Environmental Impact Statement (EIS)

Black River Wind Limited Wind Energy Project, Creignish Rear Site

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Black River Wind Limited
October 2005

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SECTION 1. PROJECT SUMMARY

Purpose of This Environmental Impact Statement:

This Environmental Impact Statement (EIS) is submitted by the proponent to the Nova Scotia Department of Environment and Labour, as under the province's *Environmental Assessment Regulations, 2003* there is a requirement for a provincial Environmental Assessment for projects over 2MW production capacity[1].

The proponent is also seeking federal regulatory approval in accordance with the requirements of the *Canadian Environmental Assessment Act* (CEAA) as the project described herein is to be partially funded under Natural Resource Canada's Wind Power Production Incentive (WPPI) Program[2]; projects that are funded by the Government of Canada require an environmental impact assessment under CEAA.

Section 1 of this EIS provides a brief summary of the project. More detailed information about the project site and proposed activities is provided in Section 2. Section 3 describes the scope of the project and its assessment, as well as methodology. Section 4 provides detailed information on existing environmental characteristics surrounding the proposed project site. Section 5 provides detailed coverage of potential environmental impacts and cumulative effects as proscribed by the *Environmental Impact Statement Guidelines for Screenings of Inland Wind Farms Under the Canadian Environmental Assessment Act*, published by Natural Resources Canada. The remaining sections cover follow-up measures, public consultation, conclusions and supporting documents.

1.1 Project Proponent

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[1] Black River Wind Ltd. submitted a draft EA with the Nova Scotia Department of Environment and Labour in August 2005 and received comments in September 2005.
[2] Black River Wind Ltd. submitted a *Letter of Interest* to Natural Resources Canada's WPPI Program and received confirmation of the basic eligibility criteria on January 30, 2004.

1.2 Title of Project

Black River Wind Limited Wind Energy Project, Creignish Rear Site

WPPI Registration Number: 5902-B3-4

1.3 Project Location

Creignish Rear, Inverness County, NS

1.4 Estimated Capacity of Wind Farm

The Black River Wind Ltd.Wind Energy Project will be in two phases. In the first stage, Black River will erect three Vensys 62 (1200 kW) wind turbines for a nameplate capacity of 3600 kW. Future developments at this site may involve an additional three machines for a total project of six. Therefore this screening is seeking approval for six. The proponent reserves the right to substitute equipment from other manufacturers based on technical, power quality, and contractual considerations. However, the installation will not exceed six turbines, nor overall height of more than 100 m ground to blade tip.

1.5 Construction Schedule

Black River Wind is undertaking this pruject through a turnkey contract with the manufacturer. All work will be undertaken by professionals who understand and will be compliant with relevant regulations both provincial or federal. The schedule for construction is dependent upon approval of the environmental assessment process, availabiltiy schedule from the manufacturer and arrangement of financing. The regulatory approval process is summarized in Table 1.5-1. Project construction may commence 2005, but a more likely scenario will be three turbines being erected in the spring of 2006. There is no schedule plan at this time for the second phase of the project.

Table 1.5-1 Regulatory Approval Process

Permit	Authority
Approval of EA	Nova Scotia Department of Environment and Labour
Approval to proceed under CEAA (for WPPI)	Natural Resources Canada
Special Move Permit	Service Nova Scotia
Electrical Permit	Nova Scotia Power Inc.
Power Purchase Agreement	Nova Scotia Power Inc.
Confirmation of Conformance to Technical Requirements and General Terms of Interconnection	Nova Scotia Power Inc.

Table 1.5-2 Proposed Construction Schedule

Time Frame	Activity
Late 2005 or spring 2006	Preliminary site preparation, upgrading of access road and grading of access road
Late 2005 or spring 2006	Construction of foundations and distribution line to NSPI interconnection
Spring 2006	Assemble and erect wind turbines
Spring 2006	Commissioning of turbines

1.6 Provincial Departments / Agencies involved in Provincial Environmental Assessment

Initially this project was to use three Vestas V47 machines for a total nameplate capacity of 1980 kW. Because Black River has applied for the federal Wind Power Producer Incentive (WPPI) it completed a federal class environmental screening process but did not undertake a Nova Scotia Environmental Assessment, as the requirement for this is for projects greater than 2MW.

Subsequent to this, due to technical difficulties with NSPI grid-interconnection using the Vestas machines, Black River selected the Vensys model. Three of these 1.2 MW machines equal 3600 kW. The project is now beyond 2 MW and into a requirement for a Nova Scotia provincial EA under *Environmental Assessment Regulations, 2003*.

Moreover the proponent was able to obtain easements on a larger land tract and consequently the project site was relocated to Creignish Rear, approximately 2 km further inland from the original site just behind the community of Creignish and 2.5-3 km from the Northumberland Strait. Because of the increase to a larger parce of land the area can support a project with six turbines. Therefore as previously stated a second phase could occur where an additional three turbines could be added for a total of six.

Responsible Authority: Nova Scotia Department of Environment and Labour
Peter Geddes, Environmental Assessment Officer
Email: geddespi@gov.ns.ca
Tel: 902-424-6250

In preparation of this document, a draft was submitted in August, 2005 and comments received. Consultations were held with the following:

Provincial Government

Nova Scotia Department of Environment and Labour (Peter Geddes)
Nova Scotia Department of Transportation & Public Works (Todd Brown)
Nova Scotia Department of Natural Resources, Wildlife Division (Mark Elderkin)
Nova Scotia Museum of Natural History (Bob Ogilvie, Andrew Hebda, Marion Munroe)

Municipal

Cape Breton District Planning Commission (Cyril LeBlanc)
Inverness County Council
Strait-Highlands Regional Development Authority (Blaine Gillis)

Public

Stella Maris Parish Church Council and Father Hugh MacDonald
Local Property Owners
Public consultation held on June 27, 2004, Creignish Community Hall, Inverness Co.

1.7 Federal Agency Involvement in the Project

This Environmental Assessment is triggered by federal financial assistance through Natural Resources Canada's Wind Power Production Incentive Program (WPPI).

There are no federal permits required although responsible authorities must determine that the project is not likely to cause significant adverse environmental affects before a decision can be made to provide federal support.

Because there are no waterways affected by this project, there is no requirement for NWPA or HADD authorization.

Federal agencies that may be involved in review of this environmental impact statement (EIS) and preparation for the Environmental Screening Report are:

Responsible Authority: Natural Resources Canada (WPPI Registration # 5902-B2-4)
Curtis Lockett
Email: clockett@NRCan.gc.ca
Tel. / Tél.: 613-944-6159

Expert Agencies: Environment Canada, Transport Canada, Department of Fisheries and Oceans

Canadian Environmental Assessment Agency

Derek McDonald, Senior Program Officer
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Email: derek.mcdonald@ceaa-acee.gc.ca

In preparation of this document consultations were held with the following:

Federal Government

Atlantic Canada Conservation Data Centre (Stephan Gerriets)
Canadian Environmental Assessment Agency (Derek McDonald)
Environment Canada (Kevin Blair)
Natural Resources Canada (Iannick Lamirande, Dominic Cliche, Curtis Lockett)
Transport Canada (Steve McDonnough)

Aboriginal Groups

Based on screening information from NS Museum of Natural History the area is not likely to have had Aboriginal settlement in the Pre-Contact period, therefore no consultation with First Nations is planned.

1.8 Environmental Impact Statement Reporting

Report completed by:

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SECTION 2. PROJECT DESCRIPTION

2.1 Presentation of Proponent: Black River Wind Ltd.

Black River Hydro Ltd. has successfully financed and operated a small hydropower plant at Melford, Guysborough County, NS since 1984, selling 200 kW per hour under contract to Nova Scotia Power Incorporated. This business was incorporated on September 27, 1983 under the *Nova Scotia Corporation Act*. The Company is a privately owned firm. Because of its long history as an independent renewable energy producer, the company is ideally situated to diversify its commercial portfolio by investing in wind energy technology. This effort to develop wind energy projects has been undertaken under the company Black River Wind Ltd.

The Black River Wind Ltd. Wind Energy Project is presently focused on developing small-scale sites that are compatible with existing three phase power lines. Each of the selected locations is on heavily disturbed lands with existing roadways and in relatively remote settings. This conforms to a desire to reduce the ecological and visual impact of the wind turbine siting. The company is based in Atlantic Canada, where it can draw on strong regional technical expertise and broaden existing partnerships.

The Black River Wind Ltd. Wind Energy Project is carried out with technical support from:

- Frontier Power Systems Inc.
- NSWEP Wind Energy Research

2.2 Background of Project

2.2.1 Information on the Project's History, the Regional and National Political and Economic Context for the Project

The success of this project will help subsequent small-scale wind energy projects in the region to be deployed more readily. The timing for the project is driven by the growing maturity of wind energy technology and by increasing concerns over the environmental impact of current electricity supply options.

2.2.2 Environmental Considerations & Canada's Kyoto Protocol Commitments

Environmental concerns over continued and increasing reliance on fossil fuels are growing in Canada and around the world. Canada is one of the world's highest producers of greenhouse gas emissions (GHG) (Natural Resources Canada, 2003). In December 2002, the Government of Canada announced its decision to ratify the Kyoto Protocol to the United Nations Framework Convention on Climate Change. This Convention requires that each industrialized country, which is a signatory, reduce GHG emissions by a specific amount. Canada is committed to reducing its emissions to 6% below 1990 levels by 2012.

Coincident with Canadian abatement efforts, the Nova Scotia government's 2002 Energy Strategy, "Seizing the Opportunity," calls for substantial reductions in GHG, NO_X, SO_X and VOCs. It sets the specific target of approximately 2% of the Nova Scotia Power Inc.'s electric production being from renewable resources within a three-year time frame.

Approximately 44% of Atlantic Canada's GHG emissions are related to electric energy generation. In Nova Scotia, 82% of electricity is generated from fossil fuels: 27% from oil and gas, and 55% from coal (NSPI, 2003). Combustion of these fossil fuels generates not only GHG emissions but also other harmful pollutants such as sulfur dioxide (SO_X), oxides of nitrogen (NO_X), mercury, and volatile organic compounds (VOCs). These contribute to climate change and directly impact human and environmental health.

Although both the federal and provincial governments aim to reduce GHG emissions, these have continued to increase. If Nova Scotia were to reduce GHG emissions by one megatonne by 2012, NSPI would need to increase its use of renewable energy sources by 11.5 MW annually for the next 10 years, thereby displacing the need for an equivalent amount of conventional production (Hughes et al., 2003)

2.2.3 Wind Energy as a Proven Technology

Wind energy is a proven technology. The development of wind energy as a 'zero emissions' alternative for electricity generation over the last two decades has been dramatic. Every kilowatt-hour of electricity generated by the wind turbine has the potential to displace one kilowatt hour of fossil fuel generated electricity and corresponding GHG, SO_X, NO_X, and VOC emissions. As well, reducing reliance on fossil fuels lowers the environmental impact and risk associated with their extraction, processing, transportation and use.

2.3 Purpose of Project

2.3.1 Justification for the Project

Black River Wind's proposal to install 3 to 6 Vensys 62 turbines at this location is an appropriate scale of infrastructure for rural Nova Scotia settings and an appropriate application of wind technology.

This project is at the beginning stage of many similar projects throughout the country. Atlantic Canada has a significant advantage in the production of wind energy because of its excellent wind regime. In addition, this project will contribute to Canada's overall effort to reduce emissions under the Kyoto Protocol, as virtually no air emissions are associated with wind-generated electricity.

Besides the environmental benefit of having more clean power on the system, another major, positive long-term socio-economic impact that may result from this project is the increased opportunity for communities throughout the province to purchase power generated by a local source of renewable energy. Nova Scotians who are concerned about the environment will view this opportunity as a benefit.

2.3.2 Project Objectives

The Black River Wind Limited Wind Energy Project will:

1. Establish a successful small scale wind energy project which is sited with minimal ecological footprint and maximum environmental benefit;

2. Provide project developers with the practical experience to enable replication of similar projects to meet increased need for renewable energy; and

3. Be a profitable wind installation for owners and investors.

2.4 Summary of Project

Wind turbines (number, capacity, type):

The initial project involves the installation of three Vensys 62 (1200 kW) wind turbines and ancillary equipment. The total capacity will be 3600 kW, and will be interconnected to Nova Scotia Power Inc.'s local utility grid. The turbines will operate when wind speeds are within their operating range of 5 m/s to 25 m/s. A second phase of the project may install an additional three turbines for a total of six.

Connection to Grid:

Ancillary equipment will include distribution lines to connect the wind plant to the utility's 25 kV line. Underground electrical cables will be used to connect each turbine to the Nova Scotia Power Inc. three phase distribution line. Transformers for the Vensys model are contained in the base of the tower and no substation will be required for any phase of this project.

Reasons for Site Selection:

This site was chosen for the following reasons:

- It has a measured, premium wind resource;
- An existing roadway makes the site readily accessible, thereby reducing the environmental impact as well as costs and risks of project delivery and support;
- The site is large enough to accept an appropriate scale of wind generation capacity for a remote rural setting;
- The location is close to the NSPI 25 kV electrical grid interconnection point, which can accommodate additional load;
- Previous disturbance at the site (clearing, farming, re-growth, burning, pesticide application and clear-cut) mean that this is not a pristine site, there are no wetlands or watercourses in the immediate vicinity of the site, therefore there is relatively low environmental impact;
- There are no known migration routes or significant nesting habitats for any large or significant avian or bat populations;
- There are no topographical features located on or near the site that may influence avian movement;

- The community has confirmed an interest in exploring the use of renewable energy. The project is located on two parcels of private land. One of the owners and his family lives full-time on this property.

2.5 Location of the Project

2.5.1 Regional Setting

The wind energy project is in Creignish Rear, a rural area in Inverness County, NS.

Figure 2.5.1-1 Regional Setting of Creignish Rear, Inverness County

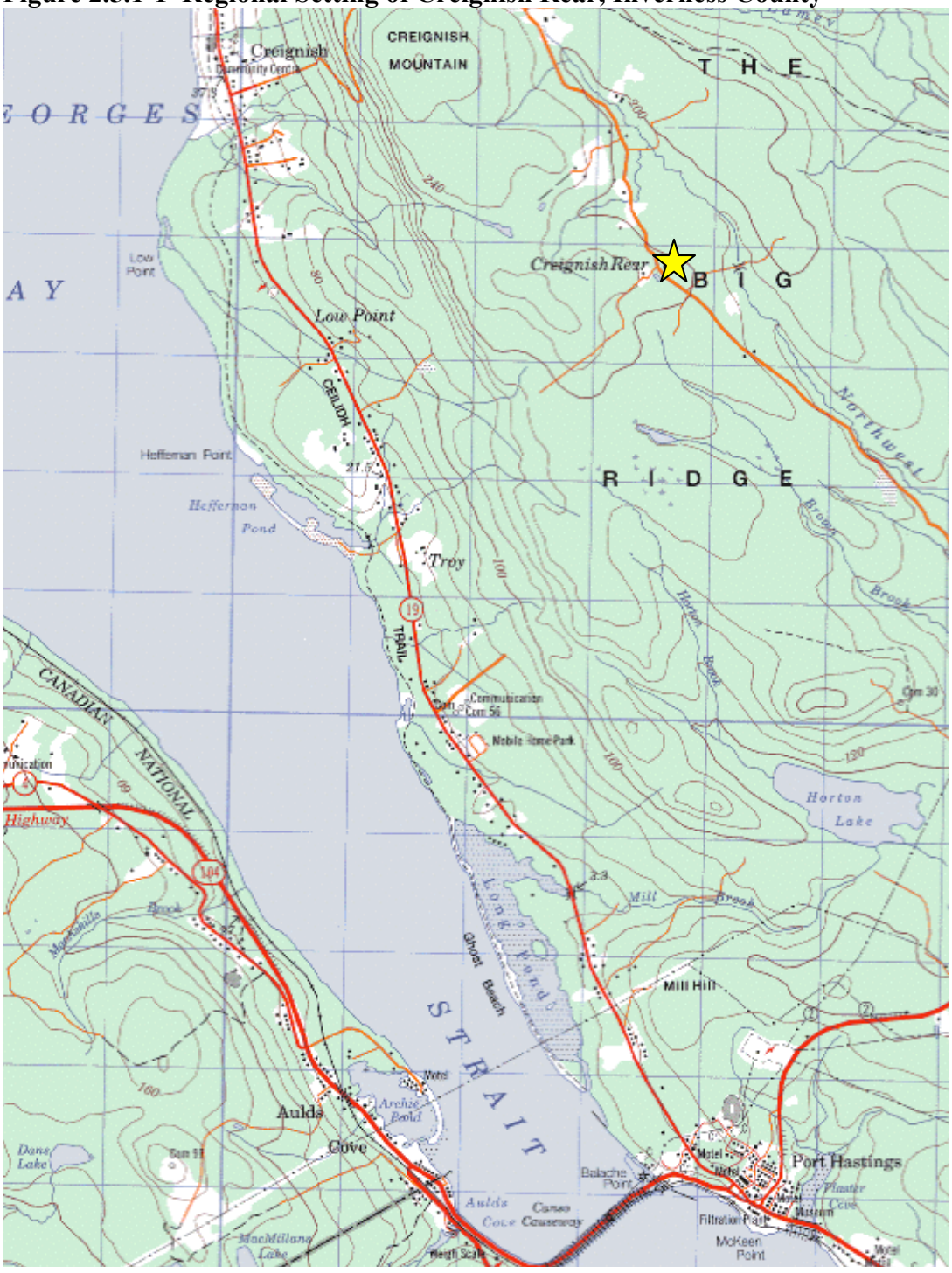


Figure 2.5.1-2 Map Illustrating Project Location

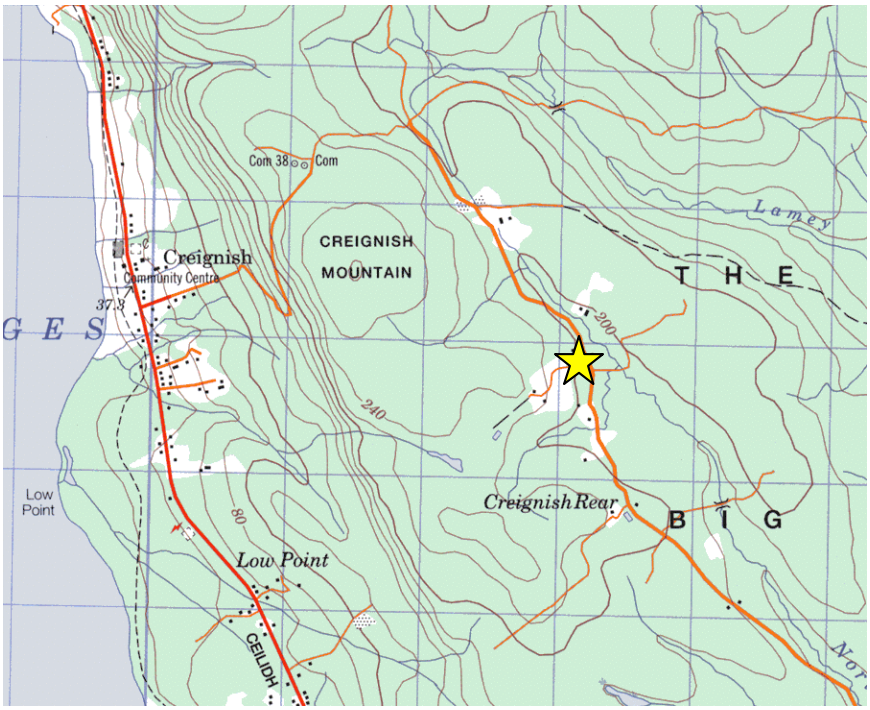


Figure 2.5.1-1 shows a map of southwestern Inverness County and the location of Creignish Rear. Figure 2.5.1-2 illustrates the specific location of the proposed project site in relation to surrounding communities. Highway 19 or the Ceilidh Trail is the coastal road; General Line is the inland route which runs through Creignish Rear.

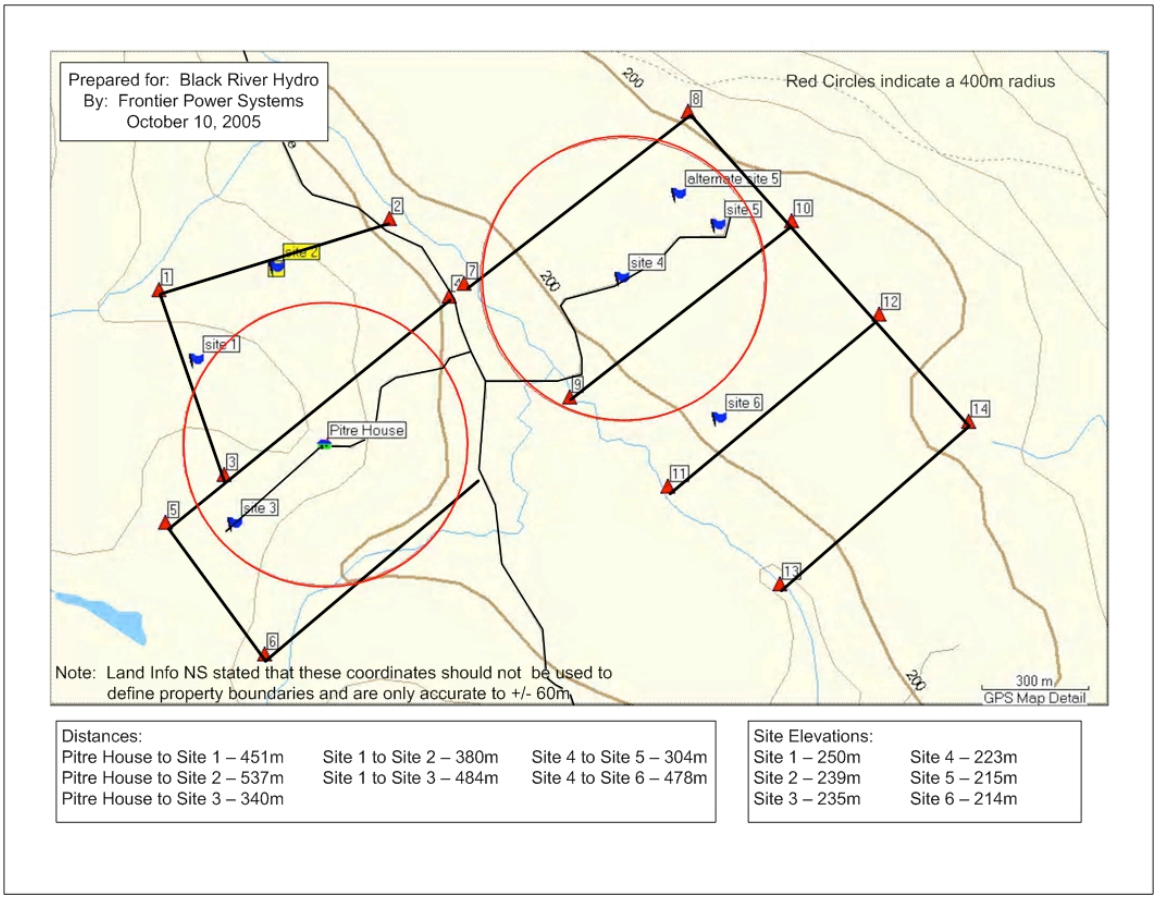
As shown in Figure 2.5.1-1, the project site is on a hill approximately 2.5 km E of the Northumberland Strait, ~ 3 km SE of Creignish and 8 km NW of Port Hastings. Creignish Rear has ~ 8 - 10 families dispursed along General Line which runs parallel to the coast, approximately 3 to 4.5 km inland. The site is accessible from the General Line leading off of the Trans Canada Highway or from Creignish via the Creignish Mountain Road which intersects with the General Line.

Creignish Rear and area is very sparsely populated. Land along the coast was settled principally Scottish settlers who received land grants for clearing and farming the land in the late 1700s. Grants ran from the coast inland to the General Line, and are characteristically long narrow strips ~ one mile in length. Present day settlement pattern has most homes clustered along the coastal road, Highway 19 in Creignish. General Line, a dirt-road, is used primarily by local traffic.

Depending on final siting of the turbines, in the first phase of the project three turbines will be located on two privately owned properties under easement agreements. In the second phase of the project, an additional three turbines will be located on property belonging to one of the land owners.

As round in Figure 2.5.1-3A, It is proposed that on the west side of the General Line, one turbine will be located on property belonging to Alyre Pitre and two turbines will be located on adjacent land to the north owned by Alan Edmunds. On the east side of General Line, three turbines will be located on property owned by Alyre Pitre on two of three parcels owned by Mr. Pitre.

Figure 2.5.1-3 Property Map



Note 1: The original project proposal was for Creignish, Inverness County (lat: 45^0 44' 07 north / long: 61^0 26' 41" west). Subsequently, the proponent was able to acquire easements from two private landowners for larger parcels of land in Creignish Rear that offer the prospect of a second phase development. Thus the development location was changed to Creignish Rear.

Note 2: The property boundaries on this map are only accurate to +/-60 m, so although the approximate location of the sites may appear on the property boundary they are located inside ~50 m.

The Creignish Rear site is presently categorized as private resource land. Black River Wind Ltd. has successfully negotiated an easement contract with the two private landowners. This is a very rural location with a scattering of 8-10 households within a 1km radius. The nearest resident (340m) Mr. Pitre, is one of the property owners, has signed an easement, and is fully supportive of the project.

In general, lands in this area are heavily disturbed, and none is in a pristine ecological state. Early disturbance at the site was principally clearing for forestry. The succession forest is comprised primarily of white and black spruce, much of which is deadfall. Lands adjacent to the site are predominantly regenerating pastures, clear-cuts or forest heavily damaged by spruce budworm infestation. As well some of the area developed as commercial blueberry operations, has been clear-cut, scarified, pesticided and burned.

Figure 2.5.1-4 Photograph of Edmund Property, west of General Line

The steepness of elevation of the project area (214 – 250 m) relative to Creignish, Port Hastings, Auld's Cove or the Canso Causeway all found at sea level, in combination with the distance from the project means the project will not be visible from these locations. The turbines will be visible from the TransCanada Highway on the mainland as the road decends towards the Strait of Canso. This is 8 to 10 km away and not prominant in the viewplane. By comparison, an open pit gravel quarry at Troy on Highway 19 is half as far away and in this landscape appears small, really only glimpsed at from the highway

which is quite heavily treed. The proponent forecasts that the turbines will not be visible from the Ceilidh Trail.

Figure 2.5.1-5 View from Pitre Residence looking NE towards Site 4, 5, & 6 (>1km)

2.5.2 Environmental, Cultural and First Nations Sites

There are no environmentally or culturally sensitive or significant sites in close proximity to this project site. Based on screening information from the Nova Scotia Museum of Natural History, the area is not likely to have had Aboriginal settlement in the Pre-Contact period. The nearest First Nations community in Cape Breton is Waycobah, approximately 50 km from the site. The nearest First Nations community on the Nova Scotia mainland is Afton (45 km). For these reasons, no consultation with First Nations groups is planned.

2.6 Detailed Project Activities

Turbine Characteristics:

The Black River Wind Ltd. Wind Energy Project located at Creignish Rear will consist of six Vensys 62 model wind turbines, each capable of generating 1200 kW of electricity. The Vensys 62 is a gearless, three blade rotor turbine with a hub height of 69m and a

rotor diameter of 62 m. Overall height is ~ 100 m. This German design machine has been developed over the last ten years at a university in Saarbrucken, Germany. There is a single test turbine near this research centre with six turbines being manufactured by the fall, 2005 and fifty more in 2006. In China, these turbines are being manufactured and erected under the licensed name, Gold Wind.

Each turbine consists of a 69 m tall tubular steel tower with a circular base that measures 4.5 m in diameter at the base and 2.5 m at the top. The tower consists of three prefabricated sections that are assembled on site by bolting these together. A secured entrance at the base of the tower leads to the internal ladder and equipment necessary for maintenance purposes. The tower's smooth exterior does not provide any means for scaling the structure.

Figure 2.6-2 Size of a tower Base (4m) relative to pick-up truck.

At the top of the tower is the nacelle, which contains a number of electrical and mechanical components including the generator, the hoisting crane and the yawing system. Attached to it is a 62 m diameter three-blade rotor. Each blade is constructed of reinforced fibreglass and is 31 m in length. A single wind turbine has a swept area of each unit is 3019 m^2. See Figure 2.6-3.

Figure 2.6-3 View of a Vensys Wind Turbine ~ 80 m distance from base.

Each turbine produces 690 V of electricity that is stepped up to 25 kV through individual transformers located in the base of the tower. Connection between an individual unit's

transformer to overhead 25 kV lines is via underground cables. As individual units have their own main breakers, operating independence for protection and isolation is ensured. The 25 kV lines will be constructed and owned by NSPI.

Preliminary engineering to determine the optimum layout design for the turbines is shown in Figure 2.5.1-3. The turbines will be strategically situated within the project area to capture the maximum amount of wind and to be the maximum distance from the residences. As previously indicated, the project will be located on lands belonging to Alyre Pitre and to Alan Edmund.

The first phase of the project will be three turbines. Subject to change, the proposed configuration will have two turbines located on property belonging to Alan Edmund (Site 1 and 2) and one tower will be located on property belonging to Alan Pytre (Site 3 or 4). The second phase, should it occur will have three towers on the Pitre property (Site 3, 5 and 6 or Site 4, 5 and 6).

The area of overall disturbance is similar to the construction footprint of a medium sized house. The foundation excavation is approximately 2-2.4 m deep and 12.5 m in diameter. The excavation hole is generally vertical, without side slope. The foundation section of the tower is a short steel tube which is integrated in the foundation. The upper layer of the steel reinforcement at the concrete runs through radial holes in the foundation section. Local contractors will install reinforced concrete foundations meeting the requirements of the application and will be responsible for erosion control.

Once installed and operating, the wind turbine's rotors operate upwind of the tower and use a forced yaw system (motorized gear drive) to orient the turbine into the wind. Optimum aerodynamic rotor efficiency, at every wind speed is achieved by using variable speed technology. The turbines operate in a wind speed range of between 3 m/s and 25 m/s. The turbines start generating power when winds increase above 5 m/s (18 km/h). The turbines automatically shut down when winds exceed 25 m/s until wind speeds decrease to 19 m/s (70 km/h).

2.6.1 Construction Phase

Construction will involve the following activities:

- Preliminary site preparation will be completed in the fall 2005 or spring 2006.

- Upgrading of access road (6 m wide) will be completed and final layout for the access roads will be determined and graded. This will be completed in the late 2005 or spring 2006 and will take approximately one week. Black River Wind and Vensey's, as the turnkey contractor, are aware that these roads are for the basic purpose of a one-time installation of the equipment and good access for maintenance. Therefore every attempt will be made to ensure that these are not

over-engineered. These roads are equivalent to the type of access which would be constructed as a driveway for a house. There are no culverts needing to be installed and there are no streams in the vicinity of the project.

- Excavation and construction of the foundations will take place in late 2005 or spring 2006. Each of the foundations will require a hole that is approximately 2-2.4 m deep and 12.5 m in diameter. The excavation hole is generally vertical, without side slope. No blasting will be required. Local contractors will install reinforced concrete foundations meeting the requirements of the application and will be responsible for erosion control.

- Individual wind turbines will be interconnected by underground cable to the NSPI grid using standard trench construction methods. The contractor will be responsible for erosion control.

- The wind turbines will be delivered on flatbed trucks. These will be assembled, mounted on the foundations and connected. This will be completed in spring 2006 with each turbine requiring approximately one – two weeks to assemble. An area of approximately 30 m x 30 m = ~0.1 ha., for temporary assembly and construction space will be required.

- Nova Scotia Power Inc.'s distribution lines will be extended to enable interconnection with the wind turbines. The utility's three-phase distribution lines will be constructed in a manner that conforms to utility standards using additional utility poles and distribution equipment commonly used by the utility. This extension will be constructed and owned by the utility.

The turbines will be commissioned in late spring 2006. Unforeseen delays may result in the construction and commissioning period being re-scheduled to summer 2006.

2.6.1.1 Land Affected by the Project

The total area of the wind energy project will be ~ 12 - 13 ha. The foundation of each wind turbine will occupy approximately 130 m^2, with an overall footprint of approximately 900 m^2 per turbine. The precise location of each turbine will be determined through further site analyses upon completion of the regulatory approval process (see Figure 2.5.1-3).

To ensure that individual turbines do not affect the performance of adjacent turbines, the minimum separation between turbines will be at least 300 m. Based on requirements for road upgrades, the proponent will determine which portion of the kV line will be extended above ground and which portion will be buried. The Summary Table 2.6.1.1 provides the range for each. Areas where construction of wind turbine foundations and underground cables will be carried out will first have the topsoil stripped and stored for reclamation.

Should a second phase of the project be undertaken it will have no more than three turbines with a similar land base being affected.

Table 2.6.1.1 Development Summary of Wind Power Project, phase 1.

Structure	**Approximate Area Affected**
Wind turbine footprint	Level area: ~ 900 m^2 / turbine
Wind turbine foundation	Foundation: ~130 m^2 / turbine
New Access roads	Area: ~6 m x 1 km = ~ 6,000 m^2 total
Temporary assembly and construction space	Area: 30 m x 30m = ~ 0.1 ha /turbine
Temporary crane pad	Area: 10 m x 16m = ~ 160 m^2/turbine
Underground cables (range)	Area: 0.4 m x 100 m = ~ 40 m^2 to 0.4 m x 2470 m =~ 988 m^2
Overhead 25 kV (range)	Area: 0.4 m x ~ 18 poles = ~ 7.2 m^2 to 0.4 m x ~ 44 poles = ~ 17.6 m^2

2.6.1.2 Surveying Activities

Site surveys have not been completed at this time. For preliminary site survey results see Figure 2.5.1-3. As noted earlier, wind turbines will be ~ 50 m from property lines.

2.6.1.3 Upgrading of Existing Access Road and Road Construction

The General Line (road) will be used to transport the wind turbine components and crane to the project site, a distance of approximately 4 km from the intersection with the TransCanada Highway 105.

As described in Section 2.6, the first phase of the project will be three turbines. Subject to change, two of these turbines will be located on property belonging to Alan Edmund (Site 1 and 2) and one turbine will be located on property belonging to Alan Pytre (Site 3 or Site 4). The second phase, when it occurs will have three towers on the Pitre property (Site 3, 5 and 6 or Site 4, 5 and 6)(Figure 2.5.1-3). Note that the sites proposed will be ~ 50 m from the property lines and will be at least 340m from the Pitre home.

Access to the Edmund property through the blueberry field for a distance of ~400 m. From that point new roads will be constructed: ~ 100 m distance to site 2 and ~325 m to

site 1. Site 3 will be accessed either through a ~ 600 m continuation of the access road beyond site 1 or along an existing road which continues behind the Pitre home, beyond the driveway. For all sites on the east side of the General Line on the property belong to Pitre, existing access roads will be upgraded by grading and adding gravel. Widening the existing roads will also accomodate the lay down area for the crane pad and assembly and erection of the wind turbines.

Although there are some small wetlands on the properties, there are no wetlands or watercourses within the project sites. However, soil conditions and surface water flow will be taken into consideration during road development. If saturated soil conditions are encountered that may result in an environmental impact from vehicular traffic, construction activities will be temporarily delayed until the potential for rutting is minimal. The construction contractor will be responsible for installation and maintenance of appropriate erosion control measures.

2.6.1.4 Delivery of Equipment

The delivery of the equipment will be undertaken by the turnkey contractor who will use experienced transportation companies with the technical capability and knowledge of NS Department of Transportation and Public Works permit requirements such as Special Move Permits . Existing accesses to the public highway will be used. Turbines will be delivered on flatbed trucks using existing roads in spring 2006. Each turbine will require either 3 - 4 deliveries of components by a single truck, for a total of up to 12 deliveries.

2.6.1.5 Foundations

The proponent is undertaking the turbine installation through a turnkey contract with the manufacturer. All activities relating to construction will be performed by experienced professionals who know and comply to regulations for the province and federation.

Excavation and construction of the foundations will take place in spring 2006 and will require approximately two to three days to complete. As described previously, each of the three foundations will require a hole that is approximately ~ 2 – 2.4 m deep and 12.5 m diameter having a total of ~130 m^2 surface area. The excavation hole is generally vertical, without side slope. An excavator will be used to dig the hole without blasting.

Local contractors will install reinforced concrete foundations meeting the requirements of the application and will be responsible for erosion control. Subsoil will be retained on-site for fill and other construction purposes as necessary. Construction debris will be managed on-site or transported to off-site disposal facilities, with recycling undertaken as required by provincial legislation. Workers will be instructed in proper handling, storage and disposal of any hazardous materials that may be required during construction, according to relevant federal and provincial regulations.

2.6.1.6 Wind Turbine Assembly and Installation

The towers, turbines and components will be delivered by flat deck trailer and assembled on site. The crawler crane used to raise the turbine and mount the nacelle and blades requires a 10 m x 16 m level pad located approximately 15 m from the centre of the tower foundation. Any topsoil stripped for leveling the assembly area or creating the crane pad will be retained on site for reclamation at the end of project construction. Reclamation will be undertaken at the assembly site, foundations and where trenching for a cable has occurred.

2.6.1.7 Temporary Storage Facilities

No temporary storage facilities will be required.

2.6.1.8 Interconnection Cabling

The transformers for Vensys' wind turbines are located in the base of the tower structure. Underground electrical cables will be used to interconnect each turbine to the utility's three-phase distribution using standard trench construction methods. These trenches will be backfilled with stored soil. The developer has at this time not determined what portion of the lines on the project site will be underground and which portion will be using standard overhead lines. This will decided once the turnkey contracter begin the road upgrades and construction as depending on the substrate it is preferable that the lines are buried. The minimum area affected by cabling will be 0.4 m x 100 m = ~ 40 m^2. The maximum area affected will be 0.4 m x 2470 m =~ 988 m^2.

2.6.1.9 Transmission Line

Additional utility poles and distribution equipment,commonly used by the utility will be installed. Nova Scotia Power Inc. has existing single phase (12.5 kV) distribution line along the General Line secondary road allowance which is close and relatively accessible to the turbine locations. This will be upgraded to a 25 kV distribution line.

From the General Line the utility poles will be extended on the west to the Edmund property at least 400 m to site 2 and to the east along the existing access roads on the Pitre property at least 150m to site 4 and 500 m to site 6. The proponent has not at this point determined if all of the remaining transmission line will be buried or if above ground distribution will be used to within 15-20 m of each wind turbine at which point underground cabeling will be used. Therefore connecting the turbines to 25 kV lines off-site will affect a minimum of 0.4 m x ~ 18 poles = ~ 7.2 m^2 to a maximum of 0.4 m x ~ ~ 44 poles = ~ 17.6 m^2. These will be standard wooden poles installed at 60 to 90 m intervals. The poles are installed using an auger mounted on a wheeled vehicle that can access the pole site from the road allowance. The auger typically creates a hole 40-50 cm in diameter.

2.6.1.10 Substation

No substation will be required in any phase of the project.

2.6.1.11 Gates and Fencing

Gates and fencing will not be required. The project sites are on private land and is approximately 400 m, 150 m and 500 m from the nearest secondary road. The existing access road may be secured with a chain.

2.6.1.12 Parking Lots

No parking lot will be required.

2.6.1.13 Proposed Project Schedule

Time Frame	Activity
Late fall 2005 or spring 2006	Preliminary site preparation, upgrading and construction of roads
Late fall 2005 or spring 2006	Construction of foundations and underground cable to NSPI interconnection site
spring 2006	Assemble and erect wind turbines
spring 2006	Commissioning of turbines

2.6.2 Operation Phase

2.6.2.1 Maintenance Plans / Activities

Black River Wind Limited expects to negotiate a long-term service and maintenance agreement with the wind turbine manufacturer. Experienced professionals, either a locally trained operator or a manufacturer's technician will provide regular service and maintenance reviews. Scheduled maintenance and servicing checks are usually carried out two times per year and includes an inspection and adjustment of the mechanical and electrical components.

Vensys has a dry transformer, without any oil. The gearbox for the yawing system contains a total of 20 litres of oil and the gearboxes for the pitch units contains a total of 10 litres of oil. These units are contained in the hub and the nacelle which have a closed design so as to prevent any leaking of lubrication. Any waste products will be disposed of as per municipal and provincial waste management regulations. As well these professionals will perform periodical repairs, however because of the sophistication of

the Vensys design, this is predicted to happen rarely. Proper training and fall safety equipment will be used during both the construction and operational phases.

The gravel access road will accommodate vehicles as required. The type of vehicle used will depend on the season and soil conditions. For example during winter snowmobiles may be used if unscheduled repairs are necessary.

2.6.2.2 Wind Turbine Operation

The turbines operate continuously at wind speeds greater than 3 m/s. At speeds greater than 25 m/s the turbines automatically shut off for safety reasons. Utility metering will be installed to gauge power sales. During the operation phase a telecommunication link will be established to the wind turbines to enable high-speed data transfer and long-distance site monitoring. This will enable Black River Wind Ltd. to provide supervisory control of the wind energy project and to monitor and control operation of the wind turbines. The telecommunication link will be a leased line telephone line or a wireless connection.

The wind turbine control systems will continuously monitor key operating parameters, and will ensure that the turbines are safely disconnected in the event of a problem within the turbine array or within the utility system.

2.6.3 Decommissioning Phase

2.6.3.1 Expected Lifetime

The life span of an individual wind turbine is rated at about 20 years.

2.6.3.2 Reconditioning Plan

Wind energy projects may be viewed as permanent. New, more advanced turbines can replace the older models extending the timeframe. Reconditioning or replacement will be undertaken as required.

2.6.3.3 Decommissioning Plan

Should circumstance make the continuation of the wind installation unfeasible, the structures would be disassembled and removed with the turbines, towers and ancillary equipment being recycled or disposed of in a manner meeting regulatory requirements. Underground cables would be left in place and foundations removed to 1 m below grade and the excavation hole re-filled with subsoil. Vegetation along the access roads will be allowed to regenerate by natural means.

2.6.4 Future Phases of Project

This development will happen in two phases. In 2006 three wind turbines are planned for development at this site. A future phase will be for an additional three wind turbines, giving a total of six.

SECTION 3. SCOPE OF THE ASSESSMENT

3.1 Scope of the Project and its Assessment

Under the Nova Scotia Environment Act, the Nova Scotia Department of Environment and Labour is the Responsible Authority and determines the scope of the project in consultation with the relevant Provincial and Federal Authorities. The lead for the Federal Authority is Natural Resources Canada. For this project the environmental impact statement conform to the requirements established by the *Proponent's Guide to Environmental Assessment (Feb. 2001, Revised Oct. 2003)* published by the department.

Physical activities to be undertaken for completion of this project are summarized in Section 1 and detailed in Section 2.6 of this report.

3.2 Methodology of Environmental Assessment

This environmental assessment was performed to determine the project's prospective environmental effects, so as to ensure that these are given consideration in minimizing the effect of the proposed project's activities on the physical, ecological and socio-economic environments. These activities have been summarized for the construction, operational and decommissioning phase of the project. The effects of these activities on Valued Environmental Components (VECs) at or near the site are summarized in Section 5 of this report. VECs are any part of the environment that is considered important by the proponent, public, scientists and government involved in the assessment process. Importance may be determined on the basis of cultural value or scientific concern.

The information needed to complete the environmental assessment has been compiled from the following sources:

- Consultation between the proponent and the NS Department of Environment & Labour;
- Consultation between the proponent and Natural Resources Canada;
- Consultation between the proponent and the municipal authority;
- Published research and data;
- Consultation with experts at the Nova Scotia Museum of Natural History;
- Consultation with experts at the Atlantic Canadian Conservation Data Centre;
- A survey of breeding birds at the site;
- A survey of vegetation at the site;
- Consultation and wind turbine site visits with the manufacturer, Vensys, Germany

SECTION 4. ENVIRONMENTAL CHARACTERISTICS

This section describes the existing environmental characteristics of the site and surrounding areas. A general description of the environmental characteristics is followed by more detail about the environmental components that may be affected by the project (VECs).

4.1 Geophysical Environment

4.1.1 Physiography and Topography

The Creignish Hills form one of three sub-units of the North Bras d'Or Uplands fault block. This is a series of elongated northeast-southwest oriented fault blocks situated to the north of the Bras d'Or Lakes.[3] The Uplands have a relatively even profile as viewed from the Strait of Canso area, dominating the first view of Cape Breton Island when approaching from the mainland via the Canso Causeway.[4]

The Creignish Hills occupy the same relative position on the planation surface as the mainland Pictou-Antigonish Highlands. The average elevation is approximately 275 m, which is similar to other hills in the region. Elevations are greatest on the southeast side of the unit where movement occurred along faults. To the west along the coastal side, the hills drop steeply to the Northumberland Strait.

4.1.2 Soil Quality

The predominant soil-forming process in this region is podsolization, which is widespread in the Acadian and Boreal Forest regions of Eastern Canada. This process occurs where high precipitation in cool climate works on coarse glacial deposits under mixed or coniferous forest cover. The result is strongly leached soils with high surface acidity that reflect the texture and composition of the bedrock.[5]

A wide variety of metamorphic and granitic rocks occurs in the North Bras d'Or Uplands Unit, but the strong podzol development and the presence of thick iron humate B horizon typical of ferro-humic podzols tend to mask the diversity of the parent materials.

The principal soil unit is known as Thom, a well-drained, stony, sandy loam which has developed from the thin mantle of stony loam till.[6] Soils at the project site are shallow,

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[3] Davis, D and S. Browne (1997) The Natural History of Nova Scotia, Vol. II: Theme Regions p. 33 (Halifax: Nimbus)
[4] Ibid.
[5] Ibid.
[6] Ibid.

with exposed rock and many rock fragments. The soil has been heavily disturbed by human activity.

4.1.3 Geology

The North Bras d'Or Uplands fault block is derived from Avalon crustal material of Precambrian age.[7] The block is divided into almost equal sections of metamorphosed volcanic and sedimentary rocks and granite. The former is Precambrian and the latter is Ordovician in age.[8]

As described in The Natural History of Nova Scotia: Theme Regions:

The northern margin of the Creignish Hills is bounded by Horton grits forming rolling upland. The southern boundary is faulted from Whycocomagh Bay to River Denys Mountain and forms a steep scarp slope against the adjacent Windsor Group deposits.[9]

4.1.4 Seismicity

Inverness County is not known to be seismically active.

4.1.5 Groundwater

The nearest well is approximately 340 m from the proposed site 3. There is no expected effect from the project on this well, or on the local or regional groundwater regime.

4.2 Aquatic Environment

The project site is not located on or near any ponds, streams, lakes or rivers. The site is located approximately 1.5 km from the Northumberland Strait.

4.2.1 Surface Hydrology

The Creignish Hills form a drainage divide across western Cape Breton. The south-flowing Inhabitants River and the north-flowing Mabou River begin here.[10] There are few lakes in this region; most of the streams and rivers feed larger rivers in the surrounding district.[11] Colluvial deposits in stream valleys are zones of springs and

[7] Davis, D and S. Browne (1997) The Natural History of Nova Scotia, Vol. II: Theme Regions p. 34 (Halifax: Nimbus)
[8] Ibid.
[9] Ibid.
[10] Ibid.
[11] Ibid.

groundwater seeps. There are no ponds, streams, lakes or rivers on the project site or within close proximity. There is a small pond and stream next to the western side of General Line on the Pitre property, however there is an existing roadway which can be used to access the turbine sites. The pond is approximately 400 m and 650 m from the closest wind turbine sites.

As mentioned previously, there are no notable drainage channels in close proximity to the project site. Surface water in the area is channeled along joint lines and follows the bedding trend. Channel flow varies seasonally; precipitation and runoff from the surrounding forested land contribute to peak flows during the spring snowmelt period. There are a couple of small wetlands on the properties, however the proximity is such that there will be no impact.

4.2.2 Surface Water Quality

Surface water in this area is generally considered to be of high quality. The nearest domestic well is approximately 340 m from the site 3. As there are no flowing watercourses, this project is not likely to have any impact on water quality. Any construction-related water quality impacts will be eliminated through common erosion control measures. There will be no blasting during construction.

4.2.3 Sediment Quality

As described in the Natural History of Nova Scotia: Theme Regions:

The North Bras d'Or Uplands were once islands in the Carboniferous Sea, were probably engulfed by sediment, but are now eroded out as topographic highs. Some parts of the margins are set against resistant early Carboniferous Horton grits, whereas others lie against the Windsor Group deposits. These softer sediments are easily eroded and expose the resistant Precambrian rocks in maximum relief. Horton sandstones, in contrast, form a resistant continuum and mask the boundary with the older rocks.[12]

In addition, colluvial deposits in stream valleys indicate the presence of groundwater seeps and springs in these areas.

[12] Davis, D and S. Browne (1997) The Natural History of Nova Scotia, Vol. II: Theme Regions p. 34 (Halifax: Nimbus)

4.3 Terrestrial Environment

4.3.1 Flora

The original forest on slope areas and high ridges likely consisted mainly of shade-tolerant hardwoods with yellow birch, sugar maple and American beech being most common, along with shade-intolerant birches, red maple and aspen. Black spruce, white spruce and balsam fir were likely scattered on the upland surfaces and ravine slopes.[13]

Potential species of concern for Inverness County were extracted from the listings of the Atlantic Canada Conservation Data Cetre, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Nova Scotia Department of Natural Resources.

It is worthwhile to note that rare or unusual plants are usually found in unique or specific habitat conditions. The Creignish Rear site is a typical woodlot undergoing succession. There are no lakes, bogs, ponds, standing bodies of water or defined streams directly at the project site.

A botanical survey was conducted on September 10, 11 and 17, 2005, by a recognized botanist: Barry R. Taylor B.Sc., M.Sc., Ph.D. (St. Francis Xavier University), assisted by Mr. Ian Bryson, B.Sc. (St. FX).

The area surveyed comprises two disjunct sites, both exposed hilltops on opposite sides of the General Line near Creignish Rear, Inverness County.

1. The Alyre Pitre property, on the northeast side of the valley, is an area of second growth mixed forest and blueberry fields intersected by bulldozed logging roads.

2. The Alan Edmund property, on the southwest side, includes a large clearcut and an open area, which appears to have suffered dieback of softwoods, possibly following a spruce budworm infestation. Blueberry fields lay down slope from the site. Immediately adjacent to the Edmund property is a second property owned by Alyre Pitre: a small clearcut 350 m upslope from his private residence. The entire area is easily accessible.

Vegetation at both of the Pitre properties and the Edmund property is typical of highly disturbed woodlands and fields in western Cape Breton. Neither site supports any provincially or federally ranked species of concern, or indeed any species noted as rare in Zincky (1998).

On the Edmund property, two potentially sensitive bogs lay a few hundred metres down the slope from the ridge where the turbines would be installed. No deleterious effects on the bogs are anticipated from the wind turbine project because they are too far away from the project site.

[13] Davis, D and S. Browne (1997) The Natural History of Nova Scotia, Vol. II: Theme Regions p. 31 & 141 (Halifax: Nimbus)

No species of special concern were found at the project site (see summary, Appendix IV).

4.3.2 Fauna

The Nova Scotia Museum of Natural History preliminary Environmental Screening (04-05-02) had no zoological collection records for the site. Noteworthy species found in the region include the rock vole (*Microtus shrotorhinus*) and Gaspé shrew (*Sorex gaspensis*). However, comprehensive survey work to identify populations of these species in the Creignish Rear has not been undertaken. It is worthwhile to note that rare or unusual species are most often found in unique or specific habitat conditions. Disturbed habitat conditions as found at this site are overrepresented in the Nova Scotian landscape.

4.3.2.1 Birds

The potential for increased avian mortality as a result of bird collisions with the tower, turbine blades, or overhead distribution lines is often cited as the issue of greatest concern in considering wind power development proposals. Migratory birds (waterfowl, neo-tropical passerines) and raptors are the main species of concern.

A recent report (Sept. 2005) by the US Government Accountability Office (GAO) on the effects of wind energy development on wildlife determined many fewer birds fly into wind turbines than is generally thought. "Although several hundred utility-scale wind farms currently operate across the (US), such problems appear to be limited to two project areas, according to the report. In the context of other sources of avian [mortality], it does not appear that wind power is responsible for a significant number of bird deaths," the report states in its conclusion.[14]

The impact of wind energy development on bird populations came to prominence due to the high number of mortalities associated with one of the world's largest wind farm developments in California's Altamont Pass.[15] This wind farm had up to 5,600 wind turbines in operation and is located in a year-round, high activity area for raptors. Additional factors including prey abundance, high-speed rotor blades, and lattice tower structures with supporting guy wires appear to contribute to increased risk of collision.[16]

Despite public perception of the issue of wind turbines and avian mortality, a review of studies shows that the rate of bird mortality at most wind energy projects quite low: approximately 1.83 birds / turbine / year.[17] When compared with other human-related causes, bird mortality at wind farms is neither biologically nor statistically significant.

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[14] http://www.gao.gov/new.items/d05906.pdf .
[15] American Wind Energy Association: Facts about Wind Energy & Birds, 5pp.-Internet Article
[16] Wally Erickson, WEST Inc., Bird and Wildlife Monitoring: presentation at National Wind Power and EA Workshop, Environment Canada: May 12, 2004, Moncton, New Brunswick.
[17] Ibid.

The following sources of avian collision mortality in the United States have been estimated:[18]

- Vehicles: 60 – 80 million
- Building and Windows: 98 – 980 million
- Power lines: tens of thousands – 174 million
- Communication Towers: 4 – 50 million
- Wind Generation Facilities: 10,000 – 40,000

The sites in Creignish Rear have habitats, which are abundantly represented in the Province, and therefore the chance of finding something rare is lower. Although migratory routes in Atlantic Canada are not completely understood, the sites surveyed for this proposed project do not geographically resemble any of the known migratory routes in the region (i.e. there is no geographic funnel to these sites, nor is the site along the coast).

The Nova Scotia Museum determined that breeding records exist in the area for the following bird species of note: sharp-tailed sparrow (*Ammodramus caudacutus*); black-billed cuckoo (*Coccyzus erythrophthalmus*) and bald eagle (*Haliaeetus leucocephalus*). Department of Natural Resources Consultation GIS query indicated nor records for bird species of concern within 3km of the Creignish Rear location. Terns are found at Hefferman's Pond but as this is at least 5 km from the site and there is no significant body of water at the project site this is felt to be outside the critical area of the project.

An avian survey was undertaken on June 23, 2005 by a recognized ornitholigist Randy Lauff of St. F.X. University. At that time of year, the summer resident bird population is present. None of the birds found at the study sites are listed Federally, Provincially or by the ACCDC at any level, which would warrant attention (i.e. all are secure). No birds of special status were found (see summary, Appendix IV).

4.3.2.2 Reptiles and Amphibians

The ACCDC did not contain any records of rare vertebrate or invertebrate fauna in the vicinity of the project. The report does note that wood turtles have been recorded in the general area. As well, the NS Museum of Natural History notes that the wood turtle may be present in the Inhabitants River watershed, approximately 30 km from the project location. Wood turtles have been seriously impacted by illegal collection, in contrast to their vulnerability to other disturbance by humans. They are fairly tolerant of moderate habitat alteration and may not be harmed by some clear cutting or moderate development.[19]

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[18] Ibid.

[19] The Association for Biodiversity's Central Zoology group, in cooperation with US Natural Heritage Programs & Canadian Conservation Data Centres: Wood Turtle: distributed by ACCDC, Sackville, NB

Although wood turtles may roam widely overland in summer and can be found in a variety of terrestrial habitats adjacent to streams, use of woodland bogs and marshy fields is most common in the northern part of the range.[20]. Given that there are no streams or watercourses at the project site, and the distance of the site from other preferred habitats, the project is not likely to have any impact on wood turtles.

Other herpetiles (amphibians and reptiles) which may occur in the area include yellow-spotted salamander; four-toed salamander; eastern American toad; northern spring peeper; bullfrog; green frog; wood frog; northern leopard frog; common snapping turtle and Maritime garter snake.[21] With the exception of the garter snake, all of these are amphibians that are dependent upon water for reproduction. Although dependence on water for functions other than breeding varies between species, amphibians normally spend the winter either in the soil or in the bottom sediments of ponds. Again, the absence of water bodies or watercourses at the project site reduces the likelihood of impact on these species.

4.3.2.3 Mammals

The Nova Scotia Museum of Natural History did not determine a potential for impacts on foraging hibernating bat species as a result of this project.

Based on personal communication with local residents and information from the Nova Scotia Museum of Natural History, other mammals known to occur in the area may include: coyote, red fox, American black bear, ermine, American mink, bobcat, white-tailed deer, eastern chipmunk, woodchuck, American red squirrel, deer mouse, star-nosed mole, muskrat, woodland jumping mouse, and snowshoe hare.[22] The project site is not known to be a critical habitat area for any of these species.

4.4 Atmospheric Environment

4.4.1 Climate

Climate is the long-term average describing the overall regime of an area, whereas weather is the immediate, daily pattern of temperatures, precipitation, wind and humidity. Weather statistics represent the mean value of each meteorological parameter for each month. The nearest meteorological station to Creignish is Port Hood, NS. Data for this site cover 29 years (1971 - 2000). Because of the coastal location of Port Hood and the difference in elevation between Port Hood (27.4 m) and Creignish Rear (~200 m), the reported data are likely more moderate than the conditions experienced at the project site. The average annual mean temperature is 6.0 °C; the average annual minimum

[20] Ibid.

[22] Davis, D and S. Browne (1997) The Natural History of Nova Scotia, Vol. I: Topics & Habitats pp. 477-8 (Halifax: Nimbus)

temperature, 2.0 °C; and the average annual maximum temperature, 9.9 °C. The average annual rainfall is 105.9 mm and snowfall is 242.2 cm per year.[23]

	Temperature			Precipitation		
	Max. (°C)	Min. (°C)	Mean (°C)	Rain (mm)	Snow (cm)	Total (mm)
January	-1.6	-9.7	-5.7	47.3	62.4	109.7
February	-2.2	-10.3	-6.3	36.4	54.4	90.8
March	1.6	-6.5	-2.5	49.5	45.6	95.1
April	6.6	1.0	2.8	81.3	20.1	101.4
May	12.4	3.6	8.0	86.5	1.3	87.8
June	18.3	9.0	13.7	95.2	0.0	95.2
July	22.9	14.2	18.5	94.6	0.0	94.6
August	22.3	14.0	18.2	117.6	0.0	117.6
September	17.7	9.9	13.8	116.0	0.0	116.0
October	12.4	5.4	8.9	133.5	0.6	134.0
November	6.6	0.7	3.7	110.2	10.5	120.7
December	1.8	-5.3	-1.8	87.9	47.4	135.3

Winds are strongest in the colder months and are most frequently from the north to northwest. In summer, winds from the southeast to south predominate.

4.4.2 Air Quality

Smog can be quite problematic in the Maritime Provinces. In many instances, smog levels are higher than the current national standard. The federal government estimates that 7% of the national total of particulate matter is generated in the Maritime region. Particulate matter is a serious health concern, as it can be inhaled deeply into the lungs, causing difficulty breathing and other respiratory ailments.[24]

Creignish Rear is located in Inverness County, which has no substantial industry outside the Port Hawkesbury region. However, this project is expected to have a positive impact on the regional air quality through potential reduction in coal-fired electrical generation. It will also contribute to Canada's overall effort to reduce emissions under the Kyoto Protocol.

Airborne dust may cause air quality concerns during the construction phase. The contractor will be responsible for appropriate dust control measures.

[23] http://www.climate.weatheroffice.ec.gc.ca/climate_normals/results_e.html
[24] http://www.theweathernetwork.com/features/airq/info/aq_Provincial.htm#NS

4.5 Socio-Economic Conditions

Creignish Rear and its area was first inhabited by Scottish settlers who received land grants for clearing and farming the land. The region was also heavily exploited for timber export to Britain in the 1800s. The Pitre family moved to the area approximately 50 years ago and are now the majority of the population (five households).

Farming has been in continual decline since the 1930s; no active farms remain in the area other than in recent years blueberry production. Forestry, especially fuelwood remains an important resource. Only a few individuals are directly employed in traditional resource sector occupations. Most families are self-employed.

4.5.1 Population

Creignish Rear is a scattered rural area that stretches along the General Line, Inverness County. The population is dispersed, with less than 10 full-time families over a distance of 3.5 - 4 km.

4.5.1.1 Employment Opportunities Associated with Project

The proposed project will offer limited employment opportunities, primarily during the construction phase. This project will have a relatively short construction period, and will require a relatively small number of skilled and semi-skilled workers, including crane and heavy equipment operators, engineers, electricians, electronic technicians, mechanical technicians, concrete workers and laborers. This work will be undertaken as a turnkey contract by the turbine manufacturer.

Short-term positive economic impacts to area businesses may result from increased expenditures for meals, motels, fuel, etc. However, given the small number of employees involved and the temporary nature of the work, it is not anticipated that there will be significant positive or negative impacts at the community level.

The wind farm project is unlikely to have any impact on tourism as the site is on a dirt road which is not a direct route to any common tourist destination. The turbines are not likely to be well noticed in any viewplane which would make them a destination in and of themself. For example in decending the hill on the TransCanada above Auld's Cove, the turbine blades may be visible but they are unlikely to be noticed as part of the backdrop to the Auld's Cove commercial development, signage, transmission grid, gravel quarries, shipping wharf or what remains of the view of natural landscape.

4.5.2 Land Use

Forest resource is the predominant land use designation in the area. The nearest residential property is approximately 340 m from the proposed project site.

The properties adjacent to the proposed project site are large tracts of undeveloped forest land. Most of this land has been heavily disturbed through forestry activity or through development for commercial-scale blueberry production.

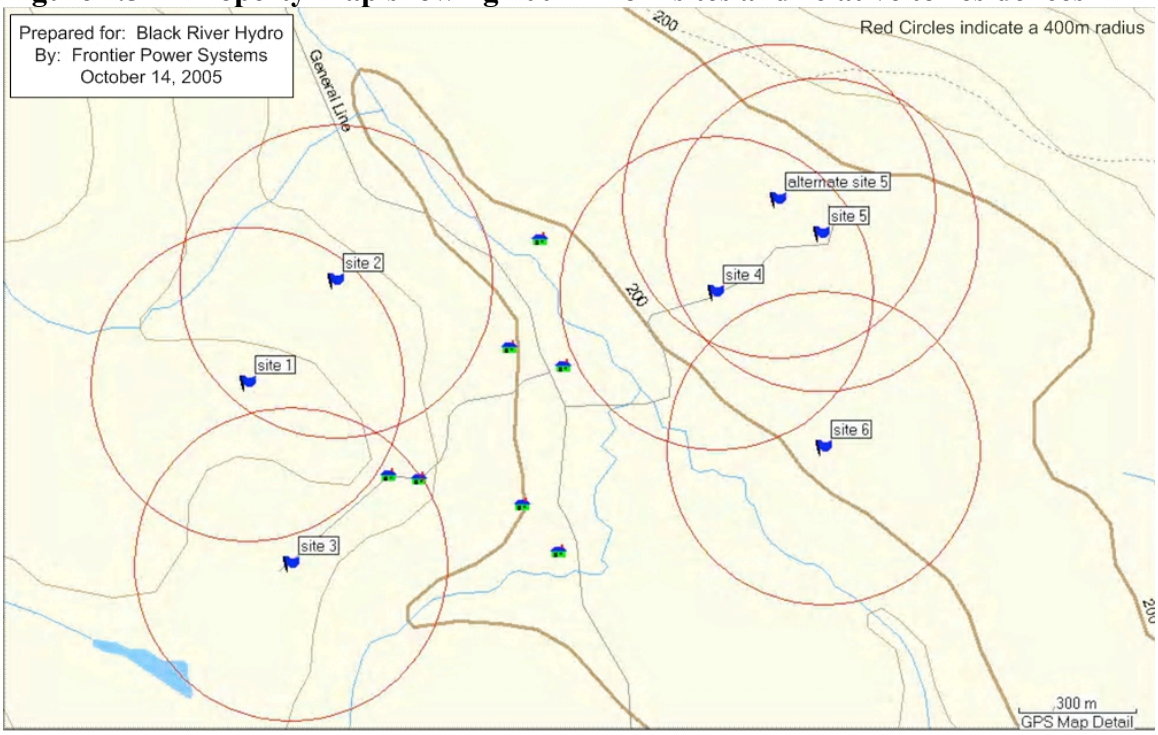
4.5.3 Cultural Resources

There is no community infrastructure in Creignish Rear. The nearest community is Creignish a distance of ~ 3 km which has the Stella Maris Roman Catholic Church and Glebe House, as well as the Creignish Community Hall. No other significant cultural resources are located within the vicinity of the project site.

4.5.4 Existing Noise Level

Existing ambient noise levels are typical for a rural area with a small population. Noise sources may include wind, birds, vehicular traffic from the road, ATVs and, at some distance, occasional boats. Most of the homes in the Creignish Rear area are located near (0.2 - 0.8 km) and facing the General Line. This road has a low traffic volume.

Figure 4.5-4 Property Map showing 400 m from sites and relative to residences



The project site (Figure 4.5-4) is approximately 340 m to 1 km from these homes. The closest resident 340 m is Alyre Pitre, one of the property owners. His Mother, Mrs. Pitre lives ~ 400 m from the site. In siting the turbines, the proponent has taken care to ensure

that all turbines are configured so as to be the maximum distance from residences. The closest wind turbine is behind the Pitre home on the other side of a heavily wooded hill. Mrs. Pitre's home is at an even lower elevation, further away down the hill.

In an effort to ensure that the noise caused by the turbines would not be problematic, the developer travelled to Germany to spend time at the Vensys' wind test site. On two visits to the sites, on average to low wind days the turbine was not significant beyond ~250 m. These weather conditions were in fact ideal for determining what one might expect during a typical summer day in Nova Scotia with similar warm temperatures and light winds, perfect conditions for being out of doors.

During windier conditions ambient noise from the wind itself and movement created by the wind of vegetation would result in maskng the turbine noise. A significant feature of the Vensey's design is that it has no gearbox which are noisy and which necessitate noise insulation measures.

Figure 4.5.4 Noise Emissions from Wind Turbines and Other Sources

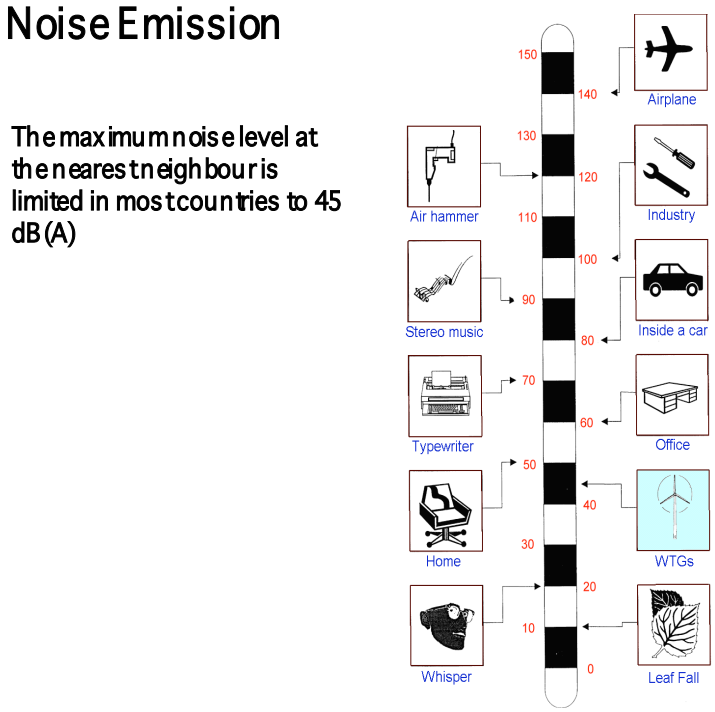


Figure 4.5.4 illustrates a range of ambient noise levels, including that of a wind turbine, for comparative purposes.[25] According to the manufacturer calculations for this specific project based on distance, number of turbines and vegetation, noise levels will not exceed: 47.4 dB(A) at 200m; 45.3 dB(A) at 250m; 45.0 dB(A) at the closest residence, 340 m; and 40.7 dB(A) at 400m.

[25] Danish Wind Turbine Manufacturers Association (www.windpower.org)

4.5.5 Heritage Sites, Archaeological Sites & Other Cultural Resources

Locations of 19th century Scottish settlement offer the greatest potential for archaeological sites. However, according to the Nova Scotia Museum of Natural History Environmental Screening, there is no recorded archaeological site at this location. The closest recorded site is situated on the coast to the southwest.

According to local knowledge and physical evidence, the proposed project site is not located on or near any previous habitation. There is no obvious evidence that the properties were cleared for fields such as stone piles or stones along the property lines.

4.5.6 Recreation Areas

There are no noteworthy outdoor recreation areas near this site. This area may be frequented by hunters or occasional use of the General Line by ATV riders.

The wind energy project will not restrict access to this site once completed.

4.5.7 Land Resources used for Traditional Purposes by Aboriginal Persons

The nearest First Nations community in Cape Breton is in Waycobah (50 km). The nearest community on the mainland is in Afton (45 km). There is no documented history of aboriginal inhabitation or resource use, nor are there any known aboriginal heritage sites in the vicinity of the project.

4.5.8 Safety Issues

The wind energy project site is located on private land. The turbines will be at least 400 m from the nearest public road. As there is no external means to climb the turbines, they are only accessible to authorized personnel. In the case of a catastrophic event, there would be no threat to public safety as the turbines will be located away from public roads and residences.

Once in operation, the individual turbines will be connected to a communication system. If a malfunction occurs, an alarm system is activated and a notification is sent out to local service technicians. Repairs will be undertaken by trained personnel, whom would themselves take appropriate safety precautions.

In the event of health, security, fire, or other safety emergencies during the construction or operational phases, various local services are available. The nearest emergency medical service facility is the Strait-Richmond Hospital (15 km) outside Port Hawkesbury. The nearest RCMP detachment is also in Port Hawkesbury. As well as the fire department in Port Hawkesbury, there is a volunteer fire department in Judique (15 km).

An adequate supply of spill prevention and emergency response equipment will be kept on-site at all times during the construction phase, as well as when maintenance is performed on the turbines. Site personnel will be trained in hazardous materials handling and emergency response procedures. Used oil, filter and grease cartridges, lubrication containers and other equipment maintenance products will be collected and disposed of at the nearest industrial waste facility. All hazardous materials stored on the project site will be labeled according to WHMIS (Workplace Hazardous Materials Information System) regulations. Protocol as laid out in Appendix III for Best Management Practices to Prevent Accidental Discharge of Lubricants will be followed.

As described in section 2.6.2.1 Black River Wind Limited expects to negotiate a long-term service and maintenance agreement with the wind turbine manufacturer. Experienced professionals, either a locally trained operator or a manufacturer's technician will provide regular service and maintenance reviews. Scheduled maintenance and servicing checks are usually carried out two times per year and includes an inspection and adjustment of the mechanical and electrical components.

Vensys has a dry transformer, without any oil. The gearbox for the yawing system contains a total of 20 litres of oil and the gearboxes for the pitch units contains a total of 10 litres of oil. These units are contained in the hub and the nacelle which have a closed design so as to prevent any leaking of lubrication. Any waste products will be disposed of as per municipal and provincial waste management regulations.

Transport Canada has been notified of the location of and given a permit for the meteorological tower used for collecting wind data, as well as the intention of locating wind turbines at this site. Transport Canada guidelines for lighting the turbines will be followed in compliance with regulation 621.19.

4.5.9 Visual Landscape

Much of the landscape surrounding the project site is undeveloped, with few prominent built landmarks apart from the Pitre home, General Line and power lines. The forested areas are heavily disturbed and most of the cleared area is dedicated to the cultivation of blueberries. Figure 2.5.1-4 and 2.5.1-5 show views of where the wind turbines will be situated on the Edmund and Pitre properties. The view of the Edmund property is looking west of the General Line and the view of the Pitre property is from the Pitre home, looking northeast towards Site 4, 5, and 6 which will be located at least 1 km away from the residence. Neither of the properties offer a view of the coast.

As described in Section 2.5, the elevation of the project area (214 – 250 m) relative to Creignish and Port Hastings, Auld's Cove and the Canso Causeway are (sea level) is steep and the distance far. The project will not be visible from these locations. The turbines although visible from the TransCanada Highway on the mainland will be a distant and not prominant in the viewplane.

SECTION 5. ASSESSMENT OF ENVIRONMENTAL IMPACTS, MITIGATION REQUIREMENTS AND RESIDUAL EFFECTS

This section deals with the following topics:

- The likely effects of the project on the environment;
- The cumulative environmental effects;
- The potential for accidents and malfunctions; and,
- The effects of the environment on the project, including climate fluctuations and extreme events.

The six-step process specified in the *Environmental Impact Statement Guidelines for Screenings of Inland Wind Farms Under the Canadian Environmental Assessment Act* has been followed in the preparation of this report. This process was developed to ensure that:

- the interactions between the project components and the environment are adequately described;
- the likely environmental effects are identified and properly assessed; and,
- the importance of any residual effect is determined.

The subsection headings and content in this section are those proscribed in the *Guidelines*. Possible project activities that may take place and that could cause environmental impacts are identified. Valued Environmental Components (VECs) that may be affected by project activities are listed for each activity, and are referenced to the portions of Section 4 in which environmental characteristics are described in detail.

The importance of effects after mitigation measures (residual effects) are reported using the definitions established in the *Guidelines*, as follows:

Table 5-1 Definitions for Importance of Effects After Mitigation Measures (Residual Effects)

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 slight decline in resource in study area during life of the project. Research, monitoring and/or recovery initiatives would not normally be required.
Minimal	Potential impact may result in slight decline in resource in study area during construction phase, but should return to baseline levels.

5.1 Project Construction Activities – Environmental Effects

In this section, environmental concerns are identified and measures are proposed to mitigate foreseeable impacts. The proposed mitigation measures will be sufficient to eliminate any significant, long-term environmental impacts from the construction, operation, or decommissioning phases of the project.

Black River Wind Limited, as the proponent, will negotiate a turnkey construction contract and a maintenance agreement with the turbine manufacturer, Vensys. In this manner, the proponent is ensuring that highly experienced and trained personnel will be employed, and that general environmental protection measures will apply to all activities associated with the development of this project.

5.1.1 Surveying and Siting Operations

Activities: Determination of the location of wind turbine foundations and access roads, and geotechnical investigation to determine the depth of bedrock.

Valued Environmental Components (VECs)	None
Potential Impact	None
Proposed Mitigation	None
Residual Effects & Importance	**No Impact.**

5.1.2 Land Clearing

Activities: Clearing of the entire site will not be necessary: brush and shrub vegetation will only be removed along surveyed rights-of-way, in foundation sites and work areas.

Valued Environmental Components (VECs)	Flora (§ 4.3.1) Fauna (§ 4.3.2) Employment Opportunities (§ 4.5.1.1) Existing Noise Level (§ 4.5.4)
Potential Impact	• Removal or disturbance of existing vegetation • Coverage of existing vegetation by fill material • Habitat alteration in limited areas • Temporary employment opportunities • Chain saw / brush cutting equipment noise
Proposed Mitigation	• Existing vegetation will only be removed or

	covered by fill where necessary for road and foundation construction. Disturbance to vegetation elsewhere will be minimal. No seeding or re-vegetation will be required. • Botanical survey conducted by professional botanist; no other special status species identified. • Avian survey conducted by professional ornithologist; no special status species or critical habitat identified. • The site is a previously heavily disturbed, clear-cut early succession forest or blueberry field. The project will not result in loss or alteration of quality wildlife habitat. Wetland areas are not close to project site. • Activities will be restricted to surveyed rights-of-way, work areas and tower sites. • Noise from chain saws and equipment will be temporary; nearest residence is ~ 340 m away.
Residual Effects & Importance	**Low.**

5.1.3 Road Construction / Modification

Activities: Up to ~ 1 km of new road will be constructed. Existing access road will be widened by 1 m (total width 6 m) and surfaced with gravel.

Valued Environmental Components (VECs)	Soil Quality (§ 4.1.2) Groundwater (§ 4.1.6) Surface Water Quality (§ 4.2.2) Flora (§ 4.3.1) Air Quality (dust) (§ 4.4.2) Employment Opportunities (§ 4.5.1.1) Existing Noise Level (§ 4.5.4) Safety Issues (§ 4.5.8)
Potential Impact	• Soil compaction and disturbance • Rutting and surface degradation due to heavy equipment use • Admixing of topsoil and subsoil • Soil erosion and surface water quality impacts • Disruption of existing surface drainage patterns • Accidental lubricant discharge • Temporary employment opportunities • Noise from construction machinery

	• Safety
Proposed Mitigation	• Avoid steep slopes and uneven terrain. • Minimize surface grading to limit removal or coverage of existing vegetation by fill material. • Limit vehicles to existing and approved work areas. • Avoid using heavy equipment when soil is saturated, and avoid wheel spin. • Strip topsoil from access roadss and store for reuse during reclamation procedures. • Keep topsoil and subsoil separate. • Soil will not be placed near any surface drainage channel. • Contractor will install and maintain appropriate erosion and dust control measures. • Where necessary, restore surface drainage by appropriate grading or installation of ditches. • Best management practices will be used to prevent accidental discharge of lubricants; contractor will immediately clean up any spilled fluids to avoid groundwater contamination. • Construction equipment will be inspected daily for fluid leaks. • Best management practices to prevent accidental discharge of lubricants as per Appendix III will be adhered to. • Noise from the construction machinery will be temporary; nearest residence is ~ 340 m away. • Construction contractor will be responsible for worker and public safety / traffic control. • Site access road will be closed to unauthorized use. • Garbage and sewage will be collected throughout construction period, and disposed of offsite at an approved facility.
Residual Effects & Importance	**Low.**

5.1.4 Delivery of Equipment

Activities: The three turbines will be delivered on flatbed trucks, using existing roads. Each turbine will requires ~ 12 deliveries.

Valued Environmental Components (VECs)	Safety Issues (§ 4.5.8)
Potential Impact	• Temporary disruption of local traffic
Proposed Mitigation	• None. This will be for a short period of time, for a limited number of deliveries, and will not occur in a high traffic area. The General Line has two exits.
Residual Effects & Importance	**Minimal.**

5.1.5 Temporary Storage Facilities

Activities: No temporary storage facility will be required. However, a temporary assembly site of 30 m x 30 m = ~ 900 m^2 will be required.

Valued Environmental Components (VECs)	Soil Quality (§ 4.1.2) Groundwater (§ 4.1.6) Surface Hydrology (§ 4.2.1) Surface Water Quality (§ 4.2.2) Flora (§ 4.3.1) Safety Issues (§ 4.5.8)
Potential Impact	• Portions of work area may be covered by fill. • Soil erosion • Accidental lubricant discharge • Safety issues re: outdoor storage of construction equipment
Proposed Mitigation	• A previously disturbed area will be selected for turbine assembly. • Vegetation will only be removed or disturbed where necessary. • The site is relatively flat with low

	potential for erosion or transportation of sediment to adjacent areas. • Where necessary, restore surface drainage by appropriate grading or installation of ditches. • Soil will not be placed near any surface drainage channel. • Contractor will be responsible for safe storage of construction equipment, tools and lubricants. • Construction equipment will be inspected daily for fluid leaks. • Best management practices will be used to prevent accidental discharge of lubricants; contractor will immediately clean up any spilled fluids to avoid groundwater contamination.
Residual Effects & Importance	**Minimal.**

5.1.6 Foundation Construction

Activities: Excavation of wind turbine foundation footprint (12.5 m diameter x ~ 2 - 2.4 m deep) to enable formed-in-place reinforced concrete foundations to be poured. Topsoil will be stripped and stored for reuse during post-construction reclamation. Subsoil will be stored separately from the topsoil and replaced before the topsoil.

Valued Environmental Components (VECs)	Soil Quality (§ 4.1.2) Groundwater (§ 4.1.6) Surface water quality (§ 4.2.2) Flora (§ 4.3.1) Existing Noise Level (§ 4.5.4) Safety Issues (§ 4.5.8)
Potential Impact	• Soil disturbance and relocation • Admixing of topsoil and subsoil • Removal or coverage of vegetation • Construction noise • Temporary increase in truck traffic (concrete mixers) • Accidental lubricant discharge • Construction area safety and security
Proposed Mitigation	• Retain soils for use as road surfacing

	material or fill. • Keep topsoil and subsoil separate. • Remove vegetation only in the area to be covered by the foundation. • Groundwater, if encountered, will be pumped, filtered, and discharged. • Construction period is short. • Noise level will not affect nearest residence (~ 340 m) • Contractor will install and maintain appropriate erosion control measures. • Soil will not be placed near any surface drainage channel. • Construction equipment will be inspected daily for fluid leaks. • Concrete mixer truck traffic will take place over a short period time and will not occur in a high traffic area. The General Line has two exits. • Best management practices will be used to prevent accidental discharge of lubricants; contractor will immediately clean up any spilled fluids to avoid groundwater contamination. • Construction contractor will be responsible for worker safety.
Residual Effects & Importance	**Minimal.**

5.1.7 Tower and Turbine Assembly and Installation

Activities: Delivered turbines will be assembled in the temporary construction space adjacent to the foundations. A crane will be used to erect the turbines.

Valued Environmental Components (VECs)	Soil Quality (§ 4.1.2) Surface water quality (§ 4.2.2) Existing Noise Level (§ 4.5.4) Safety Issues (§ 4.5.8)
Potential Impact	• Soil compaction • Construction noise • Accidental lubricant discharge • Construction area safety and security
Proposed Mitigation	• Construction is for a short duration. • Restricting operation to approved work

	areas will minimize soil compaction by crane. • Noise level will not affect residents because of distance and the proximity of most homes. • Contractor will be responsible for safe storage of tools and lubricants and safety measures during the construction phase. • Construction equipment will be inspected daily for fluid leaks. • Mechanical safety will be a priority and all personnel working above ground level will be outfitted with fall restraint equipment and trained in its use.
Residual Effects & Importance	**Minimal.**

5.1.8 Interconnection from Turbines to 3 phase power line

Activities: Underground cables will connect individual turbines to interconnection point of NSPI three phase power line using standard trench construction methods. Affected area will be from ~ 0.4 m x ~100 m = ~40 m^2 to 0.4 m X 2470 m = 988 m^2

Valued Environmental Components (VECs)	Soil Quality (§ 4.1.2) Surface Water Quality (§ 4.2.2)
Potential Impact	• Soil erosion due to trenching and excavation
Proposed Mitigation	• Contractor will install and maintain appropriate erosion control measures. • Use of underground cables will minimize surface disturbance.
Residual Effects & Importance	**Minimal.**

5.1.9 Substation Construction

No substation will be constructed for this project.

5.1.10 Transmission Line to Power Line

Activities: If underground cables are laid as planned Nova Scotia Power Inc.'s distribution line will be extended along the existing secondary and access roads for a total of between 18 to 44 poles affecting 7.2 –17.6 m^2.

Valued Environmental Components (VECs)	Soil Quality (§ 4.1.2) Flora (§ 4.3.1) Existing Noise Level (§ 4.5.4) Safety Issues (§ 4.5.8)
Potential Impact	• Minor disturbance of soil and vegetation during utility pole installation • Minor construction related noise • Short term effect on vehicular traffic on Creignish Mountain secondary road
Proposed Mitigation	• The utility's standard practices for installation of power poles and lines will be used.
Residual Effects & Importance	**Minimal.**

5.1.11 Fencing / Gates

As there is no external access to the turbine, there will be no fencing or gate required.

5.1.12 Parking Lots

No parking lot will be required.

5.2 Operational Activities – Environmental Effects

For each activity carried out during the operation of the wind plant, the six-step process described in the introduction to this section has been used to evaluate potential impacts.

To avoid the considerable overlap in the reporting of the valued environmental components (VECs) in the subsections that follow, only the most relevant VECs are reported in each section. For example, because noise impacts are covered in detail in section 5.2.1.3, noise is not listed as a VEC in section 5.2.1.1 dealing with land use.

5.2.1 Wind Turbine Operation

5.2.1.1 Land Use

Activities: In addition to the ~13 ha that will occupied by the wind farm, the surrounding area may be affected by other impacts covered in this report.

The project site and adjacent lands are unoccupied forest resource and commercial blueberry fields. There has been no development for either commercial or residential purposes other than the home of Alyre Pitre who has responded favorably to having turbines located on his land.

A literature search indicates little research has been conducted on the effects of wind farm development on property values. Moreover, wind farm development is only one of a myriad of factors that can influence property values. A recent study sponsored by a U.S. government agency determined there is no empirical support for the perception that wind developments have a negative influence on property values.[26] This analysis examined 25,000 records of property sales in both the U.S. and Europe within 8 km of wind turbine view sheds.

The study concluded that property values in view shed areas increased more rapidly than did those in comparable communities outside the view shed. In fact, property values within the view sheds increased more quickly than they had prior to wind farm development. In conclusion, statistical evidence does not support the contention that property values within the view sheds suffer or perform more poorly than those in comparable communities outside the view shed.[27]

At the public consultation session held in June 2004, for the original proposed site in Creignish, only one person expressed opposition to the project, one concern being that the wind farm would have a negative effect on property values in the area. Since that meeting the project has been re-located to Creignish Rear where both a resident and non-resident landowner enthusiastically support the project and have signed easements to have the project located on their lands.

Valued Environmental Components (VECs)	Land Use (§ 4.5.2) Recreation Areas (§ 4.5.6) Safety Issues (§ 4.5.8)
Potential Impact	• Project may limit existing and planned use of adjacent lands, including property values.
Proposed Mitigation	• The project site and adjacent lands are primarily unoccupied forest resource.

[26] Sterzinger, G. et.al. (2003) The Effect of Wind Development on Local Property Values: Renewable Energy Policy Project: (Washington, D.C; www.repp.org)
[27] Ibid.

	• Future homes would be constructed away from the project site. • A recent comprehensive examination of the effect of wind farm development on property values concluded that the value of land within the view shed of wind farms increased more rapidly than in comparable communities without such developments. • The site is on private land. There is no means to mount the turbines from the exterior so public access is effectively restricted.
Residual Effects & Importance	**Low.**

5.2.1.2 Visual Impact

Activities: The proposed wind energy project will add a new visual dimension to the area and will be visible from the General Line and the 5 residences in the immediate vicinity. The nearest residence at ~ 340 m will not be affected by shadows, reflections or flicker from the turbines. The turbines may be noticed from the TransCanada Highway on the mainland at a distance of 8 – 9 km.

Valued Environmental Components (VECs)	Visual Landscape (§ 4.5.9)
Potential Impact	• Visual intrusion from wind turbines • Concerns about the effect of the turbines on the view shed were expressed by one resident.
Proposed Mitigation	• The project has been relocated to a less populated area. • The wind turbines are not in a dominant view plane from any residence, the closest residence (340 m) faces away from the turbine. That person is supportive of the project. • The number of turbines is small (6). • The view from the mainland is far (8- 9 km)
Residual Effects & Importance	**Low to Medium.**

5.2.1.3 Noise Impacts

Activities: The movement of the wind turbine blades sweeping through the air and the mechanical action of the drive train emit aerodynamic and mechanical noise.

Valued Environmental Components (VECs)	Existing Noise Level (§ 4.5.4)
Potential Impact	Increase in existing noise level

Proposed Mitigation	• Noise generation of most commercial wind turbines is about 100 dBA at source. At a distance of 250 m, this diminishes to approximately 45 dBA, and is comparable to ambient outdoor noise. • No mitigation is required as the nearest residence is about 340 m from the site.
Residual Effects & Importance	**Low.**

5.2.1.4 Wildlife Disturbance

Activities: Wind turbines may interfere with bird behaviour, and may result in increased fatalities. However, as discussed in Section 4.3.2.1, public concern is generally greater than statistical evidence warrants. Studies indicate that the effect of wind turbines on avian populations is small (~1.83 birds/turbine/year). As noted previously, there are no known bat hibernacula in the area. As the first phase of the project will involve 3 turbines only, the proponent will conduct a one-year mortality monitoring follow-up programme for the 3 turbines as proscribed by CWS to determine impact on birds and bats. Based on the outcome from this monitoring, and provided there are no adverse effects, should a second phase occur, the proponent in discussion with Environment Canada and Canada will determine at that time if a second monitoring phase is required.

Valued Environmental Components (VECs)	Birds (§ 4.3.2.1) Mammals (§ 4.3.2.3)
Potential Impact	• Increase in bird / bat mortality • Increase in risk to special status species
Proposed Mitigation	• The number of turbines is small (6) and will be developed in two phases. These are located on heavily disturbed land. • No special status bird species or nests were observed during the avian field survey. • The use of tubular towers and elimination of any perching/nesting locations minimizes the risk of bird collisions. • A one year mortality monitoring follow-up programme as proscribed by CWS will be followed. Second phase monitoring determined in consultation with EC and CWS.
Residual Effects & Importance	**Low.**

5.2.1.5 Safety Issues

Activities: Security, electrical and mechanical safety must be considered to minimize risk to workers, members of the public and operators. Nova Scotia Power Inc. will install new poles and lines to utility standards which should reduce concerns about maintenance.

Valued Environmental Components (VECs)	Safety Issues (§ 4.5.8)
Potential Impact	• potential injury to workers, trespassers, facility or utility employees • potential hazards to aircraft • Liability
Proposed Mitigation	• Design of the turbine tower is such that no access or foothold is available on the exterior. • Installation of the project will be fully compliant with utility electrical standards and practices. • Industry standard warning signage will be installed. • The manufacturer is commissioning a turnkey contract to undertake turbine assembly using highly trained, experienced, personnel. • Mechanical safety will be a priority during construction and operation. • Personnel will be equipped with and trained in the use of fall-restraint equipment and proper handling and storage of hazardous materials. • At speeds greater than 25 m/s the turbines automatically shut off for safety reasons. • Transport Canada has been notified of the project, and lighting will be compliant with regulation 621.19. • The proponent will carry insurance for each of the turbines covering liability as required by the utility, NSPI.
Residual Effects & Importance	**Low.**

5.2.2 Maintenance Activities

Activities: Regular maintenance will ensure safe and reliable operation of the turbines. Scheduled maintenance will be conducted two times per year, and will include inspection and adjustment of the mechanical and electrical components.

Valued Environmental Components (VECs)	Soil Quality (§ 4.1.2) Surface Water Quality (§ 4.2.2) Safety Issues (§ 4.5.8)

Potential Impact	• accidental discharge of lubricants • employee safety
Proposed Mitigation	• A long-term service and maintenance agreement with the manufacturer will ensure that trained, experienced professionals will undertake the maintenance. • Vensys has a dry transformer without oil. Other lubrication is contained within units inside the hub and nacelle which has a closed design. • Best management practices will be used to prevent accidental discharge of lubricants; contractor will immediately clean up any spilled fluids to avoid groundwater contamination. • Personnel will be equipped with and trained in the use of fall-restraint equipment and proper handling and storage of hazardous materials.
Residual Effects & Importance	**Low.**

5. 3 Decommissioning And Abandonment Plans – Environmental Effects

Wind energy projects are considered to be permanent installations. However, the rated lifetime of individual turbines is about 20 years. Older models are disassembled and replaced with newer, more advanced turbines.

If the wind energy project is abandoned, all turbines will be disassembled. Scrap and waste materials will be collected and disposed of in a manner meeting regulatory requirements. Concrete foundations are removed to 1 m below grade. Excavation holes will be filled with subsoil. Vegetation will be allowed to regenerate naturally.

5.3.1 Removal of Turbines and Ancillary Equipment

Activities: Turbines will be lowered from the towers and prepared for shipment. Towers will be disassembled and prepared for shipment.

Valued Environmental Components (VECs)	Soil Quality (§ 4.1.2) Surface Water Quality (§ 4.2.2) Existing Noise Level (§ 4.5.4) Safety Issues (§ 4.5.8)
Potential Impact	• Soil compaction • Construction noise • Accidental lubricant discharge • Construction area safety and security
Proposed Mitigation	• Demolition is for a short duration. • Limiting operation to approved work areas will minimize soil compaction by crane. • Noise level will not affect residents because of distance. • Contractor will be responsible for safe storage of tools and lubricants and safety measures during the construction phase. • Construction equipment will be inspected daily for fluid leaks. • Mechanical safety will be a priority and all personnel working above ground level will be outfitted with fall restraint equipment and trained in its use. • All materials, including fluids or waste, will be collected on site and disposed of as per regulations.
Residual Effects & Importance	**Minimal.**

5.3.2 Removal of Buildings and Waste

Activities: There is no building for removal. Fluids and solid waste will be collected and disposed of at approved sites.

Valued Environmental Components (VECs)	Soil Quality (§ 4.1.2) Surface Water Quality (§ 4.2.2)
Potential Impact	• Discarded materials / waste on site
Proposed Mitigation	• All materials, including fluids and solid waste, will be collected on site and disposed of as per regulations
Residual Effects & Importance	**Minimal.**

5.3.3 Removal of Power Line

Activities: Power lines and poles will be removed by the utility for reuse where possible. Underground cables at the wind energy site will be disconnected just below ground level and left in place.

Valued Environmental Components (VECs)	Soil Quality (§ 4.1.2) Flora (§ 4.3.1) Existing Noise Level (§ 4.5.4) Safety Issues (§ 4.5.8)
Potential Impact	• Minor disturbance of soil and vegetation during utility pole removal • Minor construction related noise
Proposed Mitigation	• The utility's standard practices for removal of power poles and lines will be used.
Residual Effects & Importance	**Minimal.**

5.3.4 Site Remediation

Activities: Concrete foundations will be removed to 1 m below grade and the excavation hole re-filled with subsoil. Concrete will be disposed of as per regulations at an approved site.

Valued Environmental Components (VECs)	Soil Quality (§ 4.1.2) Surface water quality (§ 4.2.2) Flora (§ 4.3.1) Existing Noise Level (§ 4.5.4)

	Safety Issues (§ 4.5.8)
Potential Impact	• Minor disturbance of vegetation • Soil disturbance and relocation • Admixing of topsoil and subsoil • Noise from demolition of concrete • Accidental lubricant discharge • Increased traffic (concrete removal by dump truck) • Construction area safety and security
Proposed Mitigation	• Retained soils will be used to fill excavation holes. • Keep topsoil and subsoil separate. • Remove vegetation only where necessary to complete removal work. • Noise will be of a relatively short duration. • Contractor will install and maintain appropriate erosion control measures. • Soil will not be placed near any surface drainage channel. • Construction equipment will be inspected daily for fluid leaks. • Best management practices will be used to prevent accidental discharge of lubricants; contractor will immediately clean up any spilled fluids to avoid groundwater contamination. • Dump truck traffic will take place over a short period time and will not occur in a high traffic area. The General Line has two exits. • Construction contractor will be responsible for worker and traffic safety.
Residual Effects & Importance	**Low.**

5.4 Accidents and Malfunctions – Environmental Effects

Note: *Accidents due to extreme weather events will be addressed in Section 5.5.*

The wind plant will be developed under a turnkey contract with the manufacturer, Vensys, to ensure due diligence in design, construction and operation. Control systems will continuously monitor key operating parameters, and will ensure that the turbines are safely disconnected in the event of a problem within the turbine array or within the utility system.

The manufacturer will dispatch trained personnel to the site as soon as possible after an accident or malfunction to assess the problem and undertake repairs as necessary. Problems within the 25 kV distribution lines will be handled by employees of Nova Scotia Power Inc. in accordance with their established procedures.

As discussed in previous sections, repair contractors will be responsible for safe storage of tools and lubricants and safety measures. Equipment will be inspected daily for fluid leaks. Best management practices will be used to prevent accidental discharge of lubricants; the contractor will immediately clean up any spilled fluids to avoid groundwater contamination. All materials, including fluids or waste, will be collected on site and disposed of as per regulations.

Mechanical safety will be a priority throughout all phases of the project, and all personnel working above ground level will be outfitted with fall restraint equipment and trained in its use. In the event of an accident involving employees, the site supervisor will immediately notify Emergency Health Services through the provincial 911 system.

5.5 Effects of the Environment on the Project

The major portion of the development of wind turbines and of wind energy installations has occurred in northern countries with extremely varied climatic conditions. Therefore, out of necessity, much of the design has ensured that turbines are able to operate safely in extreme weather conditions.

5.5.1 Climatic Fluctuations

The strongest wind regime in Nova Scotia typically occurs during the late fall to early spring period (November to April). This is also the period when maximum electrical generation is anticipated to occur.

Data from the Port Hood weather recording station indicate an average low temperature for January of –9.7 °C, with an average high temperature for July of 22.9 °C. The average annual rainfall is 105.9 mm and snowfall is 242.2 cm per year. As mentioned previously, conditions at Port Hood may be more moderate than those at Creignish Rear. However, the data are within the normal operating range for the Vensys turbine. Freezing rain is not a frequent problem in this area.

Average monthly wind speeds range between 6 and 10 m/s. When wind speeds exceed this range, the turbine automatically shuts down until conditions return to normal operating parameters. The turbine is designed to stop functioning if winds exceed 90 km/h.

As the expected life span of this turbine is approximately 20 years, long-term climatic fluctuations are not expected to be a concern. Work is ongoing at the manufacturer's

level to improve equipment, monitoring and operation procedures with respect to climate change.

5.5.2 Extreme Events

The Vensys model is designed to be able to withstand extreme weather events, including wind gusts. The wind turbine installations will be a turnkey contract with the manufacturer to ensure due diligence in design, construction and operation. Catastrophic events such as hurricanes or tornadoes may cause failure of the turbine. However, internal sensors will shut down any turbine operating where conditions exceed acceptable levels.

In the case of a catastrophic event, there would be no threat to public safety as the wind turbines will be located away from public roads and residences.

Lightning Strikes

Individual wind turbines are equipped with lightning protection systems to prevent damage to the internal mechanisms. Lightning strikes may abruptly stop energy production; however, no other damage is likely to ensue.

Ice Buildup

Individual wind turbines are designed to withstand a certain amount of ice buildup. The rotation of the blades and their naturally flexible design tends to keep them free of ice. Braking systems, pitch controls and related speed controls generally ensure that design limits are not exceeded. Internal sensors are able to detect when the performance is being affected by ice build up and will shut the turbine down. Ice shedding will not be a concern, as the turbines will be installed in an isolated location.

Valued Environmental Components (VECs)	Safety Issues (§ 4.5.8)
Potential Impact	• Ice shedding
Proposed Mitigation	• Turbine is to be installed in an isolated location; nearest residence is ~ 800 m from site
Residual Effects	**Low.**

5.6 Cumulative Effects Assessment

This section describes the potential cumulative effects of the project on the site and surrounding areas. It is essentially an evaluation of the effects on the environment that

result from impacts of the project in combination with those of existing and potential future projects and activities.

5.6.1 Past, Present, and Future Projects at the Site

The Black River Wind Limited Wind Energy Project at the Creignish Rear site will consist of three to six wind turbines situated on approximately 10 ha of land, along with access roadss, underground cables from the turbines to overhead distribution lines and new overhead distribution lines.

The proposed wind power project is a permanent installation, and is anticipated to remain in operation for the foreseeable future. This wind energy project is not expected to lead to any significant related development within the project area. The energy will be interconnected with Nova Scotia Power Inc.'s grid, so there are no specific benefits or related business opportunities that would result in future development. In addition, the distribution line capacity is such that six wind turbines is the maximum number that can be located at this site; no future expansion of the project is planned.

As discussed previously, the surrounding lands are designated as forest resource. There no major installations in the area. Forest and blueberry harvesting operations would be expected to continue based on the maturity and suitability of the products for harvest. Harvesting operations will have no effect on the project, nor will the project have an effect on harvesting operations.

Recent analyses of the effect of wind energy projects on the property value of homes within the viewshed indicate that the value increases faster and more than in comparable areas without these projects.

Therefore, the combined effect of the project with these activities will have **no cumulative effect**.

5.6.2 Interactions Between Projects and Description of Cumulative Environmental Effects

Disturbance to Terrain

As described previously, the project site itself, as well as the surrounding lands, have been previously disturbed by land clearing for farming, and, in recent years, by clear-cut forestry and development for commercial blueberry production. Previous disturbance was one of the reason for selection of this site for wind farm development. Based on the development summary for the wind power project, a total area of approximately 12 – 13 ha will be affected. The affected area will be very small relative to the land base of the surrounding area. Therefore, there will be **minimal cumulative effect** related to terrain disturbance.

Disturbance to Wildlife and Wildlife Habitat

The potential does exist for the wind power project to result in wildlife mortality. The issue of bird collisions with turbines has been discussed in detail in Section 4.3.2. However, the project site is not on an important migration route for birds, nor is there any known bat hibernacula in the vicinity. A one-year mortality monitoring programme for the three turbines will be followed based on CWS protocol. Habitat alteration is the only other foreseeable hazard to these creatures in the area.

Other existing hazards to wildlife and wildlife habitat in the area include roads, residential and commercial development, and clear-cut forestry. Potential impacts of these activities may include vehicle collisions with animals, driving or walking on nests, and alteration of wildlife behaviour.

The post-construction level of human activity at the project site will be minimal, and existing development and forestry activities are not likely to increase beyond current levels. For these reasons, **minimal cumulative effect** is anticipated when considering the effects of this project in combination with existing activities.

Destruction of Native Vegetation

The wind turbines, access roadss, overhead distribution lines and underground cables will be located on previously disturbed land. No rare or unusual plants were found at the project site. The contractor will be directed to avoid any wetland areas.

Clear-cut forestry and commercial blueberry growth are significant existing sources of vegetation destruction in the area. The total footprint for the wind power project (~12 - 13 ha) is very small relative to the surrounding forest resource lands. Therefore, the project will have **minimal cumulative impact** on native vegetation.

Permanent Change of Land Uses

The project site is on private land, and has been secured through a long-term easement agreement with the landowners. Existing land use patterns in the area have remained essentially unchanged since farming declined in the 1930s. The area does not have an established pattern of recreational or tourist use, and development and forestry activities are not likely to increase beyond current levels.

The project will change the long term use of the project site itself. However, the site is small (12-13 ha) relative to the remaining land available for future development. As stated previously, no future expansion of the project itself is planned. For these reasons, there will be **no cumulative effect** related to land use change.

Changes to Ambient Noise Levels

As discussed in Section 5.2.1.3, wind turbine operation does generate aerodynamic and mechanical noise. As previously discussed the noise level at source is ~ 100 dBA. At a distance of 250 m this diminishes to approximately 45.3 dBA. The ambient noise level at the nearest residence (340 m from the site) is estimated to be approximately no greater than 45 dbA. During the construction phase there will be some increase in local noise levels due to use of equipment. However, periodic use of chain saws and heavy equipment in forestry operations is already commonplace in this area. Due to distance attenuation, the combined effect of the turbines with existing noise sources will result in **no cumulative effect.**

Visual / Aesthetic Impacts

The operating wind turbines will add a new visual element to the landscape. The project site is not located in a highly populated area, nor will the turbines be dominant in the view plane of homes in the area.

The *direct impact* of adding the turbines to the existing rural landscape was assessed through the public consultation process. About thirty-five members of the community attended the public meeting. Of these, only one was opposed to the turbines while three completed the questionnaire, and their responses were favorable toward the project. Two other individuals were interested in receiving information on prospective investment opportunities, which seems to implicitly indicate support for the project. As previously stated since that time the project has moved to Creignish Rear, ~ 3 km away and a more remote location.

Any views of the wind turbines from the TransCanada Highway will be a considerable distance >8km and small relative to closer more prominent features. There are no other prominent structures in the surrounding landscape that could result in a cumulative effect in combination with the proposed project. For these reasons, **no cumulative effect** on aesthetics is anticipated.

Socio-Economic Effects

This will be one of the first "green" energy project in Inverness County. In the near term, the project may be a source of curiosity, as well as a source of pride among residents who support growth in sustainable energy. However, as sustainable energy projects are expected to become more commonplace in the coming decades, the novelty of the project will diminish.

The project itself will have limited socio-economic impacts. There will be some short-term positive economic benefits during the construction phase. As discussed previously, existing land uses and property values in the area are expected to remain unchanged. Likewise, existing trends in population, settlement, and employment in the region are expected to continue unchanged; no in-migration is expected. For these reasons, no **cumulative effect** on socio-economic conditions is anticipated.

Safety Issues

Black River Wind is undertaking this project with a negotiated turnkey contract for installation and maintenance. Therefore, all individuals working on the project during construction or maintenance will be highly trained and take all due precautions, following best practices in undertaking the various work related activities. The project site is on private land, and site access will be restricted. Other than ongoing forestry operations and natural catastrophic events, there are no existing sources of public safety concern in the area. There will be no additional burden on local emergency services as a result of the project. As a result, there will be **no cumulative effect** relating to safety issues.

5.7 Summary of Potential Environmental Impacts and Cumulative Effects

In this section, the two following tables summarize the environmental assessment information identified in Section 5 of the EIS. Table 5.7-1, "Summary of Environmental Impacts," has been completed using the using the environmental impact assessment information identified in sections 5.1 through 5.4. Table 5.7-2, "Summary of Cumulative Effects", has been completed using the cumulative effect assessment information identified in section 5.6 of the EIS.

The level of impact reported (see definitions in Table 5-1) is determined after mitigation measures have been taken.

Table 5.7-1 Summary of Environmental Impacts

Project Activities	Environmental Components Subject to Impacts	Impacts – Short Description	Mitigation Measures	Residual Environ-mental Effects	Level of Residual Impact (Table 5-1)
Construction Activities					
5.1.2 Land Clearing	flora	removal / disturbance / coverage of vegetation	clear roadss and work areas only; botanical survey by botanist; restrict activity to ROW and work areas; avoid any wetland area	None; vegetation will recover after construction.	Minimal
5.1.2 Land Clearing	fauna	habitat alteration in limited areas	avian survey; schedule to avoid nesting period; site selected because it is not pristine; limit activity to ROW and work areas;	Some impact, but limited area	Low
5.1.2 Land Clearing	employment opportunities	limited short term employment	None; no long-term in-migration or added burden on local services.	None anticipated	Minimal
5.1.2 Land Clearing	existing noise level	chain saw and equipment noise	natural distance attenuation	None anticipated	Minimal.
5.1.3 Road construction / modification	soil quality air quality (dust)	soil compaction; surface disturbance; soil erosion; admixing; lubricant dischg.	avoid steep slopes; minimize grading; stockpile topsoil and subsoil; avoid wet periods; restrict vehicles to work area; retain and stockpile soil for use; erosion and dust control measures	Some impact, but short duration	Minimal
5.1.3 Road construction / modification	flora	removal or coverage of vegetation by fill	minimize grading; limit vehicles to existing and approved work areas	Some impact, but short duration	Minimal
5.1.3 Road construction / modification	surface hydrology surface water quality	alteration of existing drainage patterns	avoid steep slopes; avoid wet periods; stockpile soil away from drainage channels; restore drainage where necessary	Some impact, but short duration	Minimal
5.1.3 Road construction / modification	existing noise levels	construction related noise	natural distance attenuation	None anticipated	Minimal
5.1.3 Road construction / modification	soil quality; surface water quality	accidental lubricant discharge	Best Management Practices, immediate clean-up, daily equipment inspection	None anticipated	Minimal
5.1.3 Road construction / modification	vehicular traffic safety issues	temporary re-direction of traffic	standard traffic control and safety measures	None anticipated	Minimal
5.1.3 Road construction / modification	employment opportunities	limited short term employment	None; no long-term in-migration or added burden on local services.	None anticipated	Minimal
5.1.4 Delivery of Equipment	safety issues	temporary disruption of local traffic	None; short period, limited number of deliveries, low traffic area, General Line has two exits	None anticipated	Minimal

Project Activities	Environmental Components Subject to Impacts	Impacts – Short Description	Mitigation Measures	Residual Environ-mental Effects	Level of Residual Impact (Table 5-1)
5.1.5 Temporary Storage Facilities	soil quality groundwater surface hydrology surface water quality flora	fill coverage; soil erosion	use previously disturbed area, minimize vegetation removal, low slope site, restore surface drainage, stockpile soil away from drainage channels	Some impact, but limited area	Minimal
5.1.5 Temporary Storage Facilities	soil quality; surface water quality	accidental lubricant discharge	Best Management Practices, daily equipment inspection	None anticipated	Minimal
5.1.5 Temporary Storage Facilities	safety issues	potential for injury to trespassers on stored equipment	contractor responsible for safe storage of construction equipment, tools and lubricants	None anticipated	Minimal
5.1.6 Foundation Construction	soil quality; flora	soil disturbance or relocation; admixing; removal or coverage of vegetation by fill	limit soil removal, vegetation removal or coverage to areas where necessary; retain and stockpile soil for use; keep soil and subsoil separate; erosion control measures	Some impact, but limited area	Low
5.1.6 Foundation Construction	surface water quality groundwater	erosion, groundwater seepage into excavations	Pump, filter and discharge seepage; contractor responsible for erosion control; keep soil away from drainage channels	Some impact, but limited area	Minimal
5.1.6 Foundation Construction	existing noise level	construction related noise	natural distance attenuation	Some impact, but short duration	Minimal
5.1.6 Foundation Construction	safety issues	temporary traffic increase	standard traffic control and safety measures	None anticipated	Minimal
5.1.6 Foundation Construction	soil quality; surface water quality	accidental lubricant discharge	Best Management Practices, daily equipment inspection	None anticipated	Minimal
5.1.7 Tower and Turbine Assembly / Installation	soil quality	compaction	limit crane operation to approved work areas	Minor impact, limited area	Minimal
5.1.7 Tower and Turbine Assembly / Installation	soil quality; surface water quality	accidental lubricant discharge	Best Management Practices, daily equipment inspection	None anticipated	Minimal
5.1.7 Tower and Turbine Assembly / Installation	existing noise level	power tool noise during assembly	natural distance attenuation	None anticipated	Minimal

Project Activities	Environmental Components Subject to Impacts	Impacts – Short Description	Mitigation Measures	Residual Environ-mental Effects	Level of Residual Impact (Table 5-1)
5.1.7 Tower and Turbine Assembly / Installation	safety issues	safety of employees working above ground	outfit and train employees with fall restraint equipment	None anticipated	Minimal
5.1.8 Interconnec-tion from Turbines to Pad Mounted Transformers	soil quality; surface water quality	soil erosion due to trenching and excavation	install erosion control measures	None anticipated	Minimal
5.1.10 Transmission Line to Power Line	soil quality; flora	minor disturbance during pole installation	utility standard practices for installation of poles and lines	None anticipated	Minimal
5.1.10 Transmission Line to Power Line	existing noise level	minor construction related noise	natural distance attenuation	None anticipated	Minimal
5.1.10 Transmission Line to Power Line	safety issues	temporary disruption of local traffic	standard traffic control and safety measures	None anticipated	Minimal
Operational Activities					
5.2.1.1 Land use	land use	potential limitations on future use; concerns about land value	adjacent lands are unoccupied forest resource or commercial blueberry operation; research indicates no negative impact on land value	Long term, but no monitoring required	Low
5.2.1.1 Land use	safety issues	safety issues related to trespassing	site is on private land, public access restricted	Long term, but no monitoring required	Low
5.2.1.2 Visual Impact	visual landscape	visual intrusion	public consultation; plant located away from community; small number of turbines; property owners supportive	Long term, but no monitoring required	Low
5.2.1.3 Noise Impacts	existing noise level	aerodynamic and mechanical noise	public consultation; plant located away from community; natural attenuation	Long term, but no monitoring required	Low
5.2.1.4 Wildlife Disturbance	birds mammals	potential injury or mortality	small number of turbines; avian avoidance instincts; avian field survey; no special status species encountered	Long term, one year mortality monitoring proposed	Low
5.2.1.5 Safety Issues	safety issues	site security, electrical and mechanical safety	trespassing prohibited; remote location; standard utility electrical safety practices; warning signage; employees outfitted and trained with fall restraint equipment	Long term, but no monitoring required	Low

Project Activities	Environmental Components Subject to Impacts	Impacts – Short Description	Mitigation Measures	Residual Environ-mental Effects	Level of Residual Impact (Table 5-1)
5.2.1.5 Safety Issues	safety issues	aircraft safety	Transport Canada regulations for lighting under reg 621.19 will be observed.	Long term, but no monitoring required	Low
Maintenance Activities					
5.2.2 Maintenance Activities	soil quality; surface water quality	accidental lubricant discharge	Best Management Practices, immediate clean up	None anticipated	Minimal
5.2.2 Maintenance Activities	safety issues	electrical and mechanical safety of employees	employees outfitted and trained with fall restraint equipment	Long term, but no monitoring required	Low
Decommissioning / Abandonment Activities					
5.3.1 Turbine / equipment removal	soil quality; surface water quality	accidental lubricant discharge, soil compaction	Best Management Practices, immediate clean up, daily equipment inspection, limit activities to work area	None anticipated	Minimal
5.3.1 Turbine / equipment removal	existing noise level	demolition and power tool noise	natural attenuation	None anticipated	Minimal
5.3.1 Turbine / equipment removal	safety issues	electrical and mechanical safety of employees	employees outfitted and trained with fall restraint equipment	None anticipated	Minimal
5.3.2 Removal of Buildings and Waste	soil quality; surface water quality	discarded materials / waste on site	all fluids and solid waste collected and transported to an approved disposal facility	None anticipated	Minimal
5.3.3 Removal of Power Line	soil quality flora	minor vegetation disturbance during pole removal	utility standard practices for pole removal	None anticipated; vegetation will recover.	Minimal
5.3.3 Removal of Power Line	existing noise level	minor construction noise	natural attenuation	None anticipated.	Minimal
5.3.3 Removal of Power Line	safety issues	temporary disruption of local traffic	standard traffic control and safety measures	None anticipated	Minimal
5.3.4 Site Remediation	soil quality surface water quality flora	disturbance of vegetation and soil surface, admixing of soil	remove vegetation only where necessary; excavation holes filled with stockpiled soil; erosion control measures; stockpile topsoil and subsoil separately	Some impact, but short term	Low
5.3.4 Site Remediation	safety issues	temporary increase in truck traffic	standard traffic control and safety measures; short period, limited number of deliveries, low traffic area, road has 2 exits	None anticipated	Minimal

Project Activities	Environmental Components Subject to Impacts	Impacts – Short Description	Mitigation Measures	Residual Environ-mental Effects	Level of Residual Impact (Table 5-1)
5.3.4 Site Remediation	soil quality; surface water quality	accidental lubricant discharge	Best Management Practices, daily equipment inspection	None anticipated	Minimal
5.3.4 Site Remediation	existing noise level	demolition noise	natural attenuation	None anticipated	Minimal
Accidents and Malfunctions					
5.4 Accidents / Malfunctions	safety issues	electrical and mechanical malfunctions and failures, blade throw	turnkey operation and performance monitoring by manufacturer; automatic shut down; separation from nearest residence	Potential impacts requiring repairs	Minimal
5.4 Accidents / Malfunctions	safety issues	electrical and mechanical safety of employees	employees outfitted and trained with fall restraint equipment	None anticipated	Minimal
5.4 Accidents / Malfunctions	soil quality surface water quality	accidental lubricant discharge	Best Management Practices, immediate clean up; units self-contained	None anticipated	Minimal
5.5.2 Extreme Events	safety issues	lightning strikes wind gusts	automatic shutdown	None anticipated	Minimal
5.5.2 Extreme Events	safety issues	ice shedding	separation from nearest residence	None anticipated	Minimal

Table 5.7-2 Summary of Cumulative Effects

Valued Ecosystem Components (VECs)	Description of Project Activity	Other Known Activities	Assessment of Cumulative Effects	Level of Cumulative Effect
soil quality surface water quality surface hydrology flora fauna land use visual landscape	site preparation and construction	land cleared for farming, clear cut forestry	Extensive past disturbance; clear cut forestry in area; botanical survey conducted; project site is small in comparison to surrounding forest resource lands.	Low
fauna	presence of turbines (habitat loss, behaviour)	roads, development, clear cut forestry	Post-construction on-site activity will be minimal; existing development and forestry patterns surrounding site are unlikely to change. Site is small in comparison to surrounding forest resource lands.	Low
fauna (birds, bats)	presence of turbines (injury / mortality)	clear cut forestry	Project is not on a major migration route; no bat hibernacula in area. No other potential sources of injury / mortality in area. No cumulative effect likely.	Low
land use	presence of turbines	clear cut forestry, watershed	Project site is surrounded by forest resource lands. Land use has remained unchanged for decades.	Low
ambient noise levels	noise from turbines	forestry operations	Sporadic noise from forestry operations in area. Turbines are far enough from residences that cumulative effect with other noise sources is unlikely.	Low
visual / aesthetic impacts	presence of turbines	none	No other prominent structures or industrial buildings in area to cause cumulative impact.	Low
socio-economic effects	construction and operation of plant	local economy and development, current land values	Short-term employment and economic benefits during construction phase. Property values expected to remain unchanged. Existing population, settlement, employment expected to remain unchanged. No in-migration or tourism anticipated as a result of project.	Low
safety issues	safety of workers, area residents	forestry operations, catastrophic events	Highly-trained construction and maintenance staff equipped with fall prevention equipment. Project on private land, site access restricted. No additional burden on local emergency services as a result of project.	Low

SECTION 6. MONITORING AND FOLLOW-UP MEASURES

Given the minimal and low impact classifications for all activities associated with this project, a one-year mortality monitoring programme for birds and bats is proposed. The proponent will maintain a file and respond to written concerns about environmental impacts of the project on an ongoing basis.

Upon completion of the construction phase, the site will be inspected to ensure that any areas that require re-seeding, restoration of surface drainage, erosion control, or other reclamation measures have been adequately addressed. As turnkey operator of the project, the manufacturer will ensure that all site personnel adhere to general environmental protection measures and specific mitigation measures proscribed for development of this site.

Although the project is expected to have no long-term impact on local bird populations, the proponent will document cases of avian injury and mortality as per CWS protocol for one year. Based on the outcome from this monitoring, and provided there are no adverse effects, should a second phase occur, the proponent in consultation with Environment Canada and Canada will determine at that time if a second monitoring phase is required.

SECTION 7. PUBLIC CONSULTATION

CEAA requires that the proponent hold information session(s) to inform the public about the project and to give them the opportunity to raise concerns about the project. A summary of the consultation process for this project is presented in this section.

Time and Date of Public Consultation Session: 2 – 4 pm, Sunday June 27, 2004

Location : Creignish Community Hall, Creignish, Inverness County

Publicity for Session:

Detailed advertisement in the Inverness area Oran, Friday June 18th;
Detailed advertisement in the weekly Port Hawkesbury area Reporter, Friday June 18th;
Notification of community through Stella Maris Parish Council and Church ;
Posting in community by Parish Council
Emails to MP, MLA, County Council, District Planning Commission, Regional Development Authority.

Weather: sunny and cool

Approximately 35 local residents attended the session.

Information Provided by Proponent

Detailed poster presentation on project background, proponent, & location;
Maps and photographs of the site;
General information on wind energy with photographs of several existing wind farms;
Project Description;
Manufacturer model, brochures and posters;
Information on financing, including community economic development fund;
Response form.

In addition, the proponent was available to answer any questions or respond to concerns about the project.

Comments

As described previously the public consultation was for a proposed project site immediately behind Creignish. Due to technical difficutlies with NSPI line interconnection using the Vestus machine the proponent selected a differnt manufacturer and larger turbine. The project was therefore moved to Creignish Rear approximately 2 km further inland, where a larger land base could be secured. This area is away from the community of Creignish, has few families (5) in the immediate vicinity of the project, and has the support of the land owners.

At the public consultation attendees were invited to provide written comments on the project for inclusion in the environmental impact statement. About thirty-five members of the community attended the public meeting. Of these, only three completed the questionnaire, and their responses were favorable toward the project. A fourth attendee distributed a handout highlighting her concerns to those in attendance, but not directly to the proponent.

This was the only person who expressed concerns about the project. As this person's concerns were about the proximity of the turbine to the community and in particular her property and the project has since been relocated, these concerns have been addressed. Two other individuals were interested in receiving information on prospective investment opportunities, which seems to implicitly indicate support for the project.

Written comments have been transcribed and one hand written submission are included in their entirety in Appendix II.

SECTION 8. FIRST NATIONS CONSULTATION

As described in previous sections of this report, the Creignish area is not likely to have had aboriginal settlement in the Pre-Contact period. The nearest First Nations community in Cape Breton is Waycobah (50 km). Afton is the closest First Nations community on the mainland (45 km). There is no documented history of aboriginal inhabitation or resource use, nor are there any known aboriginal heritage sites in the vicinity of the project.

For these reasons, no consultation with First Nations is planned.

SECTION 9. CONCLUSIONS

Black River Wind Limited's Wind Energy Project at the Creignish Site is not a large wind farm development. This site was chosen in part because environmental impacts of development at this location are expected to be minimal. The wind turbines will be located on heavily disturbed land using an existing access road. Construction activities will be of short duration, and the affected area (< 13 ha) will be quite small. There are no culturally or archaeologically significant areas in proximity to the site. There are no standing or moving bodies of water, areas of significant habitat or migration routes at the project site. The field studies did not identify any special status species of flora or fauna.

It is the opinion of the proponent that the size and design of the project, along with proposed mitigation measures and general environmental protection procedures will ensure that the project will have minimal overall environmental impact.

Appendix I. Letter of Support from the Strait-Highlands RDA.

Inverness County * Port Hawkesbury * Richmond County
Strait - Highlands
REGIONAL DEVELOPMENT AGENCY

July 8, 2004

Mr. Neal Livingston, President
Black River Hydro Limited
P. O. Box 55
Mabou, Nova Scotia
B0E 1X0

Dear Mr. Livingston :

The Strait-Highlands Regional Development Agency (S-HRDA) has a planning/facilitating role in community economic development, opportunity identification and project development. In October, 2002, the S-HRDA delivered a workshop on Sustainable Community Energy Systems for the Strait Highlands Region. Response to the workshop was positive and participants expressed interest in learning more about the subject matter.

As a follow up to this Energy Systems workshop, the S-HRDA hosted on March 24, 2004, an "Innovation Town Hall" conference on "Climate Change and Energy Needs". The overall recommendation of the attendees is to approach the development of a sustainable community energy strategy.

The S-HRDA is aware that Black River Hydro Limited is currently investigating the establishment of wind generated energy from turbines in the Creignish Mountain and Mabou Highlands region of Inverness County. The S-HRDA would see this project as a positive development in the region and would lead to a sustainable community energy strategy.

Cordially yours,

Blaine A. Gillis
Chief Executive Officer

32 Paint Street, Unit 5 , Port Hawkesbury, NS, B9A 3J8
Tel: (902) 625-3929 Fax: (902) 625-1559
email: vmacdona@strait-highlands.ns.ca Toll Free: 1-800-546-3390 Web Site: www.strait-highlands.ns.ca

Appendix II. Community Consultation Survey and Comments

Transcribed Comments

1. Hugh MacDonald, Parish Priest: "It was very informative. I think it is a very sound idea, particularly from an environmental point of view."

2. Iain MacDonald, Resident: "Interesting…environmentally responsible. This is a new technology; there really isn't a lot of historical data on this subject. Tangible benefits seem to be nil. The proposed rental income is really a non-factor. Benefits would be subject to individual estimates. Same with negative aspects."

3. Richard MacIssac, Resident: I think it is a great project, (I'd) like to see the community be able to profit from this some how. These projects are more eye pleasing than rock quarries etc. This should be expressed more."

4. Two others in attendance left their contact information so they could receive information about prospective investment opportunities.

5. A hand-written submission by Ms. Sandra Buker, the only opponent to the project follows. As previously noted the project site has since been relocated.

Re: ENVIRONMENTAL IMPACT of WIND TURBINES ON CREEGNISH MTN - NEIL LIVINGSTON, BLACK RIVER HYDRO LTD. PROPOSAL

ISSUES: ① Proximity to & proposed homes
② devaluation of ALL LAND on CREEGNISH MTN.
③ Safety
④ Liability
⑤ Noise AND Visual Pollution
⑥ Proof of PRIOR SUCCESS in developing AND implementing A WIND project of similar scale

We Refused NEIL LIVINGSTON because of the following considerations

① WIND TURBINES seriously affect 10 year LAND use plan on our PROPERTY AND will cause devaluation of ALL these properties AT TOP of CREIGNISH MTN - one of the most beautiful views in

② THIS AREA CONSISTENTLY SHOWS HIGH forest FIRE DANGER when every o AREA is cold. WHEN it does RAIN it quickly gushes off the mtn. dou guts.

③ EXISTING small power LINE which goes through our property CANNOT be ADEQUATELY MAINTAINED because of A cliff + bog that it PASSES OVER. I HAVE been told it is A fire hazard A disaster WAITING to HAPPEN + NOT to WALK on it!

④ We will not ALLOW POWER LINES to PASS over OR through our PROPERTY. the mountain property has received A lot of CARE AND WAS PURCHASED because of its beauty + peacefulness 10 years AGO - AS well AS to MAINTAIN the integrity of the MOUNTAIN BACKING the community visually.

⑤ PROJECT is of NO BENEFIT to community AND will in effect HARM it by changing PRESENT LAND use + future PLANS.

⑥ It is yet to be determined where the LIABILITY LIES in these CASES, ESPECIALLY IN ONE AS COMPLICATED AS THIS. MILLIONS of dollars of INSURANCE will BE NECESSARY for both PARISH members on the PARISH COUNCIL, ANY other LAND owner involved AND MR. NEIL LIVINGSTON AND his COMPANIES.
ie. who is liable in CASE of fire?
A Power surge which destroys N.S. Power equipment?
PROPERTY DAMAGE
CHANGES in REAL ESTATE VALUE of SURROUNDING properti
⑦ ASK yourself - would you RATHER buy A house with OR WITHOUT A WIND TURBINE NEXT TO you?

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7. When N.S. Power is deregulated CREIGNISH might benefit by its own project ACROSS the TOP ON LAND with Lesser value — but when that time comes it will be a community project that receives its own government money etc. AND ALL of the benefits.

8) To sign AWAY rights AND be tied up for 20 years is risking future LAND use with NO benefit to either adjoining LAND owners OR the parish.

9) The "discovery" process requires signing on - once done, NO MATTER what information might be unearthed concerning these companies, N.S. Power, LIABILITY issues, safety issues - there is NO turning back.

10) I am requesting A comprehensive ENVIRONMENTAL IMPACT STUDY AS WELL AS A PROVINCIAL ONE, because, strangely, 660 KW CAPACITY just sneaks under the provincial regulation for 2 Mega WATT CAPACITY ASSESSMENT.

Andrea Burke
Creignish
June 27 2007

Proposed Black River Wind Limited Wind Energy Project
Open House

Thank you for taking the time to visit us today. To help us learn about environmental factors of local importance that may have a bearing on the proposed wind energy project, please complete this questionnaire. You can submit it now or forward via the contact information below, before July 3rd.

Your comments will be recorded in the Environmental Assessment Report, along with your name. To include comments, the following contact information must be complete.

Name:_____

Address:__

Phone No:_____

1. Did this open house provide the information that you needed or expected? What additional information would you have liked?

_____

_____

_____

_____

2. What do you think about the proposed wind energy project? What leads you to this conclusion?

_____

_____

_____

3. Please identify any historical, cultural, archaeological, geological or biological features associated with or adjacent to the project site that we should be aware of.

_____

_____

_____

4. Please identify what you believe the community could stand to gain or lose from this project?

_____

_____

_____

5. Please provide any additional comments or questions you may have about this project.

_____

_____

_____

_____

_____

Appendix III. Best Management Practices to Prevent Accidental Discharge of Lubricants

The construction contractor and wind plant operations and maintenance staff shall adhere to the following practices to prevent accidental discharge of **oil**, **lubricants**, and **hydraulic fluid**, as well as **spent oil**, **oil-soaked absorbent materials** and **filters**.

1) An impervious, oil-proof tarp must be placed on the ground surrounding equipment that contains oil or hydraulic fluid prior to performing maintenance activities. If any leakage occurs, the tarp must be thoroughly cleaned using absorbent materials, which must then be disposed of as directed in practice (3).

2) Maintenance of mobile equipment, such as construction machinery, must be performed at least 15 m (50 feet) from the nearest water body or wetland area to minimize the potential for water pollution. Mobile equipment must be removed from the site for cleaning / washing.

3) Spent oil, lubricants, hydraulic fluid, absorbent materials and filters must be collected in oil proof containers and removed from the project site for disposal in an appropriate manner.

4) Oil, lubricants and hydraulic fluid must be stored in a secure enclosure or vehicle when not in use, preferably at least 15 m (50 feet) from the nearest water body or wetland area. The fluids must be placed in locked storage overnight.

5) Equipment must be maintained to a high standard. Any noticeable leakage of oil, lubricants or hydraulic fluid must be reported to the onsite manager immediately. Leaking mobile equipment must be removed from the site for inspection. Turbines must be shut down and inspected. Practice (1) must be followed during the inspection.

6) Any equipment that will operate in or near water bodies or wetlands must be inspected for leaks by the onsite manager prior to beginning operation. If leaks are found, practice (5) must be followed.

Appendix IV: Avian Survey

Bird Survey Results for the proposed wind turbine sites at Creignish Rear, Nova Scotia.

Randy Lauff, M.Sc.

Methods: Birds were surveyed at the proposed wind turbine site on 23 June 2005. The survey was carried out during the early to late morning. Due to their close proximity, the two sites at Creignish Rear were recorded as one for the purpose of this report; undoubtedly, many of the birds freely move between the two properties routinely, so separating them out would be biologically meaningless. Having said that, bird numbers for the sites west (010) and east (006, 007) of General Line are tabulated independently.

As instructed, after I surveyed the area around site 010 I traveled in a north to northwest direction, to another site under consideration approximately 300 m away. The areas around these two sites, and also sites 006+007 (across the road) were surveyed by sight and sound, by following roads and roads, as well as walking through and around clearings and forested areas.

Results:

General site description, 006+007: These sites are composed primarily of commercial blueberry field and young forest. The forest is made up of primarily red maple and yellow birch, stands of which were only three to eight meters in height.

General site description, 010 + northwards: This area is made up of scattered young trees (large saplings in many cases), dominantly hardwoods with some balsam fir, suggesting regrowth from a clear cut in the not too distant past. Towards the northern aspect, the area looks more untouched, with black spruce dominating.

None of the birds found at the study sites is listed Federally, Provincially or by the ACCDC at any level which would warrant attention (i.e. all are secure). The sites have habitats which are abundantly represented in the Province, and therefore the chance of finding something rare is lower. The rarer species tend to be found in less common habitats (e.g. saltmarsh, old growth forest, etc.). The sites are not representative of essential overwintering habitat, and are not known to be along a migratory route, though the dearth of birders in the vicinity may bias this knowledge. Although migratory routes in Atlantic Canada are not completely understood, the sites surveyed for this proposed project do not geographically resemble any of the known migratory routes in the region (i.e. there is no geographic funnel to these sites, nor is the site along the coast).

Erskine (1992) indicates a probable nesting of Bobolink somewhere within the 10 km square which includes the study site. There was suitable habitat (a field bordered by scattered trees and shrubs) for this species approximately 330 m east of site 010. No Bobolinks were identified during the survey. The Vesper Sparrow (provincially listed as Yellow) is well known to use blueberry fields; I had been alerted to the fact that I would encounter blueberry fields, so I was particularly alert for this uncommon species; none

was encountered. The other species encountered during the atlassing years (Erskine 1992) in the 10 km square which harbours these sites are listed in the appendix. Only the Brown Thrasher record (listed as a *possible* breeder) is of any note (ranked by the ACCDC as S1S2B, G5). This species was only positively documented as a breeding bird in NS in 2002, and that record was hundreds of kilometres to the south of the study sites. I am unaware of any other confirmed records for the province and suggest that Brown Thrashers breeding anywhere near the study sites is extremely unlikely.

Department of Natural Resources Consultation: I requested information from Lawrence Benjamin, DNR (Terrestrial Habitat) regarding any species of concern at or near this site (and the Cape Mabou site). His reply for is as follows:

> "I ran a GIS query and there are no records for birds within 3km of the location you gave near Creignish Rear."

Table 2. Birds present at the two Cape Breton sites, 23 June 2005. None are Federally or Provincially ranked at any level of concern.

				study sites		
GLOBAL NAME	**COMMON NAME**	**G-RANK**	**S-RANK**	**006/007**	**010**	**totals**
Falco sparverius	American Kestrel	G5	S5B		1	1
Falcipennis canadensis	Spruce Grouse	G5	S5		1[28]	1
Bonasa umbellus	Ruffed Grouse	G5	S5		1[1]	1
Zenaida macroura	Mourning Dove	G5	S5B	1	2	3
Ceryle alcyon	Belted Kingfisher	G5	S5B	1		1
Colaptes auratus	Northern Flicker	G5	S5B		1	1
Contopus virens	Eastern Wood-Pewee	G5	S5B		2	2
Contopus cooperi	Olive-sided Flycatcher	G5	S4S5B	1	1	2
Empidonax alnorum	Alder Flycatcher	G5	S5B	5	1	6
Empidonax minimus	Least Flycatcher	G5	S5B	1		1
Cyanocitta cristata	Blue Jay	G5	S5	3	1	4
Corvus brachyrhynchos	American Crow	G5	S5	3	3	6
Corvus corax	Common Raven	G5	S5	2		2
Poecile atricapillus	Black-capped Chickadee	G5	S5	3		3
Poecile hudsonica	Boreal Chickadee	G5	S3S4	1		1
Regulus satrapa	Golden-crowned Kinglet	G5	S5B	1		1
Regulus calendula	Ruby-crowned Kinglet	G5	S5B	2	1	3
Catharus guttatus	Hermit Thrush	G5	S5B	2		2
Turdus migratorius	American Robin	G5	S5B	3		3
Vireo olivaceus	Red-eyed Vireo	G5	S5B	2		2
Vermivora ruficapilla	Nashville Warbler	G5	S5B		2	2
Parula americana	Northern Parula	G5	S5B	1		1
Dendroica magnolia	Magnolia Warbler	G5	S5B	2	2	4
Dendroica virens	Black-throated Green Warbler	G5	S5B	2		2
Mniotilta varia	Black-and-White Warbler	G5	S5B	2		2
Seiurus aurocapillus	Ovenbird	G5	S5B	3		3
Oporornis philadelphia	Mourning Warbler	G5	S5B	1	1	2
Passerculus sandwichensis	Savannah Sparrow	G5	S5B	1		1
Melospiza melodia	Song Sparrow	G5	S5B	1		1
Melospiza lincolnii	Lincoln's Sparrow	G5	S5B		1	1
Zonotrichia albicollis	White-throated Sparrow	G5	S5B,SZN	3	4	7
Junco hyemalis	Dark-eyed Junco	G5	S5	5	3	8
Quiscalus quiscula	Common Grackle	G5	S5B	4		4
Carduelis pinus	Pine Siskin	G5	S5	1		1
Carduelis tristis	American Goldfinch	G5	S5	3	60	63

[28] Female with brood.

Summary: For the most part, the Creignish Rear study sites do not consist of pristine habitat, nor anything close to pristine; most of the area at the sites have undergone clear cutting in the recent past, though do have a small variety of trees and shrubs at different stages of growth. None of the trees can be described as old or even large. The site is made up of habitats which are abundantly represented in Nova Scotia. Were a rare species to be displaced by this project, the individuals would have no trouble finding similar habitat. The only truly natural area is the seemingly undisturbed black spruce forest north of site 010. However, the area harbouring this habitat is not large, and is abundantly represented elsewhere.

The areas do not match known geographic parameters of migration routes and would not likely contribute to extraordinary avian mortality.

I feel the proponents have carefully chosen their proposed site and that the impact on birds will be minimal, if not negligible.

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Surveys and Databases utilized:

Atlantic Canada Conservation Data Center

Appendix table: The historic breeding status of birds recorded in the vicinity of the study site and the status of the populations as interpreted at the Provincial level (if not green; all are Federally secure). Breeding codes: po=possible, pr=probable, c=confirmed (Erskine 1992). ACCDC rankings are listed separately after this table.

GLOBAL NAME	COMMON NAME	Atlas breeding code	G-RANK	S-RANK	Provincial Ranking
Phalacrocorax auritus	Double-crested Cormorant	po	G5	S5B	
Ardea herodias	Great Blue Heron	po	G5	S5B	
Haliaeetus leucocephalus	Bald Eagle	po	G4	S5B,S3N	
Buteo jamaicensis	Red-tailed Hawk	po	G5	S5B	
Falco columbarius	Merlin	po	G5	S3S4B	
Actitis macularia	Spotted Sandpiper	po	G5	S5B	
Ceryle alcyon	Belted Kingfisher	c	G5	S5B	
Sphyrapicus varius	Yellow-bellied Sapsucker	po	G5	S5B	
Picoides pubescens	Downy Woodpecker	po	G5	S5	
Picoides villosus	Hairy Woodpecker	pr	G5	S5	
Colaptes auritus	Northern Flicker	pr	G5	S5B	
Dryocopus pileatus	Pileated Woodpecker	po	G5	S5	
Contopus cooperi	Olive-sided Flycatcher	po	G5	S4S5B	
Contopus virens	Eastern Wood-Pewee	po	G5	S5B	
Empidonax flaviventris	Yellow-bellied Flycatcher	po	G5	S5B	
Empidonax alnorum	Alder Flycatcher	po	G5	S5B	
Empidonax minimus	Least Flycatcher	po	G5	S5B	
Tachycineta bicolor	Tree Swallow	c	G5	S5B	
Riparia riparia	Bank Swallow	po	G5	S5B	
Hirundo rustica	Barn Swallow	po	G5	S5B	
Perisoreus canadensis	Gray Jay	c	G5	S5	
Cyanocitta cristata	Blue Jay	po	G5	S5	
Corvus brachyrhynchos	American Crow	po	G5	S5	
Corvus corax	Common Raven	po	G5	S5	
Poecile atricapillus	Black-capped Chickadee	po	G5	S5	
Poecile hudsonica	Boreal Chickadee	po	G5	S3S4	
Troglodytes troglodytes	Winter Wren	po	G5	S5B	
Regulus satrapa	Golden-crowned Kinglet	po	G5	S5B	
Regulus calendula	Ruby-crowned Kinglet	c	G5	S5B	
Catharus ustulatus	Swainson's Thrush	po	G5	S5B	
Catharus guttatus	Hermit Thrush	po	G5	S5B	
Turdus migratorius	American Robin	c	G5	S5B	

Toxostoma rufum	Brown Thrasher	po	G5	S1S2B	
Bombycilla cedrorum	Cedar Waxwing	po	G5	S5B	
Vireo solitarius	Blue-headed Vireo	pr	G5	S5B	
Vireo olivaceus	Red-eyed Vireo	c	G5	S5B	
Vermivora peregrina	Tennessee Warbler	po	G5	S5B	
Parula americana	Northern Parula	po	G5	S5B	
Dendroica petechia	Yellow Warbler	po	G5	S5B	
Dendroica magnolia	Magnolia Warbler	c	G5	S5B	
Dendroica caerulescens	Black-throated Blue Warbler	po	G5	S5B	
Dendroica coronata	Yellow-rumped Warbler	pr	G5	S5B	
Dendroica virens	Black-throated Green Warbler	po	G5	S5B	
Dendroica fusca	Blackburnian Warbler	po	G5	S4S5B	
Dendroica palmarum	Palm Warbler	po	G5	S5B	
Dendroica castanea	Bay-breasted Warbler	po	G5	S5B	
Mniotilta varia	Black-and-White Warbler	po	G5	S5B	
Setophaga ruticilla	American Redstart	po	G5	S5B	
Seiurus aurocapillus	Ovenbird	po	G5	S5B	
Oporornis philadelphia	Mourning Warbler	c	G5	S5B	
Geothlypis trichas	Common Yellowthroat	c	G5	S5B	
Wilsonia canadensis	Canada Warbler	po	G5	S5B	
Spizella passerina	Chipping Sparrow	po	G5	S5B	
Melospiza melodia	Song Sparrow	c	G5	S5B	
Melospiza lincolnii	Lincoln's Sparrow	pr	G5	S5B	
Melospiza georgiana	Swamp Sparrow	po	G5	S5B	
Zonotrichia albicollis	White-throated Sparrow	po	G5	S5B,SZN	
Junco hyemalis	Dark-eyed Junco	po	G5	S5	
Dolichonyx oryzivorus	Bobolink	po	G5	S3B	yellow
Agelaius phoeniceus	Red-winged Blackbird	pr	G5	S5B	
Euphagus carolinus	Rusty Blackbird	po	G5	S3S4B	
Quiscalus quiscula	Common Grackle	po	G5	S5B	
Pinicola enucleator	Pine Grosbeak	po	G5	S5	
Carpodacus purpureus	Purple Finch	pr	G5	S5B	
Carduelis pinus	Pine Siskin	po	G5	S5	
Carduelis tristis	American Goldfinch	pr	G5	S5	
Coccothraustes vespertinus	Evening Grosbeak	po	G5	S5	

ACCDC Ranks

Subnational Rank Definitions: S-ranks

S1	Extremely rare throughout its range in the province (typically 5 or fewer occurrences or very few remaining individuals). May be especially vulnerable to extirpation.
S2	Rare throughout its range in the province (6 to 20 occurrences or few remaining individuals). May be vulnerable to extirpation due to rarity or other factors.
S3	Uncommon throughout its range in the province, or found only in a restricted range, even if abundant in at some locations. (21 to 100 occurrences).
S4	Usually widespread, fairly common throughout its range in the province, and apparently secure with many occurrences, but the Element is of long-term concern (e.g. watch list). (100+ occurrences).
S5	Demonstrably widespread, abundant, and secure throughout its range in the province, and essentially ineradicable under present conditions.
S#S#	Numeric range rank: A range between two consecutive numeric ranks. Denotes uncertainty about the exact rarity of the Element (e.g., S1S2).
SH	Historical: Element occurred historically throughout its range in the province (with expectation that it may be rediscovered), perhaps having not been verified in the past 20 - 70 years (depending on the species), and suspected to be still extant.
SU	Unrankable: Possibly in peril throughout its range in the province, but status uncertain; need more information.
SX	Extinct/Extirpated: Element is believed to be extirpated within the province.
S?	Unranked: Element is not yet ranked.
SA	Accidental: Accidental or casual in the province (i.e., infrequent and far outside usual range). Includes species (usually birds or butterflies) recorded once or twice or only at very great intervals, hundreds or even thousands of miles outside their usual range.
SE	Exotic: An exotic established in the province (e.g., Purple Loosestrife or Coltsfoot); may be native in nearby regions.
SE#	Exotic numeric: An exotic established in the province that has been assigned a numeric rank.
SP	Potential: Potential that Element occurs in the province, but no occurrences reported.
SR	Reported: Element reported in the province but without persuasive documentation which would provide a basis for either accepting or rejecting the report (e.g., misidentified specimen).
SRF	Reported falsely: Element erroneously reported in the province and the error has persisted in the literature.
SZ	Zero occurrences: Not of practical conservation concern in the province, because there are no definable occurrences, although the species is native and appears regularly. An NZ rank will generally be used for long distance migrants whose occurrences during their migrations are too irregular (in terms of repeated visitation to the same locations) or transitory. In other words, the migrant regularly passes through the province, but enduring, mappable Element Occurrences cannot be defined.

Global Rank Definitions: G-ranks

G1 Critically imperilled Globally because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of extreme vulnerability to extinction due to some natural or man-made factor.

G2 Imperilled Globally because of rarity (6 to 20 occurrences or less than 3000 individual) or because of vulnerability to extinction due to some natural or man-made factor.

G3

Either very rare and local throughout its range (21 to 100 occurrences or less than 10,000 individuals) or locally in a restricted range or vulnerable to extinction from other factors.

G4 Apparently secure Globally (may be rare in parts of its range).

G5 Demonstrably secure Globally.

GH Of historical occurrence throughout its range, may be rediscovered.

GX Believed to be extinct throughout its range.

GXC Extirpated in the wild but still known from captivity or cultivation.

G#? Tentative rank (eg.G2?)

G#G# Range of rank; insufficient data to assign specific Global rank (eg.G2G3).

G#T# Rank of a taxonomic subgroup such as a subspecies or variety; the G portion of the rank refers to the entire species and the T portion refers to the specific subgroup; numbers have same definitions as above (eg.G3T1).

G#Q Rank of a questionable species - ranked as species but questionable whether it is a species or subspecies; numbers have same definitions as above (e.g. G2Q).

G#T#Q Same as above, but validity as subspecies or variety is questioned.

GU Due to lack of information, no rank or range can be assigned.

G? Not yet ranked (temporary).

Qualifiers

Breeding Status

B Breeding: Basic rank refers to the breeding population of the element in the province.

M Non-breeding, Migratory: Basic rank refers to the non-breeding migratory population of the element in the province.

N Non-breeding: Basic rank refers to the non-breeding population of the element in the province.

Other

? Inexact or uncertain: for numeric ranks, denotes inexactness, e.g., SE? denotes uncertainty of exotic status. (The ? qualifies the character immediately preceding it in the SRANK)

C Captive or cultivated: Element is presently extant in the country or province only in captivity or cultivation.

Appendix V: Botanical Survey

Vegetation Assessment of Proposed Creignish Rear Wind Farm, Inverness County, Nova Scotia

Methods

The vegetation in the area proposed to support up to six wind turbines was assessed by Barry R. Taylor B.Sc., M.Sc., Ph.D. (St. Francis Xavier University), assisted by Mr. Ian Bryson, B.Sc. (St. FX) on 10 and 11 September 2005. We walked over all the areas where disturbance was anticipated from the towers themselves, or from staging areas where they would be assembled, as well as access roads and possible electrical transmission corridors. Information on the probable locations of the wind turbines was provided by the project proponents.

The area surveyed comprises two disjunct sites, both exposed hilltops on opposite sides of the General Line near Creignish Rear, Inverness County. The Alyre Pitre property, on the northeast side of the valley, is an area of second growth mixed forest and blueberry fields intersected by bulldozed logging roads. The Alan Edmund property, on the southwest side, includes a large clearcut and an open area which appears to have suffered dieback of softwoods, possibly following a spruce budworm infestation. Blueberry fields lie downslope from the site. The entire area is easily accessible. Weather on 10 September was variable and at times rainy but the following day was sunny.

A new turbine location was added south of the Edmund property after the original survey. The new site, a small clearcut, is on a second property owned by Alyre Pitre and lies about 350 m upslope from his residence. This new site, referred to here as Pitre Property (Southwest) was inspected by Barry R. Taylor on 17 September 2005. Weather that day was overcast and rainy.

Potential species of concern for Inverness County were extracted from the listings of the Atlantic Canada Conservation Data Centre, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Nova Scotia Department of Natural Resources. We walked through all the habitat types at the study site, making note of the nature and species composition of the vegetation whenever it changed. Sensitive habitats, or those likely to support rare or unusual species were noted and geo-referenced with a GPS unit, and a photograph was taken of each habitat. We searched specifically for habitat suitable for rare species identified as potentially present in the area. Specimens of less obvious

species were taken back to St. Francis Xavier University for identification. All taxonomy follows Zinck (1998).

Site Description

The areas surveyed are shown in Figure 1; names in text in capital letters refer to points identified on the map. A complete list of all species identified at the site is given in Table 1.

Pitre Property (Northeast)

The northeast Pitre property can be subdivided into three habitat types: young forest (Turbine 5), blueberry fields (Turbines 4 and 6) and roadsides. The forest at the most northerly turbine site (WIND1), and throughout the northeast Pitre property, is a dense hardwood-dominated forest, perhaps 25-30 years old, growing on sandy soil strewn with boulders. Old stumps from earlier harvesting are evident throughout. The overstorey is mostly red maple and yellow birch, with some white birch, American beech and balsam fir, the latter barely penetrating to the canopy. A few very large pin cherry appear to be remnants of an earlier forest community.

The understorey here is a carpet of ferns, predominantly evergreen wood fern *(Dryopteris intermedia*) with a few northern beech fern (*Phegopteris connectilis*) on rocky outcrops. Hay-scented fern (*Dennstaedtia punctilobia*) becomes dominant wherever shade is relieved. The forest floor is populated with typical forest herbs such as bunchberry, lily-of-the-valley, wood-sorrel, violets, woodland sedges, and moss. Approximately 110 m from the access road (EDGE1), the forest ends at a much younger clearcut supporting a dense, shoulder-high thicket of mostly the same species listed above.

No species of concern were observed at this site. Although some woodland species such as orchids could easily have been missed because of the lateness of the season, this frequently disturbed land is hardly suitable habitat for species favouring mature forests. The remainder of the forests on the northeast Pitre property were similar to the site surveyed in detail. All are young, dense, dominated by hardwoods, and frequently interrupted by harvesting.

The other two turbines on the Pitre property (WIND2, WIND3) would be raised on land already severely disturbed and managed as commercial blueberry fields. These sites support a surprisingly diverse assemblage of agricultural weeds, wildflowers, grasses, shrubs and brambles along with the dominant low-bush blueberry (*Vaccinium angustifolium*). The upper site (WIND3) which has not been recently harvested, is succeeding to bush-size red maple and pin cherry, along with blackberries, bristly sarsparilla (*Aralia hispida*) and meadow-sweet (*Spiraea alba*). Ferns and perennial wildflowers, especially goldenrods (*Solidago puberula*, *S. rugosa*, *Euthamia graminifolia*) and asters (*Aster lateriflorus*, *A. novi-belgii*, *A. umbellatus*) are also common here. While the richness of the plant assemblage is impressive, none of these species are of special note, and there is no suitable habitat in these exposed, managed fields for species of concern.

Roadside vegetation was inspected because upgrades to the present logging roads will be necessary to accommodate the turbines and their towers. For the most part, the roadside vegetation consisted of young or dwarfed specimens of the woody forest species, accompanied by typical wildflowers and herbaceous vegetation as can be seen along any rural road in northern Nova Scotia. A common grass, brown top (*Agrostis capillaris*) formed a lawn over the logging roads in drier areas. In roadside ditches and wet depressions, the vegetation of wildflowers and old field species was replaced by wetland plants such as bulrushes (*Scirpus cyperinus*, *S. atrovirens*), bog aster (*Aster nemoralis*), waterside sedges (*Carex gynandra*) and rushes (*Juncus effusus, J. brevicaudatus*). Again, while the diversity of the vegetation is high, all of these species are common in disturbed areas where sunlight is abundant and competition is low.

The logging road connecting the two blueberry fields (between WIND1 and WIND2) crosses a small stream, <0.5 m wide. A dense thicket of streamside vegetation grows here: boneset (*Eupatorium perfoliatum*), marsh St. John's-wort (*Triadenum fraseri*) sedges (*Carex gynandra, C. lurida*), soft rush, tear-thumb (*Polygonum sagittatum*) turtlehead (*Chelone glabra*), rattlesnake grass (*Glyceria canadensis*) and creeping buttercup (*Ranunculus repens*), among others. This small habitat supported a few specimens of touch-me-not, probably the common *Impatiens capensis*. The uncommon pale touch-me-not (*I. pallida*) cannot be distinguished without flowers. The streamside supported only a few plants. This road would not be used for access to the wind turbines.

Edmund Property

The Edmund property, a windy hilltop above blueberry fields, lies across the valley from the northeast Pitre property. This site encompasses two habitat types. The area nearest the access road (RIDGE, a farm lane) is a slowly regrowing clearcut, perhaps 10-20 years old. The site is open, with a sparse, clumped overstorey of pin cherry (*Prunus pensylvanica*) and grey birch (*Betula populifolia)*, with lesser numbers of white birch and small balsam fir. The occasional shrubs are mostly false holly (*Nemopanthus mucronata*) and red-berried elder (*Sambucus racemosa*).

The understorey here is a dense, unbroken mat of ferns, dominated by hay-scented fern and bracken fern, with a few New York fern (*Thelypteris noveboracensis*). The land surface is hummocks and hollows interrupted by rocky outcrops; old stumps and woody debris are evidence of recent cutting. Beneath thickets of young trees, the ferns are replaced by a sparse ground cover of bunchberry (*Cornus canadensis*), gold-thread and lily-of-the-valley. Scattered asters (*A.acuminatus*, *A. umbellatus*) and rough goldenrod (*Solidago puberula*) were the other common herbaceous plants.

Beginning approximately 150 metres along the ridge (near WIND4), a slightly different second habitat is evident. This area is largely open, and contains many standing dead conifer trunks, suggesting an outbreak of spruce budworm. Dense thickets of young balsam fir, grey birch and red maple are scattered throughout. While ferns persist in the understorey, the unbroken carpet observed earlier is replaced here with a more diverse assemblage of blueberries (*Vaccinium* spp.), brambles (*Rubus* spp.), meadow-sweet, wood aster (*Aster acuminatus*), narrow-leaved goldenrod (*Euthamia graminifolia*), club-moss (*Lycopodium clavatum*), and moss. A stand of robust black spruce (*Picea mariana*) occurs just off the top of the hill, underlain with rhodora (*Rhododendron canadense*), at least two species of sedge (*Carex* spp.) and moss. A hummocky grass, too advanced to be identified, occurred sporadically.

The open, standing-dead habitat is extensive, and uniform in vegetation structure across the hill. We found no species of special interest anywhere at this site, nor does it seem likely that any species of concern would occur in this highly disturbed habitat. Below the hilltop (west), in the vicinity of the third wind turbine, lies a small (1-2 ha), open bog

(BOG), supporting characteristic species such as stunted black spruce and cotton-grass (*Eriophorum virginicum*). Large numbers of pink ladies'- slippers (*Cypripedium acaule*) were discovered under large spruce at the edge of the bog. This site may support other species, especially orchids, which may be of conservation interest. The bog lies 40-50 m downslope from the hilltop and therefore should not suffer any disturbance from the proposed wind turbines.

Access roads and a power line right-of-way would create further disturbance at the Edmund property between the hilltop and the General Line at the valley bottom. These linear disturbances would follow the edge of intensely managed blueberry fields, which support a subset of the unexceptional plant species observed at the northeast Pitre site.

Pitre Property (Southwest)

Another potential location for a wind turbine near the Edmund property was briefly inspected a week after the other sites. This turbine would be located 350 m southeast from the nearest location described above, along the same line of hills (NEWIND). A continuation of the laneway to the Pitre residence provides access.

Most of this site is an open clearing recovering from recent harvesting, probably within the previous 5-10 years. Surviving trees are white spruce, white and yellow birch and pin cherry. Seedlings of red maple, white spruce and balsam fir are coming up in the understorey. Counts of stump rings suggest the forest was only 25-30 years old when it was harvested. The cutover includes < 1 ha on the northwest side (looking toward the other turbine sites), and a much larger area on the other side of the laneway. Beyond lies a young, dense, vigorous forest of balsam fir, white and black spruce and a few red maple and hemlock. This forest is also recovering from previous harvesting.

The understorey here is similar to that at the other sites. Bunchberry, raspberry, wood aster and a variety of ferns (including evergreen wood fern, northern beech fern and hay-scented fern) are the most common species. Running-pine (*Diphasiastrum digitatum*) grows on the laneway. No species of concern were observed, nor are any likely in this intensely managed habitat. A few pink ladies'- slipper occurred in the forest some 100 m from the laneway, suggesting the possibility of other woodland orchids.

A small, open, boggy area (NEWBOG) lies 80 m west from the laneway; it is too far downslope to suffer disturbance when the turbine is erected. The small lake indicated on the map is not visible from the ridgetop and was not inspected. It also is too far away to be disturbed by construction of the wind turbines.

Assessment

Vegetation at both the Pitre properties and the Edmund property is typical of highly disturbed woodlands and fields in western Cape Breton. Neither site supports any provincially or federally ranked species of concern, or indeed any species noted as rare in Zinck (1998). These continually disturbed sites are not habitat for most rare species. The possibility that the few *Impatiens* sp. observed at the stream crossing on the northeast Pitre property is in fact pale touch-me-not (*I. pallida*), a provincially ranked rare (Yellow) species, instead of the common *I. capensis* cannot be completely discarded, but remains unlikely. On the Edmund property, two potentially sensitive bogs lie a few hundred metres down the slope from the hilltop where the turbines would be installed. No deleterious effects on the bogs are anticipated from the wind turbine project because they are too far away from the hilltop. Nevertheless, planning should proceed with full awareness of the bogs, so that they remain protected by any changes in the project.

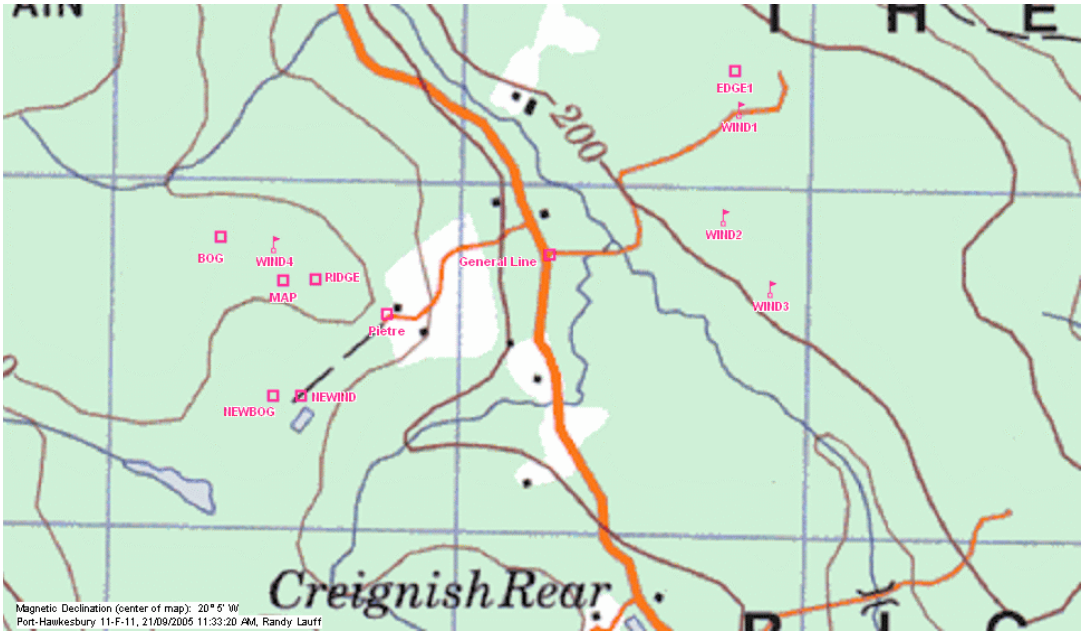

Figure 1. Map of the inspected area near Creignish Rear where the proposed wind turbines would be erected. See text for explanations of the symbols.

Literature Cited

Zinck, M. 1998. Roland's Flora of Nova Scotia. Third Edition. Nimbus Publishing and Nova Scotia Museum, Halifax, N.S. Two volumes, 1297 p.

Table 1. Vascular plants observed at the proposed Creignish Rear Wind Farm, 10 and 11 September 2005. Habitat Types are: (A) Young **M**aple-birch forest at northeast Pitre property; (B) **B**lueberry fields on northeast Pitre property; (C) **R**oadsides; and (D) Young maple-birch-fir forest on **E**dmund property. An asterisk indicates that a voucher specimen has been deposited in the Herbarium of St. Francis Xavier University.

		Habitat Type				
Scientific Name	**Common Name**	**M**	**B**	**R**	**E**	**Notes**
Abies balsamea	balsam fir	ÿ	ÿ		ÿ	saplings and seedlings
Acer pensylvanicum	striped maple	ÿ				one tree
Acer rubrum	red maple	ÿ	ÿ		ÿ	young trees
Acer saccharum	sugar maple	ÿ				Few
Achillea millefolium	yarrow		ÿ			Few
Agrostis capillaris	brown top			ÿ	ÿ	confluent on dry roads; occasional among ferns
Alnus incana	speckled alder			ÿ		Common
Amelanchier sp.	serviceberry		ÿ	ÿ		occasional and small
Anaphalis margaritacea	pearly everlasting		ÿ	ÿ	ÿ	Occasional
Aralia hispida	bristly sarsaparilla		ÿ			abundant in upper field
Aralia nudicaulis	wild sarsaparilla	ÿ	ÿ			
Aster acuminatus	wood aster			ÿ	ÿ	
Aster lateriflorus	aster		ÿ	ÿ		
Aster nemoralis	bog aster			ÿ		Ditches
Aster puniceus	rough aster			ÿ		
Aster umbellatus	tall white aster		ÿ	ÿ	ÿ	Scattered

Table 1. Continued.

Scientific Name	Common Name	Habitat Type M	B	R	E	Notes
Betula alleghaniensis	yellow birch	ÿ				
Betula papyifera	white birch	ÿ			ÿ	
Betula populifolia	grey birch				ÿ	
Carex gynandra	sedge			ÿ		ditches, streamside
Carex intumescens	sedge			ÿ		at stream crossing
Carex lurida	sedge			ÿ		at stream crossing
Carex scoparia	sedge		ÿ			in wet ruts
Carex stipata?	sedge		ÿ			a few plants
Carex spp. (includes *C. novae-angliae* and *C. intumescens*)	sedges	ÿ		ÿ	ÿ	occasional in shade
Centaurea nigra	knapweed		ÿ	ÿ		
Chelone glabra	turtlehead			ÿ		at stream crossing
Clintonia borealis	clintonia-lily	ÿ				
Coptis trifolia	goldthread			ÿ	ÿ	beneath trees
Cornus canadensis	bunchberry		ÿ	ÿ	ÿ	common
Dennstaedtia punctilobula	hay-scented fern	ÿ	ÿ	ÿ	ÿ	abundant
Deschampsia flexuosa	common hair grass		ÿ	ÿ	ÿ	
Dryopteris intermedia	evergreen wood fern				ÿ	abundant
*Epifagus virginiana**	beech-drops	ÿ				one plant
Epigaea repens	mayflower			ÿ		
Epilobium angustifolium	fireweed		ÿ	ÿ		
Eupatorium perfoliatum	boneset			ÿ		at stream crossing
Euthamia graminifolia	narrow-leaved goldenrod		ÿ	ÿ	ÿ	occasional
Fagus grandifolia	American beech	ÿ				a few trees

Table 1. Continued.

Scientific Name	Common Name	Habitat Type M	B	R	E	Notes
Festuca sp.	fescue		ÿ			*F. ovina* or *F. rubra*
Fragaria virginiana	wild strawberry			ÿ	ÿ	
Galiopsis tetrahit	hemp-nettle		ÿ			scattered in wet areas
Galium palustre	marsh bedstraw			ÿ		at stream crossing
Glyceria canadensis	rattlesnake grass			ÿ		at stream crossing; possibly *G. X laxa*
*Gnaphalium uliginosum**	low cudweed		ÿ			few
Hieracium floribundum	king devil		ÿ			
Hieracium kalmii ?	hawkweed		ÿ	ÿ		
Hieracium pilosella	mouse-eared hawkweed		ÿ			
*Hieracium scabrum**	rough hawkweed		ÿ			one plant

Hypericum canadense	St. John' s-wort		ÿ			
Ilex verticillata	Canada holly				ÿ	
Impatiens sp.	forget-me-not		ÿ	ÿ		Probably *I. capensis*
*Juncus brevicaudatus**	rush		ÿ	ÿ		wet areas, ditches
Juncus effusus	soft rush			ÿ		wet areas, ditches
Lactuca sp.	wild lettuce		ÿ	ÿ		occasional
Linnaea borealis	twinflower				ÿ	
Luzula multiflora	common woodrush		ÿ			
Lycopodium clavatum	club-moss	ÿ		ÿ	ÿ	
Lycopodium obscurum	ground-pine	ÿ				
Lycopus americanus	water-horehound		ÿ			low spot
Maianthemum canadense	wild lily-of-the-valley	ÿ			ÿ	
Mitchella repens	partridge-berry				ÿ	

Table 1. Continued.

		Habitat Type				
Scientific Name	**Common Name**	**M**	**B**	**R**	**E**	**Notes**
Myrica pensylvanica	bayberry			ÿ		a few plants
Nemopanthus mucronata	false holly				ÿ	common
Onoclea sensibilis	sensitive fern			ÿ		at stream crossing
Oxalis acetosella	wood-sorrel	ÿ				
*Panicum lanuginosum**	panic grass		ÿ			single plant
Phegopteris connectilis	northern beech fern	ÿ				occasional, hummocks
Phleum pratense	timothy		ÿ	ÿ		uncommon
Picea glauca	white spruce		ÿ			saplings
Picea mariana	black spruce				ÿ	common below ridge
Polygonum cilinode	fringed black bindweed			ÿ	ÿ	climbing fern stems
Polygonum sagittatum	tear-thumb			ÿ		at stream crossing
Populus tremuloides	trembling aspen			ÿ		uncommon
Prunella vulgaris	heal-all			ÿ		occasional
Prunus pensylvanica	pin-cherry	ÿ	ÿ		ÿ	
Pteridium aquilinum	bracken fern		ÿ		ÿ	abundant
Ranunculus repens	creeping buttercup			ÿ		at stream crossing
Rhododendron canadense	rhodora			ÿ		in ditches, bog
Ribes glandulosum	skunk currant				ÿ	
Rosa virginiana	common wild rose				ÿ	
Rubus pubescens	dewberry			ÿ		
Rubus sp.	blackberry		ÿ	ÿ	ÿ	forest edges
Rubus idaeus	red raspberry		ÿ	ÿ	ÿ	scattered
Rumex acetosella	sheep-sorrel		ÿ			scattered weed
Rumex crispus	curled dock		ÿ			occasional

Table 1. Continued.

Scientific Name	Common Name	Habitat Type M	B	R	E	Notes
Sambucus racemosa	red elderberry			ÿ	ÿ	common
Salix sp.	willow			ÿ		
Scirpus atrovirens	bulrush			ÿ		ditches
Scirpus cyperinus	bulrush			ÿ		wet areas, ditches
Solidago canadensis	Canada goldenrod			ÿ		
Solidago puberula	rough goldenrod		ÿ	ÿ	ÿ	
Solidago rugosa	rough goldenrod		ÿ	ÿ		
Sorbus decora	northern mountain-ash				ÿ	
Spiraea alba	meadow-sweet		ÿ	ÿ	ÿ	
Thelypteris noveboracensis	New York fern		ÿ		ÿ	scattered
Triadenum fraseri	marsh St. John's-wort			ÿ		at stream crossing
Trientalis borealis	starflower				ÿ	
Tussilago farfara	coltsfoot			ÿ		at stream crossing
Tsuga canadensis	hemlock			ÿ		one sapling
Vaccinium angustifolium	lowbush blueberry		ÿ	ÿ	ÿ	abundant
Veronica officinalis	field speedwell		ÿ			
Viburnum nudum	witherod				ÿ	uncommon
Viola spp.	violets	ÿ	ÿ		ÿ	no flowers