AULD'S COVE TRANSMISSION PROJECT

Environmental Assessment Registration Document

March 4, 2016

Nova Scotia Power Incorporated

Nova Scotia POWER An Emera Company

Nova Scotia
POWER
An Emera Company

PO Box 910 • Halifax, Nova Scotia • Canada • B3J 2W5

March 3, 2016

Environmental Assessment Branch
Nova Scotia Environment
PO Box 442, Halifax, Nova Scotia
B3J 2P8

To Whom It May Concern:

Please find enclosed the Environmental Assessment Registration Document for the Auld's Cove Transmission Line Crossing.

The undersigned approves and accepts the contents, as submitted to the Nova Scotia Environment, Environmental Assessment Branch.

Yours truly,

Terry Toner

Terrence Toner
Director Environmental Services – Nova Scotia Power Inc.

Executive Summary

Nova Scotia Power Inc. (NSPI) is proposing to construct a new transmission line crossing over the Strait of Canso at Auld's Cove. The project will involve a physical separation of the 345kV and 230kV lines which currently share the existing double circuit towers at Auld's Cove. The separation of the two lines will protect the system against a potential common tower fault such as a lightning strike, which could create electrical instability with the remaining transmission system. In addition to increasing reliability and protecting the electrical system in Nova Scotia, the development of a new crossing will also increase available capacity for energy from Cape Breton and the Maritime Link, to help NSPI meet provincial renewable energy targets, balance wind generation and strengthen grid connectivity.

The proposed new transmission line crossing, with associated suspension and anchor towers, will be constructed approximately 45 m south of the existing towers.

The project scope involves the construction of six foundations and towers total (three on either side of the Strait) and the installation of two circuits (six wires) similarly configured as the existing crossing.

The Project is considered a Class 1 undertaking under the Nova Scotia Environmental Assessment Regulations and as such, requires a registered Environmental Assessment as identified under Schedule A of the Regulations.

The Environmental Assessments and the registration document have been completed according to the methodologies and requirements outlined in the "Proponent's Guide to Environmental Assessment" (Nova Scotia Environment 2001, updated 2014) and accepted best practices for conducting Environmental Assessments.

The goal for completing the environmental assessment is to identify potential Valued Ecosystem Components (VECs), determine what effects the Project may have on each VEC and develop mitigation techniques that will eliminate, reduce or control any adverse environmental effects.

Various environmental studies and considerations are required to support the Environmental Assessment.

Special focus component studies and considerations were completed for the following VEC's:

- Avifauna;
- Cultural and heritage resources
- Archaeological resources
- Wetlands and watercourses

- General habitat
- Marine benthic habitat and fisheries
- Significant habitats and rare species

Additional VEC’s that have been considered during the assessment process are:

- Terrestrial flora
- Terrestrial fauna
- Visual aesthetic
- Geophysical environment
- Atmospheric environment
- Economy
- Land use and value
- Recreation and tourism
- Human health

Based on the data collected during the component studies and the research conducted for each of the respective VECs, the proponent used the data to develop constraints mapping to ensure, to the extent possible, that avoidance was the first consideration. This data was further used to determine reasonable mitigation strategies to further lower the potential impacts to VECs.

The vast majority of the potential effects on the VECs evaluated were determined to have low to no residual effects based on the activities surrounding the construction, operations and maintenance and decommissioning of the project. Potential impacts on VECs that may result in residual effects will be lowered to an acceptable level with the deployment of appropriate mitigation, best management practices and follow up programs.

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1 Project Information

This section of the Environmental Assessment (EA) report provides a description of the project proponent, a brief overview of the project, and a description of the regulatory requirements. The structure of the overall document is also provided.

1.1 Proponent Description and Background

Nova Scotia Power Inc. (NSPI) currently provides approximately 95 per cent of the generation, transmission and distribution of electricity in Nova Scotia, and serves 500,000 residential, commercial and industrial customers across the province.

NSPI manages $4.1 billion worth of generation, transmission and distribution assets and produces close to 10,000 gigawatt hours of electricity each year.

NSPI utilizes a generation mix including hydro, tidal, wind, coal, oil, biomass and natural gas to produce electricity. Our facilities can generate as much as 2,453 megawatts of electricity at a given time that is delivered across 32,000 km of transmission and distribution lines throughout Nova Scotia.

Nova Scotia's transmission and distribution system consists of 32,000 km of power lines stretching across roughly 29,500 transmission towers, 500,000 distribution poles, and 190 substations to bring electricity from generating stations to customers.

More specifically, about 5,300 km of transmission lines operating at high-voltages from 69 KV to 345 KV bring electricity from generating stations to distribution substations throughout the province.

A critical shift towards renewable energy has come to Nova Scotia in recent years. Led by Provincial Regulations reflecting a public desire for cleaner, renewable electricity, NSPI has been building its renewable energy portfolio to meet renewable energy requirements for 2020, when at least 40% of our electricity will come from renewable sources.

The reconfiguration of the lines and addition of a new transmission crossing at Auld's Cove while providing increased reliability and security for the electrical system, will also increase available capacity for energy from Cape Breton and the Maritime Link. The addition of the new crossing will also help NSPI and Nova Scotia meet renewable energy targets, balance wind generation and strengthen grid connectivity.

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1.2 Purpose of the Project

A four-party agreement was signed in November of 2010 between Emera, Nalcor, The Government of Newfoundland and Labrador, and the Government of Nova Scotia which guaranteed that Nova Scotia would receive 20% of the power originating from Muskrat Falls at a fixed rate for 35 years.

NS Power has been meeting government mandated Green House Gas (GHG) emission reductions through the development of renewable electricity generation within the province. This generation is often intermittent, and requires incremental load balancing and grid connectivity planning.

The current electrical transmission connection between mainland Nova Scotia and Cape Breton Island at Auld’s Cove, includes 345kV and 230kV lines on a single tower infrastructure, which limit the contingencies if there is a physical fault with a tower.

In addition to the existing transmission infrastructure at Auld’s Cove, there are two 230kV lines and one 138kV line which cross the Canso Causeway from Cape Breton Island to mainland Nova Scotia. If the 345kV line and 230kV line sharing the common towers at Auld’s Cove are out of service, the remaining lines do not have sufficient capacity for existing commitments and the anticipated Maritime Link energy volumes.

On June 28, 2015, Atlantic Canadian Premiers reiterated their support of the Muskrat Falls development and underscored the importance of electricity transmission in the region being coordinated and sufficient to allow for the efficient and reliable flow of energy for environmental benefits and trade. Therefore, a second electrical transmission crossing is being proposed across the Strait of Canso (The Project), in order to separate the existing 345kV and 230kV lines sharing the common towers. This will provide additional capacity, redundancy, access to Muskrat Falls electricity for Nova Scotia, and continue to fulfill the requirements of the Nova Scotia Renewable Electricity Standards.

The Maritime Link is part of a comprehensive, long-term and sustainable electrical power management strategy to address the growing demand for more renewable energy.

For Nova Scotia, the Maritime Link will create a more diversified portfolio of energy options, reduce dependency on existing commercial-scale carbon-based generation facilities, and help meet government regulations that require 40 percent renewable energy by 2020.

By providing firm hydroelectric back up generation, the Maritime Link project enables more intermittent renewable energy development and integration in Nova Scotia.

Nova Scotia Power will be spending $40 Million in capital investments to build capacity in transmission to accommodate the Maritime Link volumes. This investment will also provide a second physical transmission connection across the Strait of Canso.

1.3 Regulatory Framework

The Project is subject to a Class I EA as defined by the Environmental Assessment Regulations under the *Nova Scotia Environment Act*. As such, the proponent is required to register the Project with Nova Scotia Environment (NSE) and subsequently comply with the Class I registration process as defined by the "Proponent's Guide to Environmental Assessment" (NSE, 2014a).

An application to Transport Canada under the Navigation Protection Act (NPA) for the crossing of the Strait will be submitted for the project. Permits will also be required from Nova Scotia Transportation and Infrastructure renewal (NSTIR) for the Highway 104 crossing & the overhead wire crossing of the railway.

An application for easements over submerged Crown land between the ordinary high water marks of Archie Pond, Long Pond and the shores of the Strait and two terrestrial parcels on the Cape Breton side of the Strait has also been submitted to Nova Scotia Department of Natural Resources (NSDNR).

1.4 Structure of Document

Table 1.1 outlines the content of each section of the EA report.

Table 1.1 EA Report Structure

Section	Content
Section 2	Project description including an overview of Project location, activities and schedule
Section 3	Scope and methodologies used during the EA process
Section 4	Identification and evaluation of the key components of the project including avifauna, cultural and heritage resources, terrestrial habitat and the marine environment
Section 5	Evaluation of alternatives to the project
Section 6	Other considerations, including geophysical and atmospheric environment and socio-economics
Section 7	Public, First Nation consultation and Municipal consultation
Section 8	Analysis of the effects of the Project on the environment
Section 9	Effects of the environment on the Project

Section 10	Analysis of cumulative effects
Section 11	Follow up measures including environmental protection and monitoring
Section 12	Other approvals required
Section 13	Concluding remarks
Section 14	References
Section 15	Appendices

1.5 Investigators and Authors

Table 1.2 presents consultants and investigators for the Project and authors of the EA report. Credentials are provided in Appendix A.

Table 1.2 List of Consultants/Investigators Main Contacts and Work completed

Company	Main Contacts	Work Completed
Nova Scotia Power Inc.	Glenn Goudey, Stephanie Walsh, Trevor Ford	EA Report
Strum Environmental	Andy Walter, Shawn Duncan, Scott Dickey, Heather Mosher	Avian Assessment
Acadia University	Dr. Phil Taylor, Jake Walker	Avian Radar Assessment
CBCL Limited	Chris Kennedy, Ian Bryson, Carrie Bentley	Wetland and Rare Species Assessment, Marine Aquatic Assessment
Kelman Heritage Consulting	Darryl Kelman	Archaeological Resource Assessment
Membertou Geomatics Solutions	Jason Googoo	Mi'kmaq Ecological Knowledge Study (MEKS)
Hatch	F. Liu, L. Murphy	Submarine Cable Preliminary Cost Estimate, Line Design

2 Project Description

2.1 Project Overview

The transmission reconfiguration calls for the separation of the 345kV line (L-8004) and the 230kV line (L-7005) currently sharing the existing double circuit tower (DCT) at the Auld's Cove crossing.

For a common tower fault (such as a lightning strike), the simultaneous loss of both of these lines, with the additional power flows from the Maritime Link, will result in the remaining transmission system becoming electrically unstable.

The most feasible solution to eliminate the potential for a common tower fault is to build a second crossing, directly adjacent to the existing tower crossing, to physically separate these two (2) lines.

The requirement for the second crossing has been identified as part of the Nova Scotia transmission system upgrades required for the Maritime Link Project.

The existing crossing consists of two (2) double circuit suspension towers, six (6) anchor structures and high strength self-dampening conductor. The span over the Strait of Canso is approximately 1.4 km with additional spans of 1.0 km and 0.7 km to the anchor towers on the adjacent hills.

This new proposed crossing will include a completely integrated design from dead-end structure to dead-end structure, as well as any supporting structures required to reconnect back into existing circuit (L-7005) (Appendix B). The proposed new transmission line crossing, with associated suspension and anchor towers, will be constructed approximately 45 m south of the existing L-7005 / L-8004 structures.

The scope of work required would include structures and foundations at each side of the Crossing and the installation of two circuits (six wires) similarly configured as the existing crossing. Navigational lighting will be installed on the towers and the new lines will incorporate vibration dampers and any navigational marking devices as required by Transport Canada. The crossing will be designed in a manner to minimize the overall footprint and to match up as close as possible with the existing crossing in terms of tower and line height.

One of the two new circuits will be available for future use while the other circuit is to be designed such that it is reconnected back into existing circuit (L-7005). Refer to Appendix B for associated drawings of the existing and proposed crossings showing general arrangements. Also included in Appendix B is topographical information of the existing crossing and adjoining Line Details on each Side of Crossing.

2.2 Geographical Location

The Project spans Antigonish County and Inverness County. The Project centre is located at 5057005.79 N and 622249.37E (NAD83 Zone 20T). The communities of Auld's Cove and Newtown are located within the Project boundary, with the former occurring within the western section of the Project and the latter within the eastern section of the Project. Beyond these two communities, the community of Port Hastings is located approximately 1.5 km from the southern boundary, the Town of Port Hawkesbury and the Town of Mulgrave are each located approximately 6 km from the southern boundary, of the Project.

Highway 104 runs through the western section of the Project, and Highway 19 runs through the Project on the eastern end. A map of the location of the Project is provided in Drawing 2.1.

The railway on the Cape Breton side of the Project, as well as a portion of the peninsular beach on the Nova Scotia side are both designated Restricted and Limited Use Lands by the Nova Scotia Department of Natural Resources (NSDNR). Outside of the Project Boundaries, the Pomquet Beach Provincial Park is located approximately 28 km to the west of the Project and the Bayfield Beach Provincial Park is located approximately 24 km to the west of the Project.

The River Inhabitants Nature Reserve is located approximately 10 km to the east of site; this area is protected under the *Special Places Protection Act* (1981). Additions have been proposed to this nature reserve; however their designation has been delayed until 2020 due to issues relating to mineral rights.

The Paq'tnkek First Nation Reserve is located approximately 23 km to the west of the Project. The Waycobah First Nation Community is located approximately 40 km to the northeast of the Project. The Potlotek First Nation Community is located approximately 50 km to the east of the Project.

A list of all the PIDs involved in the Project can be found in Table 2.1

Table 2.1 List of PID's Involved in the Project

PID	PID	PID
10040023	01253863	50242510
10010015	10050599	50001387
10071553	01253830	50177591
01253863	01253822	50001734
01253855	01253814	
01253889	01254242	
10110286	10052074	
01295773	50240407	

The closest Important Birding Area (IBA) to the Project is the Pomquet Beach Region and it is located approximately 27 km to the west of the Project. The Basque Islands and Michaud Point IBA is located approximately 57 km away to the southeast. Archie Pond, located within the Project boundary, is designated as Migratory Bird habitat by the NSDNR as identified in Drawing 2.2.

Table 2.2 presents the associated GPS coordinates for the proposed towers.

Aulds Cove Transmission Project
Location of Study Area

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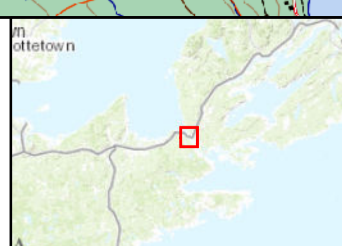
Assessment Area

0 0.5 1 2 3 Km



Date: January 18, 2016
CRS: NAD83 UTM Zone20
Scale: 1:50,000
Sources: NSPI, NSDNR

N

Drawing 2.1

Aulds Cove Transmission Project
Environmental Constraints

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Assessment Area	Species at Risk
Other Habitat	Wetland of Special Significance
Deer Wintering	Protected Beach
Migratory Bird	Wetland

Date: January 18, 2016
CRS: NAD83 UTM Zone20
Scale: 1:25,000
Sources: NSPI, NSDNR;Significant Habitat, Wetland, NSE

N

0 125 250 500 750 m

Drawing 2.2

Engineering design is not finalized at this time, but is anticipated to be very similar to that of the existing crossing. Proposed Structures 3A and 4A are anticipated to be steel lattice transmission towers. Proposed Structures 1A, 2A, 5A and 6A are proposed to be dead end (anchor) structures.

Table 2.2 GPS Coordinates of Proposed Tower Locations

Structure Number	X Easting (m)	Y Northing (m)	Centerline Z Elevation (m)
Proposed 1A	620894.036	5056240.392	75.26
Proposed 2A	621015.538	5056306.792	57.91
Proposed 3A	621777.399	5056723.143	1.80
Proposed 4A	623053.623	5057420.591	10.70
Proposed 5A	623542.960	5057688.010	73.20
Proposed 6A	623611.372	5057725.422	82.30
Existing Structure 1	620872.187	5056279.732	75.29
Existing Structure 2	620993.853	5056346.224	57.92
Existing Structure 3	621755.835	5056762.648	1.08
Existing Structure 4	623031.940	5057460.042	10.70
Existing Structure 5	623520.960	5057727.292	73.47
Existing Structure 6	623589.762	5057764.893	82.30

2.3 Project Activities

General Activities

The use of provincial roads during the construction, operation and decommissioning phases of the Project will be in compliance with the "Nova Scotia Temporary Workplace Traffic Control Manual (2009)". All required permits and approvals will be obtained prior to construction.

Potential site services required prior to and during construction include:

- Staging and storage facilities;
- Temporary offices;
- Temporary sanitary facilities;
- Utilities and communications; and,
- Garbage collection and off-site disposal.

Activities that are weather dependent (e.g. steel delivery and erection) will be scheduled to occur during optimal time frames to minimize the potential for delay. For example, the delivery of the tower steel will occur outside of the spring weight restrictions, which are pursuant to Subsection 20(1), Chapter 371 of the Revised Status of Nova Scotia, *The Public Highways Act* and published by the Nova Scotia Transportation and Infrastructural Renewal (http://novascotia.ca/tran/trucking/springweight.asp). The timing and duration can change annually based on weather conditions, as such delivery will be scheduled between May and December and the spring restrictions will be reviewed prior to transport if it is occurring close to typical spring closure months.

General activities required for construction of the Project are:

- Vegetation clearing and site preparation;
- Possible upgrades to access points;
- Lay down and storage area(s);
- Foundations construction;
- Tower assembly;
- Tower erection; and,
- Stringing of conductor.

Clearing and construction activities will be carried out in accordance with all applicable provincial and federal regulations and requirements and following the NSPI Environmental Protection Plan (EPP) for clearing and construction of the line and the NSPI *Contractor Environmental Requirements Handbook*.

<u>Site Preparation</u>

In order to prepare for construction, several activities have or will be completed, including:

- Land surveys and confirmation/acquisition of required easements;
- Geotechnical investigations;
- Development and implementation of an Environmental Protection Plan (EPP) including an Erosion and Sediment Control Plan.
- Placement of erosion and sedimentation control measures;
- Installation of any temporary bridges, stream crossings or other mitigation controls; and,
- Clearing of trees and grubbing areas for construction.

Required vegetation clearing will occur outside of the bird nesting season, unless an approved mitigation plan has been agreed to by NSE, NSDNR and the Canadian Wildlife Service (CWS).

The majority of clearing will be carried out via machine. However, in areas of increased environmental sensitivity such as wetlands, the areas will be assessed by the contractor as well as the NSPI environmental representative and appropriate mitigation measures will be applied. If necessary, these areas will be cleared by hand.

Construction

The existing Auld's Cove crossing consists of two (2) double circuit suspension towers, six (6) anchor structures and high strength self-dampening conductor. The span over the Strait of Canso is approximately 1.4 km with additional spans of 1.0 km and 0.7 km to the anchor towers on the adjacent hills.

This new proposed crossing will include a completely integrated design from dead-end structure to dead-end structure, as well as any supporting structures, to reconnect back into existing circuit (L-7005). The proposed new transmission line crossing, with associated suspension and anchor towers, will be constructed approximately 45 m south of the existing L-7005 / L-8004 structures.

The scope of work required would include structures and foundations at each side of the Crossing and the installation of two circuits (six wires) similarly configured as the existing crossing.

Existing roads and established access points will be used in order to minimize the amount of land disturbance. These areas may require upgrading to facilitate construction.

Any material removed for road construction/maintenance will be stored or disposed of in accordance with regulations and best practices for road construction. Any material stored on site will be accompanied with appropriate erosion and sedimentation control measures, or reused. Prevention of erosion and sedimentation will be considered at all times in proximity to marine and freshwater environments. If access routes and/or construction activities pose a risk of siltation to wetlands and/or watercourses, an ESC plan will be developed and implemented prior to any disturbance.

Tower Foundations

A geotechnical assessment has occurred at each tower foundation location to determine the design requirements, to establish bedrock and overburden depth, and to complete bedrock/soil material sampling. General activities during foundation construction may include:

- Removal of trees;
- Installation of erosion and sedimentation control measures;
- Removal of overburden;
- Blasting of bedrock (to be determined);
- Excavation of soils;
- Pouring and curing of concrete;

- Placement of competent soils for grading purposes; and,
- Compaction of soils.

Any wash water from the cleaning of the concrete trucks will be disposed of on-site using standard industry practices and following environmental regulations/guidelines for the protection of watercourses and wetlands.

All soils removed during the excavation phase will be stored according to provincial regulations and best practice guidelines. Any soil needed for backfilling after the foundation has been poured will be stored temporarily adjacent to the excavations until needed. Any remaining excavated material will be used on site or removed and sent to an approved disposal facility. Prior to excavation activities, erosion and sedimentation control measures will be deployed and assessed on a regular basis. All control measures will be maintained to ensure protection of watercourses and wetlands.

Tower Assembly and Erection

Given the size of the towers and location, it is anticipated that the tower will be assembled to the extent possible off site, delivered and then constructed on site through the use of cranes and a helicopter.

Crane and landing pads will be required, however it is anticipated that existing laydown areas will be used. Should additional earthworks be required for the landing and crane pads, any material removed will be stored or disposed of in accordance with regulations and best practices. Any material stored on site will be accompanied with appropriate erosion and sedimentation control measures, or reused.

Stringing of Conductor

Stringing is anticipated to occur through the use of ropes and tensioners and possibly a helicopter. A designated landing pad, most likely an existing laydown area, will used on site.

Removal of Temporary Works and Site Restoration

Once construction of all phases has been completed, all temporary works will be removed. Excess soil and gravel will be used on site as required, or disposed of at an appropriate facility. All areas will be appropriately graded and erodible soils will be stabilized. Once stabilized, temporary erosion and sedimentation controls are removed. Attention will be paid during site reinstatement to ensure areas will promote wildlife return to the area, to the extent possible.

<u>Commissioning</u>

The commissioning phase of the project will consist of the following:

1. Mechanical inspection including Factory Acceptance Test (FAT) of towers and conductor prior to delivery and installation.
2. Quality control tests, as applicable, including a climbed inspection carried out by the contractor and NSPI. All rock anchors shall be tested to 80% of the guaranteed ultimate tensile strength. Applicable concrete slump tests will be performed to confirm consistency of concrete.
3. The lines will be energized with acceptance, signoff and handover of the lines (L-8004 and L-7005) to the NSPI Energy Control Center (ECC).

<u>Operations and Maintenance</u>

Various Environmental Protection Procedures are required to ensure that right of way (ROW) practices used by NSPI and those working on behalf of NSPI address all relevant acts and regulations, meet environmental due diligence requirements, and meet all company commitments to government, the public, and landowners.

NSPI document *ENV-014 Environmental Protection and ROW Management* outlines the environmental planning and activities required for maintenance and management of transmission and distribution lines throughout the province.

The document in conjunction with various NSPI Environmental Services "Technical Specification Procedures" address the identified VEC's as well as:

- The required environmental planning associated with construction and maintenance activities for T&D infrastructure including:
  - Environmental protection measures associated with watercourses and temporary bridging
  - Environmental protection measures and strategies associated with wetlands
  - Erosion and sedimentation control procedures and techniques
  - Working around fresh, salt and navigable water

During the life span of the Project (estimated to be 80 to 100 years), line inspections which are carried out on a set schedule, will be required. Much of the line inspection work is completed by helicopter with actual on the ground inspections completed once every 3-5 years. Ground inspections can be completed by travelling the right of way with an ATV or on foot if necessary to avoid sensitive wetland areas and/or watercourses. Operational maintenance, as identified through the inspection program and vegetation management activities, will be required as needed to ensure the safe and reliable operation of the line and reliable delivery of electricity. Efforts are made with the NSPI vegetation management program to leave all compatible vegetation which does not pose a risk to the line.

Once the line is in the operational phase, the ongoing maintenance and management will be the same as what is currently experienced with the existing crossing at Auld's Cove.

During the operational phase, Valued Ecosystem Components (VECs) may be monitored, as required by NSE. The VECs to be monitored will be specified within the EA Approval and plans will be developed per the terms and conditions.

Decommissioning

The Project currently has a project life span estimated to be 80 to 100 years. A decommissioning plan will be completed and submitted to NSE in an appropriate time frame to ensure removal of all structures are within the EA approval terms and conditions.

Generally, decommissioning will follow the same steps as construction:

- Towers will be dismantled and removed from the site;
- Tower foundations will be removed to below grade and top soil will be reinstated to ensure stabilization of the land;
- Internal roads and site entrance, if not required for forestry purposes, will be removed. If removed, land will be reinstated and stabilized; and,
- All other equipment will be removed and all land will be instated and stabilized.

2.4 Project Construction Schedule

Table 2.3 presents the Project schedule from EA approval to Project decommissioning. The Project schedule is subject to change due to changes in RFP deadlines and other seasonal restrictions (i.e. spring weight restrictions, etc.).

Table 2.3 Project Schedule

Project Activity	Scheduled Start	Duration
Environmental Assessment Approval	Spring 2016	N/A
Engineering Design	December 2015	4 months
Clearing	Fall 2016	1 month
Construction (spring weight restrictions will be taken into account prior to detailed construction schedule)	Winter 2016	8 months
Commissioning	Summer 2017	2 months

Operations	End of Summer 2017	80-100 years
Decommissioning	End of 2098	N/A

Commissioning of the Project in the summer of 2017 is critical to ensure the provincial transmission system is prepared for the safe, reliable and efficient transfer of energy from Muskrat Falls and the Maritime Link.

3 Project Scope and Methodology

3.1 Assessment Scope

An Environmental Assessment (EA) is a planning tool used to predict the environmental effects of a proposed project, identify measures to mitigate adverse environmental effects, and to predict whether there will be significant adverse environmental effects after any required mitigation is implemented.

The purpose of EA is threefold:

- To minimize or avoid adverse environmental effects before they occur;
- To promote sustainable development by protecting and conserving the environment; and
- To incorporate environmental factors into decision making.

To ensure the registration document complies with all requirements under Section 9(1A) of the NS *Environment Act*, the following information has been considered:

- Name, location and identification of proponent;
- Nature of the undertaking;
- Purpose and need of the undertaking;
- Proposed construction and operation schedules;
- Description of the undertaking;
- Environmental baseline information;
- All steps taken by the proponent to identify and address concerns of the public and Aboriginal people;
- A list of all concerns regarding the undertaking expressed by the public and Aboriginal people;
- A list of approvals which will be required and other forms of authorization; and
- Sources of any public funding.

In addition to the requirements of the NS *Environment Act*, the registration document has been prepared using the following provincial guideline:

- "A Proponent's Guide to Environmental Assessment", published by the Environmental Assessment Branch of NSE and revised in 2014 (NSE, 2014a).

3.2 Assessment Boundaries

The assessment boundaries for this project are shown in Drawing 2.1. For the purposes of the Auld's Cove Environmental Assessment, the boundaries of the project assessment area, include areas assessed for potential environmental interactions during construction, operation and decommissioning of the project. The primary assessed project area is 61.4 ha, and due to the nature of the project the area is roughly rectangular in shape.

A projects potential Valued Ecosystem Components (VECs) dictate the assessments required, identifying areas or resources with the potential to be altered or impacted, due to the construction, operation or decommissioning of the proposed project.

Given the nature of the project area for the transmission line, there are no definitive landscape or anthropogenic features, except to the north of the area, where the existing power lines, towers and associated right of way, comprise the approximate project boundary.

Both highway 104 and highway 19, cut through the assessment area and would therefore have formed assessment boundaries of their own, not having been assessed for biological features.

The project assessment boundary encompasses parts of, or the entire area of Property Identification Number (PID) parcels. 15 PIDs on the mainland side and four (4) PIDs on the Cape Breton side are present within the project area;

- Northern boundary PIDs are 01253889, 01253855, 10050599, 50001387, and 50177591;
- Southern boundary PIDs are: 10071553, 10010023, 0110286, 01253814, 50001387, and 50001734;
- The project boundary to the west is just after Tower Road;
- The project boundary on the east side of the strait, is in proximity to where the transmission right of way (ROW) separates, with transmission line L-8004 continuing east and transmission line L-7005 heading south.

As part of the environmental assessment, the surrounding area including the Canso Causeway, were also assessed, particularly for the avian components of the EA.

3.3 Assessment Methodology

The EA process involves:

- Identification of VECs that may potentially be affected, either negatively or positively, by the proposed project;
- Determination of activities associated with the project that may interact with identified VECs;
- Determination of mitigation measures that may reduce or eliminate potential negative effects;
- Evaluation of potential residual effects; and
- Development of follow-up measures to monitor residual effects.

Potential Project / VEC interactions were discussed and analyzed as part of the effects assessment. Interactions are associated with specific activities that generally take place during the site preparation/construction, operation/maintenance and decommissioning phases of the project.

The process for identifying VECs begins with high-level, small scale evaluation of the Project area, using various data sources such as desktop searches of species at risk records, and provincially identified wetlands and habitat mapping. This information, once combined into a report, determines the field studies and schedule required, and helps generate the preliminary VECs.

In order to complete the Environmental Assessment for this project, several site assessments were completed; the methodologies for these assessments are given in detail in the related appendices at the end of this document.

In some instances, such as the Atlantic Canada Conservation Data Centre (AC CDC) data search for rare species records, an area surrounding the project area was assessed. In this instance, areas of 5 km and 100 km from the Project center point were examined for species at risk presence, using both historical and recent observation data. However, where a species was sedentary in nature, only those actually falling within the project area were considered further.

All biological assessments involved project site visits, walking through, or observing the area, using relevant scientific methods specific to that assessment. In the case of the MEKS, local and Provincial First Nations communities and organizations are consulted. In this instance, traditional knowledge of Elders was sought, rather than using scientific methodologies.

Other assessments, where required, were completed using research and data collection methods, without a dedicated field component.

3.4 Valued Ecosystem Components (VEC's) Selection

The potential VECs were identified as discussed in Section 3.3, mainly with desktop studies, further studies were then conducted where necessary, to confirm if the potential VEC was of concern to the project. See table below, for the potential VECs and studies conducted.

Table 3.1 List of Potential VEC Assessments and Corresponding Section of Report

Potential VEC	Study/Assessment	Date Completed	Reference
Wetlands and Watercourses	Preliminary Assessment (Desktop)	June, 2015	Section 4.3.1 Appendix G
	Wetland Delineation (Field)		
	Watercourse assessment (Field)		
Significant Habitats and Rare Species	Preliminary Assessment / Data Search (Desktop)	April – June, 2015	Section 6.2.1
	Species at Risk Habitat Potential Assessment (Field)	June, 2015	Section 6.2.1 Appendix G
Avifauna	Preliminary Assessment (Desktop)	April, 2015	Section 4.1 Appendix C
	Project specific avian powerline interaction studies (Field)	November, 2015	Section 4.1.2 Appendix C & D
	Local area avian powerline interaction studies (Field)	November, 2015	Section 4.1.2 Appendix C & D
General wildlife / Terrestrial Fauna	Preliminary assessment (Desktop)	April, 2015	Section 6.0
	General observations during site assessments (Field)	June, 2015	Section 6.0
General habitat	Preliminary Assessment (Desktop)	May, 2015	Section 4.3.2 Figure 4.5
	General observations during site assessments (Field)	June, 2015	Section 4.3.2
Cultural and Heritage Resources	Archaeological Assessment (Field and Desktop)	June – July, 2015	Section 4.2.1
	MEKS	Ongoing	Section 4.2.3
Marine	Marine Benthic Habitat and	December	Section 4.4

Environment	Fisheries (Field and Desktop)	2015	Appenidx H
Terrestrial Flora	Wetland and Rare Species (Field and Desktop)	June, 2015	Section 6.1 Appendix G
Geophysical Environment	Research and data collection (Desktop)	N/A	Section 6.3
Atmospheric Environment	Research and data collection (Desktop)	N/A	Section 6.4
Economy	Research and data collection (Desktop)	N/A	Section 6.5.1
Land Use and Value	Research and data collection (Desktop)	N/A	Section 6.5.2
Recreation and Tourism	Research and Data collection (Desktop)	N/A	Section 6.5.3
Human Health	Research and Data collection (Desktop)	N/A	Section 6.5.4

The identification of specific VECs, such as wetlands, watercourses, cultural resources and archaeological high potential areas facilitated the planning of constraints for the project footprint. The development of detailed mapping resulted in constraints layers, and an understanding of environmental and cultural requirements for preferred infrastructure placement.

Identification of buffering and setback distances, in order to avoid significant areas, and therefore, eliminate the need for mitigation for specific features or resources is possible through constraint mapping.

4 Key Components and Evaluation

Based on desktop research and investigation, including review of provincial mapping and databases, expertise from consulting companies and the project team and field assessment, the following VECs have been selected as having the most potential for interaction with the project:

- Avifauna
- Cultural and Heritage Resources
- Archaeological Resources
- Wetlands and Watercourses
- General Habitat
- Marine Benthic Habitat and Fisheries
- Significant Habitats and Rare Species

4.1 Avifauna

4.1.1 Overview

The Strait of Canso provides a migratory pathway for bird species, specifically those following coastal routes to winter in areas south of Nova Scotia. Cormorants, terns and gulls tend to nest in coastal colonies often amidst one another, where access to an abundant fish supply is present (NSDNR 2013). Each year, Atlantic Saury migrate from the Gulf of St. Lawrence to the eastern seaboard of the United States in late fall/early winter (Chaput and Hurlburt 2010). Because of the physical barrier created by the construction of the Canso Causeway, dense congregations of Atlantic Saury are found each year along the northern portion of the Causeway (Canadian Heritage Information Network 1998). This annual influx of fish-stocks tends to attract a large abundance of birds to the area.

To support the Environmental Assessment, a comprehensive avian assessment, including a multitude of field studies, was conducted at the project location of Auld's Cove as well as the surrounding area, including the Canso Causeway. These avian field studies ran from April 2015 to October 2015. The primary objective of the studies was to characterize avian composition and behavior in the study area, particularly at the project location of Auld's Cove. An evaluation of trends and utilization of the site by avian populations in the area, enables an evaluation of potential impacts or risk to the avian community as a result of the planned transmission project across the Strait of Canso.

4.1.2 Field Surveys

A variety of survey protocols and methodologies were utilized to comprehensively evaluate the avian community within the study areas. Studies included passerine migration surveys, diurnal movement surveys, seabird and shorebird nesting and breeding surveys, nocturnal activity surveys, acoustic monitoring, an avian radar assessment and infrastructure interaction analysis. Additional information related to completed studies can be found in (Section 5.0 - Appendix C) and in Table 4.1 below.

Table 4.1 Survey Program Methodology

Survey Type	Survey Methodology	Data
Passerine Migration	• Standardized area search methodology • Three surveys conducted through May and June 2015 • 36 standardized area searches conducted at 12 locations • Surveys conducted within 4 hours after sunrise	• Species composition and abundance • Behavioral activities, breeding evidence

Diurnal Movement	• Watch Count Methodology • 50 surveys conducted at Auld's Cove from April-October 2015 • 32 surveys conducted at the Canso Causeway from July to October 2015 • Surveys split evenly between morning and evening • Completed at suitable vantage points for each location	• Species composition and abundance • Behavioral activities and diurnal movement patterns • Interactions and responses to transmission infrastructure
Seabird and Shorebird nesting and Breeding	• Watch Count Methodology • 10 surveys in total (6 hour durations) conducted from early July to mid-September • Survey areas consisted of Archie's Pond and Long Pond	• Species composition and abundance • Behavioral activities including nesting and breeding
Nocturnal Activity	• Employed modified version of Watch Count Methodology • Auditory observations recorded by expert birder and visual observations made using thermal imaging monocular • 6 surveys conducted throughout October completed at Auld's Cove	• Species composition (where possible) • Species behavior • Interactions and responses to NSPI infrastructure
Acoustic Monitoring	• Monitors placed at three locations within the Auld's Cove and Canso Causeway study areas • 10 minute recordings from every hour between 10pm and 5am daily • Activity levels assessed for 3 randomly selected nights/week from early June to late October • Species composition and flight call classification conducted for three randomly selected nights every second week from June to late October	• Avian acoustic activity level • Species composition (where possible) • Call type classification
Infrastructure Interaction	• Watch Count (August-October 2015) • Three days/week, 6-8 hours per day (286 hours of monitoring	• Avian interactions with transmission infrastructure

	time total) • Suitable vantage point at Auld's Cove location	
Radar Assessment	• Recorded bird movements related to the transmission lines at Auld's Cove and the Canso Causeway.	• Data used to describe volume, direction and altitude of presumed bird targets

4.1.2.1 Diurnal Passage Surveys

Diurnal watch count surveys (EC 2007) were used during a total of 50 surveys at Auld's Cove between April and late October 2015. A further 32 diurnal movement surveys were completed at the Canso Causeway location during early July to late October 2015. These surveys collected data on the movement patterns of birds in the area, and assessed how the birds interacted with NSPI infrastructure. Full methodology can be found in Appendix C.

A total of 14,613 birds were observed at Auld's Cove; 2,077 in spring; 3,829 during summer; and 8,435 in the fall. Of these birds, 5,299 were observed during evening surveys and 9,042 during morning surveys. Abundance of birds during winter months is expected to be low, so no winter surveys were completed.

Of those that could be identified to species, observations were categorized into 60 different species, with the most frequently observed being Double-crested cormorant (37%), Bonaparte's Gulls (20%) and common Terns (15%). Table 4.2 below shows more details of observations, arranged into Guilds.

Table 4.2 Total Number of Observed Birds by Guild During Diurnal Passage at Auld's Cove

Guild	Total Number observed	Percentage	Number of Species
Cormorants	5448	37%	1
Gulls	5044	35%	8
Terns	2199	15%	4
Sea Ducks and Waterfowl	805	6%	15
Northern Gannet	641	4%	1
Passerines / Raptors	352	2%	18
Shorebirds	116	1%	10
Seabirds	8	<1%	3

The height of birds crossing the Auld's Cove lines was divided into specific categories related to the existing transmission infrastructure:

- Skimming the water;
- Well below lines;
- Just below lines;
- Through lines;
- Just above lines; and
- Well above lines

The trends in heights that birds crossed the lines were generally consistent from season to season. The vast majority (87.4% +/- 0.9%, 95% CL) of birds were observed to fly well below the lines or skim the water. The number of birds observed to be skimming the water as they passed by the lines was almost exclusively due to the behavior of the Double-crested cormorants, which were by far the most abundant species identified during the surveys (37% of all birds observed). 75% of Double crested cormorants observed were noted as skimming the water. Notably, only 10.1% of all species observed passed either just below or just above the lines and only 1.0% (+/- 0.2%, 95% CL) passed through the lines at Auld's Cove. No mortality events or collisions were observed at Auld's Cove during the field assessment.

Movement patterns were documented for all birds, both travelling in flocks and individually as they passed across the existing power lines during diurnal surveys at Auld's Cove. Full detailed results can be found in Appendix C; however, of note, is that the birds that consistently crossed through, just below, or just above the power lines were larger gull species (e.g. Herring gull and Great Black-backed gulls). They generally crossed singularly or in small groups of up to 5 individuals.

A relatively equal number of birds crossed the Auld's Cove power lines over Long Pond (east cove), and over the three areas of the Strait of Canso (center east, center and center west). These trends varied seasonally as a result of varying bird species using the area. Very few birds were observed to have crossed the lines overland on either side of the Strait (far-east and far-west); see Figure 3, Appendix C for more details.

In comparison with Auld's Cove, a total of 12,715 birds were observed at the Canso causeway during the Diurnal surveys, between the beginning of July and the end of October 2015; with 4,869 in summer and 7,846 in the fall. Of these birds, 5,596 were observed in the evening and 7,119 in the morning. A total of 55 species were observed at the Canso Causeway, with Double-crested Cormorant (73%), Common Terns (6%), Herring Gulls (5%) and Great Black-backed Gulls (5%) being the most commonly observed species. Table 4.3, below illustrates the percentage observations of birds in Guilds.

Table 4.3 Total Number of Observed Birds by Guild During Diurnal Passage at the Canso Causeway

Guild	Total Number observed	Percentage	Number of Species
Cormorants	9254	73%	1
Gulls	1795	14%	6
Terns	700	6%	1
Sea Ducks and Waterfowl	288	2%	12
Northern Gannet	198	2%	1
Passerines / Raptors	344	3%	21
Shorebirds	108	<1%	8
Seabirds	17	<1%	4

Movement patterns of the birds were observed and recorded for each bird that passed across the power lines during the diurnal surveys. Full details and analysis can be found in Appendix C; however it should be noted that proportionately more birds flew through, just above or just below the lines at the Canso Causeway than at Auld's Cove, which may be due to the presence of the causeway itself as well as the lower height of the power lines. The majority of birds (55% +/- 0.9%, 95% CL) were observed to cross the Canso Causeway well below the lines. 36.3% of all birds were identified as crossing just above or just below the lines and only 3.0% (+/- 0.3%, 95% CL) of total birds observed crossed through the power lines which further indicates avoidance behavior. Another reason for the larger number of birds passing just below the wires (23.1%), is undoubtedly due to the large numbers of cormorants in the area. Cormorants, which typically skim the water (as seen at Auld's Cove), are unable to do so at the Causeway as they are forced upwards by the physical barrier.

The majority (approximately 79%) of the birds at the Canso Causeway crossed the power lines in the center east, and generally, to the immediate southwest of the tower at Balache Point, where the power lines are highest. Approximately 15% crossed at the center of the causeway, other areas had significantly lower numbers of crossings (see Table 6, Appendix C for more details).

Table 4.4, below illustrates the similarities and differences between bird guild crossings at the Auld's Cove power line (April to late October) and those crossing at the Canso Causeway (July to late October). In both instances, cormorants are the most frequently observed species, followed by gulls. The profile is generally very similar except for the percentages of each observed, which could in part be due to the Canso Causeway surveys not starting until July.

Table 4.4 Guild Comparisons Auld's Cove to Canso Causeway

	Auld's Cove			Canso Causeway		
Guild	**Total Number observed**	**Percentage**	**Number of Species**	**Total Number observed**	**Percentage**	**Number of Species**
Cormorants	5448	37%	1	9254	73%	1
Gulls	5044	35%	8	1795	14%	6
Terns	2199	15%	4	700	6%	1
Sea Ducks and Waterfowl	805	6%	15	288	2%	12
Northern Gannet	641	4%	1	198	2%	1
Passerines / Raptors	352	2%	18	344	3%	21
Shorebirds	116	1%	10	108	<1%	8
Seabirds	8	<1%	3	17	<1%	4

At both Auld's Cove and the Canoe Causeway it was observed that the movement of birds was generally North to South in the evening and South to North in the morning. Numbers fluctuated at various times of year due to feeding, migrating and breeding variations; however the general movement appeared to remain the same.

4.1.2.2 Coastal Pond/Shorebird Surveys

Seabird and shorebird surveys used the Watch Count Methodology (EC 2007). A total of ten (10) surveys were conducted from early July to mid-September, to assess the abundance and diversity of seabirds and shorebirds utilizing habitat features in the area during the breeding season. For full methodologies refer to Appendix C.

Key coastal habitats in the Strait of Canso area were surveyed to characterize the seabird and shorebird community. Survey areas focused on two coastal ponds, Long Pond and Archie's Pond, on the eastern and western shorelines of the Strait of Canso respectively.

An active Common Tern colony was observed on an island in the middle of Long Pond and nesting had already started for 20-30 pairs when the surveys began in July. Tern activity increased into August, as juveniles appeared, and was then followed by decreasing population counts into September, until Terns were absent during surveys on September 24th.

Twenty four (24) bird species were recorded at Archie's Pond during these surveys, including spotted sandpipers (*Actitis macularis*) and Willets (*Tringa semipalmata*) in early July; however breeding was not confirmed for either species.

Thirty two (32) species were observed in the vicinity of Long Pond during the seabird and shorebird surveys, with spotted sandpipers confirmed as breeding.

Table 4.5 SOCI at Long Pond and Archie's Pond

Common Name	Scientific Name	Archie's Pond	Long Pond
Greater Yellowlegs	*Tringa melanoleuca*	Yes	Yes
Killdeer	*Charadrius vociferous*	Yes	No
Savannah Sparrow	*Passerculus sandwichensis*	Yes	Yes
Semipalmated Sandpiper	*Calidris pusilla*	Yes	Yes
Spotted Sandpiper	*Actitis macularius*	Yes	Yes
Tree Swallow	*Tachycineta bicolor*	Yes	Yes
Whimbrel	*Numenius phaeopus*	Yes	No
Willet	*Tringa semipalmata*	Yes	Yes
Arctic Tern	*Sterna paradisaea*	No	Yes
Chimney Swift	*Chaetura pelagica*	No	Yes
Red Knot	*Calidris canutus*	No	Yes

Table 4.5 shows that a total of eleven (11) Species of Conservation Interest (SOCI) were observed during the coastal bird surveys, full details of the species found in each pond and SOCI observed, can be found in Appendix C.

4.1.2.3 Passerine Surveys

Passerine migration surveys used the Standardized Area Search methodology (EC 2007) and were conducted in May and June 2015, to identify critical breeding habitat which may be impacted by the new infrastructure. Full methodologies can be found in Appendix C.

A total of 53 species, comprising 488 individual birds were observed during the passerine surveys. However, passerine species were also observed during other, non-passerine specific surveys at Auld's Cove and the Canso Causeway, resulting in a total of 67 passerine species during the entire survey period.

A number of passerine species which are also Species of Conservation Interest (SOCI) where identified and are summarized in Table 4.6 below. The complete table and full lists of species and their locations, can be found in Appendix C.

Table 4.6 Passerine SOCI Identified in all Bird Surveys

Common Name	Scientific name	SARA Status	NSESA Status	NS DNR Status	COSEWIC Status
Bay-breasted Warbler	*Dendronica castanea*	Not Listed	Not Listed	Sensitive	Not Listed
Chimney Swift	*Chaetura pelagica*	Threatened	Endangered	At Risk	Threatened
Eastern Kingbird	*Tyrannus tyrannus*	Not Listed	Not Listed	Sensitive	Not Listed
Golden-crowned Kinglet	*Regulus satrapa*	Not Listed	Not Listed	Sensitive	Not Listed
Killdeer	*Charadrius vociferous*	Not Listed	Not Listed	Sensitive	Not Listed
Olive-sided Flycatcher	*Contopus cooperi*	Threatened	Threatened	At Risk	Threatened
Pine Siskin	*Spinus pinus*	Not Listed	Not Listed	Sensitive	Not Listed
Ruby-crowned Kinglet	*Regulus calendula*	Not Listed	Not Listed	Sensitive	Not Listed
Rusty Blackbird	*Euphagus carolinus*	Special Concern	Endangered	May Be At Risk	Special Concern
Savannah Sparrow	*Passerculus sandwichensis*	Not Listed	Not Listed	Secure	Not Listed
Tree Swallow	*Tachycineta bicolor*	Not Listed	Not Listed	Sensitive	Not Listed

The habitat identified during breeding bird surveys was primarily middle aged to mature mixed wood forest stands, with regenerated hardwood and softwood under the existing power line corridor. No critical habitat for SOCI was identified. Further discussion of the above noted SOCI is included in (Appendix C – Section 6.7)

During the Auld's Cove surveys, 1490 passerine birds (67 species) were identified, the most abundant being American Crow (*Corvus brachyrhynchos*), song sparrow (*Melospiza melodia*), Blue Jay (*Cyanocitta cristata*), American Robin (*Turdus migratorius*), Belted Kingfisher (*Megaceryle alcyon*) and American Redstart (*Setophaga ruticilla*).

At the Canso Causeway, 441 passerine birds (24 species) were observed, with the most abundant being American Robin, American Goldfinch (*Spinus tristis*), American Crow, American Redstart, Belted Kingfisher and European Starling (*Sturnus vulgaris*).

4.1.2.4 Acoustic Analysis and Nocturnal Migrants

Nocturnal surveys consisting of acoustic monitoring and visual surveys were completed to characterize nighttime bird activity and potential infrastructure interactions at Auld's Cove and the Canso Causeway.

Acoustic monitors were placed at 3 key locations within the Auld's Cove and Canso Causeway study areas and 10 minute recordings were captured every hour between 10:00pm and 5:00am from June 11, 2015 to October 31, 2015.

Data was subsampled and analyzed and given a ranking from 0-4 corresponding with bird activity during the segment.

During the months of June and July activity levels were highest at 5am and lowest between 11pm and 3am. This is likely due to breeding passerines calling continuously during the morning chorus. In August, activity levels were much more consistent throughout the night with a peek between 11pm and 12am. During October, activity levels were consistently low throughout the night.

The highest weekly activity levels were observed throughout August, followed closely by September. This may have been due to migrant birds passing through the area. Activity levels in June, July and October were consistently lower.

99 hours of acoustic recordings were analyzed with 46 bird species identified. Diversity of species was highest in June/July and progressively decreased into the fall. This could be due to migration to wintering grounds and/or an under representation in the late summer and fall with birds pairing and no longer singing.

Flight calls were the most common auditory cue identified and were most abundant during the month of August, coinciding with the start of fall migration. Passerine songs were most abundant during the breeding season in June and July and were not recorded at all during September and October.

Nocturnal surveys consisting of visual monitoring were completed at the Auld's Cove project area in October and consisted of six post dusk and pre-dawn surveys. These surveys were initiated late in the overall avian assessment period, when the limitations and challenges associated with the radar assessment became better understood and it was determined that additional data related to nocturnal avian activity would be beneficial.

These nocturnal surveys included an auditory identification component and a visual observation component utilizing a thermal imaging monocular.

A total of 44 birds composed of 15 species were identified during the auditory surveys. Identified birds consisted of passerines, sea ducks and waterfowl and seabirds.

Table 4.7 Nocturnal Auditory and Visual Observation Survey Results

Bird Species	Guild	Number of birds Identified (Auditory)	Number of Birds Identified (Visual)
American Black Duck	Sea Duck and Waterfowl	11	0
Duck sp.	Sea Duck and Waterfowl	0	5
Great Black backed Gull	Gull	2	0
Great Blue Herron	Sea Duck and Waterfowl	2	0
Hermit Thrush	Passerine/Raptors	2	0
Gull sp.	Gull	2	51
Herring Gull	Gull	1	0
Northern Gannet	Northern Gannet	0	5
Passerine sp.	Passerine/Raptors	4	0
Rock Pigeon	Passerine/Raptors	1	0
Savannah Sparrow	Passerine/Raptors	1	0
Semipalmated Plover	Seabird	2	0
Song Sparrow	Passerine/Raptors	2	0
Sparrow sp.	Passerine/Raptors	9	0
Unknown sp.	Unknown	3	15
Warbler sp.	Passerine/Raptors	1	0
Yellow-rumped warbler	Passerine/Raptors	1	0
Total Birds		44	76

46% of the visual observations of birds during the nocturnal surveys were noted in high risk areas (just beneath, through or just above the lines). However, it should also be noted that the thermal imaging monocular was pointed directly at the lines and the visual limitations of the scope does not allow for a full viewscape of the area as experienced during the daylight hours. For this reason, nocturnal observations are biased towards those birds directly in line with the scope which was orientated at the lines. It is likely that birds well below the lines or skimming the water as well as those well above the lines were not captured with the scope thus skewing results towards a higher proportion of interactions (Appendix C).

Given the limitations of the nocturnal visual survey approach and relatively small sample size, confidence is reduced when compared to diurnal surveys. The data collected however, did indicate significantly lower bird activity at night when compared to diurnal surveys during the same period. This indicates that although interaction rates were found to be higher at night, there were far fewer birds moving through the area, thereby greatly reducing the potential risk of collision.

Of the birds (80% were gulls) observed flying near the powerlines at night, effectively all exhibited some sort of avoidance behavior in proximity to the lines. This indicates that despite the low light conditions, the birds observed showed the ability to perceive the power lines and avoid them, just as they typically would during the day. While anecdotal, this observed behavior may indicate that instances of collisions at night may be rare.

4.1.2.5 Radar Surveys

From June to October 2015 an Avian Radar Assessment (Appendix D) of the Strait of Canso was completed including the project area of Auld’s Cove as well as the Canso Causeway and surrounding area. The project utilized four 25kW Furuno radars installed to record bird movements in the area. Movement of biological targets (primarily birds and insects) were recorded, a subset of the data was utilized to monitor an area immediately south of the existing Auld’s Cove lines and targets were extracted that were most likely birds.

Three of the units were installed at the Canso Canal facility operated by the Department of Fisheries and Oceans Canada (DFO), and one at the weigh station on opposite side of the strait, operated by Nova Scotia Vehicle Compliance (Appendix D). Two of the radars; one vertically oriented and one horizontally orientated were positioned to cover the wires at the Auld’s Cove location, while the remaining two radars (one vertical and one horizontal) were positioned to cover the Canso Causeway.

Due to limitations of the radar equipment and subsequent data collected, in an attempt to get a more thorough representation of avian activity at the project location of Auld’s Cove, the vertically oriented radar aimed at the causeway was rotated to provide additional coverage of the Auld’s Cove wires on August 31, 2015. The objective of the study, at this time, became more focused on attaining data related to the project location. Initial tuning adjustments and subsequent power failures and other malfunctions caused loss of data during various time intervals, summarized in Appendix D.

The goals of the study were to obtain a dataset comprising the altitudes of likely bird targets in the area in front of the transmission lines, to determine potential risk to avian populations in the area associated with the existing Auld’s Cove transmission lines and to therefore determine any additional risks which may be associated with the construction of an additional crossing at Auld’s Cove. These data could then be used to describe and model patterns of movement of birds throughout the season, at different times of day, and under different weather conditions.

The final data sets used for the bulk of visualizations and analysis comprised blips and tracks of birds as detected by the (one) vertical radar at the canal, in a zone approximately 200 m long by 450 m wide in front of the wires at Auld’s Cove (and as high as the detection range of the radar, about 1.5 km). Figure 4.1 provides a visual representation of the assessment area utilized for statistical analyses. The existing transmission lines are marked with a blue line. The area bordered in yellow is the overall detection area of the vertical radar unit, and the area bordered in red is the area used for statistical analyses of bird altitudes.

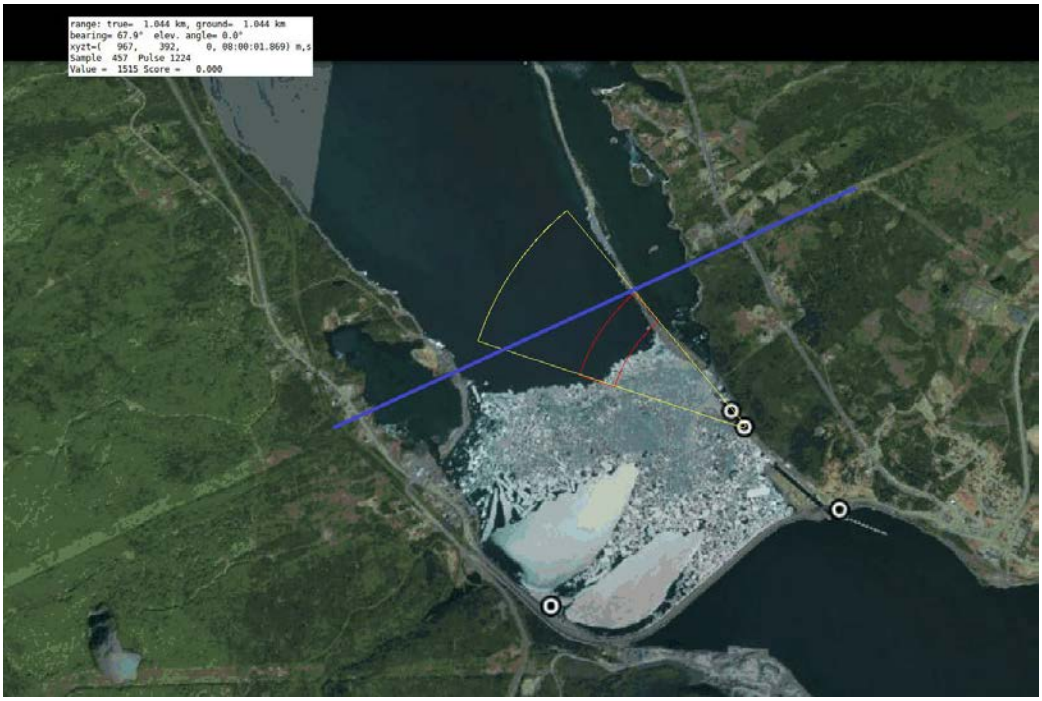


Figure 4.1 Radar Assessment Area

As the assessment area in red moves from the Cape Breton side of the Strait towards the mainland side, the assessment "arc" moves further from the lines. The resulting assessment range captured biological targets distributed in the volume of space from the leading edge of the wires to a range of 200 m from the wires (on the canal side) and ~450 m from the wires at the far Western edge of the sampled area.

The angle between the wires and the location of the radar also resulted in a large area that is obscured by reflections from the wires, which impeded detection of targets at the height of the wires beyond 820 meters from the radar (the leading edge of the wires). Essentially, a blind spot was created by the reflections of the wires and targets were not able to be picked up by the radar beyond the existing transmission infrastructure in the altitudinal range of the existing wires (approx. 45m-110m) (Appendix D).

Altitudinal densities of targets were assessed in relation to distance from the lines, seasonal effects, time of day and weather.

Dates were assigned to a season as follows: Summer (June 15-August 15; peak shorebird migration and the beginning of neotropical songbird migration), Early Fall (August 15 - September 15; the peak of neotropical songbird migration) and Late Fall (September 15- November 1; the peak of temperate-wintering songbird migration and the beginning of waterfowl migration). Targets were separated into altitude classes for various analyses: below the wires (~3-45 m), the same altitude as wires (45-110 m), above the wires (110-150 m), and well above the wires (>150 m). For most statistical analyses, only data on tracks of targets (a track being a presumed bird target) within 200 m of the leading edge of the wires were utilized. Because the leading edge of the wires is closer to the radar at the canal side (the East), this means that the maximum extent of the area sampled was further from the wires at its western edge as illustrated in Fig 4.1 above and in Appendix D. This essentially, also resulted in only the eastern half of the Strait being assessed in proximity to the lines.

Weather data (wind speed and direction, pressure, temperature, humidity, and visibility) were acquired from Environment Canada's Weather Station in Port Hawkesbury (www.http://climate.weather.gc.ca/). Data from the area in red (Figure 4.1) were examined to determine the potential effects of weather on target altitude (Appendix D).

Coordination of radar data and visual surveys with 10 minute segments from field observations were compared to radar data of the same time interval. GPS timestamps were recorded during the visual observations and data collected in terms of altitude, species and area of the crossing. Single targets were matched to radar blips using the timestamp information, direction of travel and altitude bin. The comparison was also utilized to determine differences in detection probabilities between visual surveys and radar monitoring (Appendix D).

The overall pattern of migration as detected by the radar corresponded well with known migration patterns in the area. There was also evidence of nocturnal migration across the Strait of Canso.

From July through early August very few targets were identified within any of the altitudinal bins. From mid-August to September much larger numbers were identified within all altitudinal levels, with a peak in activity mid-September. This was particularly true during sunset and midnight periods with songbirds and shorebirds migrating at generally high altitudes across the study area. Although most targets passed the lines high overhead during this period, they may also stop over regionally, so higher numbers of targets at lower altitudes (surface and wires) were noted (Appendix D). Evidence of an additional peak was noted in late October, although limited data was collected to support this.

To determine if birds are avoiding the wires at different times of day and to assess if altitudinal densities change with distance from the lines, profiles of targets were plotted at different ranges from the wires. The distance from the wires ranged from 200m on the Cape Breton side of the study area and up to 450m from the wires at the western edge of the assessment area (Appendix D). Because the western edge of the assessment area is upwards of 450m away from the lines and a large portion of the Strait (in proximity to the lines) is not included, there are limitations in determining how avian populations interact with the lines at Auld's Cove. Evidence of avoidance, with low altitudinal densities increasing closer to the wires were noted during some periods particularly in the summer at sunset. Overall the plots show how the numbers of targets at different altitudes varied considerably across the season and time of day. Additional information is included in Appendix D.

The effects of weather on altitudinal targets ware also modelled. Modelling the effects of weather on the counts of targets at different altitudes is complex as the relationships between weather and counts may vary seasonally, by time of day, and at different altitudes. Visibility was not included in the assessment because there was only usable radar data from one day of the sub-sampled data with low visibility. Most low visibility days were associated with rain, which drowned out biological blips on the radar (Appendix D).

Plots confirmed that there appear to be no simple generalizable relationships between weather variables and the counts of targets moving through the Strait. For the models of probability detecting targets as they relate to the existing transmission infrastructure there was also a complex pattern of responses related to weather. It was beyond the scope of the radar assessment and analysis to assess this further, but it is likely in part, due to the complexity of responses of bird targets to weather patterns in the area. That is, there were many different bird species tracked, across different stages of their life cycles, and each of those species groups and life-cycle stages exhibit different behavioral responses to weather. Appendix D provides additional information related to weather effects.

Comparisons between the radar data and visual field observations were collected for 13 (10 minute) periods. During these periods the observers identified 98 targets, with the radar estimating 75 targets identified under the wires. Some visual observations may have been beyond the range of the radar and the tracking algorithm may not track all targets detected by the radar. 62 of the 75 targets detected by the radar were linked to visual observations (Appendix D). This accounts for only 63% of the birds identified through visual observations. Targets that were not detected by the radar (but that were detected by the field observers) may have been targets that were beyond the range of the radar, too close to the surface of the water, or targets that had convoluted paths that were not captured by the tracking algorithm (Appendix D). Targets detected by the radar but not detected by the field observers (13) may have been non-bird targets (insects), non-biological targets, or targets that could not be linked because of the relatively simple approach to linking these observations. This does indicate that the majority of targets identified with the radar are in fact birds. There was no difference in the proportion of targets detected by the two methods, by species (Appendix D).

4.1.2.6 Infrastructure interaction Study

Interaction and behavioral responses by birds to existing power line infrastructure at Auld’s Cove and the Canso Causeway were recorded during all visual observation surveys completed for the study. In addition, targeted watch count surveys were conducted at the Auld’s Cove location, morning and afternoon for a total of 6-8 hours per day, three days per week, from August to October 2015. All total, all surveys conducted resulted in over 500 hours of visual observations in the project area.

<u>Auld’s Cove</u>

During targeted watch counts surveys, a total of 198 survey hours were completed at Auld’s Cove, during which, one near miss was observed when a gull travelling from north to south crossing near the center of the power lines came in close contact with the lower line. Weather conditions may have been a contributing factor for this incident, with the presence of heavy fog/cloud cover. No other interactions were observed (Appendix C).

Gulls and seabirds were the most commonly observed flocks passing the Auld’s Cove lines during the targeted watch count surveys with avian activity the greatest during the early morning, immediately following sunrise. The majority of the birds recorded were travelling south to north, center-west of the lines (Drawing 2, Appendix C), either skimming the water or flying well below the lines.

During Diurnal passage surveys, 1253 birds of a total of 14613 birds were observed to interact with the lines, for a total interaction rate of 8.6% for all species. An interaction is described as any bird whose behavior changed due to the presence of the power lines and can include turning around or hesitating prior to crossing the lines. High risk interactions, (where the birds fly through the lines, just above or just below the lines, accounted for approximately 75% of observed interactions during diurnal surveys.

Eighteen species were observed to interact with the Auld’s Cove power lines during the Diurnal passage surveys, (see Figure 18, Appendix C) for full details. Northern Gannets had the highest interaction rate (52.4%), followed by gulls at 8.9%. This may be due to the flight height preference of Northern Gannets, which is coincidently approximately the same height as the Auld’s Cove power lines, particularly while foraging for fish. Seabirds did not interact with the lines at all, and only 0.2% of terns interacted. Despite being one of the more commonly observed species during spring and summer at Auld’s

Cove, only 5 total interactions were observed for the Common Tern. Terns typically passed well below the lines or skimmed the water (Appendix C).

Most cormorants were observed to be skimming the water as they passed the Auld's Cove transmission lines. Instances were cormorants were not observed to be skimming the water appeared to correlate with poor weather conditions and high winds resulting in rough/choppy water. 5,403 cormorants were observed with 400 passing the Auld's Cove lines in higher risk areas or 7.5%. No collisions or mortality events were observed however and cormorants appear to be very aware of the transmission lines and could be seen adjusting flight paths and behavior several hundred meters away. Despite their abundance, cormorants behave in a way which does not put them at great risk of interacting with the lines at Auld's Cove (Appendix C).

Sea ducks and waterfowl interacted with the lines 3.0% of the time with 805 birds observed. 13 high risk interactions were observed with no collisions or mortality. Most of the observed birds in this guild crossed well below the lines. Generally, Sea ducks and Waterfowl species did not exhibit behavior which put them at risk of interacting with the lines at Auld's Cove (Appendix C).

5,044 gulls were observed with over 91% passing the lines without interactions. 449 total interactions were observed with 88.9% of these considered high risk. Generally, the species, for the most part, were observed skimming the water or flying well below the lines as they passed. Like cormorants, gulls appeared to have a good awareness of the power lines and while Herring Gulls and Great Black-backed gulls were observed to fly close to the lines in some instances, the appeared to avoid them comfortably under normal conditions (Appendix C).

Northern Gannets had the highest rate of interaction largely due to foraging behavior. Typically when gannets passed the lines they appeared aware of the infrastructure and maintained a safe distance, usually passing well below the lines. The majority of high risk interactions occurred just below the lines or though the lines. Although the Northern Gannets do appear to exhibit good awareness and avoidance behavior they do exhibit behavior which puts them at higher risk, particularly in poor weather conditions (Appendix C).

Seabirds, shorebirds and other species (Passerines/Raptors) were observed in limited numbers and generally did not exhibit behavior which put them at risk from the Auld's Cove power lines.

Most species interacted with the lines during spring and fall migration; however, gulls were observed interacting at fairly even rates throughout the surveys. For more detailed individual species reports on interactions with power lines, refer to Appendix C.

Canso Causeway

Surveys through 2015 at the Canso Causeway captured any interactions with the existing infrastructure. In addition, diurnal passage surveys specifically monitored for bird behavior and interactions around the two sets of lines from July to October 2015 (Appendix C).

A total of 1937 birds including 26 species interacted with the power lines at the Canso Causeway, with sea ducks, waterfowl and Northern Gannets having the highest rates. Approximately 49% of the sea ducks and waterfowl observed interacted with the lines and approximately 41% of the Northern Gannets. The total rate of interactions for all guilds was approximately 15% with the majority of these being considered high risk (Appendix C).

Almost every guild had at least a two to three-fold increase in interaction rates at the Canso Causeway power lines compared to the Auld's Cove lines. Figure 37, Appendix C, shows interaction rates for bird guilds.

700 Common Terns were observed to cross the Causeway during the study. Of the 170 Common Tern interactions, 166 were considered high risk, potentially due to the lower height of the lines at the causeway, combined with Common Tern flight height preferences. Terns typically crossed the Causeway lines in the center east, immediately southwest of the tower at Balache Point. Generally, they were typically observed flying low over the water, up to around 10m high, they adjust their flight pattern to avoid the physical barrier of the Causeway and vehicle traffic, which puts them in closer proximity to the power lines. Differences in the way terns behave at the Causeway when compared to Auld's Cove are likely due to the physical barrier, vehicular traffic as well as the differences in the transmission infrastructure; specifically the lower height of the lines. Terns typically fly low to the water, but a forced behavioral modification occurs at the causeway due to the barrier and vehicular traffic. No collisions were observed in 2015 and generally speaking, terns appeared able to navigate through the obstacles at the Causeway. However, weather conditions such as high winds and low visibility do appear to increase the risk of interaction with the lines.

A total of 9254 cormorants were observed at the Causeway with interactions noted 1189 times (12.8%) 1106 of the interactions were considered high risk. Again, center east was the preferred crossing point (where the lines are higher), and the majority of cormorants were observed crossing well below the lines. Two collisions were observed resulting in one confirmed mortality. Cormorants were abundant at the causeway, with large flocks moving from the south towards Auld's Cove to forage each day.

Thirteen species of sea duck and waterfowl were observed in the area accounting for 301 observed crossings. 148 interactions were noted, 147 of which were considered high risk. The most commonly observed species was Common Eider (*Somateria mollissima*), crossing at center east, the majority of other species crossed at center. Sea ducks and waterfowl have the highest rate of interaction compared to other guilds during Canso Causeway surveys. They fly low over the water, which they cannot do over the causeway, and tend to be heavier bodied than other guilds. This Guild had more interactions at the Canso Causeway than the Auld's Cove crossing. No mortalities were noted, but there was considerably higher rate of interaction at the Causeway when compared to Auld's Cove.

Five species of gulls were observed during the surveys accounting for 1795 birds. 322 interactions were noted during the surveys, with 317 considered high risk. Most gulls crossed at center or center east of the lines. One mortality was observed when a Great Black-backed gull struck the power lines and fell into the water. Despite the incidence, gulls were observed to exhibit a good deal of confidence when navigating through the causeway. Again, considerably higher rates of interaction occurred at the causeway when compared to Auld's Cove.

1098 Northern Gannets were observed and interacted with the lines 82 times, all of which were considered high risk. Most crossings were at center or center east of the lines. One collision was recorded in which a Northern Gannet carrying a fish struck the line, but continued to fly.

Nine species of shorebirds were observed during the surveys, but only three interactions with lines were noted, two of which were considered high risk. Due to habitat preferences, the majority of this guild are found in the Auld's Cove area, and therefore don't often cross the causeway lines.

Full species analysis including height of crossing and location of line crossings can be found in Appendix C.

When the limitations of the radar data were fully understood, nocturnal visual observations were carried out in October using a thermal imaging monocular. Results of these surveys are describes in Section 4.1.2.4

At both Auld's Cove and the Canso Causeway, each guild was assigned a "risk score" of low, medium or high. The risk scores correspond to the following:

Low – It is very unlikely that a member of a given guild will collide with the power lines at any time under any conditions.

Medium – it is unlikely that a member of this guild will collide with the power lines, unless under specific conditions (such as bad weather or during the migration season).

High – it is likely that a member of this guild may collide with the power lines at any time under any conditions.

At Auld's Cove; Terns, Sea Ducks and Waterfowl, Seabirds, Shorebirds and other species (Passerines/Raptors) were assigned a risk score of low while Cormorants, Gulls and Northern Gannets are considered moderate. For the most part, the risk posed by the Auld's Cove lines is considered low.

At the Canso Causeway; Terns, Cormorants, Sea Ducks and Waterfowl, Gulls and Northern Gannets were given a ranking of high with Shorebirds and "Other Species" ranked as low. Seabirds were ranked as "undetermined" as no species were observed.

Even though some species generally showed the ability to navigate through the Causeway, the risk posed by the Causeway for a number of species is considered high.

Additional information related to risk score justification can be found in (Section 7.1 – Appendix C)

The data indicates that generally speaking, birds behave differently, and much more favorably associated with the Auld's Cove lines when compared to the transmission lines at the Canso Causeway. Explanations for this are dependent on several variables including:

- Species specific behavioral characteristics;
- Feeding an foraging behavior and the concentrations of fish at the Causeway;
- Differences in the infrastructure arrangement (i.e. Auld's Cove lines are higher with less bird traffic at the altitude of the wires);
- The actual physical barrier at the Causeway which pushes certain species upwards;
- Vehicular traffic at the Causeway causing sudden alterations to flight paths and behavior;
- The larger conductor of the 345kV lines make them more visible; and
- The existing transmission infrastructure (as well as the planned lines) at Auld's Cove do not have overhead ground wires or static wires which are known to be involved with the majority of avian collisions due to their smaller diameter, making them less visible (APLIC 2012)

4.1.2.7 2014 Canso Causeway Surveys

Prior to the completion of the 2015 study at the project location of Auld's Cove as well as the general area including the Canso Causeway, information related to avian populations (abundance and species composition), bird behavioral responses to NSPI infrastructure and other potential mortality factors were assessed through a focused bird interaction study at the Canso Causeway by Strum Consulting in 2014 (Appendix E). The focus of the study included two main field components: active observations; and carcass searches. Carcass searches were coordinated with NSDNR, who have been conducting weekly carcass searches at the causeway, in the fall of the year, since 2011. The study consisted of bi-weekly surveys within two, six week periods in late spring and fall.

The field surveys also assessed:

- Other potential mortality factors, including vehicular traffic;
- Environmental and climatic conditions potentially influencing bird activity and/or mortality including: wind direction and speed; visibility and precipitation
- General behavioral observations of birds in the area:
  - Subsurface foraging
  - Scavenging
  - Roosting
  - Transiting
- Bird interaction and behaviors to other biological and contributing factors such as concentrations of aquatic food sources/prey species.

The Canso Causeway is approximately 1,372m in length across the water with a surface width 24.3m. The Causeway has been in operation since 1955 with the single circuit transmission towers on the east side constructed in 1959 and the double circuit transmission towers on the west side constructed in 1970.

The study area encompassed the entire causeway and surrounding viewscapes.

Carcass searches were carried out along the Causeway to estimate bird mortality trends. Searches were completed on a bi-weekly basis during two six week periods in the late spring and fall. The surveys were completed between the morning and afternoon watch counts during this time. Where possible, mortality resulting from other outside influences such as vehicular traffic was distinguished from that resulting from the transmission lines. Observed carcasses were left in place and re-visited during subsequent searches to estimate scavenging rates. Crows, ravens and gulls were often noted perching on top of the bridge and towers and scavenging along the causeway. In many instances, carcasses were found during the carcass surveys, however collisions were not observed the previous day. It is assumed these mortality events occurred at night.

One sighting of a Bank Swallow, listed as "threatened" under the Nova Scotia Endangered Species Act (NS ESA) was recorded on July 19, 2014. Two additional provincially protected species were observed during the fall surveys: the Harlequin Duck (listed as "Special Concern" under SARA and "Endangered" under NS ESA) and the Savannah Sparrow (listed as "Special Concern") under SARA. No other species with legal protection under SARA or the NS ESA were recorded.

The most common observed species during spring and fall surveys are listed in Table 4.8.

Table 4.8 Most Commonly Observed Species (Canso Causeway 2014)

Species	Number of Individuals Observed		Total
	Spring	Fall	
Double-crested Cormorant	628	16,848	17,476
Herring Gull	677	906	1,583
Great Black-Backed Gull	407	796	1,203
Gull sp.		670	670
Common Tern	623		623
Bonaparte's Gull		531	531
Blue Jay		303	303
American Robin	21	264	285
Common Eider		221	221
American Crow	72	146	218
Northern Gannet	177		177
European Starling	113	50	163
Common Merganser		143	143
Bald Eagle	28	75	103
Duck sp.		97	97
Great Blue Herron	15	63	78
Surf Scooter		66	66
Common Grackle		50	50
Pigeon		40	40
Common Raven	37		37
Rock Dove	29		29
Cedar Waxwing	28		28
Osprey	20		20
Common Loon	19		19
American Goldfinch	18		18
Yellow Warbler	16		16
Song Sparrow	13		13

During the fall observations, bird counts were significantly higher during early fall (September – early October) with a noticeable decline mid-late October.

3,093 birds were observed during the spring surveys. A total of 31 "close call events" or high risk interactions were observed, including one confirmed mortality (Common Tern). Most of these events involved single birds, with herring Gull and Common Tern being the most common. A total of 21,502 birds were observed during the fall surveys with the vast majority of these (78%) being Double-crested cormorants. 46 "close call" events were observed during the fall surveys including 8 mortalities. Many of these events involved multiple birds, primarily due to large flocks of Double-crested cormorants moving through the area. A summary of the spring and fall active observation surveys can be found in (Appendix E). Although numbers of close call events and mortalities are undoubtedly higher, these numbers do indicate a relatively small percentage of events related to total bird populations in the area.

Transmission infrastructure appearing to cause the most difficulties were the overhead ground wires (OHGW) on the 230kV towers running along the western side of the causeway. Shield wires or OHGW are installed are non-energized line sand are installed above phase conductors to protect from lightning. Studies suggest shield wires are the lines most associated with bird collisions on transmission lines as they are the highest wires and are smaller in diameter making them more difficult for birds to see (APLIC, 2012). When birds are flying at the elevation of the shield wires or gaining altitude to avoid the more visible phase conductors, the potential collision with the shield wire increases (APLIC, 2012). Many studies of lines with high collision rates indicate that collision risk can be lowered by 50% – 80% when these lines are marked, though a study in 2012 demonstrated a much lower reduction rate of 9.6% (Barrientos, 2012). However, recommendations for which device is the most effective and standard spacing are not possible due to differences in study designs and site-specific conditions. As a result of these differences, reduction rates may not be replicable from one line or study to another (APLIC, 2012).

During the spring surveys, a greater number of close calls or high risk interactions were witnessed on June 28, July 6 and July 18. A total of 26 events occurred during the 3 surveys, the majority of which involved terns and gulls attempting to cross either through or over the lines. High wind conditions (> 50km/hr) were present during the June 28 and July 6 surveys which is believed to be a contributing factor (Appendix E).

Wind direction and speed appeared to be factors in choosing routes over or around the Causeway. In high wind conditions, many birds, including cormorants approached the causeway near the canal (Balache Point) and showed avoidance behavior by detouring to a land to the east of the causeway on the Cape Breton side.

Successful areas for crossing the Causeway appeared to be near the northeastern most tower in addition to areas near the bridge and ship canal (Appendix E). The southwestern portion of the causeway appeared more difficult for individuals to cross and species would often hesitate and turn around in this area.

During the spring surveys, there was a fairly even distribution of birds flying over and beneath the lines, while significantly fewer chose to fly between the lines. Fall surveys showed a large proportion of birds travelling beneath the lines as opposed to over. Cormorants in particular, which made up the vast majority of birds identified, commonly flew under the lines by a high spot near the northeastern most tower. Mortalities observed, generally occurred when birds attempted to fly through the lines (Appendix E).

No vehicle related mortalities were observed; however, traffic was shown to effect the behavior and flight pattern of birds passing through the Causeway. Several birds which were observed to approach the Causeway at a lower elevation would become deterred by passing vehicles and turn around. Alternatively, approaching birds would circle back, sometimes several times to gain the altitude needed to pass over traffic. Double-crested cormorants were observed to be monitoring traffic and would proceed under the transmission lines once a break in traffic was available. Herring Gulls, Double-crested Cormorants, Great Black-backed Gulls and terns were all observed to adjust their flight pattern in response to vehicular traffic (Appendix E).

The following key findings were identified during the 2014 surveys:

- Over 70 species were observed during the spring and fall component of the study with a total of 3,093 total birds observed in the spring and 21,502 in the fall (largely in part to a significant increase in Double-crested Cormorants and Gulls).
- The most common species observed were Double-crested Cormorant, Herring Gull, Great Black-backed Gull, Common Tern and Bonaparte's Gull
- Terns were commonly observed carrying food from the south side of the causeway and then heading north, suggesting a possible nesting colony exists north of the causeway
- Foraging activities appeared concentrated in two areas. Gulls were commonly foraging along the north side of the causeway extending to Auld's Cove, whereas Cormorants appeared to forage further north of the Causeway, throughout the northern extent of the Strait of Canso.
- Flight path adjustments in response to NSPI infrastructure included backtracking and completing several circles to achieve the sufficient height needed to pass over the power lines; hesitation before flying through the power lines; and

increased apprehensiveness on windy days, especially with lighter species such as terns.

- The area where birds most frequently crossed the Causeway appeared to be near the tower installed on Balache Point (immediately west of the Canso Causeway Canal) where the lines are higher.
- Injuries and mortalities were observed when birds attempted to fly between the wires as opposed to over or under.
- Transmission infrastructure appearing to cause the most difficulties were the overhead ground wires (OHGW) on the 230kV towers.
- A risk factor exists for species that would normally fly low over the water such as terns and sea ducks. Upon approaching the Causeway, these species are forced upward by the physical barrier and either fly low over vehicular traffic or over the power lines thereby increasing their risk of collision with vehicles and/or the lines.
- A larger number of close calls were observed during the fall surveys compared to the spring. This was in large part due to increased numbers and large flocks of birds, especially Double-Crested Cormorants passing back and forth through the Causeway.
- 8 mortality events were observed during the fall surveys and 1 in the spring.
- 69 carcasses were identified during the spring and fall carcass searches. The most common carcasses observed were Double-crested cormorants and Herring Gull.
- Scavenging rates appear to be high as the majority of carcasses observed were already partially consumed. However, remnants (i.e. skeletal remains) generally remained present for multiple surveys.
- No vehicle related bird mortalities were observed; however, traffic was shown to influence the behavior and flight pattern of birds.
- Results from the study indicate the northeastern side of the causeway to be the most favored pathway for birds compared to the southwestern side. In addition, higher mortality and close calls for collisions were observed in the vicinity of the southwest tower (Appendix E).

Although numbers of total mortalities and close call events are known to be higher than what was observed during the two six week periods of the study, the overall biological significance of these events is considered relatively low. Planned mitigation measures at the Canso Causeway are discussed in Section 4.1.4.

4.1.2.8 Effects of Weather and Tide

Although anecdotal observations suggest risk to birds is greater with increased wind speed, the trend is not reflected in the data for Auld's Cove. For the most part, interaction rates were relatively steady at Auld's Cove with varying wind speeds. At the Canso Causeway, there was a general correlation between wind speeds and interaction rates, with higher wind speeds generally resulting in higher rates of interaction.

The highest rates of interaction appeared to occur at Auld's Cove during northwesterly winds with southerly and southeasterly winds also resulting in higher interaction rates. A similar trend was also noted at the Canso Causeway with southerly winds resulting in the highest rate of interaction. A true correlation between wind direction and interaction rates was difficult to ascertain with any certainty however.

Observed interaction rates at Auld's Cove were higher during surveys that occurred during slack tides. This may be due to the influence of tides on habitat in the Auld's Cove area. Mud flats and rock bars are exposed during slack tides, which may attract larger numbers of birds to the area during these times. Tides did not appear to exert any discernable trend on interaction rates at the Canso Causeway.

Sky conditions that resulted in reduced visibility (i.e. fog and heavy fog) led to higher interaction rates at both locations.

Although efforts were made to include as many fog and heavy fog days as possible during the assessment, the number of these days that occurred during the study period was somewhat limited. Survey ability was also impaired during these due to the reduced visibility. Taking into consideration the limitations of the surveys, the average number of birds observed during 'fog' and 'heavy fog' days was less than half of what was seen per hour under normal conditions. This is likely due in part to the limitations of the surveys, but may also indicate less bird movement through the area under these conditions, thereby offsetting the increased risk of interaction with lower total numbers of birds.

In an effort to quantify the average number of fog days based on archived weather data for the area. Weather data was accessed from Environment Canada's Climate Data Online Database (EC 2016). Data recorded at the nearby Port Hawkesbury weather station was analyzed to determine the average number of foggy days in the spring, summer and fall for the last 5 years. The analysis determined that on average, 32 fog days occurred per season during the last 5 years. 19 occurred in the spring, 9 in the summer and 4 in the fall. Given this information and the interaction data collected during diurnal surveys, it was determined that on average, approximately 22.6% of interactions that occur during a season likely occur under foggy conditions.

4.1.3 Discussion of Results

Several key findings were identified during the avian field observations as well as the radar assessment and are presented below:

- Field observations revealed that the vast majority (87%) of birds crossing the Auld's Cove location fly either well below the lines or skim the water.
- Almost every guild had at least a two to three-fold increase in interaction rates at the Canso Causeway power lines compared to the Auld's Cove lines.
- Proportionately more birds were observed flying just below, through or just over the lines at the Canso Causeway when compared to Auld's Cove.
- The vast majority of birds were observed crossing the Canso Causeway in the center-east location.
- Higher wind speeds appear to exacerbate avian risk at the Causeway however no correlation between wind speeds and interactions were evident at Auld's Cove.
- Sky conditions resulting in low visibility (e.g. fog and heavy fog) resulted in a higher rate of interaction at both the Canso Causeway and Auld's Cove power lines. Although the amount of data is limited, additional analysis indicates that on an average year, 22.6% of interactions may occur in foggy conditions, and the majority of these are likely to occur in the spring.
- The radar data indicates that several species were observed within the altitudinal bins of the wires and alter their flight paths and behavior as they approach the lines at Auld's Cove. These patterns were seen during the day and at night. Field observations confirmed that the majority of birds in the area deal well with the existing transmission lines at Auld's Cove.
- The data indicates that generally speaking, birds behave differently, and much more favorably associated with the Auld's Cove lines when compared to the transmission lines at the Canso Causeway. Explanations for this are dependent on several variables and are outlined in Section 4.1.2.6.
- Four collisions were observed at the Causeway and none at Auld's Cove despite over 500 hours of surveys carried out at the location.
- The limited nocturnal survey data showed significantly lower bird activity when compared to diurnal surveys during the same time period (dates).
- Despite the low light conditions at night, the birds observed (primarily gulls) appeared to have the ability to perceive the power lines and showed avoidance behavior similar to what was observed during the day.
- The radar data was limited in the vertical plane by the angle of the radar to the lines, which reduced the probability of detecting birds in the middle or in the western half of the strait. Similarly, because the wires droop in the middle of the Strait and are highest near the sides at the tower locations, birds detected at similar altitudes may have been flying over the wires in the middle of the Strait or under the wires at the edge, but with the radar data were classified as being at the same height as the wires.
- The radar did not see evidence for consistent effects of weather on patterns of risk.

- The habitat identified during breeding bird surveys was primarily middle aged to mature mixed wood forest stands, with regenerated hardwood and softwood under the existing power line corridor. No critical habitat for SOCI was identified.

4.1.4 Effects and Mitigation

According to the Migratory Soaring Bird Project (MSBP, 2015), the biggest impacts to migrating birds across flyways for medium to high voltage power lines are believed to be:

- Displacement/barriers along migration routes or to suitable habitats and feeding grounds
- Habitat impacts: fragmentation of habitats at landscape level
- Electrocution
- Collision

Avian trends and behavior related to the 2015 surveys has been utilized to predict potential avian impacts, as listed above, to the avian community at the project Area of Auld’s Cove related to the existing lines as well as the proposed new crossing. Additional information can be found in Appendix C

Displacement Barriers

Survey results suggest that although the area is utilized as a flyway during periods of migration, the existing infrastructure does not appear to obstruct or alter migration behavior to any significant extent. Development of the new crossing is not expected change this to any significant extent, and no significant impacts are expected to local feeding and foraging habitat.

Habitat Impacts

Habitat features on the coastal berm by Archie’s Pond is limited to gravel/rock surface and habitat impacts in this area are expected to be minimal. Small scale clearing of vegetation will occur in the forested northern extent of the project area; however none of the existing habitat was identified as significant to avian populations in the area and therefore so significant impacts to habitat are expected.

Electrocution

Electrocution risks are normally associated with distribution lines and low-medium voltage transmission lines. The transmission infrastructure at Auld’s Cove are high voltage towers, and comprise downwardly hanging, insulated high strength self-dampening conductors, hence significantly reducing the risk of electrocution. The electrical configuration and spacing of the high voltage lines at Auld’s Cove does not pose a significant risk of electrocution for birds. 2015 surveys confirmed no evidence of nesting/roosting on the Auld’s cove towers and no bird carcasses, indicating possible electrocutions, were observed underneath the towers. The new crossing at Auld’s Cove will not increase the risk of electrocution.

Collision

In addition to the biological characteristics and environmental conditions, previously discussed, engineering aspects including: infrastructure design (i.e. diameter of lines), line placement and orientation, line configuration, structure type and lighting (constant and blinking) can influence avian risks relate to collision.

The arrangement of the existing and planned lines at Auld’s Cove (including line height), and their presence within a migration flyway, fall within parameters which can increase risk of collision. The size of the conductor and the absence of Overhead Ground Wires (OHGW) reduces the risk of collision dramatically however, and the 2015 surveys suggest that existing infrastructure at Auld’s Cove is not adversely affecting bird behavior, nor is it precipitating avian collisions or mortality.

The smaller diameter of transmission line shield wires or OHGW, are the lines most often involved in avian collisions with transmission infrastructure (Scott et al. 1972; Willard et al. 1977; Brown et al. 1987, Faanes 1987; APLIC 1994; Savereno et al. 1996; Jenkins et al. 2010). Because of their smaller diameter compared to phase conductors, and their position above the larger phase conductors, shield wires are the least visible type of power lines and they are in the flight path of birds that gain altitude to avoid the more obvious phase conductors (APLIC, 2012). As indicated, the existing lines at Auld’s Cove as well as the new crossing do not have shield wires. The 230kV lines at the Canso Causeway however, do have shield wires and this will be discussed in greater detail with proposed mitigation measures at the Causeway.

During nighttime periods, artificial lighting can attract birds during migration, particularly when the sky is cloudy and the ceiling is low (Gauthreaux Jr. S and Belser. C 2006). Steady burning white or red lights can disorient migrating birds at night especially when migration coincides with inclement weather (Manville 2007a, 2009; Gehring et al. 2009, 2011). The existing lighting set-up at Auld’s Cove includes vertically aligned flashing white lighting, which will be replicated on the new towers. Strobe or flashing lighting has been shown to decrease the levels of avian mortality by allowing birds a chance to “break free” of the zone of influence that the artificial light can have on them (Longcore et al., 2008). While lighting is controlled by Transport Canada, research has shown that flashing or strobe lights are one of, if not the easiest way, to reduce bird strikes and mortalities when compared to constant lighting. No additional effects to birds are expected in this regard.

Data collected during the 2015 surveys indicates that the existing transmission lines at Auld’s Cove do not generally have a direct effect on bird movement through the area and do not appear to cause bird mortality. The proposed transmission crossing at Auld’s Cove is currently being re-designed to ensure line heights will be as similar as possible to the existing infrastructure. Construction of the new infrastructure at this location will possess a similar power line arrangement and should not substantially increase the cross sectional profile of transmission lines in the area. Therefore, it is not expected to contribute to additional risk to birds moving through the area.

From the 2014 and 2015 field assessments as well as the radar study completed in 2015, risks to birds including collisions, with the exiting Auld's Cove transmission infrastructure as well as the new proposed crossing are considered low. The Auld's Cove lines will conform with Transport Canada requirements for aerial navigation markings and will also have vibration dampers installed which have been proven effective in reducing bird collisions (APLIC 2012). The diameter of the conductor is also quite large at Auld's Cove (particularly the 345kV lines) which results in greater visibility to avian species and reduced risk.

Accessing the lines over the Strait of Canso once installed, is obviously very difficult. Items placed on transmission lines such as bird flight diverters can create negative effects such as wind/ice loading and corona effect (particularly as voltage increases). Corona effect occurs when the voltage of a phase conductor ionizes the surrounding air, which then also becomes a conductor. This effect can lead to degradation of the line, hissing sounds, local radio interference and outages leading to complicated and costly repairs. In addition, the conductors that will be used are 49 mm in diameter (1.92 inches) and due to their large size are highly visible. The Transport Canada aerial navigation markings and vibration dampers planned for the line have also been proven to be an effective form of collision avoidance by providing a visual cue (APLIC 2012). Because of this, and because of the low risks to avian populations at the project site of Auld's Cove, additional line markings are not intended to be installed on the Auld's Cove infrastructure at this time.

Power lines are only one of numerous anthropogenic causes of bird collision mortality. Others include tall building, windows, vehicles, communication towers, airplanes and wind turbines (Avery et al. 1980; Erickson et al. 2005) (APLIC, 2012).

From a biological perspective, significance of avian collisions evaluates whether collision mortality will affect the viability of species' population. Biological significance results from an influence that significantly affects the ability of species' population to sustain itself or increase in size (APLIC, 2012). This definition is used by population biologists to understand the influence of an adverse effect on a particular population or species. Because of their higher reproductive rates, common bird species such as those identified within the project area, including the Canso Causeway are at less risk of population effects from power line collisions (APLIC, 2012). Drewitt and Langston (2008) conclude that few studies of bird collisions with power lines show that collisions are biologically significant, which means individual losses from collision mortality are unlikely to affect large and robust populations (APLIC 2012).

Although perhaps not biologically significant, the greater risk to birds in the area, including collisions, is related to the existing transmission infrastructure at the Canso

Causeway. This has been shown through the 2014 study as well as NSDNR surveys and has been confirmed with the 2015 comprehensive avian assessment.

Since 1994, line marking devices have been further developed in North America, Europe and South Africa. Advances in aerial marker spheres, spirals and suspended devices include changes in design, colors, attachments and materials in an effort to improve effectiveness and durability and to reduce possible damage to lines (APLIC, 2012).

As indicated, studies suggest that most bird collisions with transmission infrastructure occur with the shield wire. Many studies of lines with high collision rates indicate that collision risk can be lowered by 50% to 80% by marking these wires. Other studies have indicated a more modest reduction in risk however (APLIC 2012). Regardless, most studies have shown a reduction in collisions and/or an increase in behavioral avoidance at marked lines when compared to unmarked lines, this can vary with location, type of line marking device and bird species (Jenkins et al. 2010; Barrientos et al. 2011).

Through the 2014 and 2015 field observations completed at the Canso Causeway, it has been determined that the 230kV lines on the western side of the causeway and particularly the OHGW or shield wires create the most difficulties for avian species in the area. In an effort to reduce the risks to avian populations in the area, bird flight diverters will be installed on the overhead shield wires on the 230kV lines at the Canso Causeway for the full length of the Causeway. The installation of bird flight diverters at the Causeway is expected to provide an effective mechanism to significantly reduce the risk of avian collisions at this site. The bird flight diverters (BFD’s) will be installed at the earliest opportunity, depending on system reliability constraints and minimal impacts to customers. The reduction of risk at the Causeway should have an overall positive effect for the avian communities in the area, including the project location of Auld’s Cove. Follow up monitoring will occur at the Causeway to examine the effectiveness of the proposed mitigation.

Additional mitigation

In addition to the mitigation already described, the following mitigation measures will also be employed.

- Construction of the new line will be timed to coincide with lower bird activity as much as possible (i.e. December through February and June through August).
- Clearing of vegetation associated with the project, although minimal, will occur outside of nesting season.
- A project Environmental Protection Plan (EPP) will be developed.
- Post construction monitoring studies will be completed as required at the project location.

4.2 Cultural and Heritage Resources

4.2.1 Archaeological Resource Impact Assessment

Kelman Heritage Consulting was contracted to conduct an Archaeological Screening and Reconnaissance for the project area to determine the potential for historic and pre-contact period archeological resources within the Property Boundaries through background research and field reconnaissance. The Archaeological Screening and Reconnaissance and shovel testing reports can be found in Appendix F.

The background research or screening explored the land use history of the study area and its physical environment, to identify known archaeological and historic sites and to determine locations requiring field delineation and reconnaissance. Environmental attributes, and historic settlement and development patterns of the study area and the surrounding region were reviewed, in order to provide the necessary information for evaluating the area's archaeological potential.

The land within the study area was once divided between two greater Mi'kmaw territories: the mainland portion is located in what was once known as *Piktuk*, meaning 'explosive place', while the Cape Breton portion of the study area is situated in *Unama'kik*, which is a variation on the word *Mi'kma'kik* meaning 'Mikmaq territory' (Sable & Francis 2012: 21). The Strait of Canso, known in Mi'kmaq as Tui'gn, served as an important resource exploitation and harvesting area for a variety of plants and animals (Macleod-Leslie, 2015). Based on the abundance of local resources, it is likely that encampment and/or processing sites existed along the Strait (Appendix F).

Early European activity in the region began in the fifteenth and sixteenth centuries, with the arrival of the basques, Bretons and Portuguese, who fished along the coast (MacDougall 1922: 9; Dawson 2012: 148). By the early eighteenth century, the French had well established settlements, on Cape Breton at Ingonish and Ingonish Island known as *Ninganishe* and Ile *d'Orleans* respectively (Appendix F)

None of the eighteenth century maps, reviewed during the background research showed any signs of development within the study area along the shoreline of the Strait of Canso. However, this absence may simply be a reflection of the purpose of these maps, namely to depict the Strait as a navigation route between the Gulf of St. Lawrence and the Atlantic Ocean (Appendix F).

In order to facilitate development of the coal industry in the area establishment of a railway was required to transport coal to a viable harbour. Within the study area, the railway was built on 'Ghost Beach', which forms the western edge of Long Pond. The railway was purchased by the Canadian National Railway in 1929 and abandoned in 1986 (Appendix F).

Aulds Cove was originally known as 'Porcupine Cove' (named for nearby Cape Porcupine). Around 1820, it was renamed Mill Brook Cove due to the presence of a recently-constructed mill. In the 1840s, the named was changed to Auld's Gut of Canso, after early settler Alexander Auld who had established a grist mill at that location by 1820. In 1847, the name was changed to Forestall's Gut of Canso after Edward Forestall took over the ferry service across the Strait. Finally, the name was changed to Aulds Cove, in 1876, and remains such to this day (Purcell 1993: 7). In addition to operating the mill, Alexander Auld operated a ferry service across the Strait of Canso, from 1822, and established a postal way-office in 1841 (Purcell 1993: 11). The ferry ran from Auld's Cove to McMillan's Point. In 1847, Edward Forestall took over the ferry operation and the postal way-office. Forestall also opened a hotel and had a stable service for stage coaches (Purcell 1993: 11) (Appendix F).

Archie Pond was originally called 'Bass Pond'. It was renamed Archie Pond in the 1830s after Archie MacDonald, who had a property that bordered onto it (Purcell 1993: 7). The 1878 A.F. Church map of Antigonish County depicts the spit of land that sticks out into the Strait of Canso, and forms the eastern edge of Archie Pond, as two separate pieces with a gap in the middle (Appendix F).

A review of the Archaeological Resource Inventory (MARI), the provincial archaeological site database maintained by the Special Places Program, identifies one registered historic archaeological site within 2km of the study area and one registered pre-contact archaeological site within 5km of the study area. The historic site is a mid-nineteenth century stone foundation located at Morrisons Lake, just south of Auld's Cove. The pre-contact site, consists of three flake scatters on the beach at Troy, north of Newtown (Appendix F). These sites are related to the project area in general proximity only and will not be impacted in any way by the planned construction activities.

Prior to the field reconnaissance, archaeological potential for the study area was assessed based on the background review. The shorelines along the Strait of Canso, Long Pond and Archie Pond were considered to exhibit high archaeological potential for precontact and historical resources. Additional areas assessed as having the highest archaeological potential for historic resources are situated in close proximity to historic road alignments, such as highway 104 on the mainland side of the Strait and Highway 19 on the Cape Breton side. The remainder of the study area was determined to have low archaeological potential.

Following completion of the background research, the study area was visually assessed. The goals of the archaeological reconnaissance were to conduct a pedestrian survey of the study area; to document any archaeological sites identified during the course of the background research and visual inspection; to identify and document any specific areas of potential archaeological sensitivity; and to design and recommend a strategy for the protection and preservation of those resources. Waypoints and track logs were recorded using a handheld Global Positioning System (GPS). All UTM coordinates were recording using a NAD83 datum.

The archaeological field reconnaissance was conducted by Kelman Heritage archaeologists, on May 29, 2015. The pedestrian survey determined that there are three localities, within the study area, that exhibit high archaeological potential. Two of these areas (Areas A and B) are considered to exhibit high archaeological potential for precontact resources, while the third area (Area C) is considered to exhibit high archaeological potential for historic resources (Drawings 4.1 and 4.2). The remainder of the study area has been determined to exhibit low archaeological potential (Appendix F).

4.2.2 Cultural and Heritage Resources Effects and Mitigation

None of the areas identified through the archaeological screening and reconnaissance as exhibiting high archaeological potential will be impacted through construction activities. Based on the final design for tower placement, none of the six tower locations interact with areas identified as having high archaeological potential.

Tower 4A located on the Cape Breton side, closest to the shore of Long Pond is located in relative proximity to the area designated as High Potential Area A (Drawing 4.2). For this reason, even though no impact to this area will occur during tower placement and construction activities, an archaeological assessment was completed by Kelman Heritage Consulting for the Tower 4A location.

The goals of the archaeological assessment were to assess the Tower 4A footprint through a program of shovel testing, to document any archaeological sites identified during the course of the testing program, and to design a strategy for the mitigation and documentation of any archaeological resources identified prior to any disturbance from construction related activities.

The study area was systematically shovel tested on a 5 meter staggered grid pattern.
Shovel test pits, averaging 40 centimetres in diameter, were excavated through the topsoil into subsoil. All soil removed from the test pits was screened through 6 millimetre hardware cloth in order to standardize artifact recovery, if present, in the excavated soil (Appendix G).

A total of 66 shovel tests were excavated across the study area with none registering as positive for artifact recovery. The shovel testing program did not identify any significant archaeological features or deposits (Appendix G).

In the event an archaeological site or artefact is unearthed during clearing or construction, the Special Places Coordinator, NS Department of Communities Culture and Heritage as well as the Director of KMKNO if the find is suspected Mi'kmaq in origin, shall be contacted immediately.

Aulds Cove Transmission Project
Archaeology Survey

Nova Scotia POWER
An Emera Company

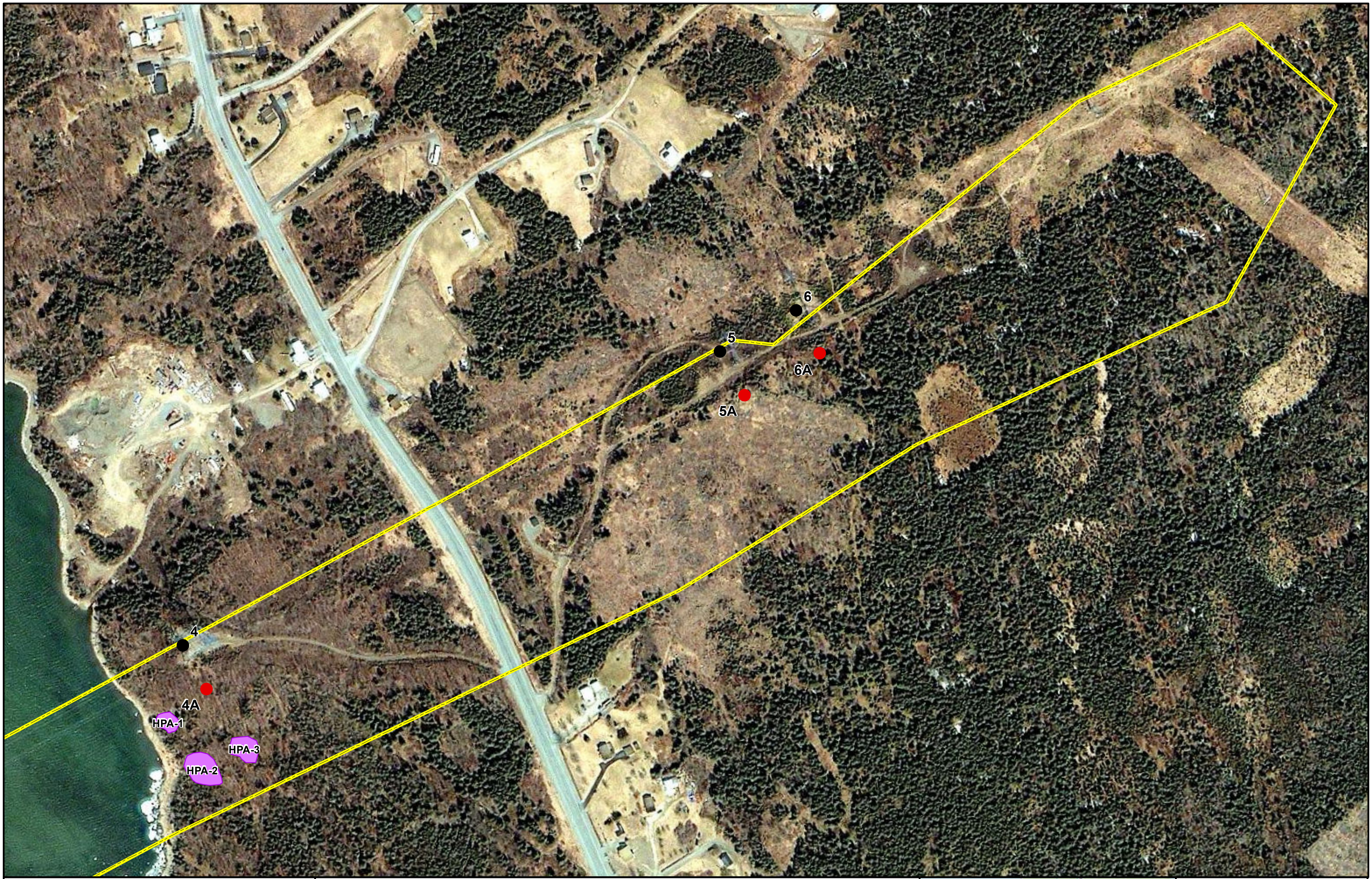
- Existing Structure
- Proposed Structure
- Assessment Area
- Archaeology-HPA

Date: January 18, 2016
CRS: NAD83 UTM Zone20
Scale: 1:4,700
Sources: NSPI, Kelman Heritage

N

0 25 50 100 150 m

Drawing 4.1



Aulds Cove Transmission Project
Archaeology Survey

Nova Scotia POWER
An Emera Company

- Existing Structure
- Proposed Structure
- Assessment Area
- Archaeology-HPA

Date: January 18, 2016
CRS: NAD83 UTM Zone20
Scale: 1:4,700
Sources: NSPI, Kelman Heritage

N

0 25 50 100 150 m

Drawing 4.2

4.2.3 Mi'kmaq Ecological Knowledge Study (MEKS)

The Mi'kmaq people have a long-existing, unique, and special relationship with the land and its' resources which involves the use and conservation of natural resources and spiritual ideologies regarding such. This knowledge is held by the Mi'kmaq and has been passed on from generation to generation; *kisaku kinutemuatel mijuijij*. As a way to identify and document Mi'kmaq use of the land and resources and Mi'kmaw ecological knowledge, NSPI is completing a Mi'kmaw Ecological Knowledge Study (MEKS) for The Project. The MEKS is currently ongoing and is being completed by Membertou Geomatics Solutions (MGS). The MEKS will involve several First Nation communities in mainland Nova scotia as well as Cape Breton including: Paq'tnkek, Potlotek, Waycobah and Wagmatcook. Several components of the MEKS have been completed and a preliminary report can be found in Appendix M.

The MEKS gathers and documents the collective body of ecological knowledge of the Mi'kmaq people. The MEKS will assist in providing assurances that the Mi'kmaq use and knowledge of the project area and its' resources are considered within the overall scope of the Project.

The Mi'kmaq Ecological Knowledge Study identifies land and resource use, which is of particular importance to the Mi'kmaq people, with respect to the study area. The MEKS includes the following key components:

Historical Review/Research - A historical review and research of the Project Site, including immediate surrounding areas, has been undertaken (Appendix M). These activities included a review of the relevant historical documentation with regards to the area including land claims, past occupation, archaeological sites, present day occupation, etc. This also includes research of existing documentation on resources, such as species at risk information. This review and research allowed MGS to identify which, if any, areas are of significant historical importance to the Mi'kmaq people.

Traditional Use Data – A review of existing documentation regarding Mi'kmaq traditional land and resource use of the study area has also been completed (Appendix M). The purpose of this activity is to provide information on historical Mi'kmaq use and occupation related to the study area, including the immediate surrounding areas. This provides a more detailed understanding of Mi'kmaq use of the land and waters in question.

Present Day Use – The purpose of this study is to document information from the surrounding Mi'kmaq communities as a means of identifying current use of lands or resources in the study area. This was accompished by contacting the various Mi'kmaw communities involved and interviewing various individuals who may possess information regarding Mi'kmaq use and ecological knowledge of the project area, including the immediate surrounding areas.

Mi'kmaq Significant Species Survey (MSS) – Mi'kmaq land and resource use often involves plant and animal species which play a key role to the Mi'kmaq community. These species may be utilized for food, medicine or spiritual purposes. Such species are not necessarily identified within Canadian standards which seek to identify species of importance, such as Species at Risk. As such, in order to identify what species may be of key importance to the Mi'kmaq, a Mi'kmaq Significant Species Component will be included in the study during the spring of 2016. This will be done with the aid of a Mi'kmaq Individual or Individuals who are custodians of Mi'kmaq knowledge regarding Mi'kmaq significant species. This will assist with predicting the effects of the project on the study area with respect to Mi'kmaq culture, learning or practices.

As indicated, the MEKS is currently ongoing, with the first three phases of the study completed and included in Appendix M. The Significant Species Survey will be completed in the spring of 2016 and will be added as an addendum to the MEKS.

4.3 Freshwater Environment and Terrestrial Habitat

The Project area is within the Tracadie and River Inhabitants watersheds (NSE, 2015). The Tracadie (1DS) watershed, on the mainland side of the project is 585 km^2, while the Inhabitants (1FA) watershed, on the Cape Breton side of the project, is 1204 km^2 (Davis and Browne, 1998).

There are no lakes or freshwater bodies in the study area. However, near the study area are; MacAskills Brook, Dan's Lake, Harvey's Lake, MacMillan Lake, Wright's River, and Archie Pond, all in Antigonish County. On the Cape Breton side are; Horton Lake, Horton Brook, Mill Brook and Long Pond. None of these freshwater resources will be impacted by the proposed work.

4.3.1 Wetlands and watercourses

Wetlands and watercourses are important features in the landscape. Wetlands help to control flow of precipitation and surface water, as well as providing unique habitats for many species, including a number of the provinces species at risk. A wetland and watercourse survey was completed for the site, to determine any potential for impact.

The Nova Scotia Department of Natural Resources (NSDNR) wetlands database, wet areas mapping, forest cover mapping and recent aerial photographs were reviewed prior to fieldwork. Additionally, an ACCDC rare taxa data report was acquired and reviewed to provide insights on the potential presence of rare species at the Project site (Appendix H).

Ground level determination and delineation was performed as per the protocols outlined by the US Army Corps of Engineers Wetland Delineation Manual. Wetland determination and delineation is focused on establishing the wetland-upland edge and is based upon the presence of positive indicators for three parameters:

- Hydric soils;
- Hydrophytic vegetation; and
- Wetland hydrology.

See full report in Appendix H for complete details of sampling.

Fifteen wetlands and three unmapped watercourses were surveyed and delineated during the May 26th, 2015 site visit. Six of those wetlands and two of the watercourses are located on the mainland side of the Canso Strait at Aulds Cove, NS. (Drawing 4.3). The remaining nine wetlands and one (1) watercourse are located on the Cape Breton side of the Canso Strait in Newtown, NS (Drawing 4.4.).

The vast majority of the fifteen (15) wetlands encountered were treed or shrub swamps with some level of disturbance, whether it be historic logging operations or ongoing transmission corridor vegetation management. Nova Scotia experienced an uncharacteristically long winter and subsequent late spring, as such flora observations were limited by the delayed onset of leaves, flowers and other vegetative structures that allow for accurate identification (Appendix H).

All three of the mapped watercourses were either intermittent or ephemeral in nature. None sustain permanent water flow and all have sections that flow underground. As such, none of the three delineated watercourses represent viable fish habitat (Appendix H).

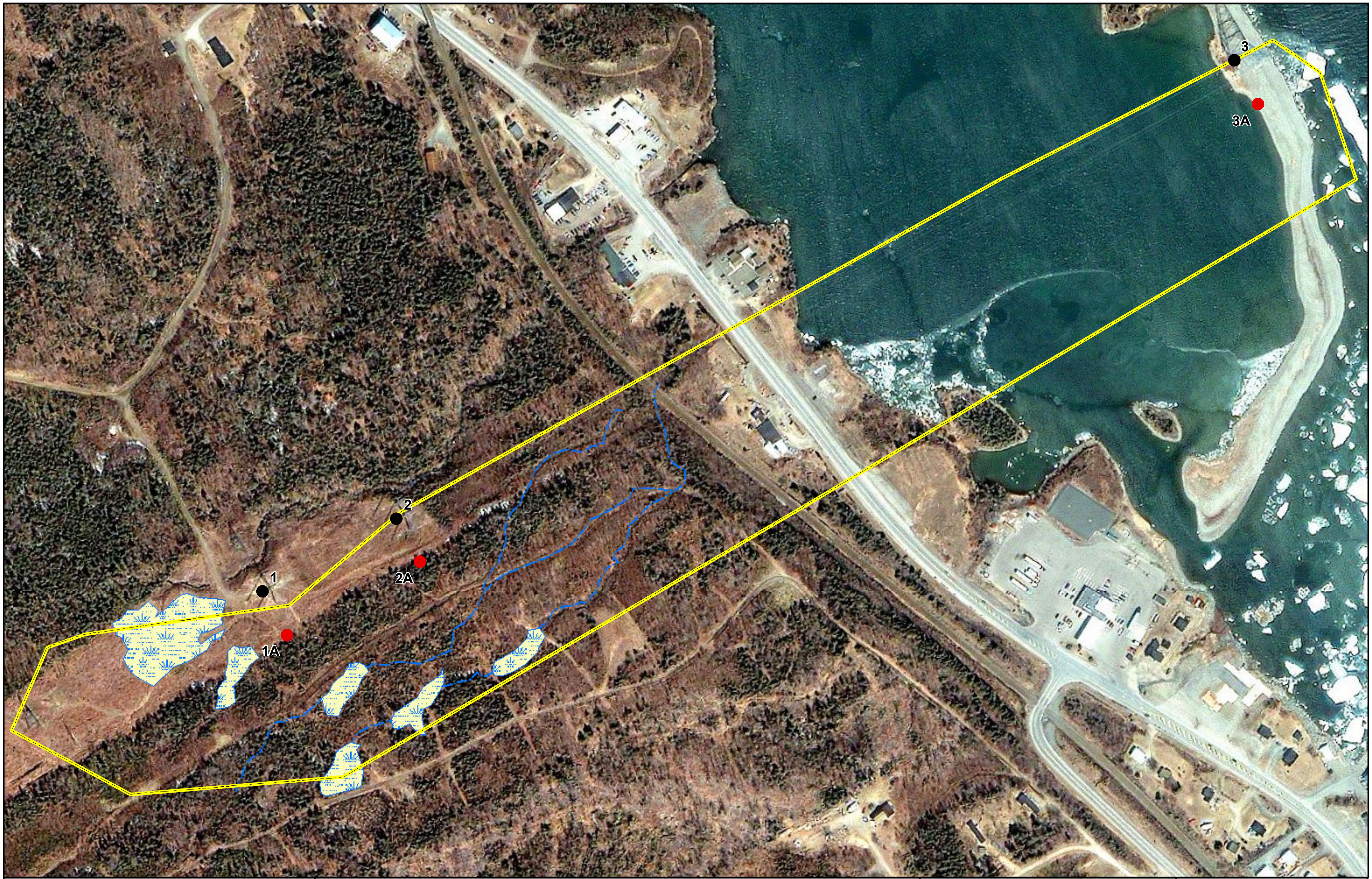
The delineation and characterization information for each wetland can be found in Appendix H.

The following are potential impacts to surface water resources as a result of clearing and construction activities:

- Erosion and sedimentation
- Contamination
- Loss of habitat/riparian vegetation

No watercourses will be directly impacted through construction activities. The following general mitigation will be implemented to minimize impacts to surface water resources:

- No activity shall be conducted within 30 m of a watercourse that could result in sediment being deposited in the watercourse.
- Machinery shall not enter the watercourse.
- Fording of any watercourse is prohibited.
- Blasting in or near a watercourse is prohibited unless authorized in writing by NSE.



Aulds Cove Transmission Project
Wetland Survey

Nova Scotia POWER
An Emera Company

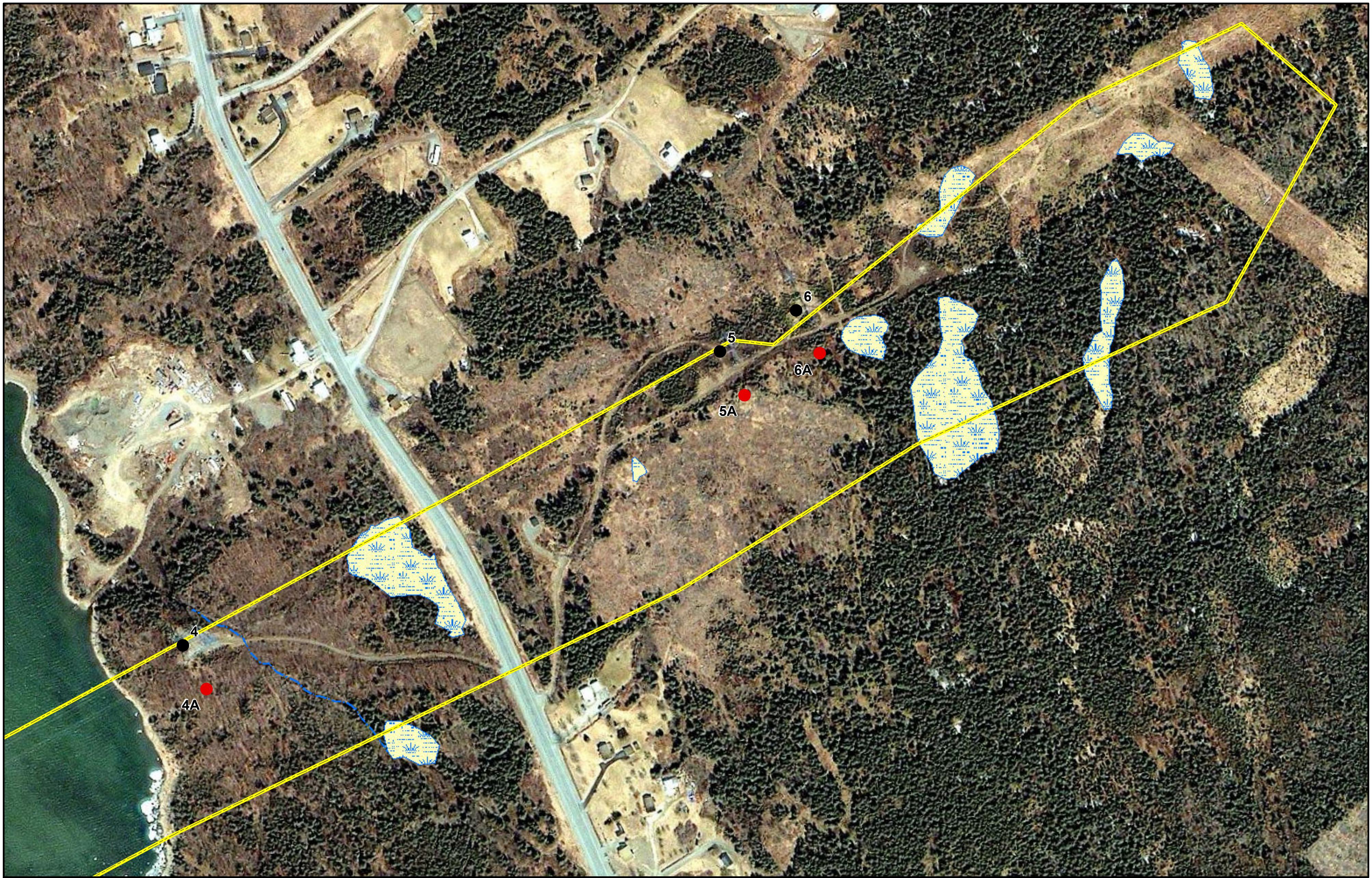
- Existing Structure
- Proposed Structure
- Delineated Watercourse
- Assessment Area
- Delineated Wetland

Date: January 18, 2016
CRS: NAD83 UTM Zone20
Scale: 1:4,700
Sources: NSPI, CBCL

N

0 25 50 100 150 m

Drawing 4.3



Aulds Cove Transmission Project
Wetland Survey

Nova Scotia POWER
An Emera Company

- Existing Structure
- Proposed Structure
- Delineated Watercourse
- Assessment Area
- Delineated Wetland

Date: January 18, 2016
CRS: NAD83 UTM Zone20
Scale: 1:4,700
Sources: NSPI, CBCL

N

0 25 50 100 150 m

Drawing 4.4

- A buffer of 30 m shall be maintained from watercourses for the following activities:
    - Equipment/machinery staging;
    - Vehicle re-fueling, maintenance and washing; and
    - Material storage or stockpiles
- Fuel storage shall be at least 100 m away from a watercourse.
- Sediment and erosion control structures (i.e. silt fences, matting, sand bags, and hay bales) will be kept on site and installed adjacent to the watercourse as required, particularly around areas of elevated risk and/or steep gradient.
- Sediment and erosion control will be left in place until vegetation or other permanent structures are in place.
- Hazardous waste materials will be handled in an appropriate manner and in accordance with the Workplace Hazardous Materials Information System Regulations and the Dangerous Goods Management Regulations, or any other applicable legislation.
- All emergency response procedures will be followed in the event of an oil/chemical spill.
- All vehicles/machinery/other equipment will be in good working order to prevent/minimize the likelihood of spills.
- Installation of temporary bridges or other watercourse crossings will be minimized to the extent possible. The preferred method will be to use established access roads to access locations on either side of a watercourse.

The following are potential impacts to wetlands as a result of clearing and construction activities:

- Erosion and sedimentation;
- Contamination; and
- Habitat/vegetation loss.

No wetlands will be directly impacted through construction activities. The following general mitigation will be implemented to minimize potential impacts to wetland habitat in the project area:

- A buffer of 30 m shall be maintained from wetlands for the following activities:
    - Equipment/machinery staging;
    - Vehicle re-fueling, maintenance and washing; and
    - Fuel (and other hazardous materials) storage.
- Soil/fill materials shall not be stockpiled within 30 m of a wetland.
- Excavated material shall not be buried or stored in a wetland.
- All vehicles/machinery/other equipment will be in good working order to prevent/minimize the likelihood of spills.
- All emergency response procedures will be followed in the event of an oil/chemical spill.

Any required watercourse crossings on the existing transmission right of way, will be managed according to the NSE requirements and under NSPI's transmission rights of way agreement (ENV-014).

Due to the small size of the project area, and the scope of planned project activities, it is not anticipated that any wetlands or watercourses will be impacted during this work.

4.3.2 General Habitat

The habitat in the area of the study site is predominantly previously cleared transmission line right of way. Nova Scotia Power transmission rights of way are managed to provide compatible vegetation, thus reducing the frequency of the vegetation management cycle. Low growing species such as alder are encouraged as competition for taller and fast growing species, which would need to be managed more frequently, due to presenting safety and reliability hazards, by growing close to, or into the power lines. Vegetation that reaches certain heights (identified by NSPI) can cause fire hazards and result in outages to customers. While not requiring rights of way to be mown strips, compatible vegetation allows for some habitat growth, with less management.

Adjacent to the right of way is treed, natural stand (Drawing 4.5).

A small portion of the study site on the Cape Breton side, is identified as Beach and Coastal Habitat on Drawing 4.5.

4.3.3 Effects and Mitigation

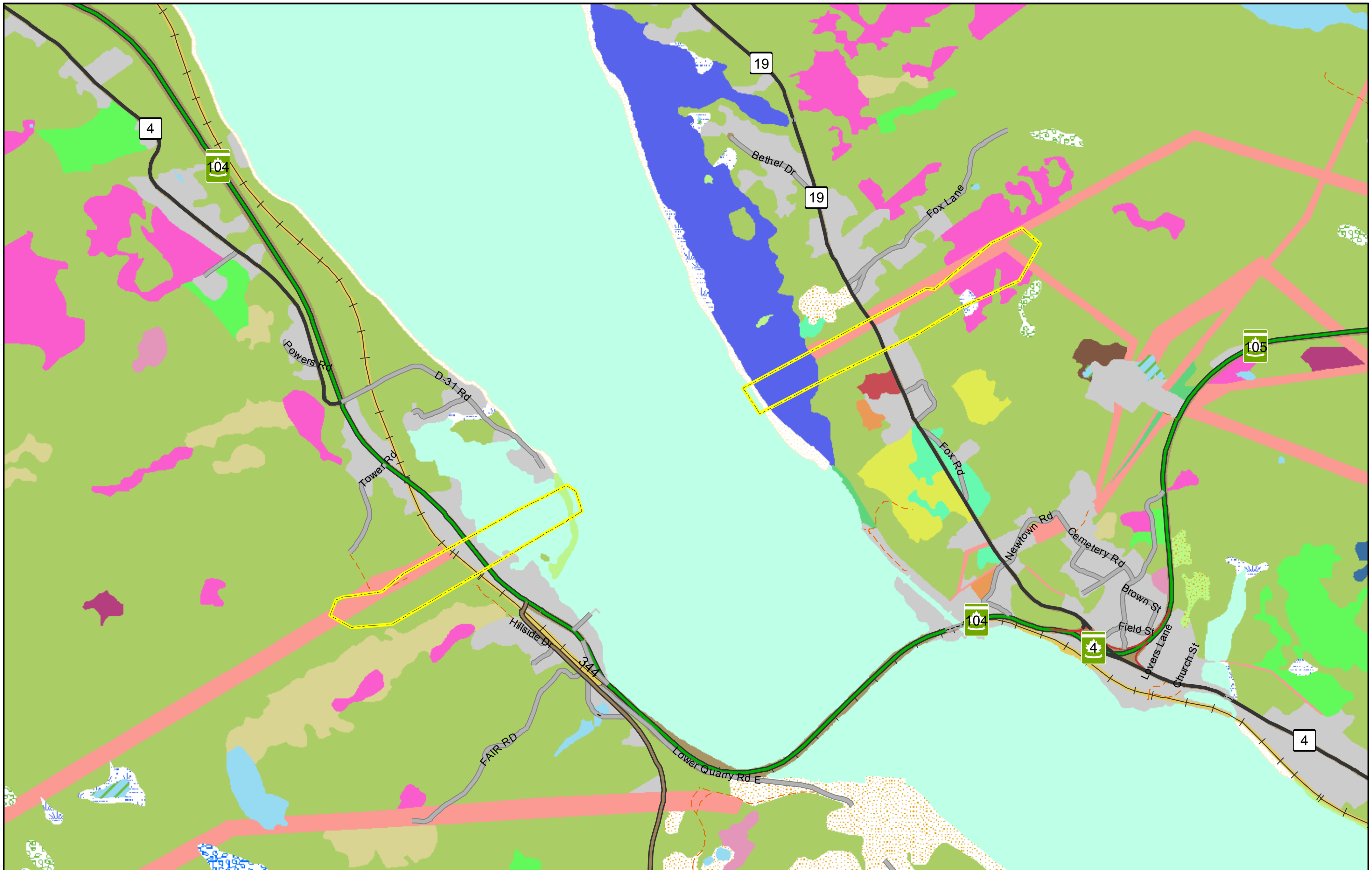
The development is mainly occurring in the previously cleared transmission right of way and immediately adjacent to this area. The nature of the right of way means that shrubs and small trees remain on the right of way, all tall vegetation, which may interfere with safe operation of the transmission lines, is managed and cleared.

The amount of new vegetation cleared will be limited to only the area required to accommodate the construction of the new line. All clearing will be completed outside of bird nesting season.

If beach habitat is impacted, due to installation of a tower, necessary permits and consultation will take place with NSE and NSDNR.

4.4 Marine Environment

A marine underwater benthic habitat survey was completed by CBCL Limited in November 2015 (Appendix I). At that time, there was the potential for infilling to be



Aulds Cove Transmission Project
Habitat Cover Type

Nova Scotia POWER
An Emera Company

- Assessment Area
- Natural Stand
- Treated
- Old field
- Dead
- Treated stand
- Plantation
- Brush
- Alders <75% cover
- Alders >= 75% cover
- Clear cut
- Partial depletion verified
- Wetlands general
- Beaver flowage
- Open bogs
- Treed bogs
- Coastal habitat area
- Lake wetland
- Cliffs, dunes, coastal rocks
- Inland water
- Ocean
- Agriculture
- Urban
- Misc.
- Beach
- Gravel pit
- Powerline corridor
- Road corridor
- Rail corridor

Date: January 18, 2016
CRS: NAD83 UTM Zone20
Scale: 1:25,000
Sources: NSPI, NSDNR Forest Inventory

N

0 125 250 500 750 m

Drawing 4.5

required for construction of the Tower 3A pad on the peninsula by Archie's Pond, on the mainland side of the Strait. The survey assessed the nearshore area immediately south of the existing transmission tower on both the exposed shoreline adjacent to the Strait of Canso and the sheltered shoreline adjacent to Archie's Pond. The survey consisted of 20 spot checks and one transect line filmed using an underwater drop camera.

A review of commercial, recreational and Aboriginal (CRA) fisheries that could occur within the project study area, or within proximity to the study area was also conducted to determine potential interactions.

Since the survey was conducted, additional engineering design work has been completed which will reduce the overall footprint of the tower. As such, the need for infilling is not anticipated to occur, and therefore limited impacts to the marine environment are expected.

The following sections are derived from information and data collected by CBCL Limited during the November 2015 Underwater Benthic Habitat Survey (Appendix I).

4.4.1 CRA Fisheries Assessment

Although minimal to no impacts are expected to the marine environment through the various phase of the project, various sources were utilized to determine potential CRA fisheries species within or on close proximity to the project area including:

- Personal communications with Fisheries and Oceans (DFO)
- Comprehensive desktop review; and
- Species identification utilizing underwater video

A list of all species selected for the CRA fisheries assessment is provided in Table 4.9

Table 4.9 List of Selected CRA Fisheries Species

Common Name	Species Name	Inclusion Criteria
Atlantic cod	Gadus morhua	Recreational
White hake	Urophycis tenuis	Recreational
Cunner	Tautogolabrus adspersus	Prey species to CRA
Yellowtail flounder	Limanda ferruginea	Potentially observed in study area Commercial, Recreational
Winter flounder	Pseudopleuronectes americanus	Potentially observed in study area Commercial, Recreational
Windowpane flounder	Scophthalmus aquosus	Potentially observed in study area Commercial, Recreational
Sand shrimp	Crangon sp.	Observed in study area Prey species to CRA
Atlantic rock crab	Cancer irroratus	Observed in study area Commercial
Hermit crab	Paragus sp.	Observed in study area

		Prey species to CRA
American lobster	Homarus americanus	Commercial, Aboriginal
Sea scallop	Placopecten magellanicus	Commercial, Recreational
Snow crab	Chionoecetes opilio	Commercial, Aboriginal
Bluefin tuna	Thunnus thynnus	Commercial, Recreational, Aboriginal
Mackerel	Scomber scombrus	Commercial, Recreational
American oyster	Crassostrea virginica	Observed in study area Commercial, Recreational
Bar clam	Spisula solidissima	Commercial, Recreational
Northern quahog	Mercenaria mercenaria	Commercial, Recreational
American eel	Anguilla rostrata	Commercial, Recreational, Aboriginal
Alewife	Alosa pseudoharengus	Commercial, Recreational
Green crab	Carcinus maenas	Observed in study area Commercial
Blue mussel	Mytilus edulis	Observed in study area Commercial, Recreational
Razor clam	Ensis directus	Commercial, Recreational
Atlantic salmon	Salmo salar	Recreational, Aboriginal
Atlantic silverside	Menidia menidia	Commercial
Soft shell clam	Mya arenaria	Commercial, Recreational
Striped bass	Morone saxatilis	Recreational, Aboriginal

The commercial species that were observed in the underwater video include:

- Rock crab;
- Green crab;
- Yellowtail flounder (potential);
- Winter flounder (potential);
- Windowpane flounder (potential);
- Blue mussel; and
- American oyster

Recreationally fished species observed in the underwater video include:

- Yellowtail flounder (potential);
- Winter flounder (potential);
- Windowpane flounder (potential);
- Blue mussel; and
- American oyster

Aboriginal fisheries for American lobster, snow crab and Bluefin tuna are presently ongoing in the St. Georges Bay region (Dwyer, Alan, pers. Comm., 2015). Other potential species harvested by the Aboriginal fishery in the region include: Atlantic salmon, American eel and striped bass.

4.4.2 Habitat

Within the Project boundaries, the marine study identified rocky intertidal habitat, mixed substrate habitat and fines dominant habitat as being present.

Rocky Intertidal Habitat

This habitat type was observed solely in the Strait of Canso. From the east side of the peninsular projection, this habitat extended to the shallow subtidal zone. This habitat is mainly comprised of large and small boulders, large and small cobbles, and gravels with intermittent small patches of sandy fines.

This habitat has been identified as proving good or moderate to good habitat to the following species:

- Hermit crab;
- American lobster;
- Rock crab;
- Green crab;
- Cunner; and,
- Atlantis silverside.

Macroflora observations carried out through the study varied based on the depth within this habitat type. At less than 1 m depth, brown alga (*Ascophyllum nodosum)* was the most abundant macroflora. At depths up to 3 m, *Fucus sp*. and *Lithothamnium sp*. were the most abundant. Macrofauna observations consisted mostly of periwinkles (*Littorina sp*.) and barnacles (*Balanus sp*.). Due to tidal changes that this habitat experiences, it could explain as to why so few macrofauna species were observed.

Mixed Substrate Habitat

This habitat type was observed mainly in the Strait of Canso as well, specifically being observed approximately 50 m from the eastern side of the peninsular shore in the shallow subtidal zone. One section was observed close to the western shore of the peninsular shore as well. This habitat type is comprised of cobbles and gravels, with some protruding boulders and small patches of sandy fines.

This habitat has been identified as proving good or moderate to good habitat to the following species:

- Hermit crab;
- American lobster;
- Mackerel;

- Blue mussel;
- Rock crab;
- Sea scallops; and,
- Atlantis silverside

Several species of algae were observed within this habitat, although not at any great abundance. *Chondrus crispus* was the most abundant alga species observed, specifically on exposed cobbles and small boulders. Few macrofauna observations were noted, with intermittent sightings of barnacles (*Balanus sp.*), and periwinkles (*Littorina sp*.), and a single rock crab. Due to the complexity of the substrate, it is likely that additional macrofauna were present during the study, but remained hidden in interstitial spaces and in the macroflora.

Fines Dominant Habitat

This habitat type was dominant within Archie Pond and was not observed inside the Strait of Canso. This habitat is comprised of entirely of fines, with the exception of one area that had some fixed fines and gravel substrate. The fines themselves appear to be a mix of sand, silt, clay and mud. When the fines are disturbed they reveal a shallow anoxic layer.

This habitat has been identified as proving good or moderate to good habitat to the following species:

- American oyster;
- Hermit crab;
- Rock crab;
- Sand shrimp;
- Winter flounder; and,
- Windowpane flounder.

Macroflora was uncommon in this habitat, with a few occurrences of green alga (*Spongomorpha sp.*) on shell debris and rubber tires present throughout Archie Pond. Macrofauna identified in this habitat were infrequent and limited to hermit crabs (*Pagurus sp.*), sand shrimp (*Crangon sp.*), slipper snails (*Crepidula sp.*), oysters (*Crassotrea virginica*), blue mussels (*Mytilus edulis*), green crabs (*Carcinus maena*), and unidentified juvenile flounder. Shell debris was abundant close to shore and it is likely that these shells were deposited largely by feeding shore birds.

DFO has indicated the study area is within the bounds of active lobster fishing grounds. The outer study area in the Strait of Canso contains suitable habitat for the entire life cycle of American lobster.

No sensitive or rare habitat types were identified within the study area.

5 Alternatives to the Project

5.1 Overview and Evaluation

NSPI has a responsibility to serve Nova Scotians with high quality, reliable electric service at the most reasonable cost possible. As outlined in section 2.1, to reliably deliver the renewable energy provided by the Maritime Link Project, increase available capacity for energy from Cape Breton, help NSPI and Nova Scotia meet renewable energy targets and balance wind generation and strengthen grid connectivity, the transmission lines across the Strait of Canso need to be re-configured. In order to achieve this, The Project (as described in Section 2.0) and two alternatives to the Project were examined in order to determine the most cost-effective and feasible option.

Subsea Conductor

A considered alternative to the aerial crossing at Auld's Cove was to remove the existing L-7005 transmission line at the existing Auld's Cove Crossing and replace it with a subsea conductor. High voltage insulated cable would be utilized under the Strait to relocate the 230kV line. In order to evaluate this method, a preliminary cost estimate report was created and can be found in Appendix J. Two methods of installation were examined: submarine cable installation and Horizontal Directional Drilling (HDD).

In order to evaluate this alternative option with greater certainty, additional engineering designs would be required. This work would include geotechnical studies and analysis to determine the preferred cable route. If the preferred route was determined to be outside the existing ROW, a new ROW would be required and this could involve a lengthy approval process.

The subsea crossing would result in a negative impact on the schedule due to various unknowns associated with this type of design, specifically with regards to additional geotechnical studies. The results of these studies could delay the Project as they may impact the final location of the subsea cable. As well, there is an anticipated long procurement and delivery period for the subsea cable.

Submarine cable installation would result in greater negative impacts to the environment when compared to HDD. Submarine cable installation would involve trenching and burying the cable in Archie Pond, Long Pond and the Straight of Canso. The trenching required would result in impacts to the marine environment, and potentially CRA fisheries in the area as well as the migratory bird habitat found in Archie Pond. The HDD method avoids direct impact to the marine environment through drilling from the shore and under the marine environment. The caveat to this method is that additional geotechnical studies would be required to determine if the subsea cable option is feasible, and if so where it could safely be installed. Once installed, if complications or an outage occurs, it is very difficult to troubleshoot, repair or replace.

Based on the report (Appendix J), the cost for the submarine cable installation method is estimated to be $46,410,000 CAD. For the HDD method, the cost is estimated to be $49,180,000 CAD. The estimated cost for both of these methods greatly exceeds that of the new overhead transmission crossing option proposed in this document.

Based on the assessment of this alternative to the Project, its results show that it is not a feasible option. Based on the estimated cost, increased environmental impact to the marine environment, potential delays to scheduling as a result of permitting requirements, potential issues with regards to maintenance and repair of the subsea cable, and potential unknown issues resulting from design and geotechnical data, the subsea conductor option was not selected when compared to the Auld's Cove transmission crossing.

Canso Causeway Upgrade

The other alternative to the Project that was evaluated involved upgrading the Canso Causeway through a swap of L-7005 (currently on the double circuit tower at Auld's Cove) and the 138kV line (L-6515) which runs on the eastern side of the Causeway. This option would result in replacing 3 km of the existing 138kV line with a new 230kV line and diverting L-6515 to the present location of L-7005 at the Causeway. The project would involve significant transmission work in the surrounding area, as well as the construction of significantly taller monopole tubular structures on the causeway in order to accommodate the L-7005 line. Existing concrete footings on the causeway would require replacement to accommodate the 230kV line

While the land on the mainland side remains largely undeveloped, there are a number of residential properties on the Cape Breton side from which land easements would be required. In order to complete this Project, an additional nineteen (19) easements would be required. Gaining these additional easements could result in lengthy delays, through negotiations and potential legal challenges resulting in potential project delays.

In order to complete the upgrade of the Causeway, the decommissioning of the existing 138 kV line and installation of the new 230 kV line would result in significant reliability risk for customers. In addition to this, due to the limited space on the Causeway, the major works would result in vehicle disruption for automobile, locomotive and marine traffic. Due to this disruption, scheduling of decommissioning and construction activities would need to be coordinated with various stakeholders in order to mitigate the severity of the impact. This complex coordination could result in a very tight and aggressive schedule for the causeway upgrade that would be unable to properly adapt to delays in order to accommodate the stakeholders and prevent major vehicle disruption.

Due to the known challenges with avian mortality related to the existing transmission infrastructure, re-development of the Causeway including larger infrastructure could exacerbate risks to avian species and was considered undesirable.

The Causeway property has recently changed ownership from the federal to provincial government. Transport Canada owns the terrestrial lands around the canal as well as the submerged lands. A license would be required for this crossing & encroachment, along with an application under the new Navigation Protection Act. Consultation would also be required with the Railway to ensure the addition of the 230kV lines would not impede their operation.

The estimated cost of the Canso Causeway upgrade is $13 million.

Based on the assessment of this alternative to the Project, its results show that it is not a feasible option. Based on the potential increased environmental impact to avifauna, potential extended outages for costumers, potential delays to scheduling as a result easement approvals, and issues with regards traffic disruption, the Canso Causeway upgrade option was not selected when compared to the Auld's Cove transmission project.

6 Additional Considerations

6.1 Terrestrial Vegetation

On hardwood hills in this area, sugar maple, beech, red maple and yellow birch pre-dominate. White spruce, red spruce and balsam fir form mixedwoods with the above hardwoods in some valleys and slopes. Hemlock is commonly found in ravines. On the hummocky terrain of the Mulgrave Plateau, St. Mary's River and Central Uplands, red spruce, balsam fir, white pine and hemlock are common on well drained soils.

Occasionally these tolerant softwoods mix with the tolerant hardwoods to create diverse mixedwoods, especially on the lower slopes where seepage has enriched soils with nutrients and moisture. Black spruce and eastern larch occur on the imperfect and poorly drained soils (Neily, 2005).

Terrestrial vegetation in the project site is dominated by shrub and low growing vegetation due to the nature of the managed transmission line corridor.

A small amount of clearing of mixed wood trees will take place to widen the right of way and accommodate the new line, this will be completed outside of the bird nesting season.

No flora species of concern were observed on the project site during the field studies. The following are potential impacts to flora (plant) as a result of clearing and construction activities:

- Loss or physical damage to flora species and flora species of concern.
- Soil contamination.

The following mitigation will be implemented to minimize impacts to flora species:

- A 30 m buffer around sensitive habitats such as watercourses, wetlands and other water bodies shall be maintained, to the extent possible.
- Hazardous waste materials will be disposed of in an appropriate manner and in accordance with any applicable guidelines and/or legislation.
- All emergency response procedures will be followed in the event of an oil/chemical spill.
- All vehicles/machinery/other equipment will be in good working order to prevent/minimize the likelihood of spills.
- Burning of vegetation shall not be permitted.
- Rutting and other such vehicular disturbances shall be minimized to the extent possible.
- Clearing/fragmentation of habitat shall be minimized to the extent possible.
- Alignment of access roads with existing roads and logging trails will be implemented where possible.

No significant impact on terrestrial vegetation is expected.

6.2 Terrestrial Fauna

There is potential for a number of species to use habitats in and around the study site. Larger mammals such as bears, coyotes, deer and moose often use rights of way as movement corridors. Birds may use wetlands and shrub habitats for roosting and nesting activities.

Generally, effects to wildlife during clearing and construction are temporary due to the relative short duration and the transient nature of fauna (animal) receptors. While direct impacts to fauna species (i.e. mortality) are unlikely during clearing and construction, the following are potential indirect impacts as a result of clearing and construction activities:

- Temporary disturbance due to noise from the operation of heavy equipment and increased human presence.
- Habitat loss/fragmentation due to removal of vegetation.

The following mitigation will be implemented to minimize impacts to fauna:

- Clearing of vegetation will be minimized to the extent possible.
- Machinery will be in good working order to minimize noise.
- Work sites will be kept clean to minimize access to garbage that may attract wildlife.
- Alignment of access roads with existing roads, logging trails and the existing transmission right of way will be implemented where possible.

Little impact is expected on these habitats, as work around the towers will involve a small footprint and some tree removal, but wires will run above the majority of these terrestrial habitats.

No significant impact is expected to terrestrial fauna.

6.2.1 Significant Habitats and Rare Species

Provincial habitat mapping (DNR, 2015) shows that the project site is located in Deer Zone 110. Just outside of the project area, along Long Pond, is a saltmarsh (2.2ha) and Archie Pond is listed as Significant Habitat AT436 – migratory bird. A number of swamp wetlands are also identified in proximity to the project site. One species at risk habitat (IN285) is identified at Horton Lake, which is 3.5 km from the project site.

The project site has been disturbed at various points in the past, and the overall habitat value of the site is considered rather low. The highest potential for presence of rare species was in the wetlands and along the watercourses referenced above. However, no species of interest were noted during surveys.

Of the species identified in the AC CDC report (Appendix K) that are legally protected in Nova Scotia, the Olive-sided Flycatcher and Rusty Blackbird were identified during passerine surveys. Although not listed in the AC CDC report, the Chimney Swift and Red Knot were also identified within the study area during coastal pond and shorebird surveys.

An Atlantic Canada Conservation Data Centre (AC CDC) search revealed that there were four records of three vascular plants within 5 km of the project site. There were also 75 records of 32 vertebrate, 1 record of 1 invertebrate fauna. On the ground work during the wetland survey, revealed there was no suitable habitat for these species within the study site.

No significant impact is expected for significant habitats and species.

6.3 Geophysical Environment

The project area (centered at 5057005.79N 622249.37E) lies within Ecoregion 3, Nova Scotia Uplands and in the Mulgrave Plateau and Cape Breton Hills Ecodistricts of Nova Scotia, which extend roughly from Mulgrave to Guysborough and Goshen, and from Port Hastings to East Ainslie Lake and Bras D'or lakes respectively (DNR, 2015).

The Strait of Canso and the surrounding area have a complex history. This is reflected in the geology and soils, which influence the development of surface drainage patterns and have a bearing upon groundwater resources (MRMS, 1975).

Although the region is a relatively small part of the province, 17 of the 24 geological formations of Nova Scotia have been mapped in the area. These range from the province's oldest rocks of the George River group, 800-900 million years old, to the second youngest, the Annapolis group, formed about 200 million years ago. Tectonic movements have complicated the geological structure. A major fault line extending from Minas Basin past the south shore of Chedabucto Bay separates the Nova Scotia Uplands in the south from the Lowlands to the north. The lowlands are bordered in the northwest by the Antigonish Highlands and in the east by the Mabou Highlands and in the hills around Bras d'Or Lake, formed by smaller, usually tilted blocks of older bedrock. During the past 1.5 to 2 million years, four major glacial periods, separated by long-term interglacial intervals, have occurred. During the last period, the entire region was covered by glaciers, which disappeared 11,000 to 12,000 years ago. The turbulent past is also reflected in the soils. Most of the major soil types of the province are represented, and in most instances they exhibit characteristics derived from the underlying bedrock. (MRMS, 1975)

The project lies within the Antigonish Uplands – South River geographical classification region of the province (Davis & Browne 1997: 142). The uplands are elevated, dissected and cut by several faults. They represent a transitional zone between the coastal lowlands and upland areas to the south and west (Davis & Browne 1997: 142) (Kelman, 2015).

The locality contains several tertiary watersheds, most of which drain into St. Georges Bay. Floodplains occur along many of the streams and rivers on the mainland side of the region (Davis & Browne 1997: 142). The Strait of Canso was carved out by an ancestral river flowing from the Scotian Shelf into St. George's Bay (Davis & Browne 1997: 112) (Kelman, 2015).

Soils in the Cape Breton portion of the study area are Shulie series, which have good drainage and derive from a grayish-brown sandy loam till with variable thickness (Cann et al 1963: 33). Soils in the mainland portion of the study area are Halifax series and have developed from a gritty, sandy loam till derived from quartzite and slate (Cann & Hilchey 1954: 33). In the vicinity of Aulds Cove, conglomerate boulders litter the surface and the soils are too stony for agriculture (Cann & Hilchey 1954: 34) (Kelman, 2015).

The ultimate source of all freshwater supplies is water arriving in the area in the form of precipitation. Some of this water is stored temporarily as snow, surface water and groundwater, but in the end it is removed by stream flow, evapotranspiration and in a very minor way by groundwater flow directly to the sea (MRMS, 1975)

The major part of the region has a thin cover (less than 1m, or 3ft.) of glacial till over the bedrock. Most of the remaining area has a layer of ablation till over basal till, both of which may vary considerably in depth. Small areas are covered with drumlins, glacio-fluvial and alluvial deposits. The latter two are favorable for developing large-capacity groundwater supplies (MRMS, 1975).

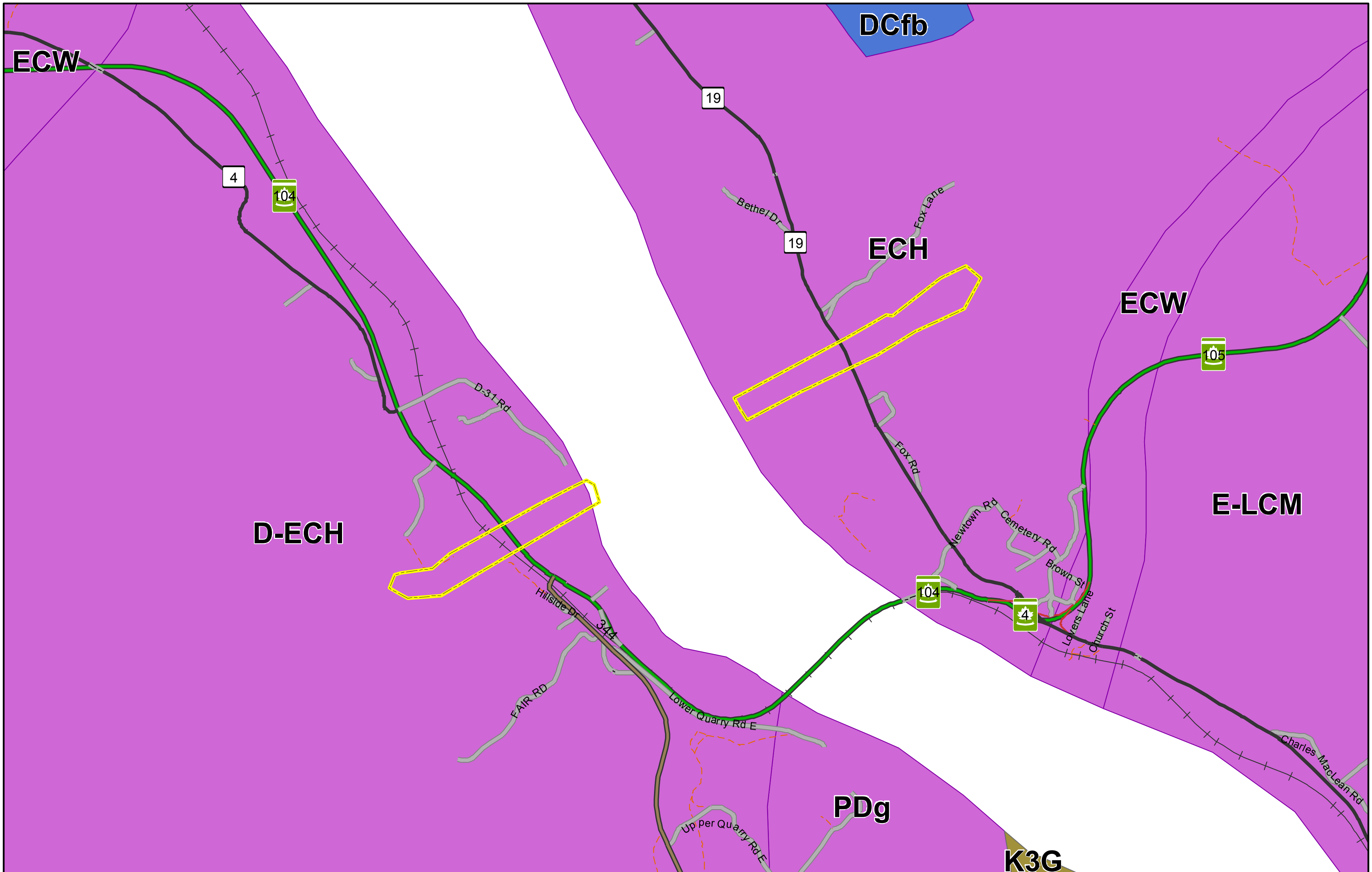
The Strait of Canso area is characterized by the long coastline relative to land area. No point within the region is farther than 24km (15mi.) from saltwater. Under these circumstances, watersheds are small, the largest being that of Inhabitants River (355km^2 or 137 sq. mi.). About 10 rivers in the region have watersheds larger than 100km^2 (MRMS, 1975).

6.3.1 Effects and Mitigation

Potential geophysical effects from the project activities include localized disturbances of surface soil and shallow bedrock from construction of the towers. There are no known groundwater wells in the vicinity of the project.

The following are potential impacts to surficial and bedrock geology resulting from clearing and construction activities:

- Soil contamination
- Soil erosion and sedimentation of wetlands and/or watercourses
- Alteration to bedrock geology and/or structural conditions of receptors resulting from blasting



Aulds Cove Transmission Project
Bedrock Geology by Formation

Nova Scotia POWER
An Emera Company

- Assessment Area
- Fisset Brook Formation
- McMillan Flowage, Blues Brook, Malagawatch and Barachois River Formations
- none

Date: January 18, 2016
CRS: NAD83 UTM Zone20
Scale: 1:30,000
Sources: NSPI, NSDNR Mineral Resources Branch

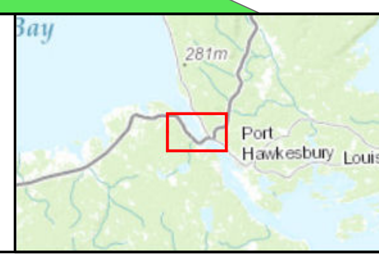
N

0 150 300 600 900 m

Drawing 6.1

Aulds Cove Transmission Project
Surficial Geology by Unit

Assessment Area
Bedrock
Marine Deposits
Silty Till Plain
Stony Till Plain
none



Date: January 18, 2016
CRS: NAD83 UTM Zone20
Scale: 1:30,000
Sources: NSPI, NSDNR Mineral Resources Branch

N

0 150 300 600 900 m

Drawing 6.2

Nova Scotia POWER An Emera Company

- Acid rock drainage

The following mitigation measures will be taken:

- Development of an EPP for construction activities, to prevent sedimentation and erosion during excavation
- If blasting is required, a blasting plan shall be developed by the contractor including proper handling, storage and disposal of spent blast medium.
- If blasting is required in areas with high potential for acid bearing rock, the blasting plan shall include a plan for the handling and disposal of acid rock. If the amount of spent medium exceeds 500 m3, the *Nova Scotia Sulphide Bearing Material Disposal Regulations* shall apply.
- All emergency response procedures will be followed in the event of an oil/chemical spill as identified in Appendix J.
- All vehicles/machinery/other equipment will be in good working order to prevent/minimize the likelihood of spills.
- If any material is encountered that is a potential contaminant, such as contaminated soil or groundwater, the material will be tested, handled and disposed of in accordance with federal and provincial regulations.
- In the event contaminated soil is discovered during project activities, the following procedures will be implemented:
    - Secure the area containing contaminated soil;
    - Take all necessary measures to prevent the flow of water to or from the area;
    - Ensure that any run-off from the area is discharged to the appropriate containment facilities and disposed of in accordance with federal and provincial regulations;
    - Avoid temporary stockpiling of soils as much as possible;
    - In the event stockpiling is required, cover the contaminated soil with plastic sheeting or tarps and surround with a berm;
    - Ensure stockpiles are located at least 30 m from a watercourse or storm drain; and
    - Characterize soil and remove for off-site treatment as soon as possible.

6.4 Atmospheric Environment

The climate around the project area is characterized by strong winds and variable temperatures. Its location on the Strait of Canso influences weather patterns. As stated in the Archaeological assessment (2015), the region is subject to both continental and maritime climatic influences, due to its location, and is best characterized by its variability (O'Neill 1977: 2).

The project is identified as being both on the Mulgrave Plateau (mainland side) and the Cape Breton Hills (Cape Breton side) eco-districts. The Mulgrave Plateau eco-district is bordered by the waters of the Northumberland Strait and the Strait of Canso with both areas prone to strong coastal winds. The Cape Breton Hills Ecodistrict is influenced by strong, cold winds of the Gulf of St Lawrence. Temperatures are slow to warm in the spring, resulting in short growing season. The area receives between 1400 – 1550 mm of precipitation annually (Neily et al, 2005).

Mean annual precipitation varies from 105 cm at Antigonish to 151 cm at Dickie Brook. Precipitation in the form of snow arrives in October and peaks in January and February to about half the total precipitation, gradually diminishing in ratio to its disappearance in May (MRMS, 1975).

The hilly topography of the uplands creates microclimatic environments where sheltered and exposed conditions can vary the local weather, especially temperatures. Overall, summers tend to be warm and winters long and cold (Neily et al. 2005).

Any industrial air bourne pollutants are likely to arrive at the project area via the strong winds on the Strait, from the port traffic and industry in the area.

6.4.1 Effects and Mitigation

The potential effects to the atmospheric environment would be limited to slightly increased emissions from heavy equipment operating during construction of the towers and lines.

There are no anticipated air temperature changes or long term effects on the atmospheric environment.

6.5 Socio-Economic Conditions and Effects Management

The Strait of Canso separates Cape Breton Island from the mainland of Nova Scotia. The Mi'kmaq were the original settlers in the area until the 1780s, when other settlements were established on both shores. Historically, fishermen used the Strait of Canso as a passageway between the Atlantic Ocean and the Gulf of St. Lawrence, establishing the Strait as a water route (Coastguard, 2015).

In addition to being a navigational shortcut for fishermen, the deep waters of the Strait of Canso were eventually used by coastal freighters and later by oil tankers. Sailing through the Strait saved time and fuel costs by trimming 70 nautical miles off the voyage to Montreal and 171 nautical miles off a trip to Charlottetown versus sailing around the tip of Cape Breton (Coastguard, 2015).

Besides travel through the Strait of Canso, there was ferry traffic between the two shores, which transported trains and vehicle traffic. As traffic congestion on both sides of the Strait of Canso increased, demand for a permanent crossing grew. Although a suspension bridge between the two shores was considered, Canadian National Railway officials insisted on a causeway to facilitate the safe movement of trains (Coastguard, 2015).

The Project site falls into the counties of Guysborough, Antigonish and Inverness. The table below shows the population statistics for these areas.

Table 6.1 Populations of Municipal Districts and Towns Near Project Site

Geographic Name	2011 Population	Total Private Dwellings (2011)	Occupied Private Dwellings (2011)	Land Area Km^2	Population Density per Km^2 (2011)
Antigonish (Total)	**19,589**	**9,591**	**7,857**	**1,457**	**13.4**
Antigonish, Subd. B	6,439	2,773	2,481	522.16	12.3
Guysborough (Total)	**8,143**	**5,310**	**3,686**	**4,044.23**	**2.0**
Guysborough MD	4,189	2,827	1,933	2,111.42	2.0
Mulgrave (Town)	794	367	328	17.81	44.6
Inverness (Total)	**17,947**	**9,577**	**7,437**	**3,830.40**	**4.7**
Inverness, Subd. C	3,357	1,956	1,398	1,033.42	3.2
Port Hastings (Town)	106	53	46	.85	124.4

Statistics Canada, 2015

The area immediately surrounding the Project area is largely rural and has a low population density. The closest communities are Mulgrave, with a population of 794 it is the largest community in this area on the mainland. The nearby community of Port Hawkesbury (population 3,366) is the local center for industry, with the Point Tupper / Bear Head Industrial Park, Point Tupper NSPI facility, Bear Head LNG facility, Port Hawkesbury paper and the Strait of Canso Super Port.

Population density in the area is low, with between 2.0 and 12.3 people per km^2 in the immediate area, compared to the provincial average of 17.4 people per km^2.

6.5.1 Economy

The Guysborough area records an employment rate of 44.9% and unemployment rate of 16.0% compared to the Provincial rates of 57.2% and 9.1% (City Data, 2015a). Antigonish records an employment rate of 59.5% and unemployment rate of 9.5% (City Data, 2015b). Mulgrave town lists 59.7% and 10.6% respectively (City Data, 2015c), while Port Hawkesbury lists similar rates of 58.6% and 10.3%(City Data, 2015d).

Mainland Nova Scotia and Cape Breton Island were linked in 1954 upon completion of the Strait of Canso causeway. The Strait is relatively narrow, varying in width from 800m to 2,000m (2,600 to 6,600 ft.) although it is most commonly 1,600m (1 mi.) wide through the 27km (17 mi.) length. The section south of the causeway is 15km (9 mi.) long, with a depth usually varying between 38 m and 64 m (125 to 210 ft.) (MRMS, 1975).

Although the primary objective of the causeway was to facilitate road and rail traffic, an additional benefit was the creation of one of the best year-round, deep water harbours found along the eastern seaboard of North America. This stimulated the development of the Strait of Canso area. Port facilities were established, industries located in the area, communities expanded rapidly, and further developments are anticipated. Considerable attention is focusing on this area (MRMS, 1975a).

Port Hawkesbury was originally named Ship Harbour (after the harbour upon which it is located) and is largely a service centre for western Cape Breton Island with many of its residents working in large industries in an industrial park located in the adjacent community of Point Tupper, Richmond County. The town has two schools and the Strait Area Campus of the Nova Scotia Community College. The port of Port Hawkesbury is the second largest by tonnage annually in Canada, second only to Vancouver, British Columbia due to large volumes of crushed rock and gravel shipments and oil trans-shipments. The Port handled 31.6 million metric tonnes in 2006, 21.6 million tonnes of crude petroleum (www, 2015).

Port Hawkesbury built ships for the timber export trade in the early and mid-19th century. Schooners and fishing boats were also built for the inshore and banks fishery by firms such as the noted boatbuilder H.W. Embree and Sons. The port further developed in the 19th century when railway connections arrived. The construction of the Canso Causeway increased the shelter capacity of the deep water port leading to further growth in shipping of bulk commodities and the establishment of several heavy industries such as the pulp mill (www, 2015).

The Town of Mulgrave was first settled in 1800 by European Loyalists fleeing the American Revolution. Mulgrave was at that time known as McNair's Cove and became a part of the lumber trade with the English government (www1, 2015).

When the lumber trade ended in 1818, the fishing industry began to take hold, and by 1830 it was the major source of employment for the residents of Mulgrave. Ferry services were also established in Mulgrave in 1833, carrying passengers from Mulgrave to Port Hawkesbury. This service provided rail and road gateways for traffic from mainland Nova Scotia and the rest of Canada to Cape Breton and Newfoundland. Steam ferries were introduced to the area in 1863, boosting the amount of traffic ferried in a day. However, in 1870, all trade agreements in the fishing industry were cancelled to protect the American fish market, and the industry collapsed. Depression set in the area, and by 1880 over 1/3 of the population had migrated to the New England area in search of employment (www1, 2015).

By the 1900's the economy was in a state of improvement as the government railway was hiring local people, a new lobster factory was built, and a new rail ferry had arrived in the area. The railroad industry was now the industry of the times, and Mulgrave was quickly becoming a bustling terminal, equipped with freight sheds, marshalling yards, and all the necessary auxiliary services of an efficient railway centre. By 1915, Mulgrave was considered a prosperous town and in 1923, the town became incorporated (www1, 2015).

Figure 6.3, below shows some of the industry located along the Strait of Canso.

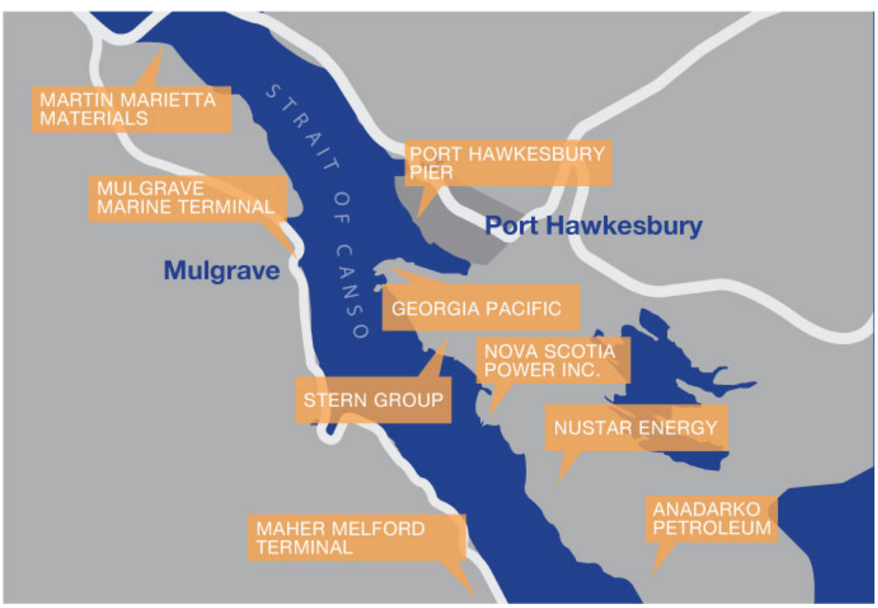


Figure 6.1 Strait of Canso 'Strait Superport' (www2, 2015)

In 2001 Antigonish/Guysborough Counties had a total experienced labour force of 13,635, which represents 3.1% of the total experienced labour force of Nova Scotia. Agriculture accounted for 2.9% of all jobs in Antigonish and Guysborough counties in 2001; this is higher than the provincial average of 1.8%. The major employment sectors in these counties were health and education, manufacturing and construction, and other services. (NSFA, 2011b)

6.5.2 Land Use and value

Land use at the project site is mainly cleared right of way with low growing vegetation, some wetland areas and is bordered by trees. However, the wider region has a large amount of agriculture. In 2013, the Northern region (including Colchester, Cumberland, Pictou, Guysborough, and Antigonish) represented approximately 26% of the agricultural industry in Nova Scotia. Although, an estimate for Guysborough County is not specifically given, the data indicates that its geographic region is a significant component to the agricultural industry in Nova Scotia (NSFA, 2011a).

In comparison to the other industries in the Northern region, agriculture accounted for approximately 2.03% of all jobs in the region, which is higher than the provincial average of 1.17%. The industries with the highest employment in the Northern region were trade, health care and social assistance, manufacturing and educational services. (NSFA, 2011a)

Agriculture in Antigonish and Guysborough Counties is characterized by a diversity of farm production activities including dairy, beef, miscellaneous specialty and fruit farms. The direct economic impact of these activities is significant.

Farm businesses have a strong local orientation they both buy and sell in their local community. The total direct and indirect jobs associated with agriculture and their linkage to other industrial sectors in Antigonish and Guysborough Counties is conservatively estimated at 408, or approximately 3% of all jobs in the local economy (NSFA, 2011b).

Given the availability of prime agricultural soils, the current level of farm production and the established agri-related business infrastructure that exists in Antigonish and Canso, it is evident that agriculture will continue to be a significant economic activity and land use in the area surrounds Antigonish and Guysborough for many years to come. (NSFA, 2011b)

In 2001, land in crops accounted for 22.63% of total land use in Antigonish/Guysborough Counties, while pasture land accounted for 9.31%. The remaining farmland accounted for 68.06% of the total county's farmland and includes such uses as summer fallow and Christmas tree production etc. (Table 6.2).

Table 6.2 Farmland Use in Antigonish and Guysborough Counties

	Antigonish & Guysborough Counties		Nova Scotia	
	# of acres	***% of total***	***# of acres***	***% of total***
Land in crops (excluding Christmas tree area)	24,788	22.6%	294,596	29.3%
Tame or seeded pasture	5,501	5.0%	56,520	5.6%
Natural land for pasture	4,695	4.3%	81,215	8.1%
All other land (including summer fallow and Christmas tree area)	74,555	68.1%	573,502	57.0%
Total	109,539	100.00%	1,005,833	100.00%

Source: Statistics Canada, 2001(NSFA, 2011b)

No farmland will be impacted and there are no anticipated impacts to socio-economic conditions due to this project.

6.5.3 Recreation and Tourism

The area around the project area has three recreation centres, two at Port Hawkesbury, and one in Mulgrave. Auld's Cove has a recreation committee, a ball field, a beach and a warf, listed under the Active Living Directory for the region (Nova Scotia, 2015). There are over 1,000 activities listed for the Guysborough, Antigonish and Pictou county regions ranging from Highland dancing to hiking and biking trails. There is also a dive supply store and diving opportunities in Auld's Cove.

There is not expected to be any impacts to tourism or recreation due this project.

6.5.4 Human Health

This project will add a second set of towers and transmission lines, at this location. The new infrastructure will be adjacent to existing towers and line, and therefore no new effects are anticipated.

There are no predicted human health effects of this project.

7 Public Consultation

7.1 Overview

To support the Environmental Assessment and construction of the Auld's Cove Transmission Crossing, the Government Relations team of NSPI provided notice and the opportunity for consultation with elected officials and government representatives in the area.

Outreach and consultation has occurred with the various levels of government as well as the community. A summary of actions that have occurred to date is included below:

Provincial Level Outreach:

- In the Spring of 2015, a briefing note was provided to the Honorable Michel Samson, Minister of Energy (who is also the MLA for a neighboring area – Port Hawkesbury) for the spring sitting of the Nova Scotia Legislature in case there were inquiries about the project by MLAs.
- At that same time, a briefing note was also provided to the two MLA's who have constituencies on each side of the proposed Strait of Canso crossing points. They are the Honorable Lloyd Hines for Guysborough-Eastern Shore-Tracade and Allan MacMaster for Inverness.
- The constituency offices of the three local MLAs – Hines, Samson, MacMaster were contacted by telephone and provided notice of the project. They agreed to provide any feedback to NSPI that they may receive from citizens in the area, and to work with us to answer citizen questions and concerns.
- Follow up conversations were held twice with Allan MacMaster and various questions were answered regarding the project.
- All MLA's and officials at the Provincial level expressed their satisfaction at being provided with advanced notice on the project and the direct connection with NSPI to access information and answers about our project.
- Communication at the Provincial level has continued and will remain a priority until the project is completed.

Municipal Level Outreach:

- The Town of Port Hawkesbury was contacted initially through a phone call to the Office of the Mayor, Billy Joe MacLean. They were then provided with a briefing note on the project in the late Spring of 2015. This briefing note was circulated to all members of the Port Hawkesbury Town Council and the Chief Administrative Officer of the Town. They also agreed to provide NSPI with any relevant citizen feedback and questions and to work with us on any citizen concerns that may arise.

- The Municipality of the District of Guysborough Warden and Chief Administrative Officer were contacted initially by phone and followed up with an email of the briefing note on the project.
- The Town of Port Hawkesbury expressed their satisfaction at being provided with advanced notice on the project and the direct connection to access information and answers about the project.

Communication at the Provincial and Municipal levels has continued and will remain a priority until the project is completed. For example, in January – these parties were contacted and provided notice that the Pettipas Market (located on the mainland side of the crossing) had been purchased by NSPI, and will be removed as part of preparations to facilitate construction of the crossing.

On November 3, 2015 and Open House was held at the Causeway Inn (21 Old Victoria Road, Port Hastings, NS). To inform local citizens of the open house, all MLAs and offices in the area and both the Town of Port Hawkesbury and the Municipality of the District of Guysborough were provided with an invitation to the public Open House and were encouraged to share the invitation with their constituents. A notice of the Open House was placed in the Port Hawkesbury Reporter on October 30, 2015.

Figure 7.1 Auld's Cove Open house

The goals of the Open House were to provide interested public an overview of the project and a mechanism to raise any questions or concerns in a relatively informal setting. Various displays were setup and provided information related to the following:

- An overview of the project including the scope of the project, why the project is required and timelines;
- An overview of NSPI including renewable energy targets;
- The Environmental Assessment process and baseline studies; and
- First Nations engagement and cultural heritage

Nineteen individuals attended the Open House and questions were raised regarding the scope, location and timelines of the project and what effects the project could have for the local community. Various individuals were also interested in the environmental baseline studies being completed to support the project and NSPI's shift towards renewable energy and renewable energy targets. Many of the Open House participants are local landowners and discussed the locations of their properties in relation to the project.

The event was very positive and none of the participants chose to provide any formalized questions, comments or concerns.

Figure 7.2 Auld's Cove Open House

7.2 First Nations Consultation

In August 2015, the Aboriginal Relations Advisor with Nova Scotia Power Incorporated (NSPI), developed an engagement plan for the Aulds Cove transmission crossing, which addressed how to approach discussions with First Nation communities related to the project and defined what strategies would be utilized to provide information to major parties including the Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO), Nova Scotia Environment (NSE), Nova Scotia Office of Aboriginal Affairs (OAA) and Paq'tnkek Mi'kmaw Nation.

On August 4, 2015 a letter was sent to Chief PJ Prosper of the Paq'nkek Mi'kmaw Nation to initiate early engagement in the spirit of mutual respect, openness and transparency and provide an overview of the project. Design and development activities were outlined and the intention of NSPI to continue to work with the KMKNO, the Assembly of Nova Scotia Mi'kmaq Chiefs and Paq'tnkek Mi'kmaw Nation was addressed. It was also indicated that preliminary cultural heritage and archaeological investigations were underway and a meeting was proposed to discuss the preliminary archaeological results, ongoing and future studies, design and the development process.

The KMKNO Staff Archaeologist was also contacted in early August to provide an overview of the project and to discuss the archaeological screening and reconnaissance and shovel testing studies carried out at the site. The Archaeological Screening and Reconnaissance and Shovel Testing Reports were also forwarded once available.

On August 10, 2015 a Letter of Correspondence was sent to the KMKNO, Nova Scotia Environment and the Nova Scotia Office of Aboriginal Affairs regarding engagement with the Paq'tnkek Mi'kmaw Nation.

On August 17th, the NSPI Aboriginal Relations Advisor attempted to contact Chief PJ. Prosper regarding the project; however the office was currently on summer shutdown until August 31, 2015. Further correspondence was sent to Chief Prosper regarding the project via email, and a copy of the letter of correspondence being sent by mail was included. A request for an initial meeting was also made with Chief and Council and the NSPI project team

The NSPI Aboriginal Relations Advisor, during a community visit with Rose Julian, Director of Lands and Economic Development, Paq'tnkek Mi'kmaw Nation confirmed a meeting of the NSPI team with Paq'tnkek Mi'kmaw Nation Chief and Council for September 15, 2015. The meeting was later canceled due to scheduling conflicts with some of the councillors. NSPI phoned Josephine Poulette, Executive Secretary, Paq'tnkek Mi'kmaw Nation regarding rescheduling a meeting with Paq'tnkek Mi'kmaw Nation to discuss the project. The meeting was rescheduled for September 22, 2015 at 2:00 pm. Further to that conversation, NSPI sent an email communication with a summary of the project document and copy of the initial letter to Josephine Poulette, Paq'tnkek Mi'kmaw Nation to provide information for Chief and Council prior to the meeting. This meeting was eventually rescheduled to September 29, 2015 as Chief Prosper was not available.

On September 29, 2015 the NSPI team met and presented the Aulds Cove project to Paq'tnkek Mi'kmaw Nation Chief and Council. The project team provided an overview of the project including:

- The project team
- Project scope and site
- Timelines
- The need for the project and benefits
- The Environmental Assessment process
- Studies and assessments

- MEKS
- Community and First Nations engagement
- Renewable energy targets and how the project relates to the Maritime Link

Questions were raised in regards to:

- The MEKS and archaeological screening and reconnaissance;
- The flow of energy across the Auld's Cove transmission lines;
- Electricity rates and potential effects of the project as well as the Maritime Link on power rates in NS;
- Risks to bird populations in the area related to the project;
- Potential employment opportunities; and
- Ongoing engagement

All questions were answered by NSPI during the meeting and any follow up actions and deliverables were addressed through email correspondence.

On October 7, 2015, NSPI sent email communication to Josephine Poulette, Paq'tnkek Mi'kmaw Nation regarding action items from the initial engagement meeting. Included in the email were items with regard to the MEKS – Chief and Council agreed to appoint representatives to have a follow up meeting to discuss the MEKS process and consultant. Archaeological reports and a copy of the presentation were also forwarded as attachments as requested. NSPI also reiterated the Aulds Cove open house taking place November 3, 2015. NSPI also requested a few dates that Chief and Council may be interested in a site visit as requested.

From October 21st to November 13th, communication continued by phone and through email correspondence to discuss the MEKS process and the representation from Paq'tnkek Mi'kmaw Nation.

Through November 17th to November 20th, the NSPI Aboriginal relations Advisor, called Chief Wilbert Marshall, Potlotek First Nation, Reg Hurst CEO, We'koqma'q First Nation and Brian Arbuthnot, Band Manager, Wagmatcook First Nation regarding the MEKS for Aulds Cove as the project area for the MEKS warrants participation from other communities.

On December 1, 2015 the NSPI Aboriginal Relations Advisor met with Rose Julian, Director of Economic Development, Josephine Poulette, Native Employment Officer and Councillor Kerry Prosper, Paq'tnkek Mi'kmaw Nation to establish communications and next steps for the MEKS. A conference call was scheduled for Monday December 7, 2015 and a follow up meeting January 7, 2016. During the meeting the representatives were interested in discussing further potential for job creation during the construction phase of the project. The NSPI Aboriginal Relations Advisor, advised that discussions concerning jobs, procurement and other opportunities would be discussed at the Chief and Council level in subsequent follow up engagement meetings, however encouraged them to bring these ideas forward to their governing body in Paq'tnkek Mi'kmaw Nation. NSPI also did a meet and greet with Darryl McDonald, new Band Manager for the Paq'tnkek Mi'kmaw Nation.

On December 7th, NSPI along with Jason Googoo, Membertou Geomatics had a conference call with Josephine Poulette, Paq'tnkek Mi'kmaw Nation to discuss the MEKS process. Subsequent communications continued over the following weeks to discuss the MEKS and the involvement of the Paq'tnkek community.

Continued positive communication with all applicable First Nations Communities is critical to the success of the project and will continue through the EA registration and construction phases.

8 Effects of the Undertaking on the Environment

8.1 Identification of Valued Ecosystem Components (VEC's)

Based on the findings in Sections 3 and 4, the following VECs were identified:

- Avifauna
- Cultural and Heritage Resources
- Archaeological Resources
- Wetlands and Watercourses
- General Habitat
- Marine Benthic Habitat and Fisheries
- Significant Habitats and Rare Species

To ensure all relevant issues and concerns related to the proposed Project are identified, an interaction matrix was used to evaluate the potential interactions between the project phases and VECs. Table 8.1, identifies relevant potential issues and concerns related to the proposed project.

Table 8.1 Interaction Matrix

Project Phase / Activity	Avifauna	Cultural and Heritage Resources	Archaeological Resources	Wetlands and Watercourses	General Habitat	Marine and Benthic Habitat and Fisheries	Significant Habitats and Rare Species
Site Preparation / Construction:							
Surveying and siting / land clearing	X	X	X	X	X	X	X
Equipment Delivery					X		
Foundation Construction	X	X	X	X	X	X	X
Tower Assembly	X				X	X	X
Temporary Storage					X		
Operation and Maintenance	X			X	X		X
Decommissioning							
Tower and line removal	X			X	X	X	X
Site re-instatement	X			X	X	X	X
Accidents / Malfunctions	X			X	X	X	X

8.2 Environmental Effects Analysis Methodology

The completion of the environmental effects analysis involves consideration of the following elements:

- Description of potential negative environmental effects
- Mitigation measures
- Residual effects
- Significance of residual environmental effects; and
- Monitoring or follow up programs

The EA includes proposed mitigation to reduce or eliminate potential adverse environmental effects. The determination of significance of adverse environmental effects is based on post-mitigation (residual) effects, rather than unmitigated potential effects. The significance of residual effects of the project will be determined using the following criteria, based on federal and provincial EA guidance, and as described in Table 8.2:

- Value of the resource affected;

- Magnitude of the effect;
- Geographic extent of the effect;
- Duration and frequency of the effect;
- Reversibility of the effect; and
- Ecological and/or social context

Table 8.2 Identification and Definition of Environmental Impacts

Attribute	Options	Definition
Scope (Geographic Extent)	Local	Impact restricted to area within 1 km of the Project Site
	Regional	Impact extends up to several km from the Project Site
	Provincial	Impact extends throughout Nova Scotia
Duration	Short-term	Impacts are significant for less than a year before population or resource returns to its previous state; or for a species, less than one generation
	Medium-term	Impacts are significant for 1 to 10 years; or for a species, for one generation
	Long-term	Impacts are significant for greater than 10 years; or for a species, significant for more than one generation
Frequency	Once	Occurs only once
	Intermittent	Occurs occasionally at irregular intervals
	Continuous	Occurs on a regular basis and regular intervals
Magnitude	Negligible	No measurable change from background in the population or resource; or in the case of air, soil, or water quality, if the parameter remains less than the standard, guideline, or objective
	Low	Impact causes <1% change in the population or resource (where possible the population or resource base is defined in quantitative terms)
	Moderate	Impact causes 1 to 10% change in the population or resource
	High	Impact causes >10% change in population in resource

The expectation for, and significance of, residual effects determines the need for a monitoring and/or follow up program.

Table 8.3 Definition of Significant Residual Environmental Impact

Significance Level	Definition
High	Potential impact could threaten sustainability of the resource and should be considered a management concern. Research, monitoring, and/or recovery initiatives should be considered.
Medium	Potential impact could result in a decline in resource to lower-than-baseline but stable levels in the study area after project closure and into the foreseeable future. Regional management actions such as research, monitoring, and/or recovery initiatives may be required.
Low	Potential impact may result in slight decline in resource in study area during life of the project. Research, monitoring, and/or recovery initiatives would not normally be required.

Minimal/None	Potential impact may result in slight decline in resource in study area during Life of the project, but should return to baseline levels.

8.3 Effects Assessment

Potential effects of the Project on the identified VECs are further considered in Tables 8.4 and 8.5.

Table 8.4 Environmental Effects Analysis - Site Preparation/Construction and Decommissioning Phases

Environmental Component	Potential Impact	Mitigation Summary	Significance Criteria	Residual effects	Significance of residual effect
Wetlands and Watercourses	• Loss of wetland habitat/function • Disturbance of hydrologic regime and sedimentation • Invasive species colonizing wetland • Damage to stream habitat	• Avoid wetland and watercourse habitat to the extent possible • Where necessary, establish a 30m buffer • Development and implementation of EPP • Avoid fording watercourses	Scope: Local Duration: Short-term Frequency: Once Magnitude: Negligible	No residual effect on wetland function or watercourse health	**N/A**
Significant Habitats and Rare Species	• Removal of vegetation • Loss of rare flora • Disruption of habitat	• Limit clearing to footprint of development • Development and implementation of EPP	Scope: Local Duration: Short-term Frequency: Once Magnitude: Negligible	Very small proportion of vegetation loss for project. No significant habitat or species loss expected	**None**
Avifauna	• Removal or disruption of habitat • Sensory disturbance • Mortality	• Minimize vegetation clearing to the extent possible • Complete vegetation clearing outside of nesting season, to the extent possible • Development and implementation of EPP • Limit site activities to designated work areas • Minimize activities in sensitive	Scope: Local Duration: Short-term Frequency: Once Magnitude: Low	None expected	**Minimal/None**

		areas, to the extent possible			
Marine Benthic Habitat and Fisheries	• Disruption of benthic habitat • Accidental release • Sensory disturbance • Disturbance of hydrology • Sedimentation	• Development and implementation of EPP to prevent sedimentation or deleterious substances entering marine environment • Establish buffer and secure work area • Avoid working in water • Minimize footprint, to the extent possible	Scope: Local Duration: Short-term Frequency: Once Magnitude: Low	Limited interaction with marine and benthic environment anticipated	**Minimal/None**
General Habitat	• Removal of vegetation • Removal or disruption of habitat	• Development and implementation of EPP • Minimize clearing and project footprint to the extent possible	Scope: Local Duration: Short-term Frequency: Once Magnitude: Negligible	None expected	**Minimal/None**
Accidents and Malfunctions	• Accidental release • Failure of erosion and sediment / control measures	• Development and implementation of EPP, including a spill prevention plan • Review of EPP and Environmental Management Plan with contractors • Development and implementation of construction/site safety and contingency plans	Scope: Local Duration: Short-term Frequency: Once Magnitude: Negligible - Low	None expected	**Minmal/None**
Socio Economic component	Potential Impact	Mitigation Summary	Significance Criteria	Residual Effects	Significance of Residual Effect
Cultural and Heritage Resources	• Disruption of cultural and heritage resources due to construction activities	• Conduct and archaeological screening and reconnaissance of project area prior to construction • Engagement of First Nations communities prior to project	Scope: Local Duration: Short-term Frequency: Once Magnitude: Low	None	**N/A**

		commencement • Conduct a Mi'kmaq Ecological Knowledge Study (MEKS) prior to construction			
Archaeological Resources	• Disruption of archaeological resources during construction	• Conduct and archaeological screening and reconnaissance of project area prior to construction • Shovel testing of tower location in relative close proximity to high potential areas • If archaeological resources are found, project construction will halt and qualified staff will be engaged.	Scope: Local Duration: Short-term Frequency: Once Magnitude: Low	None expected	**N/A**

Table 8.5 Environmental Effects Analysis - Operational/Maintenance Phase

Environmental Component	Potential Impact	Mitigation Summary	Significance Criteria	Residual Effects	Significance of Residual Effect
Wetlands and watercourses	• Change to wetland function and/or hydrology • Sedimentation to watercourses	• Adherence to NSPI *Environmental Protection and ROW Management* document as well as applicable NSPI vegetation Management Practices • Environmental awareness training for contractors and NSPI staff	Scope: local Duration: Short-term Frequency: intermittent Magnitude: Negligible	None anticipated	**N/A**
Significant Habitats and Rare Species	• Disruption of rare species during vegetation management, line	• Adherence to NSPI *Environmental Protection and ROW Management* document as well as applicable NSPI	Scope: local Duration: Short-term Frequency: intermittent	None anticipated	**Minimal/None**

	inspection and maintenance activities	vegetation Management Practices • Training and awareness	Magnitude: Negligible		
Avifauna	• Mortality • Sensory disturbance	• Installation of bird flight deterrents at the project site in the form of aerial navigation markers and vibration dampers • Conductor size • Installation of white strobe / navigation lighting on towers • Installation of bird flight diverters at the Canso Causeway on the 230kV shield wires. • No use of Overhead Ground Wire (OHGW) or static wire • Specified engineering design to minimize tower foundation size and match as close as possible the wire height of existing crossing • Post construction monitoring at Auld's Cove as well as the Canso Causeway once diverters are installed • To the extent possible, plan maintenance activities to avoid sensitive habitats and time periods	Scope: local Duration: Long-term Frequency: Continuous Magnitude: Low	Risk to avian populations and fatalities due to wire collisions at the project site is not expected to be significant. Mitigation measures incorporated at the project site and installed at the causeway will reduce the overall risk to avian populations in the area.	**Low - medium**
General Habitat	• Disruption during vegetation management, line inspection and	• Adherence to NSPI *Environmental Protection and ROW Management* document as well as applicable NSPI	Scope: local Duration: Short-term Frequency: intermittent	None anticipated	**Minimal/None**

	maintenance activities	vegetation Management Practices • Environmental awareness training for contractors and NSPI staff	Magnitude: Negligible		
Accidents and Malfunctions	• Accidental release • Sedimentation • Failure of towers and/or lines	• Scheduled inspection and maintenance • Scheduled vegetation management • Adherence to NSPI *Environmental Protection and ROW Management* document as well as applicable NSPI vegetation Management Practices and guidance documents	Scope: local Duration: Short-term Frequency: intermittent Magnitude: Negligible - Low	None anticipated	**Minimal/None**

9 Effects of the Environment on the Undertaking

Environmental factors that have potential to have damaging effects on High Voltage (HV) Overhead Transmission Lines and Supporting Structures include:

- Extreme winds;
- Ice storms / ice formation / abnormal high tides;
- Heavy snow;
- Lightning; and
- Fire.

Such extreme events may occur in Nova Scotia and therefore must be considered in terms of the potential adverse effects on the Project.

Transmission lines and associated supporting structures (towers) are equipped with a number of mechanisms to reduce damage caused by extreme weather and are designed to handle events when certain thresholds are detected. Further, best practices and industry standards will be applied to the operation of the Project to manage risks of damage from extreme events. Table 9.1 demonstrates potential effects resulting from environmental events and the mitigation associated with each.

Table 9.1 Effects of Environmental Events and Associated Mitigation

Environmental Event	Effect	Mitigation
Hurricane/Extreme Winds	• Damage to overhead transmission lines (by coming in contact with each other) & buckling supporting structures • Power-line disruptions • Utility/Customer outages	• Ensure adequate safe electrical clearances as per NSPI Standards and CSA 22.3 Overhead Systems • Wind and Ice Study performed by a third party consultant with regards to design conditions to be considered • Ensure adequate line to ground clearance at the structure under extreme wind conductor blowout conditions • Dampers to be installed to reduce aeolian vibration • Reduction in initial installed line tension to reduce aeolian vibration

		• Check for uplift. Uplift can be significant during high winds due to reduction of conductor weight on insulators from conductor blowout
Ice Storms	• Damage to overhead transmission lines & supporting structures • Power-line disruptions • Utility/Customer outages • Ice formation • High tides and erosion • Potential ice jump • Icy lines can whip violently and gallop, causing equipment to fail • Ice scour	• Ensure adequate safe electrical clearances as per NSPI Standards and CSA 22.3 Overhead Systems • Maintain adequate clearance between vertically aligned phases to prevent ice jump • Provide appropriate barrier and/or coating to base of structures to mitigate ice scour • Line maintenance according to best practices and industry standards • Signage to indicate potential falling ice • System designed to an ice loading standard
Heavy snow	• Damage to overhead transmission lines & supporting structures • Power-line disruptions • Utility/Customer outages • Snow formation	• Ensure adequate safe electrical clearances as per NSPI Standards and CSA 22.3 Overhead Systems • Maintain adequate clearance to prevent ice/snow jump • Signage to indicate potential falling snow
Lightning Strikes	• Damage to power transmission systems (lines and supporting structures) • Power-line disruptions • Utility/Customer outages	• Ensure adequate safe electrical clearances as per NSPI Standards and CSA 22.3 Overhead Systems • Structure equipped with built-in electrical grounding system (down conductors (steel rods) and robust low-impedance grounding path)

	• Flashovers • Induce voltage and current surges in electric power systems	• Lines designed with adequate insulation to maintain proper protection and to minimize damage
Fire	• Power-line disruptions • Utility/Customer outages • Potential for wooden supporting Structures to catch fire due to lighting strike(s) • Potential for fire during construction due to materials and machinery	• Appropriate safety protocol for transmission lines and supporting structures • Fire prevention plan • Evacuation plan • Local training of first responders

10 Cumulative Effects Assessment

In assessing cumulative effects, the Project is examined in terms of how changes to the environment (VECs) from the Project itself, could impact the larger environment, in relation to anthropogenic changes. For example, if there are water quality issues in a watershed and the proposed project may also degrade water quality in the same watershed, this would be a cumulative effect, as it is combined with the current conditions, which have been caused by other anthropogenic activities in the area.

The proposed Project is small in nature, with the resulting footprint of the new transmission towers being relatively minimal. This effects assessment considers activities and residual effects of the Project and other activities currently in the area, which together may lead to cumulative effects, either during construction, operation or the decommissioning phases of the Project.

10.1 Existing Environment and Activities near the Project

The Project is located in a primarily rural area, but in close proximity to the Canso Strait and the associated marine terminals, shipping activities and industrial parks. The nearest community is Auld's Cove and the nearest towns include Port Hastings, Port

Hawkesbury and Mulgrave. The closest Industrial facility is the Martin Marietta Materials, aggregate quarry and export facility at the Canso Causeway.

The existing environment immediately surrounding the Project area is mainly forested, with some residential and small businesses. A large portion of the Project area is located on an existing transmission line corridor (right of way), which is currently subject to periodic vegetation management. The Project area also has areas of wetland, clear-cut and coastal habitat.

Table 10.1 Activities Near the Project and Potential Interactions

Activity	Status of Activity	Location of Activity	Potential for Cumulative Effect	Cumulative Effect (VEC) Interaction
Right of Way Management	Historical and ongoing	In, and adjacent to Project area	Yes	• Significant habitats and rare species • Archaeological / Cultural and historical resources • Wetlands and watercourses • Avifauna
Forestry / tree harvesting	Historical and potentially ongoing?	Adjacent to Project and in local area	Yes	• Significant habitats and rare species • Archaeological / Cultural and historical resources • Wetlands and watercourses • Avifauna
Agriculture	Historical and ongoing	Wider area – Antigonish and Guysborough Counties	No	N/A
Small businesses	Historical and ongoing	Local area, Auld's Cove, Port Hastings, Port Hawkesbury, Mulgrave	No	N/A
Quarrying	Historical and	Auld's Cove	Yes	• Significant

	ongoing			habitats and rare species • Archaeological / Cultural and historical resources • Wetlands and watercourses
Marine terminals / Shipping	Historical, ongoing and future	Canso Strait, Auld's Cove, Port Hawkesbury	Yes	• Marine benthic habitat and fisheries
Power Generation	Historical and ongoing	Port Hawkesbury	No	N/A
Paper Plant	Historical and ongoing	Port Hawkesbury	No	N/A
LNG Plant	Historical and ongoing	Port Hawkesbury	No	N/A
Wind Farm	Historical and ongoing	Port Hawkesbury	Yes	• Avifauna
Petroleum Storage	Historical and Ongoing	Port Hawkesbury	No	N/A
Transmission Lines	Historical and ongoing	Auld's Cove	Yes	• Avifauna
Christmas tree farming	Historical and ongoing	Wider area – Antigonish and Guysborough Counties	No	N/A

10.2 Significance of Cumulative Effects

Due to the size of this project, and the existing, managed, transmission line right of way, few VECs were identified. Those VECs identified in section 3.4 are highlighted in Table 10.1, where other anthropogenic activities in the area are identified as having an interaction with an identified Project VEC, and are considered in more detail below.

10.2.1 Significant Habitats and Rare Species

The management of the existing right of way within the Project area, in addition to tree harvesting adjacent to the right of way has resulted in areas of clear cut and other areas of compatible vegetation, ultimately, the loss of contiguous mature forests. Management of additional right of way width and continued forestry activities in the area may result in additional pressure on significant habitats and rare species, where present. There is also potential for avifauna impacts, including mortality due to timing of clearing activities.

Quarrying activities in the local area may result in additional loss of habitat in the region. Depending on the nature of the land being quarried, the environmental resources may already have been mitigated.

The Project itself is avoiding or mitigating for any such losses and therefore, when considered with other current activities in the area, the potential for cumulative effects is not significant.

10.2.2 Cultural and Heritage Resources

Right of way management, forestry and quarrying activities have the potential to expose previously covered archaeological or cultural and historical resources. The locating of archaeological or cultural and historical resources would result in stopping work and the relevant authorities being notified.

The Project has conducted assessments of the Project area and avoided any identified significant areas; therefore, when considered with other current activities in the area, the potential for cumulative effects is not significant.

10.2.3 Wetlands and Watercourses

Wetlands and watercourses can be altered ecologically by construction activities, forestry and quarrying works.

The project has avoided any wetlands and watercourses in the project area and therefore, when considered with other current activities in the area, the cumulative effects are not significant.

10.2.4 Avifauna

This aspect of the project has been examined in detail in Section 4.1.

When considered with other current activities in the area, the potential for cumulative effects associated with the Auld's Cove Project is considered low.

10.2.5 Marine Benthic Habitat and Fisheries

Due to the presence of shipping in the Canso Strait and the associated Strait Superport, as well as marine terminals for export of goods, including aggregates, there is potential for the marine habitat to be impacted. Marine and Benthic habitat was considered a VEC for the Project, however, there are no predicted impacts from the construction, operation or decommissioning.

When considered with other current activities in the area, the cumulative effects are not considered significant.

11 Follow up Measures

11.1 Environmental Protection Plan

As part of the Environmental Protection Plan (EPP), several key aspects have been considered and will be integrated into the overall environmental protection strategy for the project including:

Erosion and Sediment Control

The following are the minimum requirements for erosion and sedimentation control during clearing and construction activities where applicable:

- The amount and exposure time of fine soils shall be minimized by staging clearing schedules, where possible. Disturbed areas shall be covered as work progresses; exposed soil shall be limited to areas of active development. Exposed areas which are not under active development shall be temporarily covered with vegetation, straw or filter fabrics.
- Both temporary and permanent erosion and sediment control measures should be implemented in an appropriate timeframe (in advance of disturbance and maintained until re-vegetation and/or stabilization). Once the area is stabilized, ESC measures will be removed.
- Steep slopes, erodible soils, watercourses, wet areas and other areas of high erosion potential shall be avoided, where possible and practical.
- Loose or eroding materials shall be stabilized and protected with mechanical techniques, such as grading exposed faces, installing brush matting or rip-rap or applying filter fabrics.
- Run-off shall be controlled and sediment prevented from leaving the site. Silt laden water shall be intercepted from access roads and/or clearing areas. Water catchment systems, such as take-off/drainage diversion ditches, sediment traps or installation of slash or straw at the base of lower slopes, shall be employed to channel drainage to sedimentation ponds or filtering systems.

- Erosion protection material, if required, shall be clean, durable, non-ore bearing, non-toxic and obtained from a non-watercourse source.
- Erosion and sedimentation control structures, such as silt-fencing, shall be used to ensure silt or other harmful materials or substances are not discharged into wetlands or watercourses.
- Erosion and sediment control measures shall be regularly maintained and monitored until a stable condition is achieved. Structures shall be in working order at all times and structures shall be inspected for integrity after any significant rainfall occurs; damaged structures shall be corrected or replaced immediately. The Environmental Compliance Monitor shall also inspect all erosion and sediment controls on a weekly basis as part of weekly site audits. Contractors shall maintain records of daily checks and provide them to the project team.
- All erosion and sedimentation control measures shall be designed and installed in accordance with the *Erosion and Sedimentation Control Handbook for Construction Sites*, developed by the NSE EA Branch**.** Appropriate training shall take place prior to installation of any erosion and sedimentation control structure.
- Controls that have fallen or have been damaged shall be repaired immediately.
- Sediment that has accumulated shall be cleaned out at regular intervals, and after heavy rainfalls.
- Accumulated sediment shall be collected and held in a covered stockpile or sent off-site.

If compliance issues arise or items of concern are identified during the project, the NSE Regional Office shall be contacted by the Environmental Lead or designate as soon as possible after discovery. The project team shall provide information for quantifying the extent of the issue and provide a connective action plan with the intended actions to eliminate or manage its potential consequences to the environment and/or human health. Where necessary, clearing/construction activities shall be halted until a plan of action is agreed to with NSE.

Disruptive Sound

Noise generated during clearing and construction activities is associated with equipment operation, and movement of traffic to and from the Project site. Noise will be temporary, intermittent and restricted to specific areas.

The following are potential impacts associated with noise due to clearing activities:

- Sensory disturbance to wildlife and human receptors.

The following mitigation will be implemented to minimize impacts due to noise:

- Residences in the immediate area shall be notified prior to and during clearing to inform customers of Project activities.
- Clearing activities shall be planned to occur between the hours of 0700 hrs and 1900 hrs.

- Equipment shall be properly maintained to minimize noise.
- All relevant by-laws/other restrictions shall be met.

Air Quality

Clearing activities associated with heavy equipment may increase particulate and vehicle emissions, including greenhouse gas emissions. Dust from exposed ground, operation of equipment on unpaved roads and from transporting dry soil may cause increased particulate emissions.

The following are potential impacts to air quality as a result of clearing activities:

- Increased vehicle emissions
- Increased airborne particulates and dust

The following mitigation will be implemented to minimize impacts to air quality:

- All clearing equipment shall be properly maintained to ensure minimal exhaust emissions.
- Open hauling trucks shall be covered as necessary.
- Vehicle speeds on-site shall be limited to 20 km/h in work areas to reduce dust generation; the use of dust suppressants (i.e. water) to control emissions from unpaved roads shall be used, if necessary.
- Clearing activities shall be conducted in a manner so as to minimize dust generation.

Waste Management

Waste generated during the Project, if not managed properly, can negatively impact groundwater and human health and attract unwanted animals. Waste can also reduce the aesthetic quality of the Project site and increase unpleasant odours, potentially attracting negative attention from surrounding residents.

The following mitigation will be implemeted to minimize impacts from improperly managed waste:

- Waste shall be properly classified and sorted:
    - Solid waste – refers to all non-hazardous waste material including metal, wood, plastic, glass, paper, masonry, roofing material and non-asbestos insulation. Solid waste must be sorted in accordance with applicable municipal laws (i.e. recyclables, paper, cardboard, organics, construction waste, etc.)
    - Liquid waste – liquids that are not classified as hazardous under applicable legislation
    - Hazardous waste – waste that has been designated hazardous under applicable legislation
    - Sanitary waste – human waste and waste from food processing

- All waste generated must be collected on site, separated and stored/removed from site as required.
- All waste generated will be disposed of in compliance with the Solid Waste-Resource Management Regulations or any other applicable legislation using waste transportation and disposal companies that are also in compliance with applicable legislation.
- Waste storage shall be at least 30 m away from a wetland or watercourse.
- Waste shall not be disposed of on the Project site.
- Waste shall not be burned on the Project site.
- Disposal of waste into watercourses, water bodies, wetlands or other sensitive environments is strictly prohibited.
- Portable washroom facilities will be regularly and properly serviced through a reputable service provider with the service contract monitored by the appropriate contractor/contract administrator.

Storage and Handling of Hazardous Materials

A variety of potentially hazardous materials may be used or stored on site during clearing and construction activities. Some hazardous materials that may be routinely used include:
Fuels, oils, lubricants

- Hydraulic fluids
- Paint
- Gas cylinders
- Solvents
- Acids
- Caustics

The most hazardous materials used during clearing activities will likely be petroleum, oil and lubricants associated with the use of heavy machinery and vehicles. The primary concern regarding the use of these substances is release to the environment through spills and subsequent impacts to soil, water quality and human health and safety.

The following mitigation will be implemented to minimize potential impacts from handling hazardous materials:

- The use of hazardous materials will be minimized to the extent possible.
- All materials on site shall be stored, handled and labelled according to Workplace Hazardous Materials Information System (WHMIS) Regulations, as well as any other applicable federal or provincial regulation or legislation.
- An inventory of hazardous materials in use/stored during clearing and construction activities shall be maintained according to WHMIS.
- All controlled chemicals will be transported in accordance with the federal *Transportation of Dangerous Good Act.*
- Material Safety Data Sheets (MSDS) shall be available for all hazardous materials used/stored on site.

- Bulk storage of any hazardous material (i.e. fuel products) shall be at least 100 m away from a watercourse or wetland. Fuel storage areas shall be clearly marked. Fuel tanks shall have spill kits sized for the capacity of the tank.
- If fuel storage tanks are greater than 450 L, tanks shall have secondary containment.
- If fuel storage tanks are greater than 4000 L, the *Petroleum Management Regulations* apply and tanks shall be registered.
- Hazardous materials, when required, shall be removed and disposed of in an acceptable manner and in accordance with the WHMIS Regulations.
- All emergency response procedures will be followed in the event of an oil/chemical spill.
- All vehicles/machinery/other equipment will be in good working order to prevent/minimize the likelihood of spills.
- Used oil filters, grease cartridges containers and other products associated with equipment maintenance shall be collected and disposed of in accordance with regulatory guidelines.
- Any waste materials collected during a spill clean-up will be disposed of at approved facilities.

Vehicle/Equipment use

The proper maintenance and functioning of vehicles and other machinery used on the Project site is imperative in preventing and minimizing impacts to sensitive environmental features. The following best practices shall be employed at all times when operating, conducting maintenance and re-fuelling vehicles and other machinery during clearing and construction activities:

- Vehicles shall be in excellent working order at all times, with no leaks.
- Inspection of vehicles and machinery shall occur on a regular basis. Any identified leaks or other issues shall be repaired promptly and any spills cleaned immediately.
- Spill kits shall be available for each vehicle at all times and shall be capable of containing spills both on the ground and water surface.
- Re-fuelling, lubricating, washing and servicing of all vehicles and machinery shall take place at least 30 m away from a surface water resource or well (water course, water body, and wetland). Re-fuelling of equipment shall occur in a manner that minimizes the potential for spills and contamination to soil and/or surface water.
- A designated fuelling area(s) shall be identified prior to the start of clearing activities on the Project site.
- Used oil filters, grease cartridge containers or other waste products associated with vehicle and machinery maintenance shall be disposed of in accordance with applicable regulations/ legislation.
- Storage of oil, gasoline, greases, lubricants, or any other hydrocarbon or deleterious substance associated with equipment use shall be at least 30 m from a surface water resource or 100 m from a well.

- Run-off from washing vehicles and machinery shall be controlled to ensure wash materials and other potentially deleterious substances do not enter the riparian zone or watercourse channel.
- All vehicles shall be free of lose dirt/debris (including tracks and tires) while crossing temporary bridges, if applicable.

Spill Response

The Project Environmental Contact(s) shall be informed of any spill occurring on the Project site as demonstrated in the process flow charts outlined in Appendix J. The primary objective during a spill is to prevent hazardous materials from entering a watercourse, wetland or other sensitive site. In the event of an oil or chemical spill, the Project Team has developed procedures which detail responsibilities and notification processes when reporting spills under specific conditions. These procedures shall be used on the Project site during clearing and construction activities and must be kept on site at all times (Appendix J). Appendix J also provides oil and chemical spill report forms; under certain circumstances, spills must be reported to the Canadian Coast Guard Spills Action Centre (Maritimes Regional Office). Although not all spills are considered reportable to Environment Canada, the Project Team will track all spills of any kind in its internal database.

Contractors shall ensure that spill response equipment containing materials for spill containment and clean-up are available at the work site prior to beginning the work. All vehicles shall be equipped with a spill kit in the event an accident should occur. All standard safety precautions and construction BMP's, including the use of personal protective equipment (PPE), will be employed. In general, spills that remain on the Project site shall be the responsibility of the Contractors and NSPI Site Supervisor. Larger, more serious spills (reportable spills), shall have additional assistance and resources available to respond appropriately. The following steps shall be taken in the event of a spill:

- All spills shall follow the processes outlined in Appendix J. A spill report form shall be filled out and forwarded to the appropriate personnel. All reportable spills shall be reported to the Spills Action Centre within 4 hours of personnel discovering the spill.
- Spilled material shall be confined to prevent further spillage. All attempts shall be made to intercept the spill from discharging into a sensitive area.
- Secondary containment shall be performed if the release cannot be controlled or contained (i.e. transfer of materials to other containers).
- Spills that occur on the ground surface shall be controlled by absorbents if the spill is fairly small.
- The use of dirt, sand or other inert material shall be used on larger spills.
- Clean-up shall rid the area of as much spill material as possible to avoid future releases to sensitive areas.
- Once the spill is under control, spill materials shall be transferred to the appropriate disposal/storage location. Any absorbents, contaminated soil, sand

or gravel shall be places in appropriately labelled containers with the proper WHMIS labels and disposed of in accordance with applicable regulations/legislation.

11.2 Post Construction Monitoring

In order to determine any effects that the Project has on avifauna, a follow up monitoring program will be carried out. This may consist of carcass searches and monitoring at the Canso Causeway following installation of bird flight diverters and repetition of the key components of the 2015 Auld's Cove field assessment once the transmission line has been constructed. The final monitoring plan will be developed in consultation with NSDNR and NSE and may include the following:

Auld's Cove and Canso Causeway diurnal movement surveys

- These surveys at Auld's Cove will be utilized to determine if birds change their diurnal movement patterns in response to the additional infrastructure at Auld's Cove.
- Surveys at the Canso Causeway would be replicated to determine the effectiveness of the mitigation measures on interaction / mortality rates.
- An emphasis on including field surveys during bad weather events and low visibility days would be included.
- Spring and fall migration periods would be targeted as well as other periods when bird activity is known to be higher.
- Survey events would involve a morning and evening survey, each 4 hours in length during the following periods:
  - **Spring migration** – Mid-April to early June (although this could start earlier depending on weather) – 4 surveys at each location.
  - **Summer** – late June to mid-August – 4 surveys at each location.
  - **Fall migration** – Late august to Late October – 6-8 surveys at each location.
  - **November / December billfish run** – 2-4 surveys depending on the start of the run and what, if anything has already been captured with the fall migration surveys.
  - **Storm or fog days** – 1-2 additional days during each period.

Canso Causeway carcass surveys

- A carcass search protocol would be discussed with NSDNR in an effort to compare post-mitigation installation numbers with the pre-mitigation NSDNR studies (as well as the 2014 Canso Causeway study completed by Strum on behalf of NSPI).

Shorebird and tern surveys – Completed following construction of the transmission crossing at Auld's Cove to assess shorebirds and terns breeding and foraging activities in the area and to confirm populations have not be affected.

Terns

- Surveys would occur once the tern colony becomes established, likely by late June / early July.
- Two surveys would be completed during this period to assess tern abundance and behavior.
- Surveys would occur during the day when visibility is more favorable.
- Surveys would be 6 hours in duration to encompass the majority of a tidal cycle.

Shorebirds

- Shorebird surveys would be conducted during their breeding season - mid July through late August.
- Two surveys would be would be completed to assess shorebird breeding in the area.
- Surveys would occur during the day when visibility is more favorable.
- Surveys would be 6 hours in duration to encompass the majority of a tidal cycle.

Nocturnal surveys at Auld's Cove – Additional on the ground nocturnal movement surveys to confirm information related to nighttime activity in the area, including avian behavior and movement patterns associated with the Auld's Cove lines.

- Surveys would alternate between pre-dawn and post-dusk and would be 3-4 hours in length during the following periods:
    - **Spring migration** – Mid-April to early June (although this could start earlier depending on weather) – 4 surveys.
    - **Summer** – late June to mid-August – 4 surveys.
    - **Fall migration** – Late august to Late October – 6-8 surveys.
    - **November / December billfish run** – 2-4 surveys depending on the start of the run and what, if anything has already been captured with the fall migration surveys.

Additional follow up measures related to other identified VEC's and key environmental components are not anticipated due to the minimal effects that will occur related to the project.

12 Other Approvals

In addition to the EA Approval, several other permits and/or approvals will be required prior to the start of construction. A list of potential permits and approvals can be found in Table 12.1

Table 12.1 List of Additional Permits and Approvals Potentially Required

Approval/Notification/Permit Required	Government Agency
Environmental Protection Plan	Nova Scotia Environment
Notification of Blasting (if required)	Nova Scotia Environment
Special Move Permit	Service Nova Scotia
Access Permit	Nova Scotia Transportation and Infrastructure Renewal
Work Within Highway Right of Way	Nova Scotia Transportation and Infrastructure Renewal
Protected Beach Permit	NSDNR
Navigation Protection Act Authorization	Transport Canada
Highway and Railway Crossings	Nova Scotia Transportation and Infrastructure Renewal
Submerged Crown Land Easements	NSDNR

13 Conclusions

The studies, regulatory assessments and valued ecosystem component evaluations described within this document have been considered both singularly and cumulatively. These bodies of work indicate that there are no significant environmental concerns or impacts that may result from the Project that cannot be effectively mitigated or monitored.

The vast majority of the potential effects on the VECs evaluated were determined to have low to no residual effects based on the activities surrounding the construction, operations and maintenance and decommissioning of the project.

Risks to avian communities at the project location of Auld's Cove have been thoroughly evaluated and the introduction of a new transmission crossing at this location is not expected to have any significant impacts. Mitigation measures as described in Section 4.1.4 will effectively reduce risk to avian communities at the Canso Causeway and thereby have an overall positive effect to birds in the area.

Potential impacts on VECs that may result in residual effects will be lowered to an acceptable level with the deployment of appropriate mitigation, best management practices and follow up programs.

Best practices and standard mitigation methods will be implemented during all phases of the Project to ensure methods and practices are comprehensively adhered to. An EPP will be developed and communicated to all employees working on the Project.

At this time, all pre-construction studies have been completed with the exception of the MEKS. Three components of the MEKS have been completed and are included in Appendix M. The outstanding portion of the MEKS, the Mi’kmaq Significant Species Survey (MSS), is not expected to impact the conclusions of the EA, and will be provided to NSE as soon as it has been finalized, following completion of the survey in the spring of 2016. First Nations and community consultation will continue throughout the project phases and has been very positive to date.

Impacts on the surrounding residents have been considered and presented and are thought to be minimal with the limited scope of the project.

The land which is being proposed for the Project currently does not have significant economic value.

Nova Scotia is championing renewable energy both in Canada and in the World with a target of 40% renewables by 2020. NS is also the only jurisdiction in North America with absolute caps on greenhouse gas (GHG) emissions from the electricity sector (Renewable Electricity Plan, Nova Scotia Energy, April 2010). The Auld’s Cove Transmission Project will contribute to Nova Scotia meeting its renewable energy targets with additional capacity, and the safe and reliable transmission of renewable energy from muskrat Falls and the Maritime Link.

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Footnotes:

[1] The North American Industry Classification System (NAICS) divides Nova Scotia into 5 geographical regions. The Northern region includes Colchester, Cumberland, Pictou, Guysborough, and Antigonish counties. According to the Labour Force Survey Estimates (LFS), some areas are too small to enable production of independent estimates from the survey. Thus, smaller regions with similar economic characteristics are grouped together (NSFA, 2011a).

Appendix A – CV's of Investigators and Authors

Appendix B – Drawings

Appendix C – Avian Assessment

Appendix D – Radar Assessment

Appendix E – 2014 Canso Causeway Bird Study

Appendix F – Archaeological Screening and Reconnaissance

Appendix G – Archaeological Shovel Testing Report

Appendix H – Wetland and Watercourse Assessment

Appendix I – Marine Underwater Benthic Habitat Assessment

Appendix J – Submarine Cable Estimate

Appendix K – ACCDC Report

Appendix L – Spill Response

Appendix M – Mi’kmaq Ecological Knowledge Study (MEKS)