Appendices

xstrata coal

Donkin Export Coking Coal Project
ENVIRONMENTAL IMPACT STATEMENT

July 2012

Stantec

APPENDIX A
EIS Guidelines

ENVIRONMENTAL IMPACT STATEMENT GUIDELINES
for the
DONKIN EXPORT COKING COAL PROJECT

January 2012

Prepared by:

Canadian Environmental Assessment Agency

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List of Acronyms

Acronym	Meaning
AAND	Aboriginal Affairs and Northern Development
ACCDC	Atlantic Canada Conservation Data Centre
ARD	Acid Rock Drainage
Agency	Canadian Environmental Assessment Agency
CACs	criteria air contaminants
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CSR	Comprehensive Study Report
DFO	Fisheries and Oceans Canada
EA	Environmental Assessment
EC	Environment Canada
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
GHG	Greenhouse Gas
HADD	Harmful Alteration Disruption or Destruction
HC	Health Canada
KMK	Kwilmu'kw Maw-klusuaqn /Mi'kmaq Rights Initiative
MBCA	*Migratory Birds Convention Act*
MEKS	Mi'kmaq Ecological Knowledge Study
ML	Metal Leaching
Mtpa	million tones per annum
NAFO	Northwest Atlantic Fisheries Organization
NSDNR	Nova Scotia Department of Natural Resources
NSE	Nova Scotia Department of Environment
NPAG	Non-Potentially Acid Generating
NRCan	Natural Resources Canada
NWPA	*Navigable Waters Protection Act*
Proponent	Xstrata Coal Donkin Management Limited
Provincial Act	*Environment Act* (Nova Scotia)
SARA	*Species at Risk Act*
TC	Transport Canada
The Act	*Canadian Environmental Assessment Act*
VEC	Valued Ecosystem Component
XCDM	Xstrata Coal Donkin Management Limited

1.0 INTRODUCTION

Xstrata Coal Donkin Management Limited (the proponent) proposes to construct and operate an underground coal mine facility on Donkin Peninsula within the Cape Breton Regional Municipality, Nova Scotia (the Project). The Project would produce approximately 3.6 million tonnes per annum (Mtpa) of raw coal that would subsequently be processed and washed to provide approximately 2.75 Mtpa of product coal. It would be capable of producing coal primarily suitable for coking coal markets, but may also supply thermal coal markets. Coal for coking markets would be transported to customers via a marine-based option (barge load-out with transshipment).

The Project includes all activities and physical works associated with the construction, operation and decommissioning of the proposed Donkin Export Coking Coal Project as described in the proponent's Project Description dated August 8, 2011. The Project Description was accepted as complete by the Canadian Environmental Assessment Agency (the Agency) on August 10, 2011.

The Project shall be subject to environmental assessment (EA) under both the Nova Scotia *Environment Act* and the *Canadian Environmental Assessment Act* (the Act). The Project is subject to a Class I Registration under the *Environment Act* and *Environmental Assessment Regulations*, and a comprehensive study under the Act.

1.1 Purpose of the Environmental Impact Statement Guidelines

These guidelines will guide the proponent in the preparation of the environmental impact statement (EIS) and identify the minimum information requirements. This document includes a description of the scope of the Project, the factors to be considered in the comprehensive study and the scope of those factors. The draft guidelines have been developed with input from the federal responsible authorities, the federal expert authority, the Province of Nova Scotia and the proponent. These guidelines also include provincial requirements in order for the EIS to satisfy both governments' information needs for their respective environmental assessment processes.

These guidelines shall not be regarded as either restrictive or exhaustive, as concerns other than those identified in the document could arise during the investigations associated with the EIS. The Agency is prepared to provide advice and assistance throughout the preparation of the EIS with regard to the identification of environmental concerns and the appropriate assessment methodology.

1.2 Guiding Principles

Environmental Assessment as a Planning Tool

Environmental assessment is a planning tool used to ensure that projects are considered in a careful and precautionary manner in order to avoid or mitigate the possible adverse effects of development on the environment and to encourage decision makers to take actions that promote sustainable development and achieve or maintain a healthy environment and a healthy economy.

The EA of this project shall, in a manner consistent with the purposes above:

- consider and evaluate alternatives;
- document consultation activities;
- identify the Project's environmental effects;
- propose measures to mitigate adverse effects; and
- predict whether there shall be likely significant adverse environmental effects after mitigation measures are implemented.

Traditional and Local Knowledge

Traditional and local knowledge refers to the broad base of knowledge held by individuals and collectively by communities that may be based on spiritual teachings, personal observation and experience or passed on from one generation to another through oral and/or written traditions.

Traditional and local knowledge, in combination with other information sources is valuable in achieving a better understanding of potential effects of projects. Traditional and local knowledge may, for example, contribute to the description of the existing physical, biological and human environments, natural cycles, resource distribution and abundance, long and short-term trends, and the use of lands and water resources. It may also contribute to project siting and design, identification of issues, the evaluation of potential effects and their significance, the effectiveness of proposed mitigation, cumulative effects and the consideration of follow-up and monitoring programs.

Traditional knowledge, which is rooted in the traditional life of Aboriginal people, has an important contribution to make to an EA. Certain issues relevant to the review process are firmly grounded in traditional knowledge such as harvesting, use of lands and resources for traditional purposes, cultural well-being, land use and heritage resources. Although the basis for traditional and local knowledge and science-based knowledge can differ, they may on their own or together, contribute to the understanding of these issues.

The proponent shall incorporate into the EIS the traditional and local knowledge to which it has access or that it may reasonably be expected to acquire through appropriate due diligence, in keeping with appropriate ethical standards and without

breaching obligations of confidentiality. To facilitate this, the proponent shall ensure that a traditional Mi'kmaq Ecological Knowledge Study (MEKS) is conducted, following the Mi'kmaq Ecological Study Protocol ratified by the Assembly of Nova Scotia Mi'kmaq Chiefs on November 22, 2007 (Assembly 2007).

Sustainable Development

Sustainable development, as defined in the Act, means development that meets the needs of the present, without compromising the ability of future generations to meet their own needs. The EIS shall consider the extent to which the Project contributes to sustainable development.

Environmental assessment provides a systematic approach for identifying, predicting and evaluating the potential environmental effects of projects before decisions are made. In addition, EA provides the means to identify mitigation measures for adverse effects. Environmental assessment provides an effective means of integrating environmental factors into the planning and decision-making process in a manner that promotes sustainable development and contributes to decision making that can ultimately provide net ecological, economic and social benefits to society.

A project that is supportive of sustainable development shall strive to integrate the objective of net ecological, economic and social benefits to society in the planning and decision-making process and shall incorporate citizen participation. The Project, including its alternative means, shall take into account the relations and interactions among the various components of the ecosystems, including the extent to which biological diversity may be affected by the Project, and how it meets the needs of the present as well as future populations.

Precautionary Approach

Under the Act, one of the purposes of federal EA is to ensure that projects are considered in a careful and precautionary manner before authorities take action in connection with them, to ensure that such projects do not cause significant adverse environmental effects.

The Government of Canada document, *A Framework for the Application of Precaution in Science-based Decision Making About Risk* (GOC 2003), sets out guiding principles for the application of precaution to science-based decision making in areas of federal regulatory activity for the protection of health and safety, the environment and the conservation of natural resources.

The proponent shall indicate how the precautionary principle was considered in the design of the Project in at least the following ways:

- demonstrate that all aspects of the Project have been examined and planned in a careful and precautionary manner in order to ensure that they would not cause serious or irreversible damage to the environment, especially with respect to environmental functions and integrity, considering system tolerance and resilience, and/or the human health of current or future generations;
- outline and justify the assumptions made about the effects of all aspects of the Project and the approaches to minimize these effects;
- evaluate alternative means of carrying out the Project and compare them in light of risk avoidance and adaptive management capacity;
- in designing and operating the Project, demonstrate that priority has been given to strategies that avoid the creation of adverse effects;
- take a conservative approach to mitigation (i.e. rather over-compensate than under-compensate) where uncertainty exists with regard to the likely extent or impact of negative effects of the project on the environment;
- develop contingency plans that explicitly address accidents and malfunctions;
- identify any proposed follow-up and monitoring activities, particularly in areas where scientific uncertainty exists in the prediction of effects or effectiveness of proposed mitigation measures; and
- present public views on the acceptability of all of the above.

2.0 THE ENVIRONMENTAL ASSESSMENT PROCESS

2.1 Contact for the Federal Environmental Assessment

Information on the federal EA may be obtained from:

Micheline Savard, Project Manager
Canadian Environmental Assessment Agency – Atlantic Office
1801 Hollis Street, Suite 200
Halifax, NS B3J 3N4
Tel: 902-426-0564 Fax: 902-426-6550
E-mail: XstrataCoalDonkin@ceaa-acee.gc.ca

2.2 Requirement for Environmental Assessment under the *Canadian Environmental Assessment Act*

The Project is an undertaking in relation to a physical work and, as such, is defined as a project under subsection 2(1) of the Act.

Fisheries and Oceans Canada (DFO) may issue one or more authorizations under section 32 and subsection 35(2) of the *Fisheries Act* with respect to the Project, specifically the marine infrastructure associated with the construction of the barge load-out facility and transshipment mooring.

Transport Canada (TC) may issue an authorization under subsection 5(2) of the

Navigable Waters Protection Act (NWPA) with respect to the Project, specifically the marine structures at barge load-out facility and transshipment mooring.

Natural Resources Canada (NRCan) may issue authorizations under paragraph 7(1)(a) of the *Explosives Act* with the respect to the Project, if explosives are stored on site.

Environment Canada (EC) may issue a Disposal at Sea authorization under subsections 127(1) and 129(3) of the *Canadian Environmental Protection Act* if construction of the barge load-out facility requires dredging and ocean disposal of the dredged material.

These authorizations are described in the *Law List Regulations* of the Act. Therefore, DFO, TC, NRCan and EC are or may be responsible authorities under the Act and must ensure that an EA of the Project is carried out before any permits or authorizations are issued. Health Canada (HC) has identified itself as an expert federal authority, and shall provide advice in relation to the EA.

The Project is subject to a comprehensive study under the Act, pursuant to paragraph 16(d) of the *Comprehensive Study List Regulations* given that it is a coal mine with a coal production capacity of 3,000 tonnes/day or more. Because the Project shall be assessed as a comprehensive study under the Act, the Agency shall exercise the powers and perform the duties and functions of the responsible authority until the Agency publishes a notice for public consultation on the comprehensive study report (CSR). After this point, DFO shall take on the role of lead responsible authority in relation to the Project.

Pursuant to subsection 17(1) of the Act, the Agency delegates the preparation of the EIS to the proponent. The EIS should be prepared according to these guidelines. Once completed, the proponent shall submit five hard copies and one electronic copy of the EIS to the Agency and electronic and paper copies to the federal authorities and province of Nova Scotia in the quantities detailed below. In addition, the proponent shall make hard copies of the EIS and of the French and English versions of the Plain Language Summary (PLS) of the EIS available at designated public viewing centers in the project vicinity. Specific numbers of copies of the EIS are as follows:

Organization	**Electronic copy**	**No. of paper copies**
Agency	1 English PLS, 1 French PLS, and 1 English EIS	5 – English EIS 1 – English PLS
DFO	1 English PLS, 1 French PLS, and 1 English EIS	2 – English EIS
TC	1 English PLS, 1 French PLS, and 1 English EIS	Nil
NRCan	1 English PLS, 1 French PLS, and 1 English EIS	2 – English EIS
EC	1 English PLS, 1 French PLS, and 1 English EIS	2 – English EIS
HC	1 English PLS, 1 French PLS,	1 – English EIS

	and 1 English EIS	
NSE	For the purpose of the provincial review, an electronic copy in a format as directed by NSE	24 – English EIS (Registration Document)
Public Viewing Locations	None required	1 French and 1 English copy of the PLS and 1 English copy of the EIS at each location

2.3 Federal and Provincial Cooperation in the Environmental Assessment

The Government of Nova Scotia requires a Class I Registration under the *Nova Scotia Environmental Assessment Regulations* for the Project. The Government of Canada and the Province of Nova Scotia have signed a harmonization agreement to coordinate their respective EA processes to reduce duplication. The proponent's EIS shall be used to satisfy both processes and there will be a joint federal and provincial comment period. For further information on the Nova Scotia EA process contact:

Steve Sanford, Environmental Assessment Officer
Nova Scotia Environment
5151 Terminal Road, 5th fl.
Halifax, NS B3J 2T8
Tel: (902) 424-7630
E-mail: sanforsl@gov.ns.ca

2.4 Public Consultation by the Agency during the Environmental Assessment Process

The comprehensive study process for the Project includes the following three opportunities for the public to participate in the EA. Specifically, the public has been or will be invited to provide their comments on:

- the draft EIS guidelines, the Project, and the conduct of the comprehensive study (current comment period) (completed);
- the Plain Language Summary of the EIS (this comment period will be jointly administered by the Agency and the Province of Nova Scotia); and
- the Comprehensive Study Report (CSR).

As required by the Act, the Project is listed on the Canadian Environmental Assessment Registry Internet Site at http://www.ceaa-acee.gc.ca/050/details-eng.cfm?evaluation=63924. Key EA documents will be available on this internet site under the Registry reference number 11-03-63924.

To facilitate and encourage public participation in the EA, the Agency made $30,000 available under its Participant Funding Program. The application deadline for this funding was December 29, 2011. For further information, please refer to http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=E33AE9FB-1.

The Agency shall e-mail individuals or organizations who would like to be notified of public comment periods, if a written request is sent to: XstrataCoalDonkin@ceaa-acee.gc.ca.

3.0 SCOPE OF PROJECT, FACTORS TO BE CONSIDERED AND SCOPE OF THE FACTORS

3.1 Scope of Project

Pursuant to section 15 of the Act, the scope of the Project for the purpose of the federal EA shall include all activities and physical works associated with the construction, operation and decommissioning of the proposed Project as described in the proponent's project description dated August 8, 2011, including, but not limited to, the following activities and components:

- site clearing and preparation;
- underground mining activities, including blasting;
- explosives, manufacturing, handling and storage;
- short- and long-term waste management;
- management of solid and hazardous wastes;
- coal washing;
- a Coal Handling Preparation Plant with a dry disposal reject handling system;
- coal and mineral rock waste disposal and water treatment infrastructure;
- water supply for domestic, process and fire suppression usage;
- ancillary services to support the underground mine and Coal Handling Preparation Plant (administration/office buildings, workshop, coal weighing and sampling facilities, dust suppression systems, conveyors, stackers, reclaimers and stockpiles, water treatment infrastructure, truck loading facilities, mobile equipment etc., a 138kV power line from Victoria Junction to the Project site);
- trucking to domestic customers and to the Port of Sydney, should marine transportation to these destinations prove impractical at any time;
- a barge load-out facility on the Donkin Peninsula to transport product coal to a transshipment mooring located southwest of Cape Morien;
- disposal of dredged material;

- ancillary services to support the marine transportation component (*e.g.*, tugboat and barge operation), dust suppression systems, conveyors, access road, power from the Project site);
- marine transportation from the barge landing facility to the transshipment mooring;
- mine decommissioning and site reclamation, including long-term management needs; and
- all physical works and undertakings associated with any anticipated fish habitat compensation plan at a conceptual level. Sufficient information should be provided that a determination of significance of impacts on fish and fish habitat can be made.

The EIS shall include a description of all components of the Project and any associated physical works and activities.

3.2 Factors to be Considered

In accordance with subsections 16(1) and (2) of the Act, the EIS shall include a consideration of the following factors:

- the environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or shall be carried out;
- the significance of the environmental effects referenced above;
- comments from the public that are received in accordance with the Act and the regulations;
- measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project;
- any other matter relevant to the comprehensive study, including the need for the project and alternatives to the project, that the responsible authority or the Minister after consulting with the responsible authority may require to be considered;
- the purpose of the project;

- alternative means of carrying out the project that are technically and economically feasible and the environmental effects of any such alternative means;
- the need for, and the requirements of, any follow-up program in respect of the project; and
- the capacity of renewable resources that is likely to be significantly affected by the project to meet the needs of the present and those of the future.

As stated in the Act: "environment" means the components of the Earth, and includes:

(a) land, water and air, including all layers of the atmosphere,

(b) all organic and inorganic matter and living organisms, and

(c) the interacting natural systems that include components referred to in paragraphs (a) and (b).

As stated in the Act, “environmental effect” means, with respect to a project:

(a) any change that the project may cause in the environment, including any change it may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species, as those terms are defined in subsection 2(1) of the *Species at Risk Act* (SARA),

(b) any effect of any change referred to in paragraph (a) on

(i) health and socio-economic conditions,

(ii) physical and cultural heritage,

(iii) the current use of lands and resources for traditional purposes by aboriginal persons, or

(iv) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, or

(c) any change to the project that may be caused by the environment.

3.3 Scope of the Factors to be Considered

Further to subsection 16(1) and (2) of the Act, the EIS shall consider the factors listed above. In addition, the EIS shall document any additional issues or concerns that may be identified through regulatory, stakeholder, Aboriginal and public consultation.

The assessment of environmental effects shall focus on valued ecosystem components (VECs). For this EA, the term VEC refers to components or attributes that are particularly important for ecological, legal, scientific, social, cultural, economic or aesthetic values. VECs for the project should be selected based on defined criteria and their selection should be justified. The assessment shall consider potential environmental effects that the project may have on these VECs.

The consideration of the environmental effects in the EA needs to be conceptually bound in both time and space. This is more commonly known as defining the study areas and time frames, or spatial and temporal boundaries of the EA. It is expected that the spatial and temporal boundaries shall vary between VECs, depending on the nature of the predicted effects. The spatial boundaries must reflect the geographic range over which the project's environmental effects may occur, recognizing that some effects will extend beyond the project area. Specific spatial and temporal boundaries must be defined in the EIS.

Impacts with respect to spatial and temporal boundaries may vary depending on the VEC, and the assessment of these impacts shall consider:

- timing/scheduling of project activities;
- natural variations of each VEC;
- the time required for recovery from an impact; and
- cumulative effects.

The following VECs were selected based on information gathered from:

- the Donkin Exploratory Phase EA (XCDM 2008) and ongoing environmental monitoring during the current care and maintenance phase of mine operations;
- previous and ongoing public engagement and issues identification;
- input from the Agency, federal responsible authorities, the federal expert authority, and the Province of Nova Scotia along with associated written government guidance; and
- input from the proponent and their environmental consultant.

VECs to be considered in the EIS shall include:

- Atmospheric Resources
    - Ambient air quality
    - Acoustic environment
- Water Resources
    - Quality and quantity of groundwater and surface water resources potentially affected by the Project
- Birds and Wildlife
    - Birds, including those species protected under the *Migratory Birds Convention Act* and associated regulations, and those species under provincial

responsibility, with particular, but not exclusive, consideration to birds or habitat that meet one of the following criteria:

- species listed under the *Species at Risk Act* (SARA), designated or under review by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), or provincial species at risk and species of conservation concern listings;
- areas of concentration of migratory birds, such as breeding areas, colonies, spring and fall staging areas, flight corridors, and wintering areas;
- breeding and nesting areas of species low in number and high in the food chain;
- interior and mature forest habitat;
- species that are identified by priority ranking systems (Partners-In-Flight); or
- habitats in or near areas that have been or are in the process of being identified by land managers as particularly important to the survival of the species globally, regionally, or locally, or habitats valued by local users of the resource. These include, but are not limited to, areas with the following existing, proposed, or potential designations:
  - Migratory Bird Sanctuaries,
  - Important Bird Areas, or
  - other types of protected or designated areas that have been established, in part, to protect migratory birds and their habitat.

- Mammals and fur bearers and their habitat, including rare or sensitive species
- Amphibian and reptile populations and their habitat, including rare or sensitive species
- All SARA and Committee on the Status of Endangered Wildlife in Canada (COSEWIC) - listed species
- All species listed in the Nova Scotia *Species at Risk Regulations* made under sections 10 and 12 of the *Endangered Species Act* and those ranked extremely rare (S1) or rare (S2) in the Atlantic Canada Conservation Data Centre (ACCDC)
- Areas of concentration for other wildlife species (e.g. deer wintering areas).

- Wetlands
  - Wetlands (defined as land commonly referred to as marshes, swamps, fens, bogs, and shallow water areas that are saturated with water long enough to promote wetland or aquatic processes)

- Coastal wetlands (e.g. salt marshes and eelgrass beds)

- Rare Plants
  - Rare vascular plants and uncommon species assemblages

- Freshwater Fish and Fish Habitat
  - Effects on habitat quality and species in freshwater bodies, including SARA - listed species and fish habitat, including spawning, nursery, rearing, feeding and migratory habitat

- Marine Environment
  - Pelagic and demersal marine finfish, and shellfish, and marine benthos, including SARA- listed species and fish habitat including spawning, nursery, rearing, feeding and migratory habitat
  - Marine and coastal mammals, and marine turtles with a focus on SARA-listed species and species of conservation concern
  - Flora and fauna, including SARA-listed species, existing on the sea floor and in sediments
  - Water quality, and quality of marine sediments and associated levels of contamination, as components of habitat quality (*i.e.*, as they potentially affect biological receptors)
  - Ecologically sensitive, protected areas or candidate protected areas (*e.g.*, St. Anne's Bank)

- Archaeological and Heritage Resources
  - Marine and terrestrial archaeological and heritage resources and sites providing evidence of past use and occupation

- Current Use of Land and Resources by the Mi'kmaq of Nova Scotia for Traditional Purposes
  - Lands and resources of specific social, cultural or spiritual value to the Mi'kmaq of Nova Scotia with focus on current use of land and resources (including terrestrial, freshwater and marine) by the Mi'kmaq for traditional purposes

- Commercial and Recreational Fisheries
  - Commercial fisheries, including but not limited to lobster, scallop, snow crab and herring.

- Land Use

- Existing land development (industrial, commercial, institutional, residential), settlement areas, recreation, tourism and areas of special community or social value. Includes discussion of land ownership.

- Includes lands along power transmission lines and truck routes as well as lands required for water lots

- Sensitive coastal habitats (e.g. dunes, beaches)

- Includes consideration of land use post decommissioning.

Rationale for VEC selection based on ecological, legal, scientific, social, cultural, economic or aesthetic values is provided in Section 4 as well as a proposed study approach. Detailed study methods and analytic methods, including incorporation of information gathered through consultation and traditional knowledge studies shall be included in the EIS.

4.0 PREPARATION OF THE EIS

The EIS is a statement of the proponent's environmental conclusions and commitments related to the Project and, as such, must be explicitly endorsed by the proponent. It shall be made available for Aboriginal consultation and public review and to the extent possible, must be written in a manner that can be understood by non-specialists. Acronyms and a glossary of technical terms must be provided. A Plain Language Summary, described in Section 4.15 must be prepared and shall serve to facilitate Aboriginal consultation and for public review.

The following sections describe the different topics to be addressed in the EIS. Sufficient information needs to be provided for each so that informed conclusions can be reached regarding the potential for impacts on the various components of the environment. However, the greatest time and effort are to be applied to data collection and interpretation related to the most significant impacts as identified by the proponent and through these guidelines. The proponent must provide a rationale if issues identified in the guidelines are not fully addressed in the EIS and highlight key impacts that are identified for more intensive investigation.

Where external sources of information or data are used, the proponent shall reference this information within the text of the EIS in addition to providing a complete reference list at the end of the document. Where conclusions that are critical to the assessment of environmental impacts are cited from other reports, the proponent shall provide sufficient detail of the original data and analysis so as to enable a critical review of that material. Such detailed reference material could be submitted as an appendix to the EIS. The EIS shall be a stand-alone document upon which a critical review can be undertaken.

Section 4 is organized into two parts. PART I: CONTENT OF THE EIS describes the layout and required content of the EIS. PART II: DETAILED GUIDANCE ON SELECT ENVIRONMENTAL COMPONENTS provides an overview of the proposed

studies and approach to be undertaken in the EIS for each VEC. Please note that the information included in this document is not intended to be exhaustive and additional detail, studies and components may require examination.

PART I: CONTENT OF THE EIS

The following section provides a description of the required structure and content for the EIS and the Plain Language Summary document.

4.1 Executive Summary

The EIS should begin with a clear and concise Executive Summary of the document. It should include a concordance table which describes where in the EIS the information requirements described in the EIS Guidelines have been addressed. The Executive Summary shall be included as a section of the EIS document.

4.2 Project Introduction

4.2.1 The Proponent

The EIS shall:

- identify the proponent and the name of the legal entity that would develop, manage and operate the Project;
- provide contact information for the proponent (e.g., name, address, phone, fax, email);
- explain corporate and management structures, as well as insurance and liability management related to the Project;
- specify the mechanism that would be used to ensure that corporate policies shall be implemented and respected for the Project;
- summarize key elements of its environmental management system and discuss how the system would be integrated into the Project; and
- identify key personnel, contractors, and/or sub-contractors responsible for preparing the EIS. The qualifications of biologists conducting surveys for migratory birds, species at risk and species of conservation concern, and wetland delineations should be provided in an appendix to the EIS.

4.2.2 Project Overview

The EIS shall briefly summarize the development proposal. If the Project is part of a larger sequence of projects, the proponent shall outline the larger context and present the relevant references. The Project location should be described in conjunction with

surrounding land uses and infrastructure. The intent of this overview is to provide the key components and the location of the Project, rather than a detailed description, which shall follow as described in Section 4.3.5 of this document.

4.2.3 Regulatory Framework and the Role of Government

To understand the context of the EA, the EIS should identify, for each jurisdiction, the government bodies involved in the assessment as well as the EA processes. More specifically, it shall:

- identify the environmental regulatory approvals and legislation that are applicable to the Project at the federal, provincial, and municipal levels;
- identify environmental government policies, resource management, planning or study initiatives pertinent to the Project and discuss their implications;
- identify Mi'kmaq policies and guidelines that are pertinent to the Project and discuss their implications;
- identify any relevant Land Use Plans, Land Zoning, and/or Community Plans;
- identify and delineate major components of the Project and identify those being applied for and constructed within the duration of approvals under provincial and federal legislation; and
- provide a summary of the regional, provincial and/or national objectives, standards or guidelines that have been used by the proponent to assist in the evaluation of any predicted environmental effects.

4.2.4 Other Participants in the Environmental Assessment

The EIS shall clearly identify the main participants in the EA including the Mi'kmaq, community groups, and environmental organizations.

4.3 Project Description

4.3.1 Purpose of the Project

The 'purpose of' and 'need for' the Project should be established from the perspective of the proponent and provide a context for the consideration of alternatives to the Project. The Project shall be designed to achieve specific objectives and these should be described. If the objectives of the Project are related to or contribute to broader private or public sector policies, plans or programs, this information should also be included. The EIS shall consider the Agency guidance document entitled: Addressing "Need for", "Purpose of", "Alternatives to" and "Alternative Means" under the Canadian Environmental Assessment Act (Agency 2007).

4.3.2 Need for the Project

The EIS must clearly describe the need for the Project (i.e., the problem or opportunity the Project is intended to solve or satisfy). The 'need for' shall establish the fundamental rationale of the Project. The EIS shall consider the Agency guidance document entitled: Addressing "Need for", "Purpose of", "Alternatives to" and "Alternative Means" under the *Canadian Environmental Assessment Act* (Agency 2007).

4.3.3 Alternatives to the Project

The EIS must include an analysis of alternatives to the Project; describing functionally different ways to meet the Project's need and purpose in accordance with the Agency guidance document entitled: Addressing "Need for", "Purpose of", "Alternatives to" and "Alternative Means" under the *Canadian Environmental Assessment Act* (Agency 2007).

The EIS shall:

- identify the alternatives to the Project that were considered;
- develop criteria to identify the major environmental, economic and technical costs and benefits of the alternatives; and
- identify the preferred alternatives to the Project based on the relative consideration of the environmental, economic and technical costs and benefits.

The analysis must be done to a level of detail which is sufficient to allow the Agency, technical and regulatory agencies, the public and the Mi'kmaq to compare the project to its alternatives.

When assessing Project alternatives, the EIS shall take into account relations and interactions among various components of the ecosystem, including affected Mi'kmaq and other communities, and any adverse impacts on potential or established Aboriginal and Treaty rights, as conveyed to the proponent by the Mi'kmaq or the Crown. Further, the EIS shall demonstrate how the preferred alternative contributes to sustainable development.

4.3.4 Project Location

The EIS shall provide a concise description of the geographical setting in which the Project shall take place. The description shall be focused on those aspects of the environment important for understanding the potential environmental effects of the Project. This description shall include the following information:

- any habitats in or near areas that have been or are in the process of being identified by land managers as designated (e.g. Important Bird Areas) or protected areas (Migratory Bird Sanctuaries, Provincial Parks); wetlands (both freshwater and coastal); sensitive coastal habitats; mature and interior forest habitat for migratory birds; habitats of provincially- or federally-listed species at risk, including critical habitat for species at risk; areas of concentration of migratory birds or other wildlife; flight corridors; breeding and nesting areas of species low in numbers and high in the food chain; and other sensitive areas and habitats;
- the current land use in the area and the relationship of the Project facilities and components with any existing land use including traditional, private and crown lands; and
- a description of local communities including the identification of all potentially sensitive human receptors and their locations relative to the project area. The identification of sensitive receptors may include residences, daycares, schools, hospitals, places of worship, nursing homes, and Mi'kmaq communities.

The description of the site location and transportation corridors shall include maps of appropriate scale. The location map should include the boundaries of the proposed site and transportation corridors, the major existing infrastructure, adjacent land uses and any important environmental features. In addition, site plans/sketches and photographs showing project location, site features and the intended location of project components should be included.

4.3.5 Project Description

Facilities and Components

The EIS shall describe in detail all of the Project's facilities and components. For the purposes of the EA, the project description shall focus on those elements of the Project with the most potential for environmental interactions and risk (e.g., Project "footprint" wastes and emissions and associated zones of influence). As appropriate to convey the information (i.e., environmental interactions), the EIS shall present descriptions, locations, plans, figures and/or drawings for each of the facilities.

Activities

The EIS shall include descriptions of the construction, operation, maintenance, foreseeable modifications, including the expansion and lengthening of the operation and, where relevant, closure, decommissioning and reclamation of sites and facilities associated with the Project and post-decommissioning activities. Detailed descriptions of the activities to be carried out during each phase of the Project should include the location of each activity, expected outputs, and an indication of the activity's magnitude and scale. Although a complete list of project activities is required, the emphasis should be on activities with the greatest potential to have environmental

effects. Sufficient information should be included to predict environmental effects and address public concerns about them. If activities involve periods of increased environmental disturbance or the release of materials into the environment, these should be highlighted.

Schedule

A schedule including time of year, frequency, and duration for major or significant project activities should be provided.

4.3.6 Alternative Means of Carrying out the Project

The EIS must identify and describe alternative means of carrying out the Project that are technically and economically feasible in accordance with the Agency guidance document entitled: Addressing "Need for", "Purpose of", "Alternatives to" and "Alternative Means" under the Canadian Environmental Assessment Act (Agency 2007).

The analysis shall:

- describe the alternative means considered, whether they are technically and economically feasible, and the rationale for rejecting alternatives;
- identify the environmental effects of the technically and economically feasible alternative means in sufficient detail to allow a comparison with the environmental effects of the Project; and
- identify the preferred means of carrying out the Project based on the relative consideration of environmental effects including the criteria and rationale for their selection.

Any potentially adverse impacts of the technically and economically feasible alternatives on potential or established Aboriginal and Treaty rights, as conveyed to the proponent by the Mi'kmaq or the Crown, should also be identified.

At a minimum, the discussion of alternative means of carrying out the Project shall include a consideration of the following:

- Mining Method (longwall/continuous miners)
- Product Coal (process(es) for preparing coal for coking and thermal markets)
- Transportation (marine, rail, road)
- Breakwater design
- Rejects Management
- Passive and/or active water treatment
- Alternative means of disposal of dredged material

4.4 Description of the Existing Environment

The EIS shall provide a baseline description of the environment in the vicinity of the Project and all other areas that could be impacted by the Project. This description shall include the components of the existing environment, and environmental processes, their interrelations and interactions, as well as the variability in these components, processes and interactions over time scales appropriate to the effects analysis. The proponent's description of the existing environment shall be in sufficient detail to permit the identification, assessment and determination of the significance of potentially adverse environmental effects that may be caused by the Project. The level of detail shall also enable the adequate identification and characterization of the beneficial effects of the Project, and provide the data necessary to enable effective testing of impact predictions during project follow-up.

The baseline description should include results from studies conducted as part of the Donkin Exploratory Phase EA (XCDM 2008) and past and ongoing monitoring at the Donkin site. It shall also include information from other environmental baseline studies conducted in support of the EIS.

Bedrock, surficial and applied geology maps will be useful in identifying potential effects on the environment when terrain, surficial geology, bedrock or soils are disturbed or used for any phase of the project. Surficial mapping and field benchmarking will also help better define the distribution of surface earth materials, soils, wetlands and rare ecosystems. Knowledge of pre-existing bedrock faults and joints may help better model the sub-surface impact of hydrogeological changes triggered by mining activities.

The baseline description shall include characterization of environmental conditions resulting from historical and present activities in the local and regional study area. In describing the physical and biological environment, the proponent must take an ecosystem approach that considers both scientific and traditional knowledge and perspectives regarding ecosystem health. It is assumed that traditional First Nations and Aboriginal knowledge shall be available through the Mi'kmaq Ecological Knowledge Studies (MEKS) commissioned by the proponent for this Project. The EIS must identify and justify the selected indicators and measures of ecosystem health (i.e., measurable parameters). These indicators should be transferable to future project monitoring and other follow-up.

In assessing impacts to the biological environment, the EIS shall consider the resilience of species populations, communities and their habitats. It shall summarize all pertinent historical information on the size and geographic extent of animal or floral populations as well as density, based on best available information. Where little or no information is available and when appropriate, specific studies shall be designed to further information on species populations and densities that could be adversely

affected by the Project. Habitat at regional and local scales should be defined in mapping of aquatic and terrestrial vegetation types and/or communities.

Habitat use should be characterized by type of use (e.g., spawning, breeding, migration, feeding, nursery, rearing, wintering), frequency and duration. Emphasis must be on those species, communities and processes most sensitive to project impacts. However, the interrelations of these components to the greater ecosystem and communities of which they are a part must be indicated. The EIS must address issues such as habitat, nutrient and chemical cycles, food chains, and productivity, to the extent that they are appropriate to understanding the effects of the Project. Range and probability of natural variation over time must also be considered.

A description of the rural and urban human communities likely to be affected by the Project should be included in the EIS as well as the proximity of the Project to sensitive features.

If the baseline data used to describe environmental conditions in the study area have been extrapolated or otherwise manipulated, the assumptions and/or extrapolations used must be described.

4.5 Effects Assessment

The EIS shall describe the Project's effects on the environment, including but not limited to the effect of any environmental change on health, socio-economic conditions, and heritage values and on the current use of land and resources by the Mi'kmaq. Potential effects from all components of the Project at the site and within local and regional study areas shall be discussed. The EIS shall predict the Project's effects during all project phases (e.g., construction, operation, maintenance, foreseeable modifications, closure, decommissioning and reclamation, post-decommissioning), and describe these effects using appropriate criteria. The EIS shall also describe the cumulative effects of various project activities.

In undertaking the environmental effects assessment, the EIS shall be based on best available information and methods. All conclusions must be substantiated. Predictions shall be based on clearly stated assumptions. With respect to quantitative models and predictions, the EIS shall discuss the assumptions that underlie the model, the quality of the data and the degree of certainty of the predictions obtained. Modelling methods and equations presented must include information on margins of error and other relevant statistical information (e.g., confidence intervals, possible sources of error).

The assessment of the project impacts shall be based on a comparison of the environment between the predicted future conditions with the Project and the predicted future conditions without the Project.

Views of the public and the Mi'kmaq relative to the EA, including any perceived changes in the environment from the Project, must be recognized and addressed as part of the impact analysis. The Proponent shall demonstrate how relevant issues raised by the public or the Mi'kmaq were addressed in the EA.

4.5.1 Accidents and Malfunctions

The EIS should identify and describe the accidents and malfunctions that may occur as a result of project activities during all project phases (e.g., construction, operation, decommissioning, post-decommissioning) and assess the significance of associated environmental effects on VECs. It should identify potential accidents, malfunctions, unplanned events (e.g., premature or permanent shutdown), or emergency situations that could be associated with all phases of the Project and the probabilities and hazards associated with them; the safeguards that have been established to protect against such occurrences such as security measures for the mine site; and the contingency/emergency response procedures in place if an accident/malfunction were to occur. Factors which contribute to the uncertainty of detecting and mitigating impacts associated with accidents and malfunctions should be assessed.

It is also recommended as part of the evaluation of the likelihood of accidents and malfunctions associated with hazardous substances and petroleum based products, that worst probable case scenarios are used. Please note that both the *Implementation Guidelines for Part 8 of the Canadian Environmental Protection Act, 1999 - Environmental Emergency Plans* and the *Risk Management Guide for Major Industrial Accidents (CRAIM)* utilize the premise that potential consequences arising from an environmental emergency should be identified using the worst probable case, as well as alternative scenarios.

Monitoring key geological indicators (e.g, coastal slope stability, groundwater levels and quality, surface water levels and quality, coal bed methane, acid rock drainage, seismic activity) prior to, during operations and following decommissioning will provide useful information for describing cumulative environmental effects and developing contingency plans, mitigation measures and response options for accidents, malfunctions and damage to infrastructure (e.g., rejects piles, containment ponds, dykes, underground works, roads, powerlines, and marine shipping facilities).

4.5.2 Capacity of Renewable Resources

As required by the Act subsection 16(2), the EIS shall describe the effects of the Project on the capacity of renewable resources that are likely to be significantly affected by the Project to meet the needs of the present and those of the future. The EIS shall identify any VECs predicted to have significant adverse residual environmental effects and describe how the Project could affect their sustainable use. The EIS shall identify and describe criteria used in considering sustainable use.

4.6 Mitigation Measures

Under the Act, mitigation is defined as the elimination, reduction or control of the adverse environmental effects of the Project, and includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means. Every comprehensive study conducted must consider measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the Project.

As a first step, the proponent is encouraged to use an approach based on the avoidance and reduction of the effects at the source. Such an approach may include the modification of the design of the Project or relocation of project components.

The EIS shall describe the standard mitigation practices, policies and commitments that constitute technically and economically feasible mitigation measures and that will be applied as part of standard practice regardless of location. The EIS shall then describe its environmental protection plan and its environmental management system, through which it will deliver this plan. The plan shall provide an overall perspective on how potentially adverse effects would be minimized and managed over time. As well, the proponent shall describe its commitments, policies and arrangements directed at promoting beneficial or mitigating adverse socioeconomic effects. The EIS shall discuss the mechanisms it would use to require its contractors and sub-contractors to comply with these commitments and policies and with auditing and enforcement programs.

The EIS shall specify the actions, works, minimal disturbance footprint techniques, best available technology, corrective measures or additions planned during the Project's various phases (construction, operation, modification, decommissioning, abandonment or other undertaking related to the Project) to eliminate or reduce the significance of adverse effects. The EIS shall also present an assessment of the effectiveness of the proposed technically and economically feasible mitigation measures.

The EIS will identify the extent to which technology innovations will help mitigate environmental effects. Where possible, it will provide detailed information on the nature of these measures, their implementation, their management and on whether follow-up will be required.

The EIS must indicate what other technically and economically feasible mitigation measures were considered and explain why they were rejected. Trade-offs between cost savings and effectiveness of the various forms of mitigation must be justified. The proponent must identify who is responsible for the implementation of these measures and the system of accountability.

For species at risk defined by the federal *Species at Risk Act* (SARA), pursuant to subsection 79(1) of that Act, RAs under the Act must notify the appropriate federal

Minister if any listed wildlife species, its critical habitat or the residences of individuals of that species may be adversely impacted by the Project. Pursuant to subsection 79(2) of the SARA, if the Project is carried out, RAs must also ensure that measures are taken to avoid or lessen those effects and to monitor them; these measures must be taken in a way that is consistent with any applicable recovery strategy and action plans. Therefore, the proponent must include information in the EIS that will allow the Agency, (performing the duties of the RA) to meet this requirement.

A conceptual fish habitat compensation plan to offset the impact of the Project on fish and fish habitat shall be provided in the EIS.

4.7 Cumulative Impact Assessment

Cumulative effects are residual effects of a project on the environment (i.e., impacts that occur after mitigation measures have been put in place) combined with the environmental effects of past, present, and future projects and/or activities. Cumulative effects can also result from the combination of different individual environmental effects of the project acting on the same environmental component. Environmental components that would not be affected by the Project can, therefore, be omitted from the cumulative effects assessment. However, a cumulative effect on an environmental component may be important even if the assessment of the Project's effects on this component reveals that the effects of the Project are minor.

The EIS must assess the effects of the Project in tandem with the effects of other projects and activities that have been or shall be carried out, and for which the effects are expected to overlap with those of the Project. It must consider different types of effects (e.g., synergistic, additive, induced, spatial or temporal) and identify impact pathways and trends. Generally speaking, the information available to assess the environmental effects from other projects and activities can be expected to be more conceptual and less detailed as those effects become more remote in distance and time to the Project, or where information about another project or activity is not available. It is important to note that the objective is *not* to identify two classes of environmental effects (project-specific and cumulative). Instead, the EIS should identify a *single* set of environmental effects that take into account the aggregate effect of the Project in the context of other foreseeable developments and activities acting upon the environment. It should determine the significance of the residual cumulative environmental effects that remain after mitigation has been implemented.

The Agency guidance documents, *Operational Policy Statement - Addressing Cumulative Environmental Effects under the Canadian Environmental Assessment Act* (Agency 2007) and *Cumulative Effects Assessment Practitioners Guide* (Agency 1999) should also be consulted regarding the assessment of cumulative impacts in the EIS.

Past and present projects and ongoing activities shall be reviewed under the description of existing conditions for each VEC.

Agency guidance states that only those future projects and activities that have a reasonable certainty of proceeding (*e.g.*, have received regulatory approvals or are currently in the approval process) should be considered for the cumulative effects assessment. There may be a cumulative effect of the Project on commercial fishers in the area since Fisheries and Oceans Canada has selected St Anns Bank, an area east of Cape Breton on the Eastern Scotian Shelf, as an Area of Interest for establishment as a Marine Protected Area under the *Oceans Act*.

4.8 Effects of the Environment on the Project

The definition of an "environmental effect" under the Act includes any change to the project that may be caused by the environment. The EIS must project how local conditions and natural hazards, such as severe and/or extreme weather conditions and external events (e.g., flooding, ice jams, rock slides, landslides, fire, outflow conditions, seismic events and tsunamis) could adversely affect the project and how this in turn could result in impacts to the environment (e.g., extreme environmental conditions result in malfunctions and accidental events). Potential impacts should be mitigated and monitored, as appropriate and/or feasible, over time for precautionary reasons.

Physical oceanographic conditions (waves, ice, currents) in the assessment area shall be summarized based on existing information sources such as MSC-50 Marine Hindcast data (MSC50 Wind and Wave Hindcast Dataset), and other existing information. Any available wave measurements, including those in the Integrated Science Data Monitoring (ISDM) archive (e.g. Gabarus Inner and Outer Bay wave buoys), should be utilized. As the MSC50 Hindcast resolution is not sufficient for very near shore areas, there should be consideration of wave transformation processes into shallow water.

4.9 Environmental Management

Planning

The EIS shall describe the proposed Environmental Management Plans (EMPs) for all stages of the Project and include a commitment by the proponent to implement the EMPs should the Project proceed. The finalization of detailed EMPs shall occur through consultation with federal and provincial government agencies, the Mi'kmaq, the public and other stakeholders. This may occur after the EA but must be consistent with the information presented in the EIS.

Pertinent legislation, regulations, industry standards, documents and legislative guides shall be used in the development of the EMPs.

Draft Solid Waste Materials Management Plan

The EIS shall provide a draft solid waste materials management plan which will be reviewed by the appropriate government departments. The plan will ensure municipal solid waste and construction and demolition debris generated during construction,

operation, and/or remediation, are sorted, collected and delivered to the appropriate recycling, composting or solid waste management facilities.

Draft Decommissioning and Reclamation Plan

The EIS shall provide the preliminary outline of a draft decommissioning and reclamation plan for any components associated with the Project. This shall include ownership, transfer and control of the different project components as well as the responsibility for monitoring and maintaining the integrity of some of the structures. The full preparation and submission of the plan to appropriate authorities, and their subsequent approvals, will occur prior to the decommissioning of the temporary components of the Project. A timeline for submission of the decommissioning plan for the temporary components should be identified as well as a timeline for submission of the complete decommissioning/reclamation plan.

The plan would serve to provide guidance on specific actions and activities to be implemented to decrease the potential for environmental degradation in the long-term during decommissioning and abandonment activities for temporary facilities, and to clearly define the proponent's ongoing environmental commitments.

For permanent facilities, a conceptual discussion on how decommissioning may occur shall be provided. The decommissioning plan for permanent components should include consideration of components necessary for implementation of the decommissioning activities (e.g. site security, wastewater treatment, offices) to ensure that required operations are not prematurely terminated). A figure should be included to portray the reclaimed site. Ongoing monitoring and adaptive management should also be part of any reclamation activity.

Draft Fish and Fish Habitat Compensation Plan

A draft conceptual level Habitat Compensation Plan should be provided in the EIS for review. Sufficient information should be provided that a determination of significance of impacts on fish and fish habitat can be made.

Follow-Up Program

The EIS must include a framework upon which follow-up, including effects monitoring, including compliance monitoring, would be based throughout the life of the Project should it proceed, including the post-closure phase. A follow-up program must be designed to verify the accuracy of the EA and to determine the effectiveness of the measures implemented to mitigate the adverse environmental effects of the Project.

The follow-up program must be designed to incorporate pre-project baseline information as well as compliance data (e.g., established benchmarks, regulatory documents, standards or guidelines) and real time data (e.g., observed data gathered in the field). Environmental assessment effects predictions, assumptions and mitigation actions that are to be tested as part of the follow-up program must be converted into field-testable monitoring objectives. The monitoring design should

include a statistical evaluation of the adequacy of existing baseline data to provide a benchmark against which to test for project effects, and the need for any additional pre-construction or pre-operational monitoring to establish a firmer project baseline.

A schedule for follow-up frequency and duration is to be developed after an evaluation of the length of time needed to detect effects given estimated baseline variability, likely magnitude of environmental effect, and desired level of statistical confidence in the results (Type 1 and Type 2 errors).

The description of the follow-up program should include;

- a discussion on the need for and requirements of a follow-up program and its objectives;
- a description of the main components of the program and each monitoring activity under that component;
- a discussion of the objectives the monitoring activity is fulfilling (i.e., confirmation of mitigation, confirmation of assumptions, and verification of predicted effects);
- the structure of the program;
- a schedule for the finalization and implementation of the follow-up program;
- a description of the roles and responsibilities for the program and its review process, by government, the Mi'kmaq and the public;
- a discussion of possible involvement of independent researchers;
- the sources of funding for the program; and
- information management and reporting.

Environmental compliance monitoring is conducted to ensure compliance with appropriate legislation and to ensure commitments made in the EIS are fulfilled. The description of the follow-up program must include any contingency procedures/plans or other adaptive management provisions as a means of addressing unforeseen effects or for correcting exceedances as required to comply with or to conform to commitments in the EA and with benchmarks, regulatory standards or guidelines.

The follow-up program plan must be described in the EIS in sufficient detail to allow for independent judgment as to the likelihood that it shall deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence thereof), confirm EA assumptions, and confirm the effectiveness of mitigation.

The SARA also establishes obligations to ensure that measures are taken to monitor the adverse effects of a project on listed wildlife species and their critical habitat. If potential adverse effects on a listed wildlife species or its critical habitat are identified, a monitoring plan should be developed, which identifies the circumstances under which corrective measures may be needed to address any issue or problem identified through the monitoring (i.e., if unanticipated effects occur or the importance of effects

is greater than anticipated). The monitoring plan should clearly describe how government departments responsible for the listed species at risk would be engaged in reviewing proposed adaptive management measures, in the event that mitigation measures are not effective.

4.10 Significance of Residual Adverse Environmental Effects

After having established the technically and economically feasible mitigation measures, the EIS should present any residual (post-mitigation) effects of the Project on the biophysical and human environments after these mitigation measures have been taken into account. The residual effects, even if very small or deemed insignificant should be described.

The EIS shall include a summary of the Project's residual effects so that the reader clearly understands the real consequences of the Project, the degree to which effects can be mitigated and which effects cannot be mitigated or compensated.

The criteria for evaluating and describing the significance of the residual effects (including cumulative effects) may include: magnitude; duration and frequency; ecological context; geographic extent; and degree of reversibility. In some cases, existing federal and provincial regulatory and industry standards and guidelines shall be relevant in identifying points of reference for evaluating significance. Professional expertise and judgment may also be applied in evaluating the significance of an environmental effect. The EIS must contain clear and sufficient information to enable the Agency, technical and regulatory agencies, the Mi'kmaq and the public to understand and review the proponent's judgment of the significance of effects.

To satisfy the Act's requirements, the EIS must include conclusions specifically on whether the Project is likely to cause significant adverse effects on each VEC. Residual effects significance criteria shall be presented for each VEC in the EIS along with the analysis to support the conclusion of significance.

4.11 Consultation

Aboriginal Consultation

When the Government of Canada contemplates conduct that may potentially adversely affect established or potential Aboriginal and treaty rights, it has a legal duty to consult Aboriginal peoples before making a decision to proceed with the proposed conduct. The Supreme Court of Canada has held in several decisions that the Crown has a duty to consult with, and if applicable, accommodate Aboriginal peoples if the Crown has knowledge of real or asserted Aboriginal or treaty rights and it exercises a power, duty or function that may adversely affect such rights. The Government of Canada's policy and procedures with respect to this obligation are set forth in its publication entitled "*Aboriginal Consultation and Accommodation - Updated Guidelines for Federal Officials to Fulfill the Duty to Consult, March 2011"* (INAC

2011). These guidelines form the basis for the Government's actions in the evaluation of the existence of asserted rights, current traditional use, and the strength of any claim in relation to the Project.

In addition to the Crown's broader obligations, the Act requires that all federal EAs consider the effect of any change in the environment caused by the Project, as well the effect of that change on current use of land and resources for traditional purposes by Aboriginal persons. The Act also requires consideration of the effect of any Project-induced change in the environment on physical and cultural heritage, as well as any structure, site or thing that is of historical or archaeological significance, such as sites historically occupied by Aboriginal peoples.

To assist the federal and provincial governments in their consultation processes, the EIS must describe the concerns raised by the Mi'kmaq in respect of the Project, and where applicable, how they have been or will be considered and where appropriate addressed. That description should include a summary of discussions, the issues or concerns raised, and should identify any asserted or established Aboriginal and treaty rights as conveyed to the proponent by the Mi'kmaq or the Crown. Where applicable, the EIS must document any significant adverse environmental effects of the Project on the current use of land and resources for traditional purposes by the Mi'kmaq as well as any measures taken or recommended that would prevent, mitigate, or otherwise accommodate such environmental effects, as applicable. This information will be then used by governments towards fulfilling any duty to consult the Mi'kmaq regarding the Project. The proponent is encouraged to engage the Mi'kmaq of Nova Scotia as referenced in the Nova Scotia Office of Aboriginal Affairs' *Proponents' Guide:The Role Of Proponents in Crown Consultation with the Mi'kmaq of Nova Scotia, 2011*.

In addition to proponent-involved Aboriginal engagement, the provincial and federal governments will undertake additional engagement activities directly with the Mi'kmaq according to the *Terms of Reference for a Mi'kmaq-Nova Scotia-Canada Consultation Process*. The federal and provincial governments will be coordinating their respective consultation processes, where appropriate, as part of the coordinated EA process.

The Agency administers the Aboriginal Funding Envelope under the Participant Funding Program that supports Aboriginal groups engaged in consultation activities on projects that are undergoing a federal environmental assessment under the Act.

Public Consultation by the Proponent

The EIS should describe public consultation activities undertaken by the proponent prior to the commencement of the EA and those conducted/planned during the course of the EA. It should include key stakeholder groups, summarize comments made, identify key issues of concern raised by the public, and describe how the proponent intends to address these issues.

4.12 Economic and Social Benefits of the Project

Information on the predicted economic and social benefits of the Project should be presented. This information shall be considered by the Agency and technical and regulatory agencies in assessing the justifiability of any significant adverse environmental effects, if necessary. Consideration of discount rates, substitutability of different capitals and inter-generational equity issues should be addressed in the economic analysis.

The EIS should include an evaluation of the Project impacts on current and future tourism in the area. This should be supported by an analysis of vehicular traffic in the areas surrounding the Project at different times of the year.

4.13 Benefits to Canadians

The proponent should describe how the EA process for the proposed project is expected to provide a benefit to Canadians. Factors to be considered include:

- Maximized environmental benefits: What expected environmental benefits will be created as a result of the project going through the EA process (*e.g.,* will the project reduce habitat fragmentation of a species-at-risk)?

- Contribution of the EA to support sustainable development: Describe how the EA process for the project is expected to contribute to the concept of sustainable development for a healthy environment and economy.

- Public participation: How is public participation in the EA expected to influence the project design and the environmental effects analysis?

- Technological innovations: Are new technologies expected to be developed to address environmental impacts that could be used for other projects?

- Increases in scientific knowledge: Is any new scientific information expected to be collected through the EA that could benefit the assessment of other projects?

- Community and social benefits: Describe any expected changes in project design that shall result in indirect benefits to communities and/or social benefits (*e.g.,* enhanced access to wilderness areas for recreation).

4.14 Assessment Summary and Conclusions

The EIS must summarize the overall findings of the EA with emphasis on the main environmental issues identified. It should make predictions on the likely significance of adverse environmental effects from the Project.

For all key VECs that were assessed, the EIS should contain tables summarizing the following key information:

- a concise summary of potential adverse environmental effects;
- a summary of proposed mitigation and compensation measures;
- a brief description of potential residual effects;
- a brief description of potential cumulative effects;
- any applicable standards or guidelines;
- comments from the public and responses; and
- comments from the Mi'kmaq and individuals and responses;
- the relationship of the VEC to the Mi'kmaq's potential or established Aboriginal and Treaty right, as conveyed to the proponent by the Mi'kmaq or the Crown;
- a summary of proposed follow-up; and
- a list of proposed commitments, summarizing the timing and responsibility of each of the actions for which a commitment (including special management practices or design features) has been made by the proponent.

4.15 Plain Language Summary

In order to enhance understanding of the EIS and facilitate consultation activities, a Plain Language Summary of the EIS, which summarizes the Project and major findings and conclusions of the associated EA process must be prepared. The Plain Language Summary (maximum 50 pages, excluding annexes) should be a separate document from the EIS. It should briefly describe the proponent, the Project (including decommissioning and reclamation activities), and the environmental impacts of the Project. Maps indicating project location and project components should be included. The report should be organized as follows:

Introduction

- Project Overview
- Environmental Assessment Process
  - Purpose of the CSR
  - Federal EA process
  - Cooperative EA Process

Project Description

- Purpose of and Need for the Project
- Project Description
  - Location
  - Components
  - Activities
  - Schedule

Scope of the Assessment

- Scope of the Project
- Factors to be Considered
- Scope of the Factors
  - Identification of VECs
  - Spatial and Temporal Boundaries

Project Alternatives

- Alternatives to the Project
- Alternative Means of Carrying out the Project
  - Description of Alternative Means
  - Environmental Effects of Technically and Economically Feasible Alternative Means
  - Selection of a Preferred Alternative Means

Consultation

- Public Consultation Activities to date
  - Cooperative and Provincial Consultation Activities
  - Public Participation in the Comprehensive Study Process
  - Public Participation Activities by the Proponent
- Mi'kmaq Consultation Activities to date
  - Cooperative and Provincial Consultation Activities
  - Mi'kmaq Consultation in the Comprehensive Study Process
  - Mi'kmaq Consultation/Engagement Activities by the Proponent

Existing Environment

Environmental Effects Assessment

- Approach
- Valued Ecosystem Components (impact matrix should be provided)
  - Potential Environmental Effects
  - Mitigation Measures
  - Residual Environmental Effects
  - Government, Public and Mi'kmaq Comments received to date and Proponent's Response
- Effects of the Environment on the Project
  - Approach
  - Potential Effects
  - Mitigation
  - Residual Effects
  - Government, Public and Mi'kmaq Comments received to date and Proponent's Response
- Effects of Possible Accidents or Malfunctions

    - Approach
    - Potential Effects
    - Mitigation
    - Residual Effects
    - Government, Public and Mi'kmaq Comments received to date and Proponent's Response
- Effects on Capacity of Renewable Resources
- Cumulative Environmental Effects
    - Approach
    - Scoping
    - Potential cumulative effects
    - Mitigation measures
    - Residual Effects
    - Government, Public and Mi'kmaq Comments received to date and Proponent's Response

Follow-Up Program

Benefits to Canadians

Overall Conclusions of the Proponent

PART II: DETAILED GUIDANCE ON SELECT ENVIRONMENTAL COMPONENTS

The following section provides an overview of the proposed studies and approach to be undertaken in the EIS for each VEC. Detailed study approaches and analytic methods and assumptions shall be provided in the EIS.

4.16 Atmospheric Resources

4.16.1 VEC Definition and Rationale for Selection

Atmospheric Resources for the EIS include the quality of ambient air and the acoustic environment. Greenhouse gas issues will also be considered within Atmospheric Resources.

Atmospheric Resources has been selected as a VEC due to:

- sensitivity of human health to air quality;
- sensitivity of the environment to air contaminants;
- aesthetics connected to the contamination of the atmosphere by air pollutants and noise;
- regulatory provisions of the federal *Canadian Environmental Protection Act* and Air Quality Regulations under the Nova Scotia *Environment Act*;

- Health Canada policy and guidelines for noise impact through annoyance on community health;
- Cape Breton Regional Municipality Noise By-law; and
- national and provincial concerns with greenhouse gas emissions as promulgated in the requisite reporting inventories of emissions.

For air pollutants and noise emissions, the spatial boundaries extend to a distance where the effects of the Project are a minor fraction of the respective standards, and generally difficult to distinguish from the variability of background levels. The proponent should ensure that the spatial boundaries include the nearest significant receptors (i.e. houses, off-site work places), noting that if analyses indicate a greater zone of influence, that the boundaries could change. Greenhouse gases are considered to present a cumulative challenge to the climate. Given the global nature of this issue, the proponent is only expected to discuss GHG emissions from the project and techniques being used to minimize them.

Temporal boundaries for assessment shall include those applicable to the regulatory criteria and guidelines, and include Project construction, operation and decommissioning. Time periods of enhanced receptor sensitivity shall also be considered.

4.16.2 Potential Project-VEC Interactions

Potential Project-VEC interactions during construction activities include:

- effects on ambient air quality from dust and construction vehicle/vessel emissions;
- odours from processes and fugitive emissions;
- cumulative greenhouse gas emissions to the atmosphere;
- process commissioning testing emissions;
- effects of underwater noise and vibration associated with marine construction; and
- effects of noise and vibration in the terrestrial environment.

Potential Project-VEC interactions during operation and maintenance activities may result in criteria air contaminants (CACs) and greenhouse gases.

The potential for malfunctions and accidental events may also have interactions with atmospheric resources throughout all phases of the project.

4.16.3 Existing Environment

Climate

The EIS shall include a discussion of climate conditions in the Donkin region including wind, precipitation, and fog. This section shall include both climate normals and extreme conditions. It shall be based upon available data from Environment Canada's nearest principal weather station at J. A. Douglas McCurdy airport at Sydney and

supplemented with onsite weather monitoring conducted by the proponent. The data sources should also include climatology from ship reports, in the International Comprehensive Ocean Atmosphere Dataset (ICOADS) archive, and climatology from nearby coastal stations, available from EC. Information about the sources of data, such as instrument type and location/elevation, should be described.

The discussion shall include extremes of temperature, precipitation, wind speeds as well as pertinent oceanographic data. In addition, the discussion shall include:

- winds over open water;
- freezing spray and precipitation with resultant icing of marine structures/ships;
- fog/low visibility conditions;
- storm surge, extreme water levels (both positive and negative), and sea level rise (using latest published projections);
- tropical cyclones and transitioning or post tropical cyclones in mid-latitudes; and
- climate variability and trends.

Air Quality

The EIS shall include information on air quality monitoring conducted for the Exploration Phase EA completed in 2008. It shall also include a description of desktop ambient air quality information based on local or regional air quality stations as available. It shall include a qualitative discussion of large air emission sources in the region with quantitative information provided, where available.

Noise

The EIS shall include information on ambient sound testing conducted for the Exploration Phase EA completed in 2008, updated as required.

A qualitative description of likely noise sources on site (e.g., equipment and vehicles) and in the surrounding communities shall be provided. Discussion of marine noise shall be provided as part of the discussion of impacts to the Marine Environment (Section 4.22.4). The proponent shall refer to the Health Canada guidance document: *Useful Information for Environmental Assessments* (Health Canada 2010), for information needs with respect to evaluating noise and human health effects associated with noise.

4.16.4 Effects Assessment and Mitigation

The EIS shall include:

- an inventory of emissions of criteria air contaminants (CACs) and greenhouse gases due to operations within the Project boundary, including emissions from any storage (i.e. coal piles), loading activities and transportation routes;
- a quantitative assessment of particulate emissions from the Project within the spatial boundaries as described in 4.16.1; and
- an assessment of impacts on ambient air quality (including air pollutants and greenhouse gases) and ambient sound due to mining operations and transportation of coal from the site (to the transshipment location) and along potential terrestrial transportation routes.

In conducting the analysis, the proponent shall consider pertinent acts, policies, guidelines and directives relating to Atmospheric Resources. The EIS shall provide a description of measures to mitigate effects to Atmospheric Resources, and predict potential residual effects and their significance.

Climate and Greenhouse Gas Emissions

This EIS section shall include discussion of flaring of methane in early years of the Project and capture and reuse of methane in later years.

With respect to greenhouse gas emissions (GHGs) the EIS should:

- list and predict the direct and indirect GHG emissions and the potential impact on carbon sinks (*e.g.* clearing of forest areas) for activities associated with the construction, operations, and decommissioning phases of the project. Predicted GHG emissions should be compared to provincial and national totals. Greenhouse gas emissions that should be considered as applicable include, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulphur hexafluoride (SF_6), perfluorocarbons (PFCs), and hydrofluorocarbons (HFCs). GHG emissions should be calculated and reported using a lifecycle GHG analysis;
- discuss the analytic techniques and relevant polices considered in the assessment. Both the International Organization for Standardization and the World Resources Institute/World Business Council for Sustainable Development have developed standard practices for quantifying GHG emissions;
- discuss mitigation measures considered to control project GHG emissions;
- consider and discuss options for measuring and monitoring baseline and going forward GHG emissions;
- discuss the GHG intensity of the proposed coal mine in comparison to regional and international standards; and
- consider and discuss the implications and risks of predicted GHG emissions under the current provincial and federal regulatory regime.

In conducting the analysis, the EIS shall consider the Agency guidance document entitled *Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners* (Agency 2003). The proponent should also look to the following sources:

- *Guide to Considering Climate Change in Environmental Assessments in Nova Scotia*. Available at: http://climatechange.gov.ns.ca/files/02/65/EA_CC_Guide1.pdf

- *Guide to Considering Climate Change in Project Development in Nova Scotia*. Available at: http://climatechange.gov.ns.ca/files/02/66/Development_CC_Guide1.pdf

Air Quality

Assessment of potential Project related effects on air quality shall include modeling for dust dispersion and discussion of dust mitigation and monitoring. The analysis should be informed by a full accounting of emissions from all project phases and activities including those from point and mobile sources. Emissions and air pollutants that should be considered as applicable include, but should not necessarily be limited to:

- Total Suspended Particulate, PM 2.5 and PM 10;
- criteria air contaminants - sulphur oxides (SO_x), nitrogen oxides (NO_x), particulate matter (PM) including total PM, PM_{10}, and $PM_{2.5}$, volatile organic compounds (VOCs), carbon monoxide (CO), ammonia (NH_3); ground-level ozone (O_3), secondary particulate matter (secondary PM)];
- air pollutants on the *List of Toxic Substances* in *Schedule 1* of the *Canadian Environmental Protection Act* (CEPA Registry 1999);
- heavy metals (e.g., mercury); and
- other toxics (e.g., benzene).

The emissions inventory should be used to identify emissions of concern from the proposed project to determine whether further analysis, discussion and/or modelling is required, commensurate with potential effects. The proponent may contact Environment Canada for guidance on recommended analysis based on inventory results.

Estimated Project related air emissions shall be compared with relevant provincial regulations and federal guidelines.

The EIS shall provide a description of measures to reduce emissions and predict potential residual effects and their significance. The analysis should include consideration of the impacts of emissions on biological receptors (e.g., vegetation, fish, wildlife, human health).

Noise

The EIS should assess the potential for noise impacts at the site and within local and regional study areas. Daytime and nighttime noise exposure and resulting effects on nearest sensitive receptors shall be predicted and noise modeling with respect to the nearest sensitive receptors is required.

The EIS should also:

- identify and quantify potential noise sources during construction and operational phases including increased road traffic;
- identify potential receptors and describe the proximity of identified receptors to the project area including identifying and describing whether particular receptors may have a heightened sensitivity to noise exposure or expectation of peace and quiet (e.g., quiet rural areas, worker camps);
- include a map illustrating estimated noise levels from the Project at key receptors; and
- describe mitigation and noise management measures including the conditions for mitigation, and evaluate project compliance with appropriate noise guidelines.

Calculation of sound pressure levels shall be used for comparison with Health Canada criteria at receptors.

4.17 Water Resources

4.17.1 VEC Definition and Rationale for Selection

Water Resources include quality and quantity of groundwater and surface water resources potentially affected by the Project.

Spatial boundaries shall include the Project property boundary and relevant watershed boundaries. Temporal boundaries for assessment shall include those applicable to the regulatory criteria and guidelines, and include Project construction, operation, decommissioning and post-decommissioning. Temporal boundaries shall also address natural variation in the quantity and quality of water resources.

4.17.2 Potential Project-VEC Interactions

The potential environmental effects of the Project shall be minimized by Project design and mitigation measures, including consideration of water conservation, diversion and recycling techniques. Groundwater flowing into and pumped from the mine workings during the operation phase shall be used in the coal production process, along with collected surface water runoff on the Project site. Any water collected in excess of the Project needs shall be treated as necessary and discharged, to meet permit requirements.

Potential Project-VEC interactions during construction activities include:

- effects related to erosion and sedimentation associated with on-site construction and modification of the current surface hydrologic regime; and
- vehicle maintenance and fueling, which is anticipated to occur on the site and could result in spills affecting water resources.

Potential Project-VEC interactions during operation and maintenance activities include:

- vehicle maintenance and fueling is anticipated to occur on the site and could result in spills affecting water resources;
- extraction of groundwater from the coal seams and surrounding rock, import and redistribution of freshwater on the site has the potential to affect the site water balance, water table conditions, and influence wetlands and surface water flows in fish-bearing streams and in ephemeral and perennial streams tributary to fish-bearing streams;
- contamination associated with mine and process water management;
- acid rock drainage from the project area including waste rock, coal stockpiles, mine workings and other exposed or disturbed areas that may result in the formation of acid rock drainage; and
- release of hazardous materials on-site.

Potential Project-VEC interactions during decommissioning activities include:

- release of hazardous materials on-site; and
- decommissioning filling of or flooding of mines with water that could result in impacts to groundwater or surface waters (e.g. overflows from the mine).

The potential for malfunctions and accidental events may also have interactions with Water Resources throughout all phases of the project.

4.17.3 Existing Environment

The baseline characterization of Water Resources for the Project has been ongoing during the current care and maintenance phase of the mine, and includes:

- results obtained from ongoing water monitoring programs at the site (both surface water and groundwater, and toxicity testing);
- results of surface water and groundwater assessments completed for the Donkin Exploratory Phase EA (XCDM 2008) and Industrial Approval Application, and the previous development of conceptual groundwater and surface water models for the Project area; and
- preliminary work completed to assess potential for acid rock drainage from the Project area (Dillon Consulting Limited 2005).

Using this, and additional information if necessary, the EIS shall describe the baseline environment for surface and ground water, including:

- a description of surface water quality, and hydrology at the site within local and regional study areas, including any water courses along the transmission line route. It should provide details of surface water quality monitoring programs conducted by the proponent, and achieve the following:

    - characterize the range and measure of water quality and aquatic ecology characteristics;
    - provide the basis for the prediction, modeling and assessment of potential effects prior to the potential project proceeding;
    - form the basis for monitoring and assessing change during construction, operation, closure and post-closure;
    - provide the basis for the formulation of site-specific water quality objectives (if any) for the aquatic environment;
    - provide the basis for the determination of allowable maximum waste water discharge based on specific water quality objectives;
    - provide a graphical presentation of key variables and stream flows over time for key sites to illustrate patterns and variability; and
    - provide power and confidence calculations, where applicable, for key variables at key sites once the impacts have been predicted, to guide and support future monitoring. Key variables are those that the impact assessment indicates may contribute to degraded water quality, and key sites are those sites where the discharge of key variables might take place.

- the delineation of drainage basins at the appropriate scales.
- a description of hydrological data such as water levels and flow rates.
- a description of hydrological regimes, including monthly, seasonal and year-to-year variability of all surface waters and assess normal flow, flooding, and drought properties of water bodies.
- the interactions between surface water and groundwater flow systems.
- whether any nearby surface water is used for recreational purposes, such as swimming, boating or recreational fishing.
- a review of the physical geography and geology of the area as it pertains to local and regional groundwater flow.
- the hydrogeologic maps and cross sections for the mine area in order to outline the extent of aquifers, bedrock fracture zones, location of wells, springs, potentiometric contours and flow direction.
- the physical and geochemical properties of hydrogeological units such as aquitards and aquifers.
- the groundwater flow patterns including recharge and discharge areas.
- a description of local and regional potable water resources in the area, including current and known future uses. Include location and proximity of any nearby private or municipal drinking water wells, and a description of the type(s) of wells (if known) i.e. dug or drilled and their depths.

- the identification of any Protected Water Areas, industrial or agricultural water use, and any withdrawals from nearby watercourses, which could potentially be impacted by this project.

The EIS will also include an investigation for Acid Rock Drainage/Metal Leaching (ARD/ML) potential. The investigation shall include:

- a description of the chronology of ARD/ML investigations and the design of an ARD/ML characterization program, including a description of all the static and kinetic test work conducted to date. The rationale, advantages and disadvantages of, detailed description, sample selections and methodology for all test work; and
- predictions of the ARD/ML potential of all materials to be disturbed or created during all phases (construction, operation, decommissioning,) of the proposed project.

The manual produced by the Mine Environment Neutral Drainage (MEND) Program, entitled, *MEND Report 1.20.1, "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials", Version 0 - December 2009* is a recommended reference for use in ARD/ML prediction.

4.17.4 Effects Assessment and Mitigation

To predict the potential environmental effects of the Project on Water Resources, consideration shall be given to the effects on water quality and quantity in relation to the following items during the construction, operation, maintenance, decommissioning and post-decommissioning phases of the project:

- collection, treatment and discharge of mine water and surface runoff (including the possibility for salt-water intrusion into groundwater or surface water);
- water management (e.g., inputs, outputs, reuse);
- contaminant loading and dispersion (including surface runoff and airborne contaminants);
- acid rock drainage risk associated with mine workings, coal storage areas, waste rock, process wastes and other rock exposed by the Project including approaches to mitigation of potential impacts on receiving water resources and monitoring;
- changes to the site water balance and water flow including impacts from extreme climatic events;
- release of contaminants, including from coal and waste rock, that could adversely affect surface and groundwater quality;
- changes to site physical hydrogeology, and potential effects on domestic well users and municipal supply and relevant mitigation and monitoring;
- changes to surface water and groundwater quality and quantity compared with baseline conditions and applicable water quality standards/objectives arising out of the various phases of the Project; and
- proposed changes to existing site water treatment system.

The EIS shall indicate where day-to-day operational problems might occur, particularly regarding runoff control and treatment, and predict the effects of a worst-case scenario in which there is an uncontrolled release of contaminants, including, for example, hydrocarbons or hazardous substances as a result of spills.

A water balance for the site shall be developed for all phases of the Project, and shall show predicted water balance on an annual and monthly basis to account for precipitation and snowmelt, for each year or stage of the mine life and all inflows and outflows. Appropriate return periods shall be defined and methods for the evaluation of monthly average precipitation, wet, dry and expected scenarios shall be discussed. The possible effects of each different precipitation sequence on the site water balance/mine water management activities shall be assessed and presented in a probabilistic framework.

The EIS shall describe waste rock management to avoid adverse effects to wetlands, watercourses and groundwater. A management plan shall be developed to manage runoff from the site, including an assessment of former and any future waste rock piles or disposal areas to ensure potential for adverse effects are avoided, minimized and/or mitigated. Mine water management (discharge) shall be described including use of existing water management facilities such as the serpentine canal and Devco settling pond. In addition, management of the coal processing plant rejects disposal area (wash plant tailings) should be described.

In conducting the analysis, the proponent shall consider pertinent acts, policies, guidelines and directives relating to Water Resources. The EIS shall provide a description of measures to mitigate effects to Water Resources, and predict potential residual effects and their significance.

4.18 Birds and Wildlife

4.18.1 VEC Definition and Rationale for Selection

The Birds and Wildlife VEC is defined as:

- migratory and non-migratory birds, including seabirds, shorebirds and raptors, with a focus on rare or sensitive species and their habitat, potentially feeding, breeding, migrating through the Project area;
- mammals and fur bearers and their habitat, including rare or sensitive species;
- amphibians and reptile populations and their habitat, including rare or sensitive species;
- all SARA and Committee on the Status of Endangered Wildlife in Canada -listed species;
- all species listed in the Nova Scotia *Species at Risk Regulations* made under sections 10 and 12 of the *Endangered Species Act* and those ranked extremely rare (S1) or rare (S2) in the Atlantic Canada Conservation Data Centre (ACCDC); and

- areas of concentration for other wildlife species (e.g. deer wintering areas).

The spatial boundaries include the footprint of the Project, including its marine facilities and potential land transportation and transmission routes, as well as surrounding areas potentially affected by the Project (e.g., as a result of noise and visual stimulus and in consideration of buffers around sensitive areas such as seabird colonies).

Temporal boundaries for assessment shall include those applicable to the regulatory criteria and guidelines, and include Project construction, operation, decommissioning and post-decommissioning, as applicable. Temporal boundaries shall also consider periods of enhanced biological sensitivity.

Birds and Wildlife has been considered as a VEC due to:

- concern with protection of species biodiversity and critical habitat;
- *Migratory Birds Convention Act*;
- SARA;
- Nova Scotia *Endangered Species Act*; and
- recreational wildlife viewing.

4.18.2 Potential Project-VEC Interactions

Potential Project-VEC interactions during construction activities include:

- habitat loss or alteration and direct mortality associated with facility construction (*e.g.,* clearing and grubbing) including construction of power transmission line;
- disruption of feeding, breeding and migratory patterns due to noise and presence of construction activity and fencing;
- habitat fragmentation;
- effects on bird behaviour due to site lighting;
- effects associated with malfunctions and accidental events; and
- wildlife attraction due to improper waste handling.

Potential Project-VEC interactions during operation and maintenance activities include:

- loss of habitat due to waste rock disposal;
- disruption of feeding, breeding or migratory patterns due to presence of facility (*e.g.* lights, noise) and barge loading and transport;
- disruption to seabird colonies due to activities associated with barge load-out facility;
- habitat fragmentation;
- effects on bird behaviour due to site lighting;

- wildlife mortality and disturbance associated with coal trucking (if required) and presence of power transmission line; and
- wildlife attraction due to improper waste handling.

The potential for malfunctions and accidental events may also have interactions with Birds and Wildlife throughout all phases of the project.

4.18.3 Existing Environment

The EIS should characterize bird and wildlife habitat on and adjacent to the Project. The description shall include data from the Donkin Exploratory Phase EA (XCDM 2008), recent onsite bird surveys (including seabird colonies) and ACCDC habitat modeling. Methodology and results of bird surveys should be clearly presented, and include maps (to scale) showing areas where surveys were undertaken in relation to the proposed project infrastructure. Maps showing any SAR and species of conservation concern, designated or protected areas, areas of concentrations of birds or other wildlife, flight corridors, wetlands, interior and mature forest habitat, flight corridors, etc, should be shown in relation to project infrastructure on appropriately scaled maps.

In addition, the EIS shall include:

- a description of terrestrial fauna (e.g., ungulates, furbearers, amphibians and raptors) and their habitat potentially at the Project site, along the transmission line and potential transportation corridors and within local and regional study areas, including the results of any surveys conducted; and
- a description of any wildlife corridors and physical barriers to movement that exist within the Project area, including along the transmission line and potential transportation corridors.

Migratory Birds

Migratory birds are protected under the *Migratory Birds Convention Act* (MBCA) and associated regulations. Migratory birds protected by the MBCA generally include all seabirds except cormorants and pelicans, all waterfowl, all shorebirds, and most landbirds (birds with principally terrestrial life cycles). Most of these birds are specifically named in the Environment Canada publication, *Birds Protected in Canada under the Migratory Birds Convention Act* (Environment Canada 1991).

Preliminary data from existing sources should first be gathered on migratory bird use of the area for all four seasons (e.g., winter, spring migration, breeding season, fall migration). In addition to information obtained from the ACCDC and naturalists, other datasets should also be consulted (see below). Datasets are downloadable through Bird Studies Canada's web portal, Nature Counts, at: http://www.birdscanada.org/birdmon/default/datasets.jsp .

In particular, data from the Maritime Breeding Bird Atlas (1st and 2nd atlas) should be considered. Data from the 2nd atlas is not yet fully available through the ACCDC. Special requests for species at risk information from the MBBA can be made directly via the Nature Counts website but will require special approval before the data are released. In addition to the Maritime Breeding Bird Atlas, other datasets of relevance to this project include: Bird Studies Canada's High Elevation Landbird Survey (contact Greg Campbell, gcampbell@bsc-eoc.org), Atlantic Canada Nocturnal Owl Survey, Christmas Bird Count, and the Breeding Bird Survey.

This data should then be supplemented by surveys. In designing required surveys, the proponent should refer to the Canadian Wildlife Service's Technical Report No. 508, *A Framework for the Scientific Assessment of Potential Project Impacts on Birds* (Hanson *et al*. 2010). Appendix 3 of this Framework provides examples of project types and recommended techniques for assessing impacts on migratory birds.

The EIS should give particular, but not exclusive, consideration to birds or habitat that meets one of the following criteria:

- species listed under the *Species at Risk Act* (SARA), designated or under review by the Committee on the Status of Endangered Wildlife in Canada, or provincial species at risk and species of conservation concern listings;
- areas of concentration of migratory birds, such as breeding areas, colonies, spring and fall staging areas, flight corridors, and wintering areas;
- breeding and nesting areas of species low in number and high in the food chain;
- interior and mature forest habitat;
- species that are identified by priority ranking systems (Partners-In-Flight); or
- habitats in or near areas that have been or are in the process of being identified by land managers as particularly important to the survival of the species globally, regionally, or locally, or habitats valued by local users of the resource. These include, but are not limited to, areas with the following existing, proposed, or potential designations:
    - Migratory Bird Sanctuaries,
    - Important Bird Areas, or
    - other types of protected or designated areas that have been established, in part, to protect migratory birds and their habitat.

4.18.4 Effects Assessment and Mitigation

Potential direct and indirect Project effects on birds and wildlife and their habitat shall be described. In addition, the EIS shall describe mitigation and monitoring to reduce the potential for adverse effects to birds and wildlife and their habitat. Management tools (i.e., federal and provincial acts and policies, guidance, and provincial or regional

strategies and plans) relevant to the protection of wildlife and/or wildlife habitat should be considered in the EIS. The EIS shall predict potential residual effects and their significance.

As a starting point, the analysis in the EIS shall include:

- a quantitative and qualitative determination of overall loss or alteration of terrestrial habitat that could result from the Project and the impact of this on key species.
- an assessment of possible physical hazards and attractants for wildlife (e.g., assessment of the potential impacts of roads, pits, and other structural features on wildlife feeding, migration and movement, denning and refuge, reproductive behaviour and success, nesting and chick-rearing, and direct mortality);
- an assessment of possible chemical hazards and attractants for wildlife (e.g., assessment of the potential impacts of identified contaminants of potential concern on wildlife feeding, migration and movement, denning and refuge, reproductive behaviour and success, and direct mortality);
- an assessment of possible sensory disturbance causing wildlife attraction or deterrence (e.g., assessment of the potential impacts of noise, light, odours, and human presence on wildlife feeding, migration and movement, denning and refuge, reproductive behaviour and success, and direct mortality);
- an assessment of the potential effects on species known to be important to the Mi'kmaq; and
- an assessment of the potential for local population level impacts to VEC species resulting from the impacts of:
    - habitat loss or alteration;
    - physical hazards;
    - chemical hazards;
    - sensory disturbances and/or other impacts.

The assessment of the potential effects on birds shall include nesting and chick-rearing, staging, and wintering life-stages (if applicable) in addition to other appropriate life stages;

The EIS shall describe measures to mitigate effects to wildlife and wildlife habitat and list potential residual effects and their significance.

The proponent should refer to the *Guide to Addressing Wildlife Species and Habitat in an EA Registration Document.*

4.19 Wetlands

4.19.1 VEC Definition and Rationale for Selection

The Wetlands VEC is defined as marshes, swamps, fens, bogs, and shallow water areas that are saturated with water long enough to promote wetland or aquatic

processes. This VEC also includes coastal wetlands (e.g. salt marshes and eelgrass beds). The EIS should apply the US Army Corps of Engineers Wetland Delineation Method (1987) to formally define wetland habitat; and the Canadian Wetland Classification System (NWWG 1997) to classify and characterize wetland habitat.

Spatial boundaries include footprint of the facility and wetland areas that could reasonably be affected by the Project, including transmission lines and transportation routes (e.g., through direct effects or through changes to hydrology).

Temporal boundaries for assessment shall include those applicable to the regulatory criteria and guidelines, and include Project construction, operation, decommissioning and post-decommissioning, as applicable. Temporal boundaries shall also consider periods of enhanced biological sensitivity and fluctuations in water levels.

Wetlands have been considered a VEC because:

- the "Federal Policy on Wetland Conservation" sets a conservation goal of no net loss of wetland function.
- the "Nova Scotia Wetland Conservation Policy" provides direction and a framework for the conservation and management of wetlands in Nova Scotia; and
- globally, wetlands are recognized as unique and valued ecosystems, providing valuable functions on a local (e.g., water quality improvement), regional (e.g., groundwater recharge) and global (e.g., carbon storage) scale (Ramsar Convention Secretariat 2006).

4.19.2 Potential Project-VEC Interactions

Potential Project-VEC interactions during construction include:

- site grading and filling, which can result in the direct loss or alteration of wetlands and their associated functions;
- the potential for new corridors to increase access to wetlands (e.g. by ATVs);
- changes to site hydrology (e.g., drainage, infiltration, runoff), which can result in the indirect loss or alteration of wetlands and their associated functions;
- accidental release of sediment nutrients, or contaminants as well as acid rock drainage, which can result in the indirect alteration of wetlands and their associated functions; and
- the potential for introduction of invasive species (e.g. invasive plants) from other areas.

Potential Project-VEC interactions during operation and maintenance include:

- disturbance or vegetation maintenance along permanent access roads, which can result in the direct alteration of wetlands and their associated functions;

- disposal of waste rock, which can result in the direct loss or alteration of wetlands and their associated function;
- disposal of the coal processing plant rejects, which can result in the direct loss or alteration of wetlands and their associated function; and
- accidental release of sediment, nutrients, acid rock drainage or contaminants to wetlands, which can result in the indirect alteration of wetlands and their associated functions.

Potential Project-VEC interactions during decommissioning and post-decommissioning include:

- mine water discharge from the flooded workings and
- runoff from the coal processing plant rejects disposal area.

The potential for malfunctions and accidental events may also have interactions with wetlands throughout all phases of the project.

4.19.3 Existing Environment

The Donkin Exploratory Phase EA (XCDM 2008) characterized the prominent wetland at the mine site (Bailey's Wetland) as well as wetlands associated with the former DEVCO settling pond on site. Wetland delineation and functional analysis should be conducted for wetlands potentially affected by the Project. A scaled approach to characterizing the existing wetlands on site shall be undertaken to focus efforts in the areas where project interactions are most likely to occur, while providing sufficient baseline data to support long term wetland protection in the region.

Desktop identification of areas of likely wetland habitat on the Donkin Peninsula shall be identified through use of provincial databases (NSDNR Wetland Inventory Database and Wet Areas Mapping) and air photo interpretation. Surface expressions of faults, joints and fracture systems should be captured during geological mapping to better delineate potential groundwater recharge and discharge zones.

Formal in-field delineation, classification, characterization (including function assessment) of wetlands >100 m^2 in area located within the footprint of the proposed Project components and preferred areas for waste rock disposal shall be assessed.

4.19.4 Effects Assessment and Mitigation

The EIS shall assess direct and indirect impacts on wetlands and describe how proposed mitigation measures will adhere to the "Federal Policy on Wetland Conservation" and related implementation guidance. Measures to ensure the no net loss of wetland function should be detailed. In the event that avoidance of wetlands is not possible, the reasons why elimination of adverse effects on wetland function was not possible should be clearly demonstrated in the EIS. Additional guidance related to the assessment of impacts to wetlands can be found in the Environment Canada

publication *Wetland Ecological Functions Assessment: An Overview of Approaches* (Hanson *et al*., 2008).

Detailed site plans (including placement of waste rock piles) shall be evaluated for potential direct and indirect effects on identified wetlands and their associated functions. The Project interactions to be evaluated shall include all physical (e.g., infilling), hydrological (e.g., draining) and chemical (e.g., acid drainage) effects. If the Project has the potential to create new corridors which increases access to wetlands (e.g. by ATVs), mitigation and monitoring measures to address this effect should be proposed in the EIS.

Where wetland avoidance is not possible, mitigation plans shall be presented for minimizing the affected area of wetland (e.g., water management, erosion prevention and sediment control).The potential Project effects to wetlands shall be quantified in terms of area affected and described qualitatively in terms of the expected functional change. The mitigation measures and monitoring plan, as well as a proposed compensation plan, should be consistent with those proposed for other projects in Atlantic Canada.

Opportunities to offset the loss of wetland area and function through wetland compensation shall be presented conceptually to Nova Scotia Environment, EC and DFO.

In conducting the analysis, the proponent shall consider pertinent acts, policies, guidelines and directives relating to Wetlands. The EIS shall provide a description of measures to mitigate effects to Wetlands and predict potential residual effects and their significance. Since wetlands are possible indicators of change in groundwater regimes within the project area, their extent and characteristics should be monitored.

4.20 Rare Plants

4.20.1 VEC Definition and Rationale for Selection

The rare plants VEC is defined as rare vascular plants and uncommon species assemblages. Spatial boundaries include footprint of the facility and areas that could reasonably be affected by the Project (e.g., due to changes in hydrology).

Temporal boundaries for assessment shall include those applicable to the regulatory criteria and guidelines, and include Project construction, operation and decommissioning. Temporal boundaries shall also consider periods of enhanced biological sensitivity.

Rare plants have been considered a VEC due to:

- protection of species biodiversity and critical habitat;

- SARA; and
- Nova Scotia *Endangered Species Act*.

4.20.2 Potential Project-VEC Interactions

Potential Project-VEC interactions during construction activities include:

- habitat loss or alteration and direct mortality associated with facility construction (*e.g.,* clearing and grubbing) including clearing for the power transmission line;
- site grading and filling and/or alteration of hydrology can cause the loss of rare plants and/or uncommon species assemblages;
- introduction of invasive plant species; and
- erosion and siltation or contaminants in surface runoff could affect rare plant communities.

Potential Project-VEC interactions during operation and maintenance include:

- changes in local hydrology could affect rare plant communities;
- vegetation management at the mine site and power transmission corridor; and
- erosion and siltation, acid mine drainage and other contaminants in surface runoff could affect rare plant communities.

The potential for malfunctions and accidental events may also have interactions with rare plants throughout all phases of the project.

4.20.3 Existing Environment

The EIS should characterize the baseline vegetation species/communities within the area potentially affected by the Project. Existing information on rare plants shall be derived from the Donkin Exploratory Phase EA (XCDM 2008), rare species database and habitat modeling. A description of plant communities at the site should be provided, including species lists and dominant species.

Habitat mapping and classification shall be prepared for the study area based on forest inventory mapping and field derived habitat descriptions. A desktop review of vegetative communities along the transportation corridor and the power transmission corridor shall be undertaken, and complemented by field studies if appropriate.

4.20.4 Effects Assessment and Mitigation

The EIS should describe potential direct and indirect Project effects on rare plants. Potential shall be evaluated based on detailed site layout including location of waste rock piles and potential changes to hydrology. In conducting the analysis, pertinent acts, policies, guidelines and directives relating to vegetation/ecological communities should be considered. The EIS shall provide a description of measures to mitigate and monitor effects to rare plants, including opportunities for avoidance and erosion

and sediment control, maintenance of local hydrology, vegetation management and management of invasive plant species. Potential residual effects and their significance should be described in the EIS.

In conducting the analysis, the proponent shall consider pertinent acts, policies, guidelines and directives relating to rare plants. The EIS shall provide a description of measures to mitigate effects to rare plants and predict potential residual effects and their significance.

4.21 Freshwater Fish and Fish Habitat

4.21.1 VEC Definition and Rationale for Selection

Freshwater Fish and Fish Habitat is considered a VEC due to potential interactions with the Project (primarily Baileys Wetland/Schooner Pond) and regulatory protection of fish and fish habitat. This VEC also includes any freshwater fish species at risk, if applicable. For the purpose of the EIS the following definitions shall apply.

Freshwater fish shall refer to fish (as defined in section 2 of the *Fisheries Act*) that live in freshwater during at least part of their life cycle. Fish habitat as defined in subsection 34(1) of the *Fisheries Act* includes spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes.

Spatial boundaries for the assessment of the freshwater fish and fish habitat VEC shall include potentially affected fish bearing water courses on the Donkin Peninsula and along the transmission line route between the Project site and Victoria Junction. Ecologically sensitive, protected areas and critical habitat features of the aquatic environment shall also be included in the assessment should they be present.

Temporal boundaries for assessment shall include those applicable to the regulatory criteria and guidelines, and include Project construction, operation, decommissioning and post-decommissioning, as applicable. Temporal boundaries shall also consider periods of enhanced biological sensitivity (e.g., fish life-cycle).

Should alteration of the freshwater aquatic habitat be necessary, authorizations under subsection 35(2) of the *Fisheries Act* will be required for a Harmful Alteration Disruption or Destruction (HADD) of the productive capacity of fish habitat (e.g., if water quality and water quantity is affected). DFO policy requires no net loss in the productive capacity of fish habitat.

4.21.2 Potential Project-VEC Interactions

Potential Project-VEC interactions during construction activities include:

- direct habitat alteration and direct mortality associated with construction of site works including drainage/dewatering;
- indirect habitat alteration due to changes in habitats or water quality caused by erosion or localized changes to hydrology; and
- potential reduction in riparian vegetation.

Potential Project-VEC interactions during operation and maintenance include:

- potential changes to water quality and quantity from mine water and process water discharges into Bailey's Wetland/Schooner Pond;
- potential changes to water quality due to turbidity, siltation and contamination from surface runoff including concerns related to acid mine drainage from stockpiles and waste rock piles;
- impacts of releases of mine water into the marine environment (the deposit of a deleterious substance into waters frequented by fish is prohibited under the *Fisheries Act*); and
- indirect habitat alteration from localized changes to hydrology and the thermal regime.

Potential Project-VEC interactions during decommissioning and post-decommissioning include:

- direct or indirect habitat alteration due to changes in habitats or water quality caused by erosion or localized changes to hydrology;
- potential changes to water quality due to the drainage of acidic waters from the Project site; and
- potential impact on freshwater fish and fish habitat from mine water discharge from the flooded workings.

The potential for malfunctions and accidental events may also have interactions with Freshwater Fish and Fish Habitat throughout all phases of the project.

4.21.3 Existing Environment

Watercourses which are likely to be directly affected by the Project include Bailey's Wetland/Schooner Pond and the associated tributaries.

Assessments of the existing Freshwater Fish and Fish Habitat have been completed for the Donkin Exploratory Phase EA (XCDM 2008). Freshwater Fish habitat was identified within the DEVCO settling pond and Bailey's Wetland/Schooner Pond. Additional assessments were performed within the tributaries to Bailey's Wetland and the DEVCO settling pond and were determined to not provide suitable fish habitat. These assessments shall be substantially relied upon for the current assessment of Freshwater Fish and Fish Habitat.

Any additional watercourses identified in the Project area which have the potential to be affected by the Project and that were not covered in the Donkin Exploratory Phase EA (XCDM 2008), shall be characterized for potential as fish habitat. This would include any watercourses present along the proposed transmission line route that may be disturbed during construction of the line.

4.21.4 Effects Assessment and Mitigation

Freshwater Fish and Fish Habitat shall be evaluated with respect to potential loss of the productive capacity of the habitat as regulated under the *Fisheries Act* and in accordance with DFO policy. Any potential Project-related HADD shall be described as well as application of the mitigative hierarchy of avoidance, mitigation and compensation as applicable for the Project.

The Donkin Exploratory Phase EA (XCDM 2008) shall be referenced for the Freshwater Fish and Fish Habitat including the mitigation currently in place and ongoing water quality monitoring, toxicity testing and standard mitigation and controls (i.e., during the current care and maintenance phase of the mine) as applicable to the proposed Project and assessment.

Any predicted changes to water quality and quantity discharged into water control systems (including potential acid rock drainage) shall be discussed, compared with relevant guidelines and standards such as Canadian Council of Ministers of the Environment guidelines for protection of freshwater aquatic life as well as existing provincial permit limits. Based on the quantification of any potential HADD, conceptual habitat compensation options shall be identified.

In conducting the analysis, the proponent shall consider pertinent acts, policies, guidelines and directives relating to Freshwater Fish and Fish Habitat. The EIS shall provide a description of measures to mitigate effects to Freshwater Fish and Fish Habitat and predict potential residual effects and their significance.

4.22 Marine Environment

4.22.1 VEC Definition and Rationale for Selection

The Marine Environment is considered a VEC due to interactions with the Project, regulatory protection of fish and fish habitat and intrinsic connection to the local commercial fishery. The Marine Environment VEC shall focus on marine fish and fish habitat (as defined under the *Fisheries Act*) including benthic habitats and sediment and water quality. Consideration of potential interactions with marine mammals and turtles shall also be considered in this section of the EIS. Special consideration shall be given to the potential for marine species at risk including species that have been identified by federal or provincial agencies as being of special concern. Ecologically sensitive, protected areas or candidate protected areas (e.g., St. Anne's Bank) and

critical habitat features of the marine environment shall also be included in the assessment.

Authorization under subsection 35(2) of the federal *Fisheries Act* shall be required for a HADD of the productive capacity of fish habitat. In addition, DFO policy requires no net loss in the productive capacity of fish habitat. Habitat compensation shall be discussed based on the characterization and quantification of marine habitat to be affected by the Project. It is expected that an Authorization under section 32 of the *Fisheries Act* shall also be required to permit Project related mortality of fish by means other than fishing. Section 36 of the *Fisheries Act* prohibits the introduction of deleterious substances into waters frequented by fish.

The EIS will consider impacts to marine sediment and water quality due to potential mobilization of contaminants contained within the surficial sediments during construction operations. Water and sediment quality are general terms that provides a means to compare physio-chemical parameters against guidelines or standards. Marine sediment quality is strongly associated with demersal fish habitat through direct contact and food sources.

Potential effects on the local commercial and recreational fishery shall be discussed in Section 4.25.4: Commercial and Recreational Fishery.

The spatial boundaries of the Marine Environment include the footprints of the transshipment and barge load-out facility sites (may need to expand beyond the physical footprint to include the zone of natural longshore sediment transport, and nearshore currents and shore cliff stability adjacent to the site); the footprints of the dredge (if necessary) and infill areas; the transportation route between the barge load-out facility and the transhipment mooring location; zones of influence related to potential deposition of contaminated sediments; and the transshipment mooring location. Consideration shall be given to potential interactions with more far ranging and migratory marine species and to the footprint associated with potential generation of underwater noise and interactions with sensitive species.

Environmental effects of the project on navigation are taken into consideration as part of the EA only when the effects are indirect, i.e. resulting from a change in the environment affecting navigation. Direct effects on navigation are not considered in the EA, but any measures necessary to mitigate direct effects will be included as conditions of the *Navigable Waters Protection Act* approval.

Temporal boundaries for assessment shall include those applicable to the regulatory criteria and guidelines, and include Project construction, operation, decommissioning, and post-decommissioning, as applicable. Temporal boundaries shall also consider periods of enhanced biological sensitivity. The temporal boundaries of the environmental impacts of the barge load out facility should include impacts on longshore sediment transport during the existence of the facility, and the impacts on

sediment transport resumption and dispersal following facility decommission and removal.

4.22.2 Potential Project-VEC Interactions

Potential Project-VEC interactions during construction activities include:

- direct habitat alteration and fish mortality associated with construction of barge load-out facility and transshipment locations - infilling, dredging and subsea structures may be required in fish habitat;
- possible habitat loss associated with disposal of dredged material (if required);
- underwater noise from construction (*e.g.,* pile driving, dredging);
- marine mammal and vessel collisions.

Potential Project-VEC interactions during operation and maintenance include:

- turbidity, siltation and contamination from surface runoff, propeller wash and ship releases, including ballast water;
- introduction of invasive marine species;
- impacts of noise on marine species;
- impacts of releases of mine water into the marine environment (the deposit of a deleterious substance into waters frequented by fish is prohibited under the *Fisheries Act*); and
- impacts of subsea tunnelling on seafloor stability.

Potential Project-VEC interactions during decommissioning or post-decommissioning include:

- potential impacts from any acid drainage from the Project site; and
- potential impacts from the release of other contaminants from the decommissioned mine site.

The potential for malfunctions and accidental events including releases from vessels, vessel accidents and marine mammal and vessel collisions may also have interactions with the Marine Environment throughout all phases of the project.

4.22.3 Existing Environment

The description of the existing marine environment shall reference aspects of the marine environment addressed by the Donkin Exploratory Phase EA (XCDM 2008). The current Project shall have a broader marine footprint and shall thus require consideration of a larger assessment area encompassing additional habitats in the marine environment. The potentially affected marine habitats shall be identified and characterized. Data for the following areas, described below, have been or shall be collected for the EIS.

A review of databases for species of conservation concern shall be undertaken to determine the potential for marine species of conservation concern to be present within the Assessment Area.

The biological aspects of commercially valuable species (e.g., lobster and crab) shall be highlighted and further discussed in the Commercial and Recreational Fisheries VEC. This information shall be supplemented with discussion with resource experts and DFO officials.

Site-specific field surveys at the barge load-out facility, transshipment location and the ocean disposal location (if required for dredge spoil disposal) shall be undertaken. This shall include marine biologists performing benthic habitat surveys of the marine environment using a subsea remotely operated vehicle. Surveys shall be performed according to DFO's Underwater Survey Guidelines.

A sediment sampling program shall be designed for the load-out facility (including an assessment of seabed sediment mobility) and the transshipment location according to Environment Canada's *Users Guide to the Application Form for Ocean Disposal* (EC 1995) by a marine biologist. Sediment sampling shall be performed according to Environment Canada's *Guidance Document on the Collection and Preparation of Sediments for Physiochemical Characterization and Biological Testing* (EC 1994). Sediment shall be analyzed for sediment quality and infaunal organisms. Characterization of the material that may be dredged shall be presented in the EIS.

Characterization of the water column at the load-out facility, transshipment location and potentially the ocean disposal site shall be undertaken for currents and oceanographic parameters such as salinity and temperature.

During all field surveys, observations of marine mammals shall be noted, including species, number, life stage, and orientation of travel.

The oceanographic parameters and physical oceanographic conditions shall be analyzed along with the sediment quality results to qualitatively assess risk of dispersion of potential resuspended sediments during the infilling, dredging and construction of the barge load-out facility. Direct observations shall be made of physical coastal processes near the barge load-out facility (i.e., scour/erosion and deposition) and include a historical review of shoreline changes using repetitive air photos where available.

4.22.4 Effects Assessment and Mitigation

The effects assessment for the Marine Environment shall be completed based on the results of the field and desktop studies to determine potential adverse environmental effects and mitigation. In particular, areas to be directly affected by marine aspects of the Project (i.e., HADD) shall be characterized and quantified as well as application of

the mitigative hierarchy of avoidance, mitigation and compensation as applicable for the Project.

The EIS shall provide an assessment of the possible fish habitat loss or disruption associated impacts of the barge load out facility on longshore sediment transport, erosion and deposition.

The Donkin Exploratory Phase EA (XCDM 2008) shall be referenced for the predicted effects on the marine environment (mainly Schooner Cove) including the mitigation currently in place and ongoing water quality monitoring, toxicity testing (undertaken during the current care and maintenance phase of the mine) and standard mitigation and controls as applicable to the Project and assessment.

Any predicted changes to marine water quality and quantity discharged into water control systems (including potential acid rock drainage) shall be discussed, compared with relevant guidelines and standards as well as existing provincial permit limits. Based on the quantification of any potential HADD, potential conceptual compensation habitat options shall be identified.

Environmental management measures to be developed and implemented as part of the Project, including: vessel ballast water discharge plans (e.g., to minimize risk of introduction of invasive species), environmental protection, contingency and emergency response plans, shall be outlined in the EIS and further details shall be developed and included in the EMP as the Project design evolves.

Repetitive seafloor multibeam surveys may be useful in detecting seafloor subsidence resulting from the proposed mining activity. (Repetitive multibeam surveys of the seafloor completed at the nearby Port Aconi mine site mapped seafloor subsidence along subsea mine tunnels and provided knowledge about the competence of the overlying bedrock. Results from the Point Aconi surveys showed subsidence occurred within 1-2 yrs after initial coal extraction in the tunnels.) The proponent will explore subsidence management methods which are appropriate and applicable to the mining methods proposed.

In conducting the analysis, the proponent shall consider pertinent acts, policies, guidelines and directives relating to the marine environment. The EIS shall provide a description of measures to mitigate effects to marine environment and predict potential residual effects and their significance.

4.23 Archaeological and Heritage Resources

4.23.1 VEC Definition and Rationale for Selection

According to the Agency Reference Guide: *Assessing Environmental Effects on Physical and Cultural Heritage Resources* (Agency 1996), a cultural heritage resource is a human work or a place that gives evidence of human activity or has spiritual or

cultural meaning, and that has historic value. Cultural heritage resources are distinguished from other resources by virtue of the historic value placed on them through their association with an aspect(s) of human history. This interpretation of cultural resources can be applied to a wide range of resources, including cultural landscapes and landscape features, archaeological sites, structures, engineering works, artifacts and associated records.

Spatial boundaries are limited to the footprint of area to be disturbed by Project activities. Temporal boundaries shall be developed in consideration of potential permanent alteration of archaeological and heritage resources during Project construction and operation.

Archaeological and heritage resources have been considered a VEC due to:

- concern with effective management of archaeological and heritage resources;
- Nova Scotia *Special Places Protection Act;* and
- Nova Scotia *Environment Act.*

4.23.2 Potential Project-VEC Interactions

Potential Project-VEC interactions during construction activities include:

- Disturbance to and loss of archaeological and heritage sites from site clearing, grubbing and grading, and marine construction.

Potential Project-VEC interactions during operation and maintenance include:

- Project related activities during the operation phase could include areas of waste rock disposal and associated grading and infilling activities.

The potential for malfunctions and accidental events may also have interactions with Archaeological and Heritage Resources throughout all phases of the project.

4.23.3 Existing Environment

Baseline information for the terrestrial aspects (i.e., mine site) of this VEC shall substantially reference the archaeological report prepared for the Donkin Exploratory Phase EA (XCDM 2008). This information shall be reviewed and updated as necessary including checking the Nova Scotia museum shipwreck database for recorded shipwrecks near the barge load-out facility and transshipment locations. Benthic video records shall also be reviewed for evidence of shipwrecks or other cultural features. This information shall also address historic use of the area by the Mi'kmaq inhabitants.

4.23.4 Effects Assessment and Mitigation

The EIS shall assess the potential effects of any change in the environment as a result of the Project on physical and cultural heritage resources and on structures, sites or things of historical, archaeological, or paleontological significance. Potential Project interactions with documented archaeological and historic features (terrestrial and marine) shall be assessed with mitigation and monitoring proposals provided.

An archaeological potential model shall also be provided including proposals for monitoring and contingency planning in the event that previously undocumented resources are discovered.

Provisions for notification and involvement of relevant regulators and the Mi'kmaq shall also be included as applicable.

In conducting the analysis, the proponent shall consider pertinent acts, policies, guidelines and directives relating to Archaeological and Heritage Resources. The EIS shall provide a description of measures to mitigate effects to Archaeological and Heritage Resources and predict potential residual effects and their significance.

4.24 Current Use of Land and Resource Use for Traditional Purposes by the Mi'kmaq of Nova Scotia

4.24.1 VEC Definition and Rationale for Selection

The Current Use of Land and Resources for Traditional Purposes by the Mi'kmaq of Nova Scotia VEC is defined as lands and resources of specific social, cultural or spiritual value to the Mi'kmaq of Nova Scotia with focus on current use of land and resources by the Mi'kmaq for traditional purposes. Spatial boundaries for the assessment of Traditional Purposes by the Mi'kmaq of Nova Scotia VEC shall be defined in the MEKS and in consideration of areas and resources potentially affected by Project activities (e.g., fishing, hunting and gathering).

Temporal boundaries for assessment shall include those applicable to the regulatory criteria and guidelines, and include Project construction, operation and decommissioning. Temporal boundaries shall also consider periods of enhanced biological sensitivity for resource species and times used for resource harvesting.

Current Use of Land and Resources for Traditional Purposes by the Mi'kmaq of Nova Scotia is considered as a VEC due to:

- concerns for Mi'kmaq interests (*i.e.,* current use of lands for traditional purposes);
- the Act; and
- *Nova Scotia Environment Act*.

The proponent is encouraged to engage the Mi'kmaq of Nova Scotia as referenced in the Nova Scotia Office of Aboriginal Affairs' *Proponents' Guide:The Role Of Proponents in Crown Consultation with the Mi'kmaq of Nova Scotia*, 2011.

4.24.2 Potential Project-VEC Interactions

Potential Project-VEC interactions during construction activities include:

- Effects on land and resource use from construction activities. For example, restricted access to the site (mine site and marine construction) could restrict First Nations fishing, hunting and harvesting opportunities. Change in habitats (terrestrial and marine) could also affect traditional land use (e.g., harvesting) by the Mi'kmaq.

Potential Project-VEC interactions during operation and maintenance include:

- Effects on land and resource use due to the presence of the mine facility (terrestrial and marine) and ongoing activities could restrict Mi'kmaq fishing, hunting and harvesting opportunities. Change in habitats (terrestrial and marine) could also affect traditional land use (e.g., harvesting) by the Mi'kmaq.

The potential for malfunctions and accidental events may also have interactions with the Current Use of Land and Resource Use for Traditional Purposes by the Mi'kmaq throughout all phases of the project.

4.24.3 Existing Environment

Baseline information on the traditional use of lands and resources shall rely substantially on the MEKS associated with the Donkin Exploratory Phase EA (XCDM 2008). The MEKS shall be updated to reflect the requirements of the current project. This information shall be supplemented with consultation with federal and provincial government departments. The EIS shall describe fishing for food and ceremonial purposes (not related to commercial fisheries). Information shall also be cross referenced to the archaeological and heritage resource section.

With respect to vegetation, the EIS shall describe flora that is harvested for subsistence, social, cultural, ceremonial or medicinal purposes including, for example:

- plant tissues e.g., roots, barks, leaves and seeds that are traditionally harvested for social, cultural (e.g., black ash) or ceremonial (e.g., white cedar) purposes;
- produce harvested from naturally occurring sources (e.g., berries, seeds, leaves, roots and lichen);
- plant tissues that are ingested for medicinal use (e.g., roots, bark, leaves and seeds); and
- any of the above foods from the Project area that are offered for sale, barter or trade and that are not captured under (traditional) systems of licensing and/or inspection (e.g., through market gardeners).

4.24.4 Effects Assessment and Mitigation

The EIS will assess the impact of the Project's environmental effects on the current use of lands and resources for traditional purposes by the Mi'kmaq. This includes impacts on traditional hunting, fishing, gathering or ceremonial activities. The analysis should focus on the identification of potential adverse effects of the Project on the ability of future generations of the Mi'kmaq to pursue traditional activities.

Traditional activities carried out by the Mi'kmaq must be described. Based on information provided by the Mi'kmaq or, if the Mi'kmaq do not provide this information, on available information from other sources, the EIS will identify:

- potential social and/or economic effects to the Mi'kmaq that may arise as a result of any change in the environment due to the Project;
- effects of any change in the environment due to the Project on current and proposed uses of land and resources by the Mi'kmaq for traditional purposes;
- effects of any change in the environment due to the Project on hunting, fishing, trapping and cultural uses of the land (e.g., collection of medicinal plants, use of sacred sites), as well as related effects on lifestyle, culture and quality of life of the Mi'kmaq;
- effects on the Mi'kmaq of area access, including deactivation or reclamation of access roads; and
- effects of any change in the environment as a result of the Project on heritage and archaeological resources in the Project area that are of importance or concern to the Mi'kmaq.

The EIS shall include measures to avoid, mitigate, compensate or accommodate these effects. Effects assessment and mitigation with respect to the traditional use of lands and resources shall rely substantially on the original MEKS and the planned updated MEKS.

In conducting the analysis, the proponent shall consider pertinent acts, policies, guidelines and directives relating to the Current Use of Land and Resource Use for Traditional Purposes by the Mi'kmaq of Nova Scotia. The EIS shall provide a description of measures to mitigate effects to the Current Use of Land and Resource Use for Traditional Purposes by the Mi'kmaq and predict potential residual effects and their significance.

4.25 Commercial and Recreational Fisheries

4.25.1 VEC Definition and Rationale for Selection

Commercial and Recreational Fisheries is considered a VEC due to interactions with the Project, regulatory protection of fish and fish habitat and the importance of the fishery to the local and regional economy and traditions. In particular, this VEC shall

address potential Project interactions with inshore commercial fisheries including, but not limited to, lobster (Lobster Fishing Area (LFA) 27), snow crab, rock crab, herring and scallop. Consideration shall also be given to the presence of any nearby aquaculture leases that could potentially be affected by the Project.

The marine environment within the assessment area is located within Northwest Atlantic Fisheries Organization (NAFO) Division 4Vn which is further divided into LFA 27. The annual lobster fishery runs from May 15 to July 15 and contributes greatly to the economic base of the region. It is anticipated that Schooner Pond Cove and Morien Bay provide rearing habitat for finfish and invertebrate commercial fish species.

This VEC is closely linked to the Marine Environment VEC with respect to potential changes to marine habitat used by commercially fished species.

Spatial boundaries for this VEC are limited to areas that could be affected by Project-related construction and operation activities of barge load-out facility and transshipment location. For example fishing activities could be directly affected by construction of the barge load-out facility and the transshipment location by limiting access to fishing grounds and/or navigation routes.

Temporal boundaries for assessment shall include those applicable to the regulatory criteria and guidelines, and include Project construction, operation and decommissioning. Temporal boundaries shall also consider periods of enhanced biological sensitivity for commercially fished species as well as fishing seasons.

4.25.2 Potential Project-VEC Interactions

Potential Project-VEC interactions during construction activities include:

- loss of commercial and/or recreational fish habitat and/or loss of access to fishing grounds due to the barge load-out and transshipment facility construction, dredging and/or the ocean disposal site (if required);
- interference with fishing gear, navigation restrictions and constricted vessel movements associated with additional marine construction traffic;
- destruction of commercial and/or recreational fish due to the barge load-out facility construction dredging and/or the ocean disposal site (if required); and
- dispersion of fish stocks based on construction noise and vibration.

Potential Project-VEC interactions during operation and maintenance include:

- loss of commercial and/or recreational fish habitat within the barge load-out and transshipment facility footprint; and
- interference with fishing gear, navigation restrictions and constricted vessel movements associated with the barge load-out facility and routine vessel movements.

The potential for malfunctions and accidental events may also have interactions with Commercial Fisheries throughout all phases of the project.

4.25.3 Existing Environment

As part of the EIS, Commercial and Recreational Fisheries potentially affected by the Project shall be identified and characterized. Information to support the assessment of this VEC shall include the following:

- Commercially valuable species shall be characterized through a desktop study. Information sources used to characterize the commercial fisheries shall include: DFO catch data; DFO trawl survey publications; DFO stock assessments; and NAFO publications. This information shall be supplemented with discussion with resource experts and DFO officials.
- The results of the marine benthic habitat surveys conducted for the assessment area as part of the Marine Environment VEC shall also be reviewed for habitat suitability for commercial species.
- Results of lobster trap surveys conducted by the proponent shall be reviewed to help characterize the distribution of fishing activity.
- Information gathered during fisheries consultation shall be reviewed as relevant to characterize the local fishery and its activity.

4.25.4 Effects Assessment and Mitigation

The EIS shall assess the potential effects of the Project on Commercial and Recreational Fish species as well as any change in the environment as a result of the Project on the Commercial and Recreational Fishery. The effects assessment for the Commercial and Recreational Fisheries VEC shall be completed based on the results of the desktop and benthic studies and consultation with DFO representatives, resource experts and input from the fisheries consultation. It is assumed that habitat compensation shall be provided to achieve no net loss of productive capacity of fish habitat in consideration of the importance of commercial species. Fish and fish habitat mitigation including HADD compensation shall be addressed in the Marine Environment VEC. Other types of issues and mitigation (e.g., avoidance of marine construction during key fishing seasons) shall also be discussed. It is likely that any specific fishing mitigation and habitat compensation plans shall be reviewed for input by local fishing industry representatives.

In conducting the analysis, the proponent shall consider pertinent acts, policies, guidelines and directives relating to the Commercial Fisheries. The EIS shall provide a description of measures to mitigate effects to Commercial and Recreational Fisheries and predict potential residual effects and their significance.

4.26 Land Use

4.26.1 VEC Definition and Rationale for Selection

The Land Use VEC shall include consideration of: existing land development (industrial, commercial, institutional, residential); settlement areas; recreation, areas of special community or social value; land ownership; and post closure land use.

Spatial boundaries limited to within the footprint of the facility (including mine site, marine facilities and power transmission line) and areas that could reasonably be affected by the Project (e.g., sensory disturbance, truck routes, demand for housing and community infrastructure/services).

Temporal boundaries for assessment shall include those applicable to the regulatory criteria and guidelines, and include Project construction, operation, decommissioning and post-decommissioning, as applicable. Temporal boundaries shall also consider periods of seasonal land use activities and potential sensitivity to Project effects.

Land use has been considered a VEC due to:

- importance as socio-economic component supporting a wide range of human activities and interests;
- municipal land use plans; and
- Nova Scotia *Environment Act*.

4.26.2 Potential Project-VEC Interactions

Potential Project-VEC interactions during construction activities include:

- exclusion/promotion of development (industrial, commercial, residential);
- exclusion of recreation sites (*e.g.,* recreational fishing, hiking, ATV use, recreational boating, and collection of terrestrial country foods, such as wild game and vegetation) or elimination of areas of special community or social value;
- additional housing and community infrastructure and services (*e.g.,* increased health and emergency services may be required to accommodate Project activities and worker requirements); and
- land use effects associated with establishment of the power transmission corridor.

Potential Project-VEC interactions during operation and maintenance include:

- exclusion of recreation activities (*e.g.,* hiking, ATV areas);
- additional housing and community infrastructure (*e.g.,* health and emergency services may be required to accommodate Project activities and worker requirements);
- improvements to lands designated for industrial uses and ongoing economic activity;

- Project facilities and presence of waste material (*e.g.,* waste piles and water treatment systems) could affect future development of site post closure;
- land use effects associated with establishment of the power transmission corridor; and
- potential disturbance associated with trucking of coal (if necessary) along transportation routes.

The potential for malfunctions and accidental events may also have interactions with land use throughout all phases of the project.

4.26.3 Existing Environment

A description of existing land uses shall rely on sources including:

- Donkin Exploratory Phase EA (XCDM 2008) including transportation study;
- Cape Breton Regional Municipality Municipal Planning Strategy;
- land use and ownership in the Project area;
- identification of informal land and water uses in discussion with municipal planners, stakeholders and experts;
- information gathered through implementation of the stakeholder consultation component of the Project shall be reviewed as relevant to characterize local land uses;
- review of Statistics Canada information for community characteristics; and
- review of the capacity of local housing stock, temporary housing and community infrastructure and services (emergency services, health care, school) to support increased work force and project requirements.

4.26.4 Effects Assessment and Mitigation

The EIS shall assess the potential effects of any change in the environment as a result of the Project on Land Use. This assessment shall include indirect and direct impacts to satisfy the requirements of the Agency and the province. The EIS shall describe:

- project related changes to existing and planned land uses, including water lot acquisition and lands along power transmission corridor and trucking routes;
- project related changes to informal land uses;
- evaluation of the capacity of local housing and community services to support the Project; and
- qualitative assessment of improvements to industrial land use and development.

Types of mitigation shall include controls on dust, noise, lighting and other potential disturbances associated with Project activities. Mitigation could also include an information program to notify local residents and, businesses and planners of upcoming Project activities and requirements.

In conducting the analysis, the proponent shall consider pertinent acts, policies, guidelines and directives relating to land use. The EIS shall provide a description of measures to mitigate effects to land use and predict potential residual effects and their significance.

Appendix A: Data and Information Sources

Assembly of Nova Scotia Mi'kmaq Chiefs. 2007. Mi'kmaq Ecological Knowledge Study Protocol. Available online at: http://66.29.197.94/uploads/KMKMEK.pdf

Canadian Environmental Assessment Agency. 1992. *Canadian Environmental Assessment Act* and Regulations. http://laws-lois.justice.gc.ca/eng/acts/C-15.2/

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Canadian Environmental Assessment Agency. 2007. *Addressing "Need for", "Purpose of", "Alternatives to" and "Alternative Means" under the Canadian Environmental Assessment Act.* http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=5C072E13-1

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Canadian Environmental Assessment Agency. 2011. *Guidelines for the Preparation of an Environmental Impact Statement for the Comprehensive Study Process Pursuant to the Canadian Environmental Assessment Act*.

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Environment Canada, 1991. Birds Protected in Canada under the *Migratory Birds Convention Act*, Canadian Wildlife Service Occasional Paper No. 1. http://www.ec.gc.ca/Publications/default.asp?lang=En&xml=97AC4B68-69E6-4E12-A85D-509F5B571564

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APPENDIX B
Key Personnel

Hamish Aubrey M.Sc.

Environmental Scientist

Hamish is an environmental scientist for the Stantec Dartmouth office and has over seven years experience as an environmental professional. Hamish is currently involved in wetland function assessment and delineation in Nova Scotia, including field analyses, mitigation and compensation planning, wetland alteration approvals, and project management. Primarily involved in natural resource management, Hamish also has several years experience working in government agencies in New Zealand and Australia, where he developed expertise in watershed management, project development and implementation, and collaboration and communication with community and other stakeholders. Hamish is keenly interested in ecosystem assessment, climate change impacts and adaption, and sustainable management of natural resources.

EDUCATION

Master of Science, Environmental Science, University of Otago, Otago, New Zealand, 2002

Bachelor of Science, Zoology, University of Otago, Otago, New Zealand, 1999

Nova Scotia Advanced Wetland Delineation and Evaluation Course, Maritime College of Forest Technology, Truro, Nova Scotia, 2009

Nova Scotia Basic Wetland Identification and Delineation Course, Maritime College of Forest Technology, Truro, Nova Scotia, 2009

MEMBERSHIPS

Member, Atlantic Society of Fish and Wildlife Biologists

PROJECT EXPERIENCE

Ecological Monitoring

Wetland Monitoring, Goldboro, Nova Scotia (Wetland Consultant)

Field assessment of 18 wetlands, 14 of which were altered, and restored during pipeline installation. Monitoring includes the assessment of wetland hydrology and vegetation, collection of geo-referenced photos for year on year comparison, and determination of wetland boundaries.

Wetland Monitoring, Middleton, Nova Scotia (Wetland Consultant)

Field assessment of an altered wetland to monitor whether there are impacts to the un-altered portion of the wetland. This involves establishing and collecting data from a groundwater monitoring well, monitoring surface water levels, and assessing wetland functioning.

Ecosystem Restoration

Wetland Restoration Along a Gas Pipeline Installation, Goldboro, Nova Scotia (Wetland Consultant)

Managed the alteration and reconstruction of 14 wetlands along a gas pipeline installation. The project also involved advising on mitigation of project impacts to nearby wetlands and watercourses.

Pondweed Salvaging, New Glasgow, Nova Scotia (Environmental Scientist)

Salvaging of a rare pondweed from an altered wetland and preserving the pondweed in similar environmental conditions. The plants are being monitored to ensure their condition is stable, and on-going adaptive management is applied when required.

Environmental Management

Climate Change Adaptation, DND Jetty, St. John's, Newfoundland and Labrador (Climate Change Consultant)

An assessment of climate change impacts, including variables such as sea level rise, storm surge, tidal variation, and local land subsidence. This is to assess the potential impacts climate change may have on the jetty and its operation, and provide opportunity for adaptation.

Climate Change Adaptation, DND Jetties, Halifax, Nova Scotia (Climate Change Consultant)

An assessment of climate change impacts, including variables such as sea level rise, storm surge, tidal variation and local land subsidence. This is to assess the potential impacts climate change may have on the jetties and their operation, and provide opportunity for adaptation.

Water Campaign Program within Local Councils*, Perth, Western Australia (Climate Change Consultant)

Implementation of the Water Campaign program within local councils of Perth, Australia.

** denotes projects completed with other firms*

Hamish Aubrey M.Sc.

Environmental Scientist

Cities for Climate Protection*, Perth, Western Australia (Climate Change Consultant)
Implementation of the Cites for Climate Protection program within local councils of Perth, Australia.

Assessment of Pest Outbreaks Due to Climate Change*, Victoria, British Columbia (Climate Change Consultant)
Research into the climatic envelopes of the Spruce Bark Beetle and Spruce Budworm and likelihood of outbreaks in Western Canada

Climate Change Centre Planning, Charlottetown, Prince Edward Island (Climate Change Consultant)
Plan development for a Climate Change Centre for PEI, which involved research into organizational structure and resource requirements.

Climate Change Adaptation for Prince Edward Island, Charlottetown, Prince Edward Island (Climate Change Consultant)
Preparing a provincial submission to Natural Resources Canada that incorporated stakeholder input and outlined key climate change adaptation projects to be implemented in PEI.

Water Quality Assessment

Rocky Lake Water Sampling, Halifax, Nova Scotia (Environmental Scientist)
Weekly assessment of streams around the Rocky Lake quarry for monitoring and assessment of water quality. The assessment also involves monthly reporting.

Halifax Airport Water Monitoring, Halifax International Airport, Nova Scotia (Environmental Scientist)
Monthly assessment of streams around the airport for monitoring and assessment of water quality and quantity.

Bruenllo Stream Assessment, Timberlea, Nova Scotia (Environmental Scientist)
Assessment of streams for a proposed golf course and residential development, including water quality assessment, stream delineation, and fish habitat assessment. Watercourse Alteration Applications were prepared.

Wetlands

Wetland and Watercourse Alteration Applications, Bedford, Nova Scotia (Wetland Consultant)
Preparation of Wetland and Watercourse Alteration applications for a development site, which also involved planning for stormwater management, mitigation of impacts and compensation.

Wetland Alteration Application, Hatchet Lake, Nova Scotia (Wetland Consultant)
Field assessment of a wetland, wetland mitigation planning, and preparation of a Wetland Alteration Application for a walking trail.

Wetland Determination, Dartmouth, Nova Scotia (Wetland Consultant)
Assessment of a potential wetland habitat, wetland delineation, and provision of guidance regarding wetland alteration.

Wetland Alteration Application, Bedford, Nova Scotia (Wetland Consultant)
Wetland Alteration Application preparation for a residential development in Bedford. This involved wetland field assessments, wetland compensation planning, and reporting.

Wetland Mitigation, Tantallon, Nova Scotia (Wetland Consultant)
Surveyed and delineated wetland habitat to avoid wetland disturbance from the construction of a fire station.

Wetland Alteration Proposal, Sydney, Nova Scotia (Wetland Consultant)
Assessed wetland information, researched compensation opportunities, and prepared a Wetland Alteration Application for regulatory review. This was for a commercial wharf development.

Wetland Evaluations, Mitigation and Compensation Planning, Middleton, Nova Scotia (Wetland Consultant)
Field assessment of a wetland and preparation of a Wetland Alteration Application for a health care centre. Wetland compensation sites were also assessed and a proposal for the compensation wetland created.

Wetland Alteration Application for a Cell Tower Structure, Brookfield, Nova Scotia (Wetland Consultant)
Wetland Alteration Application preparation for a cell tower structure. This required wetland assessment and reporting.

Wetland Alteration Application, Halifax, Nova Scotia (Wetland Consultant)
Wetland Alteration Application preparation for a residential development at Lovett Lake. This involved wetland assessment and reporting.

** denotes projects completed with other firms*

Hamish Aubrey M.Sc.

Environmental Scientist

Wetland Alteration Approval, Hwy 102 Interchange, Halifax, Nova Scotia (Wetland Consultant)
Wetland Alteration Application preparation for Hwy 102 Interchange and the surrounding development site. This project involved the alteration to 31 of 39 wetlands within the project. Compensation planning was conducted for this site.

Wetland Evaluations, Mitigation and Compensation Planning, Highway 104 Twinning, Antigonish, Nova Scotia (Wetland Consultant)
Preparation of a Wetland Alteration Application and wetland compensation planning. This involved field assessment of wetlands and report preparation

Wetland Evaluations, Mitigation and Compensation Planning, Highway 104 Twinning, New Glasgow, Nova Scotia (Wetland Consultant)
Preparation of a Wetland Alteration Application and wetland compensation planning. This involved field assessment of wetlands and report preparation.

Wetlands Assessments

Wetland Delineations and Assessment for the Construction of Hwy 107, Dartmouth, Nova Scotia (Wetland Consultant)
Surveyed, assessed and delineated wetlands along a 7km proposed highway in preparation for an Environmental Assessment application.

Wetland Determinations and Delineations, Halifax International Airport, Enfield, Nova Scotia (Wetland Consultant)
Surveying for wetlands on a large area of potential commercial land. Any wetlands found were delineated.

Wetland Assessment, Hwy 103 Twinning, Upper Tantallon, Nova Scotia (Wetland Consultant)
Surveyed, assessed and delineated wetlands along a 20km highway twinning project, and collected information in preparation for a Wetland Alteration Application for regulatory review.

Wetland Assessment of Commercial Properties, Bedford, Nova Scotia (Wetland Consultant)
Assessed and delineated wetlands, researched compensation opportunities, and prepared a Wetland Alteration Application for regulatory review. This was for expansion of a concrete plant.

Wetland Assessment and Delineation, Dartmouth, Nova Scotia (Wetland Consultant)
Surveyed a proposed development site for wetlands, and delineated and assessed wetlands found.

Wetland Assessment for a Wharf Construction, Arisaig, Nova Scotia (Wetland Consultant)
Field assessment of wetland habitat, wetland delineation and consultation on regulations pertaining to wetland alteration for a wharf construction.

Wetland Assessment at a Quarry Site, Mulgrave, Nova Scotia (Wetland Consultant)
Field assessment of wetlands and wetland creation planning in preparation for a Wetland Alteration Application at a quarry site.

Wetland Assessment, École Secondaire d'Halifax, Halifax, Nova Scotia (Wetland Consultant)
Field delineation, functional assessment, and preparation of a Wetland Alteration Application. This is for wetland alteration at a proposed school site.

Wetland Delineations and Assessment, Brunello Estates, Timberlea, Nova Scotia (Wetland Consultant)
Wetland delineations, wetland functional assessment, and preparation of a Wetland Alteration Application for 23 wetlands at a golf course and residential development site.

Wetland Delineations and Assessment for a Boardwalk and Trail, Cow Bay, Nova Scotia (Wetland Consultant)
Field assessment and preparation of a Wetland Alteration Application for wetland alteration by a public access route (boardwalk and trail).

Wetland Evaluations, Mitigation and Compensation Planning, Goldboro, Nova Scotia (Wetland Consultant)
Field assessment of wetlands for a gas pipeline and preparation of a Wetland Alteration Application. This work also involved developing compensation and monitoring planning.

Wetland Assessment, Ocean Spray, Baie du Vin, New Brunswick (Wetland Consultant)
Vegetation and hydrological assessment of wetlands for potential cranberry farming.

Wetland Delineations and Assessment for a Proposed Gas Pipeline, Alton, Nova Scotia (Wetland Consultant)
Field assessment of wetlands for a proposed gas pipeline.

** denotes projects completed with other firms*

Hamish Aubrey M.Sc.
Environmental Scientist

Wetlands Management and Treatment
Wetland Treatment Assessment, Kaizer Meadows, Chester, Nova Scotia (Wetland Consultant)
Assessment of wetlands to determine their capacity for treatment of polluted water.

Wetland Mitigation and Compensation Planning, Quarry Expansion, Halifax, Nova Scotia (Wetland Consultant)
Development of wetland creation plans for compensation of altered wetlands. This involved site selection and field assessment.

** denotes projects completed with other firms*

Michael Crowell M.Sc.

Senior Terrestrial Ecologist

Michael is a senior terrestrial ecologist with over 27 years experience with Stantec Consulting Ltd. He is a highly experienced botanist and plant ecologist having conducted numerous botanical surveys and plant community studies in a wide range of habitat types throughout Atlantic Canada. Michael is also an experienced wildlife ecologist. He has conducted breeding bird surveys, aerial raptor and waterfowl surveys, aerial large mammal surveys, small mammal trapping, general mammal surveys, reptile surveys and amphibian surveys for a wide variety of projects throughout Atlantic Canada. His terrestrial ecological skills are used mainly in environmental assessments to assess the effects of various anthropogenic activities on rare or endangered species and sensitive habitats. As part of this process Michael develops mitigative measures to eliminate or reduce the adverse effects of these activities. Michael has been responsible for designing and implementing a variety of environmental monitoring programs for rare or endangered species as well as terrestrial and wetland habitats. He is also experienced in conducting wetland evaluations and wetland functional analyses. Michael is also experienced in air photo interpretation and plant community mapping from air photos as well as the description of plant communities. He has used these skills to prepare ecological land classifications for various areas in Atlantic Canada.

EDUCATION

Master of Science, Dalhousie University, Halifax, Nova Scotia, 1988

Bachelor of Science (Honours), Terrestrial Ecology, Joint Degree awarded by Mount St. Vincent University and Dalhousie University, Halifax, Nova Scotia, 1981

PROJECT EXPERIENCE

Aquatic Ecology

Route 11 Upgrading, Shediac to Richibucto, New Brunswick (Terrestrial Ecologist)
Conducted field work to assess the existing aquatic environment along Route 11, including surface water, freshwater fish and fish habitat, and estuarine fish and fish habitat. Characterized existing fish habitat in the field using the NBDNR/DFO stream Habitat Assessment method and forms.

Ecological Monitoring and Restoration

Navy Cove Environmental Clean-up, Dartmouth, Nova Scotia (Terrestrial Ecologist)
Conducted botanical and wildlife surveys in areas to be disturbed as part of the removal of hazardous materials from the shoreline of Navy Cove.

DND Natural Resources Management Plans for DCD School, Osbourne Head and 12 Wing Shearwater, Dartmouth and Halifax, Nova Scotia (Terrestrial Ecologist)
Conducted botanical, wildlife and wetland inventories at three DND properties to provide natural resources inventories to be used in planning land uses at these facilities.

Assessment of Vegetation Control Practices at CFB Gagetown, Gagetown, New Brunswick (Plant Ecologist)
Prepared habitat mapping for CFB Gagetown using a combination of forest inventory mapping and air photo interpretation.

Bedford Rifle Range Environmental Risk Assessment, Bedford, Nova Scotia (Terrestrial Ecologist)
Conducted botanical and wildlife surveys at the DND rifle range in Bedford as part of an ecological risk assessment.

Ecological Risk Assessment of the East Pine Island Lake Pumping Station, Herring Cove, Nova Scotia (Terrestrial Ecologist)
Conducted botanical and wildlife surveys in the vicinity of the abandoned East Pine Island Lake pumping station as part of the ecological risk assessment for the facility.

Wetland Inventory at CFAD Bedford, Bedford, Nova Scotia (Wetland Ecologist)
Mapped and conducted biological inventories in wetlands found on DND property at and near CFAD Bedford.

Wetland Monitoring on the Encana Goldboro Pipeline Route, Goldboro, Nova Scotia (Wetland Ecologist)
Delineated and conducted wetland functional assessments for wetlands crossed by the natural gas pipeline. Also established and collected plant community data in semi-permanent monitoring plots in the wetlands to monitor recovery of wetland habitat following completion of wetland restoration work.

** denotes projects completed with other firms*

Michael Crowell M.Sc.

Senior Terrestrial Ecologist

Southern Twayblade Monitoring at the Halifax Stanfield International Airport, Enfield, Nova Scotia (Vegetation Ecologist)
Monitored the abundance of Southern Twayblade (Listera australis) a rare orchid species in a wetland adjacent to a taxiway at the airport. Also monitored changes in plant species composition of disturbed and undisturbed portions of the wetland.

Confederation Bridge Wildlife and Vegetation Monitoring Program, Cape Jourimain, N.B. and Borden P.E.I., New Brunswick and Prince Edward Island (Terrestrial Ecologist)
Designed and conducted monitoring studies investigating the effects of bridge construction and operation on waterfowl, seabirds, sea ducks, land birds, rare plants and salt marsh plant communities. Prepared yearly reports discussing the study findings.

Environmental Assessments

CEAA Screening Assessments for DFO Small Craft Harbour Sites, Various Locations, Nova Scotia (Terrestrial Ecologist)
Provided terrestrial ecology services including wetland services to support screenings.

Donkin Exploratory Mining Environmental Assessment, Donkin, Nova Scotia (Terrestrial Ecologist)
Conducted a variety of field surveys on the Project Site and along a proposed transportation corridor including vascular plant surveys, breeding bird surveys, seabird colony survey, wetland delineation, and wetland functional assessment. Analysed the data and prepared data reports describing the results of the wildlife surveys.

West River Bridge Hydrotechnical and Environmental Assessment, Antigonish, Nova Scotia (Vegetation Ecologist)
Reassessed the potential adverse effects of bridge construction on flood plain habitat on the West River following a change in the design of the bridge. Determined whether the design changes would alter the potential effects of bridge construction on rare plants and plant communities as discussed in the original environmental assessment.

Baddeck Quarry Expansion Environmental Assessment, Baddeck, Nova Scotia (Terrestrial Ecologist)
Conducted a rare plant survey and a breeding bird survey as part of an environment assessment for the expansion of the Baddeck quarry.

Georgeville Quarry Expansion Environmental Assessment, Georgeville, Nova Scotia (Terrestrial Ecologist)
Conducted a rare plant survey and a breeding bird survey as part of an environmental assessment for the expansion of the Georgeville quarry.

Membertou Heritage Centre Environmental Assessment, Sydney, Nova Scotia (Terrestrial Ecologist)
Compiled a vascular plant inventory for a proposed heritage centre site.

Highway 103 Twinning Environmental Assessment, Tantallon, Nova Scotia (Terrestrial Ecologist)
Conducted various field surveys in support of an environmental assessment for the twinning of Highway 103 between Tantallon and Simms Settlement. Studies included a vascular plant inventory, breeding bird surveys, wetland delineation, and wetland functional assessment surveys. Also conducted air photo interpretation for wetland mapping and augmentation of available habitat mapping. Prepared text for the wildlife valued ecosystem component.

Environmental Assessment for Twinning of Route 1 between Rothesay Avenue and Highway 111, Saint John, New Brunswick (Terrestrial Ecologist)
Conducted botanical surveys in wetlands potentially affected by twinning of Highway 1. These botanical inventories were used to complete wetland functional assessments for affected wetlands in support of the environmental assessment.

Environmental Assessment for Construction of a Trunk Sewer Line, Riverview, New Brunswick (Terrestrial Ecologist)
Conducted breeding bird surveys, botanical surveys and wetland delineations in support of an environmental assessment for a sewer line.

Environmental Assessment for Twinning of Highway 11 between Shediac and Richibucto, Shediac, Buctouche, Richibucto, New Brunswick (Terrestrial Ecologist)
Conducted numerous wetland delineations and wetland functional assessments as well as upland botanical surveys as part of the environmental assessment for twinning of Highway 11 between Shediac and Richibucto.

Stone Haven Wind Farm Environmental Assessment, Bathurst, New Brunswick (Wetland Ecologist)
Conducted botanical surveys, wetland delineation as part of an environmental assessment for a wind farm development at Stone Haven near Bathurst.

** denotes projects completed with other firms*

Michael Crowell M.Sc.

Senior Terrestrial Ecologist

Environmental Assessment for a Cranberry Bog Development Near Rogersville, Rogersville, New Brunswick (Vegetation Ecologist)
Conducted botanical surveys in a number of wetlands that were possible locations for a cranberry bog development.

Highway 103 Twinning Environmental Assessment, Upper Tantallon, Nova Scotia (Terrestrial Ecologist)
Conducted breeding bird, rare plant, wetland delineation and wetland functional assessment surveys. Analyzed data and wrote the wildlife section of the environmental assessment.

Maritimes & Northeast Pipeline, Halifax Lateral Environmental Assessment, Halifax, Nova Scotia (Terrestrial Ecologist)
Conducted rare plant surveys, wetland surveys, breeding bird surveys, aerial deer wintering area surveys and herpetofaunal surveys along the Halifax lateral pipeline route. Analysis and report writing for terrestrial valued ecological components.

Halifax Stanfield International Airport Air Freight Terminal Environmental Assessment, Enfield, Nova Scotia (Terrestrial Ecologist)
Conducted breeding bird, mammal, herpetile and vascular plant surveys as part of the environmental assessment for an air freight terminal.

Biosolids Plant Environmental Assessment, Enfield, Nova Scotia (Terrestrial Ecologist)
Conducted breeding bird surveys, mammal surveys and vascular plant surveys as part of the environmental assessment for a biosolids plant at the Aerotech Park.

Vegetation Assessments

CFB Newport Corner Fence Upgrade, Newport, Nova Scotia (Plant Ecologist)
Conducted botanical surveys along the route of anew security fence around CFB Newport Corner as part of an environmental screening for fence construction.

Species at Risk Survey at DREA, Dartmouth, Nova Scotia (Terrestrial Ecologist)
Conducted vegetation and wildlife surveys to determine if SARA listed species were present on the DREA property.

CFAD Bedford Fence Upgrade, Dartmouth, Nova Scotia (Plant Ecologist)
Conducted botanical surveys along the route of a new security fence around CFAD Bedford as part of an environmental screening for fence construction.

West River Riparian Habitat Restoration Project, Antigonish, Nova Scotia (Vegetation Ecologist)
Identified and marked all non-native trees and shrubs present in the cleared right-of-way at the West River bridge site. These trees and shrubs would be selectively cleared when the bridge was constructed.

Gullivers Cove Wind Farm Transmission Line Rare Species Habitat Modeling, Gullivers Cove, Nova Scotia (Terrestrial Ecologist)
Used Atlantic Canada Conservation Data Centre flora and fauna records and habitat mapping for a proposed electrical transmission line to predict the potential presence of plant and animal species of conservation concern along the route.

Aurora Transportation Corridor- Ecological Land Classification, Goose Bay, Newfoundland and Labrador (Vegetation Ecologist)
Conducted plant community surveys as part of an ecological land classification for a 100 km + transportation corridor as well as rare plant surveys.

Assessment of Status Ranks of Labradorian Plants, Goose Bay, Newfoundland and Labrador (Vegetation Ecologist)
Conducted directed searches for 13 plant species listed as rare in Labrador to re-assess their population status ranks.

Aurora Mine Site Ecological Land Classification, Postville, Newfoundland and Labrador (Vegetation Ecologist)
Conducted plant community surveys as part of an ecological land classification for the Aurora claim block.

Ecological Land Classification for Iron Ore Claim Blocks in Labrador, Labrador City, Newfoundland and Labrador (Vegetation Ecologist)
Classified plant communities present in two claim blocks near Labrador City.

Lower Churchill Transmission Line, Goose Bay – St. John's, Newfoundland and Labrador (Vegetation Ecologist)
Conducted botanical inventories throughout central Newfoundland as part of an Ecological Land Classification. Developed a rare plant model to identify areas having high potential to harbor rare plants.

** denotes projects completed with other firms*

Michael Crowell M.Sc.

Senior Terrestrial Ecologist

Lower Churchill River Hydroelectric Project, Goose Bay, Newfoundland and Labrador (Vegetation Ecologist)
Conducted plant community surveys as part of an ecological land classification as well as rare plant surveys for a proposed hydroelectric development on the Lower Churchill River.

Ecological Investigations of Miller and Soldier Lake on the Miller Lake Hydroelectric System, Fall River, Nova Scotia (Terrestrial Ecologist)
Conducted littoral zone botanical surveys and identified, described and mapped the distributions of shoreline wetlands on Miller Lake and Soldier Lake.

Ecological Land Classification of the Practice Target Area in Southern Labrador, Goose Bay, Newfoundland and Labrador (Vegetation Ecologist)
Conducted plant community descriptions and plant community mapping for an ecological land classification for the DND practice target area in southern Labrador.

Trans-Labrador Highway, Goose Bay, Red Bay, Port Hope Simpson, Newfoundland and Labrador (Vegetation Ecologist)
Conducted botanical surveys at various locations along the Trans-Labrador Highway as part of the environmental assessment for the highway.

Voisey's Bay Nickel Mine, Nain, Newfoundland and Labrador (Vegetation Ecologist)
Conducted plant community surveys as part of an ecological land classification for the Voisey's Bay study area. Also compiled a vascular plant inventory and plant community mapping for the study area.

Wetlands Assessments

Sutherlands River Marsh Wetland Delineation, Sutherlands River, Nova Scotia (Wetland Ecologist)
Conducted a wetland delineation on the portion of the Sutherlands River marsh wetland located adjacent to a proposed bridge construction. The margin of the wetland was flagged to facilitate avoidance of construction related disturbance to wetland habitat.

Wetland Inventory at a Housing Development Site in Rockingham, Halifax, Nova Scotia (Wetland Ecologist)
Compiled an inventory of wetlands present on a property slated for a housing development. Each wetland was delineated and inventories of plants and animals were compiled. A functional assessment was conducted for each wetland.

Verification of Wetland Identification and Delineation, Sobeys Plaza Development, Riverview, New Brunswick (Wetland Ecologist)
Inspected a wetland identification and delineation made by another wetland delineator to verify the presence of wetland habitat on a construction site in Riverview, New Brunswick.

Wetland Delineation and Functional Assessment, Moncton, New Brunswick (Wetland Ecologist)
Delineated and prepared a wetland functional assessment for a wetland near an urban setting in Moncton. Conducted vegetation and wildlife surveys as part of the functional assessment.

MK Airlines Crash Site Environmental Investigations, Enfield, Nova Scotia (Wetland Ecologist)
Inspected Johnson River from the sewage treatment plant to Soldier Lake looking for evidence of contamination by aviation fuel.

Wildlife Assessments

Bird Hazard Assessments at 12 Wing Shearwater and 14 Wing Greenwood, Dartmouth and Greenwood, Nova Scotia (Wildlife Ecologist)
Compiled existing information regarding avifauna distribution and abundance on and around the 12 Wing and 14 Wing aerodromes and prepared a bird hazard assessment for each aerodrome.

Assessment of Effects of Harbour Modifications on Wintering Harlequin Ducks, Cape St. Marys, Nova Scotia (Wildlife Ecologist)
Collected existing information regarding use of Cape St. Marys Harbor by wintering Harlequin Ducks. Assessed the potential adverse effects of extension of breakwaters and groynes on this species and developed mitigative measures to minimize adverse effects and designed a monitoring program to verify the environmental effects prediction and assess the efficacy of the mitigation.

Sandy Cove Wind Turbine Assessment, Ketch Harbour, Nova Scotia (Wildlife Ecologist)
Developed and implemented a bird survey program to collect data regarding use of the Sandy Cove area by birds during the breeding season, fall migration, spring migration, and winter. Analyzed the data and prepared a report describing use of the area by birds. This was conducted as part of the approval process for placement of a wind turbine at the NRC Sandy Cove facility.

** denotes projects completed with other firms*

Michael Crowell M.Sc.

Senior Terrestrial Ecologist

Halifax Stanfield International Airport Wildlife Management Plan, Enfield, Nova Scotia (Wildlife Ecologist)
Developed a wildlife management plan for the Halifax Stanfield International Airport. The wildlife management plan identifies potential wildlife hazards and provides recommendations to minimize these hazards.

Trans-Canada Highway Environmental Assessment, Perth Andover, New Brunswick (Wildlife Ecologist)
Conducted aerial wintering area surveys for moose and white-tailed deer near Perth Andover, New Brunswick.

Low Level Flying Wildlife Monitoring, Goose Bay, Newfoundland and Labrador (Wildlife Ecologist)
Conducted aerial surveys documenting the abundance and distribution of caribou in western Labrador.

M&NP Natural Gas Pipeline – Goldboro to Maine and Goldboro to Saint John, Nova Scotia and New Brunswick (Wildlife Ecologist)
Conducted aerial moose and white-tailed deer wintering surveys as well as aerial raptor and waterfowl surveys along the M&NP natural gas pipeline between Goldboro, Nova Scotia and the Maine border.

** denotes projects completed with other firms*

Richard LaPaix M.Sc.

Terrestrial Ecologist

Rich is a terrestrial ecologist for Stantec's office in Dartmouth, Nova Scotia, and has over five years professional experience in the field. His terrestrial ecological skills are primarily used in the context of environmental assessment and monitoring initiatives which address the effects of various anthropogenic activities on rare or sensitive species and habitats. He is an experienced botanist and vegetation ecologist, having conducted numerous botanical surveys and plant community studies in a wide range of habitat types within both eastern and western North America. Rich is experienced in wetland delineation, classification, and functional assessment and also has expertise as a wildlife ecologist, particularly in performing surveys of songbirds within Atlantic Canada.

EDUCATION

Bachelor of Science, (Biology and Environmental Studies, First Class Honours), Dalhousie University, Halifax, Nova Scotia, 2004

Master of Science, Department of Biology, Dalhousie University, Halifax, Nova Scotia, 2009

Nova Scotia Advanced Wetland Delineation and Evaluation Course, Maritime College of Forest Technology, Truro, Nova Scotia, 2010

Nova Scotia Basic Wetland Identification and Delineation Course, Maritime College of Forest Technology, Truro, Nova Scotia, 2010

AWARDS

2008 NSERC CGS-M Scholarship (2006-2008)

2004 Gary Hicks Memorial Award for research in botany

2003 Sarah Lawson Research Scholarship for research in botany

PROJECT EXPERIENCE

Ecological Monitoring and Restoration

Wetland Vegetation Monitoring, Hwy 104, Antigonish, Nova Scotia (Wetland Ecologist)
Established monitoring transects and collected vegetation data within wetlands altered by highway twinning activities.

Pipeline Corridor Wetland Monitoring, Goldboro, Nova Scotia (Vegetation Ecologist)
Installation, data collection, analyses, and interpretation of vegetation monitoring plots within wetlands affected by pipeline corridor.

GEM Health Vegetation Monitoring, Nova Scotia (Ecologist)
Installation, data collection, analyses, and interpretation of vegetation monitoring plots.

Chester Wetland Vegetation Monitoring, Chester, Nova Scotia (Ecologist)
Installation, data collection, analyses, and interpretation of vegetation monitoring plots.

Oyster Pond Wetland Vegetation Monitoring, Jeddore, Nova Scotia (Ecologist)
Data collection, analyses, and interpretation of ground vegetation monitoring plots.

Control of Invasive Plants and Native Habitat Restoration*, Trabuco Canyon, California (Research Assistant)
Control of invasive plant species, restoration of native habitats, and vegetation monitoring.

Ground Vegetation as an Indicator of Ecological Integrity*, Halifax, Nova Scotia (Ecologist)
Provided recommendations for using ground vegetation as indicators for the long-term monitoring of ecological integrity within National Parks of the Quebec-Maritime Bioregion.

Environmental Assessments

Highway 107 Connector Environmental Assessment, Burnside Industrial Park, Dartmouth, Nova Scotia (Ecologist)
Performed botanical inventories and wetland surveys along proposed connector road.

** denotes projects completed with other firms*

Richard LaPaix M.Sc.

Terrestrial Ecologist

MacDonald Quarry Extension Environmental Assessment, Georgeville, Nova Scotia (Ecologist)
Responsible for field surveys (including botanical inventories, breeding bird and other wildlife surveys, wetland delineation and functional assessments), analyses, and report writing (for Vegetation, Wildlife, and Wetland EA sections).

Louisbourg CEAA Screening, Louisbourg National Historic Park, Nova Scotia (Ecologist)
Field survey (inventory of plants, wildlife, habitats, and wetlands), consultation with parks staff, and report writing.

Hants County Quarry Extension Environmental Assessment, Windsor, Nova Scotia (Ecologist)
Responsible for field surveys (including botanical inventories, wildlife surveys, wetland delineation and functional assessments), analyses, and report writing (for Vegetation, Wildlife, and Wetland EA sections).

Aberdeen Quarry Extension Environmental Assessment, Yarmouth, Nova Scotia (Ecologist)
Responsible for field surveys (including botanical inventories, breeding bird and other wildlife surveys, wetland delineation and functional assessments), analyses, and report writing (for Vegetation, Wildlife, and Wetland EA sections).

Gillis Quarry Extension Environmental Assessment, Baddeck, Nova Scotia (Ecologist)
Responsible for field surveys (including botanical inventories, breeding bird and other wildlife surveys, wetland delineation and functional assessments), analyses, and report writing (for Vegetation, Wildlife, and Wetland EA sections).

Alva Quarry Extension Environmental Assessment, Baddeck, Nova Scotia (Ecologist)
Responsible for field surveys (including botanical inventories, wildlife surveys, wetland delineation and functional assessments), analyses, and report writing (for Vegetation, Wildlife, and Wetland EA sections).

Martin Marietta Quarry Extension Environmental Assessment, Port Hawkesbury, Nova Scotia (Ecologist)
Responsible for field surveys (including botanical inventories, wildlife surveys, wetland delineation and functional assessments), analyses, and report writing (for Vegetation, Wildlife, and Wetland EA sections).

Highway 103 Plant and Wildlife Survey, Upper Tantallon, Nova Scotia (Ecologist)
Responsible for field surveys (including botanical inventories, breeding bird and other wildlife surveys, wetland delineation and functional assessments), analyses, and report writing (for Vegetation and Wetland EA sections) of a 20 km+ section of proposed twinning alignment.

Vegetation Assessments

Digby Wind Farm Transmission – Rare Plant Modeling Exercise, Digby, Nova Scotia (Vegetation Ecologist)
Conducted rare plant modeling exercise for 20 km+ proposed transmission line.

Aurora Transmission Line – Ecological Land Classification, Goose Bay, Newfoundland and Labrador (Vegetation Ecologist)
Conducted vegetation surveys within 100 km+ proposed transmission line for an Ecological Land Classification.

Loganville Wind Farm, Loganville, Nova Scotia (Botanist)
Performed rare plant surveys.

Digby Wind Farm, Gullivers Cove, Nova Scotia (Botanist)
Performed rare plant surveys along transmission line.

Route 8 Plant Survey, New Brunswick (Botanist)
Performed botanical inventory within RoW.

Sydport Terminal Environmental Assessment, Sydney, Nova Scotia (Botanist)
Plant inventory and habitat descriptions.

Plant Inventory - Waste Water Treatment Facility, Halifax, Nova Scotia (Botanist)
Botanical inventory for site of waste water treatment plant expansion.

Highway 101 Rare Plant Survey, Windsor, Nova Scotia (Botanist)
Rare plant survey (Carex bebbii).

** denotes projects completed with other firms*

Richard LaPaix M.Sc.

Terrestrial Ecologist

Vegetation within Urban Parks*, Halifax, Nova Scotia (Graduate Student Researcher)
Assessments of understory and overstory vegetation and structure within urban parks. Project involved extensive field work, statistical analyses, and technical writing. Results were used to provide recommendations for the design and management of urban parks, for the purpose of biodiversity conservation.

Vegetation within Liscomb Game Sanctuary*, Sheet Harbour/Halifax, Nova Scotia (Honours Student Researcher)
Assessments of understory and overstory vegetation and structure. Data were used for community classification and to identify species sensitive to forestry practices. Project involved extensive field work, statistical analyses, and technical writing.

Ecological Effects of Commercial Thinning*, Corvallis, Oregon (Botanist)
Characterized forest vegetation structure and composition for an ecological study examining the effects of commercial thinning.

Lower Churchill Transmission Line – Ecological Land Classification, Goose Bay – St. John's, Newfoundland and Labrador (Botanist)
Conducted botanical inventories throughout Newfoundland and Labrador for an Ecological Land Classification.

Wetlands Assessments

Donkin Transmission Wetland Assessment, Glace Bay, Nova Scotia (Wetland Ecologist)
Performed delineations and functional assessments of wetlands along a 20 km+ proposed transmission line.

Wetland Delineations and Functional Assessment, Various Locations, Nova Scotia (Wetland Ecologist)
Performed numerous wetland delineations and functional assessments (including wildlife and hydrogeomorphological functions) for small-scale projects throughout the province.

Aerotech Park Wetland Delineation Study, Enfield, Nova Scotia (Wetland Ecologist)
Performed survey of wetlands and other environmental constraints for a large commercial property.

Kaiser Meadows Wetland Assessments, Nova Scotia (Wetland Ecologist)
Wetland delineation, classification, and habitat descriptions.

Brunello Estates Wetland Assessments, Halifax, Nova Scotia (Wetland Ecologist)
Conducted wetland inventory, delineations, plant, and wildlife surveys.

Wildlife Assessments

Digby Wind Farm, Gullivers Cove, Nova Scotia (Wildlife Biologist)
Performed bird nest searches along transmission line.

Donkin Peninsula Breeding Bird Survey, Glace Bay, Nova Scotia (Wildlife Biologist)
Performed breeding bird survey of songbirds and nesting shorebirds.

Wildlife Management Plan Review for Halifax Stanfield International Airport, Halifax, Nova Scotia (Wildlife Biologist)
Reviewed existing Airport Wildlife Management Plan and wildlife strike data, interviewed responsible airport staff, and provided recommendations for wildlife management.

Highway 101 Shorebird Survey, Windsor, Nova Scotia (Wildlife Biologist)
Shorebird survey.

Baseline Biodiversity Inventories*, Newfoundland/Nova Scotia (Terrestrial Ecologist)
Performed avian and botanical diversity inventories on properties in Newfoundland and Nova Scotia.

** denotes projects completed with other firms*

Richard LaPaix M.Sc.
Terrestrial Ecologist

PUBLICATIONS

LaPaix R. and B. Freedman. Vegetation Structure and Composition within Urban Parks of Halifax Regional Municipality, Nova Scotia. *Landscape and Urban Planning. 98: 124–135*, 2010.

LaPaix, R., B. Freedman and D. Patriquin. Ground vegetation as an indicator of ecological integrity. *Environmental Reviews. 17:249-265*, 2009.

Michael Macdonald B.Sc., B.Ed.

Terrestrial Ecologist

Michael has been an associate for over 11 years with Stantec. He is an accomplished herpetologist with over 15 years of experience. Michael is also a highly skilled botanist, horticulturist, and entomologist with considerable experience in invertebrate taxonomy. Given his extensive natural history background Michael is a valuable asset to the study team.

EDUCATION

Bachelor of Science, Saint Mary's University, Halifax, Nova Scotia, 1984

Bachelor of Education, Saint Mary's University, Halifax, Nova Scotia, 1985

PROJECT EXPERIENCE

Environmental Sciences

Integrated Biophysical Surveys (herpetile, vegetation, and wetland surveys), Various, Atlantic Provinces (Field Specialist)

- *Blood fractionation plant, Halifax, Nova Scotia*
- *M&NP Halifax natural gas pipeline lateral, Nova Scotia*
- *Point Tupper natural gas liquids processing plant at Port Hawkesbury, Nova Scotia*
- *Aggregate mine site at Porcupine Mountain, Nova Scotia*
- *Gypsum bulk plant at Sheet Harbour, Nova Scotia*
- *Aggregate quarry expansion at Lapland, Troy and Beaverbank, Nova Scotia*
- *Highway bypass between Pokiok and Short's Creek, New Brunswick*
- *Survey of wetland and environs affected by fence construction, CFAD Bedford (2002)*
- *Highway construction projects at New Minas, Beaverbank*, Digby, and Antigonish*, Nova Scotia (1999, 2000, 2001, and 2002)*
- *Highway construction projects between the River de Chute and Perth-Andover*, Aroostook River to Grand Falls*, and south of the River de Chute to near Florenceville, New Brunswick (2002 and 2003, 2003)*

Herpetological Surveys, Various, Atlantic Provinces (Field Specialist)

- *Study of the breeding biology of the four-toed salamander (Hemidactylium scutatum) in Nova Scotia*
- *Wood turtle distribution study for M&NP in New Brunswick*
- *Amphibian surveys in Shiselweni District, Swaziland.*
- *Biological inventory of the Kakamega forest in western Kenya*
- *Herpetofaunal survey along Highway 102 and western alignment of Highway 104, Nova Scotia*
- *Four-toed salamander distribution study along SOEI natural gas liquids pipeline in Nova Scotia*
- *Survey for fur-toed salamander and N. Ribbon snake (Thamnophis sauritis septentrionalis) along a portion of the Roseway river, Nova Scotia*
- *Stream salamander survey for N. Dusky salamander (Desmognanthus fuscus) at select sites in Victoria and Carleton Counties, New Brunswick*

Rare Plant Surveys, Various, Atlantic Provinces (Field Specialist)

- *Gypsum quarry in western Newfoundland*
- *Rare plant recovery program at Upper Burnside, Nova Scotia*
- *Rare plant surveys of riparian sites along the St. John River, Tobique First Nation, New Brunswick*
- *Determination of extent of populations of Canada Violet (Viola canadensis)and other rare plants at sites in Victoria and Carleton Counties, New Brunswick*

Plant Community Monitoring, Various, Atlantic Provinces (Field Specialist)

- *Rare plant and plant community monitoring at the SOEI gas plant in Goldboro, Nova Scotia*
- *Wetland plant community monitoring at the Boat Harbour effluent treatment facility in Nova Scotia*

Vegetation Assessments

Wind Energy Developments, Loganville, Nova Scotia (Team Member)

Conducted vegetation field assessments for Loganville wind development sites.

Wetlands

Wetland Alteration Approval, Hwy 102 Interchange, Halifax, Nova Scotia (Field Specialist)

Wetland Alteration Application preparation for Hwy 102 Interchange and the surrounding development site. This project involved the alteration to 31 of 39 wetlands within the project. Compensation planning was conducted for this site.

Wetlands Assessments

Wetland Evaluations, Mitigation and Compensation Planning, Goldboro, Nova Scotia (Field Specialist)

Field assessment of wetlands for a gas pipeline and preparation of a Wetland Alteration Application. This work also involved developing compensation and monitoring planning.

Wetland Delineations and Assessment, Brunello Estates, Timberlea, Nova Scotia (Field Specialist)

Wetland delineations, wetland functional assessment, and preparation of Wetland Alteration Application for 23 wetlands at a golf course and residential development site.

** denotes projects completed with other firms*

DAVID B. MCCORQUODALE

Department of Biology, Cape Breton University, Sydney, Nova Scotia B1P 6L2
902-563-1260 david_mccorquodale@cbu.ca

Education

Ph.D. 1988. Nest sharing in the sphecid wasp, *Cerceris antipodes*. Australian National University, Canberra. British Commonwealth Scholarship.

M.Sc. 1984. The provisioning flights of digger wasps (Hymenoptera: Sphecidae) as a defence against the nest parasite, *Senotainia trilineata* (Diptera: Sarcophagidae). University of Alberta. NSERC Postgraduate Scholarship.

B.Sc. 1979. University of Guelph, Ontario. Graduated with Distinction.

Work Experience

Professor, Biology, 2005-present, Cape Breton University, on faculty since 1990.

NSERC Post-doctoral Fellow, University of Calgary 1989-90

Community Service

CBC Radio Information Morning: Bird Hour, with Dave Harris, NS Department of Natural Resources, a phone-in on the birds Cape Bretoners, identification, population biology, and conservation, monthly 1992-present.

Biological Survey of Canada (Terrestrial Arthropods) Scientific Committee, 2001- present.

Arthropod Species Specialist Subcommittee of the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), 2008-2011.

NSERC representative for Cape Breton University, 2004-2008

Nova Scotia Species at Risk Working Group, February 2003-present.

Forestry Advisory Committee, NewPage (formerly Stora Enso), Port Hawkesbury, 2000-present.

Participate in monitoring programs designed to document changes in the populations of Cape Breton birds, Maritimes Breeding Bird Atlas, Breeding Bird Surveys, Christmas Bird Counts, Maritime Shorebird Survey and Cape Breton Breeding Owl Survey.

Data Verification Working Group for Maritimes Breeding Bird Atlas, 2006-2011.

Canadian International Development Agency missions to Lusaka, Zambia, 2008, 2004, workshops on environmental health, and to Tamil Nadu, India, 2001.

Organize speakers for monthly meetings of the Cape Breton Naturalists Society, 2002-present.

Examiner of M.Sc. theses, Acadia University, Saint Marys University, McGill University.

Saving the Bald Eagle. Discovery Channel, May 2000. Cyril MacInnis, cinematographer, Joan Weeks, Folkus Atlantic, producer/director, David McCorquodale, executive producer. Focuses on why the population of Bald Eagles in Cape Breton historically remained healthy and how this population was used to reintroduce eagles to Massachusetts where they had been extirpated. The video won awards, for cinematography and conservation focus, at an international wildlife film festival in the USA.

Frequent speaker in school classes (about 4-6 annually), to naturalists clubs, and service clubs on the natural history of Cape Breton, specifically birds and bugs.

Teaching

Courses taught at Cape Breton University, 1990-2006:

Environmental Biology, Ecotourism in Cape Breton, Natural History of Cape Breton, Ethology, Research Methods, Evolution, Entomology, Behavioural Ecology, Insect Systematics, Evolutionary Theory, Theoretical Ecology, Problem Centred Studies.

Awards

CBU Alumni Excellence in Teaching, May 2007

Atlantic Provinces Council on the Sciences (APICS) Science Communication for University Faculty, presented March 2008

Research Activities

i) Selected peer reviewed publications:

McCorquodale, D.B. in press. Cerambycidae (Coleoptera), the long-horned wood boring beetles, of the Atlantic Maritime Ecozone, a species analysis. In McAlpine, D. and Smith, I. (eds). Atlantic Maritime Ecozone. NRC Press, Ottawa.

McCorquodale, D.B., Brown, J.M. and Marshall, S.A. 2007. A decline in the number of long-horned beetle (Coleoptera: Cerambycidae) species in Ontario in the 20th century. Journal of the Entomological Society of Ontario. 138: 107-135.

Bouman, O.T., Vaninetti, N., Williams, G.E.M. and McCorquodale, D.B. 2005 [2004]. Ecological and Historical Evidence of Anthropogenic Forest Transformations in Eastern Cape Breton Island. Journal of Sustainable Forestry 19: 49-76.Majka, C.G., McCorquodale, D.B. and Smith, M.E. 2007. The Cerambycidae (Coleoptera) of Prince Edward Island: new records and further lessons. Canadian Entomologist. 139: 258-268.

McCorquodale, D.B., Banks, D.B., Kerr, M.I., Knapton, R.W. and Harris, D.L. 2004. Nesting seabirds on the Bird Islands, Cape Breton, Nova Scotia. Proceedings of the Nova Scotia Institute of Science. 42: 241-252.

McCorquodale, D.B. and Knapton, R.W. 2003. Changes in numbers of wintering American Black Ducks and Mallards in urban Cape Breton Island, Nova Scotia. Northeastern Naturalist 10:297-304.

More than 25 others, faunistics of beetles, bird populations and behaviour of wasps and bees 1986-2007.

<u>Reports:</u>

Marriott, M., Giberson, D. and McCorquodale, D.B. 2009. Changes in the status and geographic ranges of Canadian Lady Beetles (Coccinellinae) and the selection of candidates for risk assessment Part 1 Foundation Report. Report to the Arthropod Species Specialist Committee of the Committee on the Status of Endangered Wildlife in Canada. 53 pp.

McCorquodale, D.B. 2009. Post-construction bird monitoring at wind turbines near Lingan, NS: June 2008 through May 2009. Report for Dillon Consulting, Halifax. 30 pp.

McCorquodale, D.B. 2005. Bird issues for an environmental assessment of a wind energy project at Lingan, Cape Breton Island, Nova Scotia. Report for Dillon Consulting, Halifax. 38 pp.

McCorquodale, D.B. 2005. Bird issues for an environmental assessment of wind energy projects at Glace Bay and Port Caledonia, Cape Breton Island, Nova Scotia. Report for Dillon Consulting, Halifax. 36 pp.

McCorquodale, D.B. 1998-2005 (four times per year). Seasonal Report: Tanagers through House Sparrow. Nova Scotia Birds, quarterly publication of the Nova Scotia Bird Society.McCorquodale, D.B., Banks, D.B., Kerr, M.I., Knapton, R.W. & Harris, D.L. 2004. Nesting seabirds on the Bird Islands, Cape Breton, Nova Scotia. Proc. NS Inst. Sci. 42: 241-252.

Knapton, R.W. and McCorquodale, D.B. 2002. Survey of *Species at Risk* for Fortress of Louisbourg National Historic Site: Bicknell's Thrush and Piping Plover. Parks Canada.

McCorquodale, D.B. 2002. Birds on the campus of Periyar Maniammai College of Technology for Women, Vallam, Thanjavur, Tamil Nadu, India, Oct.- Nov. 2001. 7pp.

Knapton, R.W. and McCorquodale, D.B. 2001. Seasonal Checklist of the Birds of Cape Breton Island, Nova Scotia. UCCB Special Publication. 21pp.

McCorquodale, D.B. 1998-2006. Seasonal Report: Tanagers through House Sparrow. Nova Scotia Birds, quarterly publication of the NS Bird Society.

iii) Selected recent scientific presentations (more than 40 others 1983-2010):

Bugs and birds: sharing backyard passions. Atlantic Universities Undergraduate Conference, Memorial University, St John's NL, March 2008. Keynote address upon receipt of APICS Science Communication Award.

Diversity and habitat use of beetles in a managed dairy pasture in Nova Scotia, Canada. D'Orsay, C.W, McCorquodale, D.B. and Giberson, D. Presented at ESC, Saskatchewan, SK, Oct. 2007 and the Canadian Society of Agronomy Atlantic Agronomy Workshop, Charlottetown, PE, Jan. 2008.

The legacy of lady beetles: The unintended effects of (un)intentional introductions. Invited talk at Symposium on the ecological effects of introduced species. Montreal, Nov. 2006.

Should the Sydney Tar ponds be a nature reserve? Canadian College Environment Network, CBU, June 2005.

Searching for sustainable communities: ecological footprint analysis. International Workshop on Energy and Environment, Tamil Nadu, India, November 2001.

Is Cape Breton on the Map? Invited talk at Bird Studies Canada national meeting, Sept. 2000.

Long-term Ecological Monitoring at Irish Cove, Cape Breton. With C. Sneddon & M. Williams. Atlantic Society of Fish and Wildlife Biologists. Sydney, Sept. 1999.

APPENDIX C
Mi'kmaq Ecological Knowledge Study

Donkin Export Coking Coal Project

Mi’kmaq Ecological Knowledge Study II

Membertou Geomatics Solutions
January 2012

M.E.K.S. Project Team

Jason Googoo, Project Manager

Dave Moore, Author and Research

Craig Hodder, Author and GIS Technician

Katy McEwan, MEKS Interviewer

Mary Ellen Googoo, MEKS Interviewer

Lawrence Wells Sr., MEKS traditionalist

Keith Christmas, Membertou Natural Resources

Prepared by:	Reviewed by:
_____	_____
Craig Hodder, Author	Jason Googoo, Manager

Executive Summary

This Mi'kmaq Ecological Knowledge Study, also commonly referred to as a MEKS or a TEKS, was developed by Membertou Geomatics Solutions for Stantec, on behalf of Xstrata Coal Donkin Management Limited, for the proposed Donkin Export Coking Coal Project, located in Donkin, Nova Scotia.

This MEKS mandate is to consider land and water areas in which the proposed project will utilize, and to identify what Mi'kmaq traditional use activities that have, or is currently, occurring within, and what Mi'kmaq ecological knowledge presently exists in regards to the area. In order to ensure accountability and ethic responsibility of this MEKS, the MEKS development has adhered to the "Mi'kmaq Ecological Knowledge Protocol". This protocol is a document that has been established by the Assembly of Nova Scotia Mi'kmaq Chiefs, which speaks to the process, procedures and results that are expected of a MEKS.

The Mi'kmaq Ecological Knowledge Study consisted of two major components:

- **Mi'kmaq Traditional Land and Resource Use Activities**, both past and present,
- A **Mi'kmaq Significance Species Analysis**, considering the resources that are important to Mi'kmaq use.

The Mi'kmaq Traditional Land and Resource Use Activities component utilized interviews as the key source of information regarding Mi'kmaq use in the Project Site and Study Area. The Project Site covers the Donkin mine property located on the Donkin Peninsula (59°49'38.019"W 46°10'33.093"N), Cape Breton, Nova Scotia, an existing transmission line heading west from the Donkin mine towards the Marconi Towers and a transshipment location south of the property. The Study Area is the area within 10 km of the Project Site which encompasses the areas of Donkin, Glace Bay, Birch Grove, Port Morien, South Port Morien, and into the Atlantic Ocean.

Numerous interviews were undertaken by the MEKS Team with Mi'kmaq hunters, fishers, and plant gatherers, who shared with the team the details of their knowledge of traditional use activities. The interviews were undertaken during October 2011. These informants were shown topographical maps of the Project Site and Study Area and then asked to identify where they undertake their activities as well as to identify where and what activities were undertaken by other Mi'kmaq. All interviews were voice recorded with permission of the interviewee for the sole purpose of data verification during the data analysis. If permitted by the interviewee, their information was incorporated into the GIS data. These interviews allowed the team to develop a collection of data that reflected the most recent Mi'kmaq traditional use in this area. All interviewee's names are kept confidential and will not be released by MGS as part of a consent agreement between MGS and the interviewee to ensure confidentiality.

The data gathered was also considered in regards to Mi'kmaq Significance. Each species identified was analyzed by considering their use as food/sustenance resources, medicinal/ceremonial plant resources and art/tools resources. These resources were also considered for their availability or abundance in the areas listed above, and their availability in areas adjacent or in other areas outside of these areas, their use, and their importance, with regards to the Mi'kmaq.

This Mi'kmaq Ecological Knowledge Study has also gathered, documented and analyzed the traditional use activities that have been occurring within the Project Site and Study Area, by undertaking interviews with individuals who practice traditional use or know of traditional use activities within these areas and reside in the nearby Mi'kmaq communities.

Project Site

Based on the data documentation and analysis, it was found that the Mi'kmaq have historically undertaken some traditional use activities, primarily fishing, in the Project

Site (or adjacent to), and that this practice continues to occur today. It appears the majority of activity that occurs in the area is commercial lobster fishing.

Study Area

Based on the data documentation and analysis, it was concluded that the Mi'kmaq have historically undertaken traditional use activities in the Study Area, and these practices continues to occur today. These activities primarily involve the harvesting of fish species, but also include plants and animals; all of which occurs in varying locations throughout the Study Area and at varying times of the year.

Lobster was found to be the most fished species in the Study Area. Other species of fish noted by multiple informants are **mackerel** and **crab**. The data analyzed did not exclusively determine what species is the most hunted in the Study Area, but **rabbit**, **deer**, and **partridge** were noted to be hunted. Similar to gathering activities, the amount of data collected isn't enough to determine if there is a large number of other Mi'kmaq performing any gathering activities in this area. However, informants in this study did report **blueberry** gathering, **"brush picking"**, as well as **mayflower** and **pine cone** gathering.

Table of Contents

1.0 INTRODUCTION

1.1 Membertou Geomatics Solutions

Membertou Geomatics Solutions (MGS) is a Membertou First Nation Company that was developed as a result of the 2002 Supreme Court Marshall Decision. MGC was established as a commercially viable company that could provide expertise in the field of GIS Services, Database Development, Land Use Planning Services and Mi'kmaq Ecological Knowledge Studies (MEKS). MGS is one of many companies established by the Membertou First Nation – Membertou Corporate Division and these companies provide employment opportunities for aboriginal persons and contribute to Membertou's efforts of growth and development. As well, Membertou's excellent management and accountability of their operations is further enhanced by their ISO 9001:2008 certification.

For the development of this MEKS for Stantec regarding the Donkin Export Coking Coal Project, MGS brings to the table a team whose expertise and skills with land documentation have developed a sound MEKS. The team skills include expertise within the area of historical Mi'kmaq research, GIS data analysis, Mi'kmaq environmental knowledge and sound Mi'kmaq community connections.

1.2 Donkin Export Coking Coal Project

Xstrata Coal Donkin Management Limited (XCDM) proposes to build upon the existing Donkin Mine infrastructure to construct and operate an underground coal mine facility capable of producing coal primarily suitable for coking coal markets (known at the Donkin Export Coking Coal Project), but may also supply thermal coal markets. The Donkin Export Coking Coal Project is located on Donkin Peninsula (59°49'38.019"W 46°10'33.093"N), within the Cape Breton Regional Municipality (CBRM), Nova Scotia.

XCDM proposes a multi-continuous miner underground operation producing approximately 3.6 million tonnes per annum (Mtpa) of raw coal that is subsequently processed and washed to provide approximately 2.75 Mtpa of product coal that is primarily transported to customers via a marine-based option (barge load-out with transshipment). This coal is primarily suitable for coking coal markets, but may also supply thermal coal markets.

Stantec, on behalf of XCDM, has contracted Membertou Geomatics Solutions (MGS) to undertake a Mi'kmaq Ecological Knowledge Study (MEKS) with respect to the Donkin Export Coking Coal Project.

2.0 MI'KMAQ ECOLOGOCAL KNOWLEDGE STUDY SCOPE & OBJECTIVES

2.1 Mi'kmaq Ecological Knowledge

The Mi'kmaq people have a long-existing, unique and special relationship with the land and its resources, which involves the harvesting of resources, the conservation of resources and spiritual ideologies. This relationship is intimate in its overall character, as it has involved collective and individual harvesting of the resources for various purposes, be it sustenance, medicinal, ceremonial and/or conservation. This enduring relationship has allowed the Mi'kmaq to accumulate generations of ecological information and this knowledge is maintained by the Mi'kmaq people and has been passed on from generation to generation, youth to elder, ***kisaku kinutemuatel mijuijij***.

The assortment of Mi'kmaq Ecological Information which is held by various Mi'kmaq individuals is the focus of Mi'kmaq Ecological Knowledge Studies (MEKS), also commonly referred to as Traditional Ecological Knowledge Studies (TEKS). When conducting a MEKS, ecological information regarding Mi'kmaq/Aboriginal use of specific lands, waters, and their resources are identified and documented by the project team.

Characteristically, MEKS have some similar components to that of an Environmental Impact Assessment; yet differ in many ways as well. Among its purpose, Environmental Assessments seek to measure the impact of developmental activity on the environment and its resources. This is often done by prioritizing significant effects of project activities in accordance with resource legislation, such as *Species at Risk.* Mi'kmaq Ecological Knowledge Studies are also concerned with the impacts of developmental activities on the land and its resources, but MEKS do so in context of the land and resource practices and knowledge of the Mi'kmaq people. This is extremely important to be identified

when developing an environmental presentation of the Study Area as Mi'kmaq use of the land, waters and their resources differs from that of non Mi'kmaq. Thus, the MEKS provides ecological data which is significant to Mi'kmaq society and may add to the ecological understandings of the Study Area.

2.2 Mi'kmaq Ecological Knowledge Study Mandate

Membertou Geomatics Solutions was awarded the contract to undertake a Mi'kmaq Ecological Knowledge Study for Stantec with regards to the proposed Donkin Export Coking Coal Project. This project will require the documentation of key environmental information in regards to the project activities and its possible impacts on the water, land and the resources located here. The MEKS must be prepared as per the **Mi'kmaq Ecological Knowledge Study Protocol** ratified by the Assembly of Nova Scotia Mi'kmaq Chiefs on November 22, 2007.

MGS proposed to assist with the gathering of necessary data by developing an MEKS which will identify Mi'kmaq traditional land use activity within the project site within the Donkin Export Coking Coal Project and in surrounding areas within 10 kilometers of the project site. The proposed MEKS would identify, gather, and document the collective body of ecological knowledge which is held by individual Mi'kmaq people. The information gathered by the MEKS team is documented within this report and presents a thorough and accurate understanding of the Mi'kmaq peoples land and resource use within the Project Site/Study Area.

MGS understands that this study will be included in the comprehensive study-level environmental assessment under the Canadian Environmental Assessment Act (CEAA) that will be submitted to the regulators by Stantec on behalf of Xstrata Coal Donkin Management Limited, and will be used as a primary indicator identifying Mi'kmaq traditional land and resource use within the Study Area.

However***, it must be stated that this MEKS is not intended to be used for Consultation purposes by government and/or companies or to replace any Consultation process that may be required or established in regards to Aboriginal people. As well, this report cannot be used for the justification of the Infringement of S.35 Aboriginal Rights that may arise from the project.***

2.3 Mi'kmaq Ecological Knowledge Study Scope & Objective

This MEKS will identify Mi'kmaq ecological information regarding Mi'kmaq traditional land, water and resource use within the Project Site/Study Area. The data that the study will gather and document will include use from both the past and present time frame. The development of the MEKS report may also provide information that will identify where the proposed project activities may impact the traditional land and resource of the Mi'kmaq. If such possible impact occurrences are identified by the MEKS then the study will also provide recommendations that should be undertaken by the proponent. As well, if the MEKS identifies any possible infringements with respect to Mi'kmaq constitutional rights, the MEKS will provide recommendations on necessary steps to initiate formal consultation with the Mi'kmaq. Finally, through the development of this MEKS for Stantec, Mi'kmaq ecological knowledge and traditional land, water and resource use will be identified for Xstrata Coal Donkin Management Limited considering the Donkin Export Coking Coal Project.

2.4 MEKS Study Area

This MEKS will focus on the Donkin Mine property located on the Donkin Peninsula (59°49'38.019"W 46°10'33.093"N), Cape Breton, Nova Scotia and a transshipment location south of the property, referred to as the Project Site.

Fig 1. - Project site (red highlight), and Study Area (Purple highlight, see Map F in Appexdices

The MEKS will also include an analysis in the adjacent Study Area. The Study Area is the areas within 5 kilometers of the Project Site, encompassing the areas of Donkin, Glace Bay, Birch Grove, Port Morien, South Port Morien, and into the Atlantic Ocean.

3.0 METHODOLOGY

3.1 Interviews

As a first step to gathering traditional use data, the MEKS team initiated dialogue and correspondence with the Five (5) Mi'kmaq communities in Cape Breton, Nova Scotia: Membertou First Nation, Eskasoni First Nation, Waycobah First Nation, Wagmatcook First Nation and Potlotek First Nation. Discussions occurred regarding the identity of individuals who undertake traditional land use activities or those who are knowledgeable of the land and resources and an initial list of key people was developed by the team. These individuals were then contacted by the MEKS team members and interviews were scheduled.

For this MEKS, nineteen (19) interviews were undertaken by the project interviewers and thirty eight (38) individuals provided information in regards to past and present traditional use activities. Interviewees resided within or were from the communities of Membertou First Nation, Eskasoni First Nation, Waycobah First Nation, Wagmatcook First Nation and Potlotek First Nation. All of the interviews that were completed following the procedures identified within the Mi'kmaq Ecological Knowledge Protocol (MEKP) document. Prior to each interview, interviewees were provided information about the MEKS including the purpose and use of the MEKS; the non-disclosure of their personal information and the future use of the traditional use information they provided.

Interviewees were asked to sign a consent form, providing permission for MGS to utilize their interview information within this MEKS. During each interview, individuals were provided a map of the Project Site/Study Area and asked various questions regarding Mi'kmaq use activities, including where they undertook their activities or where they knew of activities by others. When they did such activities or when activities they knew of were done, and what type of resource they utilized or were aware of. Interviews were audio recorded, when permission

was granted by the interviewee. This assisted with the data accuracy checks and allowed for a comparison of audio data with the information documented on the maps, providing further assurance to the accuracy of the information gathered. Also, when required, interviews were conducted in the Mi'kmaq language.

3.2 Literature and Archival Research

With regards to this MEKS, various archival documents, maps, oral histories and published works were reviewed in order to obtain accurate information regarding the past or present Mi'kmaq use or occupation relevant to the Project Site/Study Area. A complete listing of the documents that were referenced is outlined within the *Sources* section.

3.3 Field Sampling

Site visits to each Project Site were undertaken by MGS staff members and an Xstrata employee, guided by a Mi'kmaq ecological knowledge holder from Membertou First Nation. Site visits took place over a period of four days in late September and early October of 2011. The site visits consisted of a walkthrough of the Project Site, noting and identifying any particular species in the area, plant and animal habitats, or other land/water features or areas that would be of importance to the Mi'kmaq.

Plant species of sage, golden thread, lichen, labrador tea, raspberry, blueberry, strawberry, blackberry, snowberry, bunchberry, huckleberry, and fox berry were identified throughout the Project Site. Trees including alder, apple, willow, cherry, birch, mountain ash, hazelnut, spruce, and tamarack were also found.

Fig 2. - Raspberry found during the site visit

Habitat areas and signs of deer, eagle, coyote, and rabbit were also visible throughout the Project Site.

4.0 MI'KMAQ LAND, WATER AND RESOURCE USE

4.1 Overview

The Mi'kmaq Land, Water and Resource Use Activities component of the MEKS provides relevant data and analysis in regards to Mi'kmaq traditional use activities that are occurring or have occurred within the Study Area. It identifies what type of traditional use activities are occurring, it provides the general areas where activities are taking place and it presents an analysis regarding the significance of the resource and the activity as well.

The Mi'kmaq traditional use activities information that is provided by interviewees is considered both in terms of "Time Periods" and in regards to the "Type of Use" that the resource is being utilized. The Time Periods that the MEKS team differentiates traditional use activities by are as follows:

"Present" – a time period within the last 10 years
"Recent Past" – a time period from the last 11 – 25 years ago
"Historic Past" – a time period previous to 25 years past

The "Type of Use" categories include spiritual use, and sustenance use, such as fishing, hunting or medicinal gathering activities.

Finally, the study analyzes the traditional use data in consideration of the type of land and resource use activities and the resource that is being accessed. This is the Mi'kmaq Significant Species Analysis, an analysis which ascertains whether a species may be extremely significant to Mi'kmaq use alone and if a loss of the resource was to occur through project activities, would the loss be unrecoverable and prevent Mi'kmaq use in the future. This component is significant to the study as it provides details as to Mi'kmaq use activities that must be considered within the environmental understanding of the Project Site/Study Area.

By analyzing the traditional use data with these variables, the MEKS thoroughly documents Mi'kmaq traditional use of the land and resources in a manner that allows a detailed understanding of potential effects of project activities on Mi'kmaq traditional use activities and resources.

4.2 Limitations

By undertaking documentation research and interviews with Mi'kmaq traditional activity users, this study has identified Mi'kmaq Traditional Use activities that have occurred or continue to occur in the Project Site/Study Area. This has allowed the study to identify traditional use activities in a manner that the MEKS team believes is complete and thorough, as required by the MEKP. Historical documents within public institutions were accessed and reviewed and individuals from five (5) Mi'kmaq communities, Membertou First Nation, Eskasoni First Nation, Waycobah First Nation, Wagmatcook First Nation and Potlotek First Nation, were interviewed. The interviews were undertaken with key Mi'kmaq community people, identified initially by the MEKS team, who are involved and are knowledgeable regarding traditional use activities. Through the historical documentation review and the interview process, the MEKS team is confident that this MEKS has identified an accurate and sufficient amount of data to properly reflect the traditional use activities that are occurring in each Study Area.

The MEKS process is highly dependant on the information that is provided to the team. Because only some of the Mi'kmaq traditional activity users and not all Mi'kmaq traditional activity users are interviewed, there is always the possibility that some traditional use activities may not have been identified by the MEKS.

4.3 Historical Review Findings

The Project Site is located near Schooner Pond, which is an area that has a long history of commercial coal mining beginning with the first commercial coal mine in North America dating as early as 1720. The coal seams in the cliffs of this region of Cape Breton Island were first noted in 1671 and the Port Morien French Mine was the nearest source of coal for the people of the Fortress Louisbourg.

The Port Morien French Mine was started in 1720 and by 1724 was exporting coal to Boston. The resource became valuable enough to warrant a blockhouse being built in 1725 to protect the resource. The site is now protected under the Nova Scotia Special Places Act. (66)

The location is underlain by the Pictou-Morien Sandstones and siltstones of the Sydney Coalfield. The Sydney Coalfield is a region that covers 1300km2 of Cape Breton Regional Municipality along the coast from Alder Point (10km NW of Sydney Mines) to Catalone Gut and inland as far as Sydney Forks. The Sydney Coalfield is a flat and undisturbed multi-layered strata of rock and coal that gradually tilts down toward the ocean at 4-15 degrees and forms table-top cliffs along the shorelines. (66)

The Sydney Coalfield is covered by mostly ground moraine of Stony Till Plain with some glacial outwash fans, deltas, kames, eskers and Silty Drumlins in the Broughton area. There are patches of Silty Till Plain on both sides of the Mira River at Mira Gut. The land is flat to rolling with many surface boulders. The bedrock is close to the surface throughout the Sydney Coalfield and a large expanse of bedrock and thin cover is an area bounded by Morrison Road in the south, Birch Gove to the east, McLeods Crossing to Kytes Hill in the north and bounded in the west at Mira Road by Highway 22. There are two large patches of bedrock and thin cover at Port Morien and the other large patch spanning the highway at Schooner Cove. Poorly drained depressed areas fill with organic

material of mostly sphagnum moss, peat and clay. There are a few large depressed areas between Donkin and Sand Lake (70)

The Sydney Coalfield is within a climate zone that promotes a Sugar Maple-Hemlock, Pine climax forest, the vegetation cover is dominated by conifers with hardwood species dominating burnt over areas. Sea ice scraping against the base of table top cliffs makes it difficult for marine plants and algae get established. (67)

Although urban land use covers a large portion of the Sydney Coalfields there is a variety of habitat for deer, coyote, red squirrel, snowshoe hare and red-backed vole and all have their place in the food chain. The cliffs, barrier beach protected bays and wetlands provide coastal birds with a variety of habitat. (67)

Post Glacial

Evidence from deep-ocean sediments indicate that there have been at least 16 glacial periods that lasted approximately 100 thousand years each. The last glacial period was the Wisconsin Glaciation which began 75 thousand years ago and ended between 12 and 10 thousand years ago. During this period glaciers both crossed over and formed within the province while being fed by the high amounts of precipitation in the region. (8) Since the 1800's glacial theory for the Atlantic region consisted of two hypothesis with one being a large continental sheet centered near Hudson Bay and Quebec and the other being local confined ice sheets. Recently after extensive sampling in Nova Scotia, evidence indicates that successive glaciation had four distinct phases with different and shifting ice centers. (8)

Glaciers take about 30,000 years to form and when average temperatures increase and when snow accumulation is less than snow loss, glaciation ceases and the ice sheets begin to recede at 4 times the rate of their formation. *(63)*

The Phase 1 ice flows were eastward across the region including Prince Edward Island and Cape Breton Island before shifting flow direction southeastward across the present day Bay of Fundy, Mainland Nova Scotia and Cape Breton Island. (8) The Phase 2 ice center was located north of present day Prince Edward Island and flowed south over mainland Nova Scotia and southeast over Cape Breton Island. The southward ice flow of Phase 2 would have widened the north-south valley passes through the Cobequid Mountains and is responsible for much of the drumlin features found in Southern Nova Scotia today. (8)

The Phase 3 ice center was parallel to the present day Nova Scotia Atlantic Coast and extended on land from Cape Sable, through Cape Canso to offshore and approximately south of present day Louisbourg, Cape Breton Island. From this ice divide, ice flows moved northeast across eastern portions of Cape Breton Island, northwest across western portions of Cape Breton Island, northeast across northern portions of the mainland from Cape George to Minas Basin west to northwest across the present day Annapolis Valley and Digby Neck. On the Atlantic side of the ice divide all flow directions were in a southeast direction over the Scotia Shelf. (8)

Phase 4 was a period when several remnant ice sheets were located throughout the province and advanced and receded in a radial direction from the ice centers. Cape Breton had two glaciers that were centered on the Highlands and another centered on the Bras d'Or Lakes. The Chedabucto Glacier filled the present day Chedabucto Bay and St. Georges Bay with a westward ice flow direction across the central portion the province into the Northumberland Strait, Minas Basin and the Atlantic. The Chignecto Glacier was centered near Baie Verte and Cape Tormentine and the South Mountain Ice Cap was centered between the Bay of Fundy and Atlantic Coast near present day Kejimkujik National Park. (8)

The last of the glaciers receded with the Bay of Fundy being ice free between 16 and 14 thousand years ago. Northern portions of the province experienced periodic stalls and advancement of a remnant ice cap centered near the Antigonish Highlands approximately 15 thousand years ago. The flow direction was westward into lowlands and southwestward to offshore of present day Sheet Harbour. By 13 thousand years ago the ice sheets had receded to the approximate coastline of today and then only residual ice caps remained in highland areas at approximately 12 thousand years ago. (8)

Between 11 and 10 thousand years ago there was an abrupt climate change with a cold period lasting approximately 200 years known as the Younger Dryas. During the Younger Dryas Period previously colonized plants that followed the receding glaciers were covered in permanent snowfields and some large mammals became extinct. (57)

As the last remnant Glaciers receded and the climate warmed again, the landscape was colonized by tundra vegetation of willow shrubs and herbaceous plants between 10 and 7.5 thousand years ago to be replaced boreal vegetation such as fir, spruce and birch until 6 thousand years ago when pine and oak was prominent. Until 4 thousand years ago, temperatures were 2 degree Celsius warmer than today and forests of hemlock mixed with beech and maple was the dominant vegetation. Gradual cooling to present day temperatures and increased moisture favored spruce forests. (57)

It is theorized that a terrestrial refuge for plants and animals existed near the edge of the continental shelf where arctic and boreal species survived the last ice age and repopulated the newly exposed land as the ice sheets receded and before the sea level rise. However, since the end of the last ice age the Chignecto Isthmus provided the land corridor for plants and animals to migrate into Nova Scotia as well as assisted airborne species migrations. The Chignecto Isthmus continues to

assist migrations of new species such as the introduction of Coyote into the province in the past few decades. (60)

Bras d'Or Lakes

The Bras d'Or Lakes fill a lowland basin carved out of soft sandstones by the successive phases of glaciers. Northeastern portions of the Lakes consist of the parallel long narrow arms of East Bay, St. Andrews Channel and the Great Bras d'Or Channel. These arms are very deep with St. Andrews Channel having depths of 280m and East Bay having depths of 81m. East Bay and St. Andrews Channel lake bottoms have evidence of a series of recessional moraines and an eastwards thickening layer of pre-glacial mud on the lake bottom *(17)*.

During the last melting period of approximately 20,000 to 10,000 years ago, shorelines changed while the landscape rebounded as the weight of the ice sheets diminished. Simultaneously, the water released from melting ice sheets further changed the landscape through erosion and deposition of materials as it flowed to the sea and gradually rising sea levels.

Land bridges between the islands in the Gulf of St. Lawrence and the Bay of Fundy appeared and disappeared during these fluctuations in sea level. The shoreline of the Atlantic Region that is recognizable today was established approximately 3000 years ago and continued to change through to present day by natural shore erosion. *(1)* Until approximately 6000 years ago, the freshwater Bras d'Or Lakes were at a level -25m of present day levels. The Lakes were flooded with sea water and gradually submerged former river systems, coves, barrier beaches, islands and points of land. *(12)*

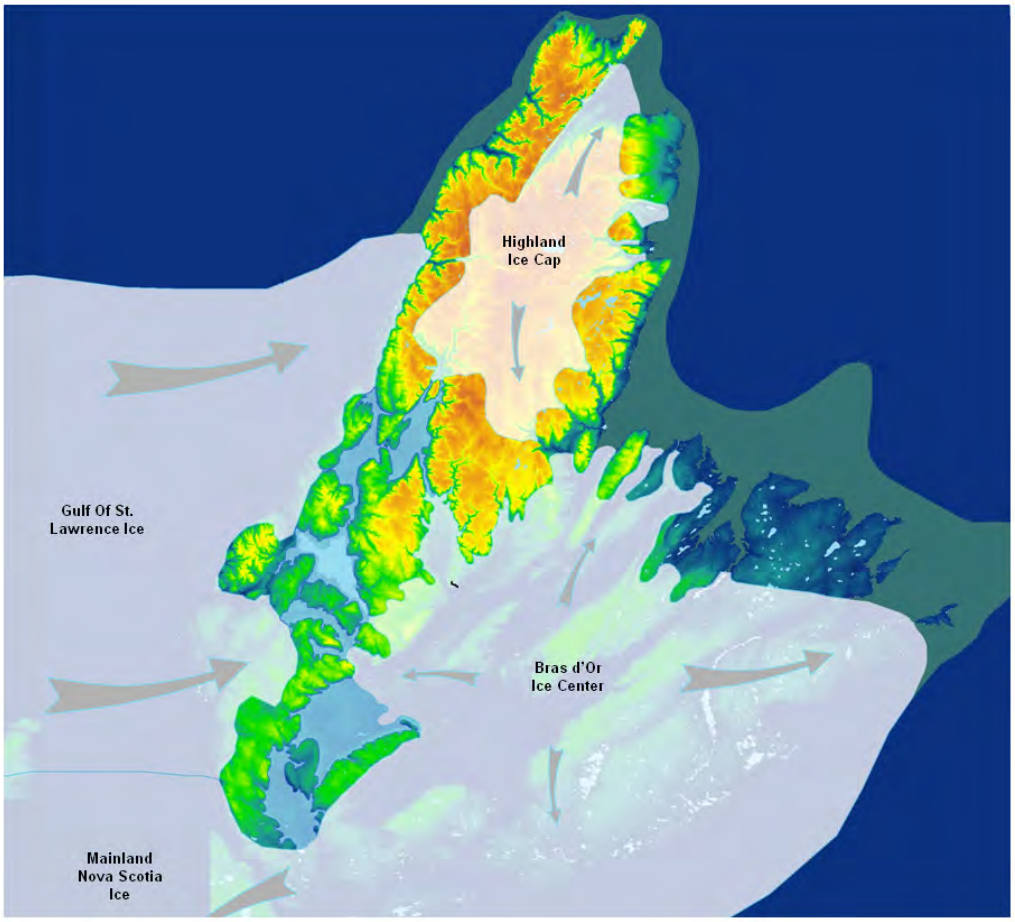

Fig 3. - The Last of the Wisconsinan Ice Sheets and Lowered Sea Level (11)

The sloping plain gradually submerged and Island shoreline changed over the last 15,000 year period. Sea levels changes ranged from -50m to -18m and back to a -50m difference from present levels. These fluctuations were due to a combination of the release of water locked in glaciers into the sea and the land rebounding as the weight of ice sheets diminished. *(11)*

During this time of fluctuating sea levels, the Bras d'Or Lakes was a freshwater paleo-lake and river system of interconnected small lakes in the deepest valley areas of Great Bras d'Or, Whycocomaugh Bay and East Bay. The largest lake at that time was at the approximate center of present day Bras d'Or. All of these smaller lakes and interconnecting rivers flowed by way of deep river valleys into the valley of present day St Andrews Channel and out to sea through Little Bras

d'Or. The paleo lake levels were -25m lower than present levels until the fresh water system was flooded with seawater approximately 6000 years ago when sea level rose to -18m and -16m of present level. This rise in lake level submerged the paleo lake and river watershed and dramatically changed the shoreline contour. The Bras d'Or Lakes water level stabilized within the last 5000 years in unison with sea to present day level. *(11)* . Sea level rise began at rate of 79cm/century and tapered to a present day rate of 36.7cm/century. *(12)*

The shoreline of present day East Bay was very different at a lake level 25m below what it is today. East Bay would have been a combination of elongated narrow lake and some small pockets of lakes joined by interconnecting water courses. A narrow and deep elongated lake would have existed from approximately MacAdam Point, Northside East Bay to approximately adjacent MacDougall Point just south of Ben Eoin. A series of smaller and more round lakes would have existed adjacent Indian Islands, Pig Pond Centre and Castle Bay. There would have been a raised ridge (possible moraine) between Castle Bay and Middle Cape that would have been almost a land bridge between the two shores as the lakes slowly flooded if not for the watercourse from the previously mentioned lakes. The watercourse would have flowed into a large bay behind a point of land (possible moraine) stretching from Benacadie Pond to almost Irish Cove. As the lakes flooded over time this point of land would have resembled a long narrow beach with the gut close to the Irish Cove shore. Any archaeological evidence along shores and banks of these lakes and watercourses are now submerged. *(61)*

The sea level fluctuations and acidic soils found in the Atlantic Region leave little evidence of early peoples within Cape Breton Island. Therefore, it is difficult to determine their past. The archaeological evidence of the peoples that were here within last 15,000 years is submerged with the former shorelines and river systems. *(12)*

The landscape of Unima'ki (Cape Breton Island) today has thick tills in the basins of the southwestern region of the island. It is also dotted with drumlin mounds on south east plains and submerged under rising Bras d'Or Lake levels of St. Peter's Bay and West Bay. *(11)*

Archaeology

Disagreement is found among researchers such as those who theorize that earlier peoples were displaced, moved on, or just disappeared from areas and those who theorize that these peoples stayed and adapted to the changing landscape and animal species available. They also adopted technological changes, stylizations and ideas that they came in contact through an early network of trade. *(13)*

At the foot of the south slopes of the Cobequid Mountains at present day Debert is found the earliest evidence of peoples populating Mainland Nova Scotia. The Debert Site is located on top of a sandy knoll south of the Cobequid Mountains and was occupied approximately 11 thousand years ago by Paleo-Indian peoples. The campsite overlooked a caribou migration route through the Cobequid Mountains to what would have been tundra plain leading into present day Cobequid Bay. The cold period of the Younger Dryas may have pushed the Paleo-Indian people south with advancing ice sheets and permanent snowfields or they may have abandoned the region. (62)

Archaeological evidence is scarce for a period of 10 to 5 thousand years ago which is thought to be due to the rise in sea levels that since submerged former coastal sites. (7) Sea level rise on the Atlantic Coast was a combination of land rebound after ice sheets receded, rising ocean temperatures and water released by melting glaciers. *(30)* As heavily weighted ice sheet centers as was located in the Gulf of St Lawrence depressed the earth's mantel, the areas of the mantel at ice sheet margins rose slightly. As the weight of the ice sheets diminished with

melting the depressed center areas rebounded and rose in elevation while the mantel of the margin areas lowered in elevation. *(59)*

The Archaic Period covers a time of 9 to 2.5 thousand years BP and is further sub divided into a periods of 5 to 3.5 thousand years BP referred to as the Maritime Archaic Period and 3.5 to 2.5 thousand years BP which was a period of Susquehanna cultural influence indicated by the artifacts found within archaeological sites. (62)(31) Tool manufacture techniques and materials indicate a connection between Archaic Period peoples within western Nova Scotia to the Susquehanna Tradition Culture (3500-2500 BP) which was centered in present day Mid-Atlantic States. (59)

The Period of 2.5 to 0.5 thousand years BP is referred to as the Ceramic Period or Maritime Woodland Period that saw the introduction of pottery and burial mounds in Nova Scotia. (7)(9) Coastal Maritime Woodland Period sites were not as impacted by rising sea levels as earlier periods but are currently impacted by coastal erosion of the glacial tills by successive storms and constant wave action. In 1837 a spear point and hollow stone tubes were found in Dartmouth near the present day location of Admiralty Place. The hollow tube artifacts were later identified as Ohio pipestone and dated between 2,600 and 2,100 years ago and indicative of the trade network that existed between the early peoples of Northeast North America. *(65)* This type of find is associated with burials and a similar find at Whites Lake in the Prospect was a burial site of the same tradition and period of the 1837 find. Laboratory analysis of charcoal determined that the Whites Lake Site dates between 2260 and 2440 years before present. *(64)* The disturbed site and remains were recorded and with the assistance of the Mi'kmaq Grand Council and the Mi'kmaq Association of Cultural Studies, the remains were reburied and the site protected. *(65)*

The remains found within the Whites Lake burial site were cremated near the burial mound and show evidence of high heat. The remains were then gathered

and placed within the burial mound along with the burial artifacts that also show evidence of high heat exposure. *(64)*

The use of clay pots was a more recent adaptation as peoples became more sedentary in their forested settings as transporting brittle clay pots was not practical for mobility while following and hunting migrating herds *(13)* Ceramic types, bowl design and stylized decorations help identify periods and distributions of peoples. The clay pots could be put right in the fire as opposed to birch bark pots and hollowed logs used to boil by continuously heating and submerging heated stones in the water. *(13)* There are clay pots found in prehistoric sites but Mi'kmaq had adopted European copper and iron pots so quickly that there are no colonial records of the Mi'kmaq using clay pots. *(19)*

It is the decay resistant tools that remain in Mi'kmaq archaeological sites found help identify the appropriate period of sites and movement of peoples through various tool styles and tool making techniques. (23)

There is no Archaeological or documented records of dug-out canoes from hollowed out logs being used by Maliseet, Mi'kmaq or Beothuk. Mailseet canoes differed from Mi'kmaq and Beothuk as Maliseet canoes lacked the raised side gunnels. *(58)*

Approximately 1,000 years A.D., light Birch Bark Canoes were in use and probably replaced heavy dugouts thereby increasing mobility by water. *(13)* Canoes of 18 to 28 feet long and up to 4 feet wide were made of large sheets of birch bark over a beech and cedar wood frame with an inside lined with cedar lath. Seams were sewn with spruce\fir roots on a pointed bone and waterproofed with spruce\fir gum which was chewed by the women into a paste and sealed with fire. Sails of bark, skin, small brush or spruce\fir bough were used when conditions were right. Canoe shapes varied among Mi'kmaq, Maliseet, Beothuk, Passamaquoddy and Penobscot peoples so that occupants of an approaching canoe

could be easily identified. (5)(23) Mi'kmaq canoes were able to carry 7 to 8 persons. *(55)*

It is proposed that coastal camps were used year round or at least utilized during winter based on shell middens and stone flakes found near or within the dwelling footprints indicating long periods spent within the dwellings inferring the cold temperatures. *(58)*

Criteria for a coastal winter camps derived from archaeology include reliable source of fresh water, good canoe landing beach, south to southeast sun exposure and protection from winter winds. *(58)*

Trade networks developed between peoples of the Bay of Fundy and Gulf of Maine river systems and traded at least in raw copper as indicated by copper derived from Cape d'Or, Nova Scotia being found at Maine archaeology sites. *(13)*

Each period of peoples developed diverse hunting, fishing and sustenance patterns while increasingly relying on the sea for food and transport. *(1)*The Woodland period is the last period prior to European contact with Mi'kmaq and Maliseet in the early 1500's. *(2)* Most known Woodland sites are along coastlines and rivers and maintained seasonal rhythms in occupation.

Period	Site\Find Location	Occupation Time Frame	Source
Post-Contact Mi'kmaq 1600-Present	See details in Section 4.3.	See details in Section 4.3.	-
Maritime Woodland Period 2,500-500 Years BP *(31)*	Ingonish Island *Flakes and points*	3,000-500 years BP	*(14)*
Archaic Period 9,000-2,500 Years BP *(31)* (10,000 to 3,000) *(13)*	Loch Lommond: *Isolated find* Grand River: *Isolated find* Troy Beach: *Flake concentrations* Mulgrave: *Several stone tools* Ingonish Island *Flakes and points* Little Narrows: *Isolated find*	Archaic Archaic Archaic? Unconfirmed Archaic? 6,000 to 8,000 years BP Unknown	*(18)* *(18)* *(18)* *(18)* *(14)* *(15)*
Paleo-Indian Period 11,000-9,000 Years BP *(31)* (12,000 to 8,500) *(13)*	Debert: *9 hectares Site* Belmont: *20 hectares Site*	10,600 Years BP 10,600 Years BP	*(26)* *(26)*

Table 1- Archaeological Sites

The Ingonish Island Site was discovered in an eroding shoreline bank. Geganisg, is the Mi'kmaq name for the Ingonish area and the Ingonish Island Site has seen at least 3 different period cultures with each separated by approximately 5,000 to 6,000 years. The peoples of these periods utilized the site for camps and tool making. The site continued to be used by Mi'kmaq until approximately 500 A.D. The area was a source of exposed rock outcrops of usable rhyolite as well as a source of good fishing as found by arriving Europeans. The extent of Ingonish Island usage is evident in the 2 tons of points, knives and flakes that was found at the site. *(14)*

A known camp near a mill at Little Narrows was investigated and some pottery and points found there were from at least 3 cultures spanning the Archaic and Woodland Periods. *(15)*

There are other prehistoric finds within Cape Breton located at Belfry Lake, Fourchu Bay, and a prehistoric find at Hillside, Mira River. There was very little information found on these sites. *(18)*

Other potential archaeological sites in Cape Breton include Cheticamp Island where local anecdotal history tells of farmers encountering shell mounds during cultivation as well as finding arrow heads. *(16)*

The remains found within the Whites Lake burial site were cremated near the burial mound and show evidence of high heat. The remains were then gathered and placed within the burial mound along with the burial artifacts that also show evidence of high heat exposure. *(64)*

Contact

As early as 1481, fishing fleets from Bristol, England were sailing to the Atlantic Coast of North America. Most likely, fleets of French and of peoples from the Basque provinces were also sailing to these Atlantic Coasts. One such Bristol fleet recorded finding an island they called the Isle of Brasil and no doubt found the fishing grounds of the Grand Banks. Due to competition, news of discoveries was kept quiet as to exploit the resources unhindered by competing fleets. *(33)*

Basques had claimed that long before Columbus, their ancestors visited the shores of Cape Breton Island which owes its name to a town on the Bay of Biscay. *(47)* The Basques also claimed that Columbus acquired a Basque ship's log that contained information that enabled him to complete his exploration voyages. *(49)*

Recent research has confirmed a Basque whale fishery had visited the Gulf of St. Lawrence and Labrador coast from the 1540's to the early 1600's. The Basque also participated in the cod fishery while establishing ports such as Plaisance (Placentia) in Newfoundland and Cape Breton until the arrival of other nation's fleets. *(49)*

By 1534, there was a fishery of ports, watering places along the Atlantic Coast from Southeastern Labrador to Southern Nova Scotia. As a sideline to fishing, fishermen began trading with the Mi'kmaq, Beothuk and Montagnais-Naskapi, the peoples that they encountered while drying their catch along the shores. *(33)*

Other fleets also favored the Cape Breton Island shores such as Baie des Espangnols, Spanish Bay (Sydney), the French bay of St. Anne and Harve a' Anglois as well as English Harbour, which later became Louisbourg after 1713. *(47)*

In the 1500's the shorelines of hunting and fishing territories were being spoiled by European fishermen hunting and frequently burning to clear land for fish processing and shelter. Newfoundland natives may have retaliated in some form as in 1565 it was recorded that *"between Cape Race and Cape Breton live a cruel and austere people with whom it is impossible to deal with…" 58*

After Nichlos Denys abandoned Cape Breton after his buildings were burned down at Saint Pierre in 1669, the Island again became the "exclusive domain of the Mi'kmaq". The exception to this was the seasonal fishing fleets of France, England and Basque. (53)

In 1713, the ship *Semslack* cruised the shores and harbours of Cape Breton and counted 25-30 Mi'kmaq families which amounted to approximately 120-180 Mi'kmaq. (53)

Prior to 1718, there were only 4 French locations on Cape Breton Island. It was increased to 13 locations in 1726 with the 6 year old fishing port of Ingonish gaining prominence among the French settlements. It later increased to 18. (47)

In the mid 1700's Isle Royale's fishing ports populations consisted mostly of migrant fishermen. Port Dauphin (St. Anns or Englishtown) and Port Toulous (St. Peters) had a low proportion of fishermen due to Port Dauphin being farther from the more productive fishing banks while Port Toulous established a coastal transport trade. (49)

Natives of the Maritime Peninsula and the Atlantic Shores that Europeans encountered were all of the Algonquin language group that included peoples located at present day New England, Quebec, Labrador and Newfoundland. To the west of Quebec and New England were peoples of the Iroquois language group. Divisions among the Algonquin language group were based on linguistic differences. *(13)*

The French assigned names to the different linguistic groups they encountered in North America and the names were not necessarily how the people referred to themselves. However, the French sometimes detailed encounters with the peoples of the region and offered a glimpse at the cultures of the people at the time of European contact. The four groups distinguished by the early French were the Souriquois who occupied the lands east of the St. John River including Nova Scotia and Newfoundland and all the north coast from Cape Breton Island to the Gaspe'. The early English referred to these same peoples as Tarrentines and they would later be known as Micmac or Mi'kmaq. *(13)*

West of the Souriquois lands and between the St. John River and the Kennebec River were peoples the French referred to as the Etchemins as did the peoples themselves. Later the Etchemins would be later known as Maliseet and included peoples between the Kennebec River and the Penobscot River. *(13)*

West of the Kennebec River and as far south as Massachusetts were the Almouchiquois as the Souriquois referred to them, “Dog People” because the Almouchiquois and Souriquois had a history of war. *(13)* Unlike European warfare, warfare among the different native peoples of Gulf of Maine watershed and the Maritime Peninsula at the time of European contact were usually a single instance or a series of skirmishes to avenge wrong doings and insults should the offences be real or perceived. *(35)*

The Almouchiquois peoples were distinct in language, clothing and dress from the peoples eastward. The Almouchiquois also practiced horticulture. This group was somehow severely impacted by early French contact and through disease and warfare eventually faded from their lands and records. *(13)*

The Abenakis were the fourth Algonquin language group encountered by the early French and occupied an area centered inland on the Kennebec River. The Abenakis associated more with the French in Quebec and eventually the French referred to all the original four groups as Abenakis. The Abenakis also practiced horticulture. The English referred to the peoples west of Abenakis lands as Pennacooks but the French grouped these separate peoples with the Abenakis. According to the French, the next group of peoples located west of the Abenakis is the Sokokis of the Connecticut Valley. *(13)*

The Mi’kmaq who the early French referred to as Souriquois and the early English referred to these same peoples as Tarrentines, has a Traditional Mi’kmaq Territory called *Mi’kma’ki* *(13)*

Mi’kma’ki covered an area that extended east from the St. John River and included Cape Breton Island, southern Newfoundland and from the Gaspe’ Peninsula, south to the south shore of Nova Scotia.

Mainland peninsular Nova Scotia is named *Kmitkinag* by Mi'kmaq and Cape Breton Island is named *Unimaki*. *Mi'kma'ki* is further divided into seven political districts: *(9)*

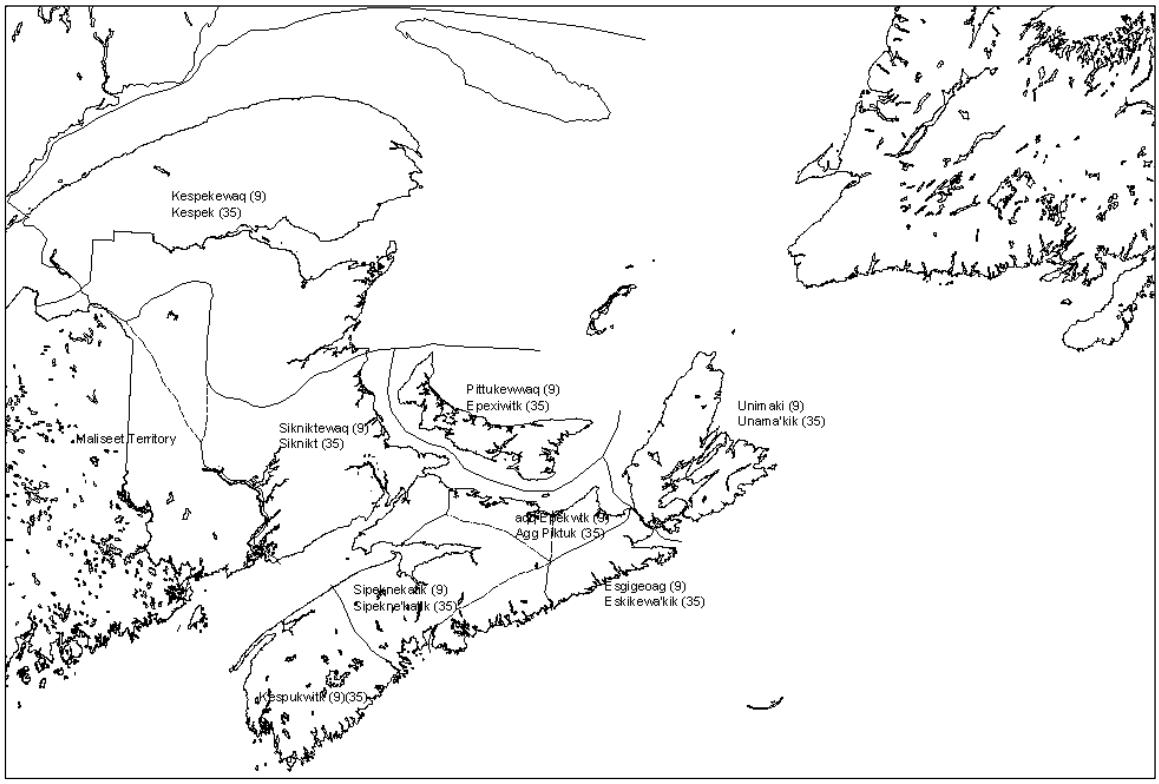

Fig 4. - Mi'kma'ki

Political Districts Circa 1600 (9)(29)(30)(35)

District (Various Spellings)	***Territory*** *(9)*
Unimaki (9) (Unama'kik) (29) (30) (35)	Cape Breton Island Southern Newfoundland
Esgigeoag (9) (Eskikewa'kik) (29) (Eski'kewag) (30)	Canso-Sheet Harbour
Sipeknekatik (9) (Sipekne'katik) (29) (Sikepne'katik) (30)	Sheet Harbour-Lahave including Minas Basin and Cobequid Bay
Kespukwitk (9)(29)(30)	Southern Nova Scotia, Lahave-Middleton
Pittukewwaq (9) (Epexiwitk) (29) (Epekwitk) (30)	P.E.I
aqq Epekwtk (9) (Agg Piktuk) (29) (Piktuk) (30)	Shediac to Canso Strait

Kespekewaq (9) (Kespek) (29) (Kespe'kewag) (30)	Chaleur Bay to Gaspe Peninsula
Sikniktewaq (9) (Siknikt) (29) (Sikniktewag) (30)	Chaleur Bay to Shediac

Three of these political areas are in close proximity to each other and converge to share a portion of the Bay of Fundy and Minas Basin. *Pittukewwaq agg Epekwtk* (P.E.I and Northumberland Strait from Shediac to Canso Strait) territory is only the distance of the width of the Chignecto Isthmus to access the Bay of Fundy. *(9)* Other sources indicate different interpretation of the bounds of Pittukewwaq agg Epekwtk as being separate districts with Pittukewwaq being only PEI and agg Epekwtk being an area between approximately Merigomish Harbour and Canso Strait. *(29)(30)* The same sources interpret Esgigeoag district as extending from Canso through to St. Margaret's Bay and Sipeknekatik as extending northwest through to the Northumberland Strait as shown in Fig 4. *(29)(30)*

Mi'kmaq could easily travel throughout Mi'kma'ki by canoe along the seacoasts and by inland water routes. In later years, Mi'kmaq could travel from Port Royal, Annapolis Basin to Quebec in 10-12 days via the Petitcodiac River to the St John River and on to Quebec. *(10)* Early ocean travel was also possible with ocean canoes of approximately 28 feet in length. *(9)*

Unama'ki Mi'kmaq and Newfoundland

There are different opinions among researchers as to when the Mi'kmaq arrived in Newfoundland. Mi'kmaq oral traditions tell of the Mi'kmaq in Newfoundland prior to European contact. Historical evidence exists that the Mi'kmaq were in Newfoundland in the 16th and 17th centuries. The earliest recordings of Mi'kmaq presence in Newfoundland was in 1602 when English explorer Gosnold encountered an all Indian crew sailing a Basque shallop off the coast of New England. These Indians were most likely Mi'kmaq as they were the nearest to Newfoundland and they drew a map of the coast of Newfoundland and located the

place name of Placentia. Shortly afterwards, explorer Champlain observed Indians travelling to Newfoundland for trade with European fishermen. In 1612 Jesuit Missionary Biard recorded that the Mi'kmaq called Newfoundland "Presentic". *(35)*

In 1705, twenty five Cape Breton Mi'kmaq families arrived in Newfoundland due to lack of game on Cape Breton Island. At that time, twenty five families could represent at least 150 Mi'kmaq. *(35)*

In 1706, it was recorded in a report by the Governor of Placentia that about 20 Mi'kmaq families had arrived on the Island of St. Pierre et Miquelon from Cape Breton to hunt and fish. In 1708, the Mi'kmaq used the Islands as part of a network of seasonal camps throughout a specific area of the southern region of Newfoundland. *(24)*

During this period, Mi'kmaq traders had fully adopted the small shallop sailing boat and created a network of exchange throughout the Gulf of St. Lawrence while acting as intermediaries between Mi'kmaq furs and European goods. *(21)*

The Mi'kmaq found European goods such as wool blankets, steel tools, iron pots and muskets very useful and found that it made daily life easier. In readily accepting European goods, traditional hunting methods and manufacturing skills were eventually lost to the Mi'kmaq. The Mi'kmaq became dependent on the goods. They realized they could not produce or repair the items themselves so replenishment involved seeking out Europeans to trade. *(35)*

Trading usually involved the exchange of animal furs for European goods which eventually required the Mi'kmaq to alter traditional seasonal migrations between the coast and inland river systems. Mi'kmaq spent longer periods hunting and trapping as the inland provided the majority of furs. The Mi'kmaq were also spending more time near European settlements trading for goods they needed. The European diet that was high in carbohydrates and salt was replacing the traditional

Mi'kmaq diet which was high in protein and was adversely impacting Mi'kmaq's health at a critical time of contact with European diseases. *(35)*

The increased pressure on the Mi'kmaq to hunt and trap for trade, as well as the efficiency of the new weapons, eventually impacted animal populations by over-hunting. By the early 1670's, Mi'kmaq were able to shoot 7-8 geese in a day with a musket compared to the 1 goose per day using traditional hunting methods and weapons. *(5)* By the mid 1700's food and fur stocks were dangerously depleted on the mainland and the Mi'kmaq of Cape Breton began to abandon the island due to lack of game such as beaver and moose. Newfoundland was an attractive second home for the Cape Breton Mi'kmaq as oral traditions place the south coast of Newfoundland at the farthest reaches of Mi'kmaq territory. The Newfoundland coast offered plenty of game and few Europeans which gave a reprieve to a lifestyle that was being lost on Cape Breton Island and the mainland. *(35)*

The remaining Mi'kmaq settlements in Unimaki District identified in 1735 were Port Dauphin, Lac Brador (Bras d'Or Lakes), Cape Breton and Ilse st Pierre *(9)*

In later years, after the defeat of France in North America, European goods became scarce as the Mi'kmaq were no longer courted for loyalty by French or English with presents of European tools and weapons and the fur trade no longer provided dependable trade for goods. *(35)*

After the Treaty of Utrecht, which barred French civilians and their former Mi'kmaq allies from travelling to Newfoundland other than to fish and dry catch, the Cape Breton Mi'kmaq ignored such terms and continued to hunt and trap in areas of Cape Ray to Fortune Bay. In the 1760's Nova Scotia and Cape Breton Island Mi'kmaq were in a desperate state and occasionally required government provisions for survival. With better prospects in Newfoundland, the Cape Breton Mi'kmaq continued to arrive in Newfoundland and approximately 200 Mi'kmaq arrived in Bay d'Espoir in 1765. *(35)*

Mi'kmaq oral tradition tells of Mi'kmaq visiting Newfoundland from Cape Breton seasonally during fall and winter. Seasonal visits became permanent with increasing numbers staying in the areas of Bay d'Espoir, St. Georges Bay, Codroy Valley and Bonne Bay. While settled in Newfoundland, Mi'kmaq maintained traditional sustenance cycles of moving between the coast for the warm months and returning inland to the woods for the cold months. *(22)*

On the Magdalen Island, a European walrus fishery encroached on Mi'kmaq hunting territory and prompted the Mi'kmaq to search for new hunting territories which included southern Newfoundland. Colonization was minimal and slow in this region which gave the Mi'kmaq freedom to move and hunt. *(22)*

After the American Revolution, the Cape Breton Mi'kmaq arrived in Newfoundland to stay. In 1787, poor fur quality and dwindling food stocks on Cape Breton Island sent a large Band of 150 Mi'kmaq to settle in St. George's Bay. From this time onward, the transplanted Cape Breton Mi'kmaq became Newfoundland Mi'kmaq. *(35)* In 1829, Thomas Haliburton recorded that the Mi'kmaq population on Cape Breton Island dwindled to approximately 300. *(44)*

Approximately thirty to forty leagues by land (90 to 120 miles), north of Plaisance, Newfoundland (Placentia), there are the "Reds". The "Reds"(Beothuk) were Natives that painted their entire bodies with red paint (red ochre) and take to the woods upon the appearance of Europeans and were impossible to catch. Similar to the Mi'kmaq and other Native peoples of the Maritime Peninsula, the "Reds" also used birch bark for canoes and shelter. (51)

Mutual avoidance describes the relationship between the Mi'kmaq of the south shore of Newfoundland and the Beothuk of northern regions of Newfoundland. Unlike the Mi'kmaq who were attracted to Europeans and their settlements, the Newfoundland Beothuk avoided contact with both Europeans and Mi'kmaq. The

belief that the Cape Breton/Newfoundland Mi'kmaq were responsible for the demise of the Beothuk is not supported by the records with the exception of a handful of questionable testimonies. It is possible that the belief may have begun as a story started by northern Newfoundland furriers who were concerned that Mi'kmaq may encroach on their northern territories. Like the Mi'kmaq, the Beothuk also suffered hardship from exposure to European diseases and their isolated numbers shrank to a small Band and eventual extinction. *(35)*

Mi'kmaq had an intimate knowledge of the ecology of their territory and fit their lives to seasonal cycles of the vegetation, animals and fish. Due to climate conditions, agriculture for food was a risk for Mi'kmaq. *(2)* Highly mobile Bands consisting of several related families would assemble at favorite camp sites. In the fall and winter small groups of 10-15 people would disperse for winter hunting. *(2)*

It was the duty and responsibility of the chief of each political district to assign the hunting territories to families and any changes were made in the presence of the Council of Elders which met in the spring and fall of every year. *(23)* Hunting districts of approximately 200-300 square miles were assigned to families. *(2)*

The districts were usually surrounded by lakes and rivers and were passed on to sons. However, if there were no sons where the district was located, then the district was assigned to another family. *(4)* The Mi'kmaq respected the boundaries of the assigned territories and only took from the land what they needed for the family to survive thereby preserving game and fish for the family's future survival. *(23)*

The hunting territories of mainland Nova Scotia were numerous compact interior territories that encompassed the watersheds of interior lakes and rivers. It was inland where Mi'kmaq did most their game hunting during colder months of the year after they moved inland from the summer coastal camps. *(4)(23)* Cape Breton

Island Mi'kmaq hunting territories are larger and more regional, encompassing shorelines and interior river systems, indicating a more sparse population. *(4)*

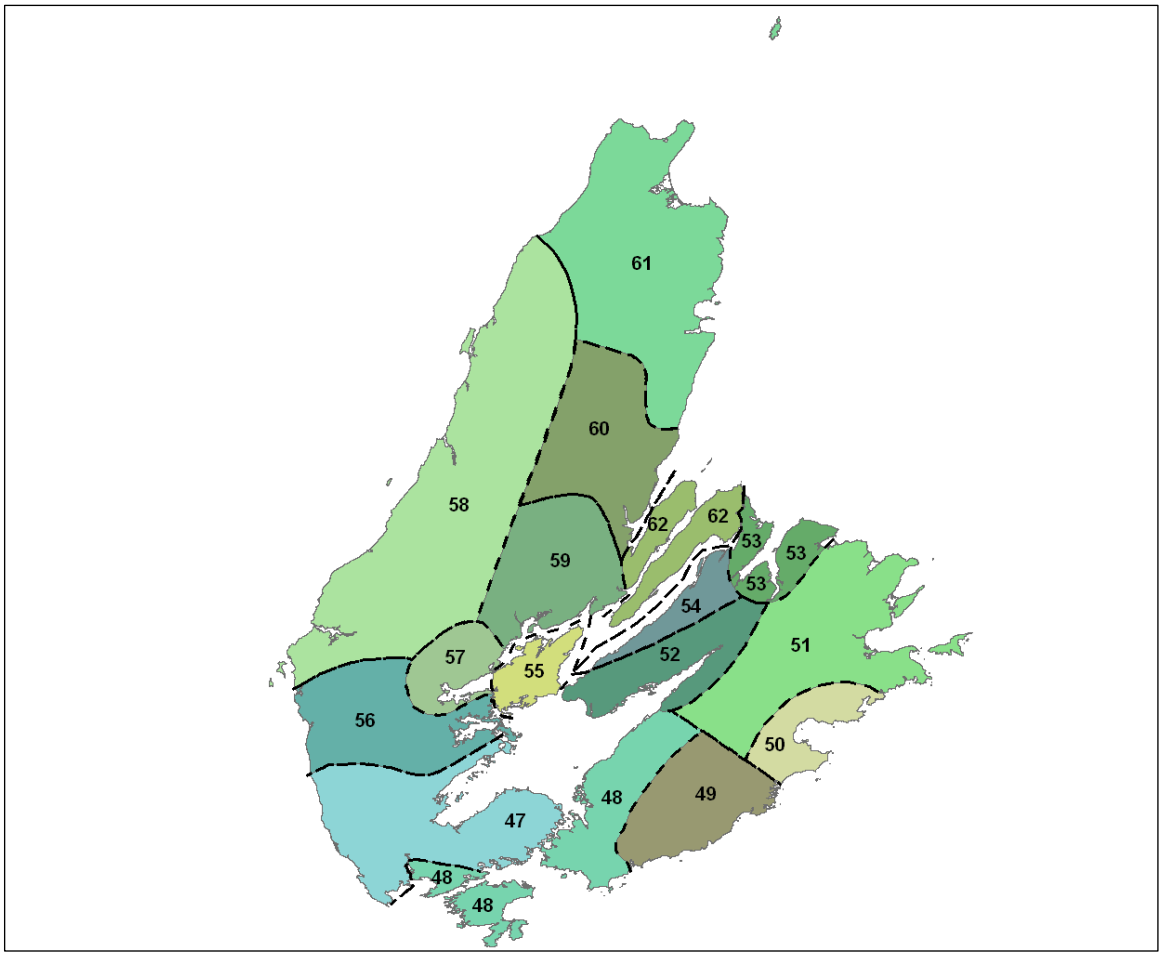

Fig 5. -Cape Breton Island Hunting Territories Derived from Elders in1920's: (4)

Ref. No.	Family Assigned	Family Hunting District	Traditional Name
47	Newell Denys (Nu'weli'dj – "Little Newell") (Noel?)	West Bay, Strait of Canso to Craigmore on St Georges Bay	Wi'a'yadjitck "Little place where red paint is found
48	Matthew Morris (Mu'lis) East Bay	East Bay, St. Peters Canal north to Salmon River	Muyala'yatc "Narrow Gorge"
49	A'belewes "Corruption of Ambrois"	East of Loch Lomond, Grand River to Forchu	
50	Louis Gabriel (Lu'idjidj – "Little Louis")	Gabarus Bay, Forchu to North of Louisbourg	Ga'balusk Corruption of "Cape Rouge"
51	Sam Denys, Joe Moose and Plansway Moose	Louisbourg to Lingan Bay	Sula'yadek "Flat at end of gorge"
52	Tomah Denys	Big Pond to Sydney River to Grand Narrows	Twi'denutck "Little Channel"

53	John Issac	Sydney Harbour, Lingan Bay to Little Bras d'Or	Kwundewe'gade "Rocky Head"
54	Captain Francis Bernard	South Shore of St Andrews Channel	Ma'lswesa'yamikek "Many little birches"
55	Michel Joe (Mi'selda'diat, "smar Michel")	Iona Island	
56	Dennis	River Denys Basin, Craigmore to Port Hood on St. Georges Bay	
57	Peter Kugu (Googoo?)	Whycocomagh Bay, Orangedale to Lake Ainslie	Weyo'yamaye "Head of the lake"
58	Paul	Western Highlands, north of Lake Ainslie, Port Hood	Wia'yatck "Place where red clay paint is found"
59	Francis Newell (Noel?)	St. Patricks Channel, Baddeck River and Middle River	Ebadek "River dividing a hill in two"
60	John Kugu (Googoo?)	St. Annes Bay, Big Harbour to Indian Brook	
61	Charles and Ben Pollet	North East Highlands, Indian Brook to Fishing Cove	Ktu'kdnuk "at the north mountain"
62	Common Use	Boularderie Island, St. Ann's Mountain	Muyela'yadek "Gorge through the mountain"

Table 2, Cape Breton Island Hunting Territories Recorded Circa 1929 *(4)*

The warmer months were times of abundance with surrounding areas of coastal camps providing fish, shellfish, fowl and eggs. Offerings were made to spirits but the Mi'kmaq rarely stockpiled enough food for the entire winter. They brought with them from the coast smoked and sun-dried seafood as well as dried and powdered hard boiled eggs. Berries were boiled and formed into cakes that were sun-dried. Grease and oils from boiled marrow and fat were stored and transported in animal bladders. Root vegetables such as *segubun* (wild potato), which was similar to today's sweet potatoes, and wild nuts were also part of the winter food supply. *(23)*

Month	Seasonal Locations	Seasonal Groupings	Food Resource
Jan.	Sea Coast	Bands	Smelt, Tomcod, Seals & Walrus Beaver, Moose, Bear, Caribou
Feb. (Period of Winter Famine Begins)	Inland	Bands & Family Units	Smelt, Tomcod (ending) Seals & Walrus, Beaver, Moose, Bear, Caribou
Mar. (Period of Winter Famine)	Inland	Bands & Family Units	Smelt, Seals & Walrus (ending) Scallops, Crab, Urchins, Winter Flounder, Beaver, Moose, Bear, Caribou
April	Sea Coast	Villages	Smelt, Winter Flounder, Scallops, Crab, Urchins,

(Period of Winter Famine ends)			Sturgeon, Brook Trout, Alewife, Herring, Spring Bird Migrations, Beaver, Moose, Bear, Caribou
May	Sea Coast	Villages	Smelt, Scallops, Crab, Urchins, Sturgeon, Salmon, Brook Trout Alewife, Codfish, Capelin, Shad, Mackerel, Skates, Herring, Spring Bird Migrations, Beaver, Moose, Bear, Caribou
Jun.	Sea Coast	Villages	Scallops, Crab, Urchins, Sturgeon, Salmon, Brook Trout Alewife, Codfish, Capelin, Shad, Mackerel, Skates Lobsters, Spring Bird Migrations, Beaver, Moose, Bear, Caribou
Jul.	Sea Coast	Villages	Scallops, Crab, Urchins, Codfish, Capelin, Shad, Mackerel, Skates Lobsters, Spring Bird Migrations, Beaver, Moose, Bear, Caribou, Strawberries, Raspberries
Aug.	Sea Coast	Villages	Scallops, Crab, Urchins, Codfish, Skates Lobsters, Beaver, Moose, Bear, Caribou, Strawberries, Raspberries, Blueberries, Ground Nuts
Sept.	Sea Coast	Villages	Scallops, Crab, Urchins, Codfish, Skates, Salmon, Herring, Eels, Fall Bird Migrations, Beaver, Moose, Bear, Raspberries, Blueberries, Ground Nuts, Cranberries
Oct.	Small Rivers	Villages	Scallops, Crab, Urchins, Smelt Codfish, Skates, Salmon, Herring, Eels, Brook Trout, Fall Bird Migrations, Beaver, Moose, Bear, Blueberries, Ground Nuts, Cranberries
Nov.	Inland	Bands	Smelt, Tomcod, Turtles, Seals, Beaver, Moose, Bear, Ground Nuts, Cranberries
Dec.	Rivers	Bands	Smelt, Tomcod, Turtles, Seals, Beaver, Moose, Bear, Ground Nuts,

Table 3: Mi'kmaq Annual Sustenance *(20)*

Due to climate conditions, agriculture for food was a risk for Mi'kmaq *(2)* Therefore Mi'kmaq rarely planted and harvested food and later preferred to trade with Europeans for bread, dried peas and beans. However, some small plots at certain locations on the south shore of Nova Scotia, such as Jordan Bay and Islands within the Roseway River, were being cultivated at the time of European contact. *(23)* Mi'kmaq may have cultivated tobacco which was a precious luxury for Mi'kmaq. *(2)*

When fish, game and plants within the proximity of an encampment became scarce, the Mi'kmaq moved the encampment miles away to a new location with

the women being responsible for breaking camp, transporting and setting up the next camp. *(5)(23)*

When a moose was taken, the hunter would take only the heart and organs back to the camp to feast and share with friends. The women were dispatched to retrieve the meat by following a trail of broken branches left by the hunters. The women dressed the moose and cut up the meat at the kill site and then carried it back to the camp to share. The meat was shared among all the families with the hunter usually receiving the least share of the kill. *(23)*

Mi'kmaq Spirituality

Mi'kmaq Spirituality (Mi'kmaq Ktlamsitasuti) belief is that all life is created by Kij-Niskam, an all-powerful being. All living things have a spirit that is to be respected. *(30)*

Mi'kmaq lived and died in the world as they found it without making attempts to change the natural order to suit the Mi'kmaq. Mi'kmaq are part of an interdependent system where everything, be it animate or inanimate, has its proper place. Fear was ever present as to not offend spirits and fear of a death at the whim of unknown power. The greatest fear was to upset the natural order, intentionally or accidently. Taboos help maintain the balance with nature. Fur bearing animals were subject to many Mi'kmaq rituals to ensure return of game. No such rituals apply to fish as fish are considered a gift for the taking. *(6)*

Mi'kmaq imagined the beginnings of all life, and their stories explained the elemental forces of nature as well as explaining why animals look and act as they do. Since all they possess and eat is provided by the living things that they know so well, Mi'kmaq had a great respect for life and thought of these living things as entities that they could communicate with. *(3)*

Early Mi'kmaq burials were at held at common burial ground sites. Mi'kmaq burials were usually one to two leagues (three to six miles) from a main camp. *(51)* The deceased was covered in a soft skin or beaver robe and bound with their legs against their chest and touching the chin. The hole was lined with fir and cedar boughs and gifts of weapons, snowshoes, utensils, beads and clothing to accompany them into the land of souls where previously deceased friends and family awaited. (5)(23) The nature of early Mi'kmaq was to compete for the best gift given and they gave the very best of what they had. (5)The quality of the gifts was such that they sometimes deprived themselves of what was necessary for survival. (5)

Mi'kmaq stories and oral traditions are an efficient way to pass important information on to future generations. They do this through stories or teachings of the Mi'kmaq past, customs and where the Mi'kmaq fit into the world. Mi'kmaq stories are circular with no beginning, middle and end. Mi'kmaq circular stories can focus on certain aspects for days. *(7)*

The following story interestingly describes a period very similar to the post Glacial period of fluctuating sea levels as discussed previously. The Mi'kmaq speaks of a great flood that covered all the land with water. One man and one women saved themselves by canoe. When the rains stopped, a beaver wished to build an island but drowned before he was finished. A muskrat took over the job and built an island where the man and woman landed. Day by day, the water receded making the island larger and larger until it formed the land that is seen today. *(51)*

Mi'kmaq believe that different peoples descended from different ancestors and that the Mi'kmaq origins are within the region of Mi'kmaq traditional territory. *(2)* Kij-Niskam created Klu'scap with divine powers to live among the Mi'kmaq and he taught them all they needed to survive. *(23)*

At the time of the European arrival, Klu'scap spent his last winter with the Mi'kmaq at Cape d'or. He explained that because of the arrival of the white men he must leave for his home in the far west and promised to return when the Mi'kmaq needed him. *(23)*

Like the Bay of Fundy, Cape Breton Island has a central role in Kluskap legends and there are differences in opinion as to the whether some Kluskap legends refer to places in the Bay of Fundy or in Cape Breton. The home of Kluskap may not have been Cape Blomidon, Minas Basin but instead, Kelly's Mountain, Cape Dauphin between Great Bras d'Or and St. Ann's Bay.

Kluskap's Cave is located where present day Fairy Holes caves are found at Cape Dauphin. Legend has it that the broken remains of Kluskap's canoe exist as the Cibou Islands (Bird Islands) directly opposite the caves. Kluskap is said to have disappeared into the caves while chasing a beaver but promised to return. The rock pillars in Plaster Cove are what are left of two Mi'kmaq girls who were turned to stone by Kluskap as punishment for laughing at him and his broken canoe. When his canoe broke, Kluskap retrieved his moose hide mat and laid it on the shore at Wreck Cove to dry where approximately 15 acres of barren ground can be found today. During the beaver hunt, which started at Indian Island, Whycocomagh, he threw a rock at the beaver and today the rock is thought to be Red Island. Kluskap also ate his meals at Table Head on the south side of Great Bras d'Or. *(34)*

Kluskap's Cave (Fairy Holes) is considered very powerful and entering the cave for trivial reasons was not recommended. *(34)* Perhaps this belief is the reason an archaeological investigation into the caves in 1989-90 failed to find any artifacts or rock carvings within the cave. The group of Archaeologists, accompanied by Mi'kmaq, systematically explored the caves looking for evidence of early Mi'kmaq visits or occupation. The group did not find any evidence of early Mi'kmaq within the more accessible parts of the cave chambers but the

accompanying Mi'kmaq squeezed through to the pitch dark depths and claim to have seen inverted "V" shaped drawings but could not be confirmed by the group's Archaeologists who felt it was unsafe to continue deeper. *(18)*

Klu'scap had prophesied a great war, and a vision of an Elder Chief of LaHave warned that involvement with the European Monarchs must be avoided at all costs. The vision inspired Grand Chief Membertou in 1610 to propose a solution that the Mi'kmaq unite with the Holy Roman Empire through baptism for protection from the Monarchs and to maintain their independence and lifestyle. *(32)*

Mi'kmaq are generally still faithful to that union and the identifiable spiritual groups in the community today are the Traditionalists, Catholics and Catholic-Traditionalists. The Traditionalist group is a general collection of varying degrees of Traditionalism where a person may perceive pre-contact Mi'kmaq beliefs only as traditional and those who are faithful to their Mi'kmaq identity in traditional practices while still maintaining Catholicism as their main spiritual belief. However Neo-Traditionalists practice pre-contact Mi'kmaq belief ceremonies that particularly distinguish themselves from Catholicism. Those considered Catholics do not consider themselves as traditionalist but as Christians. However, even the Catholic Christians of the community incorporate a little Mi'kmaq Traditionalism in their beliefs and practices. Catholic Traditionalists allow even more room in their beliefs for both Traditional and Catholic affiliations and practices. Traditional Christian beliefs and ceremonies are infused with Mi'kmaq traditional concepts and ceremonial practices. *(27)*

Twenty years after the Membertou baptisms in Port Royal, the first Catholic convert among the Cape Breton Mi'kmaq was at the French fort at St Anne (Cibou or Port Dauphine). An elderly Mi'kmaq medicine man, loyal to Membertou's wishes, convincingly threw all his spiritual articles in the fire upon conversion to the Catholic Faith. *(45)*

Traditional Mi'kmaq worship of earlier times worshiped the good spirits of the Sun and the Moon as well as to the bad spirit the devil, their Manitou. The bad spirit is worshiped as he can do great harm to the Mi'kmaq and is often present among them and abusing the Mi'kmaq. The first appearance of the missionaries caused the devil to increase its presence among the Mi'kmaq and the abuses increased after baptism. *(51)*

The Missionaries took up residence among the Mi'kmaq at Miramichi and tended the Mi'kmaq from Chaleur Bay to Beaubassin. Missionaries at Cape Sable were responsible for the Mi'kmaq from Port Royale to Cape Breton. (51)

In addition to the isolation and plentiful game in Newfoundland, the Cape Breton Mi'kmaq were also attracted to the area of the south shore of Newfoundland and offshore islands by the availability of a priest on the small French Island of Saint Pierre et Miquelon. In the early 1700's Mi'kmaq were devout Catholics and access to a priest was very important to their spirituality. *(35)*

Diseases among the native population were degenerative types of diseases that affected a small percentage of the native population. The European diseases were born from close animal contact and were epidemic diseases to which Europeans had developed partial immunities. The North American and South American native populations had no initial immunities to the diseases brought to them by early contact. *(13)*

Although the Mi'kmaq welcomed or at least tolerated Acadian settlement, they had regular contact with Acadians and Mi'kmaq paid a terrible price. Mi'kmaq had no immunity to European diseases such as smallpox and even common flus and colds devastated the Mi'kmaq population. Hardest hit by disease were Mi'kmaq encampments nearest Acadian habitations. *(9)* The Mi'kmaq of the Bay of Fundy and Eastern Atlantic Coast were most impacted by European disease. *(9)*

Between 1611 and 1760 there were several references to Mi'kmaq populations having been impacted by contagious disease but not all identify neither the disease nor the impact. The most notable references concern the Epidemic of 1616-1618 where a source states that Mi'kmaq population was reduced to approximately 2,000 from 15,000.

Between 1732 and 1733, an epidemic occurred within Louisbourg and the Mi'kmaq refused to enter Louisbourg for their gifts which they had become dependent. The epidemic coincided with 1 of 3 famines at Louisbourg occurring in 1729, 1733 and 1737. *(55)*

In 1746 a French expeditionary force landed at Cheboucto (Halifax). Reports from Annapolis Royal indicate that at least 100 Mi'kmaq died in each village of Chebenacadie, Unimaki and Abeqweit of disease attributed to the same French expeditionary force. *(9)*

Mi'kmaq mortality rates of up to 66-75 percent were reported among the impacted Mi'kmaq villages. *(10)(2)* Upon realizing the dangers of contact with Europeans, the relationship between Mi'kmaq and Acadians changed. Mi'kmaq limited their contact to only what was necessary for trade. Fewer Mi'kmaq attended European gatherings and then quickly left after obligatory feasts and distribution of gifts from the King of France. *(9)*

It is difficult to determine what the Mi'kmaq population was prior to European contact. One source states that Mi'kmaq and European contact was gradual and the Mi'kmaq population was sufficient enough to quickly repopulate after epidemics. However, the 1746-48 epidemic killed most of the Mi'kmaq repopulation gains and weakened the Mi'kmaq at the critical time of rapid expansion of English settlers on Mi'kmaq territory. *(9)* In 150 years of European

contact, it is estimated that 75 percent of the Mi'kmaq population was wiped out. *(3)*

Louisbourg, Mi'kmaq and War

In the early days of establishing a French colony on Isle Royale, the priority was to find a harbour and reestablish the fishery, to transplant colonists from Plaisance, Newfoundland (Placentia), and to attract Acadians and the native allies to the new colony. The priorities were eventually accomplished with the exception of attracting native allies to settle in the new colony of Louisbourg. *(53)*

The site chosen for Louisbourg was Harve a' L'Anglais (English Bay) as it was ice free and close to fishing and shipping routes. Other contenders were the French fishing base at St.Anne's and the Spanish fishing base at Baie des Espagnols (Spanish Bay) or Sydney. Both bays froze during the winter months and Spanish Bay was too wide to defend with a canon. From a military perspective, Louisbourg was surrounded by crashing ocean surf and difficult bog terrain which was thought to provide the military advantage to the fortress. (54)

During Louisbourg's short history, the Mi'kmaq had all but abandoned Cape Breton for a time in search of better hunting. The French tried in vain to persuade the Mi'kmaq to return and settle at Louisbourg but the Mi'kmaq returned in small numbers as most suspected that they would be drafted into labour or farming. Occasionally Chiefs would come to Louisbourg to demand tribute in the form of gifts for their loyalty. (54)

Since Louisbourg was founded in 1713, it was the Unama'ki Mi'kmaq and the tribes of the north east that had the deepest ties with Louisbourg. Maintaining the friendly relations with their native allies through gifts of provisions, cost the Louisbourg administration 5 percent of the budget of annual expenditures and sometimes as much as 10 percent. The Louisbourg administrations rationalization

of these expenditures was that it would cost much more to maintain an equal number of troops. *(56)*

The Mi'kmaq of Isle Royale camped and hunted in the southern portion of the Island near Chapel Island, St. Peters and inland from the shores of the Bras d'Or Lakes. Mi'kmaq were rarely found within the fortified town of Louisbourg but records of Mi'kmaq baptisms, domestic service and occasional visits by Mi'kmaq scouts and Chiefs indicate they did enter the fortified walls at times. There were native slaves among the French at Louisbourg and were thought to be Pawnee Indians as the records list native slaves as "Panis". *(49)*

Although there were native slaves as well as black slaves among the population of Louisbourg, no attempts were made to enslave the Mi'kmaq as they were too valuable as allies and fellow Catholics. Occasionally, groups and individual The Mi'kmaq who came to Louisbourg for religious or military purposes, seldom stayed within the town for any length of time. *(53)*

The attitude towards the native populations was vastly different between the French and English. The French recognized the natives as independent allies and not as subjects but as the sovereign owners of the land. However, the English had deeds based on their own interpretations of treaties that excluded and drove off the Native populations from their own traditional territories. *(47)*

To maintain the system of friendliness between the native populations and the French, an annual giving of practical tools and goods to the natives occurred during important gatherings or conferences at St. Peters.

The English attempted a similar policy but English punishments for native wrong doings were too harsh and humiliating for the natives. Scalp bounties for native men, women and children that were issued by the English colonies further maintained Native and French friendly relations. *(47)*

The native population, who were not subject to the same control as imposed on the colonists of Louisbourg , was a strong influencing factor in difficulty in maintaining order and control of colonist behavior. The Mi'kmaq values of liberty and independence was undermining the European standard of control and order. The colonialists of Louisbourg and Isle Royale would tolerate only so much pacification and control and their independent behaviors was attributed by authorities to the new world setting and the example of the Mi'kmaq. *(53)*

The Mi'kmaq were being harassed by the British during the Indian War and finally agreed to establish themselves on Isle Royale in 1723. The location they chose was on the western shores of the Bras d'Or Lakes at a place called Mirligueche (Malagawatch). Mirligueche was 22 leagues (66 miles) from Louisbourg and on a peninsula at the entrance of Denys Basin. This location was also close to Port Toulouse (St. Peters). The French were eager to attract as many Mi'kmaq to the Isle Royale as they could and in 1726, provided a church and Presbytery for the Mi'kmaq at Mirligueche. It was to remain the base for Cape Breton Mi'kmaq until 1750 when Father Maillard established a mission at Isle Sainte Famille or "Poteloteg" (Chapel Island). The church and Presbytery at Mirligueche were falling into disrepair and the new Sainte Famille mission location was located on the southeastern shores of the Bras d'Or Lakes and was just 6 miles north of Port Toulouse. *(55)*

Within Louisbourg's 45 year history as a colony and fortified town, there were over 30 censuses taken and at least 6 censuses taken of the Mi'kmaq on Isle Royale. *(53)* Based on the French census counts, the Mi'kmaq population on Isle Royale never exceeded 250 persons between 1720 and 1752. There was no noticeable increase after establishing the mission at Mirligueche but the mission served as a rallying point for the Mi'kmaq. *(55)*

In 1755, Acadians outnumbered British 10 to 1 in Acadia (Mainland Nova Scotia). This caused concern for the British as Acadians had a long and friendly relationship with the estimated 3,000 Catholic Mi'kmaq living on the mainland peninsula. Acadians continually refused to swear allegiance to the British Crown in part due to spiritual allegiance to the Pope. Regardless of peaceful existence on the part of Acadians, the recent arrival of thousands of Anglo-American troops for a military campaign gave the British the capacity to act. After the new troops neutralized the French forts Gaspereau and Beausejour near Amherst of today, the British demanded an oath of allegiance of the Acadians once again. Upon refusal by the Acadians, the Anglo-American troops proceeded to destroy the Acadian settlements by burning their farms, taking their livestock and deporting the Acadians as prisoners of war. Approximately two thirds of the Acadians escaped deportation and fled to the woods to join the Mi'kmaq in a Guerrilla war against the British. Some Acadians fled for St. John and some were able to flee to Isle Royale. The British then began a campaign of cleansing the mainland peninsula of Mi'kmaq and their Acadian allies with the use of New England Rangers. *(50)*

Within the British territories, Missionary Abbe' Jean Louis Le Loutre encouraged the remaining Acadians to uproot and move to French Territory such as Isle Royale. Based out of Shubenacadie, Le Loutre was labeled a fanatic due to his drive based on his religious beliefs and his devotion to France. He could not openly protest British actions but instead, quietly directed Mi'kmaq to harass the British and with approval of Paris, incite war between the Mi'kmaq and the British. *(52)*

During the deportation of Acadians, the British cut off the overland routes to Isle Royale, Louisbourg as well as routes to the St. Lawrence River. Louisbourg land connections to the mainland were by a simple road from the fortress that ran south to the Strait of Canso and then west to the Isthmus of Chignecto. From Chignecto, travel involved following several rivers and portages to the St. Lawrence River and on to Quebec. *(52)*

The British and New England Rangers were out to avenge the Massacre of Fort William Henry, near Albany New York. This was where the native allies of the Montcalm's French army attacked the column of honorably surrendered British troops and civilians of Fort William Henry as they marched to nearby Fort Edward. It is not clear if there were Mi'kmaq among the attacking warriors but there were Abenaki present. Abenaki had become a catch-all label applied to all east coast Algonquin speaking peoples. General Wolfe wrote that they (British-New Englanders) cut the Mi'kmaq to pieces wherever they found them, in return for the thousand acts of cruelty and barbarity along the road to Fort Edward. *(50)*

During the siege of the British Fort William Henry, Montcalm negotiated with British Lieutenant Colonel Munro the surrender of the fort. Montcalm was joined by 2000 warriors of Abenaki, Huron, Ottawa, and some friendly Iroquois. The prospect of great spoils of war attracted distant warriors of Miami, Sauk and Fox for which there were no French interpreters.

The Warriors were not at all pleased that the occupants of the fort were allowed to leave with their possessions that were to be the warriors' reward for battle. The result was an attack by the warriors on the British troops and civilians during their march to Fort Edward. *(52)*

The Abenaki shared the border with the English Colonies and Quebec. As well, they lived by the sea and shared many similarities with the Maliseet and Mi'kmaq in customs and beliefs.

The Abenaki were good warriors and were eager to go to war. The decision to go to war was settled by a council agreement. A specific number of warriors that were required was agreed upon and then followed by a feast prior to leaving for battle. *(51)*

Regardless of the approximately 148 years since Chief Membertou's baptism and Christianity among the Mi'kmaq, traditional belief systems were still prevalent among the Mi'kmaq. Worshipping the sun and moon during times of war was observed by the Missionary Maillard. *(56)*

Brutality of Indian warfare is designed to strike fear in their enemies and to make up for their few numbers which often prevailed over greater numbers of their European enemies. A warrior's advantage existed in their mobility, firepower, surprise and encirclement. Fighting in small scattered groups allowed retreat when required and advancement when opportunity presented itself. The warrior's advantage was their ability to go for long periods of hunger and hardship and the knowledge of living off the land. The code of vengeance and honour was familiar, and expected, among all warriors and the fate that awaited captured warriors caused them to fight with ferocity as to prefer death rather than capture. *(55)*
The Mi'kmaq and Gaspesian Mi'kmaq had 500 to 600 warriors but were not as eager to go to war as the Abenaki. However, when a decision was made to go to war, the warriors would paint themselves with hope to strike fear in their enemies and not to reveal the own fear in battle, thereby strengthening the war party's resolve. *(51)*

An officer at Louisbourg noted that war was very sacred to the Mi'kmaq and was not declared without much deliberation. However, once the decision was made to go to war, they incited rage and ferocity among themselves in preparation for battle. *(56)*

The Mi'kmaq fought back with support of Acadian allies and regardless of Rangers trying to hunt them down, a collection of mainland Mi'kmaq Bands were able to make peace with the British in 1760 and some Bands held out until 1762 before making peace. *(50)*

Although the French did not have to negotiate or sign any treaties with Mi'kmaq and neighbouring tribes, from the Mi'kmaq perspective, treaties were for maintaining peace and no Mi'kmaq territory was ever ceded to the British by treaty. The British policy of treaties with Mi'kmaq provided a basis to take ownership.*(56)*

The Treaty of 1752, which followed the revoking of the British Scalping Proclamation of 1749, was not representative of all Mi'kmaq Chiefs and Mi'kmaq Districts. The Mi'kmaq Bands interacting and aligning with Louisbourg were not part of the 1752 Treaty. The Mi'kmaq represented by the Treaty represented a small portion of the seven Mi'kmaq districts but the British had hoped more Mi'kmaq Bands would honour the peace. *(56)*

Governor Charles Lawrence issued a new Scalping bounty on Mi'kmaq in 1756 and requested more troops to hunt them down. Three attempts were made by the British to land on Isle Royale but were repelled by a mix of troops and Mi'kmaq three times. *(56)*

The Mi'kmaq Chiefs and Chiefs of the Maliseet, Passamaquoddy, Penobscots and the Kennecbec would have met sometime in late 1757 to early 1758 to decide if they would send warriors and if so, how many warriors would be committed to the defense of Louisbourg. The French were counting on higher numbers of warriors being sent to Louisbourg but only 10 percent of their expectations actually arrived. Previous years of inaction while manning coastal positions contributed to declining numbers of warriors being available. Regardless of claims and treaties by the Europeans, the Mi'kmaq considered the land theirs alone and they would defend it against those who wanted to deny them of their homeland. *(56)*

Wolf's plan for the invasion of Louisbourg was to land troops on the Mira River but it would take 2 days to march to Louisbourg. With the absence of suitable

landings along the defended and rugged shores, the Mira River plan had the best option of success. However, while cruising the shoreline and testing defenses, an errant landing craft made an unexpected landing on a rocky beach. Upon observing this, Wolfe told the others to follow and the British began their landings. *(56)*

During the second siege of Louisbourg, a French cache of provisions and weapons was established on the Mire' (Mira River) and left there for the Mainland Regiments that were available for the defense of the Fortress. The mainland regiment was led by Boishe'bert who was noted for his leadership of Native allies. It was Boishe'bert's task to harass the British landing camps with Guerrilla attacks with his complement of Native warriors. However, upon his arrival at the Mire' River, the cache of provisions was emptied by Father Maillard and his Mi'kmaq warriors as they retreated from Louisbourg upon the British landing. As Boishe'bert arrived at Louisbourg to survey the siege, like Maillard's warriors observed earlier, the battle seemed pointless and all retreated back to the Mire'. *(54)*

When the battle to defend Louisbourg was lost, the British demanded immediate surrender of all of Isle Royal, all of Isle St. Jean and all property contained within. The British had promised the Louisbourg inhabitants that they would not be harmed but did not extend any protection to the French Native allies. The warriors escaped at night by sea in canoes. *(54)*

After 1758, there were no more full time missionaries and no more gifts of provisions. Many of the Unama'ki Mi'kmaq relocated to other areas of the region including a large number that crossed over to Newfoundland between 1763 and 1768. Chief Jeannot Peguidalout of the Eastern Mi'kmaq territory of Unama'ki spent the winters in Newfoundland with as many as 200 of his followers. *(56)*

Although France had ceded and vacated all the lands they had possessed in North America, they were able to retain by concession the tiny islands of St. Pierre et Miquelon located off the south coast of Newfoundland. They were also able to retain fishing rights to the Gulf of St. Lawrence beyond a 9 mile limit off the coast of Newfoundland and beyond a 45 mile limit off the coasts of Cape Breton and Nova Scotia. *(52)*

Mi'kmaq Survival

Mi'kmaq survivors of the epidemics found the great losses had upset traditional economies and interdependence among Mi'kmaq groups. *(2)* Traditions were lost with those who died and the survivors were adopting European ways to cope. *(3)*

They became dependent on European goods and in turn, became market hunters and traded furs for the goods they became so dependent upon. Overhunting and competition for hunting territories caused conflicts until the yields became less and the Mi'kmaq who borrowed on credit accumulated debilitating debts. *(2)* Competition with European hunters and loss of habitat may have also contributed to depletion of Mi'kmaq traditional game. Reference is made in a letter from a mainland Nova Scotia English settler at Fort Lawrence (Amherst) to a "famine on the land" from 1774-1780 and the desperate condition of the Mi'kmaq as they "will part with anything" in trade for the goods for which Mi'kmaq had become dependent. *(22)*

The late1700's was a critical time in Mi'kmaq history when the Mi'kmaq population was decimated by disease. Mi'kmaq way of life was disappearing. Cape Breton saw Planters and Loyalists arrive from the 13 Colonies between 1760 and 1784. *(25)*

After the 1763 Treaty of Paris, the French left the region and there was no longer a friendly government for the Mi'kmaq to deal with as the former hostilities between the Mi'kmaq and English had led to mistrust between the two nations.

The area began to be settled by German and British Isles Protestants. *(36)*

With the arrival of Loyalists after the American Revolution, the Mi'kmaq territories were inundated with unfriendly British subjects. The British government wished to either pacify the once hostile Mi'kmaq with gifts and treaties or to offer bounties for hostile Mi'kmaq and deport threatening Mi'kmaq individuals to Newfoundland. The British implemented both options with the Scalp Proclamation of 1749 and several treaties between 1725 and 1778 offering European goods for peace proved more successful in pacifying the Mi'kmaq. *(36)*

On October 01, 1749 the Governor Cornwallis aboard the H.M.S Beaufort, anchored in Halifax Harbour, signed a proclamation that stated *"with the consent of His Majesty's Council, do promise a reward of 10 Guineas for every Indian Micmac, taken or killed, to be paid upon producing such savage taken or his scalp if killed.."* *(29)* The reward was later increased on June 21, 1750 to 50 pounds sterling per head to increase the number of scalps taken. *(29)*

This was a very dark period in the region's history as bounty hunters hunted down Mi'kmaq wherever they could be found as well as settlers supplementing their incomes with killing Mi'kmaq. Not only were Mi'kmaq taken but Acadians were taken on occasion as well. Records of how many scalps were taken are lost to history as such payments were either a miscellaneous expense or the records were destroyed. *(29)*

Due to pressure from the New England colonies who feared raising distrust and hostilities among their own native populations, Governor Cornwallis issued a Proclamation on July 17, 1752 to revoke the earlier scalp proclamations and

forbid hostile acts towards the Mi'kmaq. A further Treaty of 1752 was sought by Mi'kmaq Chiefs ending the September 23, 1749 Mi'kmaq declaration of war. They were granted full protection of the crown, freedom to hunt and fish, and provided provisions on the 1st day of October of each year as long as the Mi'kmaq maintained the peace. *(29)*

The Office of Superintendent of Indian Affairs was established to manage the peace with the Mi'kmaq and later became a conduit of provisions. As the Mi'kmaq suffered hardships from European diseases and depletion of fur and food stocks, the British treaty obligations of providing provisions was later considered charity from the Government's perspective. As the Mi'kmaq threat diminished over time so did the British treaty obligations and provisions were sporadic or had to be petitioned for by the Mi'kmaq. *(36)*

Another function of the Office of Superintendent of Indian Affairs was to process the numerous requests of Mi'kmaq for land grants of their traditional lands. The successful petitions were not outright land grants but were for hunting and fishing rights only. One such petition was by Chief Janet, Chief of the Cape Breton Mi'kmaq, to occupy settlements on the Bay of Port Allures, St. David's Bay and on Great Lake with rights to hunt and fish on the lakes and rivers. The present day place names of these locations were not determined in this historical review. *(36)*

In 1817, the Government began settling numerous Mi'kmaq families in locations such as Shubenacadie, Gold River and Bear River. Indian lands not exceeding 1000 acres were being set aside in each county of Nova Scotia totaling 22,050 acres for exclusive use by the Mi'kmaq. The Lands were not always of good quality and not necessarily traditional Mi'kmaq hunting and fishing territories. The Mi'kmaq continued to occupy, hunt and fish lands outside these new reserves. *(36)*

A massive wave of 30,000 Scottish settlers arrived in Cape Breton between 1815 and 1838. These new arrivals petitioned for land grants and Mi'kmaq traditional hunting and fishing territories were being parceled out to mostly Scottish Presbyterian settlers. *(25)* The Mi'kmaq traditional territories were granted away to these successive waves of emigrants. During these times of emigrant settlers, Mi'kmaq were not granted title to land but rather were granted "Licenses of occupation during pleasure". The land was owned by the Crown and reserved for particular Mi'kmaq Bands. The first of these licenses in Nova Scotia was granted in the 1780's and locations were typically coastal and ravine sites long frequented by Mi'kmaq.

In 1820 the reserve system was started and each county was instructed to set aside lands near sites frequented by Mi'kmaq. Each county planned reserves of approximately 1000 acres each but produced little action in establishment and it was the Mi'kmaq themselves that pushed for reserve lands. However, what the Mi'kmaq received was not always of their choosing and if their reserve was good land, it was subject to encroachment by settlers. *(2)*

The Cape Breton Mi'kmaq petitioned for land grants or Licenses of Occupation. The result was the creation of 6 reserves on the island in 1831 and 1832. Each new reserve located at the present day Mi'kmaq communities of Chapel Island, Eskasoni, Whycocomagh, Wagmatcook, Malagawatch and Indian Garden. Of the total 12,205 acres reserved for Indians, 20 percent of the acreage set aside was lost mostly by white settler encroachment. *(25)*

Cape Breton suffered an island wide famine between 1845 and 1851 and the Mi'kmaq were in transition into a more stationary peoples and maintaining small garden plots to supplement remaining traditional sustenance activities that were not regulated by new laws. The Island Mi'kmaq also sought out opportunities to provide labour or sell Mi'kmaq wares such as barrels, baskets and tool handles for exchange of goods or cash. Chapel Island Mi'kmaq found opportunities for both

their labour and wares at nearby settlements of St. Peter's and Arichat. Eskasoni Mi'kmaq would travel to Sydney to work and sell wares and had a camp at the edge of Sydney along Kings Road, which was a main road to Sydney. The Mi'kmaq of Whycocmagh and Wagmatcook travelled to North Sydney for work and selling wares. *(25)*

Although not found on historic maps, the Mi'kmaq had camps in the North Sydney, at Pottles Lake and also at the North Bar of Sydney Harbour. *(25)* The General Mining Association was interested in and eventually owned the lands the Mi'kmaq occupied in the North Sydney area and any attempts by the Mi'kmaq to have their camps converted to Reserve Land failed. The families were slowly moved to other Reserves until as late as 1913 there was still a family to be relocated to the new Reserve on Kings Road in Sydney. (68)

During these trying times for the Mi'kmaq, their traditional beliefs helped sustain each other as well as arriving immigrants when necessary. Mi'kmaq shared everything and would not dare to refuse a request of another nor refuse to share food with others as a rule of politeness. *(44)* Biard wrote that the Mi'kmaq shared everything with each other which created a mutual obligation of gratitude. No one would dare to scorn a request of another or eat without giving the other part of what they had to another. *(48)* These Mi'kmaq attitudes were foreign to European immigrants and were sometimes misunderstood.

DesBarres reports that the Mi'kmaq fed the first settlers arriving in Sydney during their first winter. The settlers were starving so the Mi'kmaq fed them moose, dogfish and eels. DesBarres stated that it is doubtful the settlers would have survived without the assistance of the Mi'kmaq. *(46)*

Indian Point Island, Strait of Canso, is so named for the dozen Mi'kmaq living there in birch bark shelters. The Indian Island Mi'kmaq fished and hunted in the

area of the mouth of Lower River Inhabitants and sold baskets and axe handles for cash income. *(37)*

Mi'kmaq of Grand River were plentiful in the area and sold baskets, butter tubs and axe handles. The Mi'kmaq came to spear eels and camped on the shore. On the west side of the river, a level piece of ground near a small brook had seven round patches of green vegetation, attributed by locals, to a former Mi'kmaq camp and eel enriched soils. *(38)*

In the early to mid 1800's, the Baddeck Mi'kmaq were described as industrious and they camped at Graveyard Point on Mutton Island (Kidston Island). They had a camp near the Steamboat Wharf that was surrounded by trees and full of small game as well as eels and fish close by. Their camps were very active with smoking trout that they had caught at Middle River, making mast hooks, oil tanks, baskets, tubs and barrels. Any of their wares not sold locally in Baddeck were taken to Little Bras d'Or and North Sydney in groups of a dozen canoes by way of Boularderie Head. In the fall, the Mi'kmaq moved inland to their reserves in Middle River and St. Peter's. *(40))*

In 1884, at a low area adjacent and west of Baddeck was a Mi'kmaq camp among a grove of dwarf cedars. The Mi'kmaq preferred their birch bark shelters over any other type of shelter, which they occupied year round. Some birch bark shelters had stoves and stove pipes protruding out the top of the conical shelter. *(39)*

Long Island, St Andrew's Channel, is approximately 3 miles long and ¾ of a mile wide. Between Long Island and Boularderie there were 2 beaches of which one is known as Indian Beach where Mi'kmaq were present when the settlers arrived. The Mi'kmaq speared fish and eels at night using torches of burning material suspended in a wire basket at the front of the boat to shine into the depths of water. *(41)*

Local anecdotal history states that there were Indians present in the Cheticamp area when settlers first arrived. *(16)* The Mi'kmaq would also arrive in the Margaree Valley in the summer for salmon where they set up camps along the river and built smoke houses for the fish. The Mi'kmaq would spear salmon at night using torches of burning bark, pitch and pine roots in wire baskets. *(42)*

In 1805-06, James Ross, a disbanded soldier of the 76th Regiment, was looking for land to settle and arrived at Little Narrows by way of Little Bras d'Or via portage. Here he encountered some Mi'kmaq who took him further by canoe to Lake Ainslie. The Mi'kmaq described a fertile valley where they took him over the mountains to what is now Rossville, North East Margaree. He spent the winter in the Mi'kmaq camp located there. He later applied and was granted 400 acres in the area as did his brothers who followed and together had 1800 acres in total. In 1810, with more settlers arriving and seeking land grants of the Mi'kmaq's valley, Francis Coogu (Googoo) on behalf of himself and 3 other Mi'kmaq families petitioned the government in Sydney and appeared at a council meeting in Sydney to state their claim of occupation of the land in the valley. The Mi'kmaq were successful in the decision and retained a prime fishing section of river where the Southwest Margaree River flows into the Northeast Margaree River. *(43)*

It was in this context in 1873 that Paul Christmas petitioned to have a deed for the property he occupied on Kings Rd. just outside of the town of Sydney. The location of the former Kings Road Reserve had been utilized by Mi'kmaq as a camp for those travelling from other areas of the island to Sydney for either work or trade, but most were from Eskasoni. The response was that patents were not issued to Indians but rather a license of occupation could be applied, which was granted. *(28)*

4.4 Mi'kmaq Traditional Use Findings

The traditional use data gathered for this MEKS was drawn from one primary source: the Mi'kmaq individuals who reside in the surrounding Mi'kmaq communities and those who are familiar with or undertake these types of activities. This data was acquired through interviews with informants that allowed the study team to identify the various traditional use activities, resources and areas that are currently or have been used by the Mi'kmaq. Interviewees were asked to identify areas within the Study Area, and Project Site, where they knew of traditional and current use that has/had taken place. These interviews took place in October, 2011. **It should be noted that MGS has conducted a previous MEKS for the Donkin Exploration Phase Mining Project. This data was not included within this report because the information collected during the current study was deemed an accurate representation of the Mi'kmaq traditional use within the study area.**

To easily identify the traditional use data findings of this study, the analysis has been categorized into two (2) geographic areas. The first is the Project Site – the Donkin mine property located on the Donkin Peninsula (59°49'38.019"W 46°10'33.093"N), Cape Breton, Nova Scotia, an existing right of way heading west from the Donkin mine towards the Marconi Towers and a transshipment location south of the property. The second is the Study Area, located within a 5 kilometer radius (from the edge) of the Project Site, encompassing the areas of Donkin, Glace Bay, Birch Grove, Port Morien, South Port Morien, and into the Atlantic Ocean.

Based on the data that was gathered by the study team, it appears there are Mi'kmaq traditional use activities that are occurring, or have occurred, in the various land and water areas throughout the Study Area, and within the Project Site.

Project Site – Donkin Peninsula to Marconi Towers and transshipping location

The Project Site, as well as locations in the *immediate* vicinity (>50 metres) of the Project Site, has been considered when analyzing traditional use activities.

Fishing

When analyzing the information gathered for the Project Site, the analysis found that lobster is the most fished species in this area.

Fourteen (14) lobster fishing areas were identified by informants in the waters surrounding the Donkin Peninsula, from Donkin to Long Beach; as well as into the Atlantic Ocean. All interviewees had indicated these activities to be commercial fishery (commercial fishing activities identified does not necessarily mean commercial licenses, rather that the area was identified as fishing for commercial purposes).

Other species identified, but to a relatively lesser degree than lobster, are mackerel, eel, flounder, gaspereau, and crab.

In terms of the timelines reported for these fishing activities, a large majority of the data was classified as current use by the informants with sixty-nine percent (69%) of the areas labeled as such. Recent past activities was classified in twenty-seven percent (27%) of the data, and four percent (4%) of the data was historic past activities.

As for types of fishery in the Project Site, all of the fishing areas were identified as commercial fishing activities.

Hunting

No informants had identified any hunting activities on the Project Site.

Gathering

South of Big Glace Bay, the existing transmission line of the Project Site intersects an area where one (1) pine cone and one (1) "brush picking" gathering areas were located.

Both of these activities took place currently and are used for commercial purposes (Christmas wreaths).

Study Area – Donkin, Glace Bay, Birch Grove, Port Morien, South Port Morien, and into the Atlantic Ocean

As mentioned previously, the MEKS data is also drawn from the Study Area which encompasses anything within a 5 kilometers radius of the Project Site. The purpose of this portion of the study is to portray other land use activities that may have been missed in the Project Site data analysis.

Fishing

From the data gathered, the study found that lobster is, by far, the most fished species throughout the Study Area.

Forty-seven (47) lobster fishing areas were identified by informants in the waters surrounding the Donkin Peninsula, from Donkin to Long Beach; from Donkin to near Glace Bay; from Long Beach to Morien Bay; the waters surrounding South Head, from South Port Morien to Waddens Cove, and past False Bay; as well as into the Atlantic Ocean. All informants had indicated these activities to be commercial fishery.

Mackerel was reportedly fished in eleven (11) areas off shore from Glace Bay to Big Glace Bay; off shore from Donkin to Schooner Pond; off shore from Wreck Point to Northern Head, on the Donkin Peninsula, and into Morien Bay; from Long Beach to Arnold Point, south of Port Morien; and off shore near South Port Morien from Campbell Point to the tip of South Head. All these areas were used for commercial purposes.

Ten (10) crab fishing areas were described by informants in the areas off shore from Glace Bay to Big Glace Bay; off shore from Donkin to Schooner Pond; off shore from Wreck Point to Northern Head, on the Donkin Peninsula, and into Morien Bay; and from Long Beach to Arnold Point, south of Port Morien. All informants had described these fishing areas as a commercial fishery.

Other species mentioned by informants, but to a relatively lesser degree than those mentioned above are trout, eel, smelt, flounder, and gaspereau.

With regards to the timeline categories for fishing activities in the Study Area is the majority of information given by informants was categorized as current use with sixty-six percent (66%) of the data given were analyzed as such. Thirty-one percent (31%) of the activities took place in the recent past, and three percent (3%) of the activities took place in the historic past.

Hunting

Two (2) rabbit hunting areas were found to be located near McLeods Crossing, and another near Birch Grove.

One (1) deer hunting area was identified near MacKays Corner, on the west side of the Study Area.

One (1) partridge hunting areas was reported by informants between McLeods Crossing and MacKays Corner.

Gathering

Blueberry gathering activities was reported in the western side of the Study Area near McLeods Crossing and MacKays Corner.

Other gathering activities and species mentioned by informants, but to a relatively lesser degree are “brush picking”, mayflowers, and pine cones.

In terms of the timeline categories sixty-seven percent (67%) of the gathering information were reported as current use, and thirty-three percent (33%) were categorized as historic past.

Cultural

An informant had pointed out there was an area where eagles had been sighted above Big Glace Bay Lake. These sightings last took place in 2011.

4.5 Mi’kmaq Significant Species Process

In order to identify possible project activities which may be of significance to the Mi’kmaq with regards to traditional use of the Study Area, the project team undertakes a number of steps in order to properly consider the MEK data. This involves three main components: Type of Use, Availability, and Importance.

Type of Use

The first component of analysis is the “Type of Use” of the resource which involves the categorization of the resource. All resources are placed into various general categories regarding the Type of Use**.** The category headings are Medicinal/Ceremonial, Food/Sustenance, and Tool/Art. These general headings are used so as to ensure further confidentiality with respect to the resources and

the area where they are harvested. As well, the total number of instances where a resource harvest has been documented by the study is quantified here as well.

Availability

After the data is considered by the Type of Use it is then considered in accordance with its' availability: This involves considering whether the resource is abundant in the Study Area or whether it is rare or scarce. Based on the information that is provided to the team from the ecological knowledge holders and/or written literature sources, the availability of the resource is then measured in regards to other water or land areas that are outside of the Study Area. This measuring is primarily done in the context of the areas adjacent to the Study Area, and if required, other areas throughout the province. By proceeding in this manner, the study can provide an opinion on whether that resource may be **rare, scarce** or **abundant**.

The data is classified in accordance with following:

Rare – only known to be found in a minimum of areas, may also be on the species at risk or endangered plants list
Common – known to be available in a number of areas
Abundant – easily found throughout the Study Area or in other areas in the vicinity.

This allows the study team to identify the potential impact of a resource being destroyed, by the proposed project activities, will affect the traditional use activity being undertaken.

Importance

The final factor the MEKS team considers when attempting to identify the significance of a resource to Mi'kmaq use is whether the resource is of major

importance to Mi'kmaq traditional use activities. This can be a somewhat subjective process, as any traditional resource use will be of importance to the individual who is acquiring it, regardless if its' use is for food or art or regardless if the resource is scarce or abundant. However, to further identify the importance; the MEKS team also considers the frequency of the use by the Mi'kmaq; whether the resource is commonly used by more than one individual, and finally the actual use itself. These factors support the broad analysis of many issues in formulating an opinion on significance and supports identifying whether the loss of a resource will be a significant issue to future Mi'kmaq traditional use, if it is destroyed by the project activities.

4.6 Mi'kmaq Significance Species Findings

This MEKS identified resource and land/water use areas within the Project Site and Study Area that continues to be utilized by the Mi'kmaq people, to varying degrees.

Type of Use

The study identified the following:

TYPE OF USE	NUMBER OF AREAS	NUMBER OF SPECIES
Food/Sustenance	104	14
Medicinal/Ceremonial	1	1
Tools/Art	3	3

At the request of Xstrata, an additional Type of Use analysis was performed on data gathered in the Project Site. However, since this does not fall within the scope of the Mi'kmaq Significant Species Process, the Project Site analysis for Type of Use is only being included for comparison purposes. Generalizations and summaries of the area should refer to the overall, Study Area analysis.

TYPE OF USE (Project Site)	NUMBER OF AREAS	NUMBER OF SPECIES
Food/Sustenance	21	6
Medicinal/Ceremonial	0	0
Tools/Art	2	2

Availability

During the information gathering for both Study Area options, there were no rare species of plants or animals identified by the informants. However, informants did mention one species that are under special concern: the American Eel (Mersey Tobiatic Research Institute).

Importance

While stated above, it is worth noting again that assigning an importance designation for any activity done by Mi'kmaq can be a subjective process, and that all activities are considered ways of preserving the Mi'kmaq way of life, in some shape or form.

One common theme that kept coming up during the analysis was the high number of commercial fishing done in the area. From lobster, crab, and mackerel, as examples, these waters are heavily fished commercially by Mi'kmaq, and any environmental effects could destroy or hamper a source of income for some Mi'kmaq.

As noted previously, eels are considered a species under special concern in Nova Scotia. The Mi'kmaq could still rely on this species for sustenance and cultural ceremonies and disturbances to their habitats could have an impact on Mi'kmaq use. However, the relatively small number of areas reported by informants could minimize this impact.

All other species mentioned throughout the study can be considered common and abundant throughout Nova Scotia.

5.0 CONCLUSIONS AND RECOMMENDATIONS

This Mi'kmaq Ecological Knowledge Study has gathered, documented and analyzed the traditional use activities that have been occurring in the Project Site and Study Area by undertaking interviews with individuals who practice traditional use, or know of traditional use activities within these areas and reside in the nearby Mi'kmaq communities.

The information gathered was then considered in regards to species, location, use, availability and frequency of use to further understand the traditional use relationship that the Mi'kmaq maintain within the Project Site and Study Area.

Project Site

Based on the data documentation and analysis, it was found that the Mi'kmaq have historically undertaken some traditional use activities, primarily fishing, in the Project Site (or adjacent to), and that this practice continues to occur today. It appears the majority of activity that occurs in the area is commercial lobster fishing.

Study Area

Based on the data documentation and analysis, it was concluded that the Mi'kmaq have historically undertaken traditional use activities in the Study Area, and these practices continues to occur today. These activities primarily involve the harvesting of fish species, but also include plants and animals; all of which occurs in varying locations throughout the Study Area and at varying times of the year.

Lobster was found to be the most fished species in the Study Area. Other species of fish noted multiple informants are **mackerel** and **crab**. There wasn't enough data to exclusively decide what species is the most hunted in the Study Area, but **rabbit**, **deer**, and **partridge** were noted to be hunted. Similar to gathering

activities, the amount of data collected isn't enough to determine if there is a large number of other Mi'kmaq performing any gathering activities in this area. However, informants in this study did report **blueberry** gathering, **"brush picking"**, as well as **mayflower** and **pine cone** gathering.

RECOMMENDATION # 1

The Donkin Coal Mine MEKS has identified Mi'kmaq Traditional Use Activities occurring in the Project Site as well in various locations throughout the Study Area. Based on the information gathered and presented in this report, there is a potential this project could affect Mi'kmaq traditional use in the area, especially with regards to commercial fishing. It is recommended that the traditional use activities of the Mi'kmaq be reflected upon in the overall environmental presentation and any remediation or project work consider the interest the Mi'kmaq have in the area.

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APPENDICES

Map A
Mi’kmaq Traditional and Current Use Areas

Donkin Coal Mine MEKS

Mi'kmaq Traditional and Current Use Areas

Lingan
Dominion
28
New Aberdeen
Table Head
Bridgeport
Gardiner Mines
Sterling
Glace Bay
Centreville Reserve Mines
Caledonia
4
McLeods Crossing
Port Caledonia
Donkin
Passchendaele
Morien Hill
Big Glace Bay
Tomkinsville
Marconi Towers
Long Beach
Sand Lake
Port Morien
Morien Junction
Morien
Birch Grove
Broughton
Homeville
0 0.5 1 2 3 4 5
Kilometers

Legend

- Transhipment Area
- MEKS_StudyArea
- Traditional Use Data
- Barge Route
- Project Infrastructure
- County Border
- Highway
- Trunk Road
- Collector Road
- Local Road
- Loose Surface/Cart Track
- Rivers
- Project Site

Disclaimer

This map is a graphical representation of Mi'kmaq ecological knowledge gathered throughout the study, and should not be used for navigation purposes. Features presented may not accurately representaactual topographical or proposed features.

The Mi'kmaq ecological knowledge data presented is a sampling of knowledge held by those interviewed and should not be interpreted as an absolute measure of Mi'kmaq ecological knowledge and land use.

N

Datum: UTM NAD83
Zone 20
Scale: 1:80,000

Version: 2
1 Mar 2012

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Map B
Mi’kmaq Traditional and Current Hunting Areas

Donkin Coal Mine MEKS

Mi'kmaq Traditional and Current Hunting Areas

Lingan
Dominion
28
New Aberdeen
Table Head
Bridgeport
Gardiner Mines
Sterling
Glace Bay
Centreville Reserve Mines
Caledonia
4
McLeods Crossing
Port Caledonia
Donkin
Passchendaele
Morien Hill
Big Glace Bay
Tomkinsville
Marconi Towers
Long Beach
Sand Lake
Port Morien
Morien Junction
Morien
Birch Grove
Broughton
Homeville
0 0.5 1 2 3 4 5
Kilometers

Legend

- Transhipment Area
- MEKS_StudyArea
- Project Site
- Hunting Areas
- Barge Route
- Project Infrastructure
- County Border
- Highway
- Trunk Road
- Collector Road
- Local Road
- Loose Surface/Cart Track
- Rivers

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N

Datum: UTM NAD83
Zone 20
Scale: 1:80,000

Version: 2
1 Mar 2012

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Map C
Mi’kmaq Traditional and Current Fishing Areas

Donkin Coal Mine
MEKS

Mi'kmaq Traditional and Current Fishing Areas

Lingan
Dominion
28
New Aberdeen
Table Head
Bridgeport
Gardiner Mines
Sterling
Glace Bay
Centreville Reserve Mines
Caledonia
4
McLeods Crossing
Port Caledonia
Donkin
Passchendaele
Morien Hill
Big Glace Bay
Tomkinsville
Marconi Towers
Long Beach
Sand Lake
Port Morien
Morien Junction
Morien
Birch Grove
Broughton
Homeville
0 0.5 1 2 3 4 5
Kilometers

Legend

- Transhipment Area
- MEKS_StudyArea
- Fishing Areas
- Barge Route
- Project Infrastructure
- County Border
- Highway
- Trunk Road
- Collector Road
- Local Road
- Loose Surface/Cart Track
- Rivers
- Project Site

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N

Datum: UTM NAD83
Zone 20
Scale: 1:80,000

Version: 2
1 Mar 2012

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Map D
Mi’kmaq Traditional and Current Gathering Areas

Donkin Coal Mine
MEKS

Mi'kmaq Traditional and Current Gathering Areas

Lingan
Dominion
28
New Aberdeen
Table Head
Bridgeport
Gardiner Mines
Sterling
Glace Bay
Centreville Reserve Mines
Caledonia
4
McLeods Crossing
Passchendaele
Morien Hill
Port Caledonia
Donkin
Big Glace Bay
Tomkinsville
Marconi Towers
Long Beach
Sand Lake
Port Morien
Morien Junction
Morien
Birch Grove
Broughton
Homeville
0 0.5 1 2 3 4 5
Kilometers

Legend

- Transhipment Area
- MEKS_StudyArea
- Gathering Areas
- Barge Route
- Project Infrastructure
- County Border
- Highway
- Trunk Road
- Collector Road
- Local Road
- Loose Surface/Cart Track
- Rivers
- Project Site

Disclaimer

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N

Datum: UTM NAD83
Zone 20
Scale: 1:80,000

Version: 2
1 Mar 2012

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GEOMATICS SOLUTIONS

Map E
Mi’kmaq Traditional and Current Cultural Areas

Donkin Coal Mine
MEKS

Mi'kmaq Traditional and Current Cultural Areas

Lingan
Dominion
28
New Aberdeen
Table Head
Gardiner Mines
Bridgeport
Sterling
Glace Bay
Centreville Reserve Mines
Caledonia
4
McLeods Crossing
Passchendaele
Morien Hill
Port Caledonia
Donkin
Big Glace Bay
Tomkinsville
Marconi Towers
Long Beach
Sand Lake
Port Morien
Morien Junction
Morien
Birch Grove
Broughton
Homeville

0 0.5 1 2 3 4 5
Kilometers

Legend

- Transhipment Area
- MEKS_StudyArea
- Cultural Areas
- Barge Route
- Project Infrastructure
- County Border
- Highway
- Trunk Road
- Collector Road
- Local Road
- Loose Surface/Cart Track
- Rivers
- Project Site

Disclaimer

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N

Datum: UTM NAD83
Zone 20
Scale: 1:80,000

Version: 2
1 Mar 2012

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Map F
Project Site and Study Area

Donkin Coal Mine
MEKS

Donkin
Cape Breton Co., NS

Lingan
Dominion
28
New Aberdeen
Table Head
Bridgeport
Gardiner Mines
Sterling
Glace Bay
Centreville Reserve Mines
Caledonia
McLeods Crossing
4
Passchendaele
Morien Hill
Tomkinsville
Port Caledonia
Donkin
Big Glace Bay
Marconi Towers
Long Beach
Sand Lake
Port Morien
Morien Junction
Morien
Birch Grove
Broughton
Homeville

0 0.5 1 2 3 4 5
Kilometers

Legend

- MEKS_StudyArea
- Project Site
- Transhipment Area
- Barge Route
- Project Infrastructure
- County Border
- Highway
- Trunk Road
- Collector Road
- Local Road
- Loose Surface/Cart Track
- Rivers

Disclaimer

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N

Datum: UTM NAD83
Zone 20
Scale: 1:80,000

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APPENDIX D
Mine Closure and Reclamation Plan

PRELIMINARY MINE CLOSURE AND RECLAMATION PLAN FOR THE DONKIN EXPORT COKING COAL PROJECT

PREPARED FOR:

Xstrata Coal Donkin Management Limited

PREPARED BY:

Stantec Consulting Ltd.

File: 121510478

April 2012

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1.0 Introduction

The Mine Closure and Reclamation Plan (MCRP) for the Donkin Export Coking Coal Project (Project) will be developed and managed in strict compliance with all applicable municipal, provincial and federal Acts and Regulations and the closure strategy will be based on Xstrata Coal (XC) *Mine Closure Planning Standard (13.1)* that takes into account the economic, social, and environmental factors to support a sustainable mine closure outcome. In addition, guidance on rehabilitation planning, resourcing, and execution will be based on XC *Rehabilitation Management Protocol* (XC SD PRO 0026) to provide superior rehabilitation outcomes in terms of quantity, quality and timing and meeting company legal and stakeholder objectives for sustainable post-closure landscapes.

This document is the preliminary MCRP. The Conceptual MCRP will be developed in the Pre-feasibility stage as a requirement of the closure planning process once the Project receives the appropriate environmental approvals and will incorporate the conditions of those approvals and/or permits. The Detailed MCRP will be based on the approval of the final land use options identified in the Pre-feasibility stage.

The MCRP for the Project will be based on the following objectives:

- Prevention of access to disused underground workings;
- Management of water for operations and post-closure conditions;
- Management of physical characteristics that may constrain site re-vegetation;
- Management of potential acid rock drainage as a consequence of the oxidation of sulfides;
- Minimization of environmental effects during decommissioning activities;
- Return of land affected by mining to conditions capable of supporting prior land use, equivalent uses, or other environmentally acceptable uses; and
- Inclusion of socio-economic considerations in post-closure objectives.

1.1 MINE CLOSURE PLANNING

All XC operations are required to prepare a life of mine (LOM) plan for XC approval. Mine closure planning is then undertaken throughout all phases of the operation including:

- Exploration;
- Prefeasibility;
- Feasibility;
- Operations with a reserve LOM greater than 5 years;

- Closure/Rehabilitation;
- Post-closure Care and Maintenance;
- Disposal of Land Asset.

Refer to Figure 1 in Appendix A for a flow chart showing the Xstrata Mine Closure Planning Process (XC SD STD 0005) included in the XC Mine Closure Planning Standard (13.1).

1.2 RECLAMATION PRINCIPLES

Reclamation principles for the Project will be based on re-contouring and re-vegetation of degraded land surface, containment of potential acid rock drainage (ARD) from waste disposal piles and the adoption of long-term water management measures.

Appropriate care and maintenance protocols will also be adopted for the long-term benefit of the local community. This will include adopting preventative measures against slope failure, management of the rejects that could limit re-vegetation, and the treatment of acid rock drainage from the coal waste disposal piles.

2.0 Closure Planning Requirements

The XC closure planning requirements will be documented in the appropriate closure document and are briefly summarized in the following sections:

2.1 KNOWLEDGE BASE

Relevant environmental and social baseline information will be developed and maintained throughout all phases of the project to make sure that this information is retained throughout the LOM and considered as part of:

- Assessment and mitigation to minimize environmental effects; and
- Development, refinement and assessment of the Project performance with respect to meeting closure objectives and criteria.

2.2 POST-CLOSURE LAND USE

Potential post mining land use options will be identified based on the intended post-closure land use type (*i.e.* native vegetation, ecological reforestation, recreational use, commercial and/or industrial use, *etc.*) where each will have specific closeout criteria. The process of defining post-closure land use options and scoping their associated activities will be undertaken in consultation with the local community and other relevant stakeholders.

2.3 CLOSURE OBJECTIVES

Initial rehabilitation closure criteria will be based on the nominated closure objective(s). The criteria will be subsequently refined based on rehabilitation monitoring and local community and other relevant stakeholder feedback. Based on post-mining constraints, this Project will establish specific closure criteria for each post-closure land use identified.

2.4 ENVIRONMENTAL AND RECLAMATION MONITORING

A rehabilitation monitoring program will be developed and implemented for each post-closure land use type, allowing similar land use types to be managed in a similar way for rehabilitation and closure. The monitoring program will incorporate appropriate indicators and methods that provide a measure of completion criteria to be assessed in accordance with the rehabilitation objectives. The environmental and reclamation monitoring program will cover each phase of the mining operation.

2.4.1 Pre-Mining Baseline Surveys

Baseline monitoring will be conducted at selected sites within the surrounding locality to compare with the proposed post-closure land use. Baseline monitoring will be conducted prior to any active mining or site disturbance. Baseline studies have been completed to support the environmental assessment process and will be used to support this program.

2.4.2 Mining Operations

During mining operations, records will be maintained of any processes that could impact upon the rehabilitation of the site and the ultimate achievement of the completion criteria. The following is typical list of information that will be recorded to provide the basis for interpretation of the future rehabilitation monitoring results:

- rehabilitation procedures;
- inventory of contaminated areas;
- records of production wastes;
- environmental monitoring records;
- inventory of soil and rehabilitation materials; and
- subsidence monitoring.

2.4.3 Reclamation

For each rehabilitation operation conducted, details of the reclamation operation will be recorded.

For the responsibilities associated with monitoring during the reclamation phase of the Project, refer to Section 4.4 of this document.

2.4.4 Post-Reclamation

Monitoring of the reclamation areas will be conducted during post-reclamation to demonstrate progress towards the completion criteria through annual rehabilitation inspections and long-term rehabilitation monitoring, which scientifically evaluates the progress of rehabilitation towards achieving completion criteria and any other statutory requirements that might apply to the site.

As per XC *Closure Criteria and Rehabilitation Monitoring* (STD 5.13), post-reclamation monitoring that will include the following:

- Annual rehabilitation inspection;
- Long term rehabilitation monitoring; and
- Verification assessment prior to sign-off.

For the responsibilities associated with monitoring during the post-reclamation phase of the Project, refer to Section 4.4 of this document.

2.5 ADAPTIVE MANAGEMENT

A Response Plan will also be developed that supplements the site's reclamation strategy and outlines the response to any inadequacy in rehabilitation performance. The Response Plan will be aligned with the completion criteria and consider a wide range of factors, including:

- The results of environmental audits or other evaluation activities;
- The results of environmental monitoring;
- The results of monitoring the performance or condition of environmental infrastructure;
- Technological developments; and
- Changing environmental conditions.

3.0 Preliminary Mine Closure and Reclamation Plan

3.1 PRELIMINARY KNOWLEDGE BASE

Information gathered to date in the development of a knowledge base for the Preliminary MCRP includes data from various completed field programs, studies, investigations and monitoring initiatives that have addressed the following issues at the site:

- Hydrogeology; surface hydrology, treated wastewater, dewatering, ambient air quality, ambient noise level (physical issues);

- Site vegetation; ponds and wetlands, birds and wildlife, fish and shellfish, species at risk (ecological issues);
- Land use in and adjacent to the site, commercial, aboriginal and recreational fisheries, archaeological findings, Mi'kmaq Ecological Knowledge Study (socio-economic issues);
- Issues of concern identified by local stakeholders during the planning and design stage of the Project (community issues such as public access for recreational purposes); and
- Gaps in information will be identified and subsequent studies and investigations will be undertaken over the LOM.

3.2 PRELIMINARY POST-CLOSURE LAND USE

Once the mine operation has concluded, the site will be restored to a condition that will provide opportunities for other land use. The final reclamation plans will clearly identify and describe sequential land use objectives that are compatible with surrounding landscapes and existing or established land use. Landscape design and visual assessments will be incorporated into the MCRP.

The preliminary post-closure land use options for the Project are wide ranging and include:

- Natural preservation of the existing habitat on all coastal lands around the Project site that will not be covered by the footprint of the mining operation (*e.g.*, CHPP and ancillary buildings, coal stockpiles, coal waste disposal stockpiles, *etc.*) to provide opportunities for future recreational activities by local residents (*e.g.*, nature trails, bird watching, hiking, *etc.*);
- Preservation of selected ancillary mine buildings and utilities to promote future industrial and/or commercial cottage industries; and
- Ecological restoration of the rejects stockpiles for compatibility with local landscapes.

3.3 PRELIMINARY CLOSURE OBJECTIVES

The preliminary closure objectives identified in the MCRP for the Project include:

- Preserve the existing native habitat along the coastal areas of the site;
- Preserve a native habitat buffer zone between the operational mine operation and the Donkin to Port Morien highway and ecologically important areas (*e.g.*, seabird colonies);
- Reforest buffer zones throughout the reclaimed site;
- Remove mining infrastructure and ancillary buildings not included in the post-closure land use plan, to the extent practical and feasible;
- Develop views that show areas cleared, rejects stockpiles and areas re-vegetated that will be developed on 5-year intervals to plan for progressive reclamation, to the extent practical and feasible;

- Develop an Environmental Management Plan (EMP) that will be refined and tailored for the closure and reclamation phase of the Project;
- Identify and manage acid rock drainage (ARD);
- Develop Option Plans for post-closure land use;
- Identify closure timeframes;
- Identify knowledge gaps and/or monitoring and research requirements;
- Restore acceptable long-term surface water and groundwater flow patterns;
- Rehabilitate disturbed areas;
- Long-term geotechnical and geochemical stability of the rejects stockpiles;
- Confirm stakeholder consultation strategy as part of the MCRP;
- Return land to conditions capable of supporting uses that are equal to or better than prior land use, to the extent practical and feasible;
- Identify post mining risks that could constrain future land use options; and
- Identify necessary approvals for closure.

3.4 PRELIMINARY ENVIRONMENTAL AND REHABILITATION MONITORING

Monitoring on the site will consist of both environmental and rehabilitation monitoring.

Environmental monitoring over the pre- and post- reclamation of the site will include air quality, surface water and groundwater quality, inventory of flora and fauna. The monitoring plan will include a management supervision plan that includes monitoring objectives and monitoring schedules to provide effective implementation of reclamation practices.

Progressively reclaimed areas will be managed in a manner consistent with the reclamation goals for the Project. Following closure, reclamation management on the rejects stockpiles will include the monitoring of vegetation growth and propagation, water quality monitoring and the maintenance of permanent features to optimize public health and safety. Quantitative monitoring will be conducted to illustrate site reclamation performance and will continue until reclamation is complete and compliant with the MCRP.

Re-vegetation success will be monitored following seedbed preparation, potential soil treatment fertility treatment, seeding, mulching and temporary erosion and sediment control measures. Growth, groundcover and species survival will be measured and reported on a regular basis. Inspection will document whether soil covers have maintained integrity and that seeps have not developed in side slopes, that slope stability has been maintained and erosion in the reclaimed area is not affecting down gradient receptors.

3.5 PRELIMINARY CLOSURE AND RECLAMATION PLAN

Reclamation measures to be incorporated into the MCRP for the Donkin Export Coking Coal Project are summarized in the following sections:

3.5.1 Closure of Underground Mining

• Tunnel portals will be sealed.
• The ventilation fans will be dismantled.
• The continuous mining equipment (bolter-miner), load-haul dump vehicles, utility vehicles and the dismantling of the belt conveyor system will be removed.
• Any subsidence where there is a potential risk to the safety of the community will be repaired.
• The existing mine will be re-flooded back to a static level.
• A groundwater strategy will be implemented as appropriate. As the underground mining is at a lower elevation than the adjoining site, effects on groundwater should be negligible.

3.5.2 Coal Handling and Preparation Plant (CHPP) Complex

• Electricity and water to the CHPP complex will be disconnected.
• The CHPP complex will be dismantled including coal feeders, size reduction crushing station, plant feed conveyor with associated weigher and primary sampling facilities, desliming screen and cyclones, DMC module for coarse coal processing, spirals for mid-size coal processing and screen bowl centrifuges for the fine coal processing, dewatering centrifuges, tailings thickener, belt press filters, feed tank and agitators, stackers, and product and rejects conveyors.
• The area where the CHPP complex has been removed will be graded to blend with the existing topography, topsoiled and seeded.

3.5.3 Ancillary Civil Works and Utilities Not Included in the Post-closure Land Use

• Electricity and water to any ancillary building not included in the post-closure land use will be disconnected and services terminated.
• The ventilation building will be demolished.
• All hazardous storage facilities (*i.e.*, surface or underground tanks) will be removed.
• Any redundant drilled or dug wells not included in the post-closure land use will be decommissioned.
• The area where ancillary buildings have been removed will be graded to blend with the surrounding topography, topsoiled and seeded.
• Module buildings or salvageable parts of structures will be reduced into manageable pieces and sold for re-use (*i.e.*, steel. timber, concrete). Items not sold will be placed in an approved landfill.

3.5.4 Ancillary Civil Works and Utilities Included in the Post-closure Land Use

• Any ancillary building including administration buildings, guardhouse, workshops, warehouses and maintenance facilities to be included in the post-closure land use will remain.
• Parking facilities, security fencing, municipal water supply from Donkin, sewage disposal system included in the post-closure land use will remain. The municipality water supply system will be used for post-closure land use (*i.e.*, shower and toilet, drinking water and fire suppression).

3.5.5 Site Runoff

• Site runoff not affected by ARD will be collected by ditches and directed to the cascade aeration and serpentine pond for treatment.

3.5.6 Footprint of the Surface Infrastructure Including Coal Stockpiles

• Concrete foundations and footings associated with the ancillary buildings that were demolished will be broken up to an elevation 0.5 m below grade and the material buried onsite.
• Carbonaceous material from the footprint of surface infrastructure, including coal stockpiles, access and haul roads will be removed and disposed of in the rejects stockpiles.
• Environmental Site Assessments will be undertaken to determine the presence and level of contamination to determine whether or not additional remediation is required.

3.5.7 Roads

• Access roads and the majority of internal haul roads will be maintained as part of the post-closure land use plan.
• Carbonaceous material on these roads will be removed and disposed of in the rejects stockpiles.

3.5.8 Barge Loading Facility and Breakwater

• The load-out wharf may be maintained as part of the post-closure land use plan.
• The breakwater may be maintained as part of the post-closure land use plan.
• The conveyor system between the coal stockpile push out and the barge loader at the loading facility will be dismantled.

3.5.9 Transshipment Facility

• The transshipment barge and associated crane to load the self-unloading bulk carriers will be removed.
• The mooring foundation at depth for the transshipment barge may be left intact.

3.5.10 Land Reclamation

• Toe drains around coal waste disposal piles to collect and direct potential ARD runoff to a treatment facility will be maintained. Coal waste disposal piles will be contoured, capped with low permeable material and re-vegetated to prevent pooling and infiltration of surface water.
• The ARD treatment facility will be maintained as long as required based on the operation, maintenance and refinement of the adopted system, which will be chronicled in the evolution of the MCRP.
• Stable slopes that promote sheet flow and are compatible with the surrounding landscape and control erosion will be established.
• Surface conditions that are conducive to the regeneration of a stable plant community that is compatible with the post-closure land use will be established.
• Native vegetation to encourage a self-sustaining and productive ecosystem on the reclaimed land will be planted.
• An erosion and sediment control plan to divert, intercept and otherwise reduce stormwater runoff from exposed soil surfaces and rejects stockpiles will be implemented.
• Sediment control structures to reduce velocity and treat surface runoff prior to the release to surface water bodies will be installed as required.

3.5.11 Post-Closure Care and Maintenance

• The reclamation monitoring program will be implemented.
• The post-closure care and maintenance plan will be implemented.
• Contingency plans for the management of any residual hazardous materials will be implemented as required.

4.0 Mine Closure Plan

4.1 PLANNING FOR DECOMMISSIONING

The MCRP will provide specific actions and activities to be implemented to decrease the potential for environmental degradation in the long-term during decommissioning and abandonment of temporary facilities and to clearly define XC's ongoing environmental commitments.

Pre-mine planning and mining operations will be undertaken with a view to potential mine closure and decommissioning requirements.

Day to day management will be based on good housekeeping principles including: staff training; regular internal checks and inspections of the water supply, wastewater treatment, electrical,

sewage systems; material/waste audits to detect losses; maintenance of site drainage systems; immediate cleanup of spills; progressive treatment and/or removal of wastes.

Appropriate preventative and management measures will be undertaken during the pre-mine and mining phases to reduce the risk of contamination of soil and groundwater, thus reducing the possible number and scale of future clean-up actions.

The Decommissioning Plan will direct that reclamation and the final decommissioning is properly and effectively programmed and monitored to confirm validation.

The development of an Environmental Management Plan (EMP) for the Project will define XC's ongoing environmental commitments; provide clear instructions regarding procedures for protecting the environment and minimizing potential environmental effects; document environmental concerns and appropriate protection measures associated with the mining activities; provide a reference document for planning and/or conducting specific activities; and communicate changes in the program through a revision process.

Regular inspections will be conducted on the site during closure and decommissioning to assess the effectiveness of re-vegetation, pollution control measures and/or the need for additional environmental protection measures.

4.2 COMPONENTS NECESSARY FOR DECOMMISSIONING

The MCRP will include the required actions associated with components of the site necessary for the implementation of the decommissioning activities such that temporary and/or existing operations are not prematurely terminated.

Refer to Table 1 for an overview of the component activities necessary for successful site decommissioning.

Table 1 Components Necessary for Decommissioning

Components	Required Actions
Site Security	Site Security, as required, will be retained during implementation of the decommissioning activities until completion (*i.e.*, appropriate security while the tunnel portals are being sealed).
Water Supply	The municipal water supply system will be disconnected from all buildings not included in post-closure land use and will remain for shower and toilet, drinking water and fire suppression in all those buildings included in the post-closure land-use.
Electrical Infrastructure	Electrical infrastructure, including pylons, electrical cables and transformers will be dismantled and removed, except for those cases where this infrastructure is to be preserved for post-closure land use or will be used for post-closure monitoring, inspection and maintenance.
Support Infrastructure	Support infrastructure, such as fuel storage tanks, pipelines, conveyors and underground services will be removed, except in cases where it is to be preserved

Table 1 Components Necessary for Decommissioning

Components	Required Actions
	for post-closure use.
Roads	The main access road to the site and the majority of other on-site roads, as appropriate, will be preserved in a sufficient condition for post-closure land use (*e.g.*, public access for approved recreational purposes) or to allow post-closure access for monitoring, inspection and maintenance activities.
Equipment Storage Areas	Equipment Storage Areas will be identified for temporary storage of salvaged mine equipment and machinery from the mine following the cessation of the mining operations. Equipment will be cleaned and stored within the equipment storage areas in preparation for removal from the site. Prior to storage, all equipment and machinery will be inspected for any potential leakages, which will be appropriately contained and treated.
Sewage Disposal System	Buildings not included in post-closure land use will be disconnected from the sewage disposal system, while those systems included in the post-closure land-use will remain intact. Construction of a new more efficient on-site system may be an option.
ARD Treatment Facility	The ARD Treatment Facility will remain in operation for treatment of the acid rock drainage after the cessation of active mining and will require ongoing supervision and maintenance, the extent of which will depend on the treatment and containment system adopted.
Buildings and Foundations	The walls of onsite buildings not included in the post-closure land use will be leveled to 0.5 m below final grade, except where the buildings are to be preserved for post-closure land use. Foundations will be covered with a sufficiently thick layer of soil to support vegetation. Where buildings are to be preserved, the structures will be inspected to confirm there is no contamination. If structures or foundations are contaminated, they will be remediated as necessary to maintain public health and safety for post-closure land use.
Water Management	The final design of the water management system will be dependent upon the outcomes of the final land use study and will be detailed in the final MCRP.

Refer to Figure 1 in Appendix B for an oblique aerial view of the existing site as is (Phase 1).

Refer to Figure 2 in Appendix B for an oblique aerial view of the reclaimed site in approximately 40 years from commencement of mining (Phase 5).

4.3 RESOURCES FOR MINE CLOSURE

The MCRP will include the resources required during the decommissioning and reclamation of the site and the resources necessary for maintaining the integrity of the buildings to be used in the post-closure plan for the site.

Monitoring programs will be designed and implemented during mine closure so that closure activities and any associated environmental effects are consistent with those predicted in the MCRP and to confirm that the objectives of mine closure are being met.

Monitoring should also be conducted mine post closure to confirm that the environmental and rehabilitation measures are functioning as designed in accordance with applicable regulatory requirements and criteria.

Refer to Table 2 for a list of the monitoring responsibilities during mine decommissioning and reclamation of the site.

Table 2 Resources for Mine Closure

Resources	Responsibilities
Xstrata's Project Manager	To oversee closure activities on the ground and to facilitate that closure is undertaken in accordance with the mine closure plan.
Xstrata's Environmental and Community Manager	To see that environmental obligations are met; and necessary environmental reporting is undertaken so that closure activities are undertaken in a safe manner.
Xstrata's Electrical and Mechanical Engineers	To undertake statutory inspections of remaining buildings – assume 1 year from commencement of closure.
Xstrata's Storeman	To manage and account for the remaining inventory on site – assume 6 months from commencement of closure.
Key Xstrata Personnel – Knowledge Retention	Retention of former mine operators that have a long history of the site and a thorough understanding of site issues.
Land Contamination Consultant	To confirm that potential contamination is identified and appropriately treated.
ARD Specialist	To monitor effluent discharge and to facilitate any necessary changes to accommodate ARD treatment in a more cost effective manner.
Demolition Contractor	To acquire appropriate permits for building demolition works.
Geotechnical Engineer	To undertake a design and oversee that the tunnel portals are sealed properly; landform stability; to investigate stability after demolition of the temporary structures on buildings and foundations to remain for post-closure land use.
Environmental Specialist	To provide environmental advice throughout the closure process; conduct surface and groundwater, noise and air environmental compliance monitoring; erosion and sediment control compliance monitoring and environmental effects monitoring.
Rehabilitation Specialist	To oversee that the rehabilitation program meets closure criteria and to facilitate the annual rehabilitation inspections and long- term rehabilitation monitoring (*e.g.*, vegetation, wetlands, watercourses, *etc.*)
Ecological Specialist	To undertake required ecological monitoring on areas that were reclaimed to verify that closure criteria has been meet (*e.g.* fauna, birds, rare or uncommon plants, *etc.*)
Security Firm	During demolition work, security may be required after hours to prevent public access to partially demolished buildings and/or mine openings. To continue security patrols until all assets and infrastructure not included in the post-closure land use have been removed from the site.

4.4 TRANSFER AND CONTROL OF PROJECT COMPONENTS

The conceptual MCRP will identify the ownership, transfer and control of the Project components associated with the site.

Once compliance with the agreed closure completion criteria is achieved, XC will seek to relinquish their ownership of the Donkin Mine property and mining leases in accordance with the XC Mine Closure Planning (Standard 5.12) which involves the following process:

1. Completion of a Closure Report including a compilation of supporting documentation that demonstrates that the closure completion criteria have been met.
2. Meeting with the Mineral Resources section of Nova Scotia Natural Resources (NSNR) to discuss any outcomes of its review of the Closure Report to identify if there are any outstanding issues.
3. The Closure Report may have to be circulated to other relevant government agencies for review depending on the Closure Plan's stakeholder communication strategy.
4. Site inspection of the site by the NSNR. During this process, the Mineral Resources section of Nova Scotia Natural Resources (NSNR) may elect to list potential post-mining constraints that may affect particular types of future land uses on the site.
5. Submission of formal application for the relinquishment of mine leases.

Refer to Table 3 for the potential ownership, transfer and control of the Project components during decommissioning and reclamation of the site.

Table 3 Transfer and Control of Project Components

Components	Potential Transfer, Control, Ownership
Underground Mine	XC will want to relinquish lease of the underground mine property back to NSNR.
Former CHPP Complex Site	Ownership of the footprint of land occupied by the former CHPP complex could be transferred for control and ownership by the Municipality or other stakeholder groups if future land use includes industrial and/or commercial cottage industries.
Ancillary Buildings included in the Post-Closure Plan	Ownership of the footprint of land occupied by the buildings included in the post-closure plan could be transferred for control and ownership by the Municipality or other stakeholder groups if future land use includes industrial and/or commercial cottage industries.
Barge Load Out Facility and Breakwater	Ownership of the breakwater could be transferred to the Municipality or Province for potential future use by local fishery groups and/or recreational users.
ARD Treatment Facility, Reclaimed Land (Waste Rock Stockpiles)	The transfer of control and ownership of the ARD Treatment Facility will be based on the operation, maintenance and refinement of the adopted treatment system, which will be chronicled in the evolution of the MCRP.

5.0 Timelines for Decommissioning Plans

5.1.1 Conceptual MCRP

The Conceptual MCRP will be completed for the Project at the Feasibility/Detailed Design and Execution Phases of the Project in compliance with XC Mine Closure Planning Standard (13.1). The Conceptual Closure Plan will include a Final Landform Plan that includes the final contours, drainage and re-vegetation design along with a rehabilitation schedule showing the progressive rehabilitation at key stages of the Project (*i.e.*, at cessation of mining).

5.1.2 Detailed MCRP

The Detailed MCRP will be based on the approved final land use option(s) identified in the Pre-feasibility Phase and will be developed within two years of the reserve LOM in compliance with XC Mine Closure Standard (13.1) for the approval by the Site and Xstrata Coal.

6.0 Municipal, Provincial and Federal Legislation

The preparation and implementation of the MCRP will be carried out in strict compliance with applicable municipal, provincial and federal Acts, Regulations and guidelines.

Relevant federal legislation includes but is not limited to: the *Canadian Environmental Assessment Act*; the *Fisheries Act*; the *Navigable Waters Protection Act* and the *Marine Act*.

Relevant Provincial legislation includes but is not limited to: the Nova Scotia *Environment Act*; Environmental Assessment Regulations; Activities Designation Regulations; the *Mineral Resources Act* and Solid Waste/Resource Management Regulations.

Municipal requirements include but are not limited to: CBRM Municipal Planning Strategy and Land Use Bylaws.

7.0 References

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APPENDIX A

Flow Chart Showing the Xstrata Mine Closure Planning Process

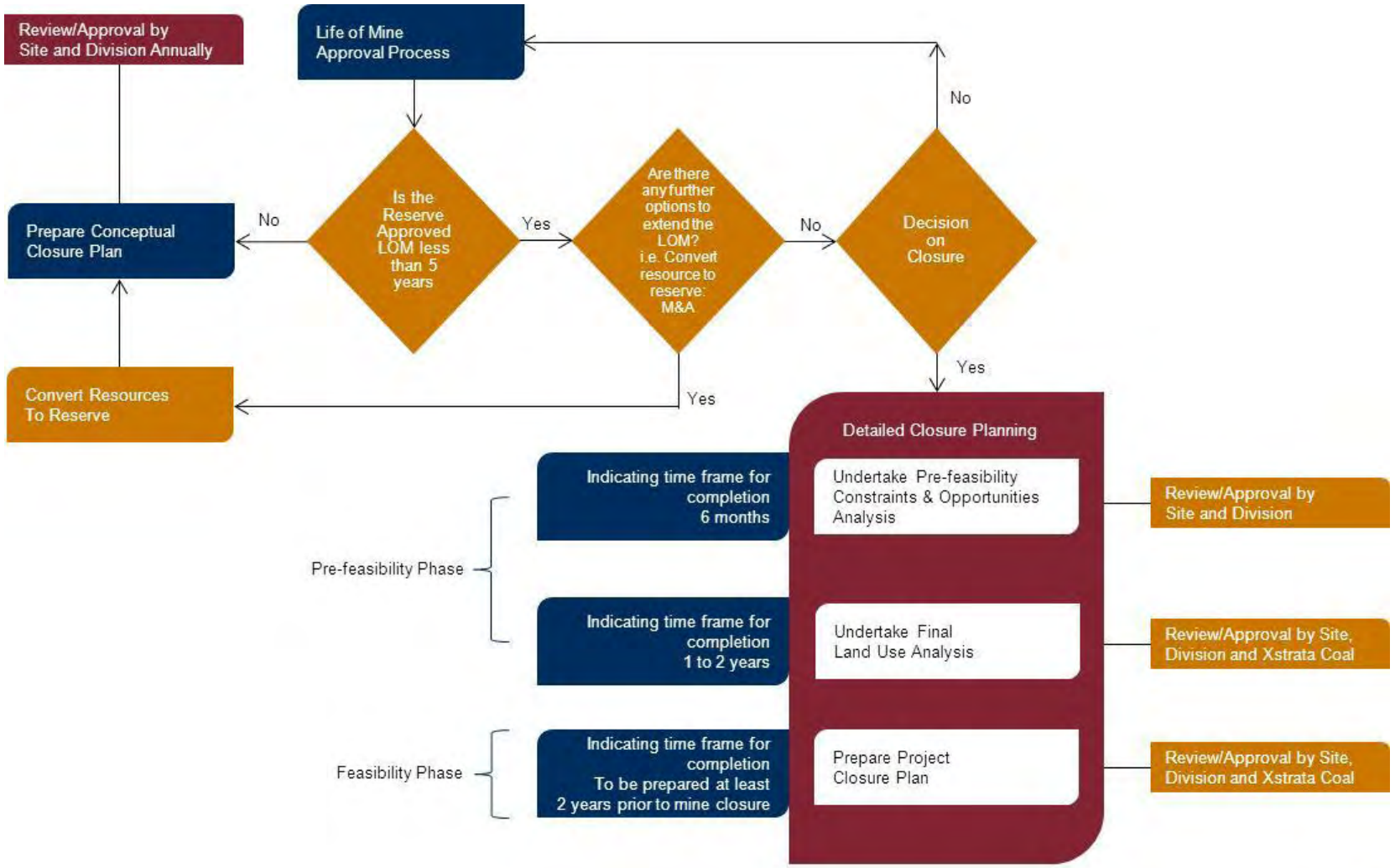

FIGURE 1

Xstrata Coal
Detailed Mine Closure Planning Process

APPENDIX B

Figures of Project Site

Figure 1


CAM06 - Barge Loadout
PHASE 01 - Existing site as is, particularly with respect to existing disturbance made by DEVCO and others (eg. Meteorological Tower)
CONCEPTUAL ONLY – NOTE: NOT A DETAILED REPRESENTATION

Figure 2


PHASE 05 - Full mine closure/post mine, reclamation complete, relevant infrastructure removed, etc (~40 yrs).
CAM05 - Overall View
CONCEPTUAL ONLY – NOTE: NOT A DETAILED REPRESENTATION