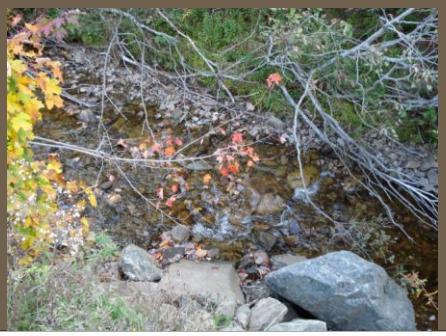
Wind / Hydro Energy Project

Environmental Assessment Registration & Project Description



Prepared for: Cape Breton Explorations Limited

Prepared by: CBCL Limited

Project Number: 072465

November 2007

CBCL LIMITED

Consulting Engineers

Contents

Acronyms

ACCDC	Atlantic Canada Conservation Data Centre
BBS	Breeding Bird Survey
BIODRA	Biodiversity Research Associates
BP	Before Present, i.e., 1950
CBEX	Cape Breton Explorations Limited
CBRM	Cape Breton Regional Municipality
CEAA	*Canadian Environmental Assessment Act*
CEPA	*Canadian Environmental Protection Act*
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DFO	Fisheries and Oceans
EC	Environment Canada
EMP	Environmental Management Plan
EPP	Environmental Protection Plan
FEED	Front End Engineering Design
HADD	Harmful Alteration, Disruption and Destruction
MBBA	Maritime Breeding Bird Atlas
NSDEL	Nova Scotia Department of Environment and Labour
NSDNR	Nova Scotia Department of Natural Resources
NSPI	Nova Scotia Power Inc.
NWPA	*Navigable Waters Protection Act*
RCMP	Royal Canadian Mounted Police
SARA	*Species at Risk Act*
TC	Transport Canada
The Agency	Canadian Environmental Assessment Agency
VEC	Valued Ecosystem Component
WTG	Wind Turbine Generators

Chapter 1 Introduction

1.1 Project Overview

Cape Breton Explorations Limited ("CBEX") is a private company based in Cape Breton that is engaged in the production of electricity from wind turbines, hydro turbines and other renewable sources of energy. Currently CBEX is focusing on the development of a hybrid wind/hydro pump storage power generating facility on the hills above Lake Uist (Figure 1.1). The reservoir, the penstock and the hydro turbines and most of the wind turbines are located in Cape Breton Regional Municipality (CBRM). Subject to further engineering, two or three of the turbines may be located within the Municipality of the County of Richmond. Irrespective of the siting of the physical infrastructure, Lake Uist and the associated waters that make up the interconnected system of streams and lakes in the study area and the communities that access and use the lands and waters of this area are located in both referenced municipalities.

The Project consists of the following primary components:

- A reservoir with the capacity of 20,000,000 m^3 in the hills approximately 190 m above sea level and 140 m above Lake Uist;
- Two 50-75 MW hydro reversible pump turbines; and
- Up to 44 wind turbines E 70 x 2.3 MW.

Wind turbines generate power when the wind is blowing, but this is not necessarily during periods of peak power demand. The challenge, therefore, is to capture and store the energy generated to ensure capacity in periods of peak demand. This Project will utilize a tested method of storing generating capacity, i.e., hydro. The innovative dimension is to use the energy generated by wind turbines to maintain the requisite head of water in the reservoir which can then be used to generate power during peak periods thereby making this a truly "green" renewable project eligible for ECOLogo certification.

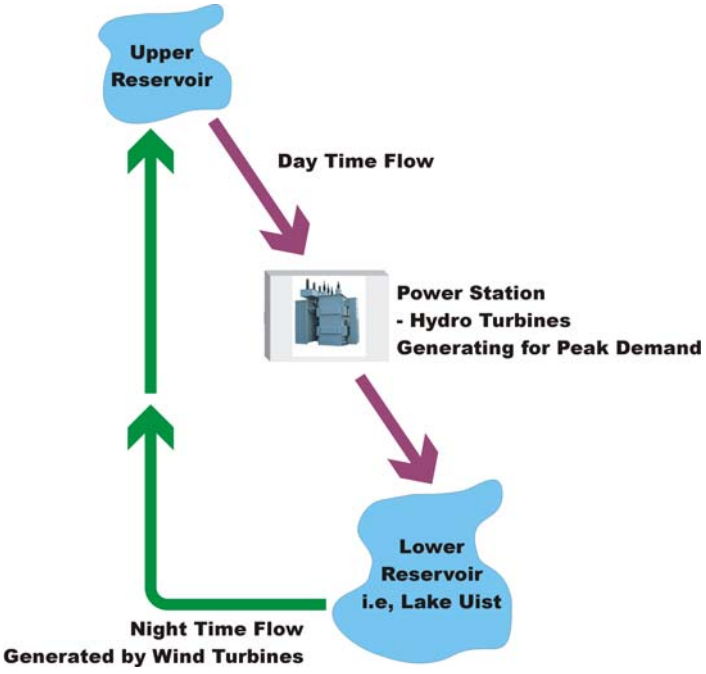


Figure 1.2: The Pumped Storage Principle

Figure 1.2 provides a schematic of the principle involved. At full output the hydro facility will generate approximately 325,000 MWH per year during the peak demand periods (up to 10 hours per day).

The objective of this Project Description Registration Document is twofold:

i) to present the Project to the Canadian Environmental Assessment Agency (the Agency) and thereby to pertinent federal departments and agencies in sufficient detail to determine the responsible and expert federal authorities for the federal environmental assessment that will likely be triggered; and

ii) to present to the Nova Scotia Department of Environment and Labour

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5080000 5075000 5070000 5065000

BRAS D'OR LAKE

Middle Cape

MIDDLE CAPE

IRISH VALE

Proposed Reservoir Site

EAST BAY HILLS

MacNeils Brook

MacCormicks Lake

Salmon River

Gaspereaux River

GLENGARRY VALLEY

Gaspereaux Lake

MacNeils Lake

TERRA NOVA

Loch Lomond Rd.

N Glen Rd.

Jim MacDonalds Brook

McCurshs Bk.

Irish Cove

Lakeshore Dr.

IRISH COVE

Irish Cove Rd.

Irish Cove Brook

JOHNSTOWN

SALEM ROAD

MacDonald Bk.

Munroe Lake

Enon Lake

ENON

Salmon River Rd.

Lake Uist

Middle River-Framboise Wilderness Area

Cape Breton Regional Municipality

Richmond Co. Municipality

Big Island Lake

RED ISLANDS

LAKE UIST

Loch Lomond

Loch Lomond Rd.

Northside Loch Lomond Rd.

LOCHSIDE

Hay Cove Rd.

Shaw Lakes

Stone Lake

LOCH LOMOND

MOUNT AUBURN

LOCH LOMOND WEST

Stirling Rd.

PEI

Cape Breton Island

Study Area

Nova Scotia

FIGURE 1.1 : Study Area

- Water Tank
- Fire Tower
- Quarry / Mine / Pit
- Communitiy
- Building
- Proposed Turbine Location
- Proposed New Roads
- Major Road
- Local Road
- Trails / Lanes / Tracks
- Boundary - County
- Transmission Corridor
- Contour - Index
- Contour - Regular
- Wetland
- Wilderness Area
- Study Area

N W E S

0 1000 2000 3000 4000 5000 6000 Metres

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Data Source: 1:10000 Digital Data, SNSMR; DNR Wetland Database; Projection: NAD83 UTM Zone 20; Cartographic Design & Layout By Shiju Mathew @cbcl.ca

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(NSDEL) a document that will serve as the Registration Document for a Class II environmental assessment in accordance with the Environmental Assessment Regulations pursuant to the Nova Scotia *Environment Act*.

To meet these dual objectives, this document has been prepared with reference to the requirements of the Agency's Operation Policy Statement, August 2000-OPS-EPO/5-2000, "Preparing Project Descriptions under the *Canadian Environmental Assessment Act*" and NSDEL's 2001, "A Proponent's Guide to Environmental Assessment". Where there are gaps or uncertainties in the information presented, these are identified in the text.

1.2 Contact Information

As has been stated, the Proponent, CBEX, is a company established for the purpose of investing in renewable energy projects. Principals of CBEX also co-own and operate the 17.8 MW wind farm at Lingan which is composed of nine wind turbines.

Proponent contact:

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Glace Bay, NS Canada B1A 4M3

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President – CFO
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Email: luciano@cbexplorations.com

Name of agent acting on behalf of the Proponent:

CBCL Limited
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Halifax, NS, Canada B3J 2R7

Ann Wilkie, VP Environment
Tel: (902) 421-7241
Fax: (902) 423-3839
Email: annw@cbcl.ca

1.3 Regulatory Overview

All levels of government have legislative responsibilities to ensure that the development of this Project occurs in a sustainable and environmentally responsible manner. The following sections discuss the potential issues and interests of the three levels of government with respect to the proposed Project.

1.3.1 Federal

Pertinent federal legislation may include the following:

- *Canadian Environmental Assessment Act* (*CEAA*);
- *Canadian Environmental Protection Act* (*CEPA*);
- *Fisheries Act*;
- *Navigable Waters Protection Act* (*NWPA*);
- *Species at Risk Act* (*SARA*);
- *Migratory Birds Convention Act;* and
- *Aeronautics Act*.

CEAA establishes the framework and requirements for the federal environmental assessment process whereby an assessment is required before a federal authority:

i) Carries out a process;
ii) Provides financial assistance to enable a process to be carried out;
iii) Sells, leases or otherwise transfers control or administration of land to enable a project to be undertaken; or
iv) Permits, approves or takes any other action specified in the Law List Regulations for the purposes of enabling a project to be carried out.

No federal authority is involved in the execution of the Project. Nor is federal financial assistance being sought to enable this Project to proceed. Further, there is neither federal activity nor land involved in the development of the Project. Items i), ii) and iii) above do not apply. Given the nature of the proposed works, including the development of a reservoir and works in Lake Uist, it is anticipated that federal approvals specified in the Law List Regulations will be required to enable this Project to be carried out. In these circumstances, it is anticipated that *CEAA* will be triggered.

The type of assessment required varies depending on the complexity, size and the significance of the potential effects of the proposed works. Under *CEAA*, the *Comprehensive Study List Regulations* prescribe those projects and classes of projects for which a comprehensive study is required. Based on review of the *Comprehensive Study List Regulations* (specifically, Part II Electrical Generating Stations and Transmission Lines), it is anticipated that the proposed works would be assessed at the screening level rather than as a comprehensive study.

The construction of the proposed works is likely to involve the following federal regulatory authorities:

- Transport Canada (TC) to provide authorization mark and/or light the proposed turbines to address the requirements of the *Aviation Regulations* pursuant to the *Aeronautics Act*, and potentially to provide authorization under the *NWPA* for works in Lake Uist and/or for the modification of any navigable channel where an existing access road needs to be upgraded;
- Fisheries and Oceans Canada (DFO) to potentially provide authorization under the *Fisheries Act* for the Harmful Alteration, Disruption and Destruction (HADD) of fish habitat in Lake Uist and/or where an existing access road needs to be upgraded at a watercourse crossing;
- Environment Canada (EC) as an expert authority under the *CEPA*, *SARA* and the *Migratory Birds Convention Act*; and
- The Agency providing coordination for the federal environmental assessment process under *CEAA*.

DFO may determine that there are one or more HADDs to fish habitat; if so, the necessary applications will be made to the department. Similarly, appropriate application(s) will be made to TC if that department determines that an authorization is required under the *NWPA*. The federal authorities will make these determinations following their review of the Project Description and any subsequent information provided by CBEX. The necessary applications to the federal authorities will be submitted as an integral part of the work associated with the preparation of the environmental assessment.

1.3.2 Provincial

Environmental impact assessment in Nova Scotia is the responsibility of NSDEL under the *Environmental Assessment Regulations* made pursuant to the *Environment Act*. Schedule A of the regulations defines those "undertakings" that may result in a significant environmental impact and may require either a Class I or Class II environmental assessment. Included as a Class II projects are the following:

- an electric power generating facility with a production rating of 10 megawatts or more, including a hydroelectric generating facility when the cumulative power generation capacity on any single river system equals or exceeds 10 megawatts; and
- a water reservoir where the designed storage capacity exceeds the mean volume of the natural water body by 10,000,000 m^3 or more.

The proposed Project has to be registered with the Minister to instigate the environmental assessment process. The process subsequent to registration shall include the issuance of terms of reference for the assessment by NSDEL, their review by the Proponent and the public and, once finalized, the preparation of an environmental assessment report by the Proponent. On receipt of an environmental assessment report that meets the requirements of the Terms of Reference, the Minister shall refer the environmental assessment report to the Nova Scotia Environmental Assessment Board and a public hearing will be scheduled.

To the extent feasible the provincial environmental assessment process will be coordinated with the federal screening level assessment as per the *CEAA*. Through the provincial environmental assessment process, other provincial departments, including, but not limited to, the Nova Scotia Department of Natural Resources (NSDNR), will have the opportunity to provide input and expertise into the preparation of the Terms of Reference.

Additional approvals may be required under Part V of the *Environment Act* and as prescribed in the Activities Designation Regulations and other applicable pieces of Provincial legislation. These will be determined in concert with the appropriate departments, such as the NSDEL. In addition to meeting the requirements of *Environment Act* and its pursuant regulations, CBEX will be required to attain other permits and authorizations, including, but not limited to, a Special Moves Permit from Service Nova Scotia.

1.3.3 Municipal

The responsibility of any municipality is to ensure that development within its geographical area takes place in accordance with its planning strategies and zoning bylaws. The majority of the wind turbines and

all of the proposed hydro facility are located within CBRM. Dependent upon further study and engineering two or three of the proposed wind turbines may be located on lands within the Municipality of the County of Richmond.

1.3.3.1 CBRM

Section 38 of the CBRM Zoning By-Law relates to utility scale wind turbines and reads as follows:

> "Utility scale wind turbines[1] shall be permitted in all zones in compliance with the setbacks in the table below. The only dwellings for which these setbacks are waived are:
>
> - the dwelling of the owner of the property on which the utility scale wind turbine is being installed; or
> - the dwelling of the owner of the property who will be leasing land to the utility scale wind turbine proponent.
>
> For purposes of this section height is defined as being the height of the tower plus the radius of the rotor.

Height of Utility Scale Wind Turbine	***Required setback from a Dwelling***
Up to 250 ft	575 ft
Greater than 250 ft	1 ft increase in setback for each 1 ft increase in height

Given the distance between the proposed turbines and the nearest dwelling, the development of the wind farm as proposed will not infringe section 38 of CBRM's Zoning By-law. Since the Zoning By-law had no provisions that addressed hydro facilities, the Proponent instigated an application for a Zoning By-law Amendment which would permit the development of the hydro portion of the Project. On November 20, 2007, CBRM Council passed the resolution to amend the by-law.

1.3.3.2 MUNICIPALITY OF THE COUNTY OF RICHMOND

The Municipality of the County of Richmond has no requirements in their zoning by-law that would restrict the development of two or three wind turbines on the plateau above Lake Uist on lands within their jurisdiction.

1.4 Consultation

Consultation is an inherent facet of the environmental assessment process. It involves several dimensions including:

- consultation with those parties and agencies, including all levels of government, who can contribute ecological and related data to facilitate an understanding of the environment in the vicinity of the proposed works;
- consultation with local people, including property owners, who may in one way or another be affected by the construction and operation of the proposed works; and

[1] Utility scale wind turbine means a device for converting wind to produce electricity with a capacity of at least 750 kw connected to NSPI's grid system.

- making contact with representatives of the aboriginal communities that may have in the past, or who may currently, use the lands in the vicinity of the proposed works.

1.4.1 Presentations and Meetings

A consultation program has been initiated. To date, this process has included discussions with local people, a presentation to over 100 people at the Loch Lomond Fire Hall, meetings with representatives of NSDNR based in Sydney, a preliminary presentation to federal and provincial regulators in Halifax in late September, 2007, meetings with CBRM and the Municipality of the County of Richmond and with other interested parties and stakeholders. The latter include land owners and other interested citizens and businesses.

Meetings and/or direct communications have been or will be held with government departments and specific groups including the following:

- Canadian Environmental Assessment Agency (The Agency);
- Department of Fisheries and Oceans (DFO);
- Transport Canada (TC);
- Nova Scotia Department of Environment and Labour (NSDEL);
- Nova Scotia Department of Natural Resources (NSDNR);
- Union of Nova Scotia Mi'kmaq;
- Confederacy of Mainland Mi'kmaq;
- Native Council of Nova Scotia; and
- Cape Breton Business Partnership.

This is not an exhaustive list, and other parties will be consulted as the environmental assessment process is undertaken.

1.5 Project Justification

The federal and provincial governments have introduced strategies to facilitate the development of alternative energy sources in a bid to reduce the emission of green house gases. The conversion of wind power into electricity is an acknowledged means of meeting this objective. As stated above, the storage of wind energy is a critical issue since the power generated cannot be relied upon to be available when it is most needed. The intent of this Project is to use wind energy to pump water to the reservoir to ensure the power can be transferred to markets in periods of highest demand.

1.6 Structure of the Document

The purpose of this Project Description Registration Document is to provide sufficient information to the federal and provincial regulatory authorities to enable NSDEL to release Terms of Reference for the Class II environmental assessment required pursuant to the Nova Scotia *Environment Act* and to determine which federal department or agencies may be Responsible Authorities pursuant to *CEAA*.

This document indicates the scope of the Project at a sufficient level of detail for these actions to be taken; it consists of the following sections:

- Section 1.0 provides an introduction to the proponent and the proposed Project, an overview of the regulatory regime and reference to the ongoing consultation process;
- Section 2.0 identifies the principle project components, activities, scheduling, anticipated emissions and discharges, as well as outlining how malfunctions and accidents will be addressed;
- Section 3.0 describes the existing biophysical and socio-economic environment; and
- Section 4.0 identifies the anticipated ecological and socio-economic impacts in anticipation of the upcoming assessment process.

Chapter 2 Scope of Project

2.1 The Wind Farm

2.1.1 The Wind Resource

The proponent has been compiling data on the wind resource in Cape Breton and on the hills above Lake Uist for several years. Wind Resource monitoring was initiated and is ongoing above Lake Uist via two 60 m meteorological towers. Data loggers on the meteorological towers transfer the information and data files in the form of time-stamped data for wind speed, wind direction and temperature. In addition to the site specific monitoring, other wind resource information has been obtained from the Canada Wind Map, the Nova Scotia Wind Map and other nearby wind production facilities. More site wind data is required before specific micro siting of the wind turbines can be completed. Based on the information compiled to date and the experience gained through the operation of their wind facility at Lingan, the Proponent believes the wind resource at the site to be commercially farmable.

2.1.2 Principal Project Components

The wind farm design process is iterative as it considers and responds to ecological, social and economical factors. Some of the factors being taken into consideration include, but are not limited to:

- Ecological – watersheds, wetlands, watercourses, flora, fauna, birds, bats, and other sensitive features (including rare species);
- Social – distance to residences (to take account of noise and visual impact), land use, traffic, archaeological resources and aboriginal interests; and
- Economic – wind energy potential, turbine selection and required infrastructure (including access roads, transmission lines and connection points).

Based on the wind regime, technical considerations and the above factors, the project team collaborated to define an area where the turbines might be located. The resultant distribution of turbines makes the best possible use of the existing logging roads and defines areas for further field work and focused study. The need for additional access roads will be based on the above parameters. Figure 2.1 shows the site location and the proposed distribution of the wind turbines.

2.1.2.1 WIND TURBINE GENERATORS

The wind turbines that will be deployed will be ENERCON E70-E4. They stand approximately 70 m to the center of the nacelle and have a rotor diameter of 71 m. The minimum distance between turbines is approximately 500 m. Table 2.1 provides additional specification data on the ENERCON E70-E4 turbine; Figure 2.2 provides a sketch of the proposed turbine.

Table 2-1: Turbine Technical Specifications

Rated power	2,300 kW
Rotor diameter	71 m
Hub height	58 – 113 m
Turbine concept	Gearless, variable speed, variable pitch control

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5082000 5080000 5078000 5076000

N W E S

BRAS D'OR LAKE

Middle Cape
4
East Bay Hwy.
MacNeils Brook
MacCormicks Lake
Gaspereaux River
Loch Lomond Rd.
Glengarry Valley
Gaspereaux Lake
Salmon River
Terra Nova
MacNeils Lake
Middle Cape
Irish Vale
HILLS
EAST BAY
Reservoir Site
Jim MacDonalds Brook
McCuishs Brk.
Irish Cove
Cape Breton Regional Municipality
Richmond Co. - Inverness Co.
Irish Cove Rd.
Irish Cove Brook
Pen Stock
Munroe Lake
Salem Road
Enon Lake
Salem Rd.
MacDonald Brk.
Intake / Discharge Structure
Substation
Lay Down Area
Hydro Plant
Lake Uist

PEI
Cape Breton Island
Study Area
Nova Scotia

FIGURE 2.1 : Site Configuration

- Spot Elevations
- Proposed Turbines
- Major Road
- Local Road
- Trails / Lanes / Tracks
- Proposed New Roads
- Boundary - County
- Transmission Corridor
- Contour - Index
- Contour - Regular
- Wetlands
- Crown Lands

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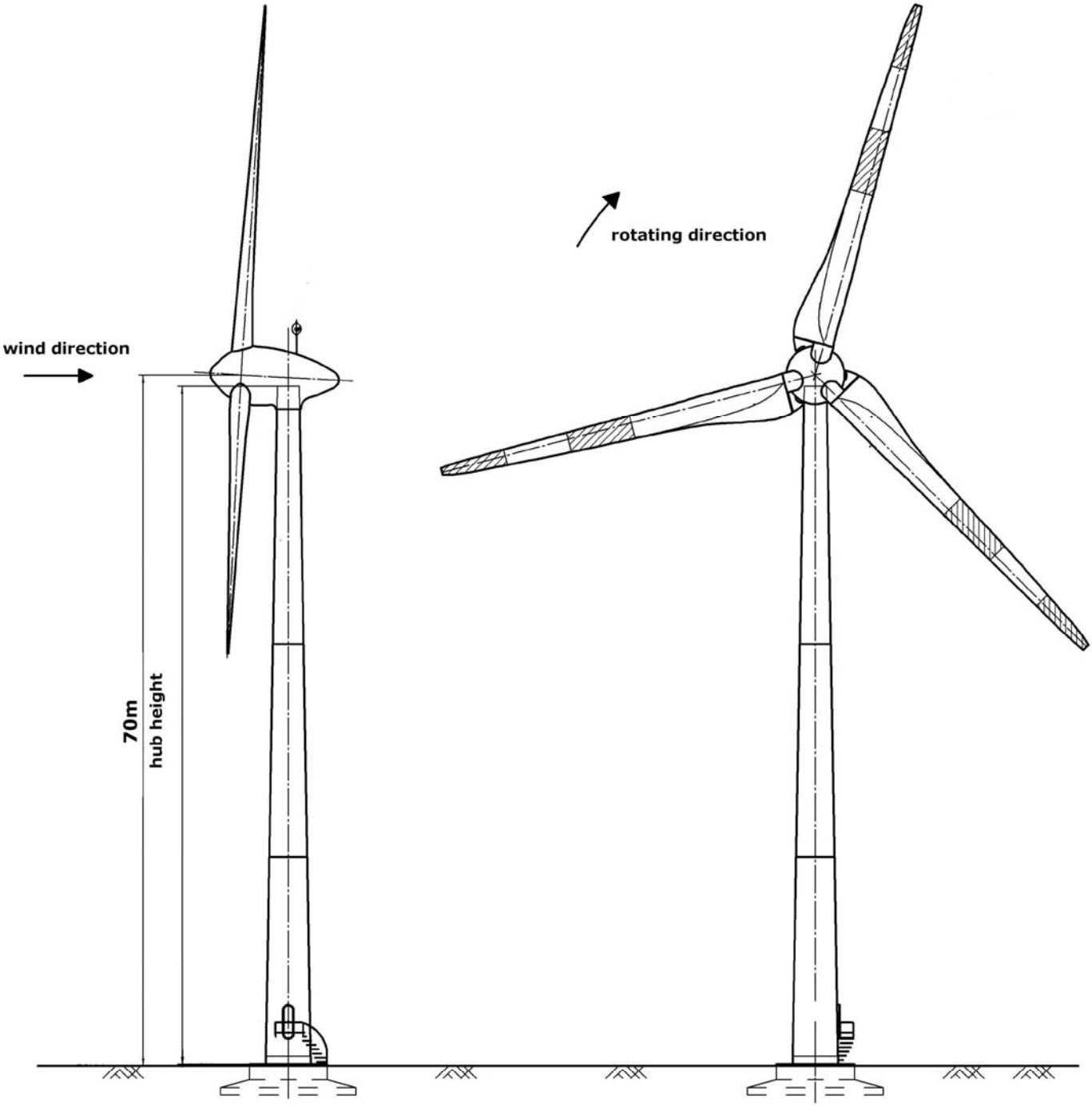

Figure 2.2. ENERCON E70

ROTOR	
Type	Upwind rotor with active pitch control
Direction of rotation	Clockwise
Number of blades	3
Swept area	3,959 m^2
Blade material	Fiberglass (epoxy resin) integrated lighting protection
Rotational speed	Variable: 6 – 21.5 rpm
Pitch control	ENERCON: blade pitch system, one independent pitching system per rotor blade with allocated emergency supply
DRIVE TRAIN WITH GENERATOR	
Hub	Rigid
Main bearings	Dual-row tapered/single-row cylindrical roller bearings
Generator	ENERCON direct-drive synchronous annular generator
Grid feeding	ENERCON converter
Braking systems	• Three independent blade pitch systems with emergency supply • Rotor brake • Rotor lock
Yaw control	Active via adjustment gears, load dependent clamping
Cut-out wind speed	28 – 34 m/s (with ENERCON storm control)
Remote monitoring	ENERCON SCADA

All wind farms must have TC approved lighting for reasons of aeronautical safety. Not every turbine, however, requires to be illuminated as the current practice is to configure lights so that the outline of the wind farm is designated. If a wind farm is square or rectilinear, then turbines at the corners of the wind farm would be illuminated. Since the proposed wind farm is irregular in shape, the exact placements of beacon lights will be determined in due course following discussions with TC. The flashing will be synchronized. There is no ground structure associated with these light units.

2.1.2.2 CONNECTION TO THE GRID

The two hydro generators (see Section 2.2.2.5) and up to 44 wind turbines will be interconnected to the NSPI transmission system on L-7012, a 230 kV line that presently carries power between NSPI's Lingan Substation and their Port Hastings Substation. This line is part of a corridor that accommodates four NSPI transmission lines. The corridor alignment is shown on Figures 2.1 and 2.3. The interconnection will be via a 230 kV underground cable system from the interconnect point directly beneath L-7012 to a facility owned substation built adjacent NSPI's right-of-way. The cable termination structure and associated equipment beneath the line will be fenced for security and public safety.

The substation will be built approximately 20 m from the edge of the NSPI cleared right-of-way and will include the following:

- A fenced area of approximately 90 m x 120 m;
- Three, maybe four, 230 kV SF_6 circuit breakers and associated equipment;
- Two power transformers to step the voltage up from 34.5 KV to 230 KV;
- 34.5 kV electrical switch gear as the collector system for the wind and hydro generators;

FIGURE 2.3: Hydro Infrastructure

Berm

Reservoir Site

NSPI Transmission Corridor

Pen Stock

Substation

Lay Down Area

Hydro Plant

Intake / Discharge Structure

Salem Road

Salem Rd.

Cape Breton Regional Municipality

Municipality of Richmond County

McCuishs Bk.

MacDonald Bk.

Munroe Lake

Enon Lake

Lake Uist

Spot Elevations

Existing Road

Wetlands

Crown Lands

Boundary - County

Transmission Corridor

Contour - Index

Contour - Regular

0 500 Metres

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- A control building to house all of the protection, control and communication systems; and
- AC and DC equipment as required.

As the power transformers are oil filled, there will be an oil containment and monitoring system installed around each transformer in the substation.

The hydro reversible turbine generators/pumps will be interconnected to the substation via 34.5 kV underground power cable. The power plant housing these two hydro turbine generator/pumps will be located approximately 3.5 km from the interconnection substation.

The collector circuits for the wind turbines will consist primarily of 34.5 kV underground power cables; there be some overhead distribution lines depending on the soil/terrain restrictions that are encountered.

There will be two step-up transformers located adjacent to the power plant to transform the generator output voltage (either 13.2 kV or 13.8 kV, depending on the supplier of the generators) to 34.5 kV.

2.1.2.3 Access Roads

Roads are required to enable construction and the subsequent servicing and maintenance of the wind turbines. During construction, the roads need to be of sufficient width, bearing capacity and grade to handle heavy and over-length loads to enable transportation of the turbine components. The turbine manufacturer has specified standards for typical access road including the necessary grades, allowable bumps and dips, minimum clearances and turning radii.

Wherever possible, the existing wood roads will be used. As much of this land is leased by Stora from the Provincial Crown and actively harvested, there is a large existing road network. Based on current site conditions and the preliminary layout of the wind farm, a significant portion of the necessary access roads already exist. Upgrading, however, may be required to some portion of these roads where there are constraints to turbine component transportation, and some new roads will be required. In some locations, existing watercourse crossings will need to be upgraded. Discussions are underway with the land owner (i.e., Stora) regarding existing permitting for their past work as these activities may require approvals from DFO under the *Fisheries Act* or TC under *NWPA*.

Based on the work done to date, it is not anticipated that any of the new access roadways will cross watercourses, wetlands or other sensitive areas, but this will be confirmed through subsequent work in the field. As much of the property is actively harvested forestry land, there are plans to work with the land lessee (i.e., Stora) to create new roads that serve both the needs of Stora and the proponent to minimize disturbance to sensitive sites including watercourses and wetlands.

During construction, temporary facilities will be provided for the needs of the site construction management and work crews, including temporary buildings, lunch and washroom facilities, laydown areas and equipment storage areas. Access roads will be maintained by the proponent following construction as they will serve as access roads for the regular maintenance of the turbines.

2.1.3 Project Activities

The four stages of the Project are described in the following sub-sections. These include planning and design; construction; operation and maintenance; decommissioning and abandonment. A general sense of the schedule is provided.

2.1.3.1 PLANNING AND DESIGN

The project team has created a preliminary plan which considers:

- Physical characteristics of the site that will be developed;
- Land ownership and current and future uses of the area;
- Ecological relevance of the lands in question; and
- Routes and pathways that will service the project including access roads and power line connections.

The physical design of the wind farm will be optimized through the application of modelling software which incorporates meteorological data from the site. The ongoing design involves a multi-disciplinary team to determine location, capacity and configuration considering ecological, social, and economic factors.

To support project planning and environmental assessment processes a range of specific studies and associated field work has been, or will be, undertaken. This work includes:

- Review of flora and fauna terrestrial habitat on the site and surrounding lands;
- Survey of watercourses for fish habitat and navigability;
- Hydrological studies of potential affected lakes and stream systems;
- Desktop review and surveys for rare and sensitive species, including those protected under the federal *Species at Risk Act* and the provincial *Endangered Species Act*;
- Bird and bat studies and surveys, including assessing migration routes;
- Assessment of the archaeological significance of the area;
- Completion of a traditional ecological knowledge study by a local Mi'kmaq group (Membertou Geomatics); and
- Consultation with local residents, politicians, regulators, aboriginal groups and other stakeholders.

Current site plans are preliminary and will be refined based on the results of the environmental assessment studies and detailed engineering.

2.1.3.2 CONSTRUCTION ACTIVITIES

It is anticipated that construction activities will begin in October 2008, after appropriate approvals and permits are in place. The initial work will generally include site preparation, including roads, site construction infrastructure, foundations and collector circuits. These initial construction activities include, but are not necessarily limited to:

- Surveys, including a site survey and a geotechnical survey;
- Upgrading of the existing roads to enable access to the turbine sites and the transportation of the turbine components, which may include adjustments for grade, allowable bumps and dips, minimum clearances and minimum turning radiuses;
- Some upgrades to existing watercourse crossings;

- Construction of new access roads where no existing road presently exists - no watercourse or wetland crossings are anticipated for the construction of the new access roads;
- Construction of on-site infrastructure including site construction offices, work crew amenities, equipment and parts storage, and water and sewer;
- Construction of collection circuits and substation;
- Preparation of the turbine pads which will involve the clearing of wooded vegetation and excavation to accommodate the concrete foundations of the tower bases;
- Preparation of the building forms for the foundation, pouring of the reinforced concrete foundation and attachment of the mounting ring for the tower; and
- Development and implementation of an erosion control plan to mitigate against sediment transfer during construction activities.

The wind turbine generators (WTG) will be delivered, and assembly will begin in Q4, 2009, following site preparation and the upgrading and construction of the access roads. The WTG assembly and ancillary construction activities include, but are not necessarily limited to, the following:

- Transportation of the WTG, including sections of the tower, the blades and nacelle, to the site on flatbed trucks;
- The lifting by crane of the tower sections which will sequentially be bolted into place. The nacelle, which contains the generating and yaw mechanism, will then be placed onto the top of the tower;
- The rotor, i.e., the blades of the turbine, will be assembled, or partially assembled, on the ground and then lifted to the nacelle and bolted into place;
- The transformer will be sited within, or in proximity to, the tower base; and
- The trenches for the power cables will be dug using heavy equipment and after the placement of the cables, the trenches will be backfilled.

Once the active construction work has been completed, site reinstatement will occur. Reinstatement activities will include, but will not necessarily be limited to, the following:

- Demobilization of the construction equipment;
- Restoration of the vegetation around the towers; and
- Removal of sediment and erosion control structures once the site is stabilized.

2.1.3.3 Operations and Maintenance

The wind turbines will be operational on a continual basis except under circumstances of mechanical breakdown, extreme weather conditions or maintenance activities. Each turbine will be subject to periodic maintenance and inspection.

Due to the number of wind turbines proposed, there will be permanent operating and maintenance infrastructure staff on site. Daily maintenance routines will be carried out as prescribed by the wind turbine manufacturer. Turbines typically undergo a preventative maintenance visit every 48 hours and are serviced every three months. Regular turbine servicing involves structural and mechanical inspections of the tower, turbine and transformer. The expected time required for each maintenance visit will be approximately two days per turbine, depending on weather conditions. It is anticipated that more maintenance time will be required during the first year of operation as the turbines are fine-tuned.

Enercon E70 turbines contain no oils or fluids and are direct drive generators without gearboxes. An appropriate number of spill kits, including absorbent material will be provided on site in the eventuality of a leakage from any of the step up transformers for each wind turbine. These spill kits will be either stored in the base of the turbine towers, or at the central storage area of the facility.

2.1.3.4 Decommissioning and Abandonment

The design life of a wind turbine is typically 20 to 30 years, and capital improvement and replacement programs can extend safe and efficient operations well beyond 40 years. Decommissioning of both the turbines and the site, when it is necessary or desirable, will be undertaken in accordance with the regulatory regime in place at the time.

At the end of their useful life, the wind turbines will be decommissioned, and all equipment will be dismantled and disposed of in a manner that meets all regulatory requirements. Such activities would likely involve the preparation of the site, e.g., the establishment of access for construction equipment and the mobilization of that equipment including cranes. The sections of the towers would be taken apart and would be reused, recycled or disposed of in accordance with regulatory requirements. After the towers had been dismantled and removed from the site, the site itself would be restored to a state similar to what currently exists through regrading and revegetation.

2.1.4 Resources and Materials Required

The proposed project will include up to 44 turbines manufactured by Enercon GMBh of Germany; these will be imported to Canada. The WTGs will be off-loaded at the nearest seaport (Sydney) and transported to the site via flatbed truck. The transportation of equipment with the dimensions of the tower sections and blades of a large turbine is a rare occurrence in Nova Scotia. Consideration is being given to the logistecs of their transportation by road. Discussions are ongoing, but their transportation will necessitate careful planning and discussion with all pertinent authorities including the Nova Scotia Department of Transportation and Public Works, TC and the RCMP. The intent is to select a cost effective and efficient means of transportation and to work with all authorities to ensure safety for all involved, including all users of the public road system.

The project will involve less than half a hectare of permanently disturbed land for the WTG pad installations (assuming about 60 m^2 per WTG). In addition, some new road construction and upgraded road works will be required. Connector circuits will be constructed as required along these roads. A substation will be constructed on leased land adjacent to and east of the existing NSPI powerline corridor approximately 200 m off of the Salem Road.

This wind farm will be installed over a large area, i.e., approximately 1,000 ha, and will not substantially change the ecology of the area. The turbines will be placed at the higher elevations, and no new watercourse crossings or disturbance to wetlands are expected, though existing watercourse crossings may need to be upgraded.

Much of the proposed land is owned by the Provincial Crown and leased by Stora and is actively harvested as part of their ongoing forestry operations. Preliminary discussions with Stora indicate

potential to coordinate activities in a manner that will reduce disturbance to the natural environment in the area

2.1.5 Anticipated Waste Generation and Disposal

The proposed wind farm will not generate air emissions.

During the construction phase of the Project, the control of silt-laden run-off may be an issue. Erosion and sediment control measures will be stringently applied throughout the construction period and will be maintained until the soils have been re-established through revegetation, or other permanent means. Construction debris will be managed on site, or at offsite disposal locations, in an approved manner. Solid wastes will be recovered for reuse or recycling or otherwise disposed of as required by provincial legislation.

A limited number of hazardous materials will be required for the construction and operation of the proposed turbines. Prior to commercial operation, an Environmental Management Plan (EMP) will be developed and implemented to ensure that all staff working at the turbines are appropriately trained to handle, store and dispose of hazardous materials which may include one or more of the following:

- Corrosion and fouling inhibitors;
- Paints;
- Industrial cleaners; and
- Lubricating oils and fuels.

All hazardous materials will be stored and handled according to all relevant federal and provincial regulations. Staff will receive the required training specified by law.

2.1.6 Malfunctions and Accidents

CBEX is aware that malfunctions and accidents that pose a risk to human health and safety and to the environment can occur and are committed to ensuring that all requisite protocols are established to:

i) Minimize the risk to human health and safety during both construction and operation; and
ii) Minimize the risk to the environment during both construction and operation.

These protocols will include:

- The development of a site Safety Management Plan;
- The formulation of a site specific Environmental Protection Plan (EPP) to ensure the application of environmental protection measures and good engineering practices through construction; and
- The preparation of an emergency response plan to address responses in the unlikely event of an accident during either construction or operation.

The construction and operation of wind turbines, through the handling of the large structural elements involved, although relatively new to this region, employs techniques and technologies that are familiar to the construction industry. The likelihood of serious malfunctions or accidents associated with their assembly and operation that would pose a risk to human health and safety, or the environment, are low.

2.2 The Hydro Facility

2.2.1 The Concept

The hydro portion of the Project will consist of a pumped storage facility. Pumped storage takes water from a lower reservoir and pumps it to an upper reservoir during hours of low demand. The water is then released from the upper reservoir through the hydro turbines to generate electricity during the peak demand hours.

The proposed Project will consist of a constructed upper reservoir on the hills above Lake Uist and a lower "reservoir" utilizing Lake Uist. The water will be pumped from Lake Uist during the night into the upper reservoir and released back to the lake over a six to 10 hour period during the day. As the water flows back into the lake by gravity, electricity will be generated using the hydro turbines. These same turbine generators, reversed and energized by wind power, will be used to pump the water back to the upper reservoir at night.

Normal operations for the facility will entail the production of electricity during the daylight hours for a period of between six to 10 hours per day. Depending on the number of hours that power is generated per day and the final design capacity of the hydro-turbines, it is expected that 2 to 5 million cubic metres will be cycled between the upper reservoir and Lake Uist daily. Power generated from the wind turbine portion of the project will be used to power the pump turbines during the off-peak night hours to refill the upper reservoir. The site will therefore be self-sustaining in its energy requirements.

The electricity generated from the hydro portion of the project will be transferred through the project substation to the transmission system owned and operated by the Nova Scotia Transmission System Operator (NSTSO). Wind energy produced during the daytime hours will also be made available to the grid.

2.2.2 Principle Project Components

The main components for the pumped storage portion of the project include the lake intake structure, the powerhouse, the penstock pipeline between the reservoir and the power house, the upper reservoir and access roads; these are shown conceptually in Figure 2.3. At this juncture it is stressed that engineering design is at a conceptual stage. Progress on several fronts, including the engineering, is made sequentially. Therefore as decisions are made with respect to the environmental regulatory process and on the corporate business and financial fronts, engineering will proceed from a conceptual level of detail through Front End Engineering Design (FEED) to the detailed engineering of all elements. Instigating the environmental assessment at this juncture enables environmental parameters to influence the engineering design to the benefit of both the Project and the environment.

2.2.2.1 INTAKE STRUCTURE

The approach to the design of the intake structure in Lake Uist is:

- to ensure the minimal impact to fish and fish habitat in the lake; and
- to maximize the hydraulic capacity of the pumps during pumping operations.

The main intake will be located within Lake Uist and will at all times be below the lowest anticipated level of the lake: it is estimated that the intake will be located at a minimum elevation of approximately 45 m above sea level. The same structure will also act as the discharge point for the water from the upper reservoir during power generation.

2.2.2.2 Upper Reservoir

It is proposed that the upper reservoir will be designed to have an upper water level elevation of 190 m above sea level and a total storage volume of 19,400,000 m^3. The reservoir will involve the design and construction of an earthen berm as illustrated in Figure 2.3. As indicated above, the reservoir will be filled with water during the night and water will be released during the day for power generation. Under normal daily operating cycles, the upper reservoir will not be completely drained. Only a fraction of the total water in the reservoir will be used on a daily basis. Daily water usage is expected to range between 10-25% of the total reservoir volume. There will be times, however, when the extended running of the hydro generators will be required for the benefit of the electrical system.

2.2.2.3 Lower Reservoir

The lower "reservoir" consists of the chain of lakes that include Lake Uist, Loch Lomond, Munro Lake and Enon Lake. The latter lakes are located upgradient to Lake Uist and discharge into Lake Uist. Lake Uist discharges water to Loch Lomond. Water will be withdrawn from Lake Uist during the night to top-up the upper reservoir and will receive water during the day during power generation operations.

The lake system has a total surface area of approximately 4.4 sq km; the depth ranges to 24 m. The lake has an estimated total water volume of approximately 34 million cubic metres.

2.2.2.4 Access Roads

Initial access to the location of the upper reservoir will be attained from the existing logging road that accesses the plateau from the Salem Road and to the extent possible use will be made of the existing logging road network. This network will have to be upgraded in places and new roads will be necessary to access the penstock, the power house and other Project facilities.

All roads will be constructed to the Class AA standard. The proposed access road alignment is shown on Figure 2.3.

2.2.2.5 Powerhouse and Generating Equipment

The powerhouse will be sited on the western shore of Lake Uist as shown on Figure 2.3. This facility will include two reversible generators each with a capacity of 50 to 75 MW that will be supplied on a competitive basis by one of the world's major manufacturer's of such equipment such as G E Hydro, Toshiba, Hitachi, Mitsubishi or Voith Siemens. A decision on the choice of this equipment is still some months away.

Access to the proposed powerhouse will be from Salem Road. The hydro generators will be connected to the substation through two step-up transformers adjacent to the power house and underground power cable. At the substation, power will in turn be delivered to a 230 KV line that is part of the NSPI grid. The proposed substation will be located close to the existing access road on the west side of Salem Road

and in proximity to NSPI's transmission corridor. An Interconnection Feasibility Study Report has been completed by NSPI and has concluded that:

"There is sufficient transmission capacity to accommodate the project with all transmission elements in service".

2.2.2.6 PENSTOCK

The buried, high pressure penstock will be approximately 3,500 m long and 6 m in diameter. The penstock will run from the upper reservoir to the proposed powerhouse located on the shore of Lake Uist. As depicted in Figure 2.3, the penstock will be in large measure parallel the site access road.

2.2.3 Activities

2.2.3.1 PLANNING AND DESIGN

As was indicated in Section 2.1.2.1 with respect to the development of the wind turbines, the project team has done a considerable amount of preparatory work to identify the preferred site and to enable work to proceed towards preliminary design. A comparable level of preparatory work has been undertaken with respect to the siting, planning and conceptual design of the hydro portion of the Project. Much work, however, does remain to be done. To ensure that the relationship between the wind farm and the hydro facility are presented and understood as coherent and integral parts of a multifaceted Project, the environmental assessment is being designed and executed as a single integrated process. The studies and field programs identified in Section 2.1.3.1 and again in Table 3.1 will therefore be designed to embrace all facets of the Project.

2.2.3.2 CONSTRUCTION ACTIVITIES

Construction of the upper reservoir, the penstock, the power house and the necessary works in Lake Uist will begin after appropriate approvals and permits are in place. The necessary sequence of activities will include the clearing of the vegetation, site preparation including necessary excavation, site construction work, the installation of foundations, works in Lake Uist, etc. These initial construction activities include many of the same, or comparable activities to those listed in Section 2.1.3.2.

The hydro turbines and associated equipment will be delivered and installed in 2009 following site and necessary structural preparations. A detailed construction sequence will be prepared as an integral part of the FEED. Once active construction work has been completed, the upper reservoir will be filled slowly over many weeks and a testing program instigated in advance of the commissioning of the works. In parallel, site reinstatement will take place which will include the removal and demolition of construction equipment, the execution of a planting program and the removal of sediment and erosion control structures once the sites are stabilized.

2.2.3.3 OPERATIONS AND MAINTENANCE

The hydro infrastructure will be operational on a continual basis except under circumstances of mechanical breakdown, or when undergoing routine maintenance. There will be permanent operating and maintenance staff on site, and protocols will be established for daily, weekly, and monthly checks and maintenance, and as required by the turbine manufacturers. All materials required for the maintenance of

the facility will be appropriately stored, and the required number of spill kits, including absorbent material, will be available on site in the eventuality of any leakage of spill.

2.2.3.4 Decommissioning and Abandonment

The expected design life of the proposed hydro facility and associated turbines is not less that 40 years and, with appropriate maintenance, the expected life expectancy would be much longer.

Decommissioning of the facility, when necessary or desirable, will be undertaken in accordance with the regulatory regime in place at the time.

2.2.4 Resources and Materials Required

As stated above, the powerhouse and generating equipment will be supplied on a competitive basis by one of the world's major manufacturers of such equipment. The balance of the works, including the necessary excavations will draw upon expertise, equipment and resources comparable to what is required for other large scale construction projects. To the extent possible the necessary resources, materials and manpower will be sourced in Cape Breton.

2.2.5 Anticipated Waste Generation and Disposal

The hydro project will not generate air emissions.

During construction, the control of silt laden runoff will be an issue that will necessitate constant vigilance. Erosion and sediment control measures will be designed to address site specific circumstances and the necessary mitigation measures will be maintained until the soils around the reservoir, throughout the length of the penstock and in the vicinity of the power house have been reestablished through revegetation, or other permanent means. Specific measures to protect Lake Uist including, but not limited to, the deployment of silt fences will be deployed to protect fish habitat and water quality. Construction debris will be managed on site, or at off site disposal locations, in an approved manner.

2.2.6 Malfunctions and Accidents

As the FEED and detailed engineering necessary to the design and development of the hydro project are undertaken, the Proponent will be working with all parties to develop an environmental management program that includes among many components, a contingency plan. This plan will identify the range of potential malfunctions and accidents that may occur from a small spill to a catastrophic event and will describe how such eventualities would be addressed. The resultant site specific procedures will address the requirements of the Nova Scotia *Environment Act* and the *Nova Scotia Occupational Health and Safety Act* and will be developed in association with the pertinent regulatory authorities and response agencies, including those who would be categorized as first responders in CBRM and in the Municipality of the County of Richmond.

Chapter 3 Existing Environment

3.1 Regional Context

The Project area is situated in Cape Breton in the hills above Route 4 on the east side of the Bras d'Or Lakes. As indicated on Figure 1.1 and referenced in Section 1.1, the site itself is located in the hills overlooking Lake Uist and in proximity to the administrative boundary between CBRM and the Municipality of the County of Richmond. Access to the site is from Salem Road, one of a network of unsurfaced roads providing access to a number of small communities around lakes Uist, Enon and Lomond. Sydney is some 50 km to the north and St. Peters some 33 km to the south. The First Nation's communities in closest proximity to the proposed works are Chapel Island, 18 km to the south, and Eskasoni some 25 km to the northwest across East Bay.

The study area as depicted on Figure 1.1 is approximately 11,225 hectares in area. This is a large area, only a small portion of which will be physically disturbed by the Project. It is also an area that encompasses several distinct habitats. The plateau above Lake Uist ranges between 130 and 185 m in elevation. At one time heavily wooded, it has been intensively managed by Stora Enso for many years and much of the area is characterized by sequences of cutting and regrowth. On the heights of the hills, there are few stances of mature tree growth. Along the shores of Lake Uist, the vegetation pattern is less disturbed.

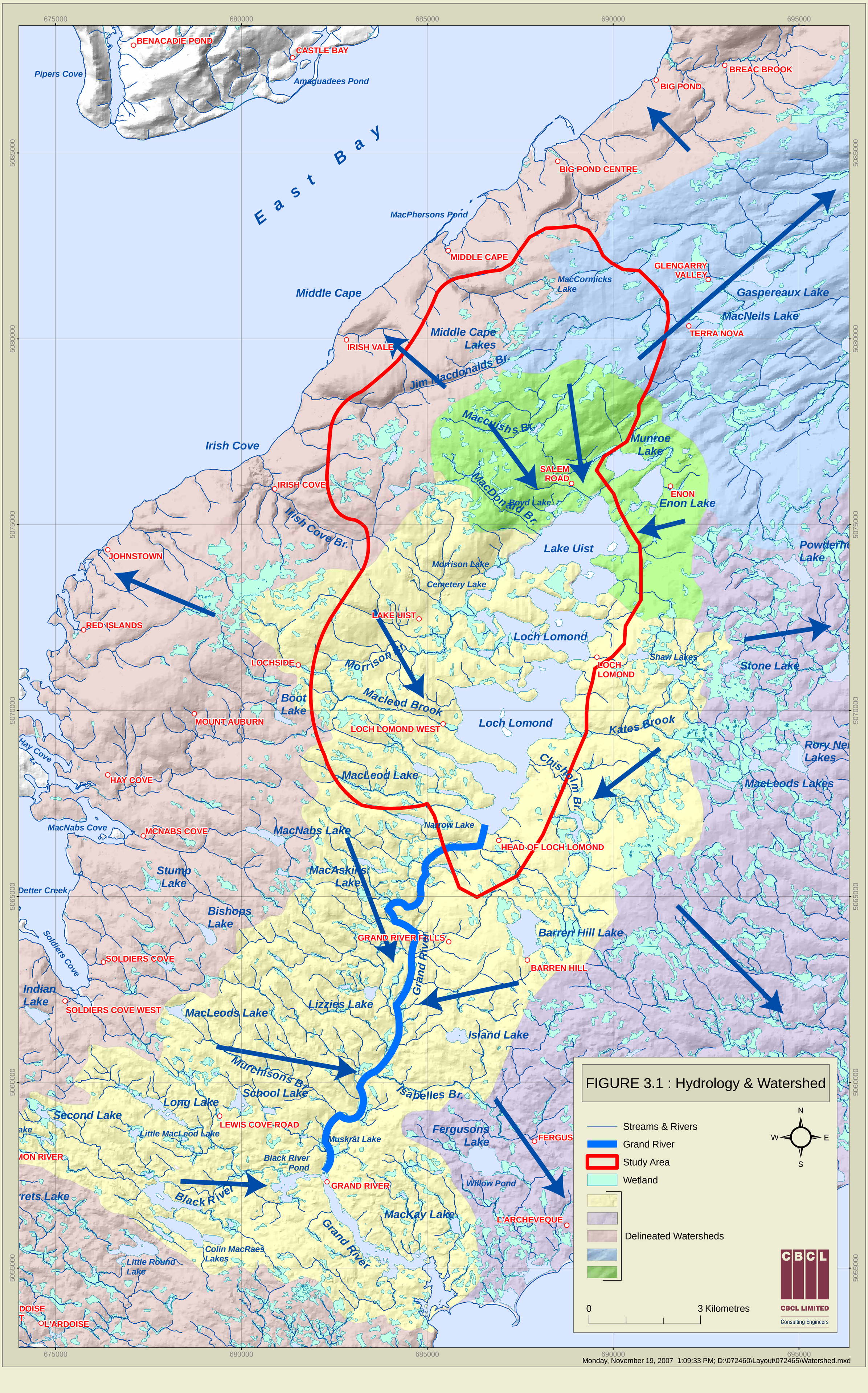
The East Bay Hills (Unit 330b) are a subset of the Fault Ridges of the Avalon Uplands. This region is characterized by severe winters and a short growing season. There are a number of lakes in the region, and many rivers and streams. The uplands in the study area include the headwaters of a number of watersheds, most notably those of the Mira and Grand Rivers (Figure 3.1). These headwaters are not particularly productive and contain a number of raised sphagnous bogs. Drainage direction in this region reflects the impacts of glaciation more than the underlying geological structure. The western slopes draining into East Bay are steeper and more dissected than those in other parts of the study area, including the eastern slopes that drain to the lakes.

3.2 Geology and Soils

The geology of the area is primarily metamorphic and igneous, and the East Bay Hill Faults result in rugged hills and valleys with step scarp slopes. The soils are predominantly stony, shallow, and particularly on the steeper slopes, well drained, heavily leached podzols of the Thom group. Sandy-loam soils of the Arichat group are found in areas of undulating, poorly drained terrain, and sphagnous peat deposits are found in areas of poor drainage such as bogs. Low evapotranspiration give rise to substantial levels of organic matter in soils in this latter area. On the plateau portion of the study area, the soils are generally imperfectly drained.

3.3 Hydrology: Lakes and Rivers

As indicated above, the uplands of the study area are the location of the headwaters of the Mira and Grand River systems. Figure 3.1 depicts these and the lesser watersheds within and beyond the defined study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BENACADIE POND
CASTLE BAY
Pipers Cove
Amaguadees Pond
East Bay
BREAC BROOK
BIG POND
BIG POND CENTRE
MacPhersons Pond
MIDDLE CAPE
GLENGARRY VALLEY
MacCormicks Lake
Middle Cape
Gaspereaux Lake
MacNeils Lake
TERRA NOVA
IRISH VALE
Middle Cape Lakes
Jim Macdonalds Br.
Macculishs Br.
Munroe Lake
Irish Cove
IRISH COVE
SALEM ROAD
MacDonald Br.
Boyd Lake
ENON
Enon Lake
Irish Cove Br.
JOHNSTOWN
Lake Uist
Morrison Lake
Cemetery Lake
LAKE UIST
RED ISLANDS
Loch Lomond
LOCHSIDE
Morrison Br.
Shaw Lakes
LOCH LOMOND
Stone Lake
Boot Lake
Macleod Brook
MOUNT AUBURN
LOCH LOMOND WEST
Loch Lomond
Kates Brook
Hay Cove
HAY COVE
MacLeod Lake
Chisholm Br.
MacLeods Lakes
MacNabs Cove
MCNABS COVE
Narrow Lake
MacNabs Lake
HEAD OF LOCH LOMOND
Stump Lake
MacAskills Lake
Detter Creek
Bishops Lake
GRAND RIVER FALLS
Barren Hill Lake
Soldiers Cove
SOLDIERS COVE
BARREN HILL
Indian Lake
SOLDIERS COVE WEST
Lizzies Lake
Grand River
MacLeods Lake
Island Lake
Murchisons Br.
School Lake
Isabelles Br.
Long Lake
LEWIS COVE-ROAD
Second Lake
Little MacLeod Lake
Muskrat Lake
Fergusons Lake
FERGUS
Black River Pond
Willow Pond
GRAND RIVER
Black River
MacKay Lake
L'ARCHEVEQUE
Grand River
Colin MacRaes Lakes
Little Round Lake
L'ARDOISE
FIGURE 3.1 : Hydrology & Watershed
Streams & Rivers
Grand River
Study Area
Wetland
Delineated Watersheds
N
W
E
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3 Kilometres
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area. A few head-water streams to the west of the study area drain into the Bras D'Or Lakes; these include Jim MacDonald's Brook, Irish Cover Brook and MacNeil's Brook. The Bras D'Or Lake is a large body of water that covers approximately 260 km^2. The lake is brackish and is connected to the ocean through the Great Bras D'Or Channel and the Little Bras d'Or Channel which are 8 m and 6 m deep respectively. There is also a smaller man-made canal with locks that connects the lake to St. Peter's Bay (Parker et al, 2007). The salinity levels in the lake is relatively low, ranging from surface water concentrations of 29 ppt at the entrance to Great Bras D'Or to 20-21 ppt at the east end of the bay. The low salinities are the result of minimal tidal influence in the lake and freshwater runoff. There is little influence on this system from groundwater sources. The lake is usually ice-covered in the winter, but water temperatures increase markedly through the spring and summer months. The Bras D'Or Lake has relatively clear water with a large photic zone that is strongly stratified (Parker et al, 2007).

The fresh water system that might be considered dominant to the north of the study area is the Salmon River lowland. Drainage throughout this area is dentritic. Tributaries flowing northeast from the study area feed into the Salmon and Gaspereaux rivers. Throughout the balance of the study area, streams flow into the lake system, i.e., lakes Enon, Uist and Lomond and hence southward into the Grand River thereby influencing the latter's flow and temperature. Surface-water pH levels in the study area range between 6.3 and 7.0. There are many raised bogs, and wetlands are associated with many lake edges throughout the study area. The pH range for Lake Uist and Loch Lomond is 5.2 to 7 while the surface dissolved oxygen concentrations range from 8.0 to 10 mg/l (Parker et al, 2007 and NSDEL, 2007).

Shoreline of Lake Uist

Salmon River

The East Bay Hills above the lakes are characterized by relatively flat, poorly drained, plateau-like crests. The streams that flow southeast towards Lake Uist and Loch Lomond, including McCuishs Brook and MacDonald Brook, are part of the Grand River watershed. In total the Grand River drains an area of approximately 217 km^2. The main stream flows 15.7 km south from Loch Lomond to the tidal waters of the Atlantic (Parker et al, 2007).

Since the hydro project will involve the creation of a reservoir on the plateau and the circulation of water between the reservoir and Lake Uist, a central part of the environmental assessment process will be to attain a thorough understanding of how the surface, subsurface and lake waters in this area currently interrelate and how they will respond to the development and operation of the proposed works. To this end the following tasks will be undertaken:

- the existing hydrological regime will be characterized and a hydrologic and hydraulic model prepared for the study area including all watersheds, lakes and streams from the proposed water impoundment site to the outlet of Loch Lomond; and
- water quality data will be compiled and a model calibrated to enable the determination of changes in water quality in the system as a result of the proposed Project.

3.4 Vegetation

Figure 3.2 provides a general distribution of vegetation categories. Vegetation in the study area can largely be categorized as falling within Loucks' Sugar Maple, Yellow birch, Balsam fir zone; the Sugar maple, Hemlock, Pine zone is also represented in the southern and eastern parts of the region.

Sugar maple (*Acer saccharum),* American beech (*Fagus grandifolia*) and Yellow birch (*Betula alleghaniensis)* are dominant climax species on (well drained) hills. White spruce (*Picea glauca*), Red spruce (*Picea rubens*), and Balsam fir (*Abies balsamea*) are dominant on valley slopes, with Black spruce (*Picea mariana*), White spruce, Eastern hemlock (*Tsuga canadensis*) and White pine (*Pinus strobus*) in valley bottoms. White ash (Fraxinus americana), Red maple (*Acer rubrum*), Aspen (*Populus spp,*), White birch (*Betula papyrifera*) are common throughout the entire study area. A vigorous shrub growth of Mountain maple (*Acer spicatum*), Beaked hazelnut (*Corylus cornuta*) and Hobblebush (*Viburnum alnifolium*) are common to cutovers and insect-killed stands.

In areas of imperfect drainage, such as the upper plateau, Larch (*Larix laricina*), Black spruce, Red maple and Alder (*Alnus spp.*) are dominant species. Numerous treed bogs support a similar growth of, sometimes dwarf, Black Spruce and Larch.

Vegetation in areas of abandoned farmland, e.g., on the western shores of Lake Uist and Loch Lomond, is predominantly White spruce and Balsam fir. Where these areas have been cutover, a Balsam fir, Red maple, Pin cherry (*Prunus pennsylvanica*), Aspen and White birch assemblage is common. Managed plantations of Pine and Spruce are scattered amongst the naturally forested landscape.

Where stands of mature conifers exist, potential Whitetail deer wintering habitat may be identified. Such stands which are located at lower elevations (with less snowfall than on plateau), are often the most suitable.

3.5 Species of Concern and Significant Habitats

An environmental screening of rare biota which may be located within the study area, has been conducted. All applicable lists have been reviewed; these include:

- the list compiled by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) under the *SARA*;
- the list compiled pursuant to the *Nova Scotia Endangered Species Act*;
- the Nova Scotia Department of Natural Resources General Status of Wild Species List (NSDNR General Status); and
- the Atlantic Canada Conservation Data Centre (ACCDC) guidance list.

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5080500 5075500 5070500 5065500

BRAS D'OR LAKE

MIDDLE CAPE
Middle Cape
IRISH VALE
IRISH COVE
Irish Cove
JOHNSTOWN
RED ISLANDS
LOCHSIDE
MOUNT AUBURN
LAKE UIST
LOCH LOMOND WEST
LOCH LOMOND
GLENGARRY VALLEY
TERRA NOVA
SALEM ROAD
ENON

MacNeils Brook
MacCormicks Lake
Salmon River
Jim MacDonalds Brook
McCurishs Bk.
MacDonalds Bk.
Irish Cove Brook
Gaspereaux River
Gaspereaux Lake
MacNeils Lake
Munroe Lake
Enon Lake
Lake Uist
Loch Lomond
Shaw Lake
Big Island Lake

Lakeshore Dr.
Irish Cove Rd.
Hay Cove Rd.
Northside Loch Lomond Rd.
Loch Lomond Rd.
N Glen Rd.
Salmon River Rd.
Stirling Rd.
Cape Breton Regional Municipality
Richmond Co. Municipality
Middle River-Framboise Wilderness Area

4

PEI
Cape Breton Island
Study Area
Nova Scotia

FIGURE 3.2 : Habitat Analysis

- Communitiy
- Building
- Proposed Turbine Location
- Proposed New Roads
- Major Road
- Local Road
- Trails / Lanes / Tracks
- Boundary - County
- Transmission Corridor

- Barren / Rocks
- Miscellaneous
- Agriculture
- Alder
- Hardwood Forest
- Mixed Forest
- Softwood Forest
- Old Field

N W E S

0 5000 Metres

CBCL LIMITED
Consulting Engineers

Data Source: 1:10000 Digital Data, SNSMR; DNR Wetland Database; Projection: NAD83 UTM Zone 20; Cartographic Design & Layout By Shiju Mathew @cbcl.ca

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Species have been screened based on their geographic occurrence and their habitat preference relative to the study area. The interim results of this desktop assessment have been used to guide the development of field work protocols. The spectrum of field programs executed or planned is summarized in Table 3.1. Some preliminary field work has been undertaken and a fall avian field program has been executed. Other programs will be executed in 2008 and the results presented in the environmental assessment and used in the analysis of project impacts on Valued Ecosystem Components (VECs) and socio-economic issues.

Table 3-1: Field Programs Undertaken or Planned

Field Program	***Status***	***Lead Researcher***
Ecological and Botanical Field Investigations	An ecological reconnaissance has been undertaken. A more detailed habitat field program including wetland categorization and investigations for priority plant species is being designed.	Clinton Pinks and CBCL team
Bird Breeding and Migratory Programs	Fall monitoring program has been executed. Breeding surveys to be designed and executed.	Dr. Andrew Horne, Dalhousie University
Large Mammal Program	Program to be designed.	Lead to be confirmed
Bat Monitoring Program	Desktop work underway and field program is being designed.	Dr. Hugh Broders, Saint Mary's University
Archaeological Program	An archaeological desktop study has been completed. An archaeological field program has been designed and will be undertaken as an integral part of the assessment.	Davis Archaeological Consultants Limited
Traditional Ecological Knowledge	A program to review traditional and current First Nation use of the study area has been instigated.	Jason Googoo, Membertou Geomatics
Watershed and Hydrological Dynamics	A program to measure water flows and water quality in Lake Uist and at selected other locations and the development of a hydrologic and hydraulic model (Stormwater Management Model, Version 5, 2007) of the study area has been designed and will be undertaken.	Alexander Wilson and CBCL team
Aquatic Habitat	A field program will be designed and executed to determine the status of aquatic habitat in the study area.	Leanda Delaney and CBCL team
Visibility Analysis	A program to determine the visibility of the wind turbines from selected locations including Lake Uist, Loch Lomond, Route 4 and the Bras d'Or Lake has been designed and will be executed.	Steffen Käubler and CBCL team

3.5.1 Significant Habitats

Figure 3.3 indicates Species of Concern and sensitive habitats within the study area based on NSDNR mapping. The East Bay Hills, for example, have been identified in this database as significant habitat for the Canada lynx (*lynx lynx*) though it has been reported that this habitat has been severely fragmented by logging; their presence in this area is unsubstantiated. This will be further examined and taken into account in the environmental assessment.

Along the Irish Cove Road, approximately 2 km from Route 4, habitat has been identified as containing species of concern. In the 1990s a Man and Biosphere Reserve, Biodiversity Monitoring Plot, was established in this area by Biodiversity Research Associates (BIODRA); BIODRA was specifically established to undertake this project and involves primarily staff and volunteers from Cape Breton University and the Nova Scotia Museum. This area was originally listed as a significant old forest area; the Crown land portion was later designated a policy reserve under the NSDNR's old Forest Policy. Species listed in this area include dwarf rattlesnake plantain (*Goodyera repens*), lesser wintergreen (*Pyrola minor*) and a number of lichens including *Collema furfuraceum*, *Leptogium laceroides*, *Nephroma arcticum* and *Nephroma bellum*. This area though valuable is out with the study area.

Most of the lakes and streams in and in close proximity to the study area, including Lake Uist and Loch Lomond, have been designated by NSDNR as significant habitat for several species of concern, including Atlantic salmon, gaspereau, American shad, brook and brown trout and at least two species of freshwater mussels: eastern pearshell (*Margaritifera margaritifera*) and alewife floater (*Anodonta implicate*). Some of the largest populations of the eastern pearshell in Cape Breton occur in Grand River. The Loch Lomond lakes are also known to provide important breeding habitat for the common loon.

The Salmon and Gaspereaux rivers are major tributaries of the Mira River. They flow northeast, away from the project site. Both watersheds have been listed as important habitat for Atlantic salmon and gaspereau. The Salmon River has also been listed as having suitable habitat for a number of freshwater mussel species including the Eastern pearshell (*Margaritifera margaritifera*), Eastern floater (*Pyganodon cataracta*), Eastern elliptio (*Elliptio complanata*) and Alewife floater (*Anodonta implicata*). The upper reaches of the Gaspereau River, near the easterly section of the study area, has been designated an important habitat for gaspereau. Migratory bird populations, including wood ducks and other waterfowl, nest along the upper reaches of the Salmon River at Terra Nova.

The Barren Hill Lake, which is downstream of Loch Lomond and approximately 11 km from the project site, is considered important breeding habitat for the common loon. The north-eastern bladderwort (*Utricularia resupinata*) has also been observed along the lake's shoreline. Several locations within and in proximity to the study area have been identified as providing important nesting habitat for the bald eagle (*Haliaeetus leucocephalus*); these areas include the lower reaches of Tom's River near McNab's Cove, and along MacNeils Brook, the Irish Cove Brook and Jim MacDonalds Brook. Barred owl nesting sites have been observed to the south of Loch Lomond.

As depicted on Figure 3.2, there are a number of deer wintering yards within the study area. Further work during the course of the environmental assessment will determine their importance and whether or not the

675000 680000 685000 690000 695000 700000

5080500 5075500 5070500 5065500

BRAS D'OR LAKE

EAST BAY HILLS

Middle Cape

Irish Cove

MIDDLE CAPE
IRISH VALE
IRISH COVE
JOHNSTOWN
RED ISLANDS
LOCHSIDE
MOUNT AUBURN
LOCH LOMOND WEST
LAKE UIST
SALEM ROAD
ENON
GLENGARRY VALLEY
TERRA NOVA
LOCH LOMOND

MacNeils Brook
MacCormicks Lake
Salmon River
Gaspereaux River
Gaspereaux Lake
MacNeils Lake
Jim MacDonalds Brook
McCurshs Bk.
MacDonald Bk.
Irish Cove Brook
Munroe Lake
Enon Lake
Lake Uist
Loch Lomond
Shaw Lakes
Big Island Lake
Toms Brook

Lakeshore Dr.
Irish Cove Rd.
Loch Lomond Rd.
N Glen Rd.
Salmon River Rd.
Northside Loch Lomond Rd.
Hay Cove Rd.
Stirling Rd.
4

Cape Breton Regional Municipality
Richmond Co. Municipality

Middle River-Framboise Wilderness Area

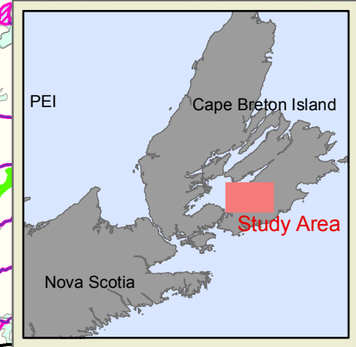

FIGURE 3.3: Species of Concern & Significant Habitat

- Communitiy
- Building
- Proposed Turbine Location
- Proposed New Roads
- Major Road
- Local Road
- Trails / Lanes / Tracks
- Boundary - County
- Transmission Corridor
- Wetland
- Wilderness Area
- deer wintering
- migratory bird
- of concern
- other habitat
- species at risk

N W E S

0 5000 Metres

CBCL LIMITED
Consulting Engineers

Data Source: 1:10000 Digital Data, SNSMR; DNR Wetland Database; Projection: NAD83 UTM Zone 20; Cartographic Design & Layout By Shiju Mathew @cbcl.ca

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development of the proposed reservoir at WTGs will adversely impact their use and value to the deer populations.

3.6 Fauna

The East Bay Hills provide habitat for a range of fauna including White-tail deer (*Odocoilius virginianas*), red fox (*Vulpes vulpes*), bobcat, coyotes, rabbits and to a lesser extent moose (*Alces alces*) and black bear (*Ursus americanus*). Sightings of the latter are scarce (Hart and Power, 2007). Raccoon (*Procyon lotor*), Mink (*Mustela vison*), ermine (*Mustela erminea*) and river otter (*Lutra canadenis*) are present, but less common. As indicated above, there are known deer wintering areas especially on the side slopes where suitable wintering habitat is present. With the possible exception of the Canadian lynx, none of the mammals are restricted to lands in the immediate vicinity of the proposed wind turbines, the reservoir or the penstock and related infrastructure associated with the hydro plant.

Various herpetofauna such as frogs, toads, salamanders, newts and turtles are known to exist, but an exhaustive survey has not been conducted within the study area. Among the most common should be the Maritime Garter Snake (*Thamnophis sirtalis pallidula*), Yellow Spotted Salamander (*Ambystoma maculatum*), Red Spotted Newt (*Notopthalmus viridescens viridescens*), Northern spring peeper (*Hyla crucifer crucifer)*, Green Frog (*Rana clamitans clamitans*), Wood Frog (*Rana sylvatica*) and Northern Leopard Frog (*Rana pipiens*). Populations of Wood Turtle (*Clemmys insculpta)* and Snapping Turtle (*Chelydra serpentina serpentina*) may exist in riparian areas.

3.6.1 Bats

Estimates for bat fatalities from wind turbines are highly variable ranging from two bats per turbine per year (Johnson et al., 2003; Johnson et al., 2004) to 20 to 50 bats per turbine per year (Jain et al., 2007; Kerns et al., 2005; Nicholson, 2003). Fatality events primarily occur in late summer and early fall and typically involve migratory species such as hoary bats (*Lasiurus cinereus)*, silver-haired bats *(Lasionycteris noctivagans)*, eastern red bats *(Lasiurus borealis)* and big brown bats *(Eptesicus fuscus)*. Fatalities have also been reported, but in smaller numbers, for short-distance migrant (or resident) bat species including the eastern pipistrelle *(perimyotis subflavus)*, the northern long-eared bat *(Myotis septentrionalis)* and the little brown bat *(Myotis lucifugus)*(Jain et al., 2007: Johnson, 2005; Kerns and Kerlinger, 2004; Nicholson, 2003).

There are occurrence records for seven species of bats in Nova Scotia, the same species as referenced above (Broders et al., 2003; van Zyll de Jong, 1985). With the exception of the northern long-eared and the little brown bat, Nova Scotia is at the northern extent of the current known range for each of these species (van Zyll de Jong, 1985). These two species, as well as the eastern pipistrelle, appear to be the only bat species with significant populations in the province (Broders et al., 2003). The little brown and northern long-eared bats are likely ubiquitous in Nova Scotia as their distributions extend into Newfoundland (Broders et al., 2003; Grindal, 1998), while the eastern pipistrelles appears to be locally abundant only in south west Nova Scotia (Broders et al., 2003; Farrow, 2007; Rockwell, 2005). Based on available evidence, the incidence of migratory bats in northern Nova Scotia is thought to be very low. The bats most likely to frequent the study area are the northern long-eared and the little brown bat.

In addition to the potential for the direct mortality of bats from striking the revolving blades, the removal and disturbance of forest habitat may degrade the local environment for bat populations that reside in the area during the summer. The guide to wind development developed by NSDEL states that wind farm sites with 25 km of a known but hibernaculum have a 'very high' site sensitivity. The proposed site is within 25 km of several abandoned mine sites (http://gis2.gov.ns.ca/website/nsgeomap/viewer.htm). There is no information on whether these sties are indeed used as hibernacula because, based on the information available, never been surveyed. To determine the presence of bat colonies in the area, the requisite field programs will be designed and executed. These will likely involve the use of an Anabat II detection system to sample the echolocation calls of bats foraging or commuting. The field program will be designed in consultation with the regulatory authorities.

3.6.2 Birds

Table 3.2 identifies those bird species found in CBRM or the Municipality of the County of Richmond that have an ACCDC subnational ranking of S4 (uncommon or rare) or a provincial ranking of Yellow or Red; it should be noted that strictly coastal species have been excluded.

Table 3-2: Bird Species of Concern in Richmond and/or Cape Breton Counties

Species	*S Rank*	*NS Status*	*Canada Status*	*Breeding Evidence?*
Common Loon	S4	Yellow		MBBA, BBS
Common Goldeneye	S2B			
Red-breasted Merganser	S2S3B			BBS
Northern Goshawk	S3B	Yellow		
Merlin	S3S4B			MBBA, BBS
Short-eared Owl	S1S2B	Yellow		
Long-eared Owl	S1S2			
Boreal Owl	S1B			
Common Nighthawk*	S4	Yellow	Threatened	MBBA
Chimney Swift*	S5	Yellow	Threatened	MBBA
Olive-sided Flycatcher*	S4	Yellow		MBBA, BBS
Eastern Phoebe	S2S3B			
Gray Jay*	S5	Yellow		MBBA, BBS
Boreal Chickadee	S3S4	Yellow		MBBA, BBS
Barn Swallow*	S5	Yellow		MBBA, BBS
Bicknell's Thrush	S1S2B	Yellow	Vulnerable	
Northern Mockingbird	S3B			
Philadelphia Vireo	S2B			
Warbling Vireo	S2B			
Bobolink	S3B	Yellow		BBS
Rusty Blackbird	S3S4B	Yellow	Special Concern	MBBA, BBS
Red Crossbill	S3S4	Undetermined		MBBA
White Crossbill*	S5	Undetermined		MBBA, BBS

*Notes:

1. For species marked Maritime Breeding Bird Atlas ("MBBA"), breeding evidence has been observed within the atlas squares (10 x 10 km squares) that included the study area; for species marked "BBS", the species has been detected on the nearest Breeding Bird Survey (BBS) route which passes through similar habitat.
2. Species identified by an asterisk have provincial status ranks of yellow (Sensitive to human activities or natural events) or undetermined, but do not appear in the ACCDC list; the subnational rank is from Nature Serve (http://www.natureserve.org/explorer/).

Wind turbines present three main risks to birds:

i) habitat destruction from turbine construction;
ii) disruption of breeding, foraging and migratory activities because the turbines are avoided; and
iii) collision with turbines and associated structures (Kingsley and Whittam, 2005).

Of these risks, the latter two, disturbance and collision, distinguish wind turbines from other developments, including the hydro dimension of this Project, and have been the chief concern of regulators, conservationists and the general public. Environment Canada has produced guidelines to evaluate the risk of wind turbines to birds (Environment Canada, 2006b), which are also recommended for environment assessments undertaken to meet the requirements of the NSDEL (NSDEL, 2007). These are the guidelines which will be followed with respect to the design and execution of all avian field programs.

In determining the requisite field programs recourse was made to the following:

- Important Bird Areas database (http://www.ibacanada.com/);
- Environment Canada's seabird colony database (courtesy of Carina Gjerdum, Wildlife Biologist, CWS Dartmouth, Nova Scotia);
- Maritime Breeding Bird Atlas (Erskine, 1992 and http://www.mba-aom.ca/English/index.html); and
- Breeding Bird Survey database (http://www.pwrc.usgc.gov/bbs/retrieval/menu.cfm).

Cape Breton is well surveyed by birders, both experienced local birders and skilled tourists so common knowledge about birding sites is fairly reliable. The study area is not located in any of the region's foremost birding locations; the nearest key areas include Isle Madame, Point Michaud, Forchu Head and the Sydney/Glace Bay area. All of these sites are best known for coastal species that are unlikely to cross the study area. Nonetheless, the eastern shore of the Bras d'Or Lake is valued for its high density of nesting Bald Eagles and the forest habitats in the region are known for their richness in boreal species, included the federally listed Rusty Blackbird, wetland species such as rails and bitterns, several species of owl and concentrations of migrant raptors stopping to forage, specifically near Glendarry (NSBS, 1991 and Maybank, 2005).

Six federally listed species at risk breed in CBRM or Municipality of the County of Richmond: Piping Plover (subspecies *melodus* – endangered); Short-eared Owl (Special Concern); Common Nighthawk (Threatened); Chimney Swift (Threatened); Bicknell's Thrush (Special Concern) and Rusty Blackbird (Special Concern; ACCDC, Erskine, 1992). The study area does not have suitable habitat for the Piping Plover or the Short-eared owl, and does not have any more suitable habitat for the Common Nighthawk or the Chimney Swift (respectively gravelly substrates near open areas and hollows trees or chimneys) than would be expected anywhere elsewhere in the province.

The Bicknells' Thrush and Rusty Blackbird, however, are known to have bred in similar areas in the vicinity of the study area. Bicknell's Thrush is a habitat specialist, occurring almost exclusively in dense stands of low spruce/fir forest above 300 m (Erskine, 1992). The nearest record of breeding evidence for the species is over 10 km distant, and there appears to be little suitable habitat within the study area; the species' absence will, however, be confirmed. Rusty Blackbirds breed along the shores of boreal forest ponds, which are common throughout the study area, and breeding has been confirmed within 10 km of the area. This species almost certainly breeds in the study area, and the location of breeding birds relative to the turbine sites and related infrastructure will be determined through field work.

Relatively few species of raptors have been recorded as breeding within 10 km of study area (Bald Eagle, Northern Harrier, Red-tailed Hawk, Merlin, and no owls (Erskine, 1992). The forests to the east of the study area, however, are known for high concentrations of owls, and the Project area lies within the highest breeding concentration of Bald Eagles in the Maritimes (Erskine, 1992). The field programs have been designed to take these factors into account.

The initial portion of the field program, namely the fall program, has been executed; the results are in course of preparation. Contrary to what is indicated in local birding guides, but has been verified in the field and through contact with several birders familiar with the area, there were few sightings in the study area of raptors on the move. A few raptors were seen foraging.

The fall field program did note movements of passerines (song birds) along the west slope, i.e., off the site, and a large flock of night migrants stopping to forage along the lake side road. This raises the possibility that song birds might migrate across the area, a possibility that will be further explored. Based on the work done to date, the ornithologist suggests that any concentrations of migrants will be offsite, particularly along the west slope of the hills.

Substrate Characteristics of Lake Uist

3.7 Fish and Fish Habitat

The entire Grand River watershed is considered by DFO significant habitat for several fish species of concern including the Atlantic salmon (*Salmo salar*), gaspereau (*Alosa* spp.), brook trout (Salvelinicus fontilais), brown trout (*Salmo trutta*), American shad (*Alosa sapidissima*), banded killifish (*Fundulus diaphanous*) and the rainbow smelt (*Osmerus mordax*). Grand River is, however, a low gradient river where fish passage has been obstructed by the falls located 10.2 km upstream from the head-of-tide (Robichaud-LeBlanc and Amiro, 2004).

The habitat characteristics of Lake Uist, the main source of water for the proposed reservoir, are consistent with salmonid nursing and

McCuish Brook

rearing habitat as well as several other species, including smelt. Smelt populations in Lake Uist are suspected to be landlocked due to the obstruction downstream.

3.7.1 Fish Species of Interest

3.7.1.1 Atlantic Salmon (Salmo salar)

Most of the water bodies in the study area are considered habitat for Atlantic salmon. In 2001 the Inner Bay of Fundy population of Atlantic salmon was designated an endangered species by COSEWIC. The population of Atlantic salmon in the study area is not part of the Inner Bay of Fundy school, but is still of concern as all Atlantic salmon populations in the Maritimes have been declining. The reasons for this decline are unknown, but causes include habitat loss and interbreeding with cultured species (COSEWIC, 2006).

Grand River has not met its salmon conservation requirement upriver of the fishway since 1999. Returns to the river since 2000 are dependent solely on wild production, something that has not occurred since 1990. Salmon passage up-river is obstructed at low discharge by the falls. Approximately 45% of the total juvenile production potential is estimated to be upstream of the falls while 55% is below the falls. The fishway is estimated to pass an average 57% of the small and 43% of the large salmon (Robichaud-LeBlanc and Amiro, 2004). Based on the four year average, the forecast of wild salmon returns to the Grand River is estimated to be about 43 fish, only 18% of conservation requirements. The probability of returns exceeding the conservation requirements of 234 fish is near zero (Robichaud-LeBlanc and Amiro, 2004).

To the north of the study area, the streams flow northwards into the Salmon and Gaspereau rivers, which are part of the Mira watershed. These rivers have the highest proportion of low gradient stretches, which are least suitable for the production of juvenile salmon. In 2001 and 2002 these rivers were assessed. The low fry and parr densities suggested that egg conservation requirements were not generally met in these rivers, albeit that they are considered suitable salmon spawning habitat.

3.7.1.2 Banded Killifish (*Fundulus diaphanous*)

Banded killifish is a euryhaline species that inhabits freshwater streams and lakes. They are often found in the clear shallow regions of lakes and ponds with muddy or sandy bottoms and high concentrations of detritus and submergent vegetation. The banded killifish are plant spawners. Females lay eggs equipped with adhesive thread that adhere to aquatic vegetation. Visual observation of Lake Uist's shoreline would identify the habitat as consistent with banded killifish nursing habitat (DFO, 2006).

3.7.1.3 Brook Trout (*Salvelinus fontinalis*)

The Brook trout is designated a Yellow species by NSDNR, meaning that it requires special attention, or protection, to prevent it from becoming at risk. It is typically found in spring fed streams that have many pools and riffles; it is found throughout the Maritime Provinces in waters ranging from tiny ponds to large rivers, lakes and salt water estuaries. Lake Uist, the streams and ponds scattered throughout the study area and the Grand River watershed have been designated significant habitat for brook trout by NSDNR. Lake Uist has been stocked with brook trout since 1987; the last recorded stocking of fingerlings was in 2003.

3.7.1.4 Brown Trout – Sea Run Trout (*Salmo trutta*)

Brown trout occur throughout Europe and western Asia and were introduced to Canadian waters in 1890. In sea-run populations, which occur in Atlantic Canada and Quebec, brown trout spend two to three years in freshwater then migrate downstream to spend one or two growing seasons in and around river mouths and estuaries. Most return to their home streams to spawn in the fall and early winter (October to November); they prefer very similar habitats to the native brook trout except that they can tolerate slightly higher water temperatures. They often use the lower reaches of rivers and streams that are unsuitable for brook trout. There is no commercial fishery for brown trout in Nova Scotia, but they have become popular with recreational anglers. Brown trout are found in the lower reaches of the Grand River, but it is unlikely that they would be found upstream within Lake Uist or Loch Lomond due to the passage obstruction at the falls.

3.7.1.5 Gaspereau (*Alosa* spp.)

Gaspereau have been listed by NSDNR as a species of concern (Yellow), but little biological information is available on the species that inhabit many of the rivers within Nova Scotia. Gaspereau comprise two closely related species: alewife (*Alosa pseudolarengus*) and the blueback herring (*A. aestivalis*). The Gaspereaux River, is a major tributary of the Mira River flowing north-easterly from the upper reaches of the study area, experiences a large gaspereau run. Gaspereau are anadromous and enter streams and rivers from early May to early June. From August to October the young-of-the-year migrate downstream in large schools to live in the estuaries and surrounding coastal areas. Adults over-winter at sea. In the Maritimes, gaspereau spend most of their life growing in salt water (NS, 2006). Gaspereau that spawn upriver tend to spawn in May and June when water temperatures are greater than 10^{o}C.

3.7.1.6 Rainbow Smelt (*Osmerus mordax*)

Little is known about the rainbow smelt populations that inhabit the Grand River watershed. Smelt generally spawn from February to June when water temperatures are cooler (4 to 10^{o}C). Landlocked populations, particularly in lake environments, tend to migrate upstream in tributaries, or in some cases spawn along the lake shorelines. Most young smelt stay close to shore, seeking cover within eelgrass beds or muddy bottoms. Larger smelt take advantage of depth during the day for protection, and migrate vertically during the night to feed (NS, 2006). It is suspected that the smelt population resident within Lake Uist is land-locked.

3.8 Key Settlements and Land Use

The study area is characterized by local rural and seasonal development patterns and presents a largely forested landscape extending from Lake Uist eastwards to the shoreline of the Bras d'Or Lake. Highway 4, also known as the Bras D'Or Lakes Scenic Drive, is the main route through the area and the spine of most settlement in the region. The study area is approximately at the midpoint between Sydney and St. Peters.

The area is generally sparsely populated, and from reports received the population is aging. There are few children in the area around the lakes and few young employed couples resident in the immediate area which is home to fewer than 1,800 people; the population density is approximately three per square kilometer. Single homes and small communities are located along Highway 4, and even more sparsely

distributed along the unpaved roads around Lake Uist, Loch Lomond and Enon Lake. Communities along Highway 4 include, from north to south, Big Pond, Middle Cape, Johnstown, Irish Vale, Irish Cove, and Red Islands; communities in the vicinity of the lakes include Salem Road, Enon, Loch Lomond and Lake Uist (Figure 1.1).

Many who reside in the area have roots in local Scottish, Irish, Acadian and Mi'kmaq cultures and have traditional ties to the area. This area of Cape Breton is not as actively involved in the tourist industry as other parts of the island, and many owners of summer residences are originally from the area. Modest summer homes and cottages are scattered throughout the study area; some are positioned to take advantage of one of the many lakes or rivers.

Non-residential development is limited, and what exists is mainly concentrated along Highway 4. There are service stations, a provincial roadside picnic park at Irish Cove, scenic viewpoints and a boat tour facility. Abandoned farms and fields are also found throughout the area. Located to the southwest of the study area on Route 4, Chapel Island is the historical capital of the Mi'kmaq nation and has been designated as a National Heritage Site.

3.9 Local Economic Activity

The economy of the immediate area is largely dependent on forestry either under the auspices of Stora Enso or on a much smaller private landowner level. As indicated above, there are some services provided along Route 4, but most people travel to St. Peter's, Port Hawkesbury/Point Tupper or Sydney both for work, or to access retail, administrative and medical services.

3.10 Archaeological Activity

A desk top archaeological resource impact assessment was conducted for the study area in the fall of 2007. The work undertaken included accessing historic maps and manuscripts as well as the Maritime Archaeology Resource Inventory. Predictive modeling for First Nations recourses was also conducted as part of this assessment.

No archaeological sites were recorded in the study area. The nearest recorded site is on the west shore of Loch Lomond northeast of the Passage and consists of a single projective point (arrowhead) dating to the Late Archaic or *Mu Awsami Sagiwe'k* period, i.e., 5,000 – 2,500 years before present ("BP"). Two traditional isolated finds located at Christmas Brook in Eskasoni and on McPhee Island in West Eskasoni Harbour are also associated with First Nations activity. Based on the predictive modeling undertaken the entire shorelines of Lake Uist, Loch Lomond and Lake Enon have been determined to be of moderate to high archaeological potential for First Nations resources, with localized areas of high potential on the shores where rivers or streams drain into the lakes and where lakes drain into one another through narrow inlets. Areas of high potential for First Nations resources are mainly restricted to the southern portion of the study area, outside of the defined development area.

The first documented European settlement in the Loch Lomond area was in the early 19th century by Scottish immigrants who were coming to the island, the mainland and other parts of Atlantic Canada in

great numbers. Very little documented history could be found for the study area in the 19th century, but historic maps show that the west side of Loch Lomond was densely settled by the last half of the century. As there is potential for in situ historic archaeological resources, both precontact and historic, within the study area, further archaeological work will be undertaken in areas where land disturbance is proposed. The results of this work will be detailed in the environmental assessment.

3.11 First Nations Use

Given the proximity of two First Nations communities to the study area, i.e., Chapel Island and Eskasoni, it was understood at the outset that the area would not only have been used in the past by the Mi'kmaq, but could still be used in the course of their annual land use activities. The relevance of the area to the First Nations was indeed confirmed by the desk top work undertaken by the archaeologists as referenced above. In recognition of the relevance of the area to First Nations peoples, a Mi'kmaq Ecological Knowledge Study has been commissioned as an integral part of the environmental assessment. The key components of this study will include the following:

- a historical review to identify which, if any, area are of significant historical importance to the Mi'kmaq people;
- a review of existing documentation regarding Mi'kmaq traditional land and resource use of the study area to provide information on the historical use and occupation of the area;
- the determination through interviews of the current use of lands or resources in the study area; and
- a Mi'kmaq Significant Species Survey to identify plant and animal species within the study area which play a key role in the life of the Mi'kmaq community, be it medicine, food or spiritual in use.

The results of this work will be reported in the environmental assessment and will be key to predicting the impacts of the proposed works, if any, on Mi'kmaq culture, learning or practices.

3.12 Visibility

Although it is unlikely that the proposed turbines will be visible from Route 4, visibility has been identified as a concern with respect to other comparable projects. It has not been raised to date in the context of this Project. Nevertheless a visual impact analysis will be conducted as an integral part of the environmental assessment.

Chapter 4 Assessment Process and Anticipated Impacts

4.1 Environmental Assessment Process

The approach to the environmental assessment process is to produce an environmental assessment document that:

- focuses on the issues of greatest concern whether these have been identified by the study team, by the public or by the regulators;
- clearly addresses regulatory requirements; and
- Integrates engineering design and mitigative measures into a framework that will enable, as the engineering proceeds, the preparation of a comprehensive EMP for the Project.

The preparation of the Project description and the environmental and socio-economic baseline are the two fundamental building blocks necessary for the environmental analysis. This work is underway. The former is derived from the work undertaken by the Proponent and their engineering team. The latter is derived from the review and compilation of pertinent secondary data sources and the execution of selected field programs. The integrity of these building blocks is critical to the credibility of the subsequent analysis; the preparation of the two, however, is iterative. This allows the environmental assessment to be used as a planning tool and to influence Project design.

The compilation of the environmental and socio-economic data base involves the review of a wide range of secondary databases, including government databases, and the structured search of defined lists, e.g., COSEWIC, ACCDC and NSDNR, to determine the likelihood of valued species of flora and fauna susceptible to impact from the development and operation of the Project. To augment this research, a number of specific field programs have been, or will be, undertaken. These have been identified in Table 3.1.

4.2 Anticipated Impacts and Benefits

The proposal by CBEX to build a hybrid wind/hydro pumped storage facility above Lake Uist in Cape Breton will generate approximately 250,000 MWH per year. Providing power directly to markets in the eastern US as well as making available a portion of its capacity to Nova Scotia customers, the facility will be Canada's first pumped storage installation powered by renewable energy. Its layout and design has taken into account ecological, economic and social factors to minimize impacts. Key points include:

- no residence within 500 m of any proposed WTG or proposed works;
- proposed works complement the existing forest use of the area, including that managed by Stora;
- no new watercourse crossings or disturbance of wetlands are anticipated, i.e., the intent is to use existing logging roads though some of these may need to be upgraded;
- considerable discussion took place with the NSDNR in the identification of the lands involved and based on the work completed to date, no significant ecological concerns are expected; and
- Consultation completed to date has been supportive of the proposed works.

Wherever possible the proposed access roads to the turbines follow the alignment of existing forestry roads; a limited amount of new road construction and road upgrading will be required to enable the

transportation of the turbine components to the WTG pads. Some wetlands and watercourses associated with the existing roads may be impacted by the road upgrades that are required. While field assessments and detailed design of the necessary road upgrades to the existing watercourse crossings have not yet been completed, it is anticipated that a number of the water courses involved will be identified as important fish habitat. Further, as indicated in Section 3.7 Lake Uist and adjoining lakes are known to provide habitat for a variety of fish species, including Atlantic salmon.

Not only will the construction of the reservoir, the penstock and the infrastructure at Lake Uist necessitate considerable excavation, but there will also be earthwork associated with the construction of the turbine pads and upgrading of the access roads. With respect to each element of the project, there will be a need to prepare a functional erosion and sedimentation control plan to protect the down gradient wetlands, the watercourses and the lakes.

The potential impact on fauna, including avian species, in the area will be further studied via field work and the review of recent literature on the impacts of comparable projects on fauna. Initial conversations with NSDNR have indicated that special attention should be paid to potential lynx populations in the area, and this will be a topic of further examination. Both Stora and NSDNR have substantial data bases relative to this area and these will be accessed and reviewed to determine habitats and to guide the execution of further work in the field.

As indicated in Section 3.10, an archaeological resource impact study was conducted in the fall of 2007 by Davis Archaeological Consultants Limited under a Heritage Research Permit (#A2007NS72). Several areas of elevated potential for First Nations resources were identified and, as the result of the occupation of the area in the early 19th century by settlers, the area is believed to be of high potential for historic period resources. Further archaeological work will be undertaken in the field as part of the environmental assessment; a traditional ecological knowledge study has also been commissioned as part of the environmental assessment.

The proposed Project will generate up to 200 jobs during the construction period and approximately 20 jobs during the project's operation. At local meetings, the proponent has emphasized that these jobs in the first instance will be made available to appropriately qualified residents of the area. As development work proceeds, other benefits will accrue to the local area. These are likely to include improvements to some of the local gravel roads and the provision of a fire hydrant that can be accessed by the local volunteer force. This Project, which will be ECOLogo certified, will enable reductions to be made in the production of green house gases and other air pollutants. It will contribute to the attainment of the “green energy” goals of both the federal and provincial governments. The proposed development also appears to be supported by the municipal governments most directly effected, i.e., CBRM and the Municipality of the County of Richmond, based on the consultations undertaken to date.

4.3 Preliminary VECs and Issues

The following is a list of anticipated VECs and socio-economic issues that will be addressed in greater detail in the environmental assessment. The methodology to be employed in the assessment will stress the importance of focusing on the VECs and socio-economic issues of greatest concern. These may

represent key species or species groups, as well as primary elements such as land and water, which are integral to ecological health. The socio-economic issues will include key quality of life factors, such as noise and aesthetics. An informed understanding of the potential relationship between the proposed project and the biophysical components and socio-economic issues is required and will be analyzed as part of the assessment process to identify potential pathways between the two.

The following have been identified as potential VECs and socio-economic issues which will be further assessed as part of the environmental assessment:

- Surface water quality;
- Groundwater quality and quantity;
- Lake shorelines;
- Wetlands;
- Species at Risk;
- Rivers and stream;
- Fish and fish habitat;
- Avian species, including migratory birds;
- Bats;
- Mammals;
- Flora;
- Traditional use of lands and resources by aboriginal peoples;
- Archaeological resources;
- Land use;
- Noise;
- Traffic;
- Commerce;
- Recreation;
- Health and safety; and
- Landscape aesthetics.

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