Lingan 10 MW Wind Farm Project Registration and Environmental Assessment

May 2006

Glace Bay Lingan Wind Power Limited

05-4359-0200

Submitted by:

Dillon Consulting Limited

REGISTRATION OF A 14-MEGAWATT WIND FARM, LINGAN, NOVA SCOTIA

This document represents formal registration of a 10 MW wind farm on a site located in Lingan, Nova Scotia (the project) by Glace Bay Lingan Wind Power Limited to meet the requirements of the Nova Scotia *Environmental Assessment Regulations*, as defined under Section 9 of the Regulations.

Name of Undertaking

10 Megawatt Wind Farm, Lingan, Nova Scotia

Location of the Undertaking

The project includes plans to construct a 10 megawatt wind farm on vacant land near Lingan, Nova Scotia.

Proponent

Glace Bay Lingan Wind Power Limited
11 Eleventh Street
Glace Bay, Nova Scotia
B2Y 4W3
Telephone: (902) 849-2444
Facsimile: (902) 849-2443

CEO

Mr. Norm Keinitz
President

Contact Person

Ms. Lisa Galanov
Vice President – Corporate Affairs

Applicant

Dillon Consulting Limited
137 Chain Lake Drive
Halifax, NS
B3S 1B3

Applicant Contact Person

Robert Young, M.Sc., P.Geo
Project Manager
Tel: 902-450-4000
Fax: 902-450-2008

Nature of the Undertaking

The term "undertaking" is defined in the *Environment Act* as:

> "...an enterprise, activity, project, structure, work or proposal and may include, in the opinion of the Minister, a policy, plan or program that has an adverse effect or an environmental effect and may include, in the opinion of the Minister, a modification, extension, abandonment, demolition or rehabilitation, as the case may be, of an undertaking".

The project consists of construction and operation of a 10-megawatt (MW) wind farm near Lingan, Nova Scotia (Figure i). The farm will consist of five (5), 2 MW turbines, access roads, and transmission cables to connect the facility with the Nova Scotia Power Inc. (NSPI) grid. A previous registration and environmental assessment has been submitted and approved for two other 2 MW turbines on the same site as this project.

Environmental planning and management is an integral part of this undertaking and is described, primarily, in the protection measures and mitigation described in detail in these documents.

Background

Glace Bay Lingan Wind Power Ltd. (GBLWP) is a Nova Scotia company formed through a partnership between GBLWP and Quantum Lead Asset Management. The firm is dedicated to renewable energy development with a desire to develop large-scale renewable energy production facilities. In April 2005, NSPI signed an agreement with GBLWP to purchase energy from its Lingan wind farm. Currently, GBLWP has 16 MW of wind energy under development through a contact with NSPI. Other developments by the company in the industrial Cape Breton region include the two 2 WM turbines at Lingan and single 800 KW turbines at Port Caledonia and Bridgeport.

Figure i Location Map

The construction of the facility proposed by GBLWP falls within the definition of a Class I undertaking under the *Environmental Assessment Regulations* pursuant to the Nova Scotia *Environment Act*. An undertaking of this type requires the submission of a Registration to the Minister of Environment for Nova Scotia, upon which the project will be evaluated under the review requirements set out in the *Environmental Assessment Regulations*. GBLWP believes that the undertaking poses no significant risk of adverse environmental impacts that cannot be mitigated, and that it should be approved by the Minister of Environment, subject to applicable and appropriate Conditions of Approval. In order to support this position, GBLWP has prepared an Environmental Assessment (EA) to accompany its Registration, and has also conducted a stakeholder and public consultation program in order to obtain comments from the public and stakeholder groups concerning environmental aspects of the proposed project.

Purpose and Need for the Undertaking

The purpose of the undertaking is to construct a wind power generating facility to generate electricity for transmission via the existing NSPI grid. This project combined with the two 2MW turbines that comprise the previously approved project are anticipated to provide an estimated 49 GWh annually. This project is part of a Nova Scotia Power Inc. initiative to increase Nova Scotia's renewable energy production to 25% from 10%. The electricity provided by the combined projects will displace the equivalent power supplied by NSPI's fossil fuel fired generating stations and reduce total GHG emissions by approximately 41,000-45,000 tonnes/year

Alternatives

Selecting a suitable location for a wind farm requires that the proposed site meet specific criteria:

- Available source of wind resource;
- Close proximity to a connection to the NSPI electrical grid;
- A community where there is a reasonable level of acceptance of wind energy and wind turbines;
- Sufficient land for the required infrastructure, and;
- Access to roads/rail for the transportation of the turbines and other materials.

The Lingan site meets all of the above criteria for the proposed wind farm project. In addition, the Lingan site is not a on a major avian flight path, unlike other headlands in the area. Although there are migratory bird habitats in Lingan Bay, the primary flight path is directly in and out of the Bay along the shore of Shanty Bay past North Head.

A lack of watercourses on the site and past uses for coal extraction reduces the likelihood of impacting sensitive aquatic or terrestrial habitat during construction. A portion of the property on which the project is planned, namely the low lying barrens along the cliff edge, show indications of seasonal flooding and vegetation consistent with a cranberry bog. No wetlands were mapped by NSDNR for this site. The proposed locations for the turbines are set back 200-250 m and upgradient from these barrens.

The Lingan site presents the best available option for a wind farm in this region of Cape Breton with the least probability of adversely impacting the environment.

Proposed Construction and Operation Schedules

When the required approvals and permits are received, GBLWP plans to begin construction in the fall of 2006 and operation to begin in mid-2007.

Description of the Undertaking

The project includes the construction and operation of a 10 MW wind generation facility consisting of five 2 MW wind turbines, access roads, interconnecting cables and a connection to the NSPI grid.

GBLWP will construct, operate, and maintain the wind turbines, the connection to the NSPI grid and the ancillary components.

The physical aspects of the undertaking are as follows:

- Five 2 MW turbines, which will be 64 m in height (hub) and 71 m rotary diameter;
- Approximately 1.6 km of interconnecting cables and the connection to the NSPI grid at the Lingan substation;
- Crane pads (for erecting each of the turbines), and;
- Approximately 1.6 km of access roads between the turbines across the site.

Approvals Required and Other Forms of Authorization

The following approvals and other forms of authorization are anticipated for the project.

- Aeronautical Obstruction Clearance from Transport Canada.

- Land Use Approval from Nav Canada.

- Approval to burn cleared vegetation, NSDEL/NSDNR - required for burning of slash and cleared vegetation during construction.

- Aggregate will be required for construction of the access roads and crane pads. GBLWP will obtain this aggregate from an offsite provider and, as such, will not need to act in accordance with the Pits and Quarries Act as the aggregate supplier will be acting in accordance with the Act.

Issues of Concern

Issues of concern have been scoped by the GBLWP EA study team through:

- reviewing applicable provincial and federal environmental laws and regulations;
- meeting with regulatory agencies at provincial and federal levels;
- conducting consultation meetings with stakeholders and documenting concerns;
- considering available environmental literature and references;
- incorporating the experience of the EA study team in conducting environmental assessments in Nova Scotia and elsewhere in Canada; and,
- considering the experience and suggestions about wind farm operation and maintenance elsewhere in Canada and from other knowledgeable team members and associates.

The Issues of Concern identified by the study team and addressed in the accompanying EA include:

- Migratory/Breeding Birds
- Other avian species
- Species at risk
- Terrestrial habitats
- Air quality
- Land use
- Accidents and malfunctions
- Cultural heritage resources

Sources of Public Funding

GBLWP intends to apply to the Wind Power Production Incentive (WPPI) program for the proposed project at a later date if further funding becomes available. For the purposes of this registration, no public funding will be used. If an application for WPPI funding is to be made, it will be done prior to construction, which is scheduled in the fall of 2006.

Summary of Concordance With Factors Relevant to the Minister's Decision

This section presents the concordance of the following EA with the factors that the Minister of the Environment must consider when formulating a decision following the registration of a Class I Undertaking. It is intended to provide a summary of the EA, as a convenience to the Minister in making that decision, and is based on the registration document and the specific commitments of, and studies and consultations carried out by GBLWP.

The following is an extract from the *Environmental Assessment Regulations* made under Section 49 of the *Environment Act*, S.N.S. 1994-95, c.1, O.I.C. 95-220, N.S. Reg. 26/95, as amended by O.J.C. 2003-67 (February 28, 2003), N.S. Reg. 44/2003.

Factors relevant to the Minister's decision.

The following information shall be considered by the Minister in formulating a decision following review of the registration documents for a Class I undertaking:

(a) *The location of the proposed undertaking and the nature and sensitivity of the surrounding area;*
(b) *The size and scope of the proposed undertaking;*
(c) *Concerns expressed by the public about the adverse effects or the environmental effects of the proposed undertaking;*
(d) *steps taken by the proponent to address environmental concerns expressed by the public;*
(e) *potential and known adverse effects or environmental effects of the technology to be used in the proposed undertaking;*
(f) *project schedules where applicable;*
(g) *planned or existing land use in the area of the undertaking;*
(h) *other undertakings in the area; and*
(i) *such other information as the Minister may require.*

Each of the nine factors listed has been addressed below. The notes following each of the nine factors provide both a summary of key points detailed in the EA and the sections that address these factors in the EA.

1. The location of the proposed undertaking and the nature and sensitivity of the surrounding area:

The project is located between the communities of New Waterford and Lingan in Cape Breton Regional Municipality, Nova Scotia. (Figure i). The lands on the site are a combination of coastal barren and scrub forest (balsam fir, back spruce and birch), which is common along the coast in this part of Cape Breton Island. The site is adjacent to the Lingan Power Generating Station and former coal mining operations.

2. The size and scope of the proposed undertaking:

The project consists of construction and operation of a 10 MW wind farm consisting of five-2 MW turbines, access roads, interconnecting cables, and a connection of the NSPI grid system.

3. Concerns expressed by the public about the adverse effects or the environmental effects of the proposed undertaking:

No comments were received from the public at the Open House regarding the proposed facility.

GBLWP has consulted with provincial and federal regulatory agencies and government scientific specialists to identify issues that might not be identified through other means. GBLWP has also requested input from the Union of Nova Scotia Indians regarding traditional use and knowledge.

4. Steps taken by the proponent to address environmental concerns expressed by the public:

As summarized in Section 4 of the accompanying EA, the environmental effects of the project are minimal, and are mitigable. Furthermore, the environmental issues that have been raised are addressed fully in the EA and the environmental protection approach adopted by GBLWP.

5. Potential and known adverse effects or environmental effects of the technology to be used in the proposed undertaking:

The potential adverse and beneficial environmental effects of the technology to be used in this project are well known and documented in the accompanying EA.

6. Project schedules where applicable:

The anticipated start-up date for construction is the fall of 2006. Surveying and geotechnical investigations of the five turbine sites will happen first followed by the necessary clearing for the access roads and turbine sites in the fall of 2006 through the winter of 2006/2007.

The construction of the roads, crane pads, foundations and erection of the five turbines will be undertaken in the fall of 2006.

7. Planned or existing land use in the area of the undertaking:

Existing land use in the project area consists predominantly of undeveloped barrens and scrub forest on the project site, while the surrounding land use is former collieries, a coal fired power-generating plant and mixed residential and commercial.

8. Other undertakings in the area:

GBLWP has registered another wind power project on the same site as this project. That project will consist of two 2 MW turbines. GBLWP is not aware of any other undertakings as defined by the Environmental Assessment Regulations in the area.

9. Such other information as the Minister may require:

GBLWP has planned the project and prepared this document and the accompanying EA in recognition of the environmental issues particular to wind power projects in Nova Scotia. Through its discussions with regulatory and other stakeholders, GBLWP does not anticipate that the Minister will require additional information. However, GBLWP is prepared to provide more information should it be required by the Minister.

LIST OF ACRONYMS

ACCDC	Atlantic Canada Conservation Data Centre
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
EA	Environmental Assessment
ECP	Environmental Construction Plan
EPP	Environmental Protection Plan
GBLWP	Glace Bay Lingan Wind Power Ltd.
GIS	geographic information system
ha	hectare
km	kilometre
L	litre
m	metre
mm	millimetre
NS	Nova Scotia
NSEL	Nova Scotia Department of Environment and Labour
NSNR	Nova Scotia Department of Natural Resources
NSTPW	Nova Scotia Department of Transportation and Public Works
NSM	Nova Scotia Museum
NSPI	Nova Scotia Power Inc.
O&M	operations and maintenance
PPE	personal protective equipment

GLOSSARY

abandonment	terminating use of facilities at the end of project life.
abiotic	non-biological; a process not mediated by or resulting from the activity of organisms. Weather is an example of an abiotic process.
acid generating bedrock	means aggregate having a sulphide sulphur content equal or greater than 0.4% (12.51 kg H_2SO_4/tonne).
archaeological resource	archaeological sites consisting of pre-contact and historical, in ground, resources.
bedrock	the more or less solid rock in place either at or beneath the surface of the earth.
channel	a natural stream that conveys waters; a ditch excavated to control the flow of water.
commuting (birds)	the daily movement of birds from roosting areas to feeding sites.
COSEWIC status	the status or rank (*e.g.*, extinct, extirpated, threatened, endangered or rare) given to species of wildlife by the Council on the Status of Endangered Wildlife in Canada (COSEWIC).
decommissioning	preparing facilities for abandonment at the end of project life.
discharge	the process by which groundwater feeds into surface water bodies, or the general flow of water from a source to a receiving body of water.
drainage	the removal of excess surface water or groundwater from land by means of surface or subsurface flow.
Environmental Construction Plan	a document that identifies location specific environmental protection measures to be used during construction (*i.e.*, construction drawings illustrating placement of sediment fences adjacent to a watercourse).
endangered	descriptive of a species threatened with imminent extinction or extirpation.
Environmental Protection Plan	identifies construction activities and mitigation strategies common to the construction of the natural gas system and may contain contingency plans.

erodible	susceptible to erosion.
erosion	detachment of soil particles by agents such as water, wind, and ice.
extinct	a species that no longer exists on the planet.
extirpated	a species that is locally extinct for a specific location, but that may exist elsewhere.
fauna	animals.
field truthing	on-site verification of information gathered from primary and secondary sources.
fine-grained texture	generally refers to the silt- and clay-size particles in soil.
fish habitat	the spawning grounds and nursery, rearing, food supply, and migration areas on which fish depend directly or indirectly in order to carry out their life processes (federal definition).
flora	plants.
fugitive emission	a gas, liquid, solid, vapour, fume, mist, fog, or dust that escapes from process equipment, or work areas.
geotextile	a flexible fabric that can be used to filter sediment from water or that can be placed over the soil surface to prevent germination and growth of weeds or to temporarily prevent soil erosion.
geotextile filter bag	a bag constructed of geosynthetic fabric used to filter sediment out of water.
grading	any ROW stripping, cutting, filling, stockpiling, or any combination thereof, including the land in its cut-and-filled condition.
gravel	rock or mineral pieces larger than two mm and up to 76 mm, in diameter, may include larger diameter cobbles.
habitat	the environment in which the life needs of a plant or animal are supplied.
hazardous materials	any prohibited, restricted, or controlled product.
heritage resources	archaeological resources, heritage structures, designated historic sites, sacred sites, burial sites, and areas of historical importance.

heritage structure	standing structure meeting Canadian Inventory of Historic Building (CIHB) criteria.
herpetiles	a category of animal consisting of amphibians and reptiles.
historic	after European arrival.
impact	an observable and measurable response of a population, individual or abiotic factor to an external source of disturbance.
migration (birds)	movement of birds, usually in large numbers, with the purpose of reaching areas used for breeding.
mitigation measures	measures applied to eliminate or minimize the potential adverse effects of an activity on the environment.
mudstone	a fine-grained sedimentary rock consisting mainly of clay mineral particles.
mulch	material such as baled hay, straw, or shredded straw mixed with newsprint and raw cotton fibres, which covers the surface of the soil and protects against the impact of erosion.
mulching	the application of mulch on slopes and other exposed ground as a temporary measure to prevent erosion of the exposed ground and siltation of watercourses.
organisms	any life forms.
passerine	perching birds.
perennial	a plant which lives for more than two growing seasons.
petroleum product	includes aviation fuel, asphalt, bunker 'C' oil, diesel fuel, engine oil, gasoline, kerosene, lubricants, mineral spirits, naphtha, petroleum-based solvents, transformer oil, and water/petroleum products (exclusive of paint and propane).
pH	a quantitative measure from 0 to 14 of the acidity or alkalinity of a solution. Low pH indicates acidity, high pH indicates alkalinity, pH7 indicates neutrality.
pre-contact	an event that predates European arrival, typically referring to First Nations peoples and their activities before contact with Europeans.
project, the	The GBLWP 10 MW Lingan Wind Farm.

rare species	species which occur in low numbers in a given area, but which are in little danger of extinction.
runoff	portion of the precipitation on a drainage area that is discharged from the area in the stream channels. Includes surface runoff, groundwater runoff, or seepage.
sandstone	a sedimentary rock consisting of sand-sized particles cemented by silica or clay.
sediment fence	fence constructed of geosynthetic fabric and installed in a special manner to collect sediments in surface runoff.
sediment pond/trap	a depression formed from the construction of a barrier or dam built to retain sediment or debris.
sediment	fine soil material that is generated by erosion and deposited from water.
sedimentary rock	rock formed by the accumulation of sediment in water (aqueous deposits) or from air (eolian deposits).
sedimentation	deposition of soil particles or other solids.
seepage	water escaping through, or emerging from, the ground; usually considered to occur along an extensive line or surface, as contrasted with a spring, where the water emerges from a localized spot.
sensitive	descriptive of a species that normally exhibits a well-defined response to an external source of disturbance when measured under controlled conditions. However, population characteristics of sensitive species may render them non-susceptible to disturbance under field conditions (see vulnerable).
silt	soil particles from 1/256 mm to 1/16 mm in diameter.
siltation	see also sedimentation. Denotes sediment pollution of a watercourse.
slate	a fine-grained metamorphic rock that originated as shale, easily split into flat smooth plates.
species	a self-perpetuating population of animals or plants which is more or less genetically isolated.
stream bank	the usual boundaries, not the flood boundaries, of a stream channel.
streambed	bottom of channel carrying streamflow.
study area	refers to the EA study area for the Lingan 10 MW Wind Farm (refer to Figure *i*).
study team	GBLWP Inc. and Dillon Consulting Limited.

surface runoff	see runoff.
surface water	all water, the surface of which is exposed to the atmosphere.
surficial	characteristic of, pertaining to, formed on, situated at, or occurring on the earth's surface; especially, consisting of unconsolidated residual, alluvial, or glacial deposits lying on the bedrock.
suspended solids	particles either floating or suspended in water.
threatened	descriptive of a species likely to become endangered.
till	non-sorted, non-stratified sediment carried or deposited by a glacier.
topography	the configuration of the Earth's surface, including the shape, elevation and position of its natural and man-made features.
turbidity	condition of water when it becomes cloudy due to sediment in suspension in the water column.
undertaking, the	as described in the Registration Document and defined by the Nova Scotia *Environment Act* and *Environmental Assessment Regulations.*
vulnerable	descriptive of a species at risk because of low numbers or restricted occurrence.
watercourse	the full width and length, including the bed, banks, sides and shorelines, or any part of a river, creek, stream, spring, brook, lake, pond, reservoir, canal, ditch or other natural or artificial channel open to the atmosphere, the primary function of which is the conveyance or containment of water whether the flow be continuous or not (provincial definition).
watershed	an area of land draining to a common collection system such as stream or lake.
wetland	land that is saturated with water long enough to promote wetland or aquatic processes as indicated by poorly drained soils, wetlands vegetation, and various kinds of biological activity which are adapted to a wet environment. Includes bogs, fens, marshes, swamps, and shallow waters.

Table of Contents

Page

List of Figures:

List of Tables:

Appendices:

1.0 Introduction

1.1 Project Overview

GBLWP Inc. plans to develop a 10 MW wind farm on the coastline northwest of the Nova Scotia Power Inc. (NSPI) Lingan power station in Cape Breton Regional Municipality. Figure 1-1 shows the proposed project location.

When the required approvals and permits are received, GBLWP plans to begin construction in the fall of 2006 and operation to begin in mid - 2007.

The 10 MW of electricity will be generated by five 2MW wind turbines positioned along the long axis of the property. The turbine selected for this project is Enercon's E70 model, which will be 64m high at the hub and have a 71 m blade diameter.

1.1.1 Need for the Project

The purpose of the undertaking is to construct a wind power generating facility to generate electricity for transmission via the existing NSPI grid. The turbine is anticipated to provide an estimate 49GWh annually. This project is part of a Nova Scotia Power Inc. initiative to increase Nova Scotia's renewable energy production to 25% from 10%. The electricity provided by the Lingan wind farm will displace the equivalent power supplied by fossil fuel fired generating stations and reduce total GHG emissions by approximately 41,000-45,000 tonnes/year.

1.1.2 Elements of the Project

The project includes the construction and operation of a 10 MW wind generation facility consisting of five, 2MW wind turbines, access roads, interconnecting cables and a connection to the NSPI grid.

GBLWP will construct, operate, and maintain the wind turbines, the connection to the NSPI grid and the ancillary components.

Figure 1-1 Proposed Wind Farm Site

The physical aspects of the undertaking are as follows:

- Five 2 MW turbines, which will be 64 m in height (hub) and 71 m rotary diameter;
- Approximately 1.6 km of interconnecting cables and the connection to the NSPI grid at the Lingan substation;
- Crane pads (for erecting each of the turbines), and;
- Approximately 1.6 km of access roads between the turbines across the site.

1.1.3 Role of Environmental Planning

Environmental planning is fundamental to the successful execution of all stages of this project. The Environmental Assessment (EA), addresses the requirements for review of the project under the Nova Scotia *Environmental Assessment Regulations.* The purpose of an EA is to identify the anticipated impacts of a proposed project, allowing for the identification of residual (remaining) impacts once reasonable and practical mitigation measures have been incorporated.

1.2 Alternatives

Selecting a suitable location for a wind farm requires that the proposed site meet specific criteria:

- Available source of wind resource;
- Close proximity to a connection to the NSPI electrical grid;
- A community where there is a reasonable level of acceptance of wind energy and wind turbines;
- Sufficient land for the required infrastructure, and;
- Access to roads/rail for the transportation of the turbines and other materials.

The Lingan site meets all of the above criteria for the proposed wind farm project. In addition, the Lingan site is not a on a major avian flight path, unlike other headlands in the area. Although there are migratory bird habitats in Lingan Bay, the primary flight path is directly in and out of the Bay along the shore of Shanty Bay past North Head.

A lack of watercourses on the site and site disturbance associated with past uses for coal extraction reduces the likelihood of impacting sensitive aquatic or terrestrial habitat during construction. A portion of the property on which the project is planned, namely the low lying barrens along the cliff edge, show indications of seasonal flooding and vegetation consistent with a cranberry bog. No wetlands were

mapped by NSDNR for this site. The proposed locations for the turbines are set back 200-250m and upgradient from this area.

The Lingan site presents the best available option for a wind farm in this region with the least probability of adversely impacting the environment.

1.3 Approvals and Permits Required

Provincial and federal approvals required for the undertaking are summarized in Table 1-1.

Table 1-1 Permitting Plan

Action	Authority	Notes/Comments
ENVIRONMENTAL ASSESSMENT		
Provincial Environmental Assessment Process	Department of the Environment and Labour (NSDEL)	An electric generating facility which has a production rating of 2 megawatts or more derived from wind energy is defined as Class I undertakings in *Environmental Assessment Regulations*. GBLWP is seeking Ministerial approval to be granted following Registration without requirement of formal Environmental Assessment (EA) Report and based on submitting a Registration that: • Meets all requirements for approval by the Minister under the EA Regulations. • Evidences that good planning and environmental management guide the assessment.
PROVINCIAL APPROVALS		
Notification and Approval for works affecting sulphide bearing material	NSDEL	As required by the *Sulphide Bearing Material Regulations*, this relates to construction activities in areas where there is sulfide-bearing material, primarily pyritic slate bedrock of the Halifax Formation. Not anticipated to be required for this project.
License of Driver to transport dangerous goods	NSTPW	Required for certain materials likely to be used in construction, which fall within the definition of "dangerous goods" under the *Nova Scotia Dangerous Goods Transportation Act.*
Permit to Generate, Carry or Receive Waste Dangerous Goods	NSDEL	"Waste dangerous goods" may be generated during some construction. Depending on volumes and characteristics, registration may be required.
Approval to Burn Cleared Vegetation	NSDEL NSDNR	Approvals under the *Air Quality Regulations* will be required when it is necessary for burning of materials cut to clear construction areas, if any burning is undertaken.
Heritage Research Permit	Nova Scotia Museum	The *Special Places Protection Act* requires a heritage research permit to carry out exploration or excavations seeking heritage artifacts (archaeological or cultural heritage resources). The permit holder must submit a report on the work above.
FEDERAL APPROVALS		
Canadian Environmental Assessment Act	Natural Resources Canada (RA)	Required if WPPI funding will be sought by GBLWP.
Aeronautical Obstruction Clearance	Transport Canada	Required to assess if structures present a hazard to aviation and to determine lighting requirements.
Land Use Approval	Nav Canada	Required to assess if structures have an impact on Nav Canada operations.

2.0 Project Description

2.1 Introduction

This provides a detailed description of the 10 MW Lingan Wind Farm project (the Project). The project was conceptually defined in the 2004 application by GBLWP to the Nova Scotia Power Inc. This description presents a refinement and elaboration of the project as presented to NSPI, with reference to the components that make up the registered undertaking.

The Project description is presented in sufficient detail that reviewers can understand the potential environmental impacts of the project and the methods that will be applied to avoid or mitigate environmental effects. An overview of standard environmental management and protection measures are integrated with the project description.

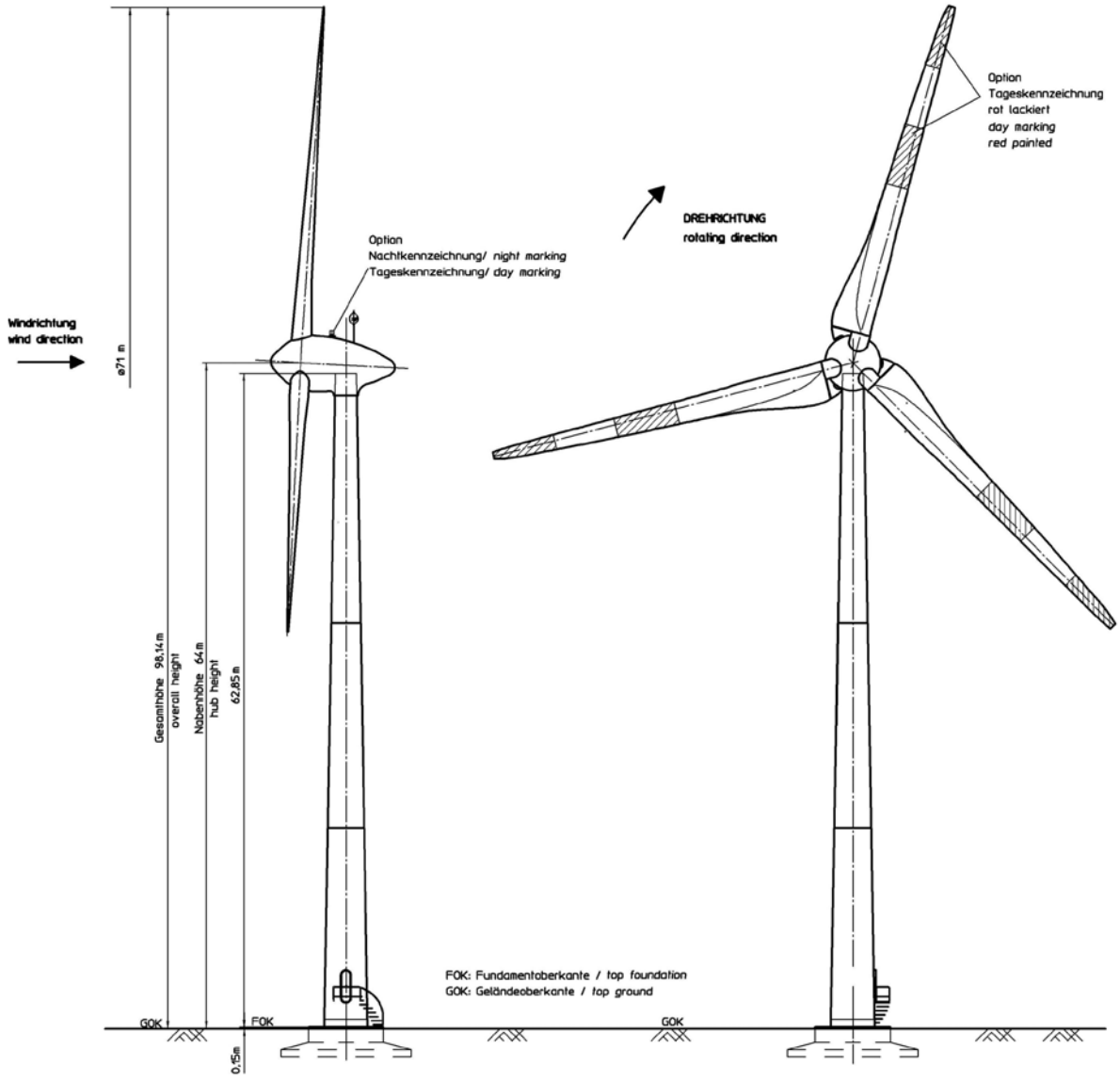
2.2 System Overview

GBLWP plans to construct a 10 MW wind energy generation facility at Gillis Cove, near Lingan, Nova Scotia. The facility will consist of five 2 MW wind turbines constructed between Hinchey Avenue and the shoreline. The turbines will be connected to the NSPI grid at Lingan, supplementing the output from the Lingan Generating Station. The area of the site chosen for the wind farm is approximately 44.8 ha.

The physical project consists of:

- Five 2 MW Enercon E-70 wind turbines (Figure 2-1);
- Connection Cables (between turbines)
- Ancillary Components
    - Access Roads
    - Service Areas (Assembly Areas)
    - Crane pads

Figure 2-1 Typical E70 Wind Turbine



2.3 System Components

Turbines

The turbines selected for this project are built by Enercon. The model, the E-70, generates a maximum 2MW (in winds over 13 m/s). The rotor diameter of the E-70 is 71 m and consists of three fibreglass blades. The tip speed of the blades varies between 22 and 80 m/s while the rotational speed ranges from 6 to 21.5 rpm. The turbine will start rotation in wind speeds of 2.5 m/s and cut out between 28 and 34 m/s (100 km/hr. and 122 km/hr.) for safety (Enercon, 2005)

The height of the tower from ground level to the hub (centre of the rotor) will be 64 m. The tower will be anchored in a circular reinforced concrete base. The advantage of a circular base is the equal distribution of force in all wind directions. Circular base construction reduces the amount of re-bar required to reinforce the concrete and reduces the size of the base compared to an asymmetrical base. Another means of reducing the amount of reinforced concrete is to fill the foundation with material excavated from the pit for the base. The depth of the foundation is dependant upon the nature of the material on the site.

Turbine Lighting

Lighting of the wind farm is determined by Transport Canada under Standard 621.19 Standards Obstruction Markings. The lighting, only visible at night, will consist of two or three red flashing lights. Chapter 5 of Standard 621.19 determines the parameters of the light. The light on the western most of the two existing turbines will be moved to the westernmost of the five turbines under this project. This moved will result in lighting of the turbines at either end of the farm. Transport Canada will determine if a third light is required in the middle of the array after the farm is operational.

Connection Cables (between turbines)

The turbines will be connected by approximately 1.6 km of cables that will be buried approximately one metre below the surface. Each turbine has its own transformer that will raise the current to a distribution level voltage of 25 KV. The individual turbine transformers are connected via cables to a main transformer/substation that raises the voltage to 69 KV for interconnection with the NSPI grid. Interconnection will occur at the DEVCO 80S substation.

Ancillary Components

Access Road(s)

GBLWP will construct approximately 1.6 km of roads to access the site and to connect the turbines. The all season roads will have a right of way of approximately 5 m and will be surfaced with gravel. The

maximum slope of the access roads will be no greater than 6%. The stone for the road surface will be imported from an approved offsite location. The roadbed will be constructed to permit a maximum axle load of 12 tonnes.

Service Areas (Assembly Areas)

The disturbed area associated with each foundation will be approximately 25 m in diameter. The crane pad will be constructed to permit a maximum axle load of 12 tonnes. The dimensions of the service area required for the E-70 are shown in Figure 2-2.

2.4 Management, Schedule, Design and Pre-construction Activities

2.4.1 Pre-Construction Management

A number of management activities are conducted prior to construction of the turbines to facilitate timely project completion. These activities include:

- Planning and design, focussing on the environmental and engineering aspects of the project;
- Pre-construction activities, including surveying and soils and environmental investigations;
- Regulatory permits and land access;
- Materials procurement; and
- Contracted resources, to be tendered for prior to construction.

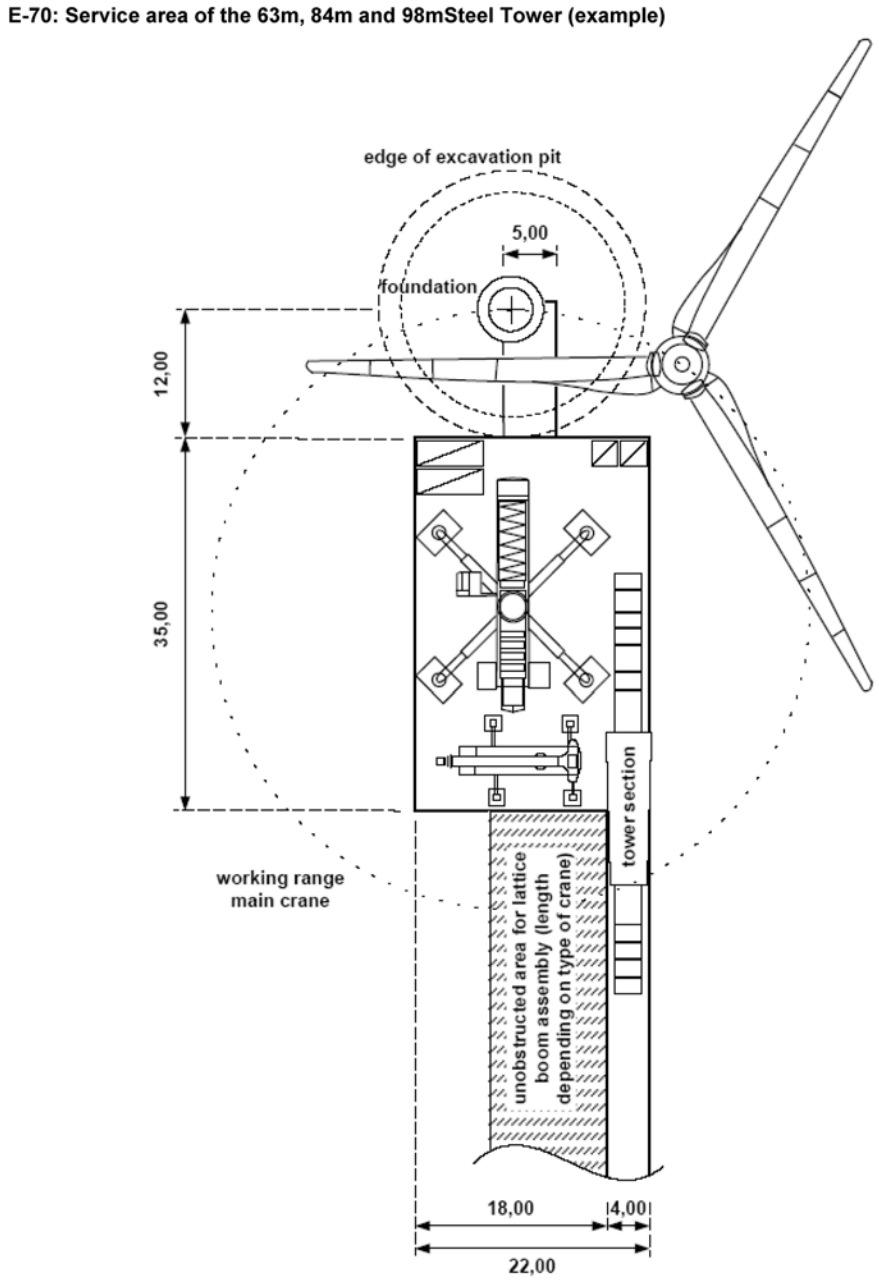
2.4.2 Construction Management

The construction stage of the project will include contract administration, construction, and pre-commissioning.

Key construction management activities include:

- Control of construction schedule and budget;
- Coordination of construction logistics;
- Coordination of contractors and contract administration;

Figure 2-2 Service Area Requirements



- Communications with the public and stakeholders during construction;
- Application of company programs and procedures relating to construction activities;
- Execution of the work in accordance with project standards and specifications;
- Implementation of the safety, quality control, quality assurance and environmental management programs, including supervision of all independent testing and inspection requirements;
- Retention of construction records.

These activities are summarized in point form below.

Project Controls

- The construction of the turbines and components is managed to meet the budget, schedule and environmental management objectives set by GBLWP.

Management and Coordination

- Construction logistics are managed with particular regard to construction staging, materials delivery, materials control, temporary facilities, emergency response during construction, and related factors;
- Contractors are coordinated and administered to meet their individual targets and objectives; and,
- Programs and procedures including environmental protection, construction safety and emergency response are applied to meet overall company goals, objectives and regulatory requirements.

Communications

- The public and affected property owners are kept informed of construction activities in a timely manner; and,
- Regulators and other stakeholders are kept informed of issues arising during construction.

Materials Quality Control

- Materials are received, and accepted from suppliers;
- Measures for material inventory control and storage are implemented;
- Delivery of material to contractors is coordinated and controlled; and,
- Records are maintained to track the location of material installation.

Installation Quality Control

- Standards and specifications are applied during construction;
- Design changes are reviewed and receive appropriate approval and sign-off; and,

- Quality control procedures are implemented to verify that construction proceeds in accordance with GBLWP's specified requirements.

Environmental Compliance

- Environmental compliance is confirmed and measured against regulatory requirements, Terms and Conditions of Approvals, and an Environmental Protection Plan (EPP) during the construction phase;
- Procedures are put in place for conducting corrective actions in the event that non-compliance is discovered during construction;
- The environmental protection program, which includes monitoring plans, environmental protection plans, emergency response plans, contingency plans, and auditing and reporting mechanisms, are applied in accordance with GBLWP's procedures and specified requirements.

2.4.3 Construction Schedule

The anticipated start-up date for construction of the turbines is October 2006. Surveying and geotechnical investigations of the five turbine sites has been complete followed by the necessary clearing for the access roads and turbine sites through the fall of 2006. An overview of the schedule is provided below:

- Clearing – October 2006
- Access Roads and Crane Pads – October 2006
- Foundation Construction – October 2006
- Turbine Construction – November 2006
- Commissioning – December 2006

2.4.4 System Planning and Design

The design process is a critical factor in assuring environmental resource protection. The planning and design of the project is described below under the following subsections:

- Regulatory Environment (2.3.3.1);
- Site Selection Process (2.3.3.2); and
- Design (2.3.3.3)

2.4.4.1 Regulatory Environment

The project will be completed in accordance with the requirements of the following federal and provincial environmental legislation and the regulations made pursuant to them.

- Canadian Environmental Assessment Act;
- Migratory Birds Convention Act;
- Canada Wildlife Act;
- Nova Scotia Environment Act;
- Nova Scotia Endangered Species Act;
- Nova Scotia Special Places Act; and
- Nova Scotia Wildlife Act.

In addition to the above act and regulations, the system will be designed to meet applicable environmental regulations and guidelines. The permitting framework for the project is presented in Section 1.4.

2.4.4.2 Site Selection Process and Design

GBLWP established specific set of criteria to determine the most suitable site for the wind farm. The criteria included the following parameters:

- Sufficient available land
- Suitable wind resource
- Proximity to the NSPI grid for interconnection
- Required setback from nearby residences
- Nature of the soil (suitable for the turbine foundations)

The site at Lingan met all of the above criteria, and following the Open House, it was determined that the project was also supported by the local community. GBLWP, through their design consultants, determined the best layout of the wind farm based on the characteristics of the wind resource, the setback requirements, interconnection between the turbines and to the DEVCO substation, and onsite environmental conditions.

2.4.5 Pre-construction Activities

Supporting activities such as surveying and geotechnical investigations. These activities are required before detailed design is completed and construction begins. These activities have relatively low and localized impact on the environment, however, GBLWP will implement the protection measures for these activities as described in the EPP.

2.4.5.1 Surveying

Surveying includes gathering of location and elevation data required for the design of the system. Surveying requires cutting of vegetation along survey lines and cross-section offsets to provide clear line

of sight for survey equipment. Given that the site is vegetated with shrubs and grasses, very little clearing will be required for surveying.

2.4.5.2 Geotechnical Investigations

Surficial soil conditions, depth to bedrock and the nature of the overburden and bedrock are investigated. Both excavation by mechanical equipment and drilling with a drill rig are used for these investigations. As with surveying, access to the site will be by existing roads. Where new access is required, it will follow the requirements of the EPP.

2.4.5.3 Clearing

A minimal amount of clearing will be required for the turbines and access roads as the vegetation on the site is primarily brush and scrub. No merchantable timber is expected to be harvested during construction.

Stumps and root systems will be retained to the extent practical except in the access road right of way and where removal is necessary for safe equipment access. The need for, and extent of, stump and root system removal will be determined on a site-by-site basis. Merchantable timber, if any, will be salvaged and the remaining debris disposed of in accordance with landowner agreements and the EPP

2.5 Construction Methods

This section summarizes typical wind farm construction activities and general environmental protection measures. Detailed environmental protection measures for each activity are detailed in the GBLWP EPP.

2.5.1 Construction Equipment

The construction equipment used in the development of the site will include excavators, bulldozers and cranes. Excavation and grading equipment will be used to construct the access roads, crane pads and turbine foundations. Cranes will be used in the erection and assembly of the turbines.

2.5.2 Grading

Environmental control measures such as sediment fencing, diversion, ditching or sedimentation ponds will be installed by the crews prior to commencement of grading activities if required. Grading may be required to level the access roads and work area. Where required, graded areas will be grubbed and topsoil stripped and stockpiled for reuse. Roots and slash generated from the grubbing operation may be buried. The locations for burial will be determined in consultation with the landowner.

Given the nature of the bedrock geology (Morien Group mudstones and sandstones) in the project area and the depth of overburden, blasting is not anticipated. In addition, acid generating rock is not anticipated as the Morien Group bedrock does not contain sulphides.

2.5.3 Construction of the Crane Pads

The crane pads for each turbine will be constructed in a similar fashion as the access roads. The pads will be constructed to permit a maximum axle load of 12 tonnes. The pads will be approximately 770m^2 and be 12m from the foundation.

2.5.4 Excavation of the Turbine Foundation Pits

The turbine foundation consists of a circular reinforced concrete base that is designed to transfer the stress and weight into the ground.

The depth of the foundation will be dependant upon the soil's ability to absorb compressive strain. Essentially, softer ground requires a deeper foundation.

Material excavated from the foundation pit will be used to fill the foundation, reducing the amount of reinforced concrete need to stabilize the foundation and reducing the amount of material to stockpile and stabilize on site.

2.5.5 Transportation of the Turbine Components

The E70 components will arrive by ship at the Sydney Coal Pier and then be transported via flatbed truck to the Lingan site. The trucks will leave the Sydney Coal Pier and travel on the Spar Road to Grand Lake Road. They will follow Grand Lake Road to Gardiner Road. From Gardiner Road the truck will turn left onto Highway 28, then right on to Lingan Road to their respective sites.

A police escort will be present for the transportation of the turbine components and Aliant personnel will be on hand to lift any telecommunication lines that may otherwise interfere with the passage of the components.

The trucking contractor will arrange for necessary permits to be in place prior to the move.

2.6 Environmental Protection Methods

2.6.1 Purpose of Providing Environmental Protection Methods

Environmental protection is an integral component of the project. GBLWP will employ the EPP to guide this aspect of the project. There are several important aspects of environmental protection that are common to several or all construction components. These include:

- soils and bedrock;
- sediment, erosion and drainage control;
- general protection measures; and,
- cultural heritage resources.

Soils are addressed relating to highly erodible or compactable soils, and contaminated soils. Bedrock in general is addressed relative to blasting, and the extent of shallow bedrock.

Cultural heritage resources refers to historic or pre-historic resources of cultural value. This section addresses the methods to be used to identify and evaluate these resources during construction, and to recover or protect the resources on their discovery.

The following subsections summarize the contents of the EPP (Appendix F). Construction contractors will receive a copy of the EPP as part of contracts.

2.6.2 Management of Soils and Bedrock

2.6.2.1 Contaminated Soils

Soil contamination relating to construction and operation may result from spills or leaks of fuels and changing of fluids (*e.g.,* oil changes) for equipment. The risk of such events is considered to be low; however, isolated spills of fuel and oil can occur during construction as with any construction project using heavy machinery. Safe handling practices and waste management issues will be employed by GBLWP as detailed in the EPP.

Soil contamination resulting from former land uses may also exist across the site as it is in a developed area of industrial Cape Breton. Where contamination is suspected, test pits will be excavated prior to construction to establish the nature and extent of the impacted soils.

During construction, areas of suspected soils contamination within excavation sites will be initially identified by visual indicators (*i.e.*, staining) and odours. Field and/or laboratory analytical procedures

will be completed to confirm the existence and nature of the contamination. Once it has been confirmed that contaminated soils have been encountered, a management plan for the material will be developed.

The physical extent of investigative and mitigative activities coordinated by GBLWP will be limited to the areas of the turbine bases, the access roads and buildings on site. The EPP documents the contaminated soils mitigation protocol, including details on emergency response procedures, personal protective equipment (PPE) and reporting.

2.6.2.2 Waste Management

Construction operations will generate minor amounts of liquid and solid wastes. Liquid waste produced includes oils, solvents, grease, fuels and sewage. Liquid wastes such as fuel, oil and solvents will be recycled or reused wherever possible and the remaining materials disposed of at an approved facility. Waste storage will be minimized by prompt removal of waste following equipment servicing. However, if liquid waste storage is required, the storage areas will be located following the requirements for fuel and lubrication storage.

Solid waste produced will include materials such as strapping, temporary fencing, signs, and containers. Construction specifications will include requirements for litter control and management of construction wastes. Non-hazardous solid waste will be collected and disposed of at an approved facility by a licensed contractor.

2.6.2.3 Management of Bedrock

The are no plans to conduct blasting in the construction of the wind farm. In the event that bedrock is used in the foundation of the turbines, anchor bolts will be drilled into the bedrock to secure the foundation. No breaking or blasting is anticipated for this process.

2.6.3 Management of Sediment, Erosion and Construction Drainage

2.6.3.1 Overview

Soils in the study area are characterized as sandy loams and the topography is a gradual slope towards the coastline.

2.6.3.2 Description of Erosion and Sediment Control Measures

The following is a brief summary of the erosion and sediment control measures to be used:

Sediment Control Fence

Sediment control fencing is a sheet of geosynthetic fabric imbedded into the ground parallel to the contours. Sediment control fencing is used to filter sheet runoff. It will be used to contain sediment within the construction site.

Stabilization Methods

Stabilization methods will be used to minimize the potential for erosion. These include:

- tackified straw mulch, polyethylene sheets or other geosynthetic materials may be used as a temporary stabilization method if there is an impending rainfall event or if a disturbed area cannot be permanently stabilized immediately;

- erosion control blankets are sheets of biodegradable material that are installed before or after seeding; the blanket protects the seed from washing away with rain and provides soil splash protection while grasses become established; erosion control blankets may be necessary in areas with erodible soils;

- gravel including clear stone, surge rock or riprap may be used in ditches where the water velocities are high, in areas with erodible soils, or to dissipate energy from stormwater discharges; and

- for permanent stabilization disturbed areas of the site not covered with gravel will be seeded following Nova Scotia Department of Transportation and Public Works (NSTPW's) Standard Specification.

2.6.4 Cultural Heritage Resource Protection During Construction

Cultural heritage resources is the collective term given to artefacts, buildings, features and landscapes that reflect past human activities. Archaeologically identified resources can take the form of First Nations campsites, fishing stations, burial sites, as well as the remains of historic farmsteads, residential or commercial buildings, and urban infrastructure. Existing historic buildings and landscapes, including cemeteries, are also considered cultural heritage resources. In addition to these observable resources, locations of spiritual and/or cultural significance to First Nations identified through traditional cultural or ecological knowledge, are also recognized as part of our collective heritage.

Construction related activities include the turbine base construction, access roads, and ancillary features. In order to minimize these impacts and mitigate those that cannot be avoided, GBLWP has undertaken a

cultural heritage impact assessment to identify areas of resource potential, to design strategies for the pre-construction field verification of resource potential, to implement construction period monitoring and to propose appropriate and responsible mitigation strategies to address accidental cultural heritage resource impacts during construction. An overview of the cultural heritage impact assessment is provided in Section 4.5.6, and Appendix D.

During construction, GBLWP will conduct a program of archaeological monitoring in areas of moderate to high archaeological sensitivity where identified as identified by the archaeological potential model. In addition, a sample of areas considered to exhibit low archaeological potential will also be monitored in order to test the validity of the model.

Archaeological monitoring will consist of visual inspection of excavation activities that will result in the disturbance of the ground surface, either within the turbine construction areas or at ancillary facility sites. Monitoring methods will be modified to address variations in excavation techniques and levels of archaeological sensitivity.

Archaeological resources recognized during the course of monitoring will be documented with particular attention paid to the identification of spatial boundaries, complexity of the site, age and function. Where possible, stratigraphic profiles will be drawn and photographed. Artifacts will be collected from the spoil piles along side the turbine base pits and documented as to their location and association with features within the excavation. Subsequent analysis and interpretation of the field data will result in the registration of significant sites and the development of appropriate protection and/or mitigation strategies.

In areas of high archaeological potential, no construction activities which would have an impact on the ground surface will be undertaken until requirements for cultural heritage resource protection have been addressed and approved by the Nova Scotia Museum.

Archaeological monitoring will be coordinated with construction management to facilitate full integration of cultural heritage resource protection measures into the construction process and all other environmental resource protection procedures.

The archaeological monitor will complete the documentation of resources in a timely manner. In situations of particular sensitivity, site inspection by the Provincial Archaeologist may be deemed necessary. The context for such inspections will be detailed in the archaeological monitoring protocol. Where feasible, advance notification will be given to the Provincial Archaeologist prior to beginning work in high potential areas. Excavations will not be backfilled until archaeological monitoring has been completed.

The Nova Scotia Museum will be contacted regarding sample archaeological specimens to be used during training. In the event that a suspected cultural heritage site is encountered in areas not subjected to archaeological monitoring, work will be suspended in the immediate area of the impact and the discovery reported immediately. The Environmental Inspector will then contact the archaeological monitors.

In the event that human remains are encountered during construction, either associated with a known cemetery or an unmarked grave, work in the area of the discovery will stop immediately. Upon securing the site, the discovery will be reported to the closest detachment of the RCMP and the archaeological monitor. The subsequent contact with the Nova Scotia Museum will be detailed in the Archaeological Monitoring Protocol developed between GBLWP and the Nova Scotia Museum.

Monitoring will be conducted by qualified archaeologists working under the terms of a Heritage Research Permit issued by the Nova Scotia Museum. As issuing agency for Heritage Research Permits, the Nova Scotia Museum reviews and approves research and field strategies before they are implemented.

2.7 Operations

2.7.1 Turbine Operation

The E-70 turbine is designed to begin rotation at wind speed above 2.5 m/s. This is known as the turbine's "cut-in wind speed". If the wind speed is less than 2.5 m/s, the rotors are idle. Conversely, the blades will stop rotating at wind speeds in excess of 28-34 m/s (exact cut-out speeds will be determined prior to installation). The turbine reaches its maximum power output at a wind speed of 13.5 m/s. Beyond this wind speed; the turbine does not exceed its 2MW power output.

The power generated in the hub of the turbine is conducted via cables to a converter located near the base of the tower. From the converter, the energy is conducted along the network of underground cables to the DEVCO 80S substation and into the NSPI grid.

2.7.2 Maintenance

Enercon will conduct routine maintenance through their Enercon Partner Concept agreement. The equipment will be serviced and maintained four times per year as well as any unscheduled repairs. The operations and maintenance requirements of the turbines will be monitored remotely by Enercon's SCADA (Supervisory Control and Data Acquisition) system. Each wind turbine has a modem link to the central remote data transmission facility. If the turbine signals malfunction, the Service Centre and the

responsible service branch are notified via the SCADA remote monitoring system. A service team can then locate the affected turbine using Geographic Information System (GIS) (Enercon, 2005).

2.8 Decommissioning, Closure and Abandonment

Once the wind farm has reached the end of its life span (anticipated to be approximately 25 years), the site will be decommissioned. The turbines will be removed from the site and the foundations will be covered over to the existing grade and reseeded. Depending on the planned used for the site following decommissioning of the wind farm, the access roads, crane pads and conduits will either be removed or left in place for re-use. If these ancillary components are removed, the site will be restored to the condition prior to construction.

3.0 Public Consultation Summary

3.1 Consultation

GBLWP believes that public and stakeholder communication are an important means of providing information on the project and soliciting input into the construction of the wind farm. In the planning for this project, GBLWP communicated with stakeholders through a public open house.

3.2 Open House

An open house was held on June 2, 2005 in Lingan to present preliminary plans for the project and to solicit comments related to the project from local residents and stakeholders. In total, people attended the information session. Issues regarding birds and noise levels from the turbines were discussed. No specific concerns related to the project were raised. No changes to the project were required as result of the public meeting in Lingan.

3.3 Regulatory Meetings

GBLWP has had meetings with Cape Breton Regional Municipality regarding zoning requirements for the Lingan site and has received the appropriate development permits from the Municipality. As well, GBLWP has applied to Transport Canada and Nav Canada for approval for the first of the five turbines.

4.0 Description of the Environment and Environmental Impact Evaluation

4.1 Introduction

This section presents the description of the environment and the environmental impact evaluation in an integrated format. Introductory subsections describe how the impact evaluation was conducted, using an issues-based approach. Each of the issues identified is presented in detail and the impact evaluation is summarized at the end of each subsection.

4.2 Setting and Boundaries

The development of the impact evaluation first requires establishment of the environmental setting and the boundaries of the assessment itself. The establishment of study boundaries and issue scoping have been conducted with a primary focus on the potential effects of the project on the environment. The environmental assessment must also consider the potential effects of the environment on the project. Where applicable, this consideration has been incorporated in the boundaries and the scoping process.

4.2.1 Spatial Boundaries

The boundaries of the assessment vary depending on the issue being addressed. The bounded area within which the project could potentially interact with terrestrial biology resources generally included the study area described above. Occasionally, additional areas outside the study area were included, such as migratory bird staging areas. In order to satisfy NSDNR's "Draft Guide to Addressing Wildlife Species and Habitats", Atlantic Canada Conservation Data Centre records were considered for a radius of 100km. Field personnel took these records into consideration when conducting field surveys.

When considering cultural heritage resources, the bounded area is the area disturbed by construction, which are the turbine foundation sites and the access roads. For traditional land uses (i.e., hunting grounds, ceremonial areas, medicinal plants), the spatial boundaries may also fall outside the study area.

4.2.2 Temporal Boundaries

Temporal boundaries for the impact evaluation cover project phases involving physical activities. Therefore, temporal boundaries encompass certain pre-construction activities, construction, operation and maintenance, monitoring, and decommissioning. In effect these boundaries are approximately 25-30 years.

4.2.3 Regulatory Boundaries

The regulatory boundaries of the project are the laws and regulations of the Province of Nova Scotia, of Canada, and the by-laws of the Cape Breton Regional Municipality. Federal laws and regulations will apply to the project and are primarily related to aspects of migratory birds. These requirements have been considered in the definition of the project and in environmental planning.

4.3 Issue Scoping

The purpose of scoping in an EA is to identify the key environmental Issues of Concern. Scoping involves defining the project scope; identifying the factors to be considered; and determining the interest of stakeholders in the project and how they can be incorporated. For this project, the project description presented in Section 2 of this report stands as a clear definition of the project scope. The experience of GBLWP and Dillon has helped to identify factors and determine the interests of stakeholders. This work has included:

- conducting consultation meetings with stakeholders and documenting concerns;
- reviewing applicable provincial and federal environmental laws and regulations;
- meeting with regulatory agencies at provincial and federal levels;
- considering available environmental literature and references;
- incorporating the experience of the EA study team in conducting environmental assessments in Nova Scotia and elsewhere in Canada;
- consideration of comments received from the regulatory review of the Registration and Environmental Assessment of GBLWPs 4 MW wind project; and,
- incorporating GBLWP's experience with wind turbine facility construction, operation and maintenance in Nova Scotia and elsewhere in Canada.

Through this scoping exercise, the EA study team developed a methodology for evaluating and presenting issues in this assessment. This methodology and the resulting Issues of Concern are described in the following subsection.

4.4 Method of Assessment

The EA is based on the assessment of *issues* identified through issues scoping and to emphasize the issues in the completion of the effects assessment. This approach is particularly relevant in applications such as

wind turbine construction and operation where there exists an extensive database of literature, previously completed EAs and well established environmental protection measures that can be used to support the review of potential project effects or a given issue. In this manner, an issue with well-defined mitigation, such as avoidance of designated areas, can be suitably addressed in the Project Description rather than in an effects assessment. This allows the assessment to focus on important site or project specific issues. The identified issues are reflected within an environmental effects assessment framework.

4.4.1 Impact Significance

The assessment methodology is based on EA study team experience and guidance from recent major environmental assessment studies undertaken elsewhere in Nova Scotia and Canada. Determination of significance is based on the consideration of the following results of interactions, as summarized in Table 4-1:

Table 4-1 Assessment of Criteria for Determination of Significance of Effects

Magnitude	Magnitude, in general terms, may vary among Issues, but is a factor that accounts for size, intensity, concentration, importance, volume and social or monetary value. It is rated as compared with background conditions, protective standards or normal variability.	
	Small	Small, relative to natural or background levels
	Moderate	Moderate, relative to natural or background levels
	Large	Large, relative to natural or background levels
Reversibility	Reversible	Effect can be reversed
	Irreversible	Effects are permanent
Nature	Positive	Net benefit
	Negative	Net loss or adverse effect
Extent	Intermediate	Confined to the project site
	Local	Effects extent beyond the project site but less than regional
	Regional	Effects on a wide scale
Duration	Short Term	Between 0 and 1 year duration
	Medium Term	Between 1 and 7 year duration
	Long Term	Beyond 7 years duration
Confidence in Prediction	Low	Based on limited understanding of cause and effect relationships and/or incomplete data
	Moderate	Based on a good understanding of cause and effect relationships using data from similar cases, or moderately understood cause and effect relationships and good site-specific information
	High	Based on a good understanding of cause and effect relationships and good site-specific information

4.4.2 Issues of Concern

The issues identified for assessment for the project through the issues scoping process are provided in Table 4-2 together with the section of the EA in which the issue is addressed.

Table 4-2 Issues and Location in the EA

No.	Aspect/Source	Issue	Primary Concerns	Location in EA	Included or Excluded from Impact Evaluation
1.	Migratory Birds	Impacts to Migratory Birds	Migratory bird losses from impact with turbines, loss of breeding habitat	4.5.1 4.7.1	**Included** in the impact assessment. Mitigating factors include: - Tower design is not conducive to roosting or nesting for birds. - The project site is not in a major flight path for migratory birds - The total amount of lost nesting habitat will be minimal due to the limited footprint of each turbine.
2.	Other Volant Species	Impacts to bats, avian invertebrates	Migratory bat, large dragonfly species and monarch butterfly losses from impact with turbines.	4.5.2 4.7.1	**Included** in the impact assessment. Mitigating factors include: - No known bat hibernacula in the study area, no records of bats from ACCDC - Avian invertebrates are unlikely to fly high enough to interact with the blades.
3.	Visual Landscape	Effect on visual landscape by observers on land and water.	Reduction of visual aesthetics	4.5.3	**Included** in the impact assessment. Mitigating factors include: - Existing and past industrial land uses for power generation and coal mining. - The topography and vegetation reduce the visibility of the turbines from a variety of viewpoints. - The impact of turbines on the visual landscape is subjective.
4.	Ambient Noise	Increase or change in noise levels	-Elevated noise levels during construction or during operation	4.5.4	**Included** in the impact assessment. Mitigating factors include: - Noise during construction is temporary - Operational noise (~ 45

No.	Aspect/Source	Issue	Primary Concerns	Location in EA	Included or Excluded from Impact Evaluation
					db) not likely to exceed background noise levels.
5.	Cultural Resources	Loss or disturbance of archaeological, historical, paleontological or architectural resources	-First Nations resources; -Archaeological sites	4.5.5	**Included** in the impact assessment. Mitigating factors include: - an archaeological assessment has been conducted to determine potential for cultural resources. - An intrusive test-pitting program will be conducted at the turbine sites to determine presence or absence of archaeological resources. - Direct impact to the WWII era forward observation post on North Head will be avoided by locating turbines a suitable distance from the site. Development of the wind farm may serve to protect the observation post by restricting access. - A Mi'kmaq Knowledge Study will be conducted to determine potential issues of concern to Mi'kmaq First Nations.
6.	Air Emissions	Effects of emissions from combustion, air quality	- Dust during construction -Equipment/truck operation during construction	4.5.6	**Included** in impact evaluation. Mitigating factors include: - Excavation and grading over a minimal area - dust suppression to be employed as required
7.	Soil Erosion	Erosion of soil and sedimentation entering water courses	- Elevated sediment in watercourses	N/A	**Excluded,** there are no watercourses on the site. The Atlantic Ocean is downgradient of the site, however, the gradient is minimal.
8	Water Quality/ Quantity/Flow	Effects on surface water or groundwater	-Contaminated surface runoff -Impact on groundwater quality	N/A	**Excluded** No nearby surface watercourse. Groundwater not used for drinking water supply as the area is serviced with municipal water. No expected groundwater withdrawal
9.	Acid Drainage	Acidification of surface water and mobilization of	- Effects on fish and fish habitat	N/A	**Excluded**, bedrock is not acid generating, no fish habitat present.

No.	Aspect/Source	Issue	Primary Concerns	Location in EA	Included or Excluded from Impact Evaluation
		metals from disturbance of acid generating rock			
10.	Wetlands	Disturbance wetlands.	-Loss of wetland habitat or function;	N/A	**Excluded**, no wetlands on site as defined by NSDNR wetland mapping Coastal barrens exhibit poor drainage and some vegetation constant with wetlands Construction will be upland of the barrens.
11.	Terrestrial Habitats	Disturbance of habitats	-Clearing, habitat loss; disturbance; fragmentation	4.5.7	**Included** in the impact assessment. Mitigating factors include: - The actual footprint of the turbines and access road is minimal. - The area is already largely disturbed by previous mining activities
12.	Species at Risk	Impacts to Species at Risk	Loss of Species at risk habitat or individuals/populations	4.5.8	**Included** in the impact assessment. Mitigating factors include: - The actual footprint of the turbines and access road is minimal.
13.	Land Use	Effects on use of lands	-Impacts on the uses of surrounding lands	N/A	**Excluded** in the impact assessment. Mitigating factors include: - Zoning for the site and land surrounding the site permit utility scale wind turbines - Minimum setback of turbines from residential structures is 175 m (575 feet).
14.	Traffic	Effects on traffic in the area	-Negative impacts on traffic patterns	N/A	**Excluded** in the impact assessment. Mitigating factors include: - Construction period is limited period of time. - Excess traffic during construction will be minimal
15.	Malfunctions or Accidents	Accidents during construction, operation or decommissioning	-Releases or spills of hazardous materials - Failure of turbines, cranes.	4.5.9	**Included** in the impact evaluation. Mitigating factors include: - Contingency plan for emergencies during all phases of the project - Geotechnical investigations will determine the most

No.	Aspect/Source	Issue	Primary Concerns	Location in EA	Included or Excluded from Impact Evaluation
					suitable location for turbines. Turbine foundation designed to withstand conceivable stresses during operation - Turbine rotors designed to "cut out" at winds in excess of 34 m/s.

4.5 Environmental Impact Evaluation

4.5.1 Migratory Birds

Some bird habitat and bird species are protected under the federal *Migratory Bird Convention Act*, or provincially under the *Wildlife Act*. In addition, NSDNR has hunting and trapping regulations, *Wildlife Guidelines and Standards*, and *Wildlife Habitat Management Regulations*; these policies strive to maintain biodiversity through maintenance of habitat such as old-growth forests.

Four bird surveys of the site and surrounding lands were conducted by Dr. David McCorquodale in the spring, early summer and autumn of 2005. The purpose of these surveys was to determine what species were using this site and in what manner (i.e., breeding, migration route, foraging etc.) The surveys were divided into point counts, a spring migration survey, a breeding survey and a fall migration survey. The following is a summary of the findings of these surveys:

Point Counts

On 16 and 22 May 2005 the site was traversed from the old Lingan Colliery to the World War II gun emplacement and along the Nova Scotia Power fence line. In between several forays into the woods of White Spruce, Trembling Aspen and White Birch were made. From this reconnaissance, seven locations for point counts with coverage of all terrestrial habitats on the site were selected. In addition, from three of these locations (Figure 4-1 points A, C and F) scans could be made of virtually all of the surrounding waters.

Spring Migration Surveys

On 22 and 28 May 2005 five-minute point counts were done at each of the seven locations. All birds heard or seen were recorded. In addition all other species seen or heard while walking to and between the seven locations were recorded. Surveys started early in the morning (before 7:00 AM) to overlap maximum bird activity. Throughout the surveys attention was paid to any birds flying overland at the

height of the wind turbines and whether there were flight paths that would potentially intersect with the locations of the turbines.

Results of Spring Migration Survey
Fewer than 50 passerines were detected during two days of surveys at a time of year when many passerines (flycatchers, warblers, vireos) would be expected to pass through.

The Lingan area is not considered to be an area of high migration numbers. Other sites in the region, such as Schooner Pond, about 15 km east, Petersfield Provincial Park, Tower Road Sewage Lagoon and at other headlands such as Point Aconi, (within 25 km) exhibit higher number of migrants during the spring migration.

There appears to be little movement of ducks and geese between Lingan Bay and the north shore of the proposed site. The waterfowl tend to exit the bay following the channel by the wharf at Lingan and then roost on the ocean beyond the Power Plant. Gulls do fly over the Power Plant and then overland to the ocean on the north shore. Double-crested Cormorants do as well, but much less frequently than gulls. There is little evidence suggesting that these species are susceptible to colliding with turbines (see Kerlinger 2005). Gulls and cormorants should be able to notice the turbines and use alternate routes.

The associated mudflats and Beach are not significant staging areas for shorebirds in the spring, but they are in the autumn migration. This issue will be addressed during an autumn migration survey in fall 2005.

No species listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) nor species listed as Red or Yellow in the General Status of Wild Species in Nova Scotia were detected during spring migration surveys. No concentrations of migrant birds were noted or expected.

Breeding Season Surveys
On 08 and 28 June 2005 five-minute point counts were done at each of the seven locations. All birds heard or seen were recorded. In addition all other species seen or heard while walking to and between the seven locations were recorded. Surveys started early in the morning (before 5:30) to overlap maximum bird activity.

Results of Breeding Bird Survey
An annotated list of breeding birds observed on the site is presented in Appendix B.

The two most common species nesting on the site are Great Cormorant and Black Guillemot (more than 50 pairs each). Next, estimated 10-20 pairs, would be Herring Gull, Song Sparrow, White-throated

Sparrow, Yellow Warbler, Common Yellowthroat roughly in decreasing order of abundance. All other species would have fewer than ten, most only one or two pairs, nesting on or within a few hundred metres of the site. The cormorants and guillemots use the cliffs on the headland between Gillis Cove and Laffins Cove for nesting. As a result of the survey, it is estimated that there are over 125 nests in the cormorant colony (Double Crested and Greater Cormorant combined) on the north side of the headland (see Figure 4-1). Black backed gulls, Herring gulls and Double Crested cormorants were observed commuting across the site between the ocean and Lingan Bay. These birds numbered only between 10 and 20 individuals on each of the four mornings that they were observed.

Gulls are potentially at a higher risk than other species because they fly within the height of the blades' rotational path and because of their nesting proximity to the site and higher numbers throughout the year. However, several studies on gull populations situated near wind farms revealed no adverse effect on local gull populations, even though the birds flew though the wind farm frequently (CWS, 2003). These same studies found similar results for cormorant populations that coexisted with the gulls. At Blyth Harbour in the UK, a nine-turbine farm was constructed adjacent to a location used by wintering Double Crested Cormorants. In seven years of mortality surveys, only one cormorant was found killed by the turbines. At another site in Buffalo Ridge, MN, where cormorants regularly flew through a 354-turbine site, no mortalities were observed in six years of surveys. (CWS, 2003)

The size of the site and location suggest that larger raptors such as Red-tailed hawks and Northern Goshawks will not have enough territory to forage. One Merlin was observed, but there was no evidence of nesting on the site.

No species listed by COSEWIC were detected during the breeding season surveys. One species listed as Yellow in the General Status of Wild Species in Nova Scotia, Common Tern, was seen during breeding season surveys.

Autumn Migration Survey

On 17 September and 25 October 2005 five-minute point counts were done at each of the seven locations. All birds heard or seen were recorded. In addition all other species seen or heard between the seven locations were recorded. Surveys started after 8:00 since fall migrants are more active mid-morning than just after dawn.

Results of the Autumn Migration Survey

Thirty species of birds were recorded during surveys on 17 September and 25 October 2005. Estimates for each species are included in the annotated list found in Appendix A.

No species listed by COSEWIC as Endangered, Threatened or Special Concern were detected. No species on the Red or Yellow lists from the General Status Ranks of Wild Species in Nova Scotia were detected.

One species, Great Cormorant, ranked S4 by ACCDC, was found. This species was considered in the breeding season section.

Consultation

Limited consultations with private individuals and groups near the site have been undertaken. More consultation will be done through the fall migration period. The wildlife biologist with the NS Department of Natural Resources (Terry Power, Coxheath office), Becky Whittam of Bird Studies Canada, Sackville, New Brunswick and coauthor of the draft guidelines for assessing the impact of wind projects on birds and a bird biologist with the Canadian Wildlife Service in Sackville, New Brunswick (Dan Busby) were consulted about the project.

Results:

Magnitude	Small
Reversibility	Reversible: Birds have the ability to recognize turbines as obstacles and avoid them.
Nature	Negative
Extent	Immediate: Limited to the project site
Duration	Long-term: Life of the project (~25 yrs)
Confidence in prediction	High: Nesting and migration patterns are well documented in this area by local experts and federal/provincial authorities.

Significance: Not significant given known migration patterns and observed diurnal use by migratory birds.

Residual Impact Statement: No significant impacts are predicted on migratory birds based on the findings of the surveys and the commitment to implement a fall migration survey prior to construction.

Figure 4-1 Known Bird Habitats and Survey Locations

4.5.2 Other Volant Species

Bats

According to NSDNR's General Status of Wild Species in Nova Scotia, six species of bats are found in Nova Scotia and all are ranked as "Yellow" status. Yellow status means the species is sensitive to human activities or natural events. The six species include: Little Brown Bat; Northern Long-eared Bat; Silver Haired Bat; Red Bat; Hoary Bat; and, Eastern Pipistrelle.

The Lingan project site is not in the vicinity of any known bat hibernacula and bat migration has not been noted in the avian surveys. According to records held by the Atlantic Canada Data Conservation Centre, no observations of bat species have been noted.

According to mortality surveys at other wind farms, bats have been killed by turbine blades, but at the same degree as, or lower than, avian mortality (Johnson et al. 2003, Johnson et al. 2003b, Young et al. 2003, Erikson et al. 2003).

A survey using an Anabat system will be conducted to determine the species of bat that may be using the study area for foraging. Also, a one-year monitoring program to determine potential bat mortality rate as a result of the wind farm will be conducted once the turbines are constructed.

Invertebrates

There is very little information of the effects of turbines on large dragonflies and butterflies. A study in northern Germany on 11 wind farms looked for evidence of insect impacts on the turbine blades. The study was established to determine the impact of the turbines on avian food supply. The impact was determined to be negligible (Gipe 1995).

Results:

Magnitude	Small
Reversibility	Reversible: Bats able to detect obstacles through echolocation. High concentrations of bats are not anticipated in this area. Avian insects fly lower than the bottom of the blade path.
Nature	Negative
Extent	Immediate: Limited to the project site
Duration	Long-term: Life of the project (~25 yrs)
Confidence in prediction	Moderate: Literature on impacts of wind farms on bat and invertebrates is limited,

Significance:	Not significant based on available data and recorded observations from ACCDC.
Residual Impact Statement:	No significant impacts are predicted on bats and avian invertebrates based on the available data for bat habitat and previous studies.

4.5.3 Visual Landscape

The most predominant visual feature on the landscape in the Lingan area is the Nova Scotia Power Inc. coal fired power generating plant at Lingan and its two chimneys. The chimneys are visible from several kilometres in all directions as is the main structure of the power plant itself. According to the Nova Scotia Atlas, the chimneys are 158 m in height. The main structure of the power plant is approximately 90 m high. By comparison, the maximum height of the E70 wind turbines (including maximum blade tip height) is 99 m. Other features associated with the power plant include transmission lines and towers and the coal pile.

The topography of the site can be described as gradually sloping toward the ocean from southwest to northeast. The top of the slope is at approximately 30 m ASL. A cliff face of approximately 20-25 metres borders the seaward edge of the project site. The slope is covered with predominantly coniferous trees that range from 10-15 m in height. From the base of the slope to the cliff edge is a barren area of relatively low relief.

The turbines will be situated on slope, upland from the shoreline, approximately 250 m from the shoreline. The turbines will be visible from the sea, as well as from the east. They will be partially visible from the south and west, as the slope will block the lower half of the turbines from view. The vegetation on the slope will obscure the lower 10-15 m of the turbine towers from view from the water.

To assess the impact of the turbines on the various view planes, scaled representations of the turbines were superimposed on photographs of the site from various directions. Figures 4-2 to 4-5 show the expected views before and after the installation of the turbines. Figures 4-2 and 4-3 illustrate the view from the water off Davys Head before (4-2) and after (4-3) installation. Figures 4-4 and 4-5 show the view of the project site from New Waterford looking east before (4-4) and after (4-5) installation.

To assess the impact of the turbines on various viewplanes scaled representations of the turbines were superimposed on photographs of the site from various directions. Figure 4-2 to 4-5 show the expected views following installation of the turbines.

Results:

Magnitude	Small: Construction, short term presence of cranes that will be visible during tower construction and blade installation Operation, all of the turbines will be only fully visible from the water. Vegetation and topography obscure much of the units form view.
Reversibility	Irreversible
Nature	Positive/Negative
Extent	Local: The impact on the visual landscape will be limited to surrounding communities of New Waterford and Dominion
Duration	Long-term: The project is anticipated to have a life span of approximately 25 years.
Confidence in prediction	High

Significance: Not significant, based on

Residual Impact Statement: The impact of a wind farm on the visual landscape is very subjective in that it varies from one observer to another. One individual may find the turbines attractive, while another may see the facility as an imposition on the visual landscape. Given the natures of the neighbouring structures and land uses in the local area, the presence of the wind farm is not considered a significant negative impact on the visual landscape.

Figure 4-2 **View of the Project Site from the Water Showing the Existing Visual Landscape**

Figure 4-3 **View of the Project Site from the Water Showing the Projected Visual Landscape**

Figure 4-4 **View of the Project Site from New Waterford Showing the Existing Visual Landscape**

Figure 4-5 View of the Project Site from New Waterford Showing the Projected Visual Landscape

4.5.4 Ambient Noise

Noise is often brought up as an issue surrounding wind turbines. Most recently associated with a wind farm at Pubnico Point, Nova Scotia. Generally there are two types of noise associated with the operation of wind turbine: the noise created by the generator and gearbox inside the nacelle; and the noise created by the blades or rotors passing through the air.

The E-70 turbine is a gearless turbine with a direct drive variable speed generator. These machines have no gearbox or drive train, and consequently no high speed mechanical (or electrical) components. Direct drive turbines are, therefore, quieter than gearbox machines as they do not produce mechanical or tonal noise. Variable speed machines change speed continuously in response to changes in wind speed and, although noise output may be higher at higher wind speeds, it is lower at low wind speeds where the low background levels occur (British Wind Energy Association website, 2005).

The blade of the E-70 has been designed to reduce noise created by turbulence. Turbulence that occurs at the blade tips due to overpressure and under pressure are effectively removed from the rotor plane. The entire length of the blade is therefore utilised without any loss of energy caused by turbulences (Enercon, 2004). An upwind orientation of the blades to the tower reduces airflow changes as the blades pass the tower. Some older models had the blades downwind of the tower, which would result in a pulse as the blade passes the tower. A modern wind turbine, like the E-70 proposed for the Lingan site, emits less noise than a suburban or rural neighbourhood. Sound pressure levels emitted from a turbine is expected to be between 47 and 50db at a distance of 200 m. Sound pressure levels measured in the spring of 2005 in the vicinity of the project site averaged 54db.

Results:

Magnitude	Small: Construction, noise sources will be limited to excavator, trucks and crane operation. Operation, the turbine blades and generator of the E70 are designed to reduce noise during operation
Reversibility	Reversible
Nature	Negative
Extent	Regional: The extent of noise effects is limited to the project site and immediate surroundings.
Duration	Short-term: The potential duration of impacts from nuisance noise is confined to the construction period, and to short durations during infrequent operations events.
Confidence in prediction	High

Significance: Not significant, based on ambient noise levels recorded in May 2005.

Residual Impact Statement: The predicted ambient noise generated by the wind farm will not exceed the background noise of the surrounding area. Sound is only produced by the turbines when the wind is blowing and due to advances in blade and generator design, the ambient noise of the turbines should be masked by the wind passing through the trees and local structures.

4.5.5 Cultural Resources

Cultural Resource Management Group was contracted to conduct an archaeological screening of the Lingan study area. The screening consisted of background information searches and a non-intrusive site visit. The Nova Scotia Museum has no records of archaeological sites in the vicinity of the study area; however, this may be due to a lack of investigations. The cultural resources report is found in Appendix C.

Historically, the Lingan area in general has been the site of Mi'kmaq, French and Irish settlement. No records of Mi'kmaq settlement exist; however, former names of the region (Indian Head and Indian Bay) suggest habitation by First Nations people. The French settled the area prior to 1716, followed by the Irish in the late 1700's.

The Lincoln Mine operated near the site of the present day generating station from 1854 to 1888.

North Head is the site of a former observation post constructed in 1939 as part of the coastal defences for Sydney Harbour. The structure still remains along with evidence of possible out buildings (privy, etc), but is in an advanced state of deterioration.

Results:

Magnitude	Moderate
Reversibility	Irreversible: once features are destroyed they cannot be recovered
Nature	Negative: due to the fragile and unique character of cultural heritage resources, the anticipated construction related impacts are considered negative Positive: the planning and modeling being undertaken to identify cultural heritage resource impacts will serve to advance the understanding of human history and population distribution
Extent	Immediate: confined only to excavated areas
Duration	Short-term: effects will only occur during construction
Confidence in prediction	High

Significance: Not significant given the recommended mitigation measures, absence of evidence of cultural resources, and the relatively small area of disturbance

Residual Impact Statement: Implementation of the pre-construction field verification strategies and construction period monitoring activities will allow GBLWP to carry out appropriate and responsible mitigation strategies to avoid impacts where practical and address accidental cultural heritage resource impacts during construction.

4.5.6 Air Emissions

Local and global air quality issues relating to the proposed project include vehicle emissions (*e.g.*, carbon dioxide and oxides of nitrogen) as well as dust and noise.

- Air emissions must comply with the provincial *Air Quality Regulation* made under Section 112 of the *Environment Act*, 1995.

It is expected that the minimal emissions of greenhouse gases during construction resulting from the project will be greatly offset by reductions in greenhouse gas emissions by use of wind power for power generation. The estimated reduction in GHG is approximately 37,000 tonnes per year.

Dust at nuisance levels can be generated by construction, however, it is expected that dust generation will be limited. Dust suppression will be carried out as required during construction. Dust can be related to health issues, however, the project will not generate dust at levels or over periods of time that need to be addressed as a health risk for the public.

Guidelines are provided for dust levels by the NSDEL. These levels are related to the disturbance and nuisance of fugitive dust.

Results:

Magnitude	Small: similar to other utility construction projects.
Reversibility	Reversible: Emissions, and dust are temporary. Positive reductions in GHG
Nature	Positive
Extent	Regional: The extent of emissions and dust effects are limited to areas close to the wind farm construction. Overall reduction of greenhouse gases from the project.
Duration	Short-term: The potential duration of impacts from emissions and dust is confined to the construction period events.
Confidence in prediction	High

Significance: Not significant. Fugitive and point source emissions from the project are minor to negligible on a global scale. In addition, greenhouse gas emissions associated with heating will be reduced as a portion of electricity generation from oil/coal is replaced by wind. The impacts of dust are not expected to be significant with protection measures.

Residual Impact Statement: The residual impacts of dust are considered not significant. During construction the effects will be mitigated by standard dust suppression methods. No residual long-term impacts on air quality are expected from the project.

4.5.7 Terrestrial Habitats

The wind farm site is characterized by a combination of coastal barrens and mixed forest and scrub. Coastal barrens are a common habitat on the shoreline between New Victoria and Donkin. The barrens on this site extend from the tree line to the cliffs that make up this headland and vary between 80 and 250 m wide. No wetlands were noted in the NSDNR wetlands database; however, the coastal barrens exhibit characteristics of a cranberry bog. The area has been subjected to extensive damage from off-highway vehicles. Ponding was observed in the ruts and tracks created by off-highway vehicles. The turbines will be situated upland from the barrens, thereby avoiding low-lying areas.

The forest component of the site consists of mixed species with the majority being white spruce and intolerant hardwoods such as alder and red maple. Trees in these stands range in average age between 25 and 35 years.

No significant wildlife habitats, as listed by NSDNR, are present on the proposed site (refer to Figure 4-6). The closest NSDNR significant wildlife habitat is located in approximately 1 km south of the site. This habitat is located in the waters of Shanty Bay and is classed as migratory bird habitat. Other migratory bird habitat includes the waters of Lingan Bay, approximately 1.8 km south of the site.

Figure 4-6 Land Cover/Terrestrial Habitats

Results:

Magnitude	Small
Reversibility	Irreversible
Nature	Negative
Extent	Immediate: limited to access roads, turbine foundations and crane pads
Duration	Long-term: Life of the wind farm (approx. 25 years)
Confidence in prediction	High: Sensitive habitat is not present on the site.

Significance: Not significant. No known significant wildlife habitat onsite, and the amount of habitat directly impacted is minimal.

Residual Impact Statement: No significant impacts are predicted on terrestrial habitats based on the limited amount of land required for the wind turbines and the degree of past disturbance.

4.5.8 Species At Risk (Flora and Fauna)

Species at risk include those for which critical habitat is restricted to a few locations, or which are represented by a few individuals locally, nationally or globally. Species at risk are valued by numerous stakeholder groups. Provincial and pending federal legislation provides for the protection, designation, recovery and other aspects of conservation of species at risk. At Risk Species are identified nationally under the Committee on the Status of Wildlife in Canada (COSEWIC) listings and provincially under the status of wildlife process. Regulatory protection is extended under the federal Species at Risk Act (SARA) and the provincial Nova Scotia Endangered Species Act (NSESA). Under SARA, the initial List of Wildlife Species at Risk is Schedule 1 and is based on recent COSEWIC assessment of endangered or threatened species. As of June 1, 2004, SARA applies to aquatic or migratory bird (under MBCA protection) at risk species and listed endangered, threatened or extirpated species on federal lands. The NSESA provides “for the protection, recovery and other relevant aspects of conservation of species at risk in the Province, including habitat protection” (Nova Scotia Department of Natural Resources 1998). At risk species are designated for protection under the Act by the Species-at-risk Working Group.

Other species are identified as potentially rare within the province based on literature assessments such as the Atlas of Rare Vascular Plants of Nova Scotia (Pronych & Wilson, 1993).

While there is potential to encounter rare species either directly within the construction area or to have construction activities result in disturbance to rare species adjacent to the site, the disturbed nature of the site decreases the potential.

Flora Methodology

Potential at-risk flora known to occur within the general vicinity of the project (10 km square or adjacent grid to ensure a complete plant list as the 10 km grid may not be centered on the study area) are identified in the Atlas of Rare Vascular Plants of Nova Scotia and in NSM and ACCDC data. A search of records from the ACCDC was conducted using a 100 km radius from the project site as described in NSDNR's Draft Guide to Addressing Wildlife Species and Habitats in an EA Registration Document (2005). Data reports are provided in Appendix B as well as a 10 km ACCDC search result.

Field surveys were conducted within the study area with particular attention paid to habitats with a higher potential for containing at-risk species. These habitats included any wetlands, swales and low-lying areas, specific forest stands and road sides/disturbed areas. A spring survey was conducted in June 2005; and a late summer plant survey was conducted in September 2005 to identify those species that flower in the late season. The results of the results of this survey are presented in Appendix C.

Fauna Methodology

Potential at-risk fauna known to occur within the general vicinity of the project are identified based on the Atlas of Breeding Birds (Erskine 1999), NSM and ACCDC data, and habitat. Data reports are provided in Appendix B.

Field surveys were conducted within the study area with particular attention paid to habitats with a higher potential for containing at-risk species. These habitats included any wetlands, swales and low-lying areas, specific forest stands and disturbed areas.

No at-risk flora or fauna were observed during field surveys.

Results:

Magnitude	Not applicable: At risk species not observed on the project site.
Reversibility	Not applicable
Nature	Not applicable
Extent	Not applicable
Duration	Not applicable
Confidence in prediction	High: Project site field truthed for at risk plants and herpetiles, the surrounding area was field truthed for at risk avian species. Species were not observed.

Significance: Not significant. Not at risk species observed.

Residual Impact Statement: No significant impacts are predicted on species at risk based on the findings of the survey and the commitment to implement field identification survey prior to construction in those areas not assessed.

4.5.9 Accidents and Malfunctions

Accidents and malfunctions that can lead to environmental effects may occur during any phase of the project. During pre-construction and construction these events largely involve minor spills of hydraulic oil, fuel, lubricants on the project site. These spills are readily contained and cleaned up following standard spill contingency measures and, when mitigated promptly, do not result in environmental effects.

To minimize the likelihood of a spill, GBLWP will implement environmental awareness training that will provide all staff with information on environmental protection measures to be employed on the project. This training will include handling and disposal of hazardous materials.

In the event of a spill, GBLWP and its contractors will follow the procedures described in the spill contingency plan detailed in the EPP. In addition, contractors will be required to maintain appropriate spill response cleanup materials during construction.

Following a release, depending upon the circumstances of the event, the spillage or unintentional release of hazardous substances will be reported to Nova Scotia Department of Environment and Labour.

Ice Throw

There is potential for ice to form on the blades of the turbine in this environment. Public injury from ice throw is unlikely for two reasons: 1) the setback required by municipal by-laws ensures that residential properties are sufficient to protect against injury to the public; and 2) since ice reduces rotation, modern turbines are equipped with sensors that will shut down the unit if ice is detected on the blades.

High Wind Conditions

The E-70 wind turbine will cease operation in winds exceeding between 28 m/s and 34 m/s reducing the potential for damage to the turbine caused by excessive wind speed. The tower foundation is circular in design to evenly distribute stress on the tower.

Results:

Magnitude	Small
Reversibility	Reversible: Spills can be contained and cleaned up.
Nature	Negative
Extent	Immediate: Largely contained to the project site, but effects can occur beyond the site if not adequately contained.
Duration	Short Term: If event occurs, contingency measures will be implemented to contain and cleanup spill or release. A shut down due to icing could last until a technician checks the turbine
Confidence in prediction	High: Due to recent experience in Nova Scotia with this issue

Significance: Not significant provided contingency and emergency plans are implemented in accordance with the EPP.

Residual Impact Statement: No significant residual impacts are anticipated as spills will be contained and cleaned up immediately following their discovery.

4.6 Effects of the Environment on the Project

Environmental effects on the project can be defined as any change to the project that may be caused by the environment. Typical effects considered in describing the environmental effects on the project include climatic events such as high winds, heavy precipitation, and ice/snow; and physical events such as coastal erosion and subsidence.

Extreme Weather Events

The E70 turbine is designed to cut out at wind speeds in excess of 28 – 32 m/s to mitigate the effects of damaging winds. The turbine tower and base are designed to withstand extreme weather conditions. A large blade flange diameter and double-row bolting that connect the blade to the nacelle provides increased strength and reduces wind stress by creating even load distribution. The circular design of the foundation distributes wind stress evenly around the base. Quality testing of the components includes structural investigation, as well as ultrasound and x-ray tests.

Aside from high winds, another weather event that has the potential to affect the project is icing of the turbine components, particularly the blades. As noted in Section 4.5.9, turbines are designed to reduce operation in the event of icing.

Access roads will be constructed under specifications designed to effectively divert storm water runoff away from the roads to prevent flooding and/or erosion damage.

Sea Level Rise

Sea levels are rising along most coasts in Atlantic Canada, in part an effect of post-glacial subsidence and also global sea-level rise (National Atlas of Canada, 2004). Much of Atlantic Canada's shoreline, especially in the Maritime Provinces, is at moderate-to-high risk of impacts from rising sea levels. Coastal areas will also be vulnerable to changes in sea ice, winter storms and storm surges. Projected sea level rise is based on the theory that a warming atmosphere will transfer that heat to the oceans, expanding the oceans as they warm. Added to this is the contribution from the melting Greenland ice cap and mountain glaciers. According to Environment Canada, the average sea level rise will be 70 cm by the year 2100 (Environment Canada 2004). The projected rise in sea level is not anticipated to have an impact on this project, as the project is 20-30 m above sea level

Coastal Erosion

The proposed locations of the five wind turbines are set back from the shoreline approximately 200 to 250 m. The rate shoreline erosion in this area of Nova Scotia averages around 1-2 m/yr. At this rate, the

project is not expected to be effected by erosion during its lifetime. This rate is beyond the lifetime of this project, which is approximately 25 years. Coastal erosion is not likely to have a negative effect on the project.

Subsidence

The former Lingan Colliery was located on lands west of the project site. Another possibility in this part of Cape Breton is the presence of "bootleg" mines. Generally, the records of the bootleg mines are poor or nonexistent and geotechnical investigations are required to reduce the risk of constructing over substandard bedrock conditions. A geotechnical report including an assessment of the potential for subsidence related to the failure of the tunnel support structures has been conducted. The report recommended a suitable separation distance from the underground workings of the former colliery and turbines and these recommendation have been incorporated into the siting of the turbines. No impact is expected from subsidence.

4.7 Cumulative Effects

Cumulative effects are those predicted effects of a project interacting with the effects of other projects, past, present and those that are reasonably foreseeable. For the purposes of this project, the boundaries of the cumulative effects assessment include are area that encompasses the communities of New Victoria, New Waterford, Lingan and Dominion. Table 4-3 presents a list of likely

Table 4-3 Past, Present and Reasonably Foreseeable Actions in Project Area

Past • Coal mining operations
Present • Coal fired power generation/transmission • Communications towers • 800 kW wind turbine at Bridgeport Cove
Reasonably Foreseeable • Additional wind power projects • Residential, industrial and commercial development growth

In order to determine the issues to be used in the cumulative effects assessment (CEA), two conditions must be met: there are local potential effects on due to the project and these issues are potentially affected

by other past, present or reasonably foreseeable actions within the boundaries of the assessment. Considering these conditions, the following issues were assessed as part of the assessment:

- Volant Species (Migratory and Non-Migratory Birds/Bats/Volant invertebrates)
- Visual Landscape

4.7.1 Volant Species

Past, present and foreseeable future projects in the study area have the potential to directly impact migratory and non-migratory birds include transmission lines, communication towers, and the 800kW turbine located at Bridgeport Cove. Given CBRM's provision for in the land use bylaws for wind energy facilities, further development of wind power in the area is possible. It is unlikely, given the surveys conducted and information available that this project will have additional significant negative impacts on volant species.

4.7.2 Visual Landscape

The remnants of former coal mining operations are still visible on the landscape in the study area in the form of brownfields and abandoned structures. Present day impacts on the visual landscape include the NSPI plant at Lingan and its transmission lines, communication towers, and the 800 kW turbine located at Bridgeport Cove. Foreseeable future projects include additional wind energy projects and additional commercial/residential and industrial growth. As discussed in section 4.5.8, potential impacts on the visual landscape are subjective in nature and vary between observers and as such, potential cumulative effects will be subjective as well.

5.0 Environmental Impact Summary

The preceding sections provide a detailed project description; outline environmental protection measures that GBLWP will follow, and discuss potential impacts resulting from project activities.

In summary, environmental impacts and residual impacts associated with the project are considered to be *not significant* as environmentally sensitive areas have been avoided and effects generally can be mitigated through environmental protection measures and project design. Further, effects are limited in scope and duration, or are reversible following the completion of construction.

Table 5-1 presents a summary of the identified issues and provides a determination of significance for each.

Table 5-1 Impact Assessment Summary

Issue (Including Mitigation)	Section Reference	Magnitude	Reversibility	Nature	Extent	Duration	Confidence
Air Quality	4.5.1	S	R	POS/NEG	R	ST	H
Terrestrial Habitat	4.5.2	S	R	NEG	I	LT	H
Species at Risk	4.5.3	N/A	N/A	N/A	N/A	N/A	H
Migratory Birds	4.5.4	S	R	NEG	I	LT	H
Other Volant Species	4.5.5	S	R	NEG	I	LT	M
Cultural Resources	4.5.6	S	I	NEG/POS	I	ST/LT	H
Ambient Noise	4.5.7	S	R	NEG	R	ST	H
Visual Landscape	4.5.8	S	I	NEG/POS	R	LT	H
Accidents and Malfunctions	4.5.9	S	R	NEG	I	ST	H

Keys to Table 4-3

N/A	Not Applicable	POS	Positive
NEG	Negative	IRR	Irreversible
REV	Reversible	I	Immediate
L	Local	R	Regional
ST	Short Term	MT	Medium Term
LT	Long Term	S	Small
M	Moderate	H	High

6.0 Follow-up

6.1 Additional Studies

A Mi'kmaq Knowledge Study (MKS) will be conducted in the late spring of 2006 to identify potential issues of concern to Mi'kmaq First Nations.

Prior to construction, an intrusive archaeological survey will be completed where turbines will be situated in areas of high archaeological potential.

6.2 Environmental Protection Plan (EPP)

GBLWP has prepared an EPP addressing its activities over the life of the project as well as environmental contract specifications. The EPP and the contract specifications are an integral part of the environmental management program. In addition to the EPP, site or project specific environmental instructions will be provided in the form of Environmental Control Plans (ECPs) where required. ECPs will be employed where the need for site-specific mitigative measures have been identified by GBLWP, the regulatory agencies, or through agreement with landowners. The EPP is found in Appendix F.

6.3 Contingency Plans

GBLWP has prepared environmental Contingency Plans as part of the EPP and its construction specifications. These address and provide direction on response to: discovery of cultural resources; discovery of contaminated materials; hazardous materials handling; and spill response.

6.4 Compliance Monitoring

Compliance monitoring will conform to the Conditions of Approval and the commitments made in the registration. Throughout the life of the GBLWP project, construction/operations/ decommissioning will be undertaken in accordance with these as well as the EPP. The intent of which is to conduct operations in an environmentally responsible manner and in compliance with applicable laws and regulations, as well as standards and guidelines.

6.5 Post-Construction Environmental Effects Monitoring

Following construction of the wind farm, a one-year post-construction avian and bat mortality monitoring program will be established to monitor the interaction of avian species with the turbines. If instances of mortality are observed, it will be reported along with the ability of the various avian species ability to avoid the turbines.

References

Agriculture and Agri-Foods Canada. Soil Survey Data for Nova Scotia – Cape Breton County

Beanland, G. and Duinker, P. 1983. *An Ecological Framework for Environmental Impact Assessment in Canada*. Institute for Resource and Environmental Studies. Dalhousie University, 132 pp.

Canadian Environmental Assessment Act S.C. 1992, c-37

Canadian Migratory Birds Convention Act S.C., 1994 c.22

Canadian Wildlife Service. 2003. Wind Turbines and Birds. A Guidance Document for Environmental Assessment. Draft report.

Davis, D and Browne, S (Eds.) 1996. *The Natural History of Nova Scotia*. Halifax. Nimbus Publishing and The Nova Scotia Museum.

Dangerous Goods Transportation Act. R.S., c. 119, s. 1

Enercon. 2005. E70 200kW Technical Fact Sheet.

Environment Act. 1994-95, c. 1, s. 1.

Environment Canada. 2004. Regional Impacts of Climate Change – Nova Scotia. Accessed at http://www.climatechange.gc.ca/english/affect/prov_territory/ns.asp.

Environmental Assessment Regulations, N.S. Reg. 44/2003 (February 28, 2003)

Erickson, W., K. Kronner, and B. Gritski. 2003Nine Canyon Wind Power project avian and bat monitoring report. Nine Canyon Tec. Advisory Comm. www.west-inc.com.

Erskine, A.J. 1992. *Atlas of Breeding Birds of the Maritime Provinces*. Nimbus Publishing and The Nova Scotia Museum.

Fisheries Act S.C., 1985 c. F-14

Johnson, G.D., W.P. Erickson, M.D. Strickland, M.F. Shepherd, and D.A. Shepherd. 2003. Mortality of bats at large-scale wind power development at Buffalo Ridge, Minnesota. AM. Midl. Nat. 150:219-235

Johnson, G.D., W. Erickson, J. White, and R. McKinney. 2003b. Avian and bat mortality during the first year of operation at the Klondike Phase I wind project, Sherman County, Oregon. Northwest Wind Power. www.west-inc.com.

National Atlas of Canada, Coastal Sensitivity to Sea Level Rise, from data from J. Shaw, 1998, accessed at http://atlas.gc.ca/site/english/maps/climatechange/potentialimpacts/coastalsensitivitysealevelrise

Nova Scotia Department of the Environment. 1995. Wetlands Directive.

Nova Scotia Department of Environment and Labour. Nova Scotia Watersheds Digital Map

Nova Scotia Department of Natural Resources. Forestry Database

Nova Scotia Department of Natural Resources. Geological Map of the Province of Nova Scotia. (ME 2000-1)

Nova Scotia Department of Natural Resources. Restricted and Limited Use Land Database

Nova Scotia Department of Natural Resources. Significant Wildlife Habitats Database

Nova Scotia Department of Natural Resources. Wetlands Database

Occupational Health and Safety Act. 1996, c. 7, s. 1.

Pronych, A. and Wilson, A. 1993. *Rare Vascular Plants Atlas for Nova Scotia*. Nova Scotia Museum curatorial report.

Service Nova Scotia and Municipal Relations. 1:10,000 Digital Topographic Series

Service Nova Scotia and Municipal Relations. Digital Property Series

Special Places Protection Act. R.S., c. 438, s. 1.

Sulfide Bearing Material Disposal Regulations NS Reg. 57/97 (April 11, 95) Nova Scotia.

Young, D.P., Jr., W.P. Erickson, R.E. Good, M.D. Strickland, and G.D. Johnson. 2003. Avian and bat mortality associated with the initial phase of the Foote Creek Rim windpower project, Carbon County, Wyoming. www.west-inc.com

Personal Communications

Busby, Dan. Canadian Wildlife Service.

Power, Terry. NSDNR Regional Biologist.

Whittam, Becky. Bird Studies Canada.

Appendix A
Avian Survey Data

Appendix B
Plant and Fauna Survey Data

Appendix C
Cultural Heritage Impact Assessment

Appendix D
Subsidence Reports

Appendix E
Environmental Protection Plan

Appendix F
Draft Bird and Bat Monitoring Program