake Wilderness Area, as well as the Economy Trail and others in the county. The Proponent has a working relationship with the Society and will continue to provide donations and services where needed as outlined in the Community Benefits program.

The county consists of many small communities and villages. The largest town in the county is Truro, known as the 'Hub of Nova Scotia'.

Dalhousie University's Agricultural College is located in Bible Hill, not far from the Kemptown Project area, as well; the Nova Scotia Community College is located in Truro.

5.9.4 Land Use

The land use in the Project Study Area over the last one hundred years has been forestry. The Canada Land Inventory, Soil Classification for Agriculture shows the area as being "Class 7" which does not support arable culture or permanent pasture. The small parcel of land that the Project will occupy has been subject to forestry and surrounded by road networks and industrial activity.

The silvaculture that has taken place on the study area will remain. Turbine pad areas have been located with the existing land use in mind.

5.9.5 Property Values

In 2006 in Colchester there were 20,855 dwellings of which 15,270 were owned and 5,445 were rented. Approximately 71% of the dwellings in Colchester were constructed before 1986. The average value of a home in 2006 was $129,116, approximately $28,884 less than the provincial average (Statistics Canada 2011).

In a study titled *Wind Energy Study – Effect on Real Estate Values in the Municipality of Chatham-Kent, Ontario,* the authors analyzed the effect on real estate values arising from the installation and operation of wind turbines. The study was prepared in accordance with the *Canadian Uniform Standards of Professional Appraisal Practice* for the APPRAISAL INSTITUTE OF CANADA (Canning and Simmons, 2010).

The report demonstrates what dozens of other studies indicate: that 'in the study area, where wind farms were clearly visible, there was no empirical evidence to indicate that rural residential properties realized lower sale prices than similar residential properties within the same area that were outside of the viewshed of a wind turbine' (Canning and Simmons, 2010).

At the Proponent's existing Dalhousie Mountain Wind Farm, property values have not been negatively affected from the construction and operation of the wind farm. If a property has a turbine on it, the value greatly increased as there is an added guaranteed income associated with the property. Since the Dalhousie project is 1,500 meters from the nearest house, and all of the local homeowners are happy with the project, there has been no negative effect on the community's opinion of the area and therefore, not affected property values. During the writing of this assessment, a family of four was in the process of building their new home less than 1500 m from this 34 turbine wind farm. In addition, the increased exposure of the Dalhousie Mountain area through media and wind farm events have made this beautiful, quiet area of Nova Scotia more widely known and used recreationally and therefore, potentially has increased the value of the properties.

Tax rates in Colchester County in 2013-2014 are $0.84 per $100 for residential property taxation. Within five kilometers of where the Project is proposed, there are no sidewalks, recreation areas, public parks, commercial development, public transit, convenience stores, artisan shops, bike routes, schools, libraries or seniors complexes. There are numerous land that used to house farms, as well as sparsely populated rural areas. There are areas that are used for camping.

Local residents are employed in various fields and locations. In the Project Area there is not a defined 'industry'. Many drive to Truro or even Halifax for work, some to Pictou County, while others may be retired or work from home.

5.9.6 Acoustic Environment

Background sound measurements were not taken as a component of this study. The location is situated in a non-residential area with the Municipal dump to the south, a rock quarry to the north and no habitable dwellings within 1.45km. The ambient background noises typical in the area include heavy trucks/ dump trucks in high volume and regular traffic.

A sound modelling study was conducted based on actual turbine sound pressure levels provided by GE about the 1.6 MW series machines. This sound assessment relied on the approach that recognizes that rural areas, with low housing density and local transportation noise can be characterized sufficiently by assuming conservatively nighttime background L_{eq} of 35 dBA, and daytime L_{eq} of 45 dBA. Based on forest vegetation, commercial and residential usage as well as roadways, ambient sound levels within and surrounding the Project Area are assumed to be 45 dB_A during the day (0700 to 2200 hrs) and 35 dB_A during the night (2200 to 0700 hrs).

Ontario guidelines for sound assessment consider only the incremental change associated with the operation of the wind turbines. It is considered appropriate here, and in similar situations, to consider the cumulative impact of all wind turbines at the receptors that are influenced by the proposed Project. The Kemptown sound study has considered the three turbines in its projections.

Sound modelling methodology, results and discussion can be found in Section 6.2.1.7.

5.9.7 Heritage Sites, Archaeological Sites and Other Cultural Resources

The assessment of archaeological potential for the site considered both prehistoric and historic period resources. Archaeological potential modeling for prehistoric era sites is based largely on the identification of landscape features which are either known to have attracted past habitation or land use, or which appear to have potential for attracting human use. These features include the availability of potable water, suitability for habitation (*e.g.,* ground conditions), proximity to desirable resources (such as workable stone), and proximity to water transportation routes, coastal areas, portage routes and food supplies.

5.9.7.1 Archaeology

In November 2011, the Proponent received a desktop screening review of the Project area from Nova Scotia Department of Tourism, Culture and Heritage (Appendix C). The result of the desktop review states 'Staff notes that there are no recorded archaeological sites on file for the project area. There are three recorded sites immediately to the north and just outside the study area. There is also a recorded site to the south east of the study area. It is also notable that the Debert and Belmont Paleo-Indian archaeology sites are within 15 to 20km of the study area. Historic maps also indicate settlement. Staff recommends that an assessment for archaeological resources takes place.' (Bennett, 2011). The original locations of the Kemptown project were close enough that this 2011 screening was also used for the updated locations. However, a new, updated desktop and field reconnaissance study was done by Davis McIntyre Archaeology for the revised site locations (Appendix H).

During the several field surveys the Proponent has taken throughout the development of the Kemptown Project there have not been any foundations or other indicators of previous settlements located on or near the study area.

A desktop archaeological study was performed for the turbine locations and road entrance followed by a field reconnaissance exercise in the Spring of 2014 (Permit # A2014NS036). The results of the study (Appendix H) determined that there are no archaeologically significant areas that will be affected by the development and operation of the Kemptown Project.

5.9.7.2 Archaeological Potential

5.9.7.2.1 First Nations

While there are no First Nations sites recorded within or immediately surrounding the Project Area, it is well known, and has been noted since the earliest written accounts of the area, that the Mi'kmaq were present in the river valleys throughout Colchester County. These areas would have been important to First Nations groups as both transportation routes and food sources are available in these areas.

The Kemptown Project is within 15-20km of the Debert and Belmont Palaeo-Indian archaeology sites. The potential for historic archaeological resources for the study area can be considered moderate to high as historic maps indicate settlement (Nova Scotia Heritage, 2011).

An MEKS was conducted by AMEC Environmental for Kemptown. During the interview process with knowledge holders from several bands in mainland Nova Scotia, there was not any significant discussion over land use for the Project Area. This site is not near any navigable waters or streams. Findings from the MEKS can be found in Appendix B.

5.9.7.2.2 Historic

The Maritime Archaeological Resource Inventory was consulted by Davis MacIntyre and Associates as part of their desktop survey. Three historic sites representing domestic activity

have been recorded less than a kilometre northeast of the study area, along Mingo Road at the site of the Colchester Waste Management Facility, also known as Irishtown. The first is the remains of a small agricultural comple including stone piles resulting from field clearing as well as a stone foundation for a building, half-buried by soil and rock bulldozed from an adjacent road. The second site consists of a small midden and two earthen or decayed wooden foundations, all most likely related to occupation in the 1930s or 1940s. The final site is that of the W. Work House (originally registered as the J. Johnson House), consisting of a dry-laid stone foundation and cellar with stone piles marking the eastern perimeter of the site. (deBoer, 2014)

Davis MacIntyre & Associates Limited conducted an archaeological resource impact assessment (ARIA) of the proposed Kemptown Wind Project in Colchester County. The purpose of the assessment was to determine the potential for archaeological resources within the study area and to provide recommendations for mitigation, if necessary. The assessment included a historic background study and reconnaissance.

The impact assessment has indicated stone features including a short wall and at least five stone piles exist in proximity to proposed turbine site 2, with part of the stone wall lying within 50m of the turbine's centre point. It is recommended that the stone wall and the area to the northwest of the wall be avoided by heavy equipment during turbine construction if at all possible. The area surrounding the remaining two turbines showed no signs of archaeological resources or areas of elevated archaeological potential. (de Boer, 2014).

5.9.7.3 Summary

Both the historical documentation and the archaeological work done in this area to date demonstrate the potential for further archaeological resources within the study area. The ARIA conducted by Davis MacIntyre & Associates suggests there will be no impact to historically significant findings in the area.

The MEKS conducted by AMEC Environmental suggests that no known sites of pre-contact significance are located within the study area.

With the above being said, it is noted that if any archaeologically significant artifacts are discovered during construction, or at any time, to contact NS Department of Communities, Culture and Heritage.

5.9.8 Land and Resources Used for Traditional Purposes by Mi'kmaq Persons

The Proponent has commissioned AMEC Environmental to conduct an MEKS for the Kemptown site to determine historical and current use of lands for traditional purposes for the proposed Project (Appendix B). This study takes into account all available records from Mi'kmaq and government/ cultural records, field studies and extensive interviews with knowledge holders from the Mi'kmaq communities. The study also contains a field work portion using existing surveys as well as new site specific studies such as botany and bird studies.

5.9.9 Transportation Infrastructure

The Project Study Area receives little traffic other than that of the commercial woodlot landowner. The site entrance is approximately 4km from TransCanada Highway 104. This highway will comprise the key transportation network expected to be used for transport of materials to the site. It is anticipated that the current road network (outside of onsite turbine access roads) will not require upgrades to accommodate construction traffic. Existing roads within the Project boundary will have to be upgraded and some new roads constructed to deliver the machinery on sites.

5.9.10 Safety Issues

Lands within the Project Area do not generally present safety issues apart from tripping or slipping on slick wet surfaces. Construction and decommissioning activities associated with the Project may present some safety challenges with respect to these hazards and routine hazards associated with construction activities. In the operational phase, safety issues such as potential for ice throw must be considered in the context of local populace and public access issues. All safety issues have been addressed with the appropriate design and mitigation measures (*e.g.,* setbacks, restricted access, public notification).

The Proponent will communicate any ice throw risks to the landowner, recreational clubs in the area and the Valley/Kemptown Volunteer Fire Department to promote safe use of the lands for winter purposes such as cross-country skiing and snow-shoeing. The landowner and other site workers also patrol the site on snowmobile during the winter to maintain no trespassing policies that have been in place since before this Project was an option.

Signs will be posted at points around the turbines advising persons to keep a minimum distance of 150m from the wind turbine as a precaution.

5.9.11 Visual Landscape

The Project Study Area is located primarily on a cleared forest land.

A visual landscape assessment was conducted for the Project (Figure 6.10). This assessment was completed with the use of a computerized simulation that used existing homes, tree cover, turbine information and elevation as the data points for running the model. This Zone of Visual Influence shows a map of the Project and 10km beyond. Each area is color coded to show whether 0, 1, 2 or 3 turbines will be visible from that location.

Being visible, for this exercise, may be as minimal as see a portion of the tip of the blade passing over during the rotation of the rotor.

Further information on the area's visual landscape are presented in Section 6.2.1.5.

6.0 ENVIRONMENTAL ASSESSMENT AND RESIDUAL EFFECTS

The following section assesses the potential interactions between the proposed Kemptown Project and the biophysical and socio-economic environment, and includes: an assessment of potential cumulative environmental effects; an assessment of the effects of the environment on the Project; and the potential effects of accidents and malfunctions.

The potential effects are described for the construction, operation and decommissioning phases of the Project and suggested mitigation is presented to reduce or eliminate these potential effects. The potential interactions between the Project and the environment are summarized, as are the proposed mitigation measures to reduce or eliminate residual (or net) effects.

Table 6.1 summarizes the potential interactions between the Project and VECs.

Table 6.1 Potential Interactions Between the Project and Valued Environmental Components

Project Activities	Valued Environmental Components												Section
	Surface Water Quality	Aquatic Environment	Soils and Vegetation	Wetlands	Birds & Other Wildlife	Archaeological/ Cultural Resources	Land Use	Local Community	Visual Aesthetics	Sound	Recreation and Tourism	Public Health and Safety	
Construction													
Surveying and Siting			X		X								6.1.1
Land Clearing			X	X	X	X	X			X			6.1.2
Road Construction/Modification			X	X	X	X	X	X		X			6.1.3
Delivery of Equipment			X		X			X		X		X	6.1.4
Temporary Storage Facilities			X		X	X						X	6.1.5
Foundation Construction			X		X	X	X			X		X	6.1.6
Tower and Turbine Assembly			X		X				X	X		X	6.1.7
Electrical Cabling Installation (Interconnection from Turbines to Point of Interconnection (POI))			X		X		X		X	X			6.1.8
Fencing/Gates							X					X	6.1.9
Operation													
Operation & Maintenance					X		X	X	X	X	X	X	6.2

Table 6.1 Potential Interactions Between the Project and Valued Environmental Components

Project Activities	Valued Environmental Components												Section
	Surface Water Quality	Aquatic Environment	Soils and Vegetation	Wetlands	Birds & Other Wildlife	Archaeological/ Cultural Resources	Land Use	Local Community	Visual Aesthetics	Sound	Recreation and Tourism	Public Health and Safety	
Decommissioning													
Turbine and Ancillary Equipment Removal					X		X	X	X	X	X		6.3.1
Removal of Power Line			X		X		X	X	X	X	X		6.3.2
Site Remediation/ Reclamation			X		X		X	X	X	X	X		6.3.3
Accidents and Malfunctions													
Accidents and Malfunctions			X		X		X	X	X	X		X	6.4

6.1 PROJECT CONSTRUCTION ACTIVITIES – ENVIRONMENTAL EFFECTS

The following sections describe the main construction activities and the potential effects associated with each activity. All activities associated with the Project construction, including equipment maintenance and refueling, will be controlled through standard mitigation to ensure that there is a low impact associated with construction of the Project. The construction zone of impact will be localized within the Project Study Area.

Overall, potential environmental impacts will be mitigated using the following standard practices:

- limit access to the turbine site via one established access road which enters off of Kemptown Road onto an existing driveway;
- keep the size of access roads to the minimum required for the safe transportation of construction equipment;
- construct proper drainage along roadways to limit washouts, maintain even road surfaces and avoid sediment runoff;
- flag/fence areas with valued environmental features (*e.g.,* archaeologically significant rock piles), and exclude construction activities from within these identified areas to the extent practical;
- whenever practical, time clearing activities to periods when the ground surface is best able to support construction equipment (winter or dry season) to prevent rutting and to avoid

clearing during sensitive ecological periods events, such as breeding seasons for resident birds (*i.e.,* May to August); and

- upon clean-up, replace topsoil stored on-site and re-vegetate areas that were temporarily cleared, where possible, with native seed mixtures or with a mix of species similar to those on adjacent lands to restore affected lands to their previous condition.

The remainder of this section focuses on the individual phases of construction and operation, and details the potential environmental effects associated with each activity.

6.1.1 Surveying and Siting Operations

The siting of the wind turbines was initially carried out through field surveys by the Proponent with a GPS, then vetted against data using computer software analyzing meteorological data. This software, however, does not account for municipal setback distances or areas that are environmentally sensitive, so site visits by biologists and archaeologists were conducted and combined with existing mapping data to identify environmental constraints. Prior to construction, land surveyors will conduct a site visit to identify the exact location of each turbine on foot. Survey stakes will be used to mark each turbine site, temporary workspace and access road for construction. These areas have been surveyed, as appropriate, by a qualified biologists, botanists and archaeologists for rare and sensitive environmental features *(i.e.,* rare plants, wetlands) and recommendations have been made to avoid these constraints to the extent possible. Table 6.2 summarizes the potential environmental effects of surveying and siting activities.

Geotechnical testing will be undertaken at the turbine sites. This will require access by testing equipment and may require limited, localized brush removal to permit equipment operation. Geotechnical testing will be undertaken by qualified operators and supervised by an attending engineer. Existing right-of-ways (RoWs) will be used where possible and the equipment will not traverse watercourses or wetlands, and is expected to have minimal environmental effects.

Table 6.2 Potential Effects of Surveying and Siting Activities

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
Birds and Other Wildlife	Sensory disturbance	• Visitors will remain within relevant areas, both in-vehicle and on-foot and will aim to preserve the site's natural areas.	1	1	1/1	R	2	Sensory disturbance may cause habitat avoidance but it likely will be temporary in nature, small in magnitude and restricted to the Project footprint. The area to be subject to this disturbance has been previously

Table 6.2 Potential Effects of Surveying and Siting Activities

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
								disturbed by human presence (*e.g.,* clearing for pasture) and Project disturbance will be reversible.
Terrestrial Vegetation	Limited vegetation removal	• Minimize vegetation removal • Avoid wetlands and watercourses • Best environmental practices for geotechnical testing	1	1	1/1	R	2	Highly localized vegetation removal for equipment access will avoid sensitive ecological features and sites will be restored as part of post construction site restoration

1 Note

Geographic Extent 1 = <500 m^2, 2 = 500 m^2 – 1 km^2, 3 = 1 –10 km^2, 4 = 11 – 100 km^2, 5 = 101 – 1000 km^2, 6 = >1000 km^2

Magnitude 1 = Low: *e.g.,* specific group or habitat, localized one generation or less, within natural variation, 2 = Medium: *e.g.,* portion of a population or habitat, one or two generations, rapid and unpredictable change, temporarily outside range of natural variability, 3 = High: *e.g.,* affecting a whole stock, population or habitat outside the range of natural variation.

Duration 1 = <1 month, 2 = 1-12 months, 3 = 13-36 months, 4 = 37-72 months, 5 = >72 months.

Frequency 1 = <11 events/year, 2 = 11-50 events/year, 3 = 51-100 events/year, 4 = 101-200 events/year, 5 = >200 events/year, 6 = continuous.

Reversibility R = reversible, I = irreversible.

Ecological Context 1 = Pristine area or area not adversely affected by human activity, 2 = evidence of adverse effects.

The net effects of siting and surveying activities will be spatially limited to certain areas within the Project footprint, as well as temporally limited to within the siting and surveying visits. Overall the level of impact will be **minimal** and **not significant**, especially considering that in the area, birds and wildlife already experience a certain level of sensory disturbance due to ongoing industrial forestry activities and associated human presence. Vegetation removal will be minimal and sensitive ecological features will be avoided. It should be noted that this phase is very important in ensuring that the overall Project is carried out with the least possible disturbance to birds and wildlife by precisely identifying sensitive habitats within or near areas proposed for disturbance. Where possible, micro siting of infrastructure will also take into consideration connectivity of landscape to maintain potential corridors for wildlife migration through the area. Appropriate construction work zones will be chosen, to the extent practical, in order to limit the degree of disturbance.

6.1.2 Land Clearing

The lands within the Project Area are cleared and in the various stages of Silva culture with evidence of recent and non-recent clearing operations. The examination of NSDNR mapping and the completion of 3 one kilometer long PGI plots have indicated that there is no occurrence of

resident Mainland Moose near the development site (Appendix J). Two priority mammal species (the Fisher and the Short-tailed Shrew) will be unaffected by the turbine development. Land clearing and vegetation removal in terms of forest habitat or wetlands will only be required for the construction of approximately 500 metres of access roads and 500 metres installation of poles for collection cables. Turbine foundations, crane pads and lay-up areas may require minimal vegetation alteration. Table 6.3 summarizes the potential environmental effects of land clearing activities.

For the construction of the Project, the Proponent anticipates that they will require minimal removal of trees but no alteration of wetlands.

Table 6.3 Potential Effects of Land Clearing Activities

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
Birds and Other Wildlife	Sensory disturbance	• Ensure that overall disturbance is limited to designated workspaces, and performed in compliance with the *Migratory Birds Convention Act* (MBCA). • Conduct clearing outside the breeding period of most migratory birds.	1	1	1/1	R	2	Sensory disturbance may cause habitat avoidance but it likely will be temporary in nature, small in magnitude and restricted to within a few hundred metres of the Project footprint. The area to be subject to this disturbance is not forested land and effects associated with sensory disturbance will be reversible.
	Habitat alteration and loss	• Clear only the land necessary for construction activities and limit the overall land disturbance to within designated workspaces. • Existing access roads will be used and this will minimize habitat loss. • Upon completion of construction and/or decommissioning, habitat will be restored to the extent possible.	1	1	1/1	I	2	Although some habitat loss will be considered irreversible (*i.e.*, 20 years), this "irreversible" habitat loss will be limited in geographic extent and magnitude and will be on land that will ultimately be cleared for timber regardless of whether the Project goes ahead or not. The area of habitat that will be altered due to land clearing activities for access roads and turbines will be a very small proportion of what

Table 6.3 Potential Effects of Land Clearing Activities

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
		• Areas of significance (*e.g.,* nesting sites) will be avoided, to the extent possible.						is available due to the size of the Project as well as the fact that the majority of the Project has been sited to use existing access roads and previously cleared areas. The impact will be minimal.
	Mortality	• In order to reduce the potential of bird mortality, land clearing and construction activities will be performed in compliance with the *Migratory Birds Convention Act*. • Train onsite personnel regarding how to identify and properly deal with any wood turtles that may enter a work site.	1	1	1/1	I	2	- Land clearing activities mirror current forestry operations in the Project Area. Due to timing of land clearing activities outside the breeding period for most migratory birds, it is predicted that there will be no residual effect on bird mortality. - Onsite staff have been trained to identify wood turtles and what to do if one is encountered during any construction/ development activity.
Soils and Terrestrial Vegetation	Soil erosion and compaction	• Limit access to the turbine sites via established access roads. • Size and grade of access roads will be kept to the minimum required for the safe construction, operation and decommissioning of the equipment. • Whenever practical, clearing activities will be conducted during periods when the ground surface is best able to support construction equipment (winter or dry season). • Replace/re-introduce	1	1	1/1	R	2	Implementation of mitigation measures will ensure that soil quality within the Project Area will be preserved, and no residual effects will exist.

Table 6.3 Potential Effects of Land Clearing Activities

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
		topsoil stored on-site to enable the reclamation of land to its original condition.						
	Loss of plant species of conservation concern	• Prior to construction, digital way-point files revealing the precise locations of all "Sensitive", "May be at Risk", "At Risk" and "Undetermined" listed species identified during field work within the area proposed for development will be provided to NSDNR. • Where Plant Species of Conservation Concern are encountered, avoidance to the extent possible will be considered, especially where there may be a threat to the regional population. Where avoidance is not possible, additional mitigative measures will be developed in consultation with NSE and NSDNR.	1	1	1/1	R	2	Vegetation surveys have been conducted to assist with micro-siting of turbines and access road layout. Mitigation for species of conservation concern encountered within the Project footprint will ensure there is no significant residual environmental effect on Plant Species of Conservation Concern. - The botany survey revealed a locally rare club moss along an existing road side (plant thrives in disturbed areas). The Proponent will create a buffer zone around the area where the plant is growing which will eliminate the potential for disturbance during construction.
Wetlands	Loss of wetland area and/or function	• Avoid all wetlands, where practical. • Erosion and sediment control measures will be implemented to protect wetlands during construction.	N/A	1	2/1	R	2	Site surveys indicate that no wetlands will be impacted for the construction of this Project.
Surface Water Quality/ Aquatic Environment	Surface water contamination	• Site access roads so as not to cross water at any new locations • General mitigation measures from the NSE Erosion and Sediment Control Handbook will be	N/A	1	1/1	R	2	By following mitigation measures, adverse interactions with surface water quality and fish habitat will be minimized and no significant residual effects will result.

Table 6.3 Potential Effects of Land Clearing Activities

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
		utilized Including: • Avoidance of watercourses • All activities, including equipment maintenance and refuelling, will be controlled or done off-site to prevent entry of petroleum products or other deleterious substances, including any debris, waste, rubble or concrete material, into a watercourse. • Construction material, excess material, construction debris, and empty containers will be stored away from watercourses and watercourse banks. • A contingency plan for accidental spills will be developed for the Project.						
	Sediment loading	• Site access roads so as not to have any water crossings • General mitigation measures from the NSE Erosion and Sediment Control Handbook will be utilized including avoidance of interaction with watercourses • Land clearing and construction will not take place near watercourses.	1	1	1/1	R	2	By following mitigation measures, negative interactions with surface water quality and fish habitat in the Project Area will be minimized and no significant residual effects are predicted.
Sound	Increases to sound levels due to the transportation and operation of	• Nearby residents will be advised of significant sound generating activities and these will be scheduled to create	1	1	2/1	R	2	Increased sound levels caused by land clearing will be temporary in nature and will be caused by activities conducted

Table 6.3 Potential Effects of Land Clearing Activities

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
	clearing equipment	the least disruption to receptors. • Heavy equipment will only be operated between 7:00 a.m. and 10:00 p.m., avoiding Sundays and holidays unless absolutely necessary. • Construction equipment will have mufflers. • Noise abatement equipment, in good working order, will be used on all heavy machinery used on the Project.						during working, daylight hours. Due to the distance to the nearest residence, existing traffic activity that takes place in the area, the short nature of this disturbance and its limited geographic range, the level of impact will be minimal and residual effect is considered not significant.
Archaeological and Cultural Resources	Disturbance	• Areas of significance will be avoided. • In the event that an archeological heritage resource is discovered, work in the immediate area will stop and the appropriate authorities will be contacted.	1	1	2/1	R	2	Local areas of archaeological potential identified near the Study Area are not anticipated to be impacted by the Project. An archaeological field survey has been conducted and recommendations have been made. No significant residual effects to archaeological and cultural resources are anticipated.

1 Note

Geographic Extent	1 = <500 m^2, 2 = 500 m^2 – 1 km^2, 3 = 1 –10 km^2, 4 = 11 – 100 km^2, 5 = 101 – 1000 km^2, 6 = >1000 km^2
Magnitude	1 = Low: *e.g.,* specific group or habitat, localized one generation or less, within natural variation, 2 = Medium: *e.g.,* portion of a population or habitat, one or two generations, rapid and unpredictable change, temporarily outside range of natural variability, 3 = High: *e.g.,* affecting a whole stock, population or habitat outside the range of natural variation.
Duration	1 = <1 month, 2 = 1-12 months, 3 = 13-36 months, 4 = 37-72 months, 5 = >72 months.
Frequency	1 = <11 events/year, 2 = 11-50 events/year, 3 = 51-100 events/year, 4 = 101-200 events/year, 5 = >200 events/year, 6 = continuous.
Reversibility	R = reversible, I = irreversible.
Ecological Context	1 = Pristine area or area not adversely affected by human activity, 2 = evidence of adverse effects.

The amount of clearing for the Project is limited by using existing access roads to the extent possible and preferential placement of the three turbines in existing cleared areas. Considering

the footprint of the turbine locations, along with access roads, it is estimated that the Project Footprint will be less than 3 ha. Vegetation types most affected by clearing include immature softwood, mature hardwood, grassy understory and gravel/ borrow pits (access roads will be built mainly on existing road right-of-ways).

The effective mapping and avoidance of natural habitat hosting vascular plant species of conservation concern during facility layout design, including site-specific vegetation and wetland surveys (where required), micro-siting of turbines and ancillary structures and infrastructure, use of existing access roads and cleared areas to a large extent, and successful restoration measures during the Project's construction, operation and decommissioning stages, will not likely result in significant environmental effects to native habitat from the Project. If wetland or watercourse alterations cannot be avoided, although highly unlikely, all necessary regulatory approvals will be obtained prior to the disturbance.

The preliminary background research indicates that the Study Area may have potential for containing First Nations archaeological resources. An MEKS has been conducted and has found no areas that need to be avoided. If an archaeological resource of any kind is discovered during land clearing activities, work in the area will cease and the Proponent will contact the proper authorities.

The net effects of clearing activities will be spatially limited to the three turbine areas and approximately 900m of new road construction within the Project footprint. Overall the level of impact will be **minimal** and **not significant**, especially considering that the area's birds and wildlife already experience a certain level of sensory disturbance due to ongoing forestry and clearing activities, and associated human presence. Standard mitigation measures to protect terrestrial resources, aquatic resources, archaeological resources and humans from construction disturbance will be adequate to effectively reduce or eliminate residual effects.

6.1.3 Road Construction/Modification

To the extent possible, existing access roads will be used, and upgraded where required. The site is currently accessible to the turbines 1 and 2. New construction of an access road will be required to reach turbine 3. Access roads will be surveyed and staked/flagged from center point onto each turbine location, with a 20 x 40m crane pad and an area for the assembled blades and hub to sit prior to lifting onto the nacelle. Access roads will be up to 10m wide to accommodate maintenance vehicles and equipment for repairs/replacements. These roads will be designed to accommodate the crane types that will be required to erect the wind turbine generators and towers.

Roads will be constructed by grubbing off the top layer of soil, pushing it aside and digging down until good material is found. This material will be dug out of the road surface and ditches and layered on top of the road bed and compacted. The remaining soil will be put back into the ditches and compacted. Where water runoff will occur, gravel and/or 3" – 8" rock will line the ditches. It is already known that the area has great road building material as this is what the

existing log-truck worthy roads have been made with and maintained with. Also, turbines 1 and 2 are being placed adjacent to borrow pits that show the material lying under the soil layer.

Watercourses and wetlands will be avoided. No watercourse crossings or wetland impact is required for the Kemptown Project. No watercourses or wetlands are within 500 m of the Project Study Area.

The potential environmental effects associated with road include impacts to birds and other wildlife, noise levels, archaeological/cultural resources, land use and traffic. Table 6.4 summarizes the potential environmental effects of road construction/modification activities.

Table 6.4 Potential Effects of Road Construction/Modification

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
Birds and Other Wildlife	Sensory disturbance	• Ensure that overall disturbance is limited to designated workspaces, and performed in compliance with the *Migratory Birds Convention Act*.	1	1	2/1	R	2	Sensory disturbance may cause habitat avoidance but it likely will be temporary in nature, small in magnitude and restricted to within several hundred metres of the Project footprint.
	Habitat loss/alteration	• Habitat loss may be mitigated by only clearing the land necessary for construction activities and by limiting the overall land disturbance to within designated workspaces. • Upon completion of construction and/or decommissioning, habitat will be restored to the extent possible.	1	1	1/1	I	2	Habitat loss will be considered to be irreversible (*i.e.*, 20 years) but the area of habitat that will be altered due to access road construction will be a very small proportion of what is available, and therefore the impact will be minimal.
	Mortality	• In order to reduce the potential of bird mortality, land clearing and construction activities will be performed in compliance with the *Migratory Birds Convention Act* (e.g., outside of critical time	1	1	1/1	I	2	It is predicted that there will be no residual effect on bird mortality.

Table 6.4 Potential Effects of Road Construction/Modification

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
		periods for breeding birds). • Onsite personnel have been trained regarding how to identify and properly deal with any wood turtles that may enter a work site.						
Soils and Terrestrial Vegetation	Soil erosion and compaction	• Access to the turbine sites will be limited to established access roads. • The size and grade of access roads will be kept to the minimum required for the safe construction, operation and decommissioning of the equipment. • Whenever possible, clearing activities will be timed for periods when the ground surface is best able to support construction equipment (winter or dry season). • Compacted soil will be reclaimed as required.	1	1	1/1	R	2	Implementation of mitigation measures will preserve soil quality within the Project Area; no residual effects are predicted.
	Loss of plant species of conservation concern	• Use of existing roads greatly reduces amount of land to be cleared. • Digital way-point files revealing the precise locations of all "Sensitive", "May be at Risk", "At Risk" and "Undetermined" listed species identified during field work within the area	1	1	1/1	R	2	Based on results of the survey for species of conservation concern encountered within the Project footprint, a significant residual environmental effect on Plant Species of Conservation Concern is not predicted.

Table 6.4 Potential Effects of Road Construction/Modification

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
		proposed for development is provided to NSDNR (listed in Appendix F). Where Plant Species of Conservation Concern are encountered, avoidance to the extent possible will be considered, especially where there may be a threat to the regional population. Where this is not possible, additional mitigation will be developed in consultation with NSE and NSDNR.						
Wetlands	Loss of wetland area and/or function	• Avoid all wetlands • All activities, including equipment maintenance and refuelling, will be controlled, or will be done off-site, to prevent entry of petroleum products or other deleterious substances, including any debris, waste, rubble or concrete material, into a wetland. • Construction material, excess material, construction debris, stockpiled soils, and empty containers will be stored away from wetlands	1	1	2/1	R	2	No loss of wetland area is predicted.
Water Quality/ Aquatic Environment	Surface water contamination	• Watercourses will be avoided.	1	1	2/1	R	2	There is no surface water identified within or close by the Project

Table 6.4 Potential Effects of Road Construction/Modification

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
		• All activities, including equipment maintenance and refuelling, will be controlled, or will be done off-site, to prevent entry of petroleum products or other deleterious substances, including any debris, waste, rubble, stockpiled soils, or concrete material, into a watercourse. • Construction material, excess material, construction debris, and empty containers will be stored away from watercourses and watercourse banks. • A contingency plan for accidental spills will be developed for the Project.						Study Area therefore, no impact is predicted.
	Sediment loading	• Design access route so as not to require any water crossings • General mitigation measures from the NSE Erosion and Sediment Control Handbook will be utilized including avoidance of interaction with watercourses to the extent possible.	1	1	2/1	R	2	There are no watercourse crossings required for the Kemptown Project. No residual effects are expected.
	Surface water	• General mitigation	2	1	2/1	R	2	No residual effects are

Table 6.4 Potential Effects of Road Construction/Modification

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
	flow	measures from the NSE Erosion and Sediment Control Handbook will be utilized including avoidance of interactions with watercourses.						expected.
	Fish mortality	• Watercourses will be avoided	1	1	2/1	I	2	No residual effects are expected.
	Loss of fish habitat	• Watercourses and lakes will be avoided completely	1	1	2/1	R	2	No residual effects are expected.
Sound	Increases to sound levels due to the transportation and operation of clearing equipment	• Heavy equipment will only be operated between 7:00 a.m. and 10:00 p.m., avoiding Sundays and holidays unless absolutely necessary. • Construction equipment will have mufflers. • Noise abatement equipment, in good working order, will be used on all heavy machinery used on the Project.	2	1	2/1	R	2	Residual effects are expected to be minimal, as discussed in Table 6.2.
Archaeological and Cultural Resources	Disturbance	• Areas of significance will be avoided to the extent possible.	1	1	2/1	R	2	No residual effects are expected.
Land Use	Reduction of forested and farmed land	• Existing roads will be used as access roads to the extent possible to eliminate forest clearing. • Foundations and layout areas will be constructed in such a manner to	1	1	1/1	R	2	The area of forestry land that will be lost is minimal and no residual effect is expected.

Table 6.4 Potential Effects of Road Construction/Modification

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
		minimize the Project footprint.						

1 Note	Geographic Extent	1 = <500 m^2, 2 = 500 m^2 – 1 km^2, 3 = 1 –10 km^2, 4 = 11 – 100 km^2, 5 = 101 – 1000 km^2, 6 = >1000 km^2
	Magnitude	1 = Low: *e.g.,* specific group or habitat, localized one generation or less, within natural variation, 2 = Medium: *e.g.,* portion of a population or habitat, one or two generations, rapid and unpredictable change, temporarily outside range of natural variability, 3 = High: *e.g.,* affecting a whole stock, population or habitat outside the range of natural variation.
	Duration	1 = <1 month, 2 = 1-12 months, 3 = 13-36 months, 4 = 37-72 months, 5 = >72 months.
	Frequency	1 = <11 events/year, 2 = 11-50 events/year, 3 = 51-100 events/year, 4 = 101-200 events/year, 5 = >200 events/year, 6 = continuous.
	Reversibility	R = reversible, I = irreversible.
	Ecological Context	1 = Pristine area or area not adversely affected by human activity, 2 = evidence of adverse effects.

The construction of access roads on individual landowner's private property will comprise a relatively small portion of the Study Area, and thereby should not jeopardize species habitat. The Proponent will take advantage of existing access roads and upgrade those as necessary. Sensory disturbance for birds and other wildlife will be temporary in nature and low in magnitude. No watercourses or standing water bodies will be impacted during the construction of roads and turbine areas. Mitigation to control surface water and thereby erosion will follow the methods outlined in the NSE Erosion and Sediment Control Handbook and further outlined in the EPP. Overall it is anticipated that with implementation of the above-stated mitigation measures, the environmental impact associated with access road construction and modification activities will be **minimal** and **not significant**.

6.1.4 Delivery of Equipment

Currently, traffic patterns in and around the Project Study Area, are largely related to forestry and landfill operations. With the exception of its boundary roads, the Project Study Area receives no traffic other than access by the landowner.

The trucks used for the heavy loads have multiple axles, with the potential to add more, and have steering capability at the back end, allowing them to turn corners much tighter than trucks without such rear (turbines and crane components) steering capability. A large mobile crane will also be required, approximately the size of a standard semi-trailer.

It is anticipated that the current road network (outside of onsite turbine access roads) will not require upgrades to accommodate construction traffic and therefore a transport study is not proposed.

Approvals for transporting these materials will be sought from the provincial transportation departments. As the turbine components are oversized, a Special Move Permit and any associated approvals will be obtained through NSTIR for heavy load transport.

The tower sections, nacelles, and rotor parts will be moved to each turbine site by flatbed truck and placed into an exact position for picking up using cranes. One flatbed truck will be used for each of the three tower sections. In addition, a flatbed truck will be used for the nacelle for each turbine, and one flatbed truck will be required to transport two rotor blades. By stacking the blades side by side on the flatbed, the transportation cost and fuel consumption is reduced by 33% for the blade transportation. Parts shipped loose will require one truckload in total for all turbines for COMFIT projects proposed by the Proponent (5 in total). Each crane requires multiple trucks to bring in the components for erection and ballast. As well, padmount transformers will be delivered three per truck, totalling one load for delivery of Kemptown's transformers. This site preparation will require approximately ten people for five days for each turbine. All the equipment at the site will be cleaned using a pressure washer and biodegradable truck wash.

The effect on traffic will be primarily increased usage of Exit 18, west onto Highway 4 and North onto Kemptown Road during the delivery of turbine components.

There is a very small possibility for impacts to local sound levels and traffic due to the transportation of materials. Only slight increases in the typical sound levels from delivery are expected. In addition, the potential increase in sound levels may cause sensory disturbance to birds and other wildlife, although neighbouring properties have various noise creation of their own, such as the Balefill Facility, Recyclying Facility and a rock quarry. Therefore the sound levels associated with large trucks are not outside of the typical sound levels experienced in the area. Table 6.5 summarizes the potential environmental effects of activities associated with the delivery of equipment to the site.

Figure 6.1 Typical blade transportation truck

Table 6.5 Potential Effects of Delivery of Equipment

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
Birds and Other Wildlife	Sensory disturbance	• Delivery vehicles will remain on designated roads.	2	1	1/1	R	2	Sensory disturbance may cause habitat avoidance but it likely will be temporary in nature, small in magnitude and restricted to within several hundred metres of the Project footprint. The area to be subject to this disturbance is forested land however disturbance will be reversible.

Table 6.5 Potential Effects of Delivery of Equipment

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
Sound	Increase in sound levels	• Equipment will be delivered between 7:00 a.m. and 10:00 p.m., avoiding Sundays and holidays unless absolutely necessary.	2	1	1/1	R	2	No significant impact on increase in sound levels from delivery is expected.
Local Community	Hazards and/or inconveniences to traffic	• No modifications to existing roads are expected. • A Special Move Permit and any associated approvals will be obtained through the Department of Transportation and Infrastructure Renewal for heavy load transport.	1	1	1/1	R	2	No significant impact on road use is expected.

Note 1 Geographic Extent 1 = <500 m^2, 2 = 500 m^2 – 1 km^2, 3 = 1 –10 km^2, 4 = 11 – 100 km^2, 5 = 101 – 1000 km^2, 6 = >1000 km^2

Magnitude 1 = Low: *e.g.,* specific group or habitat, localized one generation or less, within natural variation, 2 = Medium: *e.g.,* portion of a population or habitat, one or two generations, rapid and unpredictable change, temporarily outside range of natural variability, 3 = High: *e.g.,* affecting a whole stock, population or habitat outside the range of natural variation.

Duration 1 = <1 month, 2 = 1-12 months, 3 = 13-36 months, 4 = 37-72 months, 5 = >72 months.

Frequency 1 = <11 events/year, 2 = 11-50 events/year, 3 = 51-100 events/year, 4 = 101-200 events/year, 5 = >200 events/year, 6 = continuous.

Reversibility R = reversible, I = irreversible.

Ecological Context 1 = Pristine area or area not adversely affected by human activity, 2 = evidence of adverse effects.

It is anticipated that with implementation of the above-mentioned mitigation measures, the residual effects of the delivery of equipment will be **minimal** and **not significant**. Traffic is relatively low along the potential access routes and therefore it is unlikely that there will be a significant inconvenience to local motorists or emergency services.

6.1.5 Temporary Storage Facilities

Temporary storage facilities/equipment lay-down will comprise a small portion of the Project Study Area, and should not jeopardize species habitat. These areas have been included in the site specific studies for plants and wildlife and archaeological resources. Sensory disturbance and habitat loss/alteration for birds and other wildlife will be temporary in nature and not significant. The area's birds and wildlife already experience a certain level of sensory disturbance due to ongoing forestry activities and associated human activities. Upon completion of construction, the temporary storage facilities will be removed and the ground will be remediated to its previous use. The environmental effects of temporary storage facilities are principally due to land clearing and delivery of equipment, and are discussed in Sections 6.1.2 and 6.1.4. Overall it is anticipated that with the implementation of the above-stated mitigation measures, the environmental impact associated with the temporary storage facilities will be **minimal** and **not significant**.

6.1.6 Foundation Construction

Foundations of turbines and padmount transformers will leave a small footprint on the landscape that will last the extent of the Project's life. Excavation of soils and installation of the engineered foundations have the potential to interact with several environmental components. Environmental components that potentially could be impacted as a result of foundation construction include birds and other wildlife, soils, water quality/aquatic environment, land use, sound and archaeological/cultural resources. Table 6.6 summarizes the potential environmental effects of activities associated with foundation construction.

Table 6.6 Potential Effects of Foundation Construction

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
Birds and Other Wildlife	Sensory disturbance	• Overall disturbance will be limited to designated workspaces, and performed in compliance with the *Migratory Birds Convention Act.* • Onsite personnel have	1	1	1/2	R	2	Sensory disturbance may cause habitat avoidance but it is likely to be temporary in nature, small in magnitude and restricted to within several hundred metres of the turbine locations.

Table 6.6 Potential Effects of Foundation Construction

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
		been trained regarding how to identify and properly deal with any wood turtles that may enter a work site.						The area to be disturbed is primarily forested land however disturbance will be reversible.
	Mortality	• Construction activities will be performed in compliance with the *Migratory Birds Convention Act*.	1	1	1/2	I	2	It is predicted that there will be no residual effect on bird mortality.
Soils	Soil disturbance and erosion	• Topsoil and subsurface soils will be separated and stored on-site to be replaced appropriately after the pouring of the concrete foundation. When the soils are stored they will be protected from erosion and runoff.	1	1	1/2	R	2	By implementing these standard mitigation measures, the residual effect on soils will not be significant and will have a minimal level of impact.
Water Quality/ Aquatic Environment	Surface water contamination	• Watercourses will be avoided. • All activities, including equipment maintenance and refuelling, will be controlled, or will be done off-site, to prevent entry of petroleum products or other deleterious substances, including any debris, waste, rubble or concrete material, into a watercourse. • Construction material, excess material, construction debris, and empty containers will be stored away from watercourses and watercourse banks. • A contingency plan for accidental spills will be developed for the Project.	1	1	1/1	R	2	No residual effects are predicted. No watercourses are located within the project footprint or in the vicinity of the project footprint.

Table 6.6 Potential Effects of Foundation Construction

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
	Sediment loading	• General mitigation measures from the NSE Erosion and Sediment Control Handbook will be utilized to control water, reduce erosion and limit sedimentation. • Land clearing and construction will not take place in the immediate vicinity of a watercourse.	1	1	1/1	R	2	No residual effects are predicted.
Land Use	Reduction of land available for forestry	• Turbines, with their relatively small footprint on the land, have been sited with consideration for the potential impact to existing land uses.	1	2	1/2	R	2	The area of forested land that will be lost due to foundation construction will be a very small proportion of what is available and will be situated to minimize disturbance to existing forestry operations. Due to the limited footprint, its reversibility after decommissioning and small proportion of land to be directly impacted by foundation construction, the residual effect is expected to be minimal.
Sound	Increases to sound levels due to operation of equipment	• All internal combustion engines will be fitted with appropriate muffler systems. • Noise abatement equipment, in good working order, will be used on all heavy machinery used on the Project.	1	1	1/2	R	2	Increased sound levels caused by foundation construction will be temporary in nature and will be conducted during working, daylight hours. The nearest receptor is over 1500 metres from the foundations. Due to the short nature of this disturbance and its limited geographic range, the level of impact will be minimal and residual effect is considered not significant.

Table 6.6 Potential Effects of Foundation Construction

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
Archaeological and Cultural Resources	Disturbance	• Areas of significance will be avoided to the extent possible. • Upon any discovery of potentially significant archaeological resources, work will stop and the Proponent will contact proper authorities	1	1	1/2	R	2	No residual effects are predicted.

1 Note

Geographic Extent 1 = <500 m^2, 2 = 500 m^2 – 1 km^2, 3 = 1 –10 km^2, 4 = 11 – 100 km^2, 5 = 101 – 1000 km^2, 6 = >1000 km^2

Magnitude 1 = Low: *e.g.,* specific group or habitat, localized one generation or less, within natural variation, 2 = Medium: *e.g.,* portion of a population or habitat, one or two generations, rapid and unpredictable change, temporarily outside range of natural variability, 3 = High: *e.g.,* affecting a whole stock, population or habitat outside the range of natural variation.

Duration 1 = <1 month, 2 = 1-12 months, 3 = 13-36 months, 4 = 37-72 months, 5 = >72 months.

Frequency 1 = <11 events/year, 2 = 11-50 events/year, 3 = 51-100 events/year, 4 = 101-200 events/year, 5 = >200 events/year, 6 = continuous.

Reversibility R = reversible, I = irreversible.

Ecological Context 1 = Pristine area or area not adversely affected by human activity, 2 = evidence of adverse effects.

The foundations will comprise a relatively small portion of the Project Area. Sensory disturbance for birds and other wildlife during foundation construction will be temporary in nature. Upon completion of construction, the ground surrounding the foundations will be restored. Overall, it is anticipated that with the implementation of the above-stated mitigation measures, the residual effects associated with foundation construction will be **minimal** and **not significant**.

Figure 6.2 Foundation Partially Complete with Frames and Rebar in View

6.1.7 Tower and Turbine Assembly and Installation

The tower comes in three sections that will be assembled on site. The rotor blade system, consisting of three blades and a hub, will also be assembled on site, attached to the generator and lifted into place at the top of the tower by a large hydraulic crane. This will require approximately ten people for three days per turbine. An additional 1-2 days will be required to install the remainder of the turbine assembly. Control and switching equipment will be placed on each turbine pad by a crane. A large crawler crane with a hydraulic crane will be used to install each tower section. Each tower section will be lifted and secured with bolts to the section below, followed by the nacelle secured to the top tower section. Finally, the assembled rotor will be lifted and attached to the nacelle.

This phase of construction could potentially have impacts on birds and other wildlife, soils and vegetation, and sound levels. Table 6.7 summarizes the potential environmental effects of activities associated with tower and turbine assembly and installation.

Table 6.7 Potential Effects of Tower and Turbine Assembly and Installation

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
Birds and Other Wildlife	Sensory disturbance	• Overall disturbance will be limited to designated workspaces, and performed in compliance with the *Migratory Birds Convention Act*. • Onsite personnel have been trained regarding how to identify and properly deal with any wood turtles that may enter a work site.	2	1	2/1	R	2	Sensory disturbance likely will be temporary in nature, small in magnitude and restricted to within several hundred metres of the turbine locations. The residual effect is considered minimal.
Soils	Soil compaction and contamination	• Trucks and equipment will remain in designated workspaces. • Whenever possible, delivery will be timed for periods when the ground surface is best able to support construction equipment (winter or dry season). • Compacted soil will be reclaimed as required.	1	1	2/1	R	2	No residual effects are expected.
Sound	Increases to sound levels due to the transportation and operation of equipment	• Heavy equipment will only be operated between 7:00 a.m. and 10:00 p.m., avoiding Sundays and holidays unless absolutely necessary. • All internal combustion engines will be fitted with appropriate muffler systems. • Noise abatement equipment, in good working order, will be used on all heavy machinery used on the Project.	1	2	2/1	R	2	Increased sound levels caused by equipment assembly and installation will be temporary in nature and will be conducted during working, daylight hours. Due to the short nature of this disturbance and its limited geographic range, the level of impact will be minimal and residual effect is considered not significant.
Safety	Increase in potential for accidents	• All machinery and equipment will be maintained in good working order and inspected for wear prior to each shift • All employees and	1	1	1/1	R	2	Personnel and/ or contractors will be trained to use any equipment or machinery that they are working on/ with. No persons will be permitted to visit the site

Table 6.7 Potential Effects of Tower and Turbine Assembly and Installation

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
		contractors will adhere to the Safety Policies in place • Access to the site will be limited to employees and contractors only • Crane lifts will not take place in overly windy conditions • Emergency Response Plan is implemented and local first responders will be trained for turbine specific accidents						during construction without proper safety training. The effect is considered not significant.

1 Note Geographic Extent 1 = <500 m^2, 2 = 500 m^2 – 1 km^2, 3 = 1 –10 km^2, 4 = 11 – 100 km^2, 5 = 101 – 1000 km^2, 6 = >1000 km^2

Magnitude 1 = Low: *e.g.,* specific group or habitat, localized one generation or less, within natural variation, 2 = Medium: *e.g.,* portion of a population or habitat, one or two generations, rapid and unpredictable change, temporarily outside range of natural variability, 3 = High: *e.g.,* affecting a whole stock, population or habitat outside the range of natural variation.

Duration 1 = <1 month, 2 = 1-12 months, 3 = 13-36 months, 4 = 37-72 months, 5 = >72 months.

Frequency 1 = <11 events/year, 2 = 11-50 events/year, 3 = 51-100 events/year, 4 = 101-200 events/year, 5 = >200 events/year, 6 = continuous.

Reversibility R = reversible, I = irreversible.

Ecological Context 1 = Pristine area or area not adversely affected by human activity, 2 = evidence of adverse effects.

Figures 6.3 and 6.4 below show the hub and blade assembly positioned on the ground ready for hoisting and attaching to the nacelle

Sensory disturbance for birds and other wildlife will be temporary in nature, limited in extent, and low in magnitude. The area's birds and wildlife already experience a certain level of sensory disturbance due to ongoing forestry activities and associated human presence, and therefore are expected to be able to tolerate the similar disturbance associated with construction activities, or use available habitat outside the range of disturbance. There is very little sensitive habitat such as interior forest within the vicinity of the Project activities. Compacted soil will be remediated and reclaimed as appropriate, and measures will be in place to decrease the likelihood of contamination occurring. Safety policies and Emergency Response Plans have been implemented by the Proponent and all onsite personnel will strictly adhere to these policies. Overall it is anticipated that with the implementation of the above-stated mitigation measures, the residual effects associated with the tower and turbine assembly and installation will be **minimal** and **not significant**.

Figure 6.5 Turbine Tower Erected with Crane Ready to Hoist the Blade Assembly

6.1.8 Interconnection from Turbine to Distribution Powerlines

Above-ground 25 kVA electrical cables will be installed running from each turbine to the distribution powerlines, largely following existing linear disturbances (*i.e.,* access road system). The interconnection point is at the northern most end of the Balefill Facility.

Potentially affected environmental components include birds and other wildlife, soils, water quality/aquatic environment, noise, land use and archaeological/cultural resources. Table 6.8 summarizes the potential environmental effects of activities associated with interconnection of the turbine collector system and the distribution powerline.

Table 6.8 Potential Effects of the Interconnection from Turbines to Distribution Line

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
Birds and Other Wildlife	Sensory disturbance	• Overall disturbance will be limited to designated workspaces. • All internal combustion engines will be fitted with appropriate muffler systems. • Noise abatement equipment, in good working order, will be used on all heavy machinery used on the Project. • Personnel have been trained regarding how to identify and properly deal with any wood turtles that may enter a work site. • Mitigation recommended by the Avian Power Line Interaction Committee (1994, 1996 and updates) will be considered to	2	1	2/1	R	2	Sensory disturbance likely will be temporary in nature, small in magnitude and restricted to the Project Study Area. The residual effect is considered minimal.

Table 6.8 Potential Effects of the Interconnection from Turbines to Distribution Line

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
		minimize effects of overhead distribution lines.						
Soils and Terrestrial Vegetation	Compaction and contamination – via heavy equipment	• Topsoil will be stored on-site for future use in restoring the land to its original condition. • Standard erosion and sediment control measures will be implemented as required. • Vehicles will follow access roads.	1	1	2/1	R	2	No residual effects are expected.
Water Quality/ Aquatic Environment	Surface water contamination	• Watercourses will be avoided. • All activities, including equipment maintenance and refuelling, will be controlled, or will be done off-site, to prevent entry of petroleum products or other deleterious substances, including any debris, waste, rubble or concrete material, into a watercourse or wetland.	1	1	2/1	R	1	No residual effects are expected.
	Sediment loading	• General mitigation measures from the NSE Erosion and Sediment Control Handbook will be utilized to control water, reduce erosion and limit sedimentation. • Watercourses will be avoided.	2	1	2/1	R	1	No residual effects are expected.

Table 6.8 Potential Effects of the Interconnection from Turbines to Distribution Line

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
Sound	Increases to sound levels due to the transportation and operation of equipment	• Heavy equipment will only be operated between 7:00 a.m. and 10:00 p.m., avoiding Sundays and holidays unless absolutely necessary. • All internal combustion engines will be fitted with appropriate muffler systems. • Noise abatement equipment, in good working order, will be used on all heavy machinery used on the Project. • Powerline installation will be limited to the one property and will not be necessary outside of that private land.	2	1	2/1	R	2	Increased sound levels will be temporary in nature and will be conducted during working, daylight hours. Due to the short nature of this disturbance and its limited geographic range, the level of impact will be minimal and residual effect is considered not significant.
Land Use	Reduction of forested land	• Existing forest and access roads built earlier in the construction schedule will be used to install the collection system. • The Project will not require a substation	1	1	2/1	R	2	Provided these mitigation measures, and considering the temporary and reversible nature of this effect over a small spatial scale, no residual effects are expected.
Archaeological and Cultural Resources	Disturbance	• Areas of significance will be avoided to the extent possible. • Work will take place along ditched areas beside the access road. Earlier construction will have already vetted against resource discovery so installation	1	1	2/1	R	2	No residual effects are expected.

Table 6.8 Potential Effects of the Interconnection from Turbines to Distribution Line

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
		of the lines will not require new impact areas.						

1 Note

Geographic Extent 1 = <500 m^2, 2 = 500 m^2 – 1 km^2, 3 = 1 –10 km^2, 4 = 11 – 100 km^2, 5 = 101 – 1000 km^2, 6 = >1000 km^2

Magnitude 1 = Low: *e.g.,* specific group or habitat, localized one generation or less, within natural variation, 2 = Medium: *e.g.,* portion of a population or habitat, one or two generations, rapid and unpredictable change, temporarily outside range of natural variability, 3 = High: *e.g.,* affecting a whole stock, population or habitat outside the range of natural variation.

Duration 1 = <1 month, 2 = 1-12 months, 3 = 13-36 months, 4 = 37-72 months, 5 = >72 months.

Frequency 1 = <11 events/year, 2 = 11-50 events/year, 3 = 51-100 events/year, 4 = 101-200 events/year, 5 = >200 events/year, 6 = continuous.

Reversibility R = reversible, I = irreversible.

Ecological Context 1 = Pristine area or area not adversely affected by human activity, 2 = evidence of adverse effects.

Overall it is anticipated that, with the implementation of the above-mentioned mitigation measures, the residual effects of the collection system installation will be **minimal** and **not significant**.

6.1.9 Fencing/Gates

The access road for the Project is not gated but is privately owned. No trespassing signs, as well as hired safety personnel will deter the public from entering the work site. No gates or fencing will be required; therefore environmental effects and mitigation are not discussed.

6.1.10 Parking Lots

The need for a parking lot is not anticipated for the Kemptown Project. Temporary storage areas, addressed in Section 6.1.5, will be the location of any necessary parking of vehicles or equipment; therefore environmental effects and mitigation are not discussed.

6.2 OPERATIONAL ACTIVITIES – ENVIRONMENTAL EFFECTS

The environmental components that may be adversely affected by the operation of the Kemptown Project include land use, recreation, visual aesthetics, ambient sound levels, birds and other wildlife and health and safety. Table 6.9 provides a general overview of these components and associated impacts. The remainder of Section 6.2 describes these interactions and potential effects in greater detail.

Table 6.9 Summary of Potential Effects of Operational Activities

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
Birds	Sensory disturbance	• Site turbines in areas that are not in or near Important Bird Areas • Use modern equipment which is proven to have lower sound levels.	2	2	5/6	R	2	It is anticipated that sensory disturbance during Project operations may cause birds to change their flight patterns in order to avoid the towers and rotating blades. This will serve to reduce the number of bird collisions. There is potential for avoidance of habitat within the vicinity of the turbines; this will be evaluated during post-construction monitoring.
	Mortality	• Lighting will be the minimum allowed by Transport Canada for aeronautical safety, and white or red flashing or continuous lights (CL-865) may be used with the minimum intensity and flashes per minute allowable. The turbines for this Project will be built using tubular steel towers, as some data indicate that lattice towers encourage perching by raptors during hunting and, as a result, may put these birds at risk of collisions. • Project does not require a substation (which have bright lights usually on during nighttime hours for safety)	2	2	5/6	I	2	Given existing information from operating wind energy facilities elsewhere in North America, and the five years of operation of Dalhousie, it is anticipated that avian collision with wind turbines will not cause significant bird fatalities, either of sensitive species or large numbers of birds. Post-construction monitoring will be implemented to confirm that the effect of the Project on bird populations is not significant (Figure 6.7). - The Proponent will hire a qualified technician to create and conduct an avian (and bat) post-construction monitoring program which will be overseen by a qualified biologist. This will be created in discussion with DNR and CWS.
Other Wildlife	Sensory	• A moose monitoring	2	2	5/1	R	2	Studies of game animals

Table 6.9 Summary of Potential Effects of Operational Activities

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
	disturbance	program (pellet group inventory counts) has been implemented to determine the degree to which moose use the Project Area. • This will continue into post-construction to determine if the turbines and associated infrastructure are an impediment to free movement of mammals.						in western North America (*e.g.,* Anderson *et al.* 1999) have shown that species are either unaffected by wind energy facilities, given their small footprint and the preservation of existing land use, or that they can readily adapt to the presence of wind turbines. At this site, habitat avoidance will most likely occur during periods of construction, and may be more intermittent during periods of operation, when on-site human activities are less frequent and would occur on a short-term basis. (Figure 6.8 and 6.9) Results of the 2012, 2013 and 2014 PGI surveys have not indicated any moose presence in and around the three proposed locations and ancillary equipment (Appendix J).
	Mortality	• Post-construction monitoring will direct the need and form of further post-construction mitigation measures. • A bird and bat monitoring program will be developed in consultation with NSDNR and CWS. Based on the results of the program, necessary modifications to mitigation plans and/or wind farm operations will be undertaken.	2	2	5/1	I	2	Based on existing information from monitoring programs elsewhere in North America, as well as the results of the Kemptown Bat study, and the location of the Project relative to the existing facility at Dalhousie and its post construction monitoring results, it is anticipated that the impact of wind farm operations on bat mortality will not be significant. However, post-construction monitoring will be

Table 6.9 Summary of Potential Effects of Operational Activities

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
								implemented to confirm this expectation. The risk of bat collisions is greater for migrating bats than for resident breeding, commuting or foraging bats. Therefore, post-construction monitoring will be implemented to confirm this expectation. Pre-construction monitoring was conducted in August and September 2013 and post-construction monitoring will occur once operations begin in order to correspond to migration activities by migratory species and the movement of resident species to hibernacula.
Land Use	Disruption to undeveloped woodlands or infrastructure	• The Project has been designed to minimize impacts to the local land use. No mitigation, therefore, is required as no significant impacts are predicted.	1	2	5/1	R	2	The effect of wind turbines on undeveloped woodlands is negligible with only a small portion of the available land required for wind turbines, ancillary equipment and access roads.
Local Community	Effect on local economy	• Local residents will be employed to the extent possible during the construction, operation and decommissioning of the Project. • Annual payments in the form of lease payments, as well as community donation and assistance donations from the Project will occur every year for the lifetime of the Project • Active Community Benefits Package will aid	4	1	5/6	R	2	A positive residual effect would be realized by the operation of the Project, through increases in employment opportunities, direct landowner payments, annual hiring of snow removal services, increases in private spending due to an influx of Project personnel, and an increase in the municipal tax base. Donations to the local community by the

Table 6.9 Summary of Potential Effects of Operational Activities

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
		in a wide range of community uses						Proponent in the last two years include Hector Arena Capitol Fund, Pictou Skate Park, Dalhousie Mountain Snowmobile Club, and Pictou County Lite Horse Club, Individual Moto-cross racers (youth and intermediate), the New Glasgow Dragon Boat Festival, Mt Thom MX. This will continue and expand with the operations of this new Project. (Figure 6.6)
	Effect on property values	• None required	4	1	5/6	R	2	Existing information indicates that property values are not adversely affected by the construction and operation of wind farms. With the positive effect on local economy directly from the Project, some properties may be updated and better maintained, which can increase a property's value
Recreation and Tourism	Effect to tourism and recreation	• None required.	4	2	5/6	R	2	The Project Area is not subject to recreation other than private landowner usage, which will remain unchanged.
Visual	Change to visual landscape	• Turbines will be all of the same type and model, and will be painted light grey to reduce reflection • Screening opportunities for adjacent residences through tree planting or other measures may be considered where post-construction evaluation indicates a legitimate concern. • The Project is limited to three turbines	4	2	5/6	R	2	Given the viewing distances and sparse population, the visual impact will not be significant. Some landowners within the Study Area will have views of the wind turbines from their residences, but many views will be obstructed by terrain, existing vegetation and distance.

Table 6.9 Summary of Potential Effects of Operational Activities

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
	Lighting	• Lighting will be the minimum allowed by Transport Canada to ensure the appropriate level of aeronautical safety.	4	2	5/6	R	2	Given the viewing distance of lights on turbines combined with soft light (not brightness), the presence of these lights will not place excessive nighttime visual pollution within several kilometers of the Study Area.
	Shadow flicker	• Locate machines far enough away from homes that shadow flicker will not be possible. • Shadow flicker will not exceed allowable limits	2	2	5/1	R	2	Modeling of shadow flicker indicates there are minimal potential visual impacts at the locations throughout the Project Study Area caused by shadow flicker due to the limited duration and distance of visibility under "ideal" viewing conditions as well as the presence of existing vegetation which would effectively mitigate potential adverse effects. A registry will be created to document complaints of shadow flicker. Complaints of shadow flicker received from a will be monitored from that receptor. Information collected from the shadow flicker monitoring will be used will be used to develop further mitigation, if warranted. However, no dwellings or businesses are within the range of shadow flicker at the Kemptown site.
Sound	Increases to sound levels	• Noise created from the operation of the wind turbines will not exceed the provincial threshold of 40 dBa at any time. • Colchester County limits the sound levels even further than the	2	2	5/6	R	2	Modelling of predicted sound levels caused by the operation wind turbines indicated that all the receptors within the Project Study Area are expected to receive sound exposures from the proposed wind farm within

Table 6.9 Summary of Potential Effects of Operational Activities

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
		province, at 36 dBA maximum output.						acceptable sound limits. As a result, an increase in sound levels due to the operation of the Project is not anticipated.
Health & Safety	Electromagnetic fields (EMFs)	• Construct turbines far enough away from houses so as not to be exposed to EMF (this distance is about 350 m and the closest inhabited house to a turbine for Kemptown is over 1700 m)	1	2	5/1	R	2	The strength of the EMF from equipment decreases rapidly with increasing distance. EMF produced by this equipment is typically indistinguishable from background levels. The EMF produced by the equipment within the turbines will be very weak, reduced not just by distance, but also by objects such as trees and other objects that conduct electricity. Overall EMF is not anticipated to have any negative results on human health and safety.
	Infrasound energy	• None required.	1	1	5/1	R	2	There is no evidence that the wind turbine technology proposed for this Project presents any potential problems related to the generation of infrasound energy.
	Ice throw	• During construction and operation activities, access to the wind turbine facility will be restricted to authorized personnel wearing proper personal protective equipment and who have had appropriate safety training. • During site visits, vehicles will be parked up-wind of the turbines. • During operation, access to the wind turbine sites will be restricted to	1	1	5/1	R	2	Due to the setback distance to the nearest residence, it is not possible that ice throw would present a risk to neighbouring landowners. For maintenance personnel, the potential of ice throw presents a greater risk to health and safety. With the implementation of the mitigation measures proposed herein, the risk of injury and property damage will be reduced.

Table 6.9 Summary of Potential Effects of Operational Activities

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
		authorized personnel only. • Signage warning of the dangers of ice throw will be placed upon entrance of the facility for anyone who enters onto the private property						

1 Note
Geographic Extent 1 = <500 m^2, 2 = 500 m^2 – 1 km^2, 3 = 1 –10 km^2, 4 = 11 – 100 km^2, 5 = 101 – 1000 km^2, 6 = >1000 km^2
Magnitude 1 = Low: *e.g.,* specific group or habitat, localized one generation or less, within natural variation, 2 = Medium: *e.g.,* portion of a population or habitat, one or two generations, rapid and unpredictable change, temporarily outside range of natural variability, 3 = High: *e.g.,* affecting a whole stock, population or habitat outside the range of natural variation.
Duration 1 = <1 month, 2 = 1-12 months, 3 = 13-36 months, 4 = 37-72 months, 5 = >72 months.
Frequency 1 = <11 events/year, 2 = 11-50 events/year, 3 = 51-100 events/year, 4 = 101-200 events/year, 5 = >200 events/year, 6 = continuous.
Reversibility R = reversible, I = irreversible.
Ecological Context 1 = Pristine area or area not adversely affected by human activity, 2 = evidence of adverse effects

6.2.1 Wind Turbine Operation

The following sections discuss the potential effects of the operation of the Project on the biophysical and socio-economic environment.

The Project is owned by the Nova Scotia SPCA. A significant portion of the revenue created by the power production at Limerock will go directly to the SPCA. A portion of the revenue created will also go to the Community Benefits Fund, as described earlier, for the Valley/ Kemptown Fire Department to distribute annually. In addition to this, the Proponent actively donates to various organizations/ individuals in need throughout the existing community surrounding Dalhousie. In September 2013, the Proponent made a significant donation to the Hector Arena Capitol Fund. This is for a small rink in the town of Pictou to complete upgrades necessary to continue operating (Figure 6.6).

Figure 6.6 Proponent and Staff with Donation Check to Hector Arena Fund Representatives

6.2.1.1 Effects on Birds

Environment Canada's "Wind Turbines and Birds – A Guidance Document for Environmental Assessment" and "Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds" (Environment Canada 2007a and 2007b) were considered during the pre-construction surveys and EA of Project impacts on birds.

In particular, Tables 1 to 3 of Environment Canada (2007a) were consulted to identify the sensitivity, facility size, and level of concern. According to the criteria identified in the aforementioned tables, the facility would be considered small due to the number of turbines at the proposed Project, and is considered to have an overall low sensitivity due to the general lack of landform structures in the Project Area and the results of the pre-construction survey. As a result, the Project would be considered a Category 1. Table 6.10 identifies the information that Environment Canada would expect to be considered for projects with a Category 3 or 4 level of concern.

Projects in Category 1 represent the lowest level of potential risk to birds. Usually, such projects would require some basic surveys before construction to assess bird populations within the

proposed area for the turbines, and to confirm that there are not any sensitive factors that were previously overlooked. However, it is important to recognize that even basic surveys must usually be conducted over a one year period, to ensure they are done at the appropriate time of year for each species. Depending on the numbers of birds detected, some follow-up surveys may be required to assess impacts, but these would likely be minimal. Most likely, these would involve some surveys for short periods in each of 1 or 2 years post-construction, possibly starting one year after construction. In cases where little or no habitat would be impacted (e.g., wind turbines within an industrial park), few if any bird surveys may be required. Some carcass searching will be required to rule out unexpected mass mortality events (Environment Canada, 2007a).

Table 6.10 Questions for Consideration as per Environment Canada (2007a)

Question	Answer
Identify the species that breed and winter at the site and in the surrounding area, and indicate their relative abundance.	See Section 5.5, Appendix G
Identify any species at risk, including species listed under the *Species at Risk Act (SARA),* provincially or territorially designated species, species designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), or species designated as priority species by the ACCDC, Partners in Flight (PIF) or the CWS.	See Section 5.5, Appendix G
Identify bird colonies (note species, size, and location).	No bird colonies have been identified during pre-construction surveys, and none have been identified during other surveys in the region, including the MBBA (2006-2010).
Identify raptors, shorebird concentrations.	See Section 5.5 and Appendix G
Identify species that give aerial flight displays.	Few species that typically give aerial flight displays during the breeding season have been identified. See Section 5.5.1.2 and Appendix G.
Identify the species that congregate at significant migration staging areas at or near the site.	The Project Study Area does not appear to be a major staging or stopover site for migration (see Section 5.5 and Appendix G).
Identify the species that frequently migrate through or near the area.	See Section 5.5
Identify the species that commute (*i.e.,* between breeding and foraging habitats) through or near the area, as compared to other locations within the region.	There were no commuting species noted by the surveyor during the pre-construction survey. See Section 5.5 and Appendix G
What habitat types occur on the site and in the surrounding area?	Typical habitiats found throughout Mainland Nova Scotia are found at the Kemptown Site. Treed, planted and natural growth forest, cleared areas, gravel areas, wetlands, streams, ponds and blueberry fields are all within 1.5 km of the Project Area. See Section 5.5, Appendices B, F and G

Table 6.10 Questions for Consideration as per Environment Canada (2007a)

Question	Answer
Do these habitats typically support habitat-sensitive or habitat specialist species, *e.g.,* forest-interior species, grassland species, or shrubland species?	The Project Area does not provide valuable habitat for bird species compared to other areas in the region. Due to the fragmentation that has already occurred in the Project Area, much of the forested habitat is considered edge habitat, and no interior forest will be lost. The use of existing access for the majority of the layout and the size of the proposal will reduce the fragmentation caused by the Project.
What is the relative density of breeding birds in these habitats?	See Section 5.5, Appendix G and F
What breeding or migrating birds do these habitats typically support?	See Section 5.5 and Appendix G and F
How much of each habitat type or function will be lost or altered as a result of this development?	The Project footprint will be primarily on existing roads and previously cleared areas. Some forest in regeneration may require clearing for foundation and/ or layup areas and approximately 400m of new road construction will be required. Project infrastructure locations (including access roads) will maximize use of existing roads and cleared lands. Appendix F presents a detailed breakdown of habitat types and areas to be affected (Blaney, 2014). Most affected (according to NSDNR forestry data) include immature softwood, clear-cut, and other non-forested areas. This generally reflects the relative abundance of these habitats on the local landscape.
What topographical features, such as islands, peninsulas, and ridges, are located on or near the site that may influence bird activity and movement?	Project site is situated in hilly terrain common to the Cobequid Hills Ecodistrict; however there are no locations that would be classified as a ridge likely to concentrate migrating birds. The Study Area is at least 25 km from the coast (Tatamagouche Bay to north and Pictou Harbour to east).
What is the expected amount and type of human presence (vehicles, pedestrians, tourism, etc.) at the site at different times of the year, during and following construction?	See Section 2 for information on Project traffic. The area is already subjected to human disturbance as a result of forestry, ATV usage and landfill operations.
What are the relevant meteorological data, such as wind speed, wind direction and visibility (*e.g.,* number of days during migration period with visibility <200 m or cloud bases <200 m) for the site?	Typical climatological data for the region is provided in Section 5.8.1. Information on the frequency of low visibility conditions is unavailable for this area.
If a bird colony is located within 5 km of the Project area, or if a nationally recognized site occurs within 1 km, do individual birds pass through the proposed turbine locations as part of their daily movements? What proportion of the colony does this represent?	No bird colonies are known to occur within 5 km of the Project Study Area, nor is there a nationally recognized site within 1 km. Given the distance to the coast, there is low risk to seabird colonies. No seabirds have been recorded near the Project Study Area.
Do raptors breed at the site or within 1 km of the site? If so, what species are present and how close do they nest to the proposed facility?	No raptors were confirmed breeding at the site, nor were any raptor nests observed. However, the landfill two kilometer to the south of the area does attract bald eagles who feed in the landfill. During the bird and other field surveys, it did not appear that the Bald eagles travel through the Project Area to gain access to the landfill site.

Table 6.10 Questions for Consideration as per Environment Canada (2007a)

Question	Answer
If the site is recognized by local experts as having bird habitat that is locally important, how much of this habitat would be lost or altered by the proposed Project?	The Project Study Area is not considered to have bird habitat that is locally important. The majority of Project lands have already been impacted by forestry, power line corridor or roadways.
If the site contains land features (islands, ridges, shorelines, peninsulas, areas of open water in winter, etc.) that may concentrate birds on migration, while staging, or in winter: Do birds concentrate at this site during any of the seasons mentioned above?	As indicated in Section 5.5, the survey data generally shows no evidence of large concentrations of birds in the Project Study Area.
If the site is recognized by CWS or local experts as regionally or locally important to birds, how does the number and diversity of birds that use the site in the season of interest compare to other locations in the region or province? How much habitat would be lost or altered by the proposed Project?	The site is not recognized by CWS or local experts as regionally or locally important to birds. The habitat included in the Project Study Area is not regionally or locally important to birds. The Project Study Area is characterized primarily by fragmented forest habitat of little value compared to other locations in the region or province.
If large numbers of birds may commute through or near the area during the day, what is the height and direction of this movement, and how does this relate to the proposed Project design and turbine locations?	Refer to Section 5.5. Common Raven were observed commuting through or near the area during the day in numbers larger than 5-10.

Habitat surrounding the Project Study area was studied using NS DNR Forest Cover Maps and 2004 air photographs. The site was also visited. Habitat is predominately young forest regenerated after extensive forest harvest. Riparian habitat along the South Branch North River occurs within 500 metres of the turbines. To the north, over 500 metre from the turbines is commercial blueberry fields.

Bird monitoring for Kemptown used a combination of Point Counts and Stopover Counts. Point Counts are a standardized survey type used for breeding birds. They are done from stationary points and identify breeding birds by song or sight during a 10 minute stop. Stopover Counts will use the same locations. These are less standardized than point counts and can have various approaches, but must be of a design that is repeatable.

Mapping can be found in the Bird Study Results, Appendix G and in Figure 5.B. Seven Point Count locations were chosen within 500 metres of the proposed turbine locations. Two occur near riparian habitat and the other five within young forest. Another eleven locations are situated at distances between 500-1200 metres from any turbine. Points in the 500-1200 metre zone will serve somewhat as control plots and to survey avifauna at Big Lake and about commercial blueberry fields. There are a total of 18 Point Count locations, four of these have been used solely for the Winter Survey. Locations are situated at least 250 metres apart.

There are a few situations (Stop 5 to 14, Stop 8 to 8R and possibly onto Stop 8L) where the observer cannot drive but must walk between points. The observer here recorded bird occurrence along at least two 300 metre distance transects.

Ken McKenna is the surveyer. Ken is an expert birder and at identifying bird song during point counts. Other biologists on site, such as Ross Hall or Sean Blaney, have made incidental bird observations.

The monitoring began in Winter 2014 with a site visit by the Project Biologist while the bird surveyor was birding in South America. Spring Migration began in May and ran into June with Breeding Bird studies. Surveys were conducted in July and August and will continue through the Fall Migration. Up to date results from the surveys can be found in Appendix G but do not include the Fall Migration surveys. Currently the results are not completed but will be in less than two months. Supplemental reporting will be submitted to CWS and NSE as soon as the report has been compiled. There is no indication at this point that the Kemptown Project is situated in a special bird area.

The potential environmental effects resulting from Project-related activities on birds include sensory disturbance and mortality. Section 5.4.1 provides detailed information on the breeding, wintering and migrating birds of the Project Study Area and the broader regional area.

Sensory Disturbance

Sensory disturbance of birds may occur during all phases of the Project as a result of on-site human activities such as surveying, clearing, road construction, turbine assembly, equipment operation, site inspections and site decommissioning. A certain level of sensory disturbance to birds in the area has already resulted due to forestry and landfill activities and associated human presence. The operation of the wind turbines may also result in visual and auditory disturbance of wildlife, including birds. Breeding birds may avoid habitat within a zone surrounding the immediate Project footprint, although sensitivity is species-specific (Kingsley and Whittam 2005). Many species will not avoid habitat near rotating wind turbines, as has been noted by James (2003) and James and Coady (2003), but other species show a reduction in breeding densities near turbines (Johnson *et al.* 2000). There will be three turbines constructed in Kemptown. Habitat avoidance will most likely occur during periods of construction, and may be more intermittent during periods of operation, when human presence on-site is less frequent and typically of short duration. Given the use of existing right of ways and previously disturbed areas for the proposed wind farm infrastructure, only a small fraction of the project will add to habitat fragmentation, with no loss of interior forest habitat.

The flight behaviour of birds may be influenced by Project development. Operation of the turbines may affect bird movements through the partial obstruction of regular flight paths. Certain species (*e.g.,* waterfowl) appear to exhibit avoidance behaviour when flying close to an operating wind farm, while others do not appear to be influenced by the presence of a wind farm

(James 2003; Kingsley and Whittam 2005). (Figure 6.11) Breeding birds at Pickering, Ontario, do not appear to be disrupted by the 1.8 MW operating turbine, and birds continue to nest and move within the area as before (James 2003). Most diurnal migrants fly at low altitude, within 40 m of the ground, and are unlikely to be significantly disturbed by the wind turbines or associated facilities. At night, migrants fly well above the height of the wind turbines, typically greater than 150 m above the ground, and are thus also unlikely to be disturbed by the Project. However, visual or auditory features that cause bird avoidance may have a constructive effect in that birds will be less likely to accidentally collide with turbines. Migration surveys conducted for the proposal would suggest the site is of relatively low risk, given the low numbers of migrating birds and typically small flock sizes. The Project Study Area does not appear to be in a major migration pathway.

Mortality

A possible effect of this Project on birds is mortality due to collisions with the operating wind turbines. There is a perception that wind turbines cause many bird deaths, and it has been highlighted by regulatory agencies and non-governmental agencies as an issue that needs to be addressed. General information about bird-turbine collisions is presented below.

'We estimated impacts on birds from the development and operation of wind turbines in Canada considering both mortality due to collisions and loss of nesting habitat. We estimated collision mortality using data from carcass searches for 43 wind farms, incorporating correction factors for scavenger removal, searcher efficiency, and carcasses that fell beyond the area searched. On average, 8.2 ± 1.4 birds (95% C.I.) were killed per turbine per year at these sites, although the numbers at individual wind farms varied from 0 - 26.9 birds per turbine per year. Based on 2955 installed turbines (the number installed in Canada by December 2011), an estimated 23,300 birds (95% C.I. 20,000 - 28,300) would be killed from collisions with turbines each year. We estimated direct habitat loss based on data from 32 wind farms in Canada. On average, total habitat loss per turbine was 1.23 ha, which corresponds to an estimated total habitat loss due to wind farms nationwide of 3635 ha. Despite concerns about the impacts of biased correction factors on the accuracy of mortality estimates, these values are likely much lower than those from collisions with some other anthropogenic sources such as windows, vehicles, or towers, or habitat loss due to many other forms of development. *Species composition data suggest that > 0.2% of the population of any species is currently affected by mortality or displacement from wind turbine development*. Therefore, population level impacts are unlikely, provided that highly sensitive or rare habitats, as well as concentration areas for species at risk, are avoided'. (*Zimmerling et. al, 2013)*

Kingsley and Whittam (2005) provide a detailed review of available information regarding turbine-related bird fatalities in North America and elsewhere. Numerous studies during the last 20+ years have been conducted to estimate bird mortality at wind farms, from a single turbine or small wind farms such as the present proposal, to larger wind farms with thousands of wind turbines (Gill *et al.* 1996; Erickson *et al.* 2001; Percival 2001). This level of study effort is principally due to the circumstances at one large site in California, Altamont Pass, which alerted industry,

government and the public to potential bird mortality at wind-farms. Thousands of wind turbines installed in the early 1980s at Altamont Pass were shown to cause high raptor (hawks, eagles and falcons) mortality. Collisions with the turbine structures were the primary cause of death, although electrocution and wire collisions also played a part (Orloff and Flannery 1992). These raptor fatalities triggered an increase in scrutiny of potential wind farm developments, which has led to the development of monitoring protocols and a substantial amount of data on bird use and mortality at proposed and existing wind farms.

Despite these early studies in California, very few raptors have been found killed at other North American wind farms (Erickson and West 2001; Kingsley and Whittam 2005). Songbirds are the most frequent casualties of wind farms in North America, and tend to collide with wind turbines more frequently during migration. Breeding birds appear to adapt to the presence of wind turbines near their nesting and/or foraging areas and avoid collision (Erickson *et al.* 2002; James 2003; James and Coady 2003; Kingsley and Whittam 2005). Songbirds can make up anywhere from 10% to 90% of the overall bird fatalities, depending on the location of the wind turbine site (Erickson *et al.* 2001). Excluding California, 78% of bird casualties at wind farms in the United States tend to be of migratory species (Kingsley and Whittam 2005). Many of these collisions occur at night, when individuals may be attracted to lit structures and collide with transmission wires, turbine towers or other structures in a wind farm. Findings at a West Virginia wind farm, where 27 birds were killed by colliding with a substation and the three wind turbines closest to the substation on a foggy night during May 2003, are probably attributable to the sodium vapour lights of the substation, which, combined with the very low visibility and the presence of the wind farm on a rise in elevation, may have caused this rare mortality event (Kerlinger 2003). No fatalities were found at any of the other 41 wind turbines of the wind farm, located further away from the substation and its sodium vapour lights (Kerlinger 2003). In spring 2011, a similar event occurred in Nova Scotia during a persistent fog event. Bird mortality was observed at two wind farms (Glen Dhu and Nuttby Mountain) in the region. In both cases, these wind farms have lighted substations located within their wind farm facilities. No such mortalities were observed at Dalhousie Mountain during this fog event, which lies between the Nuttby Mountain and Glen Dhu wind farms, and it has been surmised that this may be due to the separation of the substation from the wind farm facility (5km from substation to nearest turbine at Dalhousie).

In October 2013, an Environment Canada study was released that shows that more than 276 million birds are killed in Canada every year from human-related activity, which includes deaths caused by cats owned, or not controlled well, by humans. The study also says that over 2 million nests are destroyed each year in Canada. The estimated figure of 276 million is out of a total of 10 billion birds. This study did not take into account chickens, turkeys or other poultry killed for food consumption. The methods of the avian mortality were released with deaths caused by wind turbines not making the top ten list. The total for Canada was 16,700 birds caused by wind turbines.

Although fatalities occur at wind energy facilities, the number of fatalities is generally small. This is especially noticeable when compared to bird fatalities caused by other sources, such as communication towers, roads, cats and buildings. Erickson *et al.* (2001) compared estimates of

bird mortality caused by different human sources in the United States, and estimated that an average of 2.19 birds per turbine, or between 10,000 and 40,000 birds, are killed each year. Compared to other sources, such as feral and domestic cats (hundreds of millions), power lines (130 – 174 million), windows both residential and commercial (100 million – 1 billion), pesticides (70 - 80 million), automobiles (60 – 80 million) and lighted communications towers (40 – 50 million), the mortality caused by wind turbines is significantly less (AWEA, 2013). Each house in North America kills on average between 1 and 10 birds each year, and tall buildings kill many more (Dunn 1993, Kingsley and Whittam 2005). Additionally, Kingsley and Whittam (2005) indicate that the effects are small compared to the millions of birds that travel through existing wind power developments in the U.S. each year. This has been noted for two sites in Washington and one site in Minnesota, where conservative estimates of mortality, using surveillance radar and carcass surveys to determine passage rates and fatality rates, respectively, are less than 0.01% of birds passing through each wind farm (Erickson 2003).

In Canada, existing wind farms in Alberta were included in a research study examining the movement of nocturnal migrant birds (and bats) using radar and sound recording technology. This research, conducted during the fall of 2004, compared the behaviour and abundance of birds and bats between operating wind farms and comparable sites without wind turbines. Millikin (2005) estimated that approximately 0.02% of the individuals (birds and bats combined) observed on radar may have resulted in a collision with a turbine. Furthermore, this research identified that these nocturnally migrating birds exhibited avoidance behaviour, with individuals reducing their speed and increasing their flight height to avoid the turbines (Millikin 2005). Nocturnal bird studies were not conducted as a part of the Kemptown Project.

The National Wind Coordinating Collaborative (Strickland *et al*. 2011) summarized the bird mortality rates from 63 studies of wind power facilities across North America and Canada. The NWCC reports that bird mortality rates range from 0-14.0 birds per MW per year, with two-thirds reporting less than or equal to three fatalities per MW per year. Data collected during the casualty monitoring program at Dalhousie in 2010 and 2011 suggest mortality rates are at the low end of the ranges reported by NWCC. Overall, the findings of the studies discussed above indicate that bird fatalities caused by wind turbines are very low in the majority of cases (Erickson *et al.* 2001; Percival 2001; Erickson and West2002; Kingsley and Whittam 2005). Locally, two years of post-construction monitoring of Dalhousie facility, in operation since December 2009, has resulted in very low recorded mortalities , 3 birds in 2 years, with adjusted correction factors for worst case scenario, the mortality rate is less than 0.25 birds/ turbine/ year. However, it is important to reduce or eliminate fatalities to the extent possible, and it is important to understand what factors may increase the collision risk of birds at a wind farm. A number of factors may influence the potential for bird-turbine interactions that lead to bird kills, including weather and lighting, landscape features, turbine design, facility design and bird abundance and behaviour. These are described further in the following discussion.

Weather and Lighting

When conditions are clear, there is low likelihood that birds will collide with wind turbines (Crockford 1992; Kingsley and Whittam 2005). However, low visibility (<200 m) may cause nocturnal migrants to fly at lower altitudes, and lights may attract individuals (Jones and Francis 2003; Kingsley and Whittam 2005).

Birds may be attracted to red visibility beacons or other lighting associated with turbine structures. Lighting that attracts birds can increase the probability of bird-turbine collisions and result in kills. CWS recommends that the minimum amount of pilot warning and obstruction avoidance lighting should be used on tall structures. Only strobe lights will be used at night, at the minimum intensity and minimum number of flashes per minute (longest duration between flashes) allowable by Transport Canada. The use of solid-burning or slow pulsing warning lights at night will be avoided. Transport Canada typically specifies red flashing lights for wind farms in Canada (Canadian Aviation Regulations Standard 621.19); CL-864 medium intensity red flashing lights were installed on selected turbines of the Dalhousie Site. Spotlights or other exterior or decorative lights will not be used to illuminate turbines. Lighting elsewhere within the Project will be the minimum necessary for safety. Lighting for the safety of the employees will be shielded to shine down and only to where it is needed, without compromising safety, and turned off when not in use. Final lighting selection determined in consultation with Transport Canada has three turbines lit. A recent study of communications towers found that fewer avian fatalities are recorded at flashing versus steady-burning lights, regardless of the colour (Gehring *et al.* 2009).

Turbine Design

Turbine height is believed to be a strong influence on the likelihood of collision with taller structures having an increased risk of collision, while structures below 150 m cause minimal mortality (Kerlinger 2000; Crawford and Engstrom 2001; Kingsley and Whittam 2005). Migratory birds typically fly at altitudes greater than 150 m such that structures lower than 150 m in height do not usually obstruct migratory bird movements or result in bird mortality (Kingsley and Whittam 2005). The turbines of the Project will be 80 m hub height with a rotor diameter of 82.5 m. As a result, the greatest height of the turbines will be 121.25 m above the foundation, or well below 150 m. At this height, the turbines are not predicted to obstruct the movements of most migratory birds that frequent the region or to increase risk of material collision. Furthermore, results from a research project in Alberta indicate that migrating birds will modify their flight paths to increase in flight height when approaching an operating wind farm (Millikin 2005).

Facility Design

The scale of the wind farm has a direct influence on the potential for bird-turbine collisions. Facilities of 100 turbines or more are thought to more likely have a greater effect in terms of bird mortality due to the increased number of vertical obstacles (potential collision hazards) in the landscape (Environment Canada 2007a). The Project will consist of three turbines and will therefore be considered to be a small-sized facility. With the site sensitivity is considered low

and the small size of the Project makes the facility a Category 1 level of concern (Environment Canada 2007a).

Bird Abundance and Behaviour

The avian study results (Appendix G) showed that the Kemptown survey location is an adequate representation of previously cleared Acadian forests found throughout Nova Scotia. There are no habitat types or bird species of a unique nature found throughout this study area. There are no threatened or endangered species found throughout the area. Although there are breeding populations of birds found within the Kemptown area, the habitat types are not unique in nature and there are there are suitable habitat types for alternate nesting grounds in close proximity. (*Black Bird, 2013)*

Potential Impact and Mitigation

Evidence from wind farms in North America and elsewhere, as noted above, suggests that bird collisions are likely to occur but are in very low numbers, and the potential for significant bird kills is low. The results of the pre-construction bird survey program and collection of existing data indicate that the bird use of the Project Area does not cause concern with regards to increasing risk of collision, disturbance or habitat alteration. However, there are further monitoring measures that will help verify these potential effects to bird populations.

Bird surveys will continue in the same transect and area search locations once operations begin in 2015 and further add to the knowledge of bird use in the region. Construction on-site will occur outside of the breeding season to the extent possible to avoid contravention of the *Migratory Birds Convention Act*. If clearing activities cannot be scheduled to avoid the breeding season for most birds (May to August), then a birder on-site will use non-intrusive searching methods to identify the potential for nests within or immediately adjacent to work areas, and flag them for avoidance during construction. In cases when nests are known to be easy to locate, active nest searches may be performed.

To determine the accuracy of the predicted environmental effects and ensure all mitigation measures are successful, post-construction monitoring will be conducted. This study will include breeding bird, migration, mortality, scavenger efficiency, and searcher efficiency surveys. The length of the post-construction bird monitoring program will be determined in consultation with CWS and NSDNR although it is expected that two years of monitoring may be required (see Section 7.2). The results of the post-construction monitoring will be used to assess the success of the mitigation measures.

Taking into account the mitigation measures, there likely will be residual effects of the Project on local bird populations. In general, sensory disturbance will be infrequent, temporary in nature, reversible, small in magnitude and restricted to the Project Area given the mitigation measures proposed. Residual effects of sensory disturbance are not predicted to be significant. Fatalities as a result of colliding with structures within the Project will be irreversible, but they are expected to be infrequent and minor in magnitude and in geographic extent. It is unlikely that

mortality will affect birds at a population level. As a result, the residual effect of this mortality is considered to be **low** and **not significant.**

Figure 6.11 Family of Canadian Geese Hatched and Raised in Dalhousie in Fourth Year of Operations (2013)

6.2.1.2 Other Wildlife

Other wildlife species of the Project Study Area include mammals, reptiles and amphibians. Most species are year-round residents of the Project Study Area and adjacent lands, although certain local or long-distance migrations of some species occur. Potential environmental effects of the Project on wildlife include habitat alteration, mortality and sensory disturbance.

Sensory Disturbance

Wildlife sensory disturbance may occur as a result of on-going human activity on-site as well as visual and auditory disturbance related to the operation of the turbines. Sensitivity of wildlife to disturbance varies by species and life-stage.

Human presence (noise, sight and smell) and vehicles may disturb wildlife. During operation of the wind-farm, Project-related vehicles and personnel will be in the vicinity of wind turbines on a

regular basis for ongoing maintenance. It is likely that some disturbance of diurnal wildlife will occur during operation and maintenance of the Project. The Proponent lives in Dalhousie and drives the 11km commute to work at the bottom of the mountain at least twice daily. The sighting of animals including black bear (Figure 6.8), deer, bobcat (Figure 6.9), rabbits, beavers, and a multitude of avian species are a frequent event. This suggests that if the turbines (34 at Dalhousie, three at Kemptown) have a limited effect on diurnal species when operations begin that will lessen over time as the species and individuals become accustomed to the addition of wind mills in the area. Bats are unlikely to be affected by human presence as they are nocturnal and the majority of human presence will occur in the Project Area during the day. Although there is the potential for limited human presence induced disturbance to wildlife, significant adverse effects are not predicted for several reasons. First, the Project Area has arelative degree of existing human disturbance (*i.e.,* forestry activities and leisure) and thus wildlife species have either become acclimatized to some degree of human disturbance or have already left the area. Second, disturbance will be intermittent and generated sound will be of low levels (*i.e.,* human speech and vehicle noise). Third, no rare or at-risk wildlife species were reported as breeding in the Project Study Area. In order to further reduce the severity of the effects of human disturbance on wildlife, worker presence on-site should be minimized and limited to designated work areas. In addition, all Project-related vehicles will be maintained to minimize noise and no idling will be permitted. In consideration of existing conditions and suggested mitigation, no significant adverse effects are predicted on wildlife due to human presence during operation and maintenance.

The operation of the wind turbines may also result in visual and auditory disturbance of wildlife. However, studies in the western United States have shown that there has been no significant effect of the construction and operation of wind farms on big game (Strickland and Erickson 2003), indicating that species are either unaffected by these developments, given their small footprint and the preservation of existing land use, or that they can readily adapt to the presence of wind turbines. At this site, habitat avoidance will most likely occur during periods of construction, and may be more intermittent during periods of operation, when human presence on-site is less frequent and would occur on a short-term basis.

Mainland Moose

The examination of NSDNR mapping and the completion of 5 new PGI plots have indicated that there is no occurrence of resident Mainland Moose near the development site (Appendix J). Two priority mammal species (the Fisher and the Short-tailed Shrew) will not be affected by the turbine development.

In order to determine if potential moose presence in the Project Area is increasing, the pellet group survey transects that were conducted for the Kemptown Environmental Assessment will continue to be repeated post-construction. The results of these surveys will be submitted directly to NSDNR. These surveys are discussed further in Section 7.1.

Figure 6.12 Power Pole at Dalhousie with Black Bear Markings, Spring 2013.

Figure 6.13 Bobcat Photographed by Proponent at Dalhousie Mountain Wind Farm, Summer 2013 found in landowner's woodlot.

Mortality

Mortality of wildlife has the potential to occur during all phases of Project development. During construction and decommissioning, there is a small chance that small mammals may be harmed as a result of limited site clearing and through the use of heavy equipment for moving materials on and off the Project site. However, additional potential for mortality relates to interactions between operating wind turbines and bats. Bats have been identified as animals with the potential to be affected by wind energy facilities, as measured by numbers of carcasses found during surveys at wind farms in the United States and Canada. The remainder of this section describes the issue of bat mortality at wind farms in more detail, places the issue in the Nova Scotia context and provides background to the assessment.

Bat Turbine Collisions

Despite having the ability to navigate cluttered environments in the darkness, bats are known to collide with large man-made structures, occasionally with fatal consequences. Bat collision mortality has been identified to occur with various kinds of tall structures including lighthouses, buildings, power lines, communication towers and wind turbines. Bat collision with human structures appears to be an infrequent occurrence, but it has the potential to be of concern. A recent study by Long *et al*. (2010) found that echoes returned from moving turbine blades that

could render them attractive or difficult for approaching bats to detect and locate in time for avoidance, which might explain the sometimes inordinate rates of mortality at some wind farms.

The first report of bat fatalities at a wind farm was by Hall and Richards (1972). Over four years, 22 White-striped Mastiff-Bats (*Tadarida australis*) were found at the base of turbines at an Australian wind farm. Since then, bat fatalities have been reported at several wind farms in North America (Arnett *et al*. 2006). A report by Arnett *et al*. (2006) synthesized available information from 21 post-construction fatality studies across the United States and Alberta. This summary shows a consistent trend in fatalities occurring in late summer and fall among primarily lasiurine migratory species. Hoary bats, red bats, and silver-haired bats had constituted most of the mortality at wind farms. At one wind development where the tri-colored bat is the most common resident bat, their mortality approached 25%. However, fatalities among resident bat species such as *Myotis* spp. and big brown bats were low with the exception of two sites located in Alberta and Iowa where little brown myotis comprised 25% of mortality. There were no reports of fatalities of threatened or endangered species. Overall estimated mean fatality rates per MW varied between 0.2 and 53.3 (0.1 and 69.6 deaths/turbine/year) with the highest rates occurring in the eastern US. The average rate across all sites was 11.6 fatalities/MW/year. The study also found that fatalities were not generally concentrated around particular turbines and strobe lights recommended by the FAA did not influence rates of fatality.

Based on the timing of spring migration, spring migrations of Hoary, Eastern Red and Silver-haired bats are most likely to occur in May (Koehler and Barclay 2000). Despite these movements, Arnett *et al*. (2008) found that far fewer collision fatalities occurred in the spring at wind farms in the United States and Alberta. Erickson *et al.* (2002) found that of 536 recorded bat collision fatalities at wind farms across the United States, only two were killed in May (Erickson *et al.* 2002). Collision data collected from other types of structures also support these findings. For example, of 50 dead Eastern Red Bats collected at a building in Chicago, 48 were found in the fall and two in the spring (Timm 1989). It is not clear why spring migrants collide with wind turbines far less frequently than fall migrants. Behavioral differences between migrating hoary bats in the spring and fall may influence collision risk, as suggested by Johnson *et al.* (2002). These differences have been reported in Florida, where autumn migration occurred in waves, whereas the spatial distribution of bats during spring migration appears to be far more scattered (Zinn and Baker 1979).

The principal factors adversely affecting bat populations are predation, white-nose syndrome and habitat alteration/destruction, not collision with wind turbines or any other human structure (Bat Conservation International 2001). Despite this, bats are being killed at wind farms, or at least some wind farms, though the factors putting them at risk of colliding with wind turbines are still poorly understood. Without a clear understanding of what would place bats at risk of collision, it is difficult to predict the frequency of bat-turbine collisions. For example, Erickson *et al.* (2002) report on several instances where bats were observed foraging very close to turbines without being struck by the turbine blades. This is further complicated by a lack of understanding of bat ecology, especially on migration, and the paucity of data on abundance

and movement of bats at multiple spatial scales (continent-wide, provincial, regional) that could provide context for pre-construction surveys.

Barotrauma

It is understood that barotrauma could be the cause of death of some bats found at wind energy facilities (Baerwald *et al.* 2008). Barotrauma involves tissue damage to air containing structures (*i.e.,* lungs) caused by rapid or excessive air pressure change. In this case, it is believed that air pressure change at turbine blades (in movement) causes expansion of air in the lungs not accommodated by exhalation, therefore resulting in lung damage and internal hemorrhaging. However, a more recent study by Grodsky *et al.* (2011) used radiology to investigate causes of mortality and found that a majority of the bats (74%; 29 of 39) examined had bone fractures that are likely to have occurred during direct collision with turbines. Approximately one-half (52%; 12 of 23) of bats whose ears were examined had mild to severe hemorrhaging in the middle or inner ears (or both). The true nature of mortality resulting from turbine collision remains poorly understood.

Fatalities in the Northeast

While pre-construction bat surveys have demonstrated little correlation with actual fatalities post-construction, commissioned wind farms in the area have demonstrated that bat fatalities are low. The operational Kent Hills Wind Farm located near Prosser Brook, New Brunswick along the Bay of Fundy could be considered a high potential site for bat interaction based on its location near a known hibernaculum, and proximity to the Bay of Fundy Coast. Despite these factors, mortality at this site has been low over two years of carcass monitoring (32 turbines) with only one bat carcass found in 2009 and four in 2010. The estimated casualties corrected for searcher efficiency over the entire period is 0.10 casualties per turbine (Stantec 2010, 2011a).

Likewise, a post construction monitoring study at the Mars Hill Wind Development along the New Brunswick/Maine border found no unreasonable adverse impact to these species, recording only 0.17 fatalities per turbine per year in 2008, and 0.43 in 2007 (Stantec 2009). These numbers represent only a fraction of the mortality experienced at many other wind developments in the eastern US. These low numbers could be considered noteworthy given that the Mars Hill project follows a highly pronounced north-south running ridge, surrounded by agricultural plateau that could present an obvious migratory marker for any bats that might be moving through the area.

The scientific community is moving away from quantifying mortality at wind farms as individuals per MW or turbine based on averages. This arises from the fact that during post construction studies at wind farms there have been cases where one turbine has been recorded as having a large number of bat kills but when averaged out over the number of machines at the project, the numbers look smaller (and less of an impact) than they actually are. An example would be a wind farm with 25 turbines: 17 deaths recorded at one site and a total of 19 for the whole

project. The average would be stated to be 0.76 bats per turbine which wouldn't sound that alarming. However, when reported as actual numbers, 17 bats for one turbine, the magnitude of the negative impact is better understood.

While nearby wind developments have demonstrated low rates of mortality, migration pathways can be localized and our ability to predict the locations of migration corridors is limited. There are tracking and monitoring programs underway in the Maritimes that may help to shed additional light on the general hazard of fatalities to bats in the region.

One such program is the Motus Wildlife Tracking System being coordinated locally by Dr Phil Taylor (BSC's Chair in Ornithology at Acadia University) and Stuart MacKenzie. Although the main concentration is tracking bird movement, bats can be included in the program also.

This program has been in the works for a number of years in marine tracking and in 2012 university students were able to prove that it can be applied to avian fauna as well. Basically, there are very small transmitters (<0.3 g) which are tagged onto small animals (birds/ bats). The transmitters emit a short pulse and are picked up by very high frequency (VHF) radio receivers that are placed throughout Maine, Massachusetts, the Gulf of Maine, Nova Scotia, New Brunswick, Quebec, Ontario and as far north as Southampton Island, Nunavit. The receivers are mounted on towers to build arrays that by 2013, combined with other projects in the region, have allowed over 1000 individuals of 9 species to be tagged and tracked.

Tha majority of traditional work using radio-telemetry has been conducted in closed boxes where researchers examine their own individuals, using their own equipment, in their own study areas. The philosophy behing Motus is to harness the collective power of these information silos into one massive coordinated effort that can expand the scale and impact of everyone's work, as well as optimizing scarce research dollars. The approach will provide important new insight into these fascinating ecological systems and will further aid our efforts in directing conservation, management and policy. (Taylor, 2014)

The radar deployment has opened up the amount of information collection and movement tracking that can be undertaken. Having numerous academic and consultant groups 'sharing' information will allow a more broad and meaningful database from which studies can be done.

The Proponent has entered into a working agreement with Dr. Taylor to assist in the Motus program. This will involve monetary donations as well as give the study team an opportunity to use the Proponent's equipment and land to mount receivers to. The hope is that this will add to the knowledge base surrounding bats and their migration, foraging and movement behaviors. Although this particular sect of the program is currently geared to studying birds, bats are also being used in the program in other areas.

For instance, tracking migrant bats from the Bruce Pinensula through Long Point and several other projects that have happened around Long Point. In 2013 and 2014 in Maine bat work has

been undertaken with the array, and near Texas there is a large bat project just getting underway.

Pre-construction bat surveys at the original Kemptown site (3-4km from revised locations) were undertaken in August/September 2013 (Appendix I). On July 31, four eco-location emitters and recorders were deployed at three areas. One was hoisted to 40m and attached to the met tower while one was deployed at 2m at the same location. A third detection device was deployed at about 1km east of the met tower along the edge line of field/ cleared forest area. On August 28 a fourth detector was deployed a few kilometers east of the site near a known abandoned mine. The nighttime activity was recorded from July 30 until September 30 2013. Batteries were changed and recordings uploaded on August 23 and September 13.

Results from the 2013 bat survey report are quoted below. The entire report is contained in Appendix I, along with a references sited section at the end.

The average number of recorded bat call sequences per night in the proposed development area (average for the two sites) was 0.19 (SD =0.52) during the sampling period. 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 (Laval et al. 1977, Fenton and Barclay 1980, Fujita and Kunz 1984, Krusic et al. 1996, Zimmerman and Glanz 2000, Lacki et al. 2007). Both of these previous comparisons were conducted prior to the emergence of white nose syndrome and therefore may not be directly comparable. In a forested landscape in Colchester Count, Nova Scotia, we detected an approximate 99% decrease in bat echolocation activity from 2012 to 2013 at forested and riparian sites that were monitored for bat activity following the confirmation of mortality from white nose syndrome in Nova Scotia (Segers and Broders, unpublished data).

The average number of recorded bat call sequences per night for the Brookfield, Smithfield and Kemptown abandoned mine openings were 0.40 (SD = 0.91), 1.64 (SD = 2.72), 0.14 (SD = 0.42), respectively. The Smithfield AMO had the highest level of bat activity of the four study areas and although bat activity was low, there was a trend of bat activity increasing towards the end of August and early September (Figure 1, Appendix I) as predicted for swarming sites.

Discussion

Interpretation of these data are problematic for assessing relative risk to bats at the proposed development given our knowledge of the devastating impacts that white nose syndrome has had, and is having, on local bat populations. Elsewhere, white nose syndrome reduced the summer bat activity by >75% (Dzal et al. 2011). This past winter (2012-2013), there were hundreds of fatalities recorded at several known hibernacula in the province and annual monitoring counts of bats at such hibernacula down, on average, by 94% (Broders and Burns, unpublished data). The disease is now confirmed in seven counties in central Nova Scotia, including the proposed development area. These observations are

suggestive of a major mortality event in the area, potentially decreasing the magnitude of bat activity in the area in the summer of 2013. This is supported by other work we are conducting in the region during summer suggesting a 99% reduction in the magnitude of echolocation activity in 2013, relative to 2012 (Segers and Broders, unpublished), and decimation of a number of maternity colonies in the region. For these reasons this dataset must be interpreted with caution.

Despite the above, 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 was low compared to baseline levels (collected prior to 2007) expected in a forested ecosystem in the region. 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 directly cause a large number of bat mortalities. That being said, in light of white nose syndrome and the recent listing of the species as endangered, the significance of any mortality is greater than just a couple of years ago.

The majority of the identified echolocation sequences recorded for this project was 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 (Jung et al. 1999, Henderson and Broders 2008), 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 (Miller and Treat 1993, Broders et al. 2004). There were no echolocation sequences that were attributable to the tri-colored bat, which was expected as this species is only locally abundant in southwest Nova Scotia and the proposed development is outside of the known provincial distribution for this species (Farrow and Broders 2011).

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 2005b). 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 Johnson 2005b, Jain et al. 2007, Arnett et al. 2008a). 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.

The low number of call sequences attributed to the hoary bat, a long-distance migratory bat species, suggests that there are no large populations or migratory movements of these species at the study area. This fits with our current knowledge of their status in the province, but they do occur regularly but in low frequency although are especially vulnerable to wind facilities. This species is a solitary, tree-roosting species with an extensive distributional range throughout North American (van Zyll de Jong 1985). This species, in addition to red and silver-haired bats, 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. Any mortality of this species would be significant to Nova Scotia given there low numbers in the region. 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 (Johnson 2005b, Cryan and Brown 2007, Arnett et al. 2008a), 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 (Barclay et al. 2007, Arnett et al. 2008a).

The low number of bat call sequences recorded at the abandoned mine openings suggest they are not major hibernacula. However, given the impacts of WNS such low levels of activity are not unsurprising, even if the sites were important hibernacula. Although this activity is generally low and would not qualify for the criteria set out by Randall (2011) for designating swarming sites, this current work was carried out post-white nose syndrome which almost certainly reduced the overall magnitude of bat activity recorded. Further, Randall's work was carried out directly at the entrances of underground sites where activity is highest as the animals interact, whereas the detector at Smithfield was placed on a forest edge near presumed entrances and therefore activity may be lower since it is not directly at the swarming site entrance. Despite this, the activity at the Brookfield and Kemptown AMO's suggest that they are not currently major autumn swarming sites for bats. The Smithfield AMO had the highest level of bat activity recorded of all three study areas sampled in this study and the seasonal trend of increasing activity fits the pattern of increased activity at swarming sites in the period of the end of August and early September that begins to decrease around the middle of September (Burns unpublished data; Tutty 2006). These data are more suggestive of the site being a swarming site and may also potentially be a hibernaculum. Alternatively, this site may not represent a swarming site but may be situated along a migration corridor for bats to other travel among swarming sites which may explain the trend in bat activity following the patterns known for the autumn swarming season. Further work would be required to assess the importance of this site as an autumn swarming site, migration corridor or over-wintering site (hibernaculum).

Recommendations

1. *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.

2. *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.

3. *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.

4. *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.

5. *Develop an operations fatality mitigation plan* – Recent experimental case studies in Alberta and the United States have demonstrated dramatic reductions in bat fatalities at operational wind energy facilities can be made by changing operational parameters during the peak fatality period (Baerwald et al. 2009, Arnett et al. 2010). These include changes to when turbine rotors begin turning in low winds via alterations to wind-speed triggers and blade angles to lower rotor speed. These studies have found decreases in bat mortalities ranging from 44% to as high as 93% reductions on a nightly basis at relatively low cost to annual power production loss, at approximately ≤ 1%. This plan should be adaptive as operations continue through time and be in place prior to operations commencing such that if any bat mortalities be observed at the site once operational, the plan can be implemented immediately.

6. *Remain up to date with current research* –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.

Recommendations will be adhered to as directed through DNR and CWS.

Due to limited knowledge of what numbers of bats exist in and migrate through or within Nova Scotia, and the inability to be able to predict impact with existing site specific data, the results of this survey will be used as a baseline pre-construction study for comparison to post-construction monitoring and possible future monitoring from the towers when more is known about the migration and its significance to the overall population of the three species of bats in Nova Scotia which are currently under special status as endangered (*i.e.,* the Motus Project). Dr. Broders also undertook the same study at the Proponent's Greenfield proposal which is located 10km away and, in 2007 a study completed for Dalhousie was done 14km from the Kemptown site. The results of these studies may also play a role in the bigger picture. No known bat hibernaculum is located within 5 km of the Study Area, based on the Nova Scotia Abandoned Mines and Shafts Database.

The assessment of risk based on landscape level and site specific features attributed to elevated risk levels for bat mortality found that there are no important risk factors evident within the proposed Project Study Area. Features considered to have potential for elevated risk to bats such as known hibernacula or potential caves or mines; coastline, major water bodies, and wetlands; or forested ridge habitat are absent. The Project Study Area is at, or beyond the northern range limits for migratory species and while it cannot be ruled out, high rates of mortality of the locally common *Myotis* species is not anticipated.

Post-construction fatality monitoring will be conducted at the site for at least one season, including the fall migration period from mid-August to late September. The duration of the monitoring could depend on levels of mortality found in the first season. In the event that mortality is high at the site, operational mitigation can be employed to reduce mortality which may include changes to cut-in wind speeds, feathering of blade under certain wind speeds, or shut-downs during high activity periods. The Ontario Ministry of Natural Resources (OMNR) (2010) recommends a threshold of 10 bat deaths/turbine/year after-which mitigation should be implemented to reduce mortality through operational mitigation. There are currently no guidelines in Nova Scotia for monitoring bat populations, in part due to the lack of good baseline data. In the absence of these guidelines, post-construction monitoring protocols and mitigation measures, should monitoring in the first year of operations deem them necessary, will be developed in consultation with NSDNR. Monitoring will include fall bat mortality surveys to be conducted at a frequency to be determined though consultation with regulators.

In recent (July 2014) discussions with the NSDNR Species at Risk Biologist, it was brought up that there are current studies and projects taking place that could be part of Affinity's projects, Kemptown inclusive. These new studies could include the placement of radar and VHF transmitters using nano-tags to detect migration of species as described previously regarding the Motus Study. Although currently the coordinated programming is not in place, the ultimate

goal for Affinity's participation in the Motus Study is that any detection of migrating bird or bat species would be relayed to wind projects in the path and a shut down would ensue until the migration had passed. This plan would require the cooperation of academia and developers to create a planned work practice. It is anticipated that such a project would greatly reduce the risk of migrating species colliding with moving wind turbines and ultimately mitigate the fatalities of migrating bat (and bird) species.

As discussed above, the Proponent is committed to monitoring the Project during operations to identify if a bat population is using the area, if any mortality is occurring, and will be prepared to adopt post-construction mitigation measures, including that suggested above, should there be a need. At this stage, the level of impact is considered **low** and **not significant**. These surveys are discussed further in Section 7.0.

6.2.1.3 Land Use

As indicated in Section 5.3 of this report, the land required for Project development is privately owned land which has historically been subjected to forestry activities. The Project Study Area does not support vegetation types including wetlands or streams but does contain disturbed areas such as roads, wood storage and borrow pits. The effect of wind turbines on undeveloped lands within the Project Study Area is negligible with only a minor portion of land use required to house turbines and their ancillary equipment. Land use impacts associated with construction and operation of the Project will be negligible since it will not impair or impact current land uses, change land use patterns, or be incompatible with existing uses. The residual impact to existing land use is considered to be **minimal** and **not significant**.

6.2.1.4 Property Values

Prior to 2003, there was a general lack of empirical data assessing the impact of wind energy facilities on the economic value of properties whether within a wind farm or within sight of a wind farm. However, Sterzinger *et al.* (2003) undertook such a study, statistically testing whether the perception that property values are negatively affected by wind farms is true or false. For their study, Sterzinger *et al.* (2003) compiled data on every U.S. wind energy development commissioned between 1998 and 2001 that was of a capacity of 10 MW or greater. Property sales records for the area within 5 miles (8 km) of the wind farm were collected for the three years prior to commissioning and the three years following commissioning, to determine if there was a difference between pre-construction and post-construction property sales. For comparison, sales records were also collected for the same time period from communities comparable to that included for each wind farm. A total of 10 wind power projects were analysed, including two projects from New York, two projects in Pennsylvania and one project in Vermont (Sterzinger *et al.* 2003).

Overall, property values increased with the same rate in wind farm communities within 8 km of a wind farm compared to similar communities without wind farms (Sterzinger *et al.* 2003). Nine of the ten projects showed a greater increase in property values after commissioning compared to

the period prior to commissioning, and when looking at the rate of increase in property values after commissioning of the wind farm, communities near a wind farm actually had greater increases to property values than those without a nearby wind farm (Sterzinger *et al.* 2003). These findings indicate that there is no support for the notion that the development of wind farms decreases property values.

In 2010, a study was undertaken for the Municipality of Chatham-Kent, Ontario. The purpose was to execute a market-based empirical study into the effects of wind turbines on local residential real estate values (Canning and Simmons, 2010). They selected a study area with the following attributes: there had been a sufficient volume of sales of similar properties in the same general area but not in proximity to a wind farm following its completion; there had been sufficient volume of sales of similar properties in the same general area but not in proximity to a wind farm (beyond the viewshed); and, there was sufficient access to registry office sales records, and local area real estate board listing information (Canning and Simmons, 2010). Data was analyzed to determine the effect on real estate values as a result of proximity to wind turbines. Specifically they compared properties within the viewshed and those not within the viewshed of wind turbines. Concerns expressed by those near proposed or existing wind farms were aesthetics, shadow flicker and sound (audible and low frequency) (Canning and Simmons).

In Chatham-Kent, there are over 700 wind turbines (Municipal Website 2011).

The conclusion of the study was there was no statistical inference to demonstrate that wind farms negatively affect rural residential market values in Chatham-Kent. Furthermore, this study did not find any consistent evidence from the analyzed data that such a negative correlation exists in the Municipality of Chatham-Kent. During the course of gathering data, there were no unusual quantities of rural residential properties listed for sale in the study area. Four unrelated data processes were used in studying the property sales information for Chatham-Kent. The only consistency was that each evaluation methodology found that it was highly unlikely that any type of a causal relationship exists between wind farms and the market values of rural residential real estate (Canning and Simmons).

It also summarizes that where wind farms were clearly visible, there was no empirical data to indicate that rural residential properties realized lower sale prices than similar residential properties within the same area that were outside of the viewshed of a wind turbine (Canning and Simmons).

The U.S. Department of Energy, Washington, D.C. investigated the possible relationship between proximity to wind facilities and property values in 2009. Research was collected on almost 7,500 sales of single family homes situated within 10 miles of 24 existing wind facilities in nine different U.S. states. The conclusions of the study are drawn from eight different hedonic pricing models, as well as both repeat sales and sales volume models. The various analyses are strongly consistent in that none of the models uncovers conclusive evidence of the existence of any widespread property value impacts that might be present in communities

surrounding wind energy facilities. Specifically, neither the view of the wind facilities nor the distance of the home to those facilities is found to have any consistent, measurable, and statistically significant effect on home sales prices. Although the analysis cannot dismiss the possibility that individual homes or small numbers of homes have been or could be negatively impacted, it finds that if these impacts do exist, they are either too small and/or too infrequent to result in any widespread, statistically observable impact. (Hoen, *et. al.* 2009)

Previous to the above mentioned studies, the assessment of the potential impact of wind farms on property values was conducted by ECO Northwest (2002). For this assessment, interviews were conducted with tax assessors from 13 counties in the United States for which wind farms had been developed during the previous 10 years. Based on these interviews with unbiased and trained assessors of property values, ECO Northwest (2002) concluded that there is no loss of value for those residential properties with views of wind turbines (*i.e.,* views of wind turbines do not negatively impact property values).

A report conducted by the Renewable Energy Policy Project (REPP 2003) concluded that, based on a study of nine different communities from across the United States, property values of homes within a wind farm's viewshed were not harmed by the construction and operation of the wind energy facility. To the contrary, for the majority of the projects analyzed, property values actually rose more quickly in the viewshed than in comparable communities outside of the viewshed (REPP 2003). Furthermore, statistical evidence does not support the idea that property values within the viewshed of wind farms suffer or perform poorer than in comparable regions (REPP 2003). This statistical analysis is supported by a literature review conducted as part of the REPP (2003) study.

The Environmental Review Report for the Wolfe Island Wind Project near Kingston, Ontario (CREC 2007) also includes a comprehensive review of literature on property value studies conducted in Australia, Denmark, United Kingdom, the United States, and Canada. These studies consistently reported a neutral or positive effect on property values (CREC 2007).

At the Proponent's existing 34 turbine Dalhousie Mountain Wind Farm in Pictou County, there have been a minimum of 10 new homes built within 5km since the construction of the wind farm in 2009. At the time of the writing of this EA, at least two homes were under construction at 2km and 3km from the closest turbines. The 34 turbines at Dalhousie are the same make, model and size as the 3 planned for Kemptown.

At Fitzpatrick's Mountain in Pictou County, there are two 800 kW Enercon wind turbines operating. They were constructed prior to municipal bylaws being implemented which resulted in houses being 200m, 300m, 400m, 500m, 550m, etc. Since operations began, three houses within 800m have been sold at or above values the houses were originally purchased for. Four new homes have been built in the last several years within 1300m of the turbines. A half-million dollar home was constructed less than 2km from this (and close to Dalhousie) in 2009 and in 2014 was sold at market value. One family, located 1.3km from the turbines have completely restored their century home to be valued at at least double what it was in 2008. The setting at

Fitzpatrick's Mountain is much like the setting for the Kemptown Project where the turbines are located at the height of land with rural communities and mixed land usage around the area. The turbines have been operational since 2005 and 2006.

As discussed in Section 5.6.5, at the existing Dalhousie facility, property values have not been affected. If property has turbine on it, the value is greatly increased as there is an added guaranteed income associated with the property. Dalhousie is over 1500m from the nearest house, and all of the local homeowners have no issues or concerns with the project.

The Kemptown Project is situated between a large quarry operation and the municipal dump with recreational camp use to the west and sparsley populated rural residential use to the east.

Located 14km west of Dalhousie, the proposed Kemptown Project is also in a rural setting, and is surrounded by a mix of forested and agricultural lands and residential properties. The Project has the potential to represent a long-term land use, which may have the effect of promoting some stability in land values. It is predicted that residual impacts on property values as a result of the Project are likely to be **minimal** and **not significant**.

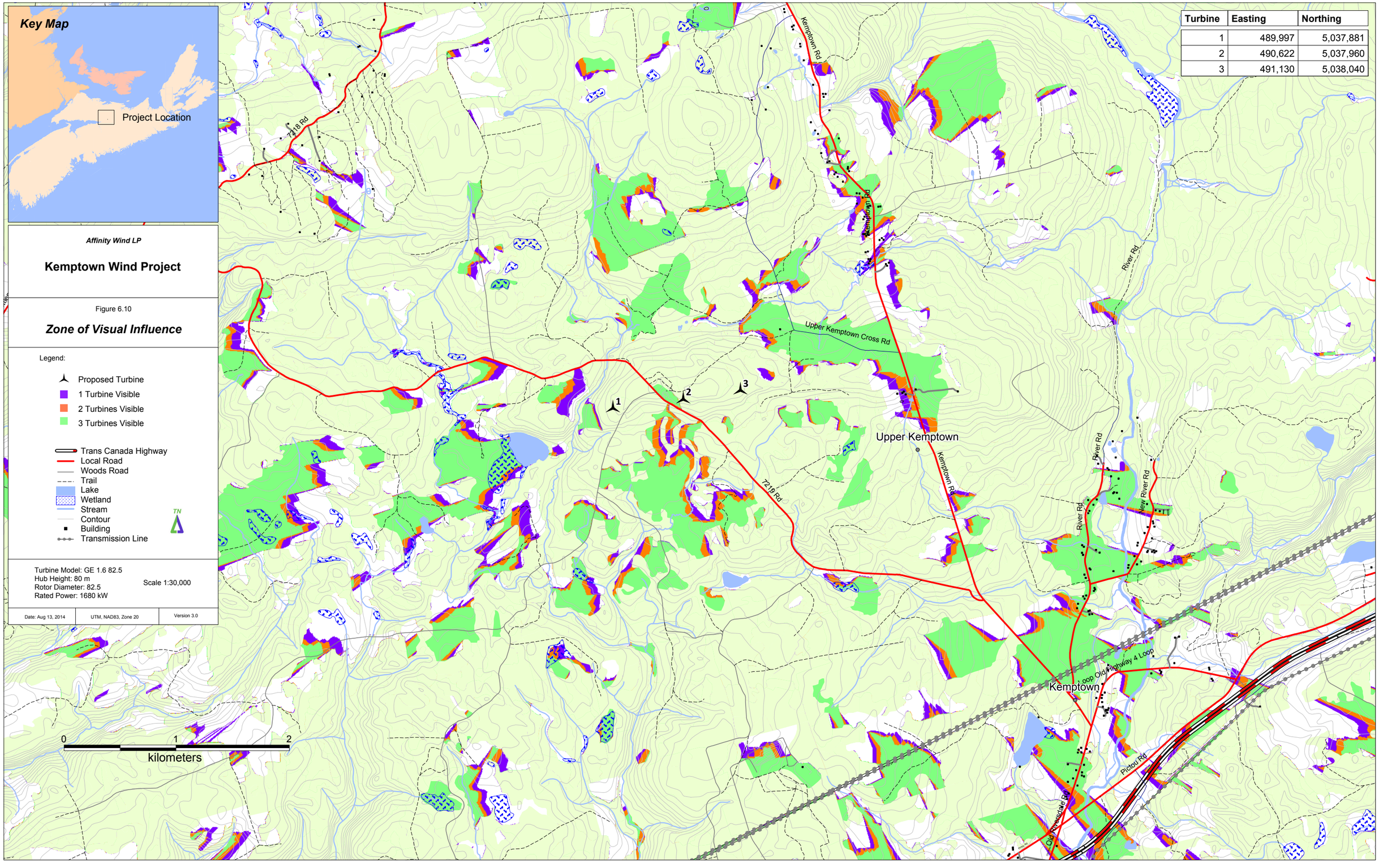
6.2.1.5 Visual Impacts

Due to the importance of assessing the potential impact to the area's visual aesthetics, a visual impact assessment was completed. The following section summarizes the visual assessment with respect to the visual influence mapping and shadow flicker analysis that were conducted.

Viewshed

A photo montage is a photograph taken in the field from a specific location with the proposed wind farm turbines superimposed to scale. It is a graphical representation of what the constructed turbines could potentially look like upon completion from a particular vantage point. Photomontages were not performed for the Kemptown revised locations. Based on discussions and comments from those living nearby Affinity's COMFIT projects, the photo montage is not a useful tool to determine what the end result of the Project will look like. The reasoning behind this is that each person/stakeholder would like for the photomontage to be taken from their own personal vantage point (e.g. kitchen window, deck or patio of home). In 2014, there are now numerous wind turbines placed throughout Nova Scotia so that it is well understood what they look like on the landscape. Running photo montages for specific locations aimed at sparsely populated areas can only show what the general public will see as their viewshed in passing by. Specific visual influence on the local population is achieved through the Zone of Visual Influence (ZVI) mapping.

The ZVI map is below as Figure 6.10. It is a color coded representation of the number of turbines visible at any given location. The model assumes no tree cover and that the receptor is at 3 metres (second story).


Key Map
Project Location
Affinity Wind LP
Kemptown Wind Project
Figure 6.10
Zone of Visual Influence
Legend:
Proposed Turbine
1 Turbine Visible
2 Turbines Visible
3 Turbines Visible
Trans Canada Highway
Local Road
Woods Road
Trail
Lake
Wetland
Stream
Contour
Building
Transmission Line
TN
Turbine Model: GE 1.6 82.5
Hub Height: 80 m
Rotor Diameter: 82.5
Rated Power: 1680 kW
Scale 1:30,000
Date: Aug 13, 2014
UTM, NAD83, Zone 20
Version 3.0
Turbine | Easting | Northing
1 | 489,997 | 5,037,881
2 | 490,622 | 5,037,960
3 | 491,130 | 5,038,040
Kemptown Rd
7218 Rd
Upper Kemptown Cross Rd
River Rd
Upper Kemptown
New River Rd
Loop Old Highway 4 Loop
Kemptown
Pictou Rd
Old Riverdale Rd
0
1
2
kilometers

Given that the viewing distance is greater than 1400m from the nearest house, combined with vegetation and terrain, the presence of these towers will not place excessive visual pollution on the residents near the Study Area.

The turbines are designed to rotate and be oriented facing the prevailing wind direction at any given time. The towers themselves will be light grey and constructed of rolled steel. The nacelle at the top of the tower, which contains the generator, is fiberglass and will also be light grey. The base of the tower is approximately 4.6 m across, while the height of the turbine towers will be approximately 80 m, with rotor blades that are approximately 41.25 m long.

Lighting

The wind turbine generators will be lit to meet the requirements of Transport Canada's Canadian Aviation Regulations (CAR) 621.19. Lighting will be the minimum required to ensure the appropriate level of aeronautic safety and red lights (CL-865) may be used with the minimum intensity and flashes per minute allowable.

The viewing distances from the locations analyzed in this report indicate that all of the residences within the Project Study Area will be greater than 1400m from the nearest wind turbine. Given the viewing distance of greater than 1400m combined with vegetation and terrain, the presence of these lit towers will not place excessive nighttime visual pollution in the Study Area.

6.2.1.6 Shadow Flicker

Shadow flicker caused by wind turbines is defined as alternating changes in light intensity due to the moving blade shadows cast on the ground and objects (including through windows of residences). At close proximity it has the potential to cause health concerns resulting from repeated exposures.

The effects of shadow flicker are more prevalent when the sun is low in the sky at either sunrise or sunset. Therefore it is also more likely to occur during the summer and winter solstices (June 21 and December 21) than during the spring and fall equinoxes (March 21 and Sept 21) when the sun is higher in the sky.

The shadow flicker frequency is related to both the rotor speed and the number of blades on the rotor. In this report shadow flicker was modeled based on the GE 1.6 MW 3 blade wind turbine that has a rotor diameter of 82.5 m and a hub height of 80 m. Most importantly, the distance between a receptor and a wind turbine will determine whether or not the receptor will be subject to shadow flicker (*i.e.,* less than 500 metres).

The modeling software that Nortek used in this analysis is produced by EMD International (Denmark) and is part of the WindPro 2.8.579 suite of modeling software. The following inputs were used by the software to predict shadow flicker:

- Turbine locations;

- Receptor locations (residences and buildings within the model's analysis extent);
- Topographic elevation within analysis extent (5 m linear contours);
- Turbine details (Rotor diameter and hub height); and
- A 1 x 1 m receptor window is used, with the bottom edge 1 m above ground.

The sun's path calculated from the turbine was predicted based on geographic position of the Project. It should be noted that the model intentionally over predicts shadow flicker effects. The results represents "worse case" scenarios regardless of natural minimizing effects that may occur. These minimizing effects include:

- The reduction of the effects of shadow flicker due to overcast weather (the model assumes that the sun is shining during all daylight hours);
- Wind direction may cause the rotor to rotate parallel to receptor, casting no shadow on that receptor (the model assumes that the wind always comes for the same direction as the sun);
- Natural obstacles (trees, buildings, terrain, etc.) occurring between the rotor and the receptor which would block the effects of shadow flicker on that receptor (the model assumes that no such objects exist within the analysis extent area); and
- The model presumes that all turbines are operating continually during daylight hours.

The province of Nova Scotia has no set regulatory limits for exposure to shadow flicker. However the industry commonly uses a combination of 30 hours per year and 30 minutes per day as a limit to reduce nuisance complaints. Calculations of shadow flicker for all nearby residences, given a worst-case scenario as described above, determined that no receptors could experience shadow flicker for up to 30 hours per year or up to 30 minutes per day (Figure 6.15 and 6.16). Shadow flicker modeling was conducted for three turbines. Based on a site visit to the receptors following modeling results, it is believed that the model has overestimated visual exposure of the turbines to the receptors. Nevertheless, if shadow flicker becomes an issue (>30 hours/year) the Proponent has agreed to implement mitigation which may include shutdown of applicable turbines during times and conditions where shadow flicker may peak.

In summary, considering the "worst-case scenario" model, actual conditions are extremely unlikely to exceed recommended shadow flicker limits. The shadow flicker from turbine blades will only extend as far as the sun and angles will allow. The model demonstrates that it will not be possible to experience shadow flicker at homes in the project surroundings.

A registry will be created to document complaints of possible shadow flicker. If a complaint or complaints of shadow flicker are received from a receptor, shadow flicker will be reassessed from that receptor. Information collected from the shadow flicker monitoring (if applicable) will be used will be used to develop further mitigation.

No mitigation measures are required for the residential receptors evaluated for the visual impact assessment. The residual effect of the Project on the area's visual aesthetics is considered to be **low** but **not significant**.

6.2.1.7 Sound Impacts

Noise can be simply defined as "unwanted sound". Sound level limits are identified on an A-weighted decibel scale (abbreviated as dBA), which is generally accepted to reflect how humans perceive sound. Conversation in close quarters is usually at a sound level of 50 to 60 dBA and an alarm clock may emit sound to levels of approximately 80 dBA. Currently, the province of Nova Scotia does not have set sound level limits specific to wind turbine operations however Nova Scotia Environment considers anything above 40 dBA to be unacceptable. The municipality of Colchester revised their wind turbine bylaw in October 2013 to include a stipulation of sound not exceeding 36 dBA outside of a residence. This guidance was considered during the development of a sound impact assessment for the Kemptown Project, completed by AL-PRO Wind Energy Consulting Canada Inc. (see Appendix D).

Wind turbine generators produce sound through a number of different mechanisms which can be categorized into mechanical and aerodynamic sound sources. The major mechanical components, including the gearbox, generator and yaw motors, each produce their own characteristic sounds, including sound with tonal components. Other mechanical systems such as fans and hydraulic motors can also contribute to the overall sound emissions. Mechanical sound is radiated at the surfaces of the turbine, and by openings in the nacelle casing. Mechanical issues involving yaw motor supports or power train design can result in anomalous sounds such as periodic booming or tonal sounds.

The interaction of air and the turbine blades produces aerodynamic sound through a variety of processes as air passes over and past the blades. The sound produced by air interacting with the turbine blades tends to be broadband sound, but its amplitude is modulated as the blades pass the tower, resulting in a characteristic 'swoosh'. Generally, wind turbines radiate more sound as the wind speed increases.

The predicted sound levels resulting from the proposed Project are an accurate representation of the potential sound levels at the selected receptor locations. Sound modelling was conducted using Wind Pro 2.9.269 which includes the calculation methodology of the International Organization for Standardization (ISO) *Standard 9613-2 – Attenuation of Sound during Propagation Outdoors Part 2*. This international standard provides a conservative estimate of sound propagation and subsequent environmental attenuation as a result of ground porosity, atmospheric attenuation and geometric spreading. Local terrain was considered in modelling. Sound power level data provided by the manufacturer were used to model operational sound at the selected receptors.

The study results presented in Appendix D show that the predicted sound levels at the receptor locations are below the guidance adopted for this Project (36 dBA) (Figure 6.7). It is not

expected that the Project will have a significant impact, with respect to sound, on nearby receptors.

Ground attenuation is considered and uses the alternative case described in the ISO-9613-2 standard. This method uses the surface shape of the terrain to determine the sound dampening characteristic between the turbine hub and the receiver. The terrain is considered to be a bare earth model with no forest, vegetation or buildings. The terrain model was developed from 5 m contour data obtained from the Nova Scotia Geomatics Center and originated from stereo interpretation of 1:10,000 aerial photography.

The A-weighted sound pressure levels are modeled and represent the range of frequencies that are audible to the human ear. Noise emission data were obtained from the turbine manufacturer specifications and are based on calculated sound pressure levels for a variety of wind speeds (Table 6.11). The octave band spectra is also presented in Table 6.12. Figure 6.7: Sound Power Levels for the GE 1.6- 82.5 Turbine with an 80 m Hub Height.

Table 6.11 Sound Pressure Levels for Various Wind Speeds for GE 1.6-82.5m Turbine

Wind Speed at 10 m Height (m/s)	1.6-82.5 m rotor diameter Lwa (dB)
3	<96
4	<98
5	<102
6	< 104
7 – cut out	<=106

Table 6.12: Octave Band Spectra for the GE 1.6- 82.5 Turbine with an 80 m Hub Height

Octave (Hz)	Sound power level (dB)
63	84.8
125	93.6
250	99.2
500	100.8
1000	100.1
2000	97.3
4000	89.1
80000	86.2
Sum	106

Table 6.13 summarizes the turbine specific and relevant input parameters that were used as

inputs to the model. An uncertainty of +/- 3 dB is referenced in the ISO 9613-2:1996 standard for situations in which there are effects due to reflections or screening are not considered. This is the case in this analysis and therefore the model was run with a turbine sound power level of 106 + 3 = 109 dBA to provide a very conservative estimate of expected sound pressure levels at receptors. Figure 6.7 shows the results of this sound modeling.

Table 6.13: Turbine Specifications Used for Sound Modeling.

Description	Specification
Manufacturer	General Electric
Model	GE 1.6, 82.5
Hub Height	80 m
Rotor Diameter	82.5 m
Rated Power Output	1,600 kW
Maximum Sound Level (nacelle)	106.0 dBA
Modeled Sound Power Level	109.0 dBA

A conservative and standardized approach has been incorporated into the analysis which is based on modeling the representative sound levels at the speeds of 7.0 m/s at a height of 10m. This coincides with a mean wind speed of 9 m/s or greater at hub height. The sound pressure levels where calculated and mapped to determine the impacts of the turbines on surrounding receptors. The threshold levels are currently used by the Ontario Ministry of the Environment and specified in *"Noise Guidelines for Wind Farms – Interpretation for Applying MOE NPC Publications to Wind Power Generation Facilities, October 2008"* and are summarized in Table 6.14

T**able 6.14: Sound Level Thresholds for Wind Turbines for Class 3 Areas (Rural)**

Wind Speed (m/s) at 10 m height	Sound Level Limits (dBA)
4	40
5	40
6	40
7	43
8	45
9	49
10	51

The results presented in Figure 6.7 show that the sound pressure threshold levels for the range of wind speeds analyzed meet the current MOE standards. All existing buildings mapped on the current Nova Scotia Topographical database located with 2.0 km of the proposed wind farm were modeled to determine the estimated sound impacts from the wind farm. In this case, two scenarios were run, one with the turbine sound power level of 106 dBA, and another at 109 dBA to account for uncertainty. The results area presented in Table 6.15 and the recprtors are mapped in Figure 6.7.1.

All existing buildings on adjacent properties within 2.0 km of the proposed wind farm are shown to have sound levels below the threshold limits shown in Table 6.14. In addition to this, the sound modeling includes the 36 dBA threshold imposed by the Municipality of Colchester. All buildings within 2.0 km of the proposed wind farm have expected sound levels below the threshold limit of 36 dBA.

The nearest receptor (outside of Project properties) is no closer than 1,392m from the nearest turbine. In addition, routine maintenance of the wind turbines and associated equipment will be conducted as recommended by the manufacturer to ensure the turbines operate efficiently and do not produce additional noise.

Table 6.15 Sound Pressure Levels at Receptors within 2km of Kemptown Wind Project

ID	Elev (m)	Easting (m)*	Northing (m)*	106 dBA	106+3 dBA	Closest Turbine (m)
1	225	492164	5039708	26.6	29.6	1962
2	213	492218	5039437	27.6	30.6	1771
3	221	492221	5039568	27	30	1878
4	227	492231	5039590	26.9	29.9	1901
5	213	492235	5039435	27.5	30.5	1780
6	207	492240	5039275	28.2	31.2	1661
7	210	492247	5039420	27.5	30.5	1775
8	214	492257	5039432	27.5	30.5	1785
9	204	492260	5039282	28	31	1679
10	221	492262	5039678	26.4	29.4	1991
11	215	492266	5039459	27.3	30.3	1818
12	198	492266	5039214	28.3	31.3	1634
13	198	492269	5039177	28.4	31.4	1609
14	210	492269	5039428	27.4	30.4	1796
15	202	492280	5039196	28.3	31.3	1631
16	202	492284	5039214	28.2	31.2	1646
17	209	492365	5039383	27.1	30.1	1825
18	206	492385	5039401	27	30	1851
19	207	492400	5039388	27	29.9	1852
20	203	492422	5039170	27.7	30.7	1716

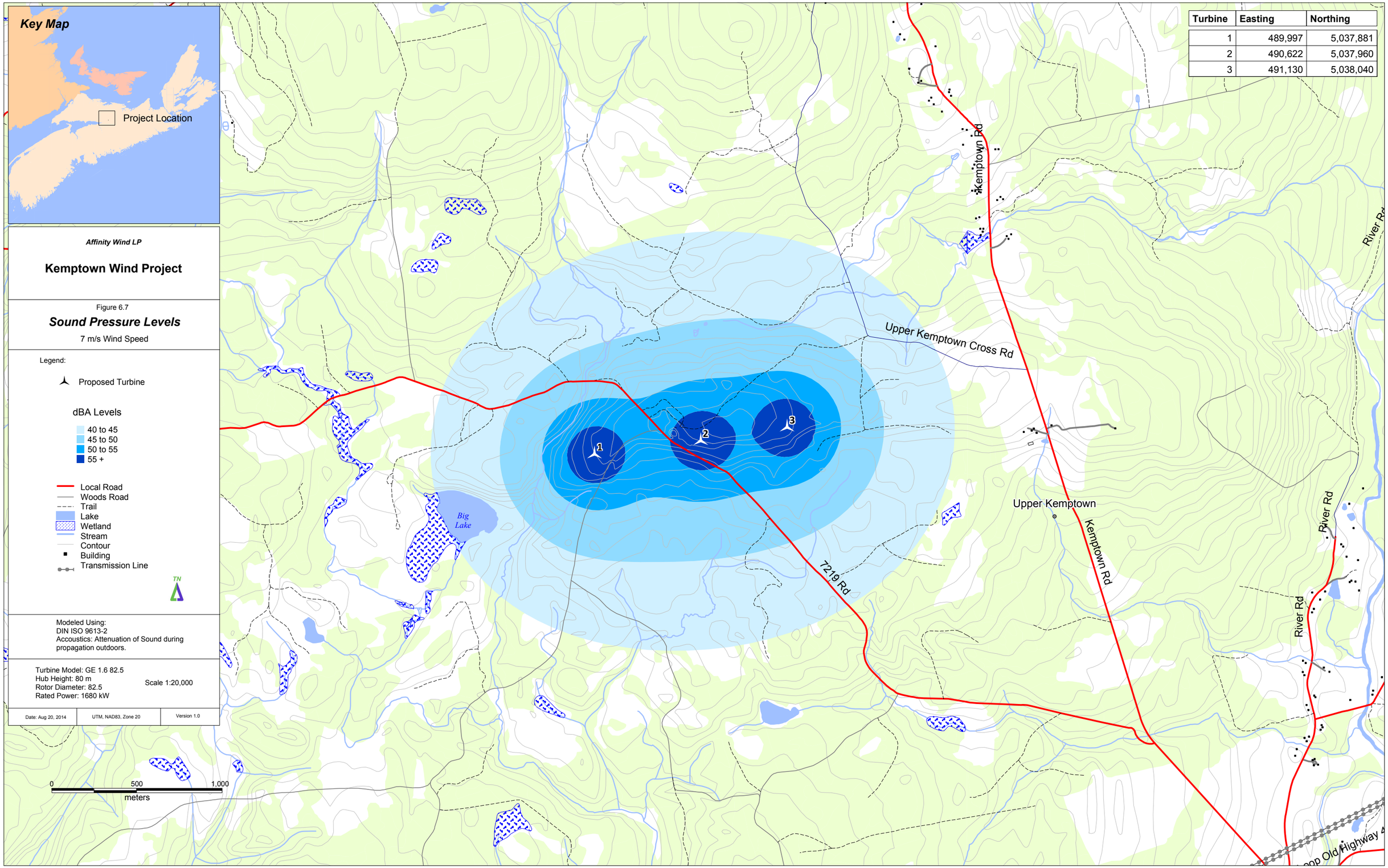
21	203	492432	5039154	27.7	30.7	1714
22	203	492447	5039181	27.5	30.5	1743
23	224	492522	5038018	29.9	32.8	1392
24	221	492568	5038026	29.5	32.5	1438
25	221	492581	5038037	29.4	32.4	1451
26	222	492597	5038013	29.2	32.2	1467
27	225	492685	5038057	28.6	31.6	1555
28	228	493060	5038039	26.3	29.3	1930

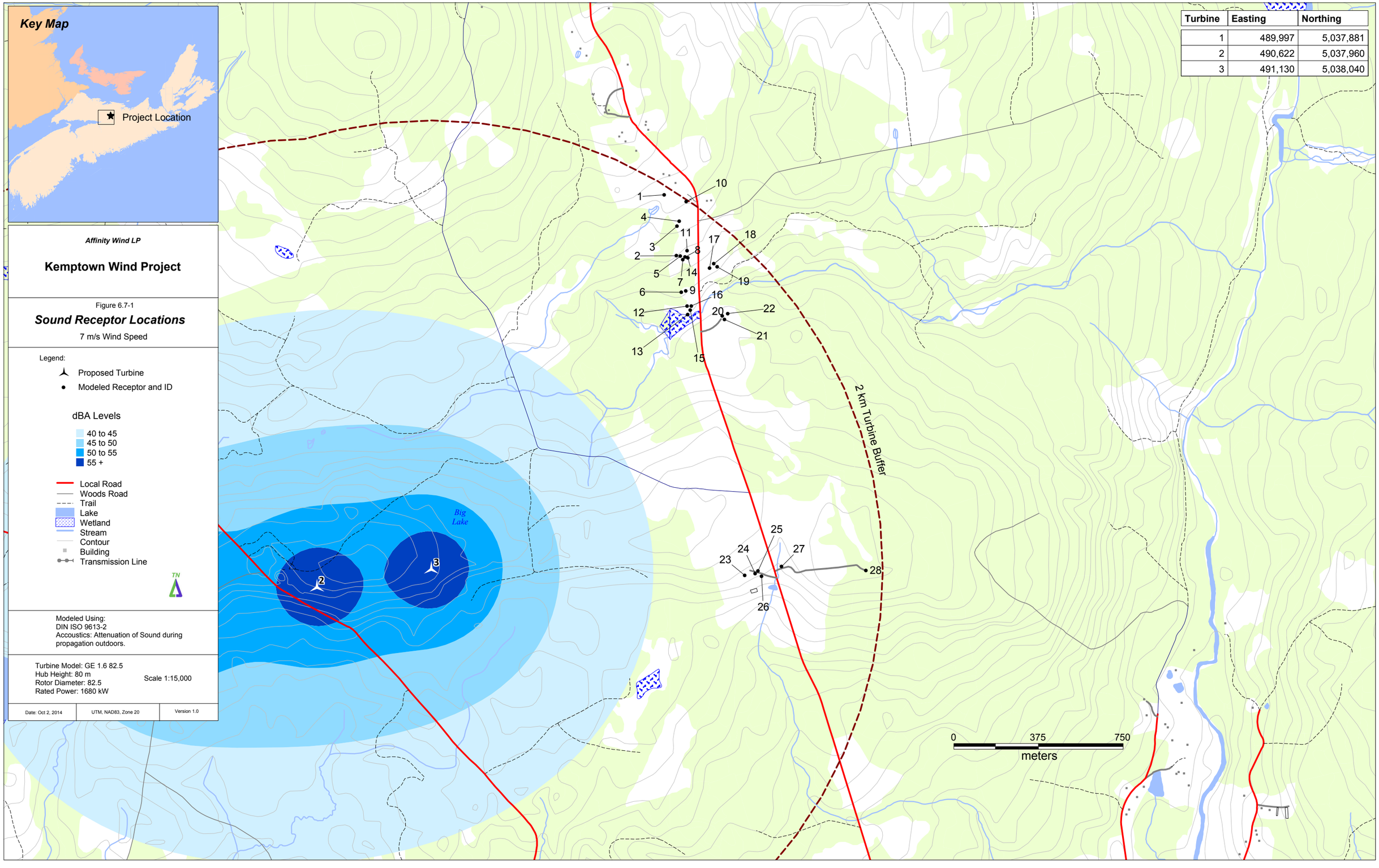
* Coordinate System: UTM, NAD83, Zone 20

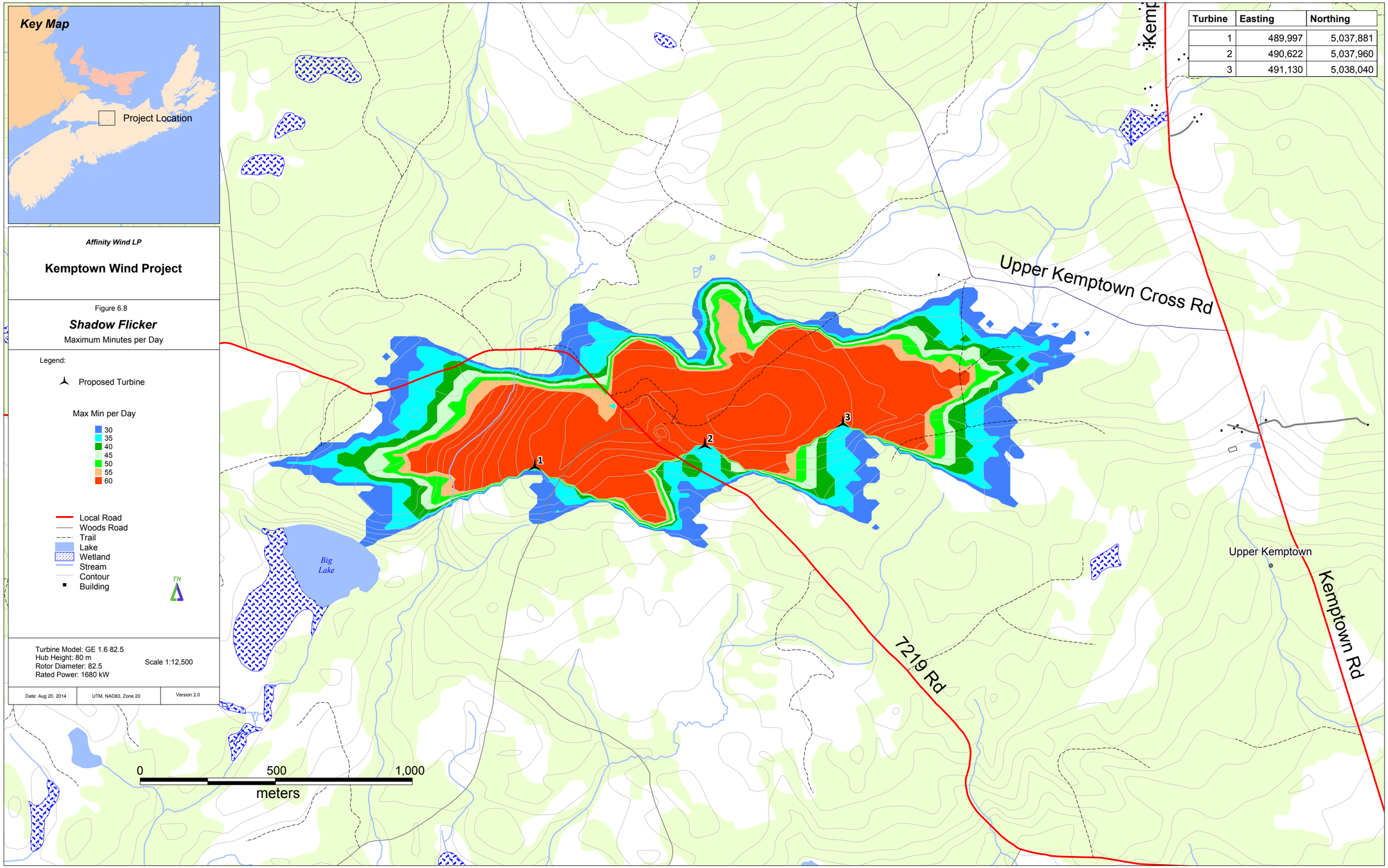
In response to noise complaints, if any occur, the Municipality of Colchester Wind Turbine Bylaw and the Proponent would measure ambient sound levels and wind speed at selected residential receptors. The sound and wind data will then be combined to produce a plot of background ambient sound pressure levels versus wind speed. If the ambient sound levels at any residential receptors are higher than permitted noise levels, a report shall be filed with NSE with the particulars of the concern, the suspected source, and any remedial actions taken or to be taken to resolve the concern. In addition to this, a contravention of enacted bylaw pursuant to Section 172 of the *Municipal Government Act,* SNS, 1998 is punishable pursuant to clause 10.3 in the 'Wind Turbine Development Bylaw.

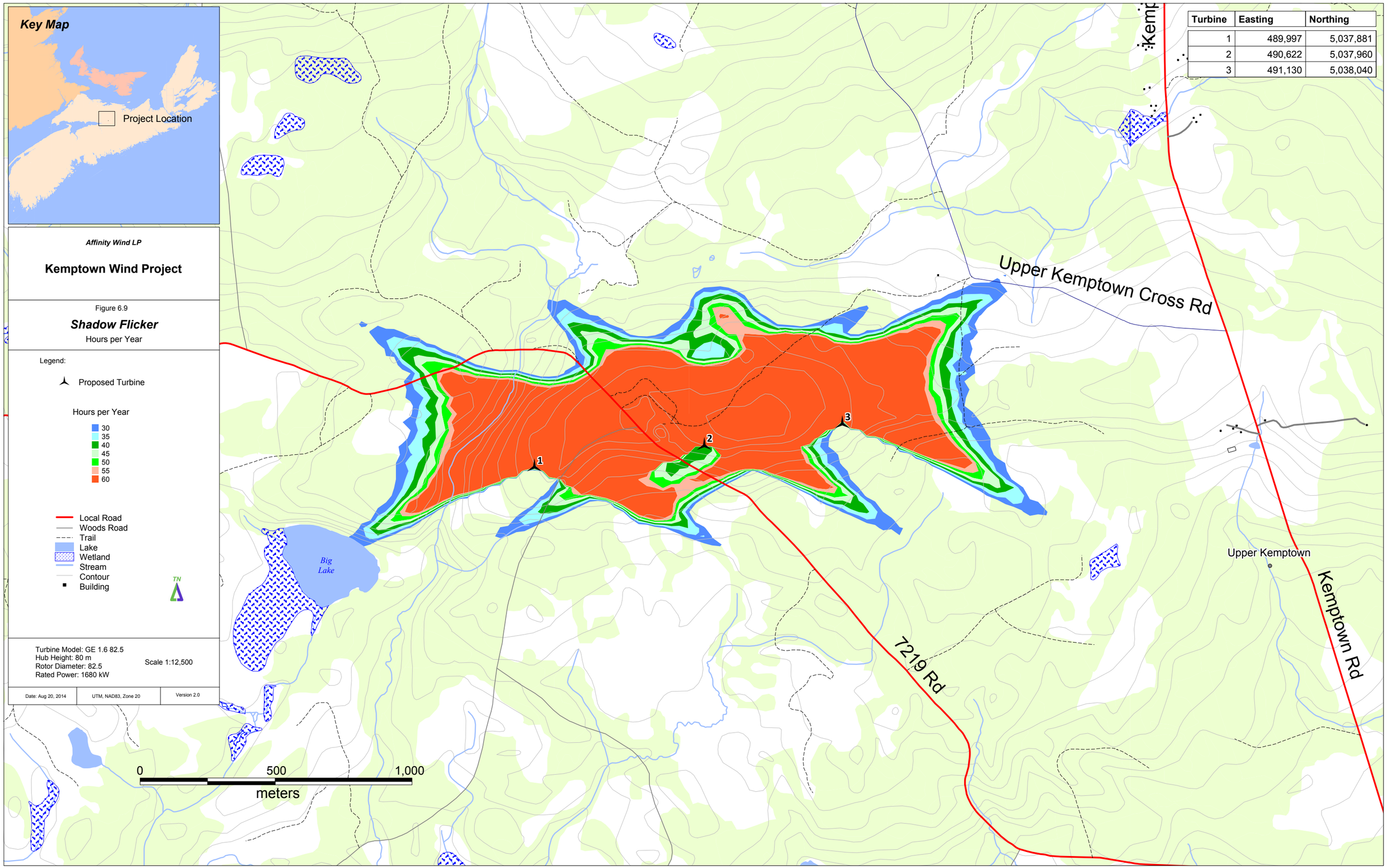
Up to date data for the GE 1.6 MW series 1.85m machine is used for the sound modelling, as well as assumptions that there is no tree cover/ obstructions. The loudest output on the 1.6 MW turbines occurs at 7.0 m/sec: this wind speed sound rating is used for the modelling.

Provided these mitigation measures are followed, the potential residual effect of the Project on noise is considered to be **not significant**.


Key Map
Project Location
Affinity Wind LP
Kemptown Wind Project
Figure 6.7
Sound Pressure Levels
7 m/s Wind Speed
Legend:
Proposed Turbine
dBA Levels
40 to 45
45 to 50
50 to 55
55 +
Local Road
Woods Road
Trail
Lake
Wetland
Stream
Contour
Building
Transmission Line
TN
Modeled Using:
DIN ISO 9613-2
Accoustics: Attenuation of Sound during propagation outdoors.
Turbine Model: GE 1.6 82.5
Hub Height: 80 m
Rotor Diameter: 82.5
Rated Power: 1680 kW
Scale 1:20,000
Date: Aug 20, 2014
UTM, NAD83, Zone 20
Version 1.0
0
500
1,000
meters
Turbine | Easting | Northing
1 | 489,997 | 5,037,881
2 | 490,622 | 5,037,960
3 | 491,130 | 5,038,040
Kemptown Rd
Upper Kemptown Cross Rd
River Rd
Big Lake
7219 Rd
Upper Kemptown
Kemptown Rd
River Rd
River Rd


Key Map
Project Location
Affinity Wind LP
Kemptown Wind Project
Figure 6.7-1
Sound Receptor Locations
7 m/s Wind Speed
Legend:
Proposed Turbine
Modeled Receptor and ID
dBA Levels
40 to 45
45 to 50
50 to 55
55 +
Local Road
Woods Road
Trail
Lake
Wetland
Stream
Contour
Building
Transmission Line
TN
Modeled Using:
DIN ISO 9613-2
Accoustics: Attenuation of Sound during propagation outdoors.
Turbine Model: GE 1.6 82.5
Hub Height: 80 m
Rotor Diameter: 82.5
Rated Power: 1680 kW
Scale 1:15,000
Date: Oct 2, 2014
UTM, NAD83, Zone 20
Version 1.0
Turbine | Easting | Northing
1 | 489,997 | 5,037,881
2 | 490,622 | 5,037,960
3 | 491,130 | 5,038,040
2 km Turbine Buffer
Big Lake
0
375
750
meters


Key Map
Project Location
Affinity Wind LP
Kemptown Wind Project
Figure 6.8
Shadow Flicker
Maximum Minutes per Day
Legend:
Proposed Turbine
Max Min per Day
30
35
40
45
50
55
60
Local Road
Woods Road
Trail
Lake
Wetland
Stream
Contour
Building
TN
Turbine Model: GE 1.6 82.5
Hub Height: 80 m
Rotor Diameter: 82.5
Rated Power: 1680 kW
Scale 1:12,500
Date: Aug 20, 2014
UTM, NAD83, Zone 20
Version 2.0
Turbine | Easting | Northing
1 | 489,997 | 5,037,881
2 | 490,622 | 5,037,960
3 | 491,130 | 5,038,040
Upper Kemptown Cross Rd
Big Lake
7219 Rd
Upper Kemptown
Kemptown Rd
0
500
1,000
meters


Key Map
Project Location
Affinity Wind LP
Kemptown Wind Project
Figure 6.9
Shadow Flicker
Hours per Year
Legend:
Proposed Turbine
Hours per Year
30
35
40
45
50
55
60
Local Road
Woods Road
Trail
Lake
Wetland
Stream
Contour
Building
TN
Turbine Model: GE 1.6 82.5
Hub Height: 80 m
Rotor Diameter: 82.5
Rated Power: 1680 kW
Scale 1:12,500
Date: Aug 20, 2014
UTM, NAD83, Zone 20
Version 2.0
Turbine | Easting | Northing
1 | 489,997 | 5,037,881
2 | 490,622 | 5,037,960
3 | 491,130 | 5,038,040
Upper Kemptown Cross Rd
Big Lake
7219 Rd
Upper Kemptown
Kemptown Rd
0
500
1,000
meters

6.2.1.8 Recreation and Tourism

As indicated in Section 5, the Project is located in rural industrial/ rural residential setting. The Kemptown Project is not anticipated to have any adverse effects on the tourism industry in the area. There is not any perceived tourism industry in the area.

Located approximately 6km to the west of the Project is Mountain Golf and Country Club. The turbines will not be visible from the majority of the course. Where they will be visible, only the top portion of the swept area will be visible.

The existing road entrance to the site is for equipment used by the landowner (forestry equipment). The landfill facility for the Municipality is located 1km east of the turbines and is therefore, a deterrent from establishing any potential tourism activity within close proximity of the Project. As well, three major transmission lines run north of the Project Area.

Visual and sound effects that could be experienced by tourists and recreational users in the area are discussed Sections 6.2.1.5 and 6.2.1.7, respectively.

The potential residual effect of the Project on recreation and tourism is considered to be **minimal** and **not significant**.

6.2.1.9 Health and Safety Issues

In recent years there has been considerable interest in potential health issues associated with the operation of wind farms. Public interest groups, government stakeholders, and industry have commissioned various studies to explore alleged health effects associated with a variety of issues, of which the most commonly discussed include turbine noise, shadow flicker, and electromagnetic fields (EMFs). Additional safety concerns include potential turbine blade and structural failure, and icing issues.

The debate over potential health issues has been waged in scientific, peer-reviewed studies published in scientific journals and popular literature and internet. Popular literature and internet sources are often based on anecdotal evidence, yet they are usually the most accessible sources to the general public. In many cases, this type of literature has been generated to support or oppose wind development. Knopper and Ollson (2011) reviewed both types of literature (peer-reviewed and popular) and found that both agree that wind turbines can be a source of annoyance for some people, although the difference between both types of literature is the reason for annoyance. In general, peer-reviewed literature finds that reported health effects are attributable to a number of environmental stressors that result in an annoyed/stressed state, but popular literature attributes reported health effects directly to turbine-specific variables like audible noise, infrasound or EMF (Knopper and Ollson 2011).

To address real and perceived health and safety issues, minimum setback distances and exposure levels have been established to reduce or avoid potential effects for people living in proximity to wind turbines. As referenced in Section 3.3, the Municipality of the County of

Colchester established wind development bylaws in 2009 with setback distances from residences of 700m. In 2013, the updated bylaw is now 1000m setback from residences. At a provincial level, there are no legislated setback distances although based on recent experience from the latest reviewed wind farms in the province and discussions with NSE staff, it would appear that the minimum setback distance should be in the range of 550 m and/or a received sound level 40 dBA. The Colchester municipal bylaw limits the sound level to 36 dBA outside at night, the provincial recommendation is exceeded and therefore, the Proponent will not exceed 36 dBA sound levels at any residence. See Appendix D – Sound Modeling Study and as discussed below, these setback distances should effectively address any potential concerns associated with health and safety issues associated with wind farm operations. It may be necessary to retain both minima to account for the fact that the setback distance itself does not prevent the situation where multiple turbines are at or near the setback, all contributing to the received sound level. The added criterion of sound level allows for this.

6.2.1.9.1 Sound (Audible, Low Frequency, and Infrasound)

Section 6.2.1.7 discusses the predicted sound levels from the operation of the three windmills.

Several studies have been undertaken to explore the possible relationship between proximity to wind turbines and health effects. A review of peer-reviewed literature indicates that some people living near wind turbines experience annoyance and that some people are also disturbed in their sleep by wind turbines. Scientific literature does not dispute that health effects may occur due to stress associated with annoyance and sleep deprivation and suggests that most anecdotal reports of health effects attributed to wind turbines are likely associated with these stressors.

In April 2012, Health Canada announced that it would be conducting an assessment of all available data to address complaints of health issues and their relation to exposure to wind turbine noise. The results of this research will support decision makers by contributing to the evidence base of peer-reviewed scientific research that ultimately supports decisions, advice and policies regarding wind power development proposals, installations and operations. *The data obtained will contribute to the global knowledge of the relationship between wind turbine noise and health. It is important to note that this research is being conducted to provide additional insight into an emerging issue; however, the results will not provide a definitive answer on their own* (Health Canada 2012). Health Canada goes on to state that *there is currently insufficient scientific evidence to conclude whether there is a relationship between exposure to wind turbine noise and harm to human health. However, the most rigorous studies available to date do not show a link between exposure to wind turbine noise and harm to human health. Health Canada continues to review emerging scientific evidence. Should new evidence become available that supports a direct link between wind turbine noise and adverse health effects, the Department will review the research and, if necessary, work with the responsible authorities to address these emerging concerns* (Health Canada, 2012).

The World Health Organization (WHO) Europe recommends a night-time noise guideline (not specifically for wind) of 40 dBA for the protection of public health from community noise (WHO 2009). According to WHO, this guideline is below the level at which effects on sleep and health occurs. This value of 40 dBA is considered to be the lowest observed adverse effect level for night noise based on expert evaluation of scientific evidence in Europe. This guideline is intended to protect the public including the most vulnerable groups such as children, the chronically ill and the elderly (WHO 2009). The United States Environmental Protection Agency (EPA) document titled Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety (1974) recommends that indoor-day-night-level (DNL) not exceed 45 dBA. DNL is a 24-hour average that gives 10 dB extra weight to sounds occurring between 10 pm and 7 am, assuming that during these sleep hours, levels above 35 dBA indoors may be disruptive. Based on the proposed setbacks and predicted noise modeling, there are no receptors who will be exposed to sound levels greater than 40 dBA (outdoor noise level). Indoor sound levels are about 10 to 20 dBA lower than those outdoor, depending on the structure of the home.

Various studies have explored the relationship amongst annoyance and wind turbine noise (Pederson and Persson Waye 2004, 2007, 2008; Pederson 2010). Knopper and Ollsen (2011) synopsize these studies into three key conclusions:

1. people tend to notice sound from wind turbines almost linearly with increasing sound pressure level;

2. a proportion of people that notice sound from wind turbine find it annoying; and

3. annoyance is not only related to wind turbine noise but also to subjective factors like attitude to visual impact, attitude to wind turbines and sensitivity to noise (refer to citations above for details on individual studies).

Recognizing that annoyance can result in a heightened sense of anxiety and potentially affect the physical, mental and social well-being of individuals, the mitigation to reduce potential effects is implemented to establish appropriate setback distances and sound level limits. Based on peer-reviewed literature, the limits proposed for this Project are considered appropriate mitigation.

The Proponent lives within 200m of a GE 1.5 MW turbine, with 33 others at various distances from the home. This has been the primary place of residence since March 2013. At no time has one of the family of 4 been unable to sleep due to noise, EMF, infrasound, vibrations or anything that could possibly be attributed to the wind turbines (*pers. Obs.). (*Figure 6.18)

Low frequency sound is generally defined as sound at a frequency of less than 200 Hz. Infrasound is considered to be sound frequencies below human's audible range (less than 20 Hz) and is usually measured in terms of dB or dBG instead of A-weighted decibels (dBA). The A-weighting network is commonly used to adjust sound levels to approximate the sensitivity of

human hearing whereas the G-weighting network was defined specifically by the International Standards Organization to deal with infrasound (HGC Engineering 2006). In the 1980s, low frequency sound was considered an associated problem with wind turbines. However, this has been attributed to earlier designs of turbines where turbine blades were placed downwind of the tower resulting in a sound output that generated high levels of energy in the infrasound range. Since then, turbine design has progressed, resulting in modern turbines with blades placed upwind of the tower, generally negating the problem (National Research Council 2007; Leventhall 2004). Research on low frequency sound and modern turbines confirms that levels of low frequency sound have been below accepted thresholds and therefore should not be considered a problem (BWEA 2005; Leventhall 2004).

Infrasound is produced by physiological processes like respiration, heartbeat and coughing, as well as man-made sources like air conditioning systems, vehicles, some industrial process and wind turbines (Knopper and Ollsen 2011). Although infrasound cannot be “heard”, there is some degree of auditory perception below frequencies of 20 Hz (*e.g.*, stimulation of outer hair cells of the cochlea) and there are non-auditory mechanisms such as the vestibular balance system and resonant excitation of body cavities by which humans can sense infrasound (HGC Engineering 2006; Salt and Hullar 2010).

Infrasonic levels created by wind turbines are often similar to the ambient levels prevalent in the natural environment due to wind. Under many conditions, low frequency sound below 40 Hz from wind turbines cannot be distinguished from environmental background noise from the wind itself (Leventhall 2006; Colby *et al* 2009, cited in CMOH 2010). There is no evidence of adverse of adverse health effects caused by infrasound below the sound pressure level of 90 dB (Leventhall *et al.* 2003).

In 2013, the Environment Protection Authority of Australia presented the findings of a study into the level of infrasound within typical environments in South Australia, with a particular focus on comparing wind farm environments to urban and rural environments away from wind turbines. Through various controlled measurements at homes located both near and far from wind turbines. The study concluded that the level of infrasound at houses near the wind turbines assessed is no greater than that experienced in other urban and rural environments, and that the contribution of wind turbines to the measured infrasound levels is insignificant in comparison with the background level of infrasound in the environment (Evans *et al, 2013).* Infrasound that

Figure 6.14 View from Second Floor Window of Proponent's Home, Turbine P1-15 is at a distance of 125m, Dalhousie Mountain Wind Farm, 2013

was detected at houses near wind turbines had the turbines shut down completely and measurements were taken again. The results were the same indicating that the infrasound that was detected was not produced by the wind turbines. Furthermore, the levels are significantly below the human perception threshold (Evans *et al, 2013).*

International standards have been established to define acceptable thresholds for infrasound exposure based on human sensitivity at 85 dBG. Therefore it is reasonable to assume that someone may be annoyed if they can perceive infrasound in the range of 85 dBG. O'Neal *et al*. (2011; cited in Knopper and Ollson 2011) conducted a study to measure wind turbine noise outside and within nearby residences of turbines (nearest turbines 305 m and 467 m from residences) at a wind farm in Texas and measured low frequency sound and infrasound at both distances. The turbine models included in the study were the GE 1.5sle (1.5 MW) and Siemens SWT-2.3-93 (2.3 MW) wind turbines. The authors concluded that the results of their study suggest there should be no adverse public health effects from infrasound or low frequency noise at distances greater than 305 m from the two wind turbine types measured (O'Neal *et al*. 2011).

There is no evidence for direct physiological effects from either infrasound or low frequency sound at the levels generated from wind turbines (indoors or outside) (Colby *et al*. 2009).

6.2.1.9.2 Shadow Flicker

A shadow flicker study of Kemptown demonstrates that shadow flicker cannot and will not extend to homes therefore; no residences will receive shadow flicker effects from the turbines in Kemptown.

Concerns have been raised about the potential for wind turbines to cause epileptic seizures as a result of shadow flicker. As discussed in Section 6.2.1, shadow flicker is caused by the rotating blades of the turbines interrupting sunlight causing flicker. Individuals diagnosed with photosensitive epilepsy (approximately 0.03% of the population) are at risk for seizures caused by flickering light at certain frequencies. Photosensitive epileptic patients are most sensitive to flickering light at 5-30 Hz, although some report sensitivity as low as 3 Hz or as high as 60 Hz (Epilepsy Action 2007). At 3 Hz or below, the cumulative risk of inducing a seizure is about 1.7 per 100,000 of the photosensitive population (Harding *et al.* 2008). At maximum rotational speeds, most turbines flicker at a frequency below 3 Hz. It is therefore concluded that shadow flicker effects would represent, at worst, a visual annoyance, rather than a health impact (refer to Section 6.2.1.6 for a discussion of shadow flicker visual effects).

6.2.1.9.3 Electromagnetic Fields

An electromagnetic field (EMF) is a physical field containing electric and magnetic aspects which is caused due to the movement of an electrical charge. All electronic devices, powerlines and generating stations produce EMFs (Sierra Club Canada 2011).

Wind turbines are not considered a significant course of EMF exposure since emission levels around wind farms are low (CMOH 2010). Previous studies have shown that magnetic field levels as a result of the cable distribution system are a fraction of those found in the vicinity of household appliances such as hairdryers, blenders or televisions (National Institute of Environmental Health Sciences 2002). At present, there are no Canadian government guidelines for exposure to EMFs at ELF. Health Canada does not consider guidelines for the Canadian public necessary because the scientific evidence is not strong enough to conclude that exposures cause health problems for the public (Health Canada 2010).

EMFs created by the operating wind farm will be localized and become weaker with distance. This project does not require a substation. EMF produced by the equipment within the turbines will be very weak, reduced not just by distance, but also by objects such as trees and other objects that conduct electricity. As a result, there is no evidence that the proposed Project will present any human health effects related to EMFs.

6.2.1.9.4 Additional Safety Issues

Additional safety issues that have been raised include potential turbine blade and structural failure, and icing issues.

Turbine Blade and Structural Failure

Wind turbine safety standards have improved considerably since they were first introduced on a commercial scale, with wind turbine safety standards meeting wind strengths equivalent to hurricane forces (Chatham-Kent 2008). The probability of a tower collapse and/or blade detachment from the turbine structure is highly improbable. However, should either of these events occur there is potential that the collapse zone and/or landing area would be damaged by the impact. The structural integrity of the turbines is designed to withstand wind speeds of about 200 km/hour (equivalent to a Level 2 tornado). However, during high wind events (>25 m/s or 90 km/h) the turbines will cease operations. The blade of a turbine weighs several tonnes, therefore in the unlikely event where a blade detaches from the rotor, it would drop to the ground rather than be flung a large distance. Maintenance technicians who work on the Proponent's existing Dalhousie Mountain Wind Farm will also maintain the three GE turbines at Kemptown. The redundancy mechanisms in place for this type of failure include a factory installed alignment indicator (checked and calibrated minimum two times per year), as well as after-market installation of vibration sensors. Visual blade inspections are done officially during semi-annual maintenance, and also with each visit to the individual turbines. Given the built-in safety features as well as ongoing maintenance of equipment, the likelihood of tower collapse and/or blade detachment is extremely remote and is not predicted to result in a significant adverse residual effect on public health and safety.

Icing Issues

Under certain weather conditions (*e.g.*, based on the right combination of air temperature, wind speed and moisture in the air), ice can form on the turbine blades. Falling ice and the throwing of ice therefore present a hazard to on-site personnel during maintenance and operation of the wind turbines.

Falling ice from an immobile turbine does not differ from other tall structures. Ice throw distance depends on a variety of factors including turbine specifications, wind speed and geometry and mass of the ice fragment itself. Several studies conducted under the Wind Energy in Cold Climates (WECO) project in Europe have analyzed the risk to public health associated with turbine icing. Morgan *et al.* (1998) report results of a survey of turbine operators on the occurrence of icing including mass and location of any observed ice debris flung off the rotor. Results showed most fragments on the ground were estimated to be in the range of 0.1 to 1 kg in mass and were found approximately 15 to 100 m from the turbines. Simulations and risk assessments have been developed to project ice throw trajectories and predict probability of events and risk to public safety. Initial work on risk assessment methodology demonstrates that the risk of being struck by ice thrown from a turbine is diminishingly small at distances greater

than approximately 250 m from the turbine in a climate where moderate icing occurs (Morgan *et al.* 1998).

Monitoring at an existing Tacke TW600 wind turbine near Kincardine, Ontario between its installation in December 1995 until March 2011 revealed ice build-up on the wind turbine on 13 occasions out of 1000 inspections conducted during this time. In most cases, only a few pieces of ice were found on the ground. During one monitoring event in February 1996, about 1 tonne of ice in approximately 1000 pieces was estimated on the ground, with the largest pieces 5 inches long, 2 inches thick and 2 inches wide (12.5x5x5 cm). The pieces were scattered up to 100 m from the base of the turbine in the same direction as the blade arms were pointing. Most pieces were found within 50 m of the tower base. There was no event recorded by the operator in which the ice that was thrown from the turbine struck any property or person (LeBlanc 2007).

A computer modeling study used to estimate the number of potential residential, vehicle and person ice strikes within a typical wind farm in Southern Ontario calculated that, assuming a building setback of 300 m, the potential number of ice strikes to buildings would be one in every 500,000 years. Predicted number of ice strikes to vehicles, with a setback of 200 m would be one in every 260,000 years and number of ice strikes to individuals on the ground (assuming a setback of 300 m) would be one in every 137,500,000 years (LeBlanc 2007). Given the setbacks used for this Project, the risk to the public from ice drop or ice throw is very small in comparison with average risk levels. The impact of turbine icing would be greatest for construction or maintenance workers when the blade is at rest and not rotating.

The Proponent has erected numerous large signs at the trail entrances onto the existing Dalhousie Mountain Wind Farm Project, and will do the same for the Clydesdale Project, warning snowmobilers to maintain a stopping distance of a minimum of 150 m from any turbine. This suggestion is repeated at monthly meetings, as well as while patrolling the site during the winter months.

During construction and operation activities, access to the wind turbine facilities will be restricted to authorized personnel wearing proper personal protective equipment and who have had appropriate safety training.

6.2.2 Maintenance Activities

The wind turbines will be visited for routine servicing and inspections. Furthermore, the facility will include a sophisticated wind energy oriented Supervisory Control and Data Acquisition (SCADA) data analysis program, as well as alarm and notification protocols. With such a system, faults can be instantly detected and addressed, operations can be monitored, equipment performance can be analyzed, trend analyses can be performed and long-term records maintained. For service-oriented visits the site will be accessed via light trucks. Although sensory disturbance to wildlife is possible, it will be short in duration, infrequent, in a small geographic area and will not be noticeable above the existing disturbance created by existing and ongoing forestry activities.

6.3 DECOMMISSIONING ACTIVITIES

Well-designed and constructed wind energy facilities may be operated for decades. Affinity expects individual wind turbines to perform for up to 25 years without significant repair or replacement. Transformer facilities and electrical cabling are designed for at least a 50 year life span. Individual wind turbines may be replaced or repaired as their useful life comes to an end, or if more efficient and cost-effective technology becomes available. The Proponent makes commitments regarding decommissioning to the landowners on whose land the equipment is placed.

6.3.1 Removal of Turbine and Ancillary Equipment

Upon a decision to decommission a single wind turbine or the entire wind farm, all equipment above ground, including towers, nacelles, transformers and controllers will be removed. Wind turbines that are operational and have market value would be carefully removed using a crane, essentially in a reverse process to assembly and installation. The resale value of such equipment would cover the cost of removal in such a case. A market for good, used wind turbines has developed in North America, and a number of wind turbines installed in Alberta in the early 1990s originated from the U.S. used wind turbine market.

Wind turbines that are no longer operational may also be removed by crane, but with less attention to preserving individual components, labelling them and storing them. Inoperative wind turbines have high salvage value. Steel and copper components are easily recycled, and there is a ready market for such materials. The remaining materials are primarily fibreglass and plastic. These may be sold to recycling facilities, or crushed and deposited in landfill sites.

Figure 6.15 Wind Turbine Recycled into a Children's Playground

Other above-ground equipment in the wind farm, including transformers and wiring, has a ready market in either used equipment sales or in salvage. Transformers will be simply removed and sold. Wiring will be removed and sold to metal salvage companies.

Environmental components that potentially could be impacted as a result of turbine and ancillary equipment removal include soils, water quality/aquatic environment, birds and other wildlife, land use, and noise. Table 6.16 summarizes the potential environmental effects of activities associated with removal of turbine and ancillary equipment.

Table 6.16 Potential Effects of Turbine and Ancillary Equipment Removal

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
Birds and Other Wildlife	Sensory disturbance	• Overall disturbance will be limited to designated workspaces, and performed in compliance with the *Migratory Birds*	2	1	1/2	R	2	Sensory disturbance may cause habitat avoidance but it is likely to be temporary in nature, small in magnitude and restricted to the Project footprint.

Table 6.16 Potential Effects of Turbine and Ancillary Equipment Removal

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
		Convention Act. • Train onsite personnel regarding how to identify and properly deal with any wood turtles or other endangedered animals that may enter a work site						
Soils	Soil disturbance and erosion	• Soils around the excavation will be disturbed but will be managed to minimize erosion and runoff.	1	1	1/2	R	2	By implementing these standard mitigation measures, the residual effect on soils will not be significant and will have a minimal level of impact.
Wetlands/Water Quality/ Aquatic Environment	Surface water contamination	• Wetlands and watercourses will be avoided • All activities, including equipment maintenance and refueling, will be controlled, or will be done off-site, to prevent entry of petroleum products or other deleterious substances, including any debris, waste, rubble or concrete material, into a watercourse or wetland. • Construction material, excess material, construction debris, and empty containers will be stored away from watercourses and watercourse banks or wetlands. • A contingency plan for accidental spills will be developed for the Project.	1	1	1/1	R	2	No residual effects are predicted.

Table 6.16 Potential Effects of Turbine and Ancillary Equipment Removal

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
	Sediment Loading	• General mitigation measures from the NSE Erosion and Sediment Control Handbook and other applicable guidelines will be utilized to control water, reduce erosion and limit sedimentation. • Construction/ decommissioning will not take place in the immediate vicinity of a watercourse. • Temporary erosion and sediment control measures, silt fence, straw bales (etc.) will be used and maintained until 100% of all work within or near a watercourse has been completed and stabilized. • Temporary sediment control measures will be removed at the completion of the work but not until permanent erosion control measures, if required, have been established.	1	1	1/1	R	2	No residual effects are predicted.
Land Use	Remediation of land	• The small footprint will be disturbed but remediated in accordance with landowner agreements.	1	2	1/2	R	2	Due to the small proportion of land to be directly impacted by foundation construction/ decommissioning and its reversibility after decommissioning, the residual effect is expected to be minimal.

Table 6.16 Potential Effects of Turbine and Ancillary Equipment Removal

Potential Interaction	Potential Effect	Mitigation	Significance Criteria for Adverse Effect[1]					Residual Effect
			Geographic Extent	Magnitude	Duration/ Frequency	Reversibility	Ecological Context	
Sound	Increases to sound levels due to operation of equipment	• All internal combustion engines will be fitted with appropriate muffler systems. • Noise abatement equipment, in good working order, will be used on all heavy machinery used on the Project.	1	2	1/2	R	2	Increased sound levels caused by the removal of turbines and ancillary equipment will be temporary in nature and will be conducted during working, daylight hours. Due to the short nature of this disturbance, the residual effect is considered negligible and the level of impact will be minimal.

1 Note

Geographic Extent: 1 = <500 m^2, 2 = 500 m^2 – 1 km^2, 3 = 1 –10 km^2, 4 = 11 – 100 km^2, 5 = 101 – 1000 km^2, 6 = >1000 km^2

Magnitude: 1 = Low: *e.g.,* specific group or habitat, localized one generation or less, within natural variation, 2 = Medium: *e.g.,* portion of a population or habitat, one or two generations, rapid and unpredictable change, temporarily outside range of natural variability, 3 = High: *e.g.,* affecting a whole stock, population or habitat outside the range of natural variation.

Duration: 1 = <1 month, 2 = 1-12 months, 3 = 13-36 months, 4 = 37-72 months, 5 = >72 months.

Frequency: 1 = <11 events/year, 2 = 11-50 events/year, 3 = 51-100 events/year, 4 = 101-200 events/year, 5 = >200 events/year, 6 = continuous.

Reversibility: R = reversible, I = irreversible.

Ecological Context: 1 = Pristine area or area not adversely affected by human activity, 2 = evidence of adverse effects.

6.3.2 Removal of Power Line

Power poles and cabling will be removed and recycled/disposed of as required. Environmental components that potentially could be impacted as a result include soils, water quality/aquatic environment, birds and other wildlife, land use, and noise. Refer to Table 6.11 for a summary of the potential environmental effects of activities.

6.3.3 Site Remediation/Reclamation

Wind energy facilities do not use or produce harmful waste products. There is no need for concern about residual toxic chemicals or exhaust products. Aside from normal recovery of lubricants from the gearbox and yaw mechanism, decommissioning activities do not produce waste. Lubricants will not contain any PCBs. Site remediation/reclamation will be conducted in accordance with landowner agreements and in accordance with the applicable regulations at the time. Environmental components that potentially could be impacted as a result include soils,

water quality/aquatic environment, birds and other wildlife, land use, and noise. Refer to Table 6.11 for a summary of the potential environmental effects of activities.

6.4 ACCIDENTS AND MALFUNCTIONS

The largest risks associated with all phases of any operations involving vehicles and machinery in forested areas include contamination by petroleum products and waste, if spilled, migrating into the surroundings; and in extreme situations a risk of fire, causing damage if not controlled immediately.

A spill of hydrocarbons associated with equipment involved in construction and maintenance of the Project could cause a variety of adverse effects on the environment, in particular to the watercourses within the Project Study Area. Spill prevention is the most important step in preventing these potential effects; prevention is based on effective and well-planned procedures and maintenance of equipment. These strategies will be outlined in a Project-specific EPP, which will be developed prior to the commencement of construction activities. Spills that could reasonably be expected to occur would be limited to relatively small quantities.

The Valley/ Kemptown Fire Department will be provided with a procedure upon commissioning to deal with logistics of fires and spills would outline the appropriate measures for responding. A site map will be provided to the Fire Chief, landowner and to Affinity employees. Setbacks from sensitive areas will be in place as will radio communications to the control center to provide lockout confirmation and procedures for safe contact with electrical components. NSE will be notified at the time of any applicable emergencies. Notification will be given to the department upon making the decision to decommission and any necessary amendments to the existing emergency measures will be added.

The plans described below are expected to mitigate any potential accidents and malfunctions that may occur. Therefore, the level of impact is considered **low** and **not significant**.

6.4.1 Corporate Environmental, Safety & Health Management Plan

An Environmental, Safety & Health (ESH) Management Plan has been developed and implemented for the existing Dalhousie Mountain Wind Farm and will be expanded and updated where necessary to include activities and operations at the Kemptown Project to ensure that environmental, safety and health requirements are consistently met throughout the Project, specifically throughout the construction and operating phases. The ESH Management Plan will be developed in conjunction with Project contractors, and shall be at all times in strict compliance with all applicable Provincial and local requirements.

The Proponent will ensure that the construction and operation contractors will be duly certified by the appropriate safety associations. As part of the ESH Management Plan, the elements of an Environmental, Safety & Health Management System (ESH-MS) for the Project will include:

- Safety Management Statement, which shall clearly articulate the health and safety objectives and commitment to continually improve the effectiveness of the ESH-MS;
- Safety System Manual, which shall define the scope of the ESH-MS and describe the structure of the ESH-MS;
- Safety Project Plans, which shall explain the strategy and approach to be used in managing activities critical to delivery of work, containing as a minimum
    - Worksite Hazard Assessment Plan;
    - Fall Protection Plan;
    - Safety Emergency Response Plan, and
    - Safety Orientation and Education Plan;
- Safety Project Procedures, which shall contain where necessary documented procedures to ensure specific tasks will be successfully completed to a consistent level satisfying all the requirements of the agreements;
- Safety Records, which will be established and maintained to provide evidence of conformity to agreements, applicable certification requirements and ESH-MS requirements;
- Accident and Incident Investigation, which shall contain a documented process to investigate, document and report all accidents and incidents, to be carried out by suitably trained personnel, and where corrective or preventative action is required, such action will be fully documented and completed;
- Joint Environmental, Safety & Health Committee, which shall consist of one or more members from each of various work groups to ensure all personnel have representation, members of which will receive appropriate training and meet periodically;
- Personal Protective Equipment, which shall assess worksites for hazards and establish the requirements for appropriate personal protective equipment, communicate such requirements to involved personnel and worksite visitors;
- Internal Auditing, which shall contain the documented process to confirm compliance with ESH-MS processes, and identify necessary corrective/preventative actions; and
- Continual Improvement, which will initiate measures to continually monitor the ESH-MS and the delivery of the work, to be implemented by a designated Environmental, Safety & Health Manager.

6.4.2 Emergency Response Planning

The Proponent will update the current emergency response plan for the unlikely event of a site emergency during any phase of the Project. The emergency response plan will include a report form and a map of the Project site, showing the most direct route from the site to an emergency resource such as a hospital. All on-site personnel and contractors will be required to complete a site safety and emergency response orientation prior to the start of pre-construction and construction activities. Prior to operation, the Proponent will provide specialized training to the local fire department for aid to workers during high rescue and suspension trauma prevention.

In locating wind projects, the balance between proximity to load capacity and proximity to residents is a delicate one. The Kemptown Project is not accessible by vehicles not properly equipped to deal with mud, large rocks, steep slope and possibly a significant amount of precipitation. The Proponent is equipped to access the Project site during an emergency, especially in the winter months. (Figure 6.16)

Figure 6.16 Maintenance vehicle used to access turbines during winter

6.4.3 Project Environmental Protection Plan

Affinity will prepare a Project-specific Environmental Protection Plan (EPP) that will be used on-site during all construction, operation and maintenance activities. The EPP will be written in construction specification format and will include the recommended mitigation measures in this EA report, as well as industry-accepted construction practices. The EPP will be used by the construction contractor and by all operations and maintenance workers during the life of the Project.

6.5 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

The following section outlines the effects of the environment on the Project, which includes climatic fluctuations and extreme events that could potentially occur over the life of the Project.

6.5.1 Climatic Fluctuations

Several aspects of the potentially changing climate have been considered, and must continue to be monitored during the lifetime of the Project. The turbines are designed to have a safe upper working limit for wind speeds. As the frequency of storms increases, particularly the strong late summer hurricanes that are anticipated to retain strong wind speeds as tropical depressions as they move up the coast, there would be an associated increase in the frequency of conditions exceeding the safe operating envelope for the turbines. During such conditions, the turbines are halted and generation suspended until safe working conditions occur again. The lost generation due to the marginal increase in storm frequency is a relatively small quantity of generation time; that is, it is not anticipated to significantly negatively affect the economic viability of the Project. Similarly, any change in the frequency of freezing rain, or blade-icing conditions, is not anticipated to significantly affect operating times, and the monitoring instruments in place will allow the physical risk to the turbines to be managed effectively.

6.5.2 Extreme Events

Weather events that put wind turbines at risk include icing conditions, particularly freezing rain, lightning, and extreme winds. Although Nova Scotia has fewer lightning storms than, for example, central Canada, the lightning protection must, and will, be designed to cope with accepted industry standards. Freezing rain is an operations issue. Blade specifications are sufficient to cope with foreseeable icing loads, but it is possible that an event that exceeds this level could be encountered. In such an event, the turbine would have been halted, and the damage would be confined to the immediate vicinity of the turbine base, should ice be falling, or structural damage occur.

The wind turbines will be the highest features in the surrounding landscape, and therefore it is necessary that a lightning protection system be incorporated into each turbine. For the Project, each turbine blade material has fibreglass-reinforced epoxy resin with integral lightning protection supply. Each blade and each turbine tower are grounded to prevent adverse effects from lightning strikes. Additional grounding rods can be installed at each turbine site. Most effects from a lightning strike would be dissipated. If lightning struck the generator at the top of the tower, serious damage could occur and the generator may be damaged.

The generator is designed to automatically shut down at wind speeds that exceed 25 m/s. The turbine tower is designed to withstand excessive wind speeds. Comprehensive geotechnical work at each site will enable for proper design of wind turbine foundation. Extreme wind conditions are used as a parameter in this design.

In the event of a lightning strike that hits a wind turbine generator, severe damage could occur and a new generator may need to be installed. However, it is highly unlikely that lightning would hit a wind turbine generator accurately enough to severely damage it. Taking into consideration the design features that will be used in the Project, a significant environmental effect is unlikely to occur as a result of extreme weather events.

6.6 CUMULATIVE EFFECTS

The assessment of cumulative effects is based on methodology developed to satisfy cumulative effects analysis requirements under *CEAA*. Although a CEAA screening assessment is not required for this Project, CEAA guidance and methodology for cumulative effects assessment is used for good practice. The evaluation of cumulative environmental effects follows five steps:

- Step 1- Identify environmental effects resulting from Project-related activities.
- Step 2- Identify other projects or activities that could interact with Project-related environmental effects.
- Step 3- Exclude environmental effects of other projects or activities that are not likely to act in combination with the environmental effects of the Project.
- Step 4- Identify the likely cumulative environmental effects that could result from the interaction of Project-related environmental effects with other past and future projects and activities.
- Step 5- Evaluate the significance of likely cumulative environmental effects.

Under *CEAA*, an EA must determine whether the project under review adds to the combined adverse effects of past, existing and imminent projects and activities. Specifically, the assessment determines the degree to which a single project is contributing to the total cumulative effects of human activities and developments in the region. For this study, "The Proponent's Guide to Wind Power Projects: Guide to Preparing an Environmental Assessment Registration Document" (NSE 2007, updated 2012) was also used to ensure provincial requirements for registration are met for describing other undertakings in the area.

A critical step in any EA is determining what other projects or activities have reached a level of certainty (*i.e.,* will be carried out) such that they are required to be considered.

It is helpful to consider the clarification provided by the Joint Review Panel for the Express Pipeline Project in Alberta. Following an analysis of subsection 16(1)(a) of *CEAA*, the Joint Review Panel determined that certain requirements must be met for the Panel to consider cumulative environmental effects:

- there must be a measurable environmental effect of the project being proposed;
- that environmental effect must be demonstrated to interact cumulatively with the environmental effects from other projects or activities; and

- it must be known that the other projects or activities have been, or will be, carried out and are not hypothetical (NEB and CEA Agency 1996).

Furthermore, the Joint Review Panel indicated that it is an additional requirement that the cumulative environmental effect is *likely* to occur, that is, there must be some *probability*, rather than a mere possibility, that the cumulative environmental effect will occur. These criteria were used to guide the assessment of cumulative environmental effects of the proposed Project.

Environmental effects resulting from Project-related activities were identified and assessed in Sections 6.1 to 6.4. The evaluation of cumulative environmental effects is warranted for several environmental components discussed in these sections, namely birds and other wildlife, visual impact, noise and economic development. This section outlines cumulative environmental effects that may result from the Project in combination with other projects or activities that have been or will be carried out, within the regional area. For the purposes of this cumulative effects assessment, the regional area is defined as Pictou and Colchester Counties.

6.6.1 Past, Present and Future Projects/Activities in the Regional Area

There is significant industrial development near the Project Study Area: a large-scale waste management facility is located three kilometers to the south of the Project and an industrial rock quarry is located three kilometers to the north of the Project. In addition to this immediate development, other wind projects are in operation and/or are in various stages of development within 25km of the Kemptown Project.

The Proponent currently owns and operates the 51 MW Dalhousie Mountain Wind Farm in Mount Thom, Nova Scotia, 14km to the east of the proposed Kemptown Project. As well, the 50.6 MW Nuttby Mountain Wind Farm is located approximately 10-15 km northwest of the proposed Project. The Spiddle Hill wind development is operational in Tatamagouche, 25km north-northeast of the Kemptown site. The Millbrook/ Truro Heights wind project is currently under commissioning phase and will be operational by November 2014. It is located within 25km of Kemptown.

There are other COMFIT projects approved by NS Department of Energy thus far including the Proponent's projects in Greenfield, Colchester County and Limerock and Fitzpatrick's Mountain, Pictou County. There will be a total of nine turbines installed with these five projects, Kemptown inclusive.

Other activities that would be expected to potentially interact cumulatively with the Project include the land use activities in and around the Study Area, including a large rock quarry, forestry, landfill facilities, recycling facilities (under construction) and power line corridors. These activities have occurred in the past thereby influencing the current landscape and will continue to occur in the future (thereby overlapping temporally with the Project) and would have effects on bird and other wildlife, visual impact, noise and economic development that could potentially interact cumulatively with the effects predicted for the Kemptown Project.

6.6.2 Interactions between Projects/Activities and Description of Cumulative Environmental Effects

Identifying potential cumulative effects is considered through a comparison of the temporal and spatial scope of the additional projects identified in the regional area. Spatially, those projects that are within the regional area are considered to be relevant. Temporally, those projects that have existed in the past, exist presently, or are likely to exist in the near future are considered relevant.

6.6.2.1 Birds and Other Wildlife

Past and ongoing forestry activities in the regional area have resulted in a loss of forest and wetland habitat and reduced the area of contiguous mature forest habitat. The Project is not expected to result in additional loss of high quality habitat or expected to contribute significantly to the cumulative environmental effects of human activities on wildlife habitat, given the limited amount of forested area that will be affected by the Project.

With respect to this Project and other projects in the area, birds and other wildlife could be affected on a regional scale. Wildlife mortality, specifically bird and bat mortality, is a residual environmental effect associated with the proposed Project. Bird and bat mortality may also occur as a result of collisions with overhead power lines, vehicles, communication towers and buildings resulting in a cumulative effect. Historical evidence (see Section 6.2.1.1 and Appendix G) as well as the post-construction monitoring reports prepared for the existing Dalhousie Project, have shown that the wind turbines do not kill large numbers of birds and bats compared with other structures. It is therefore unlikely that the incremental contribution of the Kemptown Project to bird and bat mortality will affect these species on a population basis causing adverse cumulative effects. Bird surveys did not reveal extensive use of the site by species of conservation concern making it also unlikely that rare species would experience significant cumulative effects. A post-construction bird and bat monitoring program will confirm these predictions. As a result, the cumulative effects of this Project with other activities on birds and other wildlife is deemed to be **not significant.**

6.6.2.2 Visual Impact

The development of the Project, taken into consideration with forest harvesting activities, existing and future power lines and communication towers, the existing wind turbines within 25km of the Project, and an expansion to the Balefill Facility could be considered a further visual obstruction. However, since the landscape has already been influenced by human activities, the visual effect of the Project is incremental. As a result, the cumulative effect of this Project with the other existing structures in the landscape is deemed to be **not significant**.

6.6.2.3 Sound

Acceptable sound levels are expected to be produced by the Kemptown Project (Appendix D). The three turbines in Kemptown will not cumulatively affect the sound levels at residences as a result of the setbacks of the turbines to receptors. The Project is expected to only result in an incremental increase in sound and is considered to be **not significant**.

6.6.2.4 Economic Development

This Project will continue to contribute to the community through job creation for local contractors. It is estimated that the Project will provide 15 to 20 new or existing jobs during the construction phase, two new or existing jobs during the operation and maintenance phase. In addition, the Project will provide significant municipal tax revenues and income for landowners. Through the fundraising partnership with the SPCA, the Proponent is also committed to local community benefits. Some examples of recipients include the two cemetaries located within Kemptown, the Valley-Kemptown Volunteer Fire Department, Cobequid Eco-Trails Society, the rodeo at the Provincial Exhibition, 4-H Club, local baseball field repair and upkeep, and other local charitable organizations such as the Special Olympics, food bank, Cancer fundraising and local benefit scenarios that occur in small communities for families in need. These increases in employment and economy will have a positive cumulative benefit for economic development in the region.

6.6.2.5 Summary

With the adherence to mitigation presented in this report, in addition to compliance with regulatory requirements (including terms and conditions of approval), the residual environmental effects of the Project, including cumulative effects, are predicted to be **not significant**.

6.7 SUMMARY OF POTENTIAL ENVIRONMENTAL IMPACTS

A summary of recommended measures for managing and mitigating effects of the Project, based on the preceding analysis, is provided in Table 6.17.

Table 6.17 Summary of Impact Management and Proposed Mitigation Measures

Environmental Component	Project Activity	Potential Effects	Mitigation Measures
Birds and Other Wildlife	Construction & Decommissioning	Sensory disturbance	• Visitors will remain within relevant areas, both in-vehicle and on- foot and will aim to preserve the site's natural areas. • Overall disturbance will be limited to designated workspaces and performed in compliance with the *Migratory Birds Convention Act*. • Delivery vehicles will remain on designated roads.
		Habitat loss/alteration	• Habitat loss will be mitigated by only clearing the land necessary for construction activities and by limiting the overall land disturbance to within designated

Table 6.17 Summary of Impact Management and Proposed Mitigation Measures

Environmental Component	Project Activity	Potential Effects	Mitigation Measures
			workspaces. • Upon completion of construction and/or decommissioning, habitat will be restored to the extent possible. • Areas of significance (*e.g.,* wetlands) will be avoided.
		Mortality	• In order to reduce the potential of bird mortality, construction activities will be performed in compliance with the *Migratory Birds Convention Act (e.g.,* clearing outside the critical time periods for breeding birds). • Onsite personnel were trained in June 2012 regarding how to identify and properly deal with any wood turtles that may enter a work site. Proponent and workers will continue to receive training for specific species as needed.
	Operation	Sensory disturbance	• A pre-construction Mainland Moose PGI survey has taken place and a post-construction Mainland Moose Monitoring Program will be implemented. • Winter track surveys will be conducted to determine if moose and other mammal species avoid turbine sites. This study will help to determine if the turbines and associated infrastructure are an impediment to free movement of mammals. • Overall, the Proponent is also committed to working with NSDNR and landowners to protect the mainland moose population, e.g., through initiatives in the Mainland Moose Recovery Program.
		Mortality	• To reduce the potential for increased bird fatalities due to collision with wind turbines, several decisions were made in the planning of the wind farm. The turbines to be used extend no higher than 150m above the ground thus avoiding the flight height of nocturnally migrating landbirds. Lighting will be the minimum allowed by Transport Canada for aeronautical safety, and red lights (CL-865) may be used with the minimum intensity and flashes per minute allowable. Non-flashing red lights are also still an option, depending on the recommendations of NavCanada, Transport Canada, and CWS combined. The turbines for this Project will be built using tubular steel towers, as some data indicate that lattice towers encourage perching by raptors during hunting and, as a result, may put these birds at risk of collisions. Post-construction monitoring will direct the need and form of further post-construction mitigation measures. • A bird and bat monitoring program will be developed in consultation with NSDNR and CWS. Based on the results of the program, necessary modifications to mitigation plans and/or wind farm operations will be undertaken.

Table 6.17 Summary of Impact Management and Proposed Mitigation Measures

Environmental Component	Project Activity	Potential Effects	Mitigation Measures
Soils and Vegetation	Construction & Decommissioning	Soil erosion and compaction	• Access to the turbine sites will be limited to established access roads, where possible. • Size of access roads will be kept to the minimum required for the safe construction, operation and decommissioning of the equipment. • Whenever possible, clearing activities will be timed to periods when the ground surface is best able to support construction equipment (winter or dry season). • Compacted soil will be reclaimed as required. • Standard erosion and sediment control measures will be implemented as required. • Topsoil and subsurface soils will be separated and stored on-site to be replaced appropriately after the pouring of the concrete foundation. When the soils are stored they will be protected from erosion and runoff.
		Loss of plant species	• Rare plant surveys have been conducted to assist with micro-siting of turbines and access roads. • Where Plant Species of Conservation Concern are encountered, avoidance to the extent possible will be considered, especially where there maybe be a threat to the regional population. • Prior to construction, digital way-point files revealing the precise locations of all “Sensitive”, “May be at Risk”, “At Risk” and “Undetermined” listed species identified during field work within the area proposed for development will be provided to NSDNR (Appendix F).
Wetlands	Construction & Decommissioning	Loss of wetland area and/or function	• Wetlands will be avoided. • All activities, including equipment maintenance and refuelling, will be controlled, and/or will be done off-site, to prevent entry of petroleum products or other deleterious substances, including any debris, waste, rubble, stockpiled soils, or concrete material, into a wetland. • Construction material, excess material, construction debris, and empty containers will be stored away from wetlands. • Erosion and sediment control measures will be implemented to minimize interactions with wetlands. • Regulatory approval will be obtained (including compensation for no net loss of function) from NSE for wetland alteration as required, which is highly unlikely. • Turbines will not be constructed within 300 m of a wetland.
Water Quality/ Aquatic Environment	Construction & Decommissioning	Surface water contamination	• Watercourses will be avoided. • Where alteration of watercourses is required, although highly unlikely, approval from NSE of the proposed alteration will be obtained prior to construction. • All activities, including equipment maintenance and refuelling, will be controlled, and/or will be done off-site, to prevent entry of petroleum products or other deleterious substances, including any debris, waste, rubble, stockpiled soils, or concrete material, into a watercourse. • Construction material, excess material, construction debris, and empty containers will be stored away from

Table 6.17 Summary of Impact Management and Proposed Mitigation Measures

Environmental Component	Project Activity	Potential Effects	Mitigation Measures
			watercourses and watercourse banks. • A contingency plan for accidental spills will be developed for the Project. • Turbines will not be constructed within 300 m of a watercourse unless approved by NSE.
		Sediment loading	• Watercourses will be avoided. • General mitigation measures from the NSE Erosion and Sediment Control Handbook will be utilized to control surface water, reduce erosion and limit sedimentation. • Temporary erosion and sediment control measures, silt fence, straw bales (*etc*.) will be used and maintained until 100% of all work within or near a watercourse has been completed and stabilized. • Visual assessments will be completed bi-weekly and after severe storm events to ensure the effectiveness of erosion and sedimentation controls. • Temporary sediment control measures will be removed at the completion of the work but not until permanent erosion control measures, if required, have been established.
		Surface water flow	• Watercourses will be avoided. • Although it is not anticipated that any will be required, Water Approval will be obtained for all required watercourse crossings and the conditions of approvals will be followed.
		Loss of fish habitat	• In-water work will be avoided. • All sediment and erosion control measures will be inspected quarterly as well as immediately following rainfall events.
		Fish mortality	• Watercourses will be avoided. • Watercourse crossings are not required. If this were to change, they would be constructed between June 1 and September 30 unless otherwise approved by NSE.
Sound	Construction & Decommissioning	Increases in sound levels due to the transportation and operation of clearing equipment	• Nearby residents will be advised of significant sound generating activities and these will be scheduled to create the least disruption to receptors. • Heavy equipment will be operated between 7:00 a.m. and 10:00 p.m., avoiding Sundays and holidays unless absolutely necessary. • Construction equipment will have mufflers. • Noise abatement equipment, in good working order, will be used on all heavy machinery used on the Project.
	Operation	Increase sound levels	• None required.
Tourism	Construction & Decommissioning	Effect on tourism and recreation	• None required.
	Operation	Effect on tourism and recreation	• None required.
Visual	Operation	Change to visual landscape	• Turbines will be all of the same type and model, and will be painted light grey to reduce reflection.

Table 6.17 Summary of Impact Management and Proposed Mitigation Measures

Environmental Component	Project Activity	Potential Effects	Mitigation Measures
			• Screening opportunities for adjacent residences through tree planting or other measures may be considered where post-construction evaluation indicates a legitimate concern.
		Lighting	• Lighting will be the minimum allowed by Transport Canada to ensure the appropriate level of aeronautical safety.
		Shadow flicker	• None required.
Archaeological and Cultural Resources	Construction	Disturbance	• An archaeological field survey has been conducted and an Archaeological Contingency Plan developed. • Upon discovery of an artifact, work will be stopped in the area and the appropriate authorities will be contacted.
Land Use	Construction	Reduction of forested land	• Existing right-of-ways (RoWs) (*e.g.*, woods roads) will be used to the greatest extent possible to minimize the Project footprint. • Turbines, with their relatively small footprint on the land, have been sited with consideration for the potential impact to existing land uses. • Existing logging and access roads built earlier in the construction schedule will be used to install the collection system.
	Operation	Disruption to undeveloped woodlands or infrastructure	• The Project has been designed to minimize impacts to the local land use. No mitigation, therefore, is required as no significant impacts are predicted.
Health and Safety	Operation	Electromagnetic Fields (EMFs)	• None required.
		Infrasound energy	• None required.
		Ice throw	• During construction and operation activities, access to the wind turbine facility will be restricted to authorized personnel wearing proper personal protective equipment and who have had appropriate safety training. • During site visits, vehicles will be parked up-wind of the turbines. • Warning signs will be posted at the perimeter of the Project Study Area, discouraging trespassing on private lands. • During operation, access to the wind turbine sites will be restricted to authorized personnel only.
Local Community	Construction	Hazards and/or inconveniences to forestry operation	• No modification to existing roads expected. • A Special Move Permit and any associated approvals will be obtained through the Department of Transportation and Infrastructure Renewal for heavy load transport.
	Operation	Effect on local economy	• Local residents will be employed to the extent possible during the construction, operation and decommissioning of the Project. • Financial benefits will be extended to the Valley-Kemptown Fire Department and other local organizations annually. • The SPCA will receive a significant annual income from

Table 6.17 Summary of Impact Management and Proposed Mitigation Measures

Environmental Component	Project Activity	Potential Effects	Mitigation Measures
			the production at this site. • Municipal taxes will be remunerated, thus increasing the local tax base, which could be used to increase funding of local municipal initiatives.
		Effect on property values	• None required.

7.0 FOLLOW-UP AND MONITORING

The Proponent is committed to conducting monitoring activities to address residual environmental effects with a high level of concern or uncertainty. While it is anticipated that the residual environmental effects of the Kemptown Project will not be significant, an Environmental Management Plan (EMP) and corresponding Environmental Protection, Monitoring, and Contingency Plans will be developed to address potential issues and concerns. In addition, there are site-specific pre-construction follow-up measures which the Proponent is committed to, in order to assist with micro siting of turbine and access road locations, refine mitigation as required, and support environmental regulatory approvals as required. The level of information contained in this EA Registration is considered sufficient to confidently predict the significance of residual Project-related environmental effects (including cumulative effects).

7.1 PRE-CONSTRUCTION SURVEYS AND APPROVALS

Watercourses and wetlands will be avoided.

A pre-construction Mainland Moose Pellet Group Inventory was conducted to determine if any individuals or groups of Mainland Moose are active in the area.

A one-year bird monitoring program was undertaken by Ken McKenna to determine which species are using, breeding and staging in the area.

A bat survey was undertaken at the original site (3km from updated) and at an abandoned mine nearby in 2013 to determine the amount of bats migrating/ foraging in the area from July to October. Through consultation with NSDNR and biologists, undertaking another echolocation survey at the updated site was not necessary.

An archaeological field survey was conducted based on final design and layout of Project infrastructure and proximity to areas deemed to have potential for First Nations and historical archaeological resources. The results were submitted to Nova Scotia Department of Communities, Culture and Heritage for their review and comment. The ARIA process is not considered complete until the CCH has completed their review and accepted the recommendations of the archaeologists. This information will be given to NSE as an addendum upon receipt.

A rare plant study was performed by Sean Blaney to determine if any plants of significance are found within the project footprint and recommends mitigation to deal with interactions.

An MEKS was conducted at the original site (3km from updated location) for specific land use history and to provide guidance on archaeological follow-up. Plant lists from Sean Blaney's report are available to reference for site specific traditional use plants.

7.2 FOLLOW-UP AND MONITORING PROGRAMS

The following section provides a brief overview of the Project follow-up and monitoring measures to be implemented to support construction and operations activities.

A post-construction Mainland Moose Monitoring Program will be conducted (see Table 7.1). The monitoring program will be confirmed with NSDNR. Overall, the Proponent is also committed to working with NSDNR and landowners to protect the mainland moose population, e.g., through initiatives in the Mainland Moose Recovery Program.

A post-construction bird and bat monitoring program, including carcass searches, efficiency trials and scavenger removal trials will be developed and implemented in consultation with CWS and DNR. This survey is expected to continue for a minimum of two years after operations begin at Kemptown.

The Proponent will donate annually to the Modus Program through a partnership agreement arranged with Dr. Phil Taylor, Acadia University. This will supply some money to continue tagging and monitoring, upkeep of the VHS radar transmitters as well as research and ultimately results of the monitoring of avian species' movement throughout the region.

The EMP is generally overseen by the Operations Manager, but all Project personnel will be trained in their specific requirements towards its implementation. Training will include the safe handling of hazardous materials and petroleum products, compliance with WHMIS, proper use of on-site firefighting equipment, and an environmental orientation prior to initiating on-site work. Currently, all employees of the Proponent are required to be trained and audited from time to time and annually to ensure safe operations and management of any unforeseen spill/ accident/ etc.

The Environmental Protection Plan (EPP) is a key component of the EMP, and has been developed for both the Construction and Operations phases of the Project. The EPP for the construction period aims to reduce the environmental impact during construction activities and consists of environmental protection measures for routine activities associated with the construction of the Project. This will be accomplished through: contingency procedures in the event of an erosion control failure, fuel and hazardous material spill, fire and/or encounter of archaeological and heritage resources; environmental monitoring, inspection and reporting requirements; a list of applicable permits, approvals and authorizations; and a key contact list. The EPP for the operating period aims to reduce the environmental impact of the operation activities and consists of guidelines for: equipment maintenance activities; the safe storage, handling, and disposal of petroleum, oils and lubricants (POL); and the safe storage, handling and disposal of hazardous materials.

Environmental Monitoring is a key component of the EMP. Table 7.1 outlines the Environmental Monitoring Programs that will be in place for the Kemptown Project.

The last aspect of the EMP is the Contingency Procedure Plan, which consists of a detailed response system in the event of the accidental release of POLs or other hazardous materials. Aspects of the plan include environmental concerns, personnel training, prevention measures, response-action plan, and a spill clean-up resource list.

Table 7.1 Environmental Monitoring Programs (Operations)

Component	Method	Timing	Response-Action Plan
Sound	In response to legitimate noise complaints, if any occur, Affinity would measure ambient sound levels and wind speed at selected residential receptors. The sound and wind data will then be combined to produce a plot of background ambient sound pressure levels versus wind speed.	In response to noise complaints, if any occur.	If the ambient sound levels at any residential receptors are higher than permitted noise levels, a report shall be filed with NSE with the particulars of the concern, the suspected source, and any remedial actions taken or to be taken to resolve the concern. If the sound exceedance is related to equipment wear, the maintenance schedule will be adjusted to account for this and minimize the potential for a reoccurrence.
Shadow Flicker	A registry will be created to document complaints of shadow flicker. In the event of a complaint, shadow flicker will be reviewed from that receptor using photographs, and/or video recording at the appropriate time of day and year. Anecdotal information about shadow flicker will be collected from nearby residences.	Shadow flicker will be monitored as required during operation of the Project. If required, it will be conducted once during the summer and once during the winter.	If a complaint or complaints of shadow flicker are received from a receptor located within 1,500 m of the turbine, shadow flicker will be reviewed from that receptor. Information collected from the shadow flicker monitoring will be used will be used to develop further mitigation, if warranted.
Bird and Bat Mortality	Bird and bat carcass monitoring will be performed within a 75m radius of each selected turbine. The fatality rate will require correction for scavenger removal of carcasses and field observation abilities of surveyors. The monitoring program will be confirmed with Environment Canada (CWS) and NSDNR.	It is expected that monitoring of bird and bat mortality surveys will be conducted during the two years following wind farm commissioning, with emphasis placed on surveying during peak spring and fall migration of birds and fall migration of bats.	It is likely that two years of monitoring will be conducted for bats and birds, to be determined in consultation with NSDNR and CWS
Moose	A post-construction Mainland Moose Monitoring Program will be conducted. The	A Spring PGI will be conducted annually.	The information can then be used as baseline or reference material for the

Table 7.1 Environmental Monitoring Programs (Operations)

Component	Method	Timing	Response-Action Plan
	monitoring program will be confirmed with NSDNR.	Winter track surveys will be conducted to determine if moose and other mammal species avoid turbine sites. This study will help to determine if the turbines and associated infrastructure are an impediment to free movement of mammals where turbines are not present.	Provincial Moose Recovery Program.
Aesthetics and Visual Impacts	A registry will be established to record both negative and positive comments on the aesthetics and visual impact of the wind turbines. Media comment on the wind turbines will also be collected and documented. If required, photographs will be taken of the turbine locations from a minimum of two vantage points.	Photographs will be taken at least once after the turbines become operational. The comment registry will be maintained and media comment will be collected throughout the operation of the Project.	Information collected from the aesthetics and visual impact monitoring will be used to develop further mitigation, if required.
Electromagnetic Interference	A complaint resolution system will be in place to record and investigate complaints regarding telecommunications interference.	In response to interference complaints, if any occur.	Mitigation will be conducted on a case by case basis pending results of the investigation.

8.0 CONCLUSION

The Kemptown COMFIT Wind Project is expected to provide clean energy sufficient for 2,000 homes annually in Nova Scotia. The Project will result in displacement of burning fossil fuel with an expected avoidance of greenhouse gas emissions of approximately 17,200 tonnes of carbon dioxide, as well as tonnes of sulphur dioxide and nitrogen oxide. The Kemptown Project will therefore be an important component of Nova Scotia's commitment to renewable energy and reduction of air emissions from energy combustion.

Based on the results of this EA, the study team has concluded that the Kemptown Project is not predicted to result in any significant adverse residual environmental effects. The following section summarizes key points from the EA in justification of this conclusion.

The Project Study Area comprises approximately 40 ha in total. However the actual footprint of the tower structures and ancillary facilities for the proposed wind farm will occupy only a small fraction of the land base within the Project Study Area (cleared turbine area and area for the right-of-way between turbines). The Project is predicted to result in physical disturbance of approximately 4 ha of land (including development of access roads and turbine foundations). It is believed that this prediction is an overestimate and that Project development will result in a much smaller footprint.

Existing logging roads will be upgraded and used for turbine access. Sensitive features including watercourses, wetlands, plant species of conservation of concern, and areas of high archaeological potential will be avoided. Where avoidance is not practical nor possible, detailed mitigation will be developed and all required permits will be obtained prior to construction. Follow-up surveys will be conducted if necessary at areas to be disturbed based on final design which will allow for precise mitigation planning to minimize localized environmental effects on sensitive habitats.

Installation of the proposed Kemptown Project will be completed in approximately four months of on-site work limiting the period of potential disturbance to residents and wildlife associated with increased vehicle traffic and human activity. Construction activities will be scheduled where practical to minimize environmental effects (*i.e.,* to prevent rutting and to avoid significant life history events such as breeding season for most bird species). Remediation of disturbed surface areas will be undertaken as soon as possible after construction is complete, and the conditions of affected land will be remediated to approximate pre-construction conditions in accordance with landowner agreements. The residual environmental effects associated with Project construction are therefore predicted to be **minimal** and **not significant**.

Effects associated with Project operation are also predicted to be **minimal** and **not significant**. Operation of the wind farm will result in minimal adverse effects to birds and other wildlife. While turbines present a potential collision hazard to birds and bats, this hazard is fairly low relative to other tall structures. Bird and bat collisions are expected to be infrequent considering the topography of the area, observed flying patterns, distribution of habitat, and low collision

rates documented at the Proponent's Dalhousie Mountain Wind Farm and other wind farms in the United States and Canada. Post-construction monitoring will be conducted in consultation with Environment Canada and NSDNR. This information will be used for future planning and to develop mitigation if required. Any other disturbances to birds and other wildlife (*e.g.,* sensory disturbance) will be minimal, of short duration, reversible and on a local scale.

Operation of the facility will not result in production of air emissions. Sound levels and visual effects (*e.g.,* shadow flicker) will be within acceptable standards. The visual landscape of the region will be altered by the presence of three wind turbines; while some receptors will have a clear view of the turbines, many of the homes close to the viewshed will be unable to see the wind farm due to topography and forest cover. Screening opportunities through tree planting or other measures will not likely be warranted but may be considered where post-construction assessment indicates a legitimate concern.

Existing land use (*i.e.,* residential, recreational, resource use) can continue during operation of the Project. A number of positive effects will also be realized. Landowners who are leasing their land for the Project will receive direct financial benefits from facility installation and operation, and the county will receive substantial revenue through property taxes, which will benefit county residents in turn. The power produced will provide large annual donations to the SPCA as well as annual donations on a lesser scale to the local fire department, and other community groups. The Project will offer employment and revenue to local workers.

Appropriate and effective mitigation measures have been recommended for the proposed Kemptown Project to eliminate or minimize effects that may have been associated with the development. Any residual net adverse environmental effects are predicted to be **not significant** based on the results and conclusions of this EA.

9.0 SIGNATURE

This report presents details on the EA of the proposed Kemptown COMFIT Wind Project, conducted in accordance with "The Proponent's Guide to Wind Power Projects: Guide to Preparing an Environmental Assessment Registration Document" (NSEL 2007, updated 2012). The "Environmental Impact Statement Guidelines for Screenings of Inland Wind Farms Under the *Canadian Environmental Assessment Act*" (NRCan 2003) was also used for guidance in reporting as applicable. Overall, the residual effects of the Project are not significant and are acceptable, based on a balanced assessment against all of the screening criteria and the results and conclusions of the EA.

This EA was completed internally for Affinity Wind LP. Specifically, and on behalf of Affinity, the report was prepared and reviewed by the following:

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_____ Date OCTOBER 6 2014

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