Labrador-Island Transmission Link

Environmental Impact Statement

Volume 4
Supplementary Environmental Studies

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LOWER CHURCHILL PROJECT

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NALCOR ENERGY

LABRADOR - ISLAND TRANSMISSION LINK

ENVIRONMENTAL IMPACT STATEMENT

Volume 4

Supplementary Environmental Studies

April 2012

Labrador – Island Transmission Link Environmental Impact Statement

Volume 4: Supplementary Environmental Studies

Preface

Volume 4: Supplementary Environmental Studies provides additional environmental baseline information in support of the Labrador – Island Transmission Link (the Project). This volume is comprised of six (6) associated study reports.

As a result of ongoing Project planning and engineering for the Strait of Belle Isle marine cable crossing and cable landing sites, Nalcor has focused on Forteau Point (Labrador) and Shoal Cove (Newfoundland) for the cable landing sites, and one marine cable corridor. This Project description differs from that presented in the environmental component studies submitted under the environmental assessment (EA) process.

To provide an updated description of the existing environment for the effects assessment, Nalcor has conducted several additional studies to address this change to the Project description. These studies include:

1) **2011 Listed and Regionally Uncommon Plant Survey: Strait of Belle Isle Cable Landing Sites and Shore Electrode Locations** (February 2012)
   The study involved plant surveys of the cable landing sites at Forteau Point and Shoal Cove, and at the electrode locations of L'Anse au Diable and Dowden's Point.

2) **2011 Historic and Heritage Resources Assessment and Potential Mapping: Strait of Belle Isle Cable Landing Sites and Shore Electrode Locations** (December 2011)
   The study involved an historic and heritage resource assessment and potential mapping of the cable landing sites at Forteau Point and Shoal Cove, and of the electrode locations at L'Anse au Diable and Dowden's Point.

3) **Strait of Belle Isle: Ambient Noise and Marine Mammal Survey Supplementary Report** (November 2011)
   The report presents data collected at the Newfoundland station during the second deployment period, and complements Section 3.2 of the *Strait of Belle Isle: Ambient Noise and Marine Mammal Survey* report (JASCO 2011).

4) **Marine Habitats in the Strait of Belle Isle: Interpretation of 2007 Geophysical (Sonar) Survey Information Supplementary Report, Summary of the 2007 Marine Habitat Survey, With a Focus on the 2011 Forteau Point to Shoal Cove Cable Corridor Option** (May 2011)
   The purpose of this study was to "extract" and provide a summary overview of the information from the 2007 marine geophysical surveys and associated interpretation and analyses that occur within the marine corridor option from Forteau Point to Shoal Cove.

5) **Marine Flora, Fauna and Habitat Survey – Strait of Belle Isle Supplementary Report: Summary of the 2008-09 Marine Survey Results, With a Focus on the Forteau Point to Shoal Cove Cable Corridor Option** (May 2011)
   The purpose of this study was to "extract" and provide a summary overview of the information from the 2008-09 marine surveys that occur within the marine corridor option from Forteau Point to Shoal Cove.

6) **2011 Marine Habitat and Water, Sediment and Benthic Survey: Strait of Belle Isle Cable Corridor Segment - Shoal Cove Option** (September 2011)
   A 2011 marine survey to collect water and sediment quality, benthic invertebrate and marine flora, fauna and habitat information for the new marine corridor segment to Shoal Cove – specifically, the less than 10 km long corridor segment that extends from the original corridors and in to the Shoal Cove area.

Labrador – Island Transmission Link

2011 Listed and Regionally Uncommon Plant Survey: Strait of Belle Isle Cable Landing Sites And Shore Electrode Locations

Prepared for:

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Project # 121510743

February 07, 2012

EXECUTIVE SUMMARY

Nalcor Energy is proposing to develop the *Labrador – Island Transmission Link* (the Project), a high voltage direct current (HVdc) transmission system extending from Central Labrador to the Island of Newfoundland's Avalon Peninsula. As part of the Project's environmental assessment (EA), this *2011 Listed and Regionally Uncommon Plant Survey Strait of Belle Isle Cable Landing Sites and Shore Electrode Locations Supplementary Report* was completed to support the Vegetation Component Study which was submitted under the EA process in May 2011.

The original Project concept for the proposed Strait of Belle Isle cables saw the preliminary identification of potential cable landing sites at Forteau Point, Labrador and Mistaken Cove, Newfoundland (with alternatives at L'Anse Amour and Yankee Point in Labrador and on the Island, respectively). Since that time, Nalcor Energy has continued with its Project planning and engineering work, and in doing so, has proceeded to evaluate other possible design options and alternatives. The Proponent is continuing to focus on Forteau Point as the likely Labrador cable landing site. On the Newfoundland side of the Strait of Belle Isle, Shoal Cove has also been identified as a possible site. In addition, and again as a result of continued Project planning and engineering, Nalcor Energy has identified two potential sites for the location of the shoreline electrodes at L'Anse au Diable (SOBI) and Dowden's Point (Conception Bay). As a result of these Project changes, this Supplementary Report was completed to cover these newly identified Project areas for the EA.

This report describes the methodology and results of the survey for listed and regionally uncommon plants completed for the Project. Listed plant species, as defined here, include those taxa listed under Schedule 1 of the *Species at Risk Act* (*SARA*) (Government of Canada 2003a, b) and / or *Newfoundland and Labrador Endangered Species Act* (*NLESA*) and designated as "endangered, threatened, or special concern" by Committee on the Status of Endangered Wildlife in Canada (COSEWIC). A regionally uncommon plant species is defined in this study as those assigned S Ranks of S1, S2, S2 / S3 or SU by the Newfoundland and Labrador Department of Environment and Conservation (NLDEC) Wildlife Division and as recorded by the Atlantic Canada Conservation Data Centre (ACCDC). While S3 species are of concern from a provincial biodiversity perspective, they have not been included as their populations are considered less sensitive.

Surveys were undertaken over a seven-day period in early- to mid-July, employing a single field team consisting of a botanist and a vegetation ecologist. Targeted botanical surveys were conducted in the area of the proposed Project components, in part as follow-up to the completion of associated component studies (i.e., Regionally Uncommon Plant Potential Mapping report), in addition to that of general surveys of additional areas deemed to have the highest potential for such plant species.

Field results were compared to the current understanding of plant distribution and population as determined by the Newfoundland and Labrador Department of Environment and Conservation (NLDEC) (Wildlife Division) and through the ACCDC. At each site visited, a list of vascular plant species observed was generated. Locations were recorded with a Garmin™ global positioning system, and photographs were taken of representative habitats and plant species.

In total, 317 vascular plant species were observed and recorded during the field survey. A search of the ACCDC database (2010 ACCDC Provisional Scarcity Rankings) revealed that of these 317 species, 2 were listed and 12 identified as regionally uncommon plant species. *Braya fernaldii* (Fernald's braya) and *Braya longii* (Long's braya), listed under Schedule 1 of the *SARA* and / or pursuant to the *NLESA* and assigned a rank of S1 (extremely

rare), were observed within the Study Area at Shoal Cove. Based on the results of the field surveys and a review of the literature, 12 species could be considered regionally uncommon within the Study Areas (*Streptopus lanceolatus, Botrychium simplex, Carex maritima*, *Potentilla crantzii, Maianthemum stellatum, Salix candida*, *Coptidium lappinicum*, *Thalictrum alpinum*, *Packera pauciflora*, *Rhododendron lapponicum*, *Stellaria longipes* and *Triglochin gaspensis*).

The abundance of some regionally uncommon plant species and a literature review of other Newfoundland and Labrador plant surveys suggest that the current S Ranks for several of those species may be conservative. For example, *Carex maritima* is classified as regionally uncommon primarily because it is restricted to specific habitats on calcareous substrates; however, these species are locally well represented within these habitats. Lack of adequate information on the distribution of some Labrador plant species also contributes to conservative scarcity rankings. As new information becomes available through additional botanical surveys for these species, their scarcity ranks are adjusted accordingly by NLDEC.

The results of this survey and other studies will increase knowledge and understanding of ecological relationships within the Study Areas. This information will be used to help analyze potential environmental effects of the proposed Labrador-Island Transmission Link.

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1.0 INTRODUCTION

Nalcor Energy is proposing to develop the *Labrador – Island Transmission Link* (the Project), a High Voltage Direct Current (HVdc) transmission system extending from Central Labrador to the Island of Newfoundland's Avalon Peninsula. The proposed Project includes the installation and operation of marine cables across the Strait of Belle Isle (SOBI), as well as shore electrodes at sites in the SOBI (Labrador side) and Conception Bay (Newfoundland).

The environmental assessment (EA) process for the Project was initiated in January 2009 and is in progress. An Environmental Impact Statement (EIS) is being prepared by Nalcor, which will be submitted for review by government departments, Aboriginal and stakeholder groups and the public.

This report presents the results of further, detailed plant surveys for listed and regionally uncommon plants. These surveys were conducted in 2011 at the currently proposed SOBI cable landing sites at Forteau Point (Labrador) and Shoal Cove (Newfoundland), and at identified shore electrode sites at L'Anse au Diable (Labrador) and Dowden's Point (Newfoundland). As these components of the Project and their respective locations became more clearly defined in 2011, and given the potential for plant species of special conservation concern in these areas, Nalcor Energy has undertaken additional plant field surveys and habitat potential mapping of these locations.

The information presented herein is intended to supplement that contained in the previously submitted *Regionally Uncommon Plant Potential Habitat Mapping Component Study* (Stantec 2010a, 2011a) that was submitted under the EA process in May 2011. It will be used to further inform the EA, as well as on-going Project planning.

1.1 Project Overview

The proposed Project involves the construction and operation of transmission infrastructure within and between Labrador and the Island of Newfoundland. The proposed transmission system, as currently planned, will include the following key components:

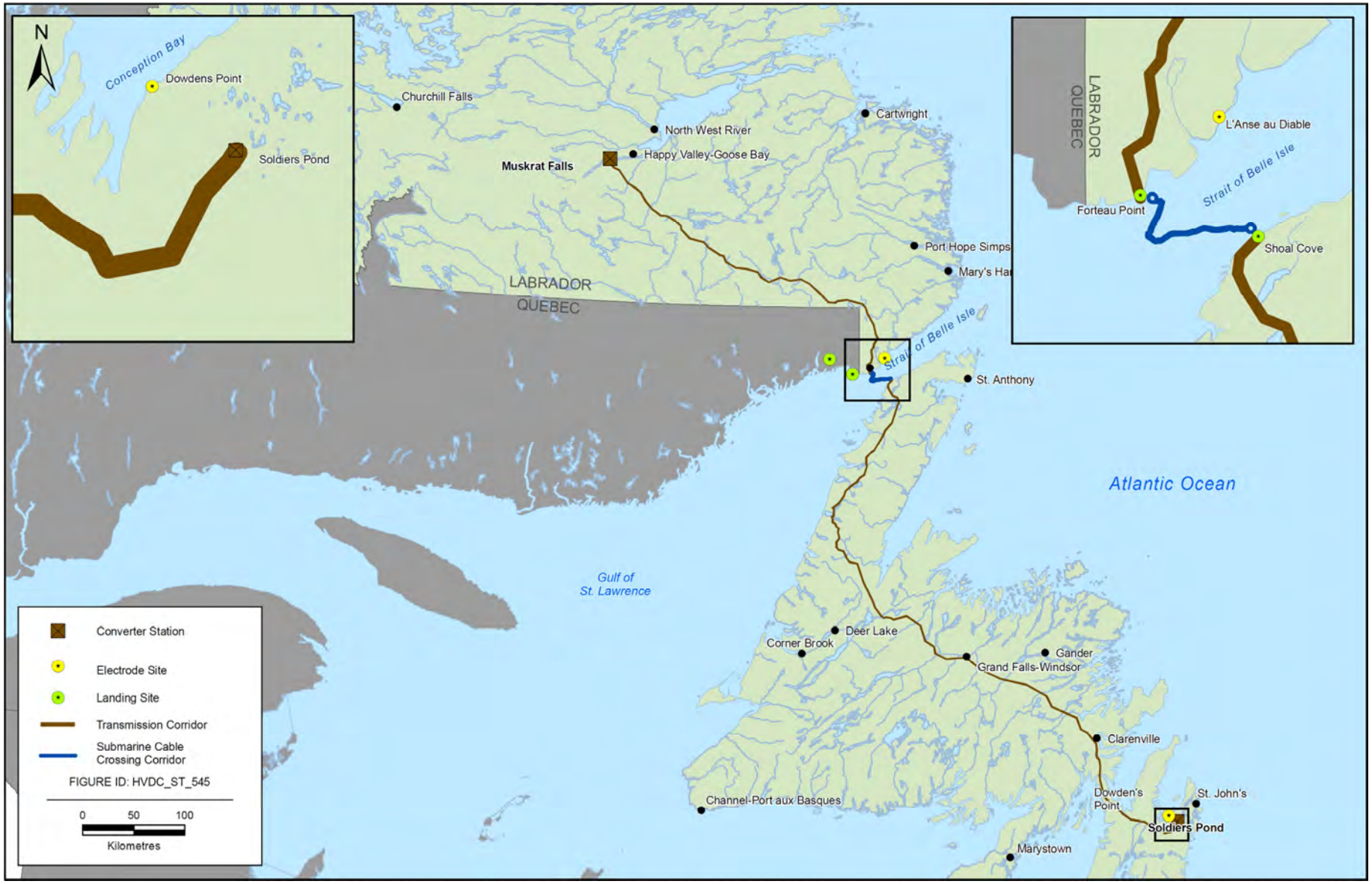
- an ac-dc converter station in Central Labrador, on the lower Churchill River adjacent to the Lower Churchill Hydroelectric Generation Project;
- an HVdc transmission line extending across Southeastern Labrador to the SOBI. This overhead transmission line will be approximately 400 km in length with a cleared right-of-way (ROW) averaging approximately 60 m wide, and will consist of single galvanized steel lattice towers;
- cable crossings of the SOBI with associated infrastructure, including cables placed under and on the seafloor through various means to provide the required cable protection;
- an HVdc transmission line (similar to that described above) extending from the SOBI across the Island of Newfoundland to the Avalon Peninsula, for a distance of approximately 700 km;
- a dc-ac converter station at Soldiers Pond on the Island of Newfoundland's Avalon Peninsula; and

- electrodes in Labrador and on the Island, with overhead lines connecting them to their respective converter stations.

As outlined above, the proposed Project includes the installation and operation of marine cables across the SOBI. The current Project concept includes potential on-land cable landing sites at Forteau Point and Shoal Cove (Figure 1.1). From these locations, on-land horizontal directional drilling technology will be used to install the three cables out to and under the Strait for up to several kilometres. From there, the three cables would be placed on the seabed within a single corridor, and each would be protected with a rock berm.

The proposed HVdc transmission system will also include the installation of electrodes, or high capacity grounding systems, in the marine environments in Labrador and Newfoundland. The current Project concept would see the development of two "shore electrodes", one at a location on the Labrador side of the SOBI (L'Anse au Diable) and one in Conception Bay (Dowden's Point). The establishment of these shore electrodes would involve the construction of an in- or near-water (breakwater-like) structure within a small natural or excavated cove or at the shoreline at the sites, in order to create a small protected marine 'pond' to house the electrode elements.

Figure 1.1 Proposed Labrador – Island Transmission Link



2.0 APPROACH AND METHODS

For the 2011 plant surveys, species of conservation concern (including their habitats) were the focus with an emphasis on listed species (e.g., species designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as nationally "at risk" (endangered, threatened or of special concern) under Schedule 1 of the *Species at Risk Act* (*SARA*) and those listed as endangered, threatened or vulnerable under the *Newfoundland and Labrador Endangered Species Act* (*NLESA*). COSEWIC and *SARA* wildlife species status categories are described in further detail in Appendix B.

In the context of this survey, a listed plant species is defined as a species which meets one or more of the following criteria:

- a plant species listed under Schedule 1 of *SARA* (Government of Canada 2003a, b) and designated as “endangered, threatened, or special concern” by COSEWIC; and/or
- named or listed species or candidates for possible future listing by the NLDEC Wildlife Division as endangered, threatened or vulnerable under *NLESA* (Government of Newfoundland and Labrador 2002) and applicable parts of the *Wildlife Act*.

The Newfoundland and Labrador Department of Environment and Conservation (NLDEC) - Wildlife Division, through the Atlantic Canada Conservation Data Centre (ACCDC), also maintains a comprehensive list of vascular plant species which it considers to be rare (i.e., species with current ACCDC scarcity ranks of S1, S2 or S2 / S3), although it carries no regulatory authority.

A regionally uncommon plant species is defined as:

- a rare plant taxa not designated under one of the Acts or their associated regulation (i.e., afforded legal protection under *SARA* and / or *NLESA*), but considered unique or unusual, either locally or regionally, by the NLDEC Wildlife Division, as recorded by the ACCDC. Scarcity ranks established and maintained by the ACCDC (ACCDC 2011), with plants assigned a conservation status of S1 (extremely rare), S2 (rare), and S3 (uncommon) or combinations thereof, based on abundance, population trends and depth of knowledge of populations. Definitions of the ACCDC general status rankings are provided in Appendix B.

The plant survey was conducted to determine the occurrence of listed or regionally uncommon plant taxa.

2.1 Study Areas

Study Areas were defined for each of the proposed cable landing sites and shore electrode sites at four specified locations: L’Anse au Diable, Labrador (Figure 2.1); Forteau Point, Labrador (Figure 2.2); Shoal Cove, Newfoundland (Figure 2.3); and Dowden’s Point, Newfoundland (Figure 2.4). In each case, site surveys encompassed a predetermined area (i.e., focused study area) identified by Nalcor Energy as the maximum

[1] Draft scarcity ranks are proposed for all plant species in the province, however, these status ranking have yet to receive official approval (A. Durocher, ACCDC Newfoundland and Labrador. Pers comm. June 2011). S Ranks will be adopted on review by relevant authorities.

extent required for the installation and operation of marine cables at the Strait of Belle Isle (SOBI), as well as shore electrodes. A description of the Study Area for each of the cable landing sites and shore electrode site follows:

- L'Anse au Diable: a 300 m by 500 m land area (shoreline and inland) encompassing the proposed Labrador shore electrode site and associated structures and construction activities;
- Forteau Point: a 300 m by 1,000 m land area encompassing the proposed Labrador cable landing site and associated structures, construction activities and access road area;
- Shoal Cove: a 300 m by 500 m land area encompassing the proposed Newfoundland cable landing site, associated structures and construction activities; and
- Dowden's Point: a 300 m by 700 m land area (shoreline and inland) encompassing the proposed Newfoundland shore electrode site, associated structures and construction activities.

In addition to focused surveys of the Study Areas, more general field investigations of larger areas, approximately 1.0 km^2 and 2.5 km^2 were undertaken at two of the sites (Forteau Point and Shoal Cove, respectively) to survey for the potential for listed and regionally uncommon plant species occurrences.

Figure 2.1 Study Area – L'Anse au Diable

Figure 2.2 Study Area and Area of General Field Investigation – Forteau Point

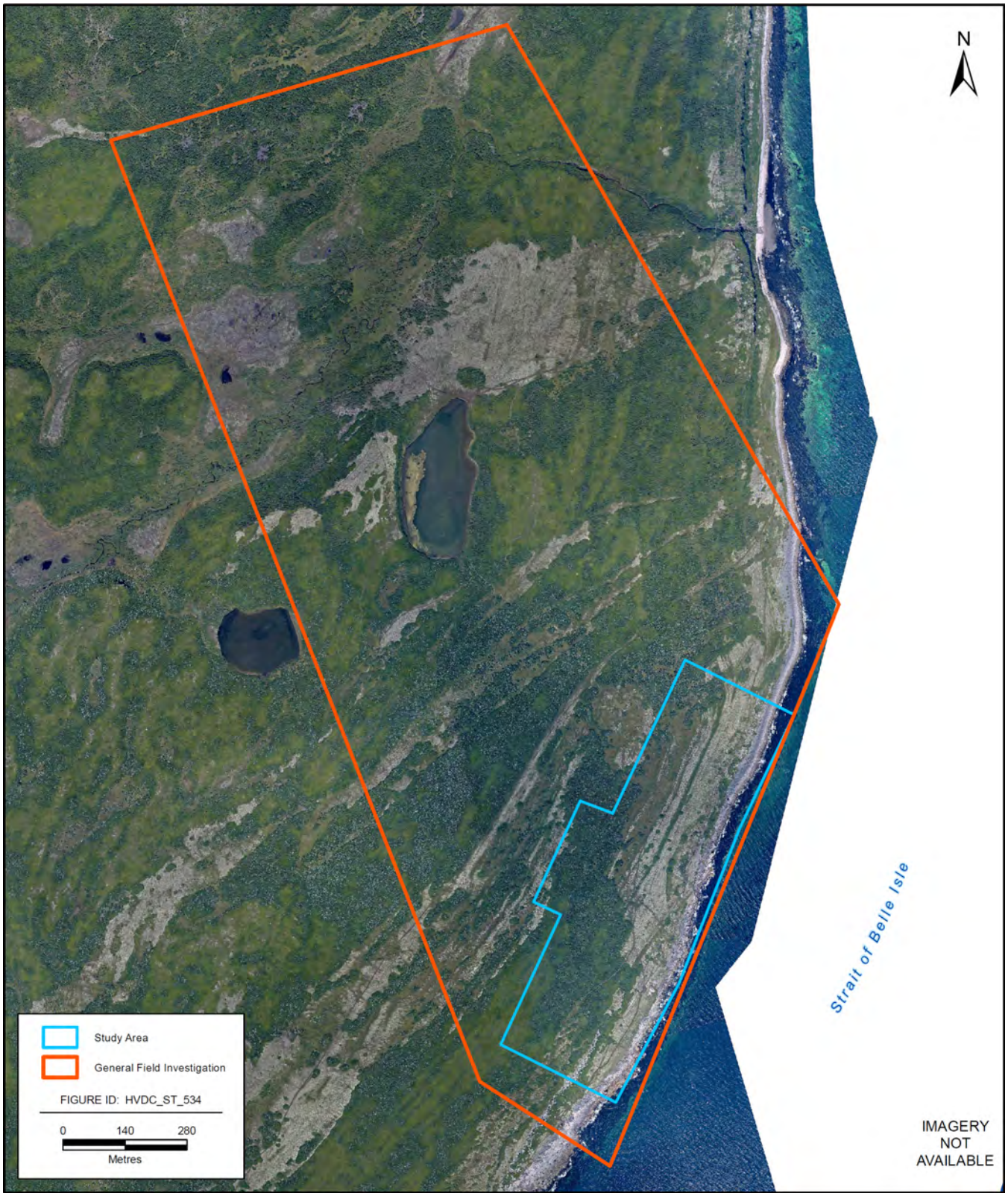
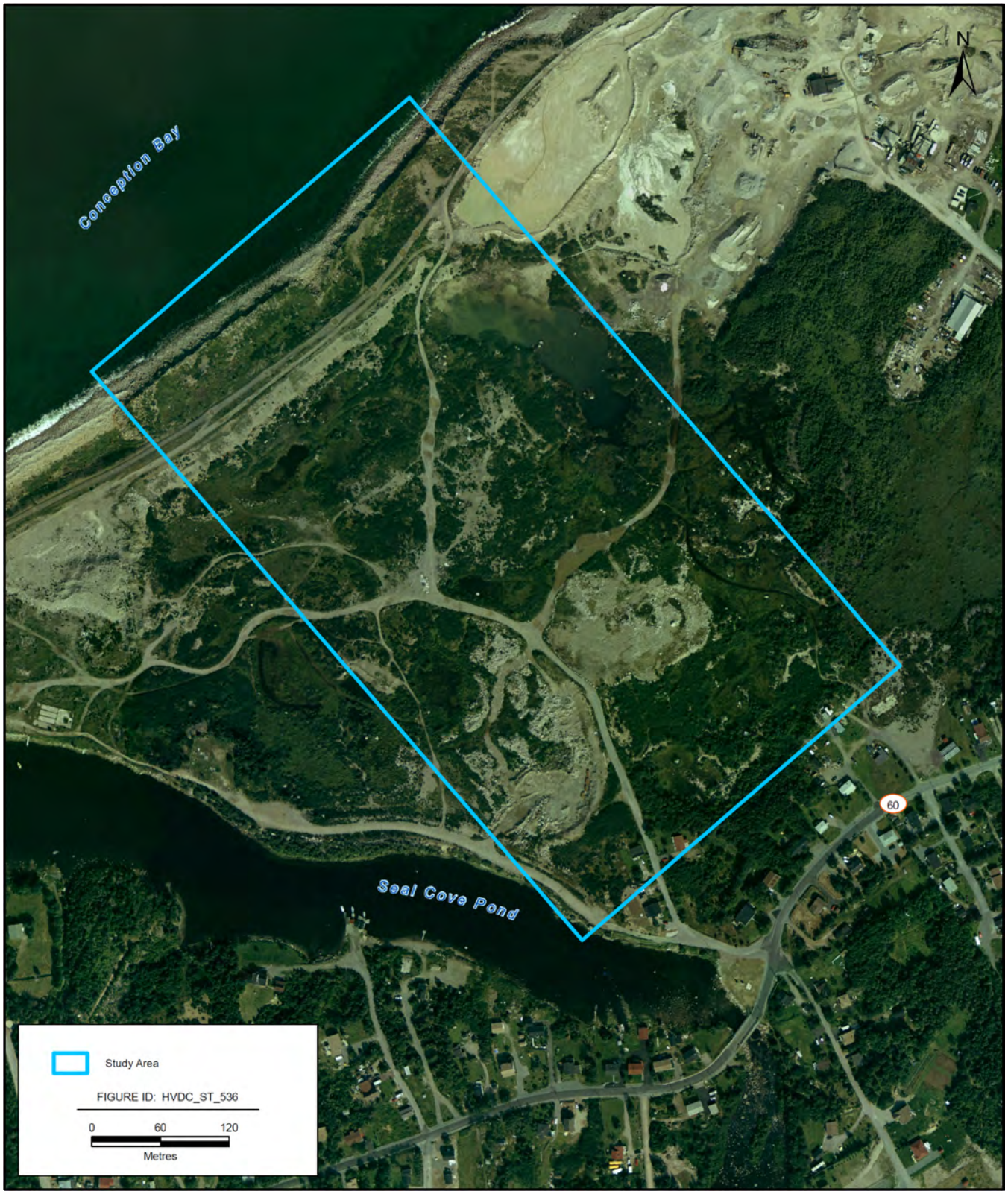


Figure 2.3 Study Area and Area of General Field Investigation – Shoal Cove

Figure 2.4 Study Area – Dowden's Point



2.2 Survey Objectives

The objectives of the surveys were to gather and present site-specific information on listed and regionally uncommon plants, and to determine their potential presence / absence (not detected) and distribution in the Study Areas, for use in the EA and ongoing Project planning and design.

2.3 Study Team

Surveys were conducted by Stantec. The Study Team included a project manager, component manager, field researchers, report writers, geographic information system (GIS) experts, and a scientific authority (Table 2.1). Team members have in-depth knowledge and experience in their fields of expertise and in the Study Area. Brief biographical statements, highlighting roles and responsibilities and relevant education and employment experience, are provided in Appendix A.

Table 2.1 Study Team and Respective Roles

Role	Personnel
Project Manager	Colleen Leeder
Component Manager	Sean Bennett
Botanists / Vegetation Ecologists	Mike Crowell
	Sean Bennett
Report Author	Sean Bennett
Scientific Authority	Susan J. Meades
GIS	Amber Frickleton
	Zach Bartlett

2.4 Pre-Survey Planning

Literature Review

A review of relevant botanical and ecological information was conducted to:

- develop an inventory of listed (as defined within federal or provincial legislation and protected under either the *SARA* or the *NLESA*) and / or "regionally uncommon" (S1, S2, S1 / S2 and S2 / S3 ranked, or combinations thereof) plant species within the Study Areas prior to conducting field surveys;
- identify any previous surveys or previously observed occurrences of special status plant species in the Study Areas;
- assess COSEWIC Status Assessments and / or *SARA* Recovery Strategies or Action Plans (if available);
- source regional floras (Gray's Manual of Botany (Fernald 1950), Flora of Canada (Scoggan 1978) and available volumes of the Flora of North America (FNA) (1993; 1997; 2002; 2006; 2007); and
- collect information from other published literature, including refereed academic journals, research project reports, government publications and current federal legislation and regulations.

A list of all potential special status plant species with the potential to occur in the Study Areas was compiled based on these resources, as well as their COSEWIC, *NLESA*, *SARA,* or ACCDC (ACCDC 2010) status ranks. This list was the basis for the field surveys; the likelihood of occurrence was based on habitat requirements and the associated suitability of habitat within the Study Areas.

The design of the field surveys used the knowledge gained from the Labrador-Island Transmission Link *Regionally Uncommon Plant Potential Mapping* (Stantec 2010a) and *Associated Supplementary Report* (Stantec 2011a) (referred to together as Stantec 2010a; 2011). These reports and the information used to support them (e.g., ACCDC database) provided information on the known occurrence of listed and / or regionally uncommon plant species potentially occurring within the Study Areas and established basic survey design criteria.

Existing Spatial Reference Data

Geospatial reference data related to known occurrences of listed and / or regionally uncommon plant species was acquired from the ACCDC and Environment Canada (EC). These were overlaid on existing geospatial data layers (e.g., National Topographic System maps at 1:50,000 scale or larger, aerial photographs / photomosaics, at a resolution appropriate for facilitating ground-based surveys) of the Study Areas. Again, the results and geospatial data from the Labrador-Island Transmission Link *Regionally Uncommon Plant Potential Habitat Mapping* and *Associated Supplementary Report* (Stantec 2010; 2011a) were important data sources.

GIS layers were then used to produce a base map upon which the survey plan was developed, and included all biophysical and geospatial data needed to stratify the landscape into patches with differing likelihood of occurrence for each species, where applicable. Additionally, a botanical surveyor's map was used to illustrate the areas to be surveyed. This included transect or sample point locations with Universal Transverse Mercator (UTM) coordinates, access routes, names and contact information for land owners or interest groups, and any information related to natural hazards in the Study Areas.

Current ACCDC general status rank data were uploaded to each of the Trimble Nomad™ hand-held data collection and mobile GIS devices. The use of these devices provided additional rigor to the survey, enabling surveyors to record the location of potential special status plant taxa directly into a Project-specific rare plant database while also immediately identifying the general status rank for that species.

Consultation with Regulatory Authority

Prior to the survey, a Scientific Research Permit was acquired. Under authority of the Newfoundland and Labrador Department of Environment and Conservation (NLDEC) Wildlife Division, the *NLESA*, and pursuant to its regulations and policies, a Scientific Research Permit is required to study wild species at risk in Newfoundland and Labrador. The Scientific Research Permit was processed and issued by the NLDEC Wildlife Division (Appendix C - Endangered Species Permit Number: 2011/12-22). Survey protocols were reviewed by Emily Herdman of the Wildlife Division in Corner Brook.

2.5 Field Sampling Methods

Field surveys were conducted from July 5 to July 13, 2011, when the probability of encountering both cool and warm season perennials was highest, and when potential species of interest (i.e., listed and / or regionally uncommon plants) including diagnostic features were most identifiable and the detectability of the majority of species maximized (Sue Meades, pers. comm. 2011).

At present, standardized guidelines for rare plant surveys have not been adopted by any government or regulating agency in eastern Canada. The survey was conducted to provide information for use in the EA.

Minimum requirements for a thorough rare plant survey (ANPC 2000) are as follows:

- The rare plant survey should provide reasonable geographic coverage of the study area including:
    - sampling of representative vegetation communities or habitat types;
    - all unique or uncommon plant associations; and
    - all features or biotic patterns with high probability of supporting rare plants.
- Timing surveys to occur during periods when potential rare species are most visible (when diagnostic features are most identifiable), and when the probability of encountering both cool and warm season perennials is highest.
- Revisit an adequate number of sites where rare plant element occurrences have been previously recorded.

All requirements were achieved through delivery of this survey.

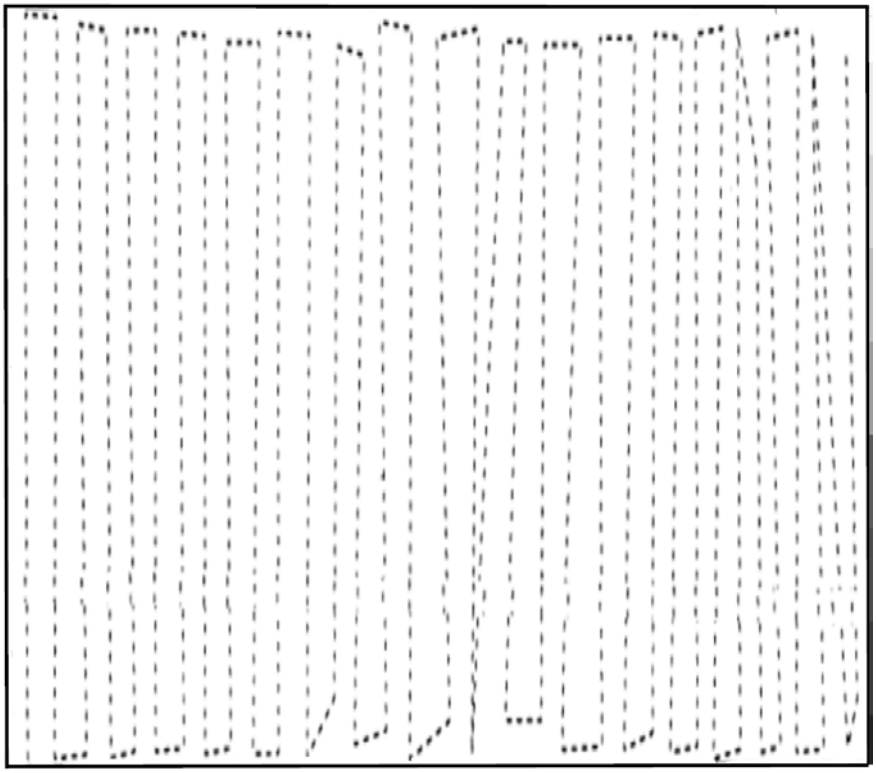
Systematic search patterns were used to minimize overlap and maximize Study Area coverage. This involved systematic searches and habitat-controlled, stratified sampling.

Systematic "Intensive" Searches

An intensive, systematic survey was conducted to provide a complete visual examination of each of the Study Areas. This was achieved by using "continuous belt-transects" to investigate the distribution, habitat and current population of listed and / or regionally uncommon plant species in relation to each Study Area. A series of roughly parallel transects within each of the Study Areas (i.e., cable landing sites and shore electrode sites) were surveyed, maximizing coverage. The abundance of individuals or populations within an area was recorded. Spacing of the search transects was dependent on the density of the vegetation cover, visibility through it, and life form(s) of target plant species. Transects were spaced such that all of the area between transects was visible and so that the smallest listed and / or regionally uncommon plant expected to occur would be visible. Surveyors had overlapping fields of vision at this distance, resulting in thorough survey coverage.

Transect layout design was based on existing protocols. A single base transect, running east to west through each of the Study Areas was established using ArcMap GIS (Version 9.3). Systematically spaced start / end points were then calculated at 15 m intervals along this base line, establishing 15 m wide linear belt-transects across the Study Area. Using UTM coordinates generated within GIS, the field crews navigated to the survey start / end points for each transect using the Trimble Nomad™ GPS technology. The field crew then systematically surveyed each 15 m wide belt-transect, following a constant latitude, longitude, easting or northing, and ensured bisection of landscape patterns and that all microhabitats occurring within the Study Area were adequately sampled (Figure 2.5). Transects were numbered in ascending order, starting from the northwest corner of each Study Area and proceeding in an easterly direction. Transects did not follow roads, trails and other existing ROWs, but rather bisected these features wherever necessary.

Figure 2.5 Illustration of Systematic Search (Continuous Belt-Transect)



When a listed or regionally uncommon plant species was found, it was identified using nomenclature of the FNA and the Database of Canadian Vascular Plants (VASCAN), and the point or polygon where it was located was recorded with a Trimble Nomad™ hand-held computer [in UTM 1983; North American Datum (NAD 83) coordinates]. GPS accuracy (measurement error) was monitored to establish accuracy of the unit at or below ± 5 m. Careful attention ensured the point or polygon being measured was not simply a small portion of a much larger polygon less than 10 m away, thus representing a separate occurrence.

Listed and / or regionally uncommon plant species were mapped and abundance was recorded, depending on the growth form of the species. In most instances, the numbers of stems were counted. In the case of known listed plant species (Long's braya and Fernald's braya) that develop ground-level leaves in a circular arrangement or basal rosette, the number of rosettes were counted. In some instances where a regionally uncommon plant species occurred in high densities, it was necessary to estimate numbers or cover percentage as an indicator of abundance.

In addition, the general distribution of the species and a description of habitat within each Study Area were recorded. In cases where listed or regionally uncommon plant species were observed outside the transect boundaries, notes were made about its general location and UTM coordinates. Point location data are suitable for plant species occurrences that are <10 m in diameter, and >10 m apart from the next nearest occurrence of the same species. Where necessary, polygons are considered suitable for those occurrences that are >10 m in diameter or for clusters of smaller patches <10 m apart that collectively occupy a patch >10 m in diameter. Polygons of different species can overlap and the area of occupancy may extend beyond the transect width.

Each observation of an individual or grouping of a listed or regionally uncommon plant species was recorded (Table 2.2).

Table 2.2 Listed and / or Regionally Uncommon Plant Species Occurrence Information

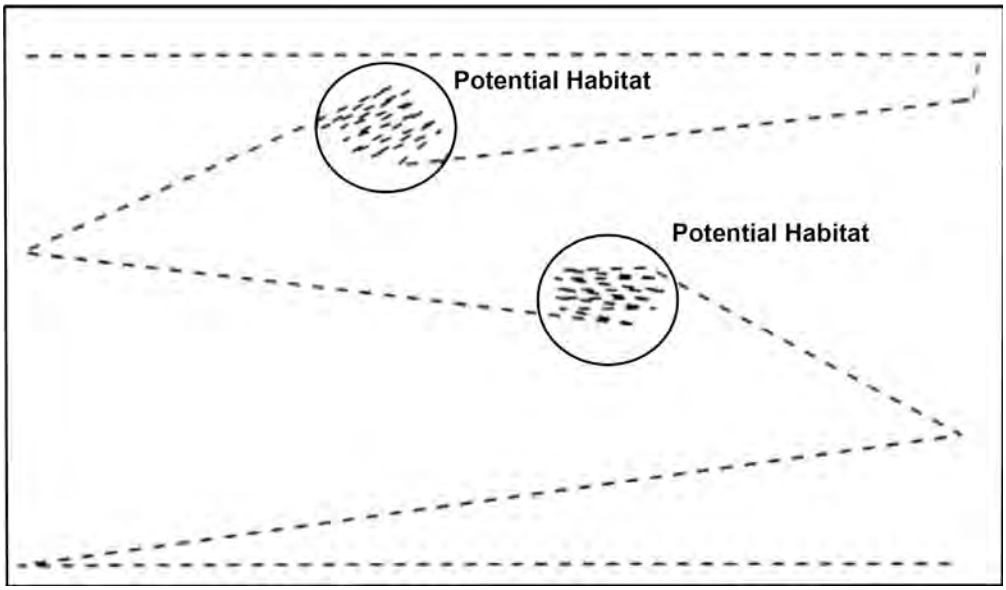
Plant Information	Definition
Site ID	The name assigned to the survey site (e.g., Shoal Cove - SC)
Date	Date of observation
Observer	Observer's name
Survey Number	The transect number if occurrence was located while performing a transect search (e.g., SC1 for Shoal Cove, Transect #1)
Plant GPS Point	The survey number for the site in coordination with a unique identifier for each species found at that site (e.g. SC1-MC1 for Shoal Cove, Transect #1, observer name, Plant 1)
Species	Plant species observed
# Individuals	The number of individual plants (or groups if this species is difficult to identify individuals. Estimate if >50 individuals
# Groups	The number of groups only if it was not possible to easily identify individuals for this species - estimate if > 50
Distribution	The approximate distribution: widely scattered, evenly distributed, or densely clumped
Area of Distribution	The approximate area (m^2) that the species is distributed across
Phenology	The approximate percentage of the individuals that are - in leaf (0-100%); in bud (0-100%); in flower (0-100%); in fruit (0-100%); dispersing seed (0-100%); or dormant (0-100%)
Unique ID	If there are > 20 individuals and identification is not certain, a single specimen may be collected (necessary permits are required) and deposited in a designated herbarium (e.g., Herbarium of the Provincial Museum of Newfoundland and Labrador). In such an event, the specimen was given a unique code or collection number: YYMMDD + 6-character GPS point
Photo Numbers	The photo number associated with any digital images of the observation

Digital photographs were taken of each target plant grouping encountered within each transect and of the general landscape in which the occurrence was recorded.

Stratified "Random Meander" Sampling

Stratified sampling involves a survey of habitats with the greatest search effort applied to areas (i.e., habitats) having the highest potential to support listed and / or regionally uncommon plants (Figure 2.6). This method is used to account for different areas (or strata) that are identified within a larger habitat polygon. Individual plant associations or habitats are rarely uniform throughout their extent, and there are often smaller, identifiable areas within a habitat which are substantially different from that of the larger habitat polygon. For instance, the calcareous substrates of limestone hillock sides or "frost boil" microhabitats preferred by the *SARA*-listed Fernald's milk-vetch (*Astraglus robbinsii* var. *fernaldii*) occur within larger areas of conifer scrub habitat, in southeastern Labrador. These strata are inclusions within the larger habitat matrix; as such, they may be sampled separately from the main body of the habitat. If sufficient information was available on the habitat requirements of potentially occurring species (substrate, plant community, etc.), and portions of the survey location were believed to be potentially suitable for those species, the stratified sample technique was utilized to document and validate the assumptions regarding species presence or absence (no detection) within areas of general field investigation.

Figure 2.6 Illustration of Stratified Sampling within General Field Investigation Survey Locations



A floristic survey of key habitats was completed, compiling a list of all plant taxa observed and the plant community where each taxon occurred, using Trimble Nomad™ hand-held data logger technology. As indicated previously, current ACCDC general status rank data were uploaded to each of the Trimble Nomad™ hand-held data collection and mobile GIS devices. The use of these devices provided additional rigor to the survey, enabling surveyors to record the location of potential special status plant taxa directly into a Project-specific rare plant database while also immediately identifying the general status rank for that species. When the field crew arrived at an area of "high potential" habitat, a detailed search of the area was completed as shown in Figure 2.6. High potential habitat areas included areas defined in the pre-survey literature review of listed and regionally uncommon taxa, and areas where these taxa were encountered. Using the aforementioned methodology, the Study Area was surveyed such that few, if any, additional species would be added to the compiled species list for the Project.

2.6 Post-Survey Data Processing

Data Compilation and Analysis

Plant species occurrence information collected in the field was entered into a digital database (MS Excel) and queries of the database were performed to provide a complete inventory of all listed and / or regionally uncommon plant species within each of the respective Study Areas locations. Listed and / or regionally uncommon vascular plant species within each Study Area were then mapped using the UTM coordinates from GPS waypoints collected during the field surveys.

ArcGIS software was used to manage all spatial data collected during field surveys. Data were stored in a geodetic datum using the NAD 83, with mapping created using the same NAD 83 coordinate system. Sampling databases, Ecological Land Classification (Stantec 2010b) polygons, and associated base map information and imagery were all managed in ArcMap GIS (Version 9.3). ArcGIS was used for all data analysis and cartographic output.

Voucher Specimens

Voucher specimens were collected only if the population was sufficient to permit collection. For plants that were not readily identifiable in the field, voucher specimens were collected for post field work identification and preservation, particularly regionally uncommon, unconfirmed, or unrecognized species of sedges, grasses, and other graminoids. Collected specimens were labeled and prepared for submission to the NLDEC (Wildlife Division) for verification and archiving.

Voucher specimens were not collected within areas of identified "critical habitat" for the listed Long's braya and Fernald's braya at Shoal Cove. Rather, regionally uncommon, unconfirmed, or unrecognized species occurrences were photo-documented for later examination by taxonomic experts.

Verification by Taxonomic Experts

In those cases where a confirmed identification was not possible in the field, verification by Sue Meades, M.Sc. (Scientific Authority - vascular plants) with the assistance of staff (Dr. Stu Hay) from the University of Montreal Herbarium was obtained.

3.0 RESULTS

3.1 Office Review

Listed and / or regionally uncommon plant species potentially occurring within the Study Areas for the Project were identified in the *Regionally Uncommon Plant Potential Habitat Mapping Component Study* and *Associated Supplementary Report* (Stantec 2010a; 2011a). These included vascular plant species listed under Schedule 1 of the *SARA* and / or *NLESA*, in addition to those assigned ACCDC status ranks of S1, S1 / S2, S2 and S2 / S3 (or combinations thereof) indicating that their populations are considered "extremely rare" to "uncommon" within the province. This list was refined to include some 47 special status vascular plant species, with 16 listed and / or regionally uncommon plant species occurring in Labrador and 31 in Study Areas on the Island Newfoundland (Table 3.1). Of these 47 plant species, the specific ecological requirements and conditions of two *SARA*-listed species - Long's braya (*Braya longii*) and Fernald's braya (*Braya fernaldii*) are known from within the Study Areas and are included on this refined list.

Table 3.1 Special Status Vascular Plant Species Potentially Occurring in the Vicinity of the Study Areas

Family	Scientific Name	Common Name	Status Ranking*			Preferred Habitat
			G Rank	N Rank	Provisional S Rank	
Labrador						
Aspleniaceae	*Asplenium viride*	green spleenwort	G4	NNR	S1	• Crevices and cliffs in limestone bedrock • Usually restricted to calcareous or basic substrates, such as limestone barrens or dolomite
Fabaceae	*Astragalus robbinsii* var. *minor*	Blake's milkvetch	G5T5	NNR	S1	• Turfy limestone barrens; exposed limestone cliff edges; usually restricted to calcareous or basic substrates (obligate calciphile), such as limestone barrens or dolomite and limestone cliffs • Grows only in exposed, frost-heaved, limestone-derived soils that are inhabited by Arctic / alpine plant communities
Fabaceae	*Astragalus robbinsii* var. *fernaldii*	Fernald's milkvetch	G5	N3N5	S1	• Turfy limestone barrens • Usually restricted to calcareous or basic substrates (obligate calciphile), such as limestone barrens or dolomite and limestone cliffs • Grows only in exposed, frost-heaved, limestone-derived soils that are inhabited by Arctic / alpine plant communities
Ophioglossaceae	*Botrychium lanceolatum subsp. lanceolatum*	triangle moonwort	G5	NNR	S1	• Turfy limestone barrens • Rich, deciduous forests, meadows and calcareous slopes • Occasionally at roadsides
Ophioglossaceae	*Botrychium martricariifolium*	daisyleaf moonwort	G5	NNR	S1	• Turfy limestone barrens • Rich, alluvial soils or in leaf mould in deciduous woods where specimens are weak and delicate • Exposed headlands; worn-out fields

Family	Scientific Name	Common Name	Status Ranking*			Preferred Habitat
			G Rank	N Rank	Provisional S Rank	
Ophioglossaceae	*Botrychium virginianum*	rattlesnake fern	G5	N5	S1	• Turfy limestone barrens • Rich, deciduous forests, meadows and calcareous slopes • Occasionally at roadsides
Pteridaceae	*Cryptogramma stelleri*	Steller's rockbrake	G5	NNR	S1 / S2	• Shaded limestone cliffs • Usually restricted to calcareous or basic substrates, such as limestone barrens or dolomite
Dryopteridaceae	*Dryopteris filix-mas*	male fern	G5	N4 / N5	S1 / S3	• Dense mixed and deciduous woods with calcareous or basic substrates of limestone or dolomite • Talus slopes with exposed boulders and gravels
Asteraceae	*Erigeron elatus*	swamp fleabane	G4?	NNR	S1	• Open limestone barrens, esp. with exposed gravels
Fabaceae	*Oxytropis deflexa* var. *foliolosa*	pendantpod locoweed	G5	NNR	S1	• Coastal limestone barrens, exposed to somewhat turfy sites
Ranunculaceae	*Ranunculus pensylvanicus*	bristly crowfoot	G5	NNR	S1	• Stream banks, bogs, moist clearings • Depressions in open forests
Colchicaceae	*Streptopus lanceolatus* var. *lanceolatus*	rose twisted-stalk	G5	N5	S1 / S2	• Rich moist coniferous and deciduous woods
Valerianaceae	*Valeriana dioica* subsp. *sylvatica*	northern valerian	G5	NNR	S1	• Turfy limestone barrens
Gentianaceae	*Gentianella propinqua*	four-part gentian	G5	NNR	S2	• Turfy limestone barrens
Fabaceae	*Hedysarum alpinum*	alpine sweetvetch	G5	NNR	S2	• Crevices and cliffs in limestone bedrock • Usually restricted to calcareous or basic substrates, such as limestone barrens or dolomite
Caryophyllaceae	*Sagina nodosa* subsp. *borealis*	northern knotted pearlwort		N5	SNR	• Frost boils in coastal limestone barrens • Tops of limestone ridges

Family	Scientific Name	Common Name	Status Ranking*			Preferred Habitat
			G Rank	N Rank	Provisional S Rank	
Newfoundland						
Asteraceae	*Arnica angustifolia*	narrowleaf arnica	G5T5	N5	S1	• Substrates: Tundra, slopes, ridges, cliffs, seashores • Imperfectly drained moist areas (rarely), or dry (often in bird-manured sited), or moderately well drained areas • Gravel, sand, clay
Fabaceae	*Astragalus robbinsii*	Robbins' milkvetch	G5T5	NNR	S1	• Exposed, frost-heaved, limestone-derived soils that are inhabited by arctic / alpine plant communities • In particular, it seems to prefer slightly elevated, drier calcareous mounds and low ridges • Generally within areas of low healthy vegetation
Brassicaceae	*Braya fernaldii*	Fernald's braya	G2	N2	S1	• Exposed calcareous gravels of the limestone barrens
Brassicaceae	*Braya longii*	Long's braya	G1	N1	S1	• Exposed, windswept limestone gravels and gravelly areas of thin patchy peat veneer over limestone
Cyperaceae	*Carex capitata*	capitate sedge	G5	NNR	S1	• Exposed coastal heath • Circumboreal distribution, growing in wet places in boreal forests and mountain meadows in alpine climates
Cyperaceae	*Carex crawei*	Crawe's sedge	G5	NNR	S1	• Seepy, often calcareous sedge meadows, fens, bogs, and shores
Cyperaceae	*Carex petricosa*	rock-dwelling sedge	G4	NNR	S1	• Substrates: slopes; dry; rocks • With low organic content; calcareous
Cyperaceae	*Eleocharis kamtschatica*	Kamchatka spikerush	G4	NNR	S1	• Weakly tidal • Some salt influence • Edge of water

Family	Scientific Name	Common Name	Status Ranking*			Preferred Habitat
			G Rank	N Rank	Provisional S Rank	
Asteraceae	*Erigeron elatus*	swamp fleabane	G4?	NNR	S1	• Floodplain meadows, pond edges, open boggy woods, tundra
Cyperaceae	*Eriophorum scheuchzeri*	Scheuchzer's cottongrass	G5	NNR	S1	• Tundra, wet peat, marshy ground, peaty soils, riverbanks, lake and pond shores
Poaceae	*Poa arctica*	arctic bluegrass	G5T4T5	NNR	S1	• Moderately to imperfectly drained gravel, on soils adjacent to wetlands, and on raised mossy hummocks in wet meadows, where it often adopts a tufted form
Ranunculaceae	*Ranunculus hyperboreus*	far-northern buttercup	G5	NNR	S1	• Floating in shallow water or stranded on exposed mud at margins of streams and ponds and open wet soil and marshes, in tundra or boreal or subalpine forest
Poaceae	*Sphenopholis intermedia*	slender wedgegrass	G5	NNR	S1	• Rocky woodlands, open upland woodlands, areas along woodland paths, meadows in wooded areas, gravelly seeps in partially shaded areas
Potamogeton-aceae	*Stuckenia filiformis*	threadleaf pondweed	G5T5	N5	S1	• Substrates: aquatic; silt. • Mud in shallow lakes and pools; only the inflorescence emergent
Cyperaceae	*Eriophorum gracile*	slender cottongrass	G5	N5	S1S2	• Meadows, bogs, shores, usually peaty, acidic substrates
Ranunculaceae	*Anemone multifida*	cutleaf anemone	G5T5	N5	S2	• Gravelly calcareous slopes, riverbanks, lakeshores, and disturbed situations
Brassicaceae	*Boechera stricta* [=*Arabis drummondii*]	Drummond's rockcress	G5	N5	S2	• Mesic to dry rock outcrops, talus slopes, gravelly soils, open forests and roadsides • Arctic-alpine habitat
Ericaceae	*Arctous rubra*	red bearberry	G5	NNR	S2	• Mossy places in open coniferous woodland, peaty soils, and rocky tundra
Orobanchaceae	*Bartsia alpina*	velvetbells	G5	NNR	S2	• Open limestone barrens in slightly sheltered locations on turfy or peaty patches with other low herbaceous vegetation

Family	Scientific Name	Common Name	Status Ranking*			Preferred Habitat
			G Rank	N Rank	Provisional S Rank	
Cyperaceae	*Carex bicolor*	two-colour sedge	G5	NNR	S2	• Substrate: wet meadows, around the margins of ponds, tundra, sea shore (on upper sandy beaches) • Imperfectly drained; calcareous; sand, silt; with low organic content, or with high organic content
Cyperaceae	*Carex concinna*	northern elegant sedge	G5	N5	S2	• Moist to dry meadows, riverbanks, thickets, flood plains, and open spruce, pine, cedar, birch, aspen, and willow woodlands • Usually on calcareous substrates
Cyperaceae	*Carex maritima*	seaside sedge	G4G5	NNR	S2	• Beaches, dunes, fresh alluvium, rocky or mineral-rich soils of lake, river, and ocean shores, seepy slopes, fens, rock barrens, mostly near the coasts
Cyperaceae	*Eriophorum brachyantherum*	closed-sheath cottongrass	G5	N5	S2	• Substrate: wet meadows, river terraces, tundra • Imperfectly drained; calcareous; rock, silt; with high organic content, or peat
Cyperaceae	*Eriophorum callitrix*	beautiful cottongrass	G5	NNR	S2	• Wet meadows, hummocks, around the margins of ponds, river terraces, tundra • Imperfectly drained moist areas, seepage slopes (occasionally), dry (rarely); silt, till; with high organic content; calcareous
Poaceae	*Festuca altaica*	northern rough fescue	G5	N5	S2	• "Limestone barrens" and / or on smaller "limestone" outcrops, patches and marls; and / or on other basic (i.e. non-acidic) substrates such as "serpentine"
Gentianaceae	*Gentianella propinqua*	four-part gentian	G5	NNR	S2	• Substrates: lakeshores, seashores (sandbars) • Imperfectly drained moist areas, dry; gravel, sand, till • With low organic content; calcareous (weakly)

Family	Scientific Name	Common Name	Status Ranking*			Preferred Habitat
			G Rank	N Rank	Provisional S Rank	
Haloragaceae	*Myriophyllum sibiricum*	Siberian watermilfoil	G5	NNR	S2	• Substrates: tundra ponds; aquatic; calcareous. • Habitats: shallow, calcareous streams
Celastraceae	*Parnassia kotzebuei*	Kotzebue's grass-of-Parnassus	G5	N5	S2	• Wet calcareous rocky places • By brooks, ponds and seepages
Orchidaceae	*Platanthera hookeri*	Hooker's orchid	G4	NNR	S2	• Dry to mesic coniferous and deciduous forest
Ranunculaceae	*Ranunculus arcticus* [=*R. pedatifidus var. affinis*]	northern buttercup	G5T5	NNR	S2	• Dry rocky places on open arctic and alpine slopes and shores, moist grassland depressions, and open aspen woods
Caryophyllaceae	*Stellaria crassifolia*	fleshy starwort	G5	N5	S2	• Wet meadows, imperfectly drained moist areas • Calcareous; silt, moss; with high organic content. • Habitats: occasional in wet meadows, where it often forms mats around the bases of tall grasses and sedges
*Status is assessed and documented at three distinct geographic scales: global (G); national (N); and subnational (S) (i.e., state / province / municipal)						

3.2 Listed and / or Regionally Uncommon Plant Occurrences within the Study Areas

A total of 14 listed and / or regionally uncommon vascular plant species were identified during the field surveys (Table 3.2). Two of these species, Long's braya and Fernald's braya are listed under Schedule 1 of the *SARA* and the *NLESA* and are therefore considered to be of high conservation concern both federally and provincially. Four species that were observed in the Study Areas are assigned rankings of S1, S2 or S1 / S2 by the ACCDC, indicating that they are of conservation concern to the Province, including rose twisted-stalk (*Streptopus lanceolatus*), least moonwort (*Botrychium simplex*), seaside sedge (*Carex maritima*), and Crantz's cinquefoil (*Potentilla crantzii*). Populations of eight species are considered "Secure" by NLDEC but have been assigned rankings varying from S2 / S3 to S3 by the ACCDC indicating that they are uncommon throughout the province and of concern. These taxa include starry false Solomon's seal (*Maianthemum stellatum*), hoary willow (*Salix candida*), Lapland buttercup (*Coptidium lappinicum*), alpine meadowrue (*Thalictrum alpinum*), alpine groundsel (*Packera pauciflora*), Lapland rosebay (*Rhododendron lapponicum*), longstalk starwort (*Stellaria longipes*) and Gaspé arrowgrass (*Triglochin gaspensis*). All species recorded from the Study Areas were previously known from both Labrador and the Island of Newfoundland.

For those Study Areas occurring in Labrador, the abundance of some of the species suggests that the current S Ranks may be conservative; that is, some species thought to be regionally uncommon may not be. The scarcity ranking may be the result of the lack of information on the distribution of Labrador plant species. Species with few observations, but whose occurrence is known to be widespread based on the current literature (Hultén 1971; Meades et al. 2000; Rouleau and Lamoureux 1992; Scoggan 1978), are not considered further.

The Study Areas shown on Figures 2.1, 2.2, 2.3 and 2.4 were surveyed as described in Section 2.4. A total of 317 vascular plant species were observed. Appendix D contains a listing of all species observed and their current or draft S Ranks. The listed or regionally uncommon plant species that were observed in Study Areas, their current or draft S Rank and survey plot location is provided in Table 3.2.

Table 3.2 Listed and Regionally Uncommon Vascular Plant Species Occurrence Information

Family	Scientific Name	Common Name	Status Ranking			Location Observed			
			N Rank[1]	G Rank[2]	S Rank[3]	Shoal Cove	Forteau Point	L'Anse au Diable	Dowden's Point
Listed									
Brassicaceae	*Braya fernaldii*	Fernald's braya	N2	G2	S1	Y	N	N	N
Brassicaceae	*Braya longii*	Long's braya	N1	G1	S1	Y	N	N	N
Regionally Uncommon									
Colchicaceae	*Streptopus lanceolatus*	rose twisted-stalk	N5	G5	S1S2	N	Y	N	N
Ophioglossaceae	*Botrychium simplex*	least moonwort	NNR	G5	S2	N	N	N	Y
Cyperaceae	*Carex maritima*	seaside sedge	NNR	G4G5	S2	Y	N	N	N
Rosaceae	*Potentilla crantzii*	Crantz's cinquefoil	NNR	G3G5	S2	Y	N	N	N
Asparagaceae	*Maianthemum stellatum*	starry false Solomon's seal	N5	G5	S2S3	N	N	Y	N
Salicaceae	*Salix candida*	hoary willow	NNR	G5	S2S3	N	N	Y	N
Ranunculaceae	*Coptidium lapponicum*	Lapland buttercup	NNR	G5	S2S3	N	Y	N	N
Ranunculaceae	*Thalictrum alpinum*	alpine meadowrue	NNR	G5	S2S3	N	Y	N	N
Asteraceae	*Packera pauciflora*	alpine groundsel	NNR	G4G5	S2S3	Y	N	N	N
Ericaceae	*Rhododendron lapponicum*	Lapland rosebay	NNR	G5	S2S3	Y	N	N	N
Caryophyllaceae	*Stellaria longipes*	longstalk starwort	NNR	G5	S2S3	Y	N	N	N
Juncaginaceae	*Triglochin gaspensis*	Gaspé arrowgrass	N3	G3G4	S2S3	Y	N	N	N

[1] nationally (N Rank)
[2] globally (G Rank)
[3] Newfoundland and Labrador (S Rank)

Listed *SARA* and / or *NLESA* Species

Based on results of a literature review, three plant species, listed under Schedule 1 of *SARA* and / or the *NLESA*: are known from the general vicinity of the Study Area. Long's braya (*Braya longii*) and Fernald's braya (*Braya fernaldii*) are known to occur in the vicinity of the Shoal Cove Study Area, while Fernald's milkvetch (*Astraglus robbinsii* var. *fernaldii*) is known to occur in the vicinity of the Forteau Point Study Area. Of the aforementioned species, two (Long's braya and Fernald's braya) were identified from field surveys of the Study Area.

In April 1997, the COSEWIC designated Long's braya as "endangered" and Fernald's braya as "threatened" (Meades 1997a; 1997b) and listed both species in Schedule 1 of *SARA* in June 2003. Long's braya and Fernald's braya are protected under the federal *SARA*. Sections 32 and 33 of the *Act* make it an offence to: kill, harm, harass, capture or take an individual of a listed species that is extirpated, endangered or threatened; possess, collect, buy, sell or trade an individual of a listed species that is extirpated, endangered or threatened, or its part or derivative; or to damage or destroy the residence of one or more individuals of a listed endangered or threatened species or of a listed extirpated species if a recovery strategy has recommended its reintroduction (Government of Canada 2003a). In 2002, Long's braya and Fernald's braya were afforded legal protection under the Province of Newfoundland and Labrador's *ESA* legislation. Under this *Act*, it is prohibited to kill, harm, trade, or possess members of this species (Government of Newfoundland and Labrador 2002).

Occurrences of these two endemic braya species have been well documented as part of the provincial Braya Recovery Team (later renamed the Limestone Barrens Species at Risk Recovery Team). While both species are endemic to the limestone barrens of the Northern Peninsula, the range of Long's braya is known only from four sites in the Strait of Belle Isle: Anchor Point East, Yankee Point, Sandy Cove (comprising 3 subpopulations), and Shoal Cove. The original (type) population, discovered by M.L. Fernald at Sandy Cove in 1924, has been nearly completely destroyed by gravel quarry activities (Meades 1997a); less than 50 plants remain at a second Sandy Cove location (Species at Risk Public Registry 2011). The Yankee Point site, along an abandoned parking area associated with the Lower Churchill Development Corporation (LCDC) Fixed Link Project (Government of Newfoundland and Labrador 2005), had supported more than 1,600 Long's braya plants during the late 1990s. Within areas of anthropogenically disturbed habitat the present size of this population is in the order of 3,200 individuals. In a 1998/2000 census, the combined populations of Long's braya from these four separate locations were estimated at approximately 7,200 individuals. Re-assessed in 2008, the population had decreased to 5,550 plants, suggesting that populations have decreased across their range (Species at Risk Public Registry 2011).

Fernald's braya has a larger natural range with more sites [15 disjunct locations between Point Riche and Burnt Cape Ecological Reserve (ER)] than Long's braya, but estimated population numbers are much lower at each site (1 to > 200 plants), with a total estimated population of approximately 3,500 plants (Species at Risk Public Registry 2011). Based on anecdotal information obtained from S.J. Meades through unrelated site visits conducted in July 2011, population numbers of Fernald's braya at two nearby ERs (Burnt Cape ER and Watts Point ER) have decreased over the last several years. While artificial disturbance introduced increased nutrients to some sites (e.g., Burnt Cape ER), the change in habitat and nutrient supply also encouraged the establishment of other more aggressive native and introduced species, resulting in an observed decline in Braya population numbers. 425 individual plants of Long's braya (422 individuals) and three Fernald's braya (3 individuals) were observed in the Study Area (Table 3.3) at Shoal Cove, all in anthropogenically disturbed sites associated with highway construction.

Table 3.3 Locations, Population Size and Phenology of Important Listed and Regionally Uncommon Plant Occurrences in the Study Areas

Location	Species	Study Area	Population Size	Phenology	Habitat
SARA / NLESA-listed and / or ACCDC Status Rank (S1)					
Shoal Cove	*Braya fernaldii*	Focused	3 individual plants	Rosette growth / shoot development (seedlings)	sparsely vegetated, exposed, gravelly substrate. Within quadrat for long-term monitoring plot
Shoal Cove	*Braya longii*	Focused	21 plants	Flowering	anthropogenically disturbed - moist, gravelly substrate associated with historic highway construction
Shoal Cove	*Braya longii*	General	96 plants	Flowering	anthropogenically disturbed - moist, gravelly substrate associated with historic highway construction
Shoal Cove	*Braya longii*	General	19 plants	Flowering	anthropogenically disturbed - moist, gravelly substrate associated with historic highway construction
Shoal Cove	*Braya longii*	General	44 plants	Flowering	anthropogenically disturbed - moist, gravelly substrate associated with historic highway construction
Shoal Cove	*Braya longii*	General	10 plants	Flowering	anthropogenically disturbed - moist, gravelly substrate associated with historic highway construction
Shoal Cove	*Braya longii*	General	47 plants	Flowering	anthropogenically disturbed - moist, gravelly substrate associated with historic highway construction
Shoal Cove	*Braya longii*	General	24 plants	Flowering	anthropogenically disturbed - moist, gravelly substrate associated with historic highway construction
Shoal Cove	*Braya longii*	General	21 plants	Flowering	anthropogenically disturbed - moist, gravelly substrate associated with historic highway construction
Shoal Cove	*Braya longii*	General	39 plants	Flowering	anthropogenically disturbed - moist, gravelly substrate associated with historic highway construction
Shoal Cove	*Braya longii*	General	11 plants	Flowering	anthropogenically disturbed - moist, gravelly substrate associated with historic highway construction
Shoal Cove	*Braya longii*	General	25 plants	Flowering	anthropogenically disturbed - moist, gravelly substrate associated with historic highway construction
Shoal Cove	*Braya longii*	General	1 plants	Flowering	anthropogenically disturbed - moist, gravelly substrate associated with historic highway construction
Shoal Cove	*Braya longii*	General	40 plants	Flowering	anthropogenically disturbed - moist, gravelly substrate associated with historic highway construction
Shoal Cove	*Braya longii*	General	39 plants	Flowering	anthropogenically disturbed - moist, gravelly substrate associated with historic highway construction
Shoal Cove	*Braya longii*	General	7 plants	Flowering	anthropogenically disturbed - moist, gravelly substrate associated with historic highway construction

Table 3.3 Locations, Population Size and Phenology of Important Listed and Regionally Uncommon Plant Occurrences in the Study Areas (continued)

Location	Species	Study Area	Population Size	Phenology	Habitat
Regionally Uncommon [ACCDC Status Rank (S1S2, S2 and S2/S3]					
L'Anse au Diable	*Maianthemum stellatum*	Study Area	Abundant	Vegetative	sparsely vegetated beach dune
Forteau Point	*Streptopus lanceolatus*	Focused	2 plants	Flowering	opening surrounded by high tuckamoor
Forteau Point	*Streptopus lanceolatus*	General	3 plants	Flowering	edge of high tuckamoor
Forteau Point	*Maianthemum stellatum*	Focused	2 plants	Vegetative	turfy barrens
Forteau Point	*Coptidum lapponicum*	General	3 plants	Flowering	moist peaty soils at edge of ATV trail; overtopped by high tuckamoor
Forteau Point	*Thalictrum alpinum*	General	1 plant	Vegetative	turfy barrens
Shoal Cove	*Potentilla crantzii*	Focused	2 plants	Flowering	anthropogenically disturbed habitat
Shoal Cove	*Botrychium simplex*	Focused	1 plant	Unbranched fertile frond	anthropogenically disturbed habitat - near highway
Shoal Cove	*Packera pauciflora*	General	several plants	Flowering	anthropogenically disturbed habitat - revegetated area
Shoal Cove	*Rhododendron lapponicum*	Focused	10 plants	Vegetative	turfy barrens
Shoal Cove	*Stellaria longipes*	Focused	1 plant	Flowering	anthropogenically disturbed habitat
Dowden's Point	*Botrychium simplex*	Study Area	8 plants	Fertile frond	anthropogenically disturbed habitat - edge of trail

Prior to the survey, element occurrences of both Long's braya and Fernald's braya were re-established from existing element occurrences (ACCDC 2010) of *Braya* species established by the Limestone Barren Species at Risk Recovery Team (LBSARRT) as part of on-going biological research for at-risk *Braya* species on the limestone barrens. Through this research, populations of both Long's braya and Fernald's braya throughout the region have been previously documented. Attempts by the Study Team to locate these research plots, using coordinate data provided by the ACCDC (ACCDC 2011), were successful in locating both braya species within or adjacent to a number of the 1 m x 2 m quadrats previously established by the Limestone Barrens Species at Risk Recovery Team.

Within the Study Area, observations of Long's braya and Fernald's braya were made within areas of suitable habitat in an area of provincially identified "critical habitat" within the Shoal Cove Study Area. Long's braya and Fernald's braya are endemic to the Island of Newfoundland and therefore known only from this region of the province's Northern Peninsula. As a result of such range restrictions, additional occurrences of Long's braya and Fernald's braya are not anticipated within any other Study Area (i.e., L'Anse au Diable, Forteau Point and Dowden's Point) identified for the Project.

Fernald's braya was observed with limited abundance (three individual seedlings) within a 1 m x 2 m quadrat (Appendix E, Photograph 15) established by the LBSRRT. Habitat associations were primarily in or adjacent to moist, shallow depressions of previously disturbed roadsides.

Long's braya (Appendix E; Photographs 16, 17 and 18) was recorded within three separate linear, belt transects at Shoal Cove between July 5 and July 13, 2011 (Table 3.2). Within the general investigation area, Long's braya

was observed in greater abundance and in habitat with similar characteristics. Their identification was visually confirmed by a taxonomic specialist in the field (S.J. Meades). In accordance with conditions of the Scientific Research Permit (Permit No. 2011/12-22), no voucher specimens were collected. Photographs of each species are presented in Appendix E.

Surveys conducted beyond the boundaries of the Study Areas, in areas of general field investigations at Forteau Point, Labrador, and Shoal Cove, Newfoundland, did result in observations of listed plant species. Populations of the *SARA / NLESA*-listed Long's braya were observed in the southeast corner of the Shoal Cove general investigation area.

No occurrences of the *SARA* / *NLESA* listed Fernald's milkvetch or their preferred habitats were recorded during the survey. Fernald's milkvetch is known primarily to occur in southeastern Labrador.

Regionally Uncommon Plant Species

Several regionally uncommon plant species (rose twisted-stalk, Lapland buttercup, and alpine meadowrue) were observed within habitats outside the Study Area for Forteau Point, while seaside sedge, alpine groundsel, and least moonwort were observed outside the Study Area at Shoal Cove. Least moonwort was also observed within the Study Area at Dowden's Point (Table 3.3).

Of the 12 regionally uncommon plant species listed in Table 3.2, several plant species (Crantz's cinquefoil, hoary willow, alpine meadowrue, Lapland rosebay and longstalk starwort) are calciphiles which typically prefer limestone substrates, were encountered frequently throughout the limestone barren habitat in the Shoal Cove Study Area and vicinity, and are considered well represented throughout the Northern Peninsula (S.J. Meades, pers. comm. 2011). Other species observed infrequently during the survey, including rose twisted-stalk, seaside sedge, least moonwort, starry false Solomon's seal, alpine groundsel and Gaspé arrowgrass, and are described below.

Maianthemum stellatum (L.) Link (starry false Solomon's seal) is a boreal North American species with a range that includes southeastern Labrador and most coastal regions of Newfoundland (Hultén 1968; Meades et al. 2000). Rouleau and Lamoureux (1992) map 57 populations of *M. stellatum* from Newfoundland, the majority of which were observed on the Northern Peninsula where their occurrence was characterized by large numbers of plants. Stemming from this study was the discovery of numerous plants at L'Anse au Diable and two plants at Point Amour, Labrador (Table 3.3).

Streptopus lanceolatus (Aiton) Reveal (rose twisted-stalk) is a boreal eastern North American species relatively common in forested habitats throughout western Newfoundland, with more than 40 locations documented in the Atlas of Vascular Plants (Rouleau and Lamoureux 1992). Scoggan (1978) records *Streptopus lanceolatus* as occurring north to southeast Labrador (51°20'); five plants were recorded during this Study at Forteau Point in tall tuckamoor (Table 3.3). While *S. lanceolatus* is common in Newfoundland, its occurrence in Labrador is restricted to a limited number of sites in the southeast coast.

Coptidium lapponicum (L.) Gand. (Lapland buttercup) was previously known from western and central Labrador (Flora North America vol. 3 (1997); Meades et al. 2000). Recently, several new collections of *C. lapponicum* were reported from Trans Labrador Highway surveys from central Labrador (JWEL/IELP 2004). A single historical report of *C. lapponicum* from Central Newfoundland was reported in Bouchard et al. (1991), but it has not been

relocated. The collection of *C. lapponicum* at Forteau Point greatly extends the known range of this species in Labrador.

Botrychium simplex E.Hitchc. (least moonwort) is a small fern previously reported from seven locations in Newfoundland (Bouchard et al. 1991; Rouleau and Lamoureux 1992). The two current occurrences of *B. simplex* from the Study Area (Shoal Cove and Dowden's Point) represent new range extensions within Newfoundland. Distribution maps in Flora North America (1993, vol. 2) and Cody and Britton (1989) show no Labrador populations of *B. simplex;* however, Farr (2006) includes central Labrador in its range. This is likely based on an extrapolation of information from adjacent ranges, rather than known data.

Carex maritima Gunnerus (seaside sedge) is small, circumpolar coastal sedge reported to occur in turfy limestone barrens and sandy terraces from the Northern Peninsula to northernmost Labrador (Scoggan 1978; Meades et al. 2000). Bouchard et al (1991) and Rouleau and Lamoureux (1992) provide maps showing the location of 12 records on the Northern Peninsula between St. Barbe and Burnt Cape, while Hultén (1968) provides a distribution map showing the Labrador range of *C. martima* extending along the entire length of the Labrador coast. More recently, element occurrences of *C. maritima* have been located at Yankee Point and Sandy Cove (Maunder 2001). Multiple fertile stems were found in the Study Area (Shoal Cove) during this field survey.

Packera pauciflora (Pursh) Á.Löve and D.Löve (alpine groundsel) is reported in Scoggan (1978) as occurring north to Komaktorvik Fjord, 59°17'N, the type location, while Hultén (1968) shows the Labrador range consisting of two disjunct locations, one in northernmost Labrador and the second in western Labrador. More recently, this species was reported from northern Labrador at Ramah Bay in 2005 (M. Burzynski in Maunder 2001) and Adlatok Bay in 2008 (Minaskuat 2009), as well as in southeastern Labrador (Meades et al. 2000) adjacent to limestone bedrock above L'Anse au Clair). It has also been reported from seven locations on Newfoundland's Northern Peninsula (Rouleau and Lamoureux 1992; Bouchard et al. 1991; Maunder 2001). Several plants were located at Shoal Cove (Table 3.3) during this Study.

Triglochin gaspensis Lieth and D.Löve (Gaspé arrowgrass) is a plant of tidal saltmarshes with known ranges that extend from northern Newfoundland south to Maine; it does not occur in Labrador (Meades et al. 2000, Brouillet et al. 2010). Rouleau and Lamoureux (1992) map 24 locations for *T. gaspensis* in Newfoundland, with the largest number of populations occurring south of Port-au-Choix.

4.0 SUMMARY

In total, 317 vascular plant species were observed and recorded during the field surveys. Of those, surveys confirmed the occurrence of two listed and 12 regionally uncommon plant species. *Braya fernaldii* and *Braya longii*, listed under Schedule 1 of the *SARA* and / or pursuant to the *NLESA,* were observed within the Study Area at Shoal Cove. Based on the results of the field surveys and a review of the literature, 12 species could be considered regionally uncommon within the Study Areas (*Streptopus lanceolatus, Botrychium simplex, Carex maritima*, *Potentilla crantzii, Maianthemum stellatum, Salix candida*, *Coptidium lappinicum*, *Thalictrum alpinum*, *Packera pauciflora*, *Rhododendron lapponicum*, *Stellaria longipes* and *Triglochin gaspensis*).

Within those areas surveyed, some locations are characterized by the presence of unique habitats. Shoal Cove, for instance, yielded a disproportionately higher number of listed and regionally uncommon species compared to other Study Areas (e.g., Dowden's Point). The habitat at Shoal Cove is underlain by calcareous substrates which form a habitat mosaic comprised largely of exposed mineral soils, rock outcrops, riparian shoreline, coastal beaches, and anthropogenic disturbance, all with varying potential to provide habitat for rare plants.

Potential suitable habitat for the federally-listed, endemic plant species Long's braya and Fernald's braya is restricted to limestone barrens of the Northern Peninsula. Suitable habitat was observed in the southeast corner of the Shoal Cove Study Area, and is known from a number of other locations throughout the region. While the majority of the Study Area has been disturbed by human activities, the locations of the *Braya* species were outside the proposed development area for the Project, in an area buffered from proposed Project activities by a band (approximately 100 m) of intact, coastal barrens.

The remaining regionally uncommon plant species and the frequencies with which they were encountered were low. The potential does exist for a species to occur at different sites with differing associated status ranks depending on the jurisdiction of its occurrence. For example, rosy twisted-stalk was observed at sites on either side of the SOBI. However, its status rank in Newfoundland (S4) differs from that of the status rank in Labrador where it is considered regionally uncommon (S1 / S2). This can be primarily attributed to the fact that Labrador has historically received little botanical attention. As a result, in some cases, rankings of Labrador species may be the product of a conservative ranking approach due the absence of knowledge of a plant species' distribution.

The abundance of some regionally uncommon plant species and a literature review of other Newfoundland and Labrador plant surveys suggest that the current S Ranks for several of those species identified within the Study Area may be conservative. That is, some species ranked as S2 and S1 / S2 by the ACCDC may not be regionally uncommon. For example, *Carex maritima* is classified as regionally uncommon primarily because it is restricted to specific habitats on calcareous substrates; however, this species is locally well represented within these habitats. Lack of adequate information on the distribution of some Labrador plant species also contributes to conservative scarcity rankings. As new information becomes available through additional botanical surveys for these species, their scarcity ranks will be adjusted accordingly by NLDEC.

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APPENDIX A

Rare Plant Survey Study Team

APPENDIX A

Sean Bennett, B.Sc., P.Biol., R.P.F., is a Professional Biologist (ASPB) and Professional Forester (CAPF) at Stantec's St. John's, NL office with over 14 years' experience in the area of environmental consulting. A technical professional with focus on the assessment and characterization of terrestrial ecosystems, Mr. Bennett has provided expertise and coordinated projects throughout Canada in accordance with applicable federal and provincial (NL, SK, AB, BC, YK, N.W.T., Nunavut) regulatory requirements. Proficient in botanical / vegetation inventories (including taxonomy and species identification) and soil classification (Canadian System of Soil Classification), with demonstrated experience in the application of ELC principles, he has conducted baseline environmental studies evaluating a variety of habitats to identify site-specific constraints (i.e., environmentally sensitive areas) and developing appropriate mitigative measures for proposed developments. Mr. Bennett served in the capacity of Report Author and Field Team Lead reviewer during the later stages of this Study.

Michael Crowell, M.Sc., is a terrestrial ecologist in Stantec's Dartmouth, N.S. office with over 27 years' experience in plant taxonomy, plant ecology, wetland ecology and wildlife ecology. In addition to involvement in previous studies for Nalcor, he has also conducted a number of other vascular plant and ecological land classification studies in Newfoundland and Labrador including work in the Lower Churchill Hydroelectric Generation Project, Voisey's Bay, Labrador City, the lower Churchill River, Goose Bay, the DND practice bombing range in southern Labrador and the Trans-Labrador Highway. Mr. Crowell served in the capacity of field researcher for the Rare Plant Survey.

Amber L. Frickleton, Ad. Dip GIS, B.A. Environmental Studies, is a GIS Technician with Stantec in St. John's, NL. She manages and maintains geographic and related attribute data for the creation of maps and datasets for internal staff and clients to support the implementation of environmental assessments. Her role includes map design and production, data manipulation and analysis and the maintenance of databases through editing and adding new features in accordance with standard formats and procedures. Ms. Frickleton's multifaceted educational experience includes relational database design and management, spatial and statistical analysis, quality assurance / quality control, data dissemination, data analysis and map creation and reporting.

Sue Meades, M.Sc., is a plant taxonomist and field botanist who has worked in Newfoundland and Labrador since 1978. She was an adjunct professor at Algoma University, northern Ontario, from 1997 to 2008 and has extensive knowledge of the botanical resources of Newfoundland and Labrador. She has participated in numerous field studies within the province and has authored many botanical reports, including the *Natural Regions of Newfoundland and Labrador* (Meades 1990), the *Annotated Checklist for Vascular Plants of Newfoundland and Labrador* (Meades et al. 2000), and subsequent updates to the Checklist of Vascular Plants of Newfoundland and Labrador. Ms. Meades served as Scientific Authority and field researcher for the Rare Plant Baseline Study for the Lower Churchill Hydroelectric Generation Project, acting in the same capacity for this Rare Plant Survey.

APPENDIX B

Explanation of Global, National and Provincial Species at Risk Ranking

APPENDIX B

Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and *Species at Risk Act* (*SARA*) Wildlife Species Status Categories

COSEWIC and *SARA* wildlife species status categories are described in Table 1.

Table 1. Committee on the Status of Endangered Wildlife in Canada and *Species at Risk Act* Species Status Category Descriptions

Rank*	Description*
Extinct	A wildlife species that no longer exists
Extirpated	A wildlife species that no longer exists in the wild in Canada, but exists elsewhere in the wild
Endangered	A wildlife species that is facing imminent extirpation or extinction in Canada
Threatened	A wildlife species that is likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction
Special Concern	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats

**COSEWIC 2010; SARA 2010. Excerpt from web site - http://www.speciesatrisk.gc.ca/legislation/default_e.cfm*

Wildlife Species – "a species, subspecies, variety or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years" (COSEWIC 2010).

NatureServe Conservation Status Ranks

The NatureServe Conservation Status Rank is used to rank rare plant species across North America. Rare species are those species that occur in only a few localities and / or are represented by relatively few individuals. The system is consistent with all conservation data centres across North America to facilitate tracking of rare plant occurrences and, where known, threat on global, national (federal) and subnational (provincial) levels. Conservation status ranks range from critically imperilled (N1) to demonstrably secure (N5). Status is assessed and documented at three distinct geographic scales: global (G); national (N); and subnational (S) (i.e., state / province / municipal) (Table 2.). These status assessments are based on the best available information and consider a variety of factors, such as species abundance, distribution, population trends and threats (NatureServe 2009).

Table 2. NatureServe National (N) and Subnational (S) Conservation Status Ranks

Status	Rank	Definition
NX SX	Extinct or Presumed Extirpated	Not located despite intensive searches and no expectation of rediscovery
NH SH	Possibly Extirpated	Possibly extinct or extirpated; known only from historical occurrences but still hope of rediscovery. There is evidence that the species or ecosystem may no longer be present in the jurisdiction, but not enough to state this with certainty
N1 S1	Critically Imperilled	At very high risk of extinction due to extreme rarity (often five or fewer populations), steep declines or other factors, making the species especially susceptible to extirpation or extinction
N2 S2	Imperilled	At high risk of extinction due to very restricted range, few populations (often 20 or fewer), steep declines, or other factors
N3 S3	Vulnerable	At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors
N4 S4	Apparently Secure	Uncommon but not rare, and usually widespread in the range. Some cause for long-term concern
N5 S5	Secure	Common or very common and widespread and abundant. Not susceptible to extirpation or extinction under current conditions
N#N# S#S#	Range Rank	A numeric range rank (e.g., S2 / S3 or S1 / S3) is used to indicate any range of uncertainty about the status of the species or ecosystem. Ranges cannot skip more than two ranks (e.g., SU is used rather than S1 / S4).
NU SU	Unrankable	Currently unrankable due to lack of information or due to substantially conflicting information about status or trends
NNR SNR	Unranked	National or subnational conservation status not yet assessed
N#? S#?	Inexact Numeric Rank	Denotes inexact numeric rank

Atlantic Canada Conservation Data Centre Rankings

The ACCDC status ranks for Labrador were used to identify regionally uncommon vascular plant species. Definitions of the ACCDC rankings are provided in Table 3.

Table 3. Definitions of the Atlantic Canada Conservation Data Centre S Rankings

Provincial Ranking	Frequency / Comments
S1	Extremely rare throughout its range in the province (typically five or fewer occurrences or very few remaining individuals). May be especially vulnerable to extirpation
S2	Rare throughout its range in the province (6 to 20 occurrences or few remaining individuals). May be vulnerable to extirpation due to rarity or other factors
S3	Uncommon throughout its range in the province, or found only in a restricted range, even if abundant in some locations (21 to 100 occurrences)
S4	Usually widespread, fairly common throughout its range in the province and apparently secure with many occurrences, but the species is of long-term concern (e.g., watch list) (100+ occurrences)
S5	Demonstrably widespread, abundant and secure throughout its range in the province, and essentially ineradicable under present conditions
S# / S#	Numeric range rank: A range between two consecutive numeric ranks. Denotes uncertainty about the exact rarity of the species (e.g., S1 / S2)
?	Inexact or uncertain: for numeric ranks, denotes inexactness (e.g., SE? denotes uncertainty of exotic status). (The? Qualifies the character immediately preceding it in the S Rank)
SU	Unrankable: Possibly in peril, but status is uncertain - more information is needed
SR	Reported but without persuasive documentation (e.g., misidentified specimen)
SE	Exotic / introduced species
Hybrid	Hybrid of two similar species

Source ACCDC 2010

For Labrador, the ACCDC currently uses both an official and draft ranking system. For many of the species identified in this survey, an official rank of S? has been assigned along with a different draft rank. An S? identifies a species that has not yet been thoroughly assessed for the jurisdiction. A regionally uncommon plant species is defined in this study as those assigned S Ranks of S1, S2, S2 / S3 or SU by the provincial NLDEC Wildlife Division and as recorded by the ACCDC. While S3 species are of concern from a provincial biodiversity perspective, they have not been included as their populations are considered less sensitive.

Wild Species: The General Status of Wild Species in Canada Rankings

The NLDEC Wildlife Division also makes use of a different ranking system known as *The General Status of Species in Canada*. *The General Status of Species in Canada* presents the results of general status assessments for a broad cross-section of Canadian species. Under this system each species assessed in the *Wild Species* reports received a general status rank in each province, territory, or ocean region in which they are known to be present, as well as an overall Canada General Status Rank (Canada rank). Definitions of the General Status rankings are provided in Table 4.

Table 4. ***Wild Species: The General Status of Wild Species in Canada***

Rank	General Status Category	Category Description
0.2	Extinct	Species that are extirpated worldwide (i.e., they no longer exist anywhere).
0.1	Extirpated	Species that are no longer present in a given geographic area, but occur in other areas.
1	At Risk	Species for which a formal, detailed risk assessment (COSEWIC status assessment or provincial or territorial equivalent) has been completed and that have been determined to be at risk of extirpation or extinction (i.e. Endangered or Threatened). A COSEWIC designation of Endangered or Threatened automatically results in a Canada General Status Rank (Canada rank) of At Risk. Where a provincial or territorial formal risk assessment finds a species to be Endangered or Threatened in that particular region, then, under the general status program, the species automatically receives a provincial or territorial general status rank of At Risk.
2	May Be At Risk	Species that may be at risk of extirpation or extinction and are therefore candidates for a detailed risk assessment by COSEWIC, or provincial or territorial equivalents.
3	Sensitive	Species that are not believed to be at risk of immediate extirpation or extinction but may require special attention or protection to prevent them from becoming at risk.
4	Secure	Species that are not believed to belong in the categories Extinct, Extirpated, At Risk, May Be At Risk, Sensitive, Accidental or Exotic. This category includes some species that show a trend of decline in numbers in Canada but remain relatively widespread or abundant.
5	Undetermined	Species for which insufficient data, information, or knowledge is available with which to reliably evaluate their general status.
6	Not Assessed	Species that are known or believed to be present regularly in the geographic area in Canada to which the rank applies, but have not yet been assessed by the general status program.
7	Exotic	Species that have been moved beyond their natural range as a result of human activity. In this report, Exotic species have been purposefully excluded from all other categories.
8	Accidental	Species occurring infrequently and unpredictably, outside their usual range.

Source '*Wild Species: The General Status of Wild Species in Canada' website http://www.wildspecies.ca/ranks.cfm?lang=e*

APPENDIX C

Newfoundland and Labrador Wildlife Division – Scientific Research Permit

Newfoundland
Labrador

GOVERNMENT OF
NEWFOUNDLAND AND LABRADOR

Department of
Environment and Conservation
Wildlife Division

A PERMIT TO CONDUCT RESEARCH ON SPECIMENS OF THREATENED AND ENDANGERDED SPECIES UNDER THE *ENDANGERED SPECIES ACT* OF NEWFOUNDLAND AND LABRADOR

Date: June 30, 2011

Endangered Species Permit Number: **2011/12 -22**

Issued To: Sean Bennett, Stantec Consulting Ltd. 607 Torbay Rd. St. John's , NL A1A 4Y6

Permit To: Complete plant surveys of rare and listed plant species including the threatened Fernald's Braya (*Braya fernaldii*) and endangered Long's Braya (*Braya longii*) as permitted under Section 18 (1) and 18 (2) of the *Endangered Species Act*.

Expiry Date: August 31, 2011

CONDITIONS:

1. Nominees also included under this permit:
   Colleen Leeder
   Michael Crowell
   Sue Meades
   Ellen Tracy
   Carolyn Pelley

2. The permit holder may designate other individuals to perform these actions on his behalf, with suitable supervision. The permit holder is responsible for the training of any designated individuals and must ensure designated individuals follow all regulations related to this permit.

3. Names and contact information for all individuals participating in research activities must be provided to the Wildlife Division prior to start of research.

4. The permit holder must consult with the Wildlife Division in preparing for and completing this project.

5. Any amendments to the methodology for this research must be provided to the Wildlife Division prior to research being conducted. Substantial changes to the methodology may result in the permit being revoked or conditions amended.

6. The permit holder must minimize disturbance to the area and must inform the Wildlife Division immediately if any plants are damaged during surveys. Limestone barrens habitat is susceptible to damage from surveyors and surveys must not occur if the ground is soft due to rain.

7. No voucher specimens may be collected within identified critical habitat for Long's Braya or Fernald's Braya. No voucher specimens of Long's Braya or Fernald's Braya may be collected anywhere as this is illegal under the *Endangered Species Act.*

8. The permit holder must provide a report of activities carried out under this permit to the Wildlife Division by September 30, 2011. This report must include specific methodology used and a copy of the data collected as a result of this research.

9. The permit holder must provide the Wildlife Division with copies of all reports generated as a result of this research.

10. Under the discretion of the Director of Wildlife, this permit can be cancelled without notice.

JOHN BLAKE
Director

APPENDIX D

Vacular Plant Species Checklist

APPENDIX D

Vascular Plant Species Observed Within Cable Landing and Shore Electrode Study Areas

Family	Scientific Name	Common Name	Status Ranking			Location Observed			
			N Rank	G Rank	S Rank	Shoal Cove	Forteau Point	L'Anse Au Diable	Dowden's Point
Pinaceae	*Abies balsamea*	balsam fir	N5	G4	S5	Y	Y	Y	N
Asteraceae	*Achillea millefolium subsp. lanulosa*	woolly yarrow	N5	G5	S3S4	Y	Y	Y	Y
Betulaceae	*Alnus viridis subsp. crispa*	mountian alder	N5	G5	S5	N	N	Y	Y
Rosaceae	*Amelanchier bartramiana*	Bartram's chuckleypear	NNR	G5	S3S5	N	Y	Y	N
Ericaceae	*Andromeda polifolia*	bog rosemary	NNR	G5	S5 / S4S5	Y	N	Y	N
Ericaceae	*Arctous alpina*	alpine bearberry	NNR	G5	S4S5 / S5	Y	Y	Y	N
Rosaceae	*Potentilla anserina*	silverweed	N5	G5	S5	Y	N	Y	N
Betulaceae	*Betula hybrid*	hybrid birch	N4	G4Q	S2S3	N	N	Y	N
Betulaceae	*Betula minor*	dwarf white birch	N4	G4Q	S4S5	N	N	Y	N
Betulaceae	*Betula cordifolia*	heartleaf birch	NNR	G5T5	S5	N	Y	Y	Y
Betulaceae	*Betula pumila*	bog birch	N5	G5	S5	N	Y	Y	N
Poaceae	*Calamagrostis canadensis*	Canada bluejoint	N5	G5	S5	Y	Y	Y	Y
Cyperaceae	*Carex aquatilis*	water sedge	N5	G5	S3S5	Y	N	Y	N
Cyperaceae	*Carex canescens*	hoary sedge	N5	G5	S3S5	N	Y	Y	Y
Cyperaceae	*Carex glareosa*	gravel sedge	NNR	G4G5	S3S5	N	N	Y	N
Cyperaceae	*Carex echinata subsp. echinata*	star sedge	NNR	G5T5	S3S5	N	N	N	Y
Cyperaceae	*Carex flava*	yellow sedge	N5	G5	S3S5	N	N	N	Y
Cyperaceae	*Carex maritima*	seaside sedge	NNR	G4G5	S2	Y	N	N	N
Cyperaceae	*Carex nigra*	smooth black sedge	N5	G5	S3S5	Y	Y	N	Y
Cyperaceae	*Carex limosa*	mud sedge	N5	G5	S5	N	N	Y	N

Family	Scientific Name	Common Name	Status Ranking			Location Observed			
			N Rank	G Rank	S Rank	Shoal Cove	Forteau Point	L'Anse Au Diable	Dowden's Point
Cyperaceae	*Carex paleacea*	chaffy sedge	NNR	G5	S2S4	N	N	Y	N
Cyperaceae	*Carex rariflora*	loose-flowered alpine sedge	N5	G5	S4S5	N	N	Y	N
Cyperaceae	*Carex scoparia*	pointed broom sedge	N5	G5	S3S5	N	N	N	Y
Cyperaceae	*Carex stipata var. stipata*	awlfruit sedge	N5	G5T5	S3S5	N	N	N	Y
Cyperaceae	*Carex trisperma*	three-seed sedge	N5	G5	S4S5	N	N	Y	N
Cyperaceae	*Eriophorum russeolum*	russet cottongrass	N5	G5	S3S5	N	N	Y	N
Cyperaceae	*Eriophorum vaginatum subsp. spissum*	hare's-tail	NNR	G5	S5	N	N	Y	N
Cyperaceae	*Eleocharis acicularis*	needle spikerush	N5	G5	S3S5	N	N	N	Y
Cyperaceae	*Eleocharis sp.*	spikerush				N	N	N	Y
Cyperaceae	*Scirpus atrocinctus*	black-girdled bulrush	N5	G5	S3S5	N	N	N	Y
Cyperaceae	*Trichophorum alpinum*	alpine clubrush	N5	G5	S3S5	N	N	N	Y
Cyperaceae	*Trichophorum cespitosum*	deergrass				Y	N	N	N
Ericaceae	*Chamaedaphne calyculata*	leatherleaf	N5	G5	S5	N	N	Y	Y
Onagraceae	*Circaea alpine*	small enchanter's nightshade	NNR	G5	S4S5	N	N	Y	N
Brassicaceae	*Cochlearia tridactylites*	limestone scurvygrass	N3N5	G3G5	S4	N	Y	Y	N
Rosaceae	*Comarum palustre*	marsh cinquefoil	NNR	G5	S3S5	N	N	Y	N
Apiaceae	*Conioselinum chinense*	hemlock parsley	N4	G5	S4S5 / S3S4	Y	Y	Y	N
Orchidaceae	*Corallorhiza trifida*	early coralroot	N5	G5	S3S4 / S3S5	Y	N	Y	N
Cornaceae	*Cornus canadensis*	bunchberry	N5	G5	S5	Y	Y	Y	N
Cornaceae	*Cornus suecica*	Swedish bunchberry	N3N5	G5	S4 / S4S5	Y	Y	Y	N
Cornaceae	*Cornus stolonifera*	red-osier dogwood	NNR	G5	S5	Y	Y	N	N
Woodsiaceae	*Cystopteris fragilis*	fragile fern	N5	G5	S3S4	N	Y	Y	N
Poaceae	*Deschampsia flexuosa*	wavy hairgrass	N5	G5	S4S5	N	Y	Y	Y
Diapensiaceae	*Diapensia lapponica*	Lapland diapensia	NNR	G5	S4S5	N	N	Y	N

Family	Scientific Name	Common Name	Status Ranking			Location Observed			
			N Rank	G Rank	S Rank	Shoal Cove	Forteau Point	L'Anse Au Diable	Dowden's Point
Droseraceae	*Drosera rotundifolia*	roundleaf sundew	N5	G5	S5	N	N	Y	Y
Dryopteridaceae	*Dryopteris campyloptera*	mountain woodfern	NNR	G5	S5 / S4	Y	Y	Y	N
Dryopteridaceae	*Dryopteris carthusiana*	spinulose woodfern	NNR	G5	S4	N	Y	Y	N
Ericaceae	*Empetrum nigrum*	black crowberry	NNR	G5	S5	Y	Y	Y	Y
Onagraceae	*Chamerion angustifolium*	fireweed	N5	G5T5	S5	N	N	Y	N
Onagraceae	*Epilobium ciliatum*	northern willowherb	N5	G5T5	S5	N	Y	Y	Y
Equisetaceae	*Equisetum arvense*	field horsetail	N5	G5	S5	Y	Y	Y	Y
Equisetaceae	*Equisetum sylvaticum*	woodland horsetail	N5	G5	S5	N	N	Y	N
Eriocaulaceae	*Eriocaulon aquaticum*	seven-angled pipewort	N5	G5	SU	N	N	Y	N
Poaceae	*Festuca rubra*	red fescue	N5	G5	S5/S4S5	Y	Y	Y	Y
Ericaceae	*Gaultheria hispidula*	creeping snowberry	NNR	G5	S5	N	Y	Y	N
Santalaceae	*Geocaulon lividum*	northern comandra	NNR	G5	S5	Y	Y	Y	N
Rosaceae	*Geum macrophyllum*	largeleaf avens	N5	G5	S3S4	N	Y	Y	N
Rosaceae	*Geum rivale*	water avens	NNR	G5	S4S / S3S4	Y	N	Y	N
Dryopteridaceae	*Gymnocarpium dryopteris*	common oak fern	N5	G5	S5	Y	Y	Y	N
Plantaginaceae	*Hippuris vulgaris*	common mare's-tail	N5	G5	S4S5	N	N	Y	N
Caryophyllaceae	*Honckenya peploides*	seabeach sandwort	NNR	G5	S5	N	N	Y	N
Lycopodiaceae	*Huperzia selago*	northern firmoss	N5	G5	SNR	N	N	Y	N
Iridaceae	*Iris hookeri*	Hooker's iris	N5	G5	S5 / S4	Y	Y	Y	N
Iridaceae	*Iris versicolor*	Blueflag	N5	G5	S5/S3S4	N	N	Y	Y
Cupressaceae	*Juniperus communis*	ground juniper	N5	G5	S4S5	Y	Y	Y	Y
Ericaceae	*Kalmia polifolia*	bog laurel	NNR	G5	S5	N	Y	Y	N
Pinaceae	*Larix laricina*	Tamarack	N5	G5	S5	N	N	Y	Y
Fabaceae	*Lathyrus japonicus*	beach pea	NNR	G5	S5	Y	N	Y	N
Poaceae	*Leymus mollis* subsp. *mollis*	sea lymegrass	NNR	G5T5	S3S5 / S4S5	Y	Y	Y	N
Apiaceae	*Ligusticum scoticum*	Scottish lovage	NNR	G5	S5	Y	Y	Y	N
Caprifoliaceae,	*Linnaea borealis*	twinflower	NNR	G5	S5	Y	Y	Y	N

Family	Scientific Name	Common Name	Status Ranking			Location Observed			
			N Rank	G Rank	S Rank	Shoal Cove	Forteau Point	L'Anse Au Diable	Dowden's Point
Orchidaceae	*Listera cordata var. cordata*	heartleaf twayblade	N5	G5T5	S3S5	N	Y	Y	N
Juncaceae	*Luzula parviflora*	smallflower woodrush	N5	G5	S3S4 / S4S5	Y	Y	Y	N
Juncaceae	*Juncus filiformis*	thread rush	NNR	G5	S5 / S4S5	Y	N	Y	N
Lycopodiaceae	*Lycopodium annotinum*	stiff clubmoss	N5	G5	S5	N	Y	Y	N
Lycopodiaceae	*Diphasiastrum complanatum*	northern ground-cedar	N5	G5	S5	N	N	Y	N
Asparagaceae	*Maianthemum canadense*	wild lily-of-the-valley	N5	G5	S5	N	Y	Y	N
Asparagaceae	*Maianthemum stellatum*	starry false Solomon's seal	N5	G5	S5 / S2S3	Y	N	Y	N
Asparagaceae	*Maianthemum trifolium*	threeleaf false Solomon's seal	N5	G5	S5	N	N	Y	N
Boraginaceae	*Mertensia maritima*	oysterleaf	N5	G5	S5	Y	N	Y	N
Myricaceae	*Myrica gale*	sweetgale	NNR	G5	S5	Y	N	Y	Y
Thelypteridaceae	*Phegopteris connectilis*	northern beech fern	NNR	G5	S5	Y	Y	Y	N
Pinaceae	*Picea glauca*	white spruce	N5	G5	S5	Y	Y	Y	Y
Pinaceae	*Picea mariana*	black spruce	N5	G5	S5	N	N	Y	N
Plantaginaceae	*Plantago maritima subsp. juncoides*	saltmarsh plantain	NNR	G5	S5 / S4S5	Y	Y	Y	Y
Poaceae	*Poa glauca* subsp. *glauca*	glaucous bluegrass	N5	G5T5	S3S5 / S3S4	Y	Y	Y	N
Poaceae	*Poa palustris*	fowl bluegrass	N5	G5	SNA	N	N	Y	Y
Polygonaceae	*Bistorta vivipara*	alpine bistort	NNR	G5	S5	Y	Y	Y	N
Poaceae	*Puccinellia* sp.	alkali grass				N	N	Y	N
Ranunculaceae	*Halerpestes cymbalaria*	seaside crowfoot	NNR	G5	S3S4	N	N	Y	N
Crassulaceae	*Rhodiola rosea*	roseroot	NNR	G5	S4S5	Y	Y	Y	N
Ericaceae	*Rhododendron groenlandicum*	common Labrador tea	N5	G5	S5	Y	Y	Y	N
Grossulariaceae	*Ribes glandulosum*	skunk currant	N5	G5	S5	N	Y	Y	N

Family	Scientific Name	Common Name	Status Ranking			Location Observed			
			N Rank	G Rank	S Rank	Shoal Cove	Forteau Point	L'Anse Au Diable	Dowden's Point
Rosaceae	*Rubus arcticus subsp. acaulis*	plumboy	N5	G5	S3 / S3S5	Y	Y	Y	N
Rosaceae	*Rubus chamaemorus*	bakeapple	NNR	G5	S5	N	Y	Y	N
Rosaceae	*Rubus idaeus*	wild red raspberry	N5	G5	S5 / S4S5	N	Y	Y	Y
Rosaceae	*Rubus pubescens*	dewberry	NNR	G5	S5 / S4S5	Y	Y	Y	N
Polygonaceae	*Rumex acetosa*	garden sorrel	N4N5	G5	SNA	N	N	Y	N
Polygonaceae	*Rumex* sp.	dock				N	N	Y	N
Salicaceae	*Salix candida*	hoary willow	NNR	G5	S4 / S2S3	Y	Y	Y	N
Salicaceae	*Salix glauca var. cordifolia*	beautiful willow	NNR	G5	S4 / S5	Y	Y	Y	N
Salicaceae	*Salix planifolia*	tealeaf willow	NNR	G5	S5	N	N	Y	N
Asteraceae	*Senecio pseudoarnica*	seaside ragwort	NNR	G5	S3S4 / S3S5	Y	Y	Y	N
Rosaceae	*Sibbaldia tridentata*	threetooth cinquefoil	NNR	G5	S3S5	Y	Y	Y	Y
Asteraceae	*Solidago macrophylla*	largeleaf goldenrod	NNR	G5	S5	Y	Y	Y	N
Rosaceae	*Sorbus decora*	showy mountain-ash	NNR	G4G5	S3S5	N	N	Y	Y
Typhaceae	*Sparganium angustifolium*	narrowleaf burreed	NNR	G5	S5 / S3S5	Y	N	Y	N
Caryophyllaceae	*Stellaria borealis*	boreal starwort	NNR	G5	S4S5	N	N	Y	N
Caryophyllaceae	*Stellaria humifusa*	saltmarsh starwort	NNR	G5?	S4S5	N	N	Y	N
Caryophyllaceae	*Stellaria longipes*	longstalk starwort	NNR	G5	S2S3 / S4S5	Y	Y	Y	N
Liliaceae	*Streptopus amplexifolius*	claspingleaf twisted-stalk	NNR	G5	S5	Y	Y	Y	N
Asteraceae	*Symphyotrichum novi-belgii*	New York aster	N3N5	G5T5	S4S5	Y	N	Y	Y
Asteraceae	*Symphyotrichum puniceum*	purplestem aster	N5	G5	S5 / S4	Y	N	Y	N
Primulaceae	*Trientalis borealis*	northern starflower	N5	G5T5	S5	N	Y	Y	N
Ericaceae	*Vaccinium angustifolium*	lowbush blueberry	N5	G5	S5	N	Y	Y	Y

Family	Scientific Name	Common Name	Status Ranking			Location Observed			
			N Rank	G Rank	S Rank	Shoal Cove	Forteau Point	L'Anse Au Diable	Dowden's Point
Ericaceae	*Vaccinium uliginosum*	alpine bilberry	NNR	G5	S5	Y	Y	Y	N
Ericaceae	*Vaccinium vitis-idaea*	partridgeberry	NNR	G5T5	S5	Y	Y	Y	Y
Violaceae	*Viola macloskeyi*	small white violet	NNR	G5	S5	N	Y	Y	N
Aceraceae	*Acer platanoides*	Norway maple	NNR	GNR	SNA	N	N	N	Y
Aceraceae	*Acer rubrum*	red maple	N5	G5T5	S5	N	N	N	Y
Poaceae	*Agrostis capillaris*	colonial bentgrass	NNA	GNR	SNA	N	N	N	Y
Poaceae	*Agrostis stolonifera*	creeping bentgrass	N5	G5	S3S5	Y	N	N	Y
Asteraceae	*Anaphalis margaritacea*	pearly everlasting	N5	G5	S5	N	N	N	Y
Poaceae	*Anthoxanthum odoratum*	sweet vernal grass	NNR	GNRTNR	SNA	N	N	N	Y
Araliaceae	*Aralia hispida*	bristly sarsaparilla	N5	G5	S4S5	N	N	N	Y
Betulaceae	*Betula papyrifera*	white birch	N5	G5	S5	N	N	N	Y
Ophioglossaceae	*Botrychium simplex*	least moonwort	NNR	G5	S2	N	N	N	Y
Plantaginaceae	*Callitriche* sp.	water-starwort		G5		N	N	N	Y
Asteraceae	*Centaurea nigra*	black knapweed	NNA	GNR	SNA	N	N	N	Y
Caryophyllaceae	*Cerastium fontanum subsp. vulgare*	common mouse-ear chickweed	NNA	GNR	SNR	N	N	N	Y
Asteraceae	*Cirsium arvense*	Canada thistle	NNA	GNR	SNA	N	N	N	Y
Asteraceae	*Cirsium vulgare*	bull thistle	NNA	GNR	SNA	N	N	N	Y
Poaceae	*Dactylis glomerata*	orchard grass	NNA	GNRTNR	SNA	N	N	N	Y
Poaceae	*Danthonia spicata*	poverty oatgrass	N5	G5	S3S5	N	N	N	Y
Caryophyllaceae	*Dianthus deltoides*	maiden pink		GNR	SNA	N	N	N	Y
Poaceae	*Elymus repens*	quackgrass	NNA	GNR	SNA	N	N	N	Y
Equisetaceae	*Equisetum fluviatile*	water horsetail	N5	G5	S4	N	N	N	Y
Asteraceae	*Euthamia graminifolia*	grassleaf goldenrod	N5	G5	S5	N	N	N	Y
Poaceae	*Festuca filiformis*	hair fescue	NNA	G5	SNA	N	N	N	Y
Rosaceae	*Fragaria virginiana*	wild strawberry	NNR	G5	S4S5 / S3S5	Y	Y	N	Y

Family	Scientific Name	Common Name	Status Ranking			Location Observed			
			N Rank	G Rank	S Rank	Shoal Cove	Forteau Point	L'Anse Au Diable	Dowden's Point
Rubiaceae	*Galium palustre*	marsh bedstraw	NNR	G5	SNR	N	N	N	Y
Poaceae	*Glyceria fluitans*	water mannagrass	NNA	GNR	SNR	N	N	N	Y
Asteraceae	*Hieracium vulgatum*	common hawkweed	NNA	GNR	SNA	N	N	N	Y
Asteraceae	*Pilosella officinarum*	mouse-ear hawkweed	NNA	GNR	SNA	N	N	N	Y
Asteraceae	*Pilosella x floribunda*	pale hawkweed	NNA	GNA	SNA	N	N	N	Y
Hypericaceae	*Hypericum perforatum*	common St. Johnswort	NNA	GNR	SNA	N	N	N	Y
Juncaceae	*Juncus arcticus*	arctic rush	NNR	G5	S5	N	N	N	Y
Juncaceae	*Juncus brevicaudatus*	shortailed rush	N5	G5	S3S5	N	N	N	Y
Juncaceae	*Juncus bulbosus*	bulbous rush	N1	G5?	SNA	N	N	N	Y
Juncaceae	*Juncus canadensis*	Canada rush	N5	G5	S4	N	N	N	Y
Juncaceae	*Juncus effuses*	soft rush	N5	G5	S5	N	N	N	Y
Juncaceae	*Juncus tenuis*	path rush	N5	G5	S3S4	N	N	N	Y
Juncaceae	*Luzula multiflora*	common woodrush	N5	G5	S5	N	N	N	Y
Ericaceae	*Kalmia angustifolia*	sheep laurel	NNR	G5	S5	N	N	N	Y
Brassicaceae	*Lepidium campestre*	field peppergrass	NNA	GNR	SNA	N	N	N	Y
Asteraceae	*Leucanthemum vulgare*	oxeye daisy	NNA	GNR	SNA	N	N	N	Y
Plantaginaceae	*Linaria repens*	striped toadflax	NNA	GNR	SNA	N	N	N	Y
Plantaginaceae	*Linaria vulgaris*	butter-and-eggs	NNA	GNR	SNA	N	N	N	Y
Campanulaceae	*Lobelia dortmanna*	water lobelia	NNR	G4G5	S5	N	N	N	Y
Fabaceae	*Lupinus polyphyllus*	largeleaf lupine	N4	G5	SNA	N	N	N	Y
Primulaceae	*Lysimachia terrestris*	swamp candles	N5	G5	S5	N	N	N	Y
Lythraceae	*Lythrum salicaria*	purple loosestrife	NNA	G5	SNA	N	N	N	Y
Poaceae	*Muhlenbergia uniflora*	bog muhly	NNR	G5	S3S5	N	N	N	Y
Boraginaceae	*Myosotis laxa*	small forget-me-not	N5	G5	SNA	N	N	N	Y
Onagraceae	*Oenothera biennis*	common evening primrose	N5	G5	S5	N	N	N	Y
Onocleaceae	*Onoclea sensibilis*	sensitive fern	N5	G5	S4	N	N	N	Y
Osmundaceae	*Osmunda regalis var.*	royal fern	N5	G5T5	S4	N	N	N	Y

Family	Scientific Name	Common Name	Status Ranking			Location Observed			
			N Rank	G Rank	S Rank	Shoal Cove	Forteau Point	L'Anse Au Diable	Dowden's Point
	spectabilis								
Rosaceae	*Dasiphora fruticosa*	shrubby cinquefoil	NNR	G5	S3S5	N	N	N	Y
Poaceae	*Phleum pretense*	common timothy	NNA	GNR	SNA	N	N	N	Y
Plantaginaceae	*Plantago major*	common plantain	NNA	G5	SNA	N	N	N	Y
Orchidaceae	*Platanthera clavellata*	clubspur orchid	NNR	G5	S5	N	N	N	Y
Poaceae	*Poa compressa*	Canada bluegrass	NNR	GNR	SNA	N	N	N	Y
Poaceae	*Poa pratensis* subsp. *pratensis*	Kentucky bluegrass	N5	G5T5	SNA	N	N	N	Y
Orchidaceae	*Pogonia ophioglossoides*	rose pogonia	NNR	G5	S4	N	N	N	Y
Polygonaceae	*Fallopia convolvulus*	black bindweed				N	N	N	Y
Salicaceae	*Populus alba*	white poplar	NNA	G5	SNA	N	N	N	Y
Potamogetonaceae	*Potamogeton epihydrus*	ribbon-leaf pondweed	NNR	G5	S4S5	N	N	N	Y
Potamogetonaceae	*Stuckenia filiformis*	thread-leaf pondweed	N5	G5T5	S1?	N	N	N	Y
Potamogetonaceae	*Potamogeton natans*	floating-leaf pondweed	N5	G5	S4	N	N	N	Y
Rosaceae	*Prunus pensylvanica*	pin cherry	NNR	G5	S4S5	N	N	N	Y
Rosaceae	*Prunus virginiana*	chokecherry	N5	G5T5	S4	N	N	N	Y
Dennstaedtiaceae	*Pteridium aquilinum var. latiusculum*	bracken fern	N5	G5T5	S4S5	N	N	N	Y
Ranunculaceae	*Ranunculus acris*	common buttercup	NNR	G5	SNA	N	N	N	Y
Ranunculaceae	*Ranunculus repens*	creeping buttercup	NNA	GNR	SNA	N	N	N	Y
Oroganchaceae	*Rhinanthus minor*	little yellow rattle	N5	G5	S3	N	N	N	Y
Grossulariaceae	*Ribes hirtellum*	swamp gooseberry	NNR	G5	S3S4	N	N	N	Y
Rosaceae	*Rosa virginiana*	Virginia rose	NNR	G5	S3S5	N	N	N	Y
Polygonaceae	*Rumex acetosella*	sheep sorrel	NNA	GNR	SNA	N	N	N	Y
Polygonaceae	*Rumex longifolius*	longleaf dock	NNA	GNR	SNA	N	N	N	Y
Polygonaceae	*Rumex obtusifolius*	bitter dock	NNA	GNR	SNA	N	N	N	Y
Caryophyllaceae	*Sagina procumbens*	procumbent pearlwort	NNR	G5	S4S5	N	N	N	Y
Salicaceae	*Salix discolor*	pussy willow	NNR	G5	S5	N	N	N	Y
Salicaceae	*Salix humilis*	upland willow	NNR	G5	S5	N	N	N	Y

Family	Scientific Name	Common Name	Status Ranking			Location Observed			
			N Rank	G Rank	S Rank	Shoal Cove	Forteau Point	L'Anse Au Diable	Dowden's Point
Salicaceae	*Salix pyrifolia*	balsam willow	NNR	G5	S3S4	N	N	N	Y
Salicaceae	*Salix viminalis*	basket willow	NNA	GNR	SNA	N	N	N	Y
Asteraceae	*Senecio viscosus*	sticky ragwort	NNA	GNR	SNA	N	N	N	Y
Caryophyllaceae	*Silene vulgaris*	bladder campion	NNA	GNR	SNA	N	N	N	Y
Brassicaceae	*Sisymbrium altissimum*	tall tumble mustard	NNA	GNR	SNA	N	N	N	Y
Iridaceae	*Sisyrinchium montanum*	strict blue-eyed grass	N5	G5	S5	N	N	N	Y
Asteraceae	*Solidago rugosa*	roughleaf goldenrod	N5	G5	S5	N	N	N	Y
Caryophyllaceae	*Spergularia rubra*	red sand-spurrey	NNA	G5	SNA	N	N	N	Y
Rosaceae	*Spiraea alba*	white meadowsweet	N5	G5	S3S5	N	N	N	Y
Asteraceae	*Taraxacum officinale*	common dandelion	N5	G5	SNA	N	N	N	Y
Fabaceae	*Trifolium pratense*	red clover	NNA	GNR	SNA	N	N	N	Y
Fabaceae	*Trifolium repens*	white clover	NNA	GNR	SNA	N	N	N	Y
Typhaceae	*Typha latifolia*	broadleaf cattail	N5	G5	SNA	N	N	N	Y
Ericaceae	*Vaccinium macrocarpon*	large cranberry	N4?	G4	S5	N	N	N	Y
Ericaceae	*Vaccinium oxycoccos*	small cranberry	N5	G5	S5	N	N	N	Y
Scrophulariaceae	*Veronica officinalis*	common speedwell	NNR	G5	SNA	N	N	N	Y
Adoxaceae	*Viburnum cassinoides*	northern wild raisin	NNR	G5	S5	N	N	N	Y
Fabaceae	*Vicia cracca*	tufted vetch	NNA	GNR	SNA	N	N	N	Y
Rosaceae	*Alchemilla filicaulis subsp. Vestita*	lesser lady's mantle	N3?	G4	S2S4	N	Y	N	N
Brassicaceae	*Arabis alpina*	alpine rockcress	NNR	G5	S3	N	N	N	Y
Caryophyllaceae	*Cerastium alpinum*	alpine chickweed	NNR	G5?	S4S5	N	Y	N	N
Asteraceae	*Packera pauciflora*	alpine groundsel	NNR	G4G5	S2S3 / S4	Y	Y	N	N
Salicaceae	*Salix arctica*	arctic willow	NNR	G5	S3S4	N	Y	N	N
Ranunculaceae	*Actaea rubra*	red baneberry	NNR	G5	S5 / S3S4	Y	Y	N	N
Dryopteridaceae	*Athyrium filix-femina var. angustum*	northern lady fern	N5	G5T5	S4S5	N	Y	N	N

Family	Scientific Name	Common Name	Status Ranking			Location Observed			
			N Rank	G Rank	S Rank	Shoal Cove	Forteau Point	L'Anse Au Diable	Dowden's Point
Betulaceae	*Betula glandulosa*	glandular birch	N5	G5	S3 / S5	Y	Y	N	N
Campanulaceae	*Campanula gieseckeana*	Giesecke's bellflower	N5	G5	S5	N	Y	N	N
Cyperaceae	*Carex capillaris*	hairlike sedge	N5	G5	S3S5	N	Y	N	N
Cyperaceae	*Carex vaginata*	sheathed sedge	N5	G5	S3S5	Y	Y	N	N
Onagraceae	*Chamerion angustifolium*	fireweed	NNR	G5	S5	Y	Y	N	N
Liliaceae	*Clintonia borealis*	yellow clintonia	N5	G5	S5	N	Y	N	N
Brassicaceae	*Draba incana*	hoary whitlowgrass	NNR	G5	S3S4/ SNR	Y	Y	N	N
Cupressaceae	*Juniperus horizontalis*	creeping juniper	N5	G5	S5	Y	Y	N	N
Caprifoliaceae	*Lonicera villosa*	mountain fly-honeysuckle	NNR	G5	S5	Y	Y	N	N
Juncaceae	*Luzula spicata*	spiked woodrush	NNR	G5	S4S5	N	Y	N	N
Saxifragaceae	*Mitella nuda*	naked mitrewort	NNR	G5	S5/S3S4	Y	Y	N	N
Asteraceae	*Petasites frigidus var. palmatus*	palmate coltsfoot	N5	G5	S4S5	N	Y	N	N
Lentibulariaceae	*Pinguicula vulgaris*	common butterwort	NNR	G5	S5 / S4	Y	Y	N	N
Orchidaceae	*Platanthera obtusata*	bluntleaf orchid	N5	G5	S3S4	N	Y	N	N
Primulaceae	*Primula laurentiana*	Laurentian primrose	NNR	G5	S5 / S3S4	Y	Y	N	N
Ranunculaceae	*Coptidum lapponicum*	Lapland buttercup	NNR	G5	S2S3	N	Y	N	N
Grossulariaceae	*Ribes lacustre*	bristly black currant	NNR	G5	S3S4	N	Y	N	N
Salicaceae	*Salix vestita*	hairy willow	NNR	G5	S4/S3S4	Y	Y	N	N
Liliaceae	*Streptopus lanceolatus*	rose twisted-stalk	N5	G5	S4/S1S2	Y	Y	N	N
Asteraceae	*Taraxacum phymatocarpum*	dandelion	NNR	G5	S3	N	Y	N	N
Ranunculaceae	*Thalictrum alpinum*	alpine meadowrue	NNR	G5	S5/S2S3	Y	Y	N	N
Adoxaceae	*Viburnum edule*	squashberry	NNR	G5	S5	Y	Y	N	N
Violaceae	*Viola labradorica*	Labrador violet	NNR	G5	S4S5	N	Y	N	N
Cyperaceae	*Eriophorum scheuchzeri*	Scheuchzer's cottongrass	NNR	G5	S1	Y	N	N	N
Apiaceae	*Heracleum maximum*	cow parsnip	N5	G5	S5	Y	N	N	N
Juncaceae	*Juncus triglumis var.*	northern white rush	NNR	G5	S3	Y	N	N	N

Family	Scientific Name	Common Name	Status Ranking			Location Observed			
			N Rank	G Rank	S Rank	Shoal Cove	Forteau Point	L'Anse Au Diable	Dowden's Point
	albescens								
Orchidaceae	*Platanthera aquilonis*	tall northern green orchid	N5	G5	S4	Y	N	N	N
Poaceae	*Poa alpine*	alpine bluegrass	NNR	G5	S3S5	Y	N	N	N
Ericaceae	*Pyrola minor*	lesser pyrola	NNR	G5	S3S4	Y	N	N	N
Ranunculaceae	*Anemone parviflora*	small-flower anemone	NNR	G5	S5	Y	N	N	N
Ericaceae	*Arctostaphylos uva-ursi*	common bearberry	NNR	G5	S4	Y	N	N	N
Plumbaginaceae	*Armeria maritima subsp. sibirica*	sea thrift	NNR	G5	S3S4	Y	N	N	N
Ophioglossaceae	*Botrychium lunaria*	common moonwort	NNR	G5	S4	Y	N	N	N
Brassicaceae	*Braya fernaldii*	Fernald's braya	N2	G2	S1	Y	N	N	N
Brassicaceae	*Braya longii*	Long's braya	N1	G1	S1	Y	N	N	N
Ranunculaceae	*Caltha palustris*	marsh marigold	N5	G5	S4S5	Y	N	N	N
Cyperaceae	*Carex scirpoidea*	singlespike sedge	N5	G5	S3S5	Y	Y	N	N
Onagraceae	*Chamerion latifolium*	river beauty	NNR	G5	S4	Y	N	N	N
Apiaceae	*Daucus carota*	wild carrot	NNA	GNR	SNA	Y	N	N	N
Rosaceae	*Dryas integrifolia*	entire-leaf mountain avens	NNR	G5	S3S5	Y	N	N	N
Equisetaceae	*Equisetum scirpoides*	dwarf Scouring Rush	N5	G5	S3S4	Y	N	N	N
Equisetaceae	*Equisetum variegatum* subsp. *variegatum*	variegated scouring-rush	N5	G5T5	S3	Y	N	N	N
Asteraceae	*Erigeron hyssopifolius*	hyssopleaf fleabane	N5	G5	S3S4	Y	N	N	N
Juncaceae	*Juncus* sp.	rush	N5	G5	S3S4	Y	N	N	N
Asteraceae	*Leontodon autumnalis*	autumn hawkbit	NNA	GNR	SNA	Y	N	N	N
Fabaceae	*Oxytropis campestris var. minor*	Newfoundland oxytrope	NNR	G5TNR	S3	Y	N	N	N
Rosaceae	*Potentilla crantzii*	Crantz's cinquefoil	NNR	G3G5	S2	Y	N	N	N
Primulaceae	*Primula egaliksensis*	Greenland primrose	NNR	G4	S3	Y	N	N	N
Ericaceae	*Pyrola asarifolia*	pink pyrola	NNR	G5	S4	Y	N	N	N
Rhamnaceae	*Rhamnus alnifolia*	alderleaf buckthorn	NNR	G5	S5	Y	N	N	N
Ericaceae	*Rhododendron lapponicum*	Lapland rosebay	NNR	G5	S2S3	Y	N	N	N
Polygonaceae	*Rumex crispus*	curly dock	NNA	GNR	SNA	Y	N	N	N

Family	Scientific Name	Common Name	Status Ranking			Location Observed			
			N Rank	G Rank	S Rank	Shoal Cove	Forteau Point	L'Anse Au Diable	Dowden's Point
Salicaceae	*Salix arctophila*	northern willow	NNR	G5	S3	Y	N	N	N
Salicaceae	*Salix reticulata*	netvein willow	NNR	G5	S3	Y	N	N	N
Rosaceae	*Sanguisorba canadensis*	bottlebrush, Canada burnet	NNR	G5	S3S5	Y	N	N	N
Saxifragaceae	*Saxifraga aizoides*	yellow mountain saxifrage	NNR	G5	S4	Y	N	N	N
Saxifragaceae	*Saxifraga oppositifolia*	purple mountain saxifrage	NNR	G4G5	S3S4	Y	N	N	N
Selaginellaceae	*Selaginella selaginoides*	low spikemoss	NNR	G5	S4S5	Y	N	N	N
Elaeagnaceae	*Shepherdia canadensis*	soapberry	NNR	G5	S4	Y	N	N	N
Caryophyllaceae	*Silene acaulis*	moss campion	NNR	G5	S3S4	Y	N	N	N
Asteraceae	*Solidago multiradiata*	northern goldenrod	N5	G5	S3S4	Y	N	N	N
Asteraceae	*Solidago uliginosa*	bog goldenrod	N5	G4G5	S5	Y	N	N	N
Asteraceae	*Sonchus* sp.	sow thistle				Y	N	N	N
Caryophyllaceae	*Stellaria media*	common chickweed	NNA	GNR	SNA	Y	N	N	N
Liliaceae	*Tofieldia pusilla*	small tofieldia	N5	G5	S4	Y	N	N	N
Juncaginaceae	*Triglochin gaspensis*	Gaspé arrowgrass	N3	G3G4	S2S3	Y	N	N	N
Urticaceae	*Urtica dioica*	stinging nettle	NNR	G5	S3S5	Y	N	N	N
Violaceae	*Viola nephrophylla*	northern bog violet	NNR	G5	S3	Y	N	N	N
Saxifragaceae	*Saxifraga cespitosa*	tufted saxifrage	NNR	G5	S3	Y	N	N	N
Fabaceae	*Hedysarum alpinum*	alpine sweetvetch	NNR	G5	S3	Y	N	N	N
Plumbaginaceae	*Armeria maritima* subsp. *sibirica*	sea thrift	NNR	G5T5	S3S4	Y	N	N	N
Onagraceae	*Epilobium anagallidifolium*	alpine willowherb	NNR	G5	S3S4	N	Y	N	N
Rosaceae	*Sorbus americana*	American mountain-ash	NNR	G5	S3S5	Y	N	Y	Y
Cyperaceae	*Carex norvegica*	Norway sedge	NNR	G5	S3S5	N	N	Y	N
Asteraceae	*Hieracium umbellatum*	umbellate hawkweed	N5	G5	S4	N	N	N	Y
Ericaceae	*Vaccinium boreale*	northern blueberry	N4	G4	S4S5	N	Y	N	N
Araliaceae	*Aralia nudicaulis*	wild sarsaparilla	N5	G5	S5	Y	N	N	N
Ranunculaceae	*Coptis trifolia*	goldthread	N5	G5	S5	N	Y	N	N
Rosaceae	*Potentilla argentea*	silvery cinquefoil	NNA	GNR	SNA	Y	N	N	N
Rosaceae	*Fragaria vesca*	woodland strawberry	N5	G5	SNA	Y	N	N	N

Family	Scientific Name	Common Name	Status Ranking			Location Observed			
			N Rank	G Rank	S Rank	Shoal Cove	Forteau Point	L'Anse Au Diable	Dowden's Point
Betulaceae	*Betula alleghaniensis*	yellow birch	N5	G5	SNA	N	N	Y	N
Asteraceae	*Pilosella piloselloides*	tall hawkweed	NNA	GNR	SNA	N	N	N	Y
Caryophyllaceae	*Spergularia rubra*	red sand-spurrey	NNA	G5	SNA	N	N	N	Y
Caryophyllaceae	*Silene flos-cuculi subsp. flos-cuculi*	ragged-robin	NNA	GNR	SNA	N	N	N	Y
Lentibulariaceae	*Pinguicula vulgaris*	common butterwort	NNR	G4		Y	N	N	N
Cyperaceae	*Eriophorum angustifolium subsp. angustifolium*	narrowleaf cottongrass	NNR	G5T5	S4S5	N	N	Y	N
Ericaceae	*Pyrola* sp.	A wintergreen				Y	N	N	N
Asteraceae	*Solidago* sp.	A goldenrod				Y	N	N	N
Caryophyllaceae	*Silene* sp.	A catchfly				Y	N	N	N
Violaceae	*Viola* sp.	A violet				N	Y	N	N
Dryopteridaceae	*Dryopteris* sp.	A woodfern				N	Y	N	N
Orchidaceae	*Platanthera* sp.	A orchid				N	Y	N	N
Cyperaceae	*Eriophorum* sp.	A cottongrass				N	Y	N	N
Potamogetonaceae	*Potamogeton* sp.	A pondweed				N	N	N	Y
Fabaceae	*Vicia sp.*	A vetch				Y	N	N	N
Orchidaceae	*Listera sp.*	A twayblade				Y	N	N	N
Caryophyllaceae	*Stellaria sp.*	A starwort				N	Y	N	N
Rubiaceae	*Galium sp.*	A bedstraw				N	Y	Y	N

APPENDIX E

Study Area Photographs

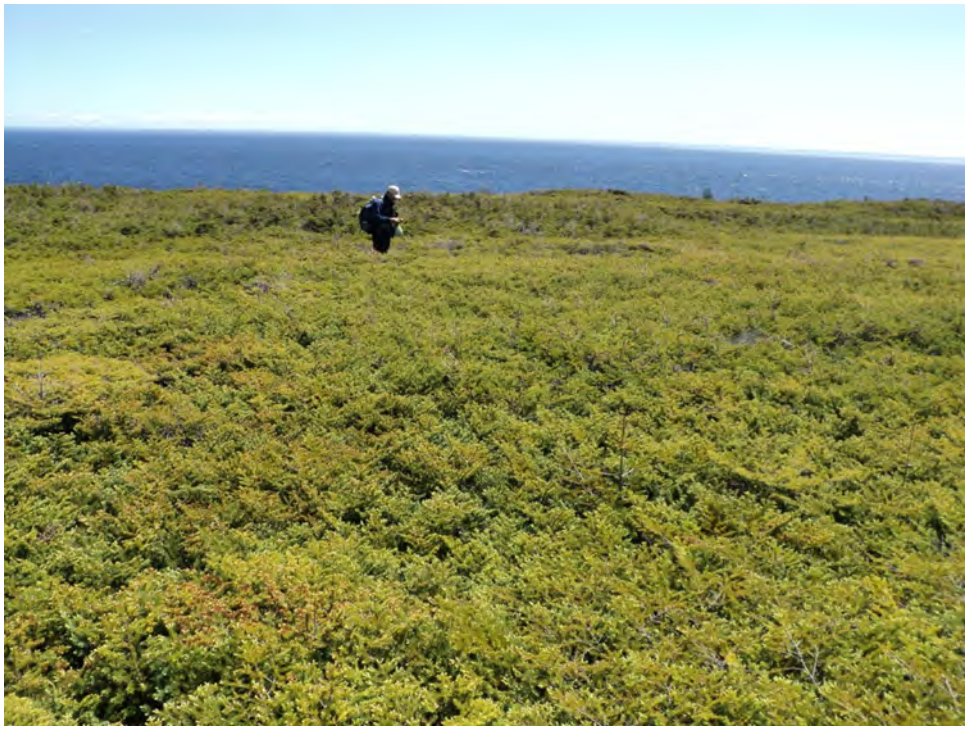
Photograph 1. L'Anse au Diable Habitat 1 – Turfy Barrens
(Note: Anthropogenic disturbance (quarry) at rear of photo)

Photograph 2. L'Anse au Diable Habitat 2 – Willow Thicket

Photograph 3. L'Anse au Diable Habitat 3 – Coastal Marine
(Note: Cove is the proposed site of the L'Anse au Diable electrode)

Photograph 4. L'Anse au Diable Habitat 4 – Coastal Dune (Note: Sparsely vegetated dune areas [blue-green grassy areas] are preferred habitat for *Maianthemum stellatum*)

Photograph 5. Forteau Point Habitat 1 – Turfy Barrens
(Note: Anthropogenic disturbance (quarry) at rear of photo)



Photograph 6. Forteau Point Habitat 2 – Low Tuckamore

Photograph 7. Forteau Point Habitat 3 – High Tuckamore

Photograph 8. Forteau Point Habitat 4 – Coastal Marine

Photograph 9. Forteau Point – Overview of Proposed Cable Landing Site

Photograph 10. Forteau Point – *Streptopus lanceolatus* at edge of High Tuckamore

Photograph 11. Shoal Cove Habitat 1 – Turfy Barrens / Fractured Bedrock (Note: Anthropogenic disturbance (quarry area) in upper left of photo)

Photograph 12. Shoal Cove Habitat 2 – Fractured Bedrock

Photograph 13. Shoal Cove Habitat 3 – Anthropogenic Disturbance – Quarry (Note: Refuse found across this portion of the site)

Photograph 14. Shoal Cove - Overview of Proposed Cable Landing Site

Photograph 15. Shoal Cove – Limestone Barren Species at Risk Recovery Site (Note: *Braya fernaldii* quadrat)

Photograph 16. Shoal Cove – *Braya longii* habitat at edge of Study Area

Photograph 17. Shoal Cove – *Braya longii*

Photograph 18. Shoal Cove – *Braya longii* (scale)

Photograph 19. Dowden's Point Habitat 1 – Anthropogenic Disturbance (former quarry area) / Willow Thicket

Photograph 20. Dowden's Point Habitat 2 – Anthropogenic Disturbance (former quarry area) / Cattail Marsh

Photograph 21. Dowden's Point Habitat 3 – Anthropogenic Disturbance (former quarry area) / Shallow Open Water

Photograph 22. Dowden's Point – Overview of Focused Study Area

Photograph 23. Dowden's Point – Anthropogenic Disturbance / Coastal Marine (Note: Site of the proposed electrode)

Labrador – Island Transmission Link

2011 Historic and Heritage Resources Assessment and Potential Mapping: Strait of Belle Isle Cable Landing Sites and Shore Electrode Locations

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Project 121510743

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EXECUTIVE SUMMARY

Nalcor Energy is proposing to develop the *Labrador – Island Transmission Link* (the Project), a High Voltage Direct Current (HVdc) transmission system extending from Central Labrador to the Island of Newfoundland's Avalon Peninsula. The proposed Project includes the installation and operation of marine cables across the Strait of Belle Isle (SOBI), as well as a shore electrode site in the SOBI (Labrador side) and Conception Bay (Newfoundland). This report presents the results of some further, detailed historic resources survey work that was undertaken in 2011 at the currently proposed SOBI cable landing sites at Forteau Point, Labrador and Shoal Cove, Newfoundland, and at identified shore electrode locations at L'Anse au Diable (Labrador) and Dowden's Point (Newfoundland). As these components of the Project and their respective locations and potential work areas became more clearly defined in 2011, and given the relative potential for historic resources in several of these areas, Nalcor Energy has proceeded to undertake some additional archaeological field survey and potential mapping effort at these locations.

Field assessment involved compiling data on previously recorded archaeological and contemporary sites, as well as visual reconnaissance and sub-surface testing, and concluded with archaeological potential mapping. Following field assessment, three new archaeological sites were recorded at Forteau Point within the General Field Investigation Area. One other site was recorded during assessment, but it is situated approximately 1.5 km to the north of the Forteau Point General Field Investigation Area. Two new archaeological sites were recorded at L'Anse au Diable in addition to the three previously identified for that Study Area. One new archaeological site was recorded at Shoal Cove within the Focused Study Area, and one contemporary site was identified outside the General Field Investigation Area. No sites were previously known for that area. No sites have ever been recorded at Dowden's Point and none were identified during assessment in 2011.

As a result of the field assessment in 2011, archaeological potential was mapped for each of the four areas. Four categories of potential have been mapped: Known Sites; High Potential; Moderate Potential; and Low Potential. Both Forteau Point and L'Anse au Diable in Labrador contain significant areas of High and Moderate archaeological potential. Shoal Cove in Newfoundland contains small areas of High and Moderate potential, and Dowden's Point Study Area is rated as Low potential.

These potential-mapping categories represent the relative potential of historic and heritage resources occurring at these sites. Development in Moderate Potential areas carries some risk of affecting historic and heritage resources, though sites have not yet been identified in these Study Areas. Specific impact areas or corridors may require archaeological monitoring during development work. Development in Low Potential areas carries little or no risk of affecting historic and heritage resources.

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1.0 INTRODUCTION

Nalcor Energy is proposing to develop the *Labrador – Island Transmission Link* (the Project), a High Voltage Direct Current (HVdc) transmission system extending from Central Labrador to the Island of Newfoundland's Avalon Peninsula. The proposed Project includes the installation and operation of marine cables across the Strait of Belle Isle (SOBI), as well as shore electrodes at sites in the SOBI (Labrador side) and Conception Bay (Newfoundland).

The environmental assessment (EA) process for the Project was initiated in January 2009 and is in progress. An Environmental Impact Statement (EIS) is being prepared by Nalcor Energy, which will be submitted for review by government departments, Aboriginal and stakeholder groups and the public.

This report presents the results of some further, detailed historic resources survey work that was undertaken in 2011 at the currently proposed SOBI cable landing sites at Forteau Point, Labrador, and Shoal Cove, Newfoundland, and at identified shore electrode locations at L'Anse au Diable (Labrador) and Dowden's Point (Newfoundland). As these components of the Project and their respective locations and potential work areas became more clearly defined in 2011, and given the relative potential for historic resources in several of these areas, Nalcor Energy has proceeded to undertake some additional archaeological field survey and potential mapping effort at these locations.

The information presented herein is intended to supplement that contained in the original *Historic and Heritage Resources Component Study* (Stantec 2010a, 2011) that was submitted under the EA process in May 2011. It will be used to further inform the EA, as well as ongoing Project planning and future permitting.

1.1 Project Overview

The proposed Project involves the construction and operation of transmission infrastructure within and between Labrador and the Island of Newfoundland. The proposed transmission system, as currently planned, will include the following key components:

- an ac-dc converter station in Central Labrador, on the lower Churchill River adjacent to the Lower Churchill Hydroelectric Generation Project;
- an HVdc transmission line extending across Southeastern Labrador to the SOBI. This overhead transmission line will be approximately 400 km in length, with a cleared right-of-way averaging approximately 60 m wide, and will consist of single galvanized steel lattice towers;
- cable crossings of the SOBI with associated infrastructure, including cables placed under and on the seafloor through various means to provide the required cable protection;
- an HVdc transmission line (similar to that described above) extending from the SOBI across the Island of Newfoundland to the Avalon Peninsula, for a distance of approximately 700 km;
- a dc-ac converter station at Soldiers Pond on the Island of Newfoundland's Avalon Peninsula; and

- electrodes in Labrador and on the Island, with overhead lines connecting them to their respective converter stations.

As outlined above, the proposed Project includes the installation and operation of marine cables across the SOBI. The current Project concept includes potential on-land cable landing sites at Forteau Point, Labrador and Shoal Cove, Newfoundland. From these locations, on-land horizontal directional drilling technology may be used to install the cables out to and under the SOBI for up to several kilometres. From there, three cables would be placed on the seabed within a single corridor, and each would be protected with a rock berm.

The proposed HVdc transmission system will also include the installation of electrodes, or high capacity grounding systems, in the marine environments in Labrador and Newfoundland. The current Project concept would see the development of two "shore electrodes", one at a location on the Labrador side of the SOBI (L'Anse au Diable) and one in Conception Bay, Newfoundland (Dowden's Point). The establishment of these shore electrodes would involve the construction of an in- or near-water (breakwater-like) structure within a small natural or excavated cove or adjacent to the shoreline at the sites, in order to create a small protected marine 'pond' to house the electrode elements.

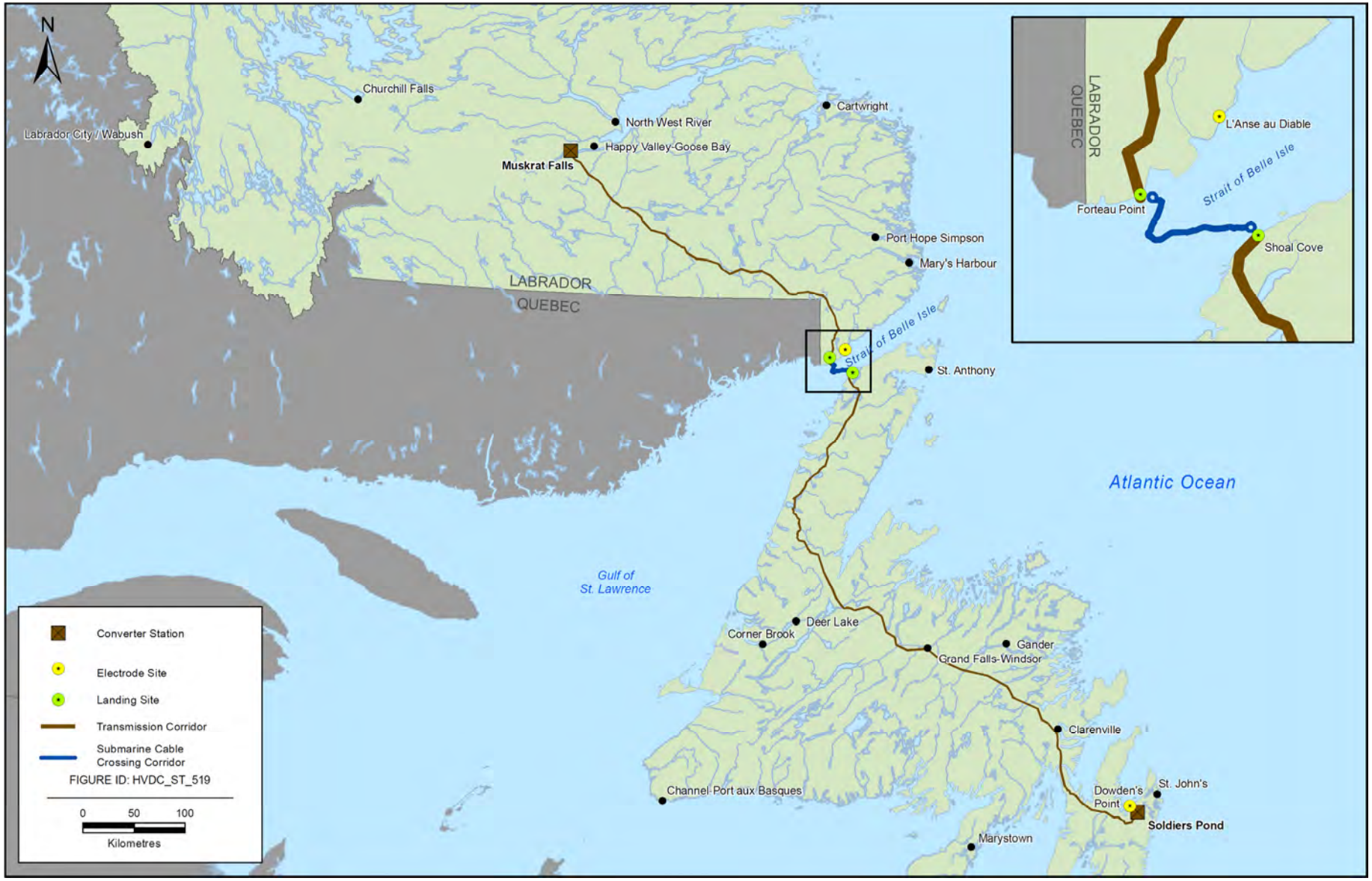
1.2 Study Objectives

The objective of the current Study is to supplement the Historic and Heritage Resources Component Study of the Project (Stantec 2010a) by focusing the assessment and archaeological potential mapping on specific cable landing and electrode sites. The archaeological potential within these sites was assessed in order to ensure that further geotechnical and construction work does not impact historic and heritage resources in these areas. Since this is a supplementary report, data on archaeological and contemporary sites and testing locations within areas previously discussed and mapped in the Historic and Heritage Resources Component Study are not repeated here or incorporated into the analysis. These data are described in detail in the Historic and Heritage Resources Component Study (Stantec 2010a). An overview of the natural landscape and resource distribution of these regions is presented in the Component Study (Stantec 2010a; Stantec 2011).

1.3 2011 Historic and Heritage Resources Report

This report presents the results of field assessment and potential mapping undertaken in 2011, focused on the specific proposed cable landing and electrode sites at Forteau Point and L'Anse au Diable in southern Labrador, Shoal Cove on the Northern Peninsula, and Dowden's Point, Conception Bay (Figure 1-1).

Figure 1-1 Labrador – Island Transmission Link Overview and Study Area Locations



2.0 APPROACH AND METHODS

2.1 Study Areas

Background research for this supplementary report encompasses the SOBI, including both the south coast of Labrador and the west coast of the Northern Peninsula, and the Avalon Peninsula, including Conception Bay. Specific Study Areas where field assessment was completed during the 2011 field program include Forteau Point and L'Anse au Diable in southern Labrador, Shoal Cove on the Northern Peninsula, and Dowden's Point, Conception Bay (Figure 1-1). The Study Areas for Forteau Point and Shoal Cove were divided into a General Field Investigation Areas (GFIA) and Focused Study Area (FSA) to accommodate the requirement for a more intensive field investigation where Project-related drilling was proposed.

2.2 Background Research

Since 1998, the historic and heritage resources research strategy for the Project has followed a three-stage approach, beginning with background research, followed by field assessment and culminating in archaeological potential mapping.

Background research serves to identify:

- known, geo-referenced archaeological sites (e.g., sites or materials pre-dating 1960 and registered in the Provincial Archaeology Office (PAO) Archaeological Site Record Inventory or referenced in historical documents;
- proxy indicators of high archaeological potential (e.g., known ethnographic / contemporary sites post-dating 1960, which have potential to include archaeologically-significant materials or features);
- settlement patterns, as indicated by existing archaeological data and also topographic and hydrographic attributes predicted to correlate with high archaeological potential (e.g., waterfalls and rapids, which are likely to enforce travel stops and thus lead to the formation of archaeological sites); and
- locations in which high potential topographic attributes and landforms may once have been present (e.g., marine terraces representing former coastal locations).

The background research methodology employed in the present study closely followed that employed for the overall Project assessment and involved the review of previous archaeological research undertaken within and adjacent to the Study Areas, and of existing historic, ethnohistoric and ethnographic literature. Specific methodologies have already been described in the Historic and Heritage Resources Component Study (Stantec 2010a) and will not be repeated here, other than to note data sources particularly germane to the cable landing and shore electrode Study Areas.

In addition to the major published and unpublished sources on the archaeology of Labrador in general, there is a specific body of literature on archaeological research undertaken along the SOBI, particularly in southern Labrador. Particularly relevant is the work undertaken by Elmer Harp (Harp 1963) in the 1940s, by Robert McGhee and James Tuck and their graduate students in the 1970s (McGhee and Tuck 1975; Madden 1976; Renouf 1976, 1977), by Reginald Auger and Marianne Stopp since the 1980s (Auger and Stopp 1987, 1989; Auger 1989; Stopp 2000) and assessment completed for the Lower Churchill Project since the 1990s (IEDE / Jacques Whitford 2000; Jacques Whitford 2003 Stantec 2010a, 2010b), as well as various survey and Cultural Resource Management projects undertaken by, or for, the PAO since the 1990s (e.g. Jacques Whitford 2003; Schwarz 2010). Work conducted in adjacent Quebec, near Blanc-Sablon (e.g., Pintal 1998), is also relevant to the regional chronological framework.

Literature bearing on archaeological research on the Newfoundland side of the SOBI includes the results of major research programs undertaken at Port-au-Choix (Tuck 1976; Renouf 1999), in addition to other research conducted along the Northern Peninsula (e.g., Ingstad 1969, 1970; Jacques Whitford 1997; Bell and Renouf 2003; Hartery 2007). In addition, there is a more limited body of literature bearing on Conception Bay, Newfoundland, including research by Gilbert (2009) and Skanes (2011).

2.3 Field Research

Field research follows from background research, serving to verify predicted potential by assessing:

- specific locations identified as known historic and/or ethnographic sites;
- specific locations ("testing locations") in order to sample broader topographic features and landforms ('testing zones") of predicted high potential; and
- a range of other topographic and hydrographic settings to verify that they are of lesser potential.

Field assessment began following completion of background research and involved the following elements:

- selection of testing locations;
- visual inspection;
- sub-surface testing; and
- field recording.

2.3.1 Selection of Testing Locations

Field assessment for this report was conducted using a two-stage process. The first stage used the results of background research, which consists of pre-selecting locations within the Study Areas for closer assessment. Within the Study Areas, high potential locations selected for testing include coastal shoreline, marine terrace systems and shorelines of major freshwater waterbodies and waterways. The second stage consisted of closer inspection of pre-selected testing locations in the field, along with assessment of any additional testing locations, which appeared during initial reconnaissance to have higher potential than previously anticipated. Field assessment included both visual inspection on the ground and sub-surface testing.

Where Study Areas were sub-divided into GFIAs and FSAs, FSAs were assessed more intensively. GFIAs were assessed by means of exploratory transects undertaken on foot in order to characterize the terrain and to determine whether previously-unidentified areas of higher archaeological potential were present. One particular focus in the 2011 assessment was on relocating and verifying the precise locations of previously recorded archaeological sites within the Study Areas.

2.3.2 Visual Inspection

Visual surface inspection was used primarily when background research indicated a testing location was likely to yield evidence of recent or historic land use with potential for surface-visible remains. It was also used when surface exposures were present in the testing location (e.g., along an eroding riverbank or an active beach). The objective was to locate deflated cultural material in exposures, along with other surface-visible remains.

2.3.3 Sub-surface Testing

Sub-surface testing was employed when: background research or visual reconnaissance indicated a testing location had potential for buried pre-contact cultural remains; when specific historic or contemporary sites were anticipated but no surface-visible remains were evident; and in testing locations under forest cover with no surface exposures. The objective of sub-surface testing was to test areas lacking surface exposures by sampling sub-surface deposits at close and regular intervals, to a depth of several centimetres below the A horizon, below which no cultural remains were anticipated. Test excavations were rarely deeper than 30 cm below the surface; in most instances, testing required depths of no more than 20 cm below the surface. Test pits were excavated by shovel and trowel. Where possible, the excavation of test pits was systematic and intensive. Test pits were excavated along pre-selected linear features in one to three rows, approximately 5 m apart and at 5 to 10 m intervals, according to the degree of forest cover.

2.3.4 Field Recording

Field notes recorded, among other things, the number, location and contents of test pits. Sites and testing locations were recorded with hand-held GPS units, with estimated horizontal error not exceeding 10 m. Readings to this degree of accuracy are sufficient to relocate the sites and testing locations in the field, allowing them to be compiled into a database that could map site distributions as a GIS layer. Field notes were transcribed into a digital format on an ongoing basis and any sites and cultural materials recorded were catalogued on standard PAO site and artifact record forms. All archaeological and ethnographic sites, testing locations and important natural and cultural features were photographed and photo catalogues were maintained. Testing locations and the locations of archaeological and ethnographic sites were also recorded on Project mapping. Where necessary, plans and sketch maps were prepared for sites which indicated the extent of archaeological deposits, the location of test pits and the distribution of any surface-visible features.

2.3.5 Contemporary Sites

Although, strictly-speaking, contemporary sites are not archaeological sites and are not typically subject to mitigation under the *Historic Resources Act* 1985, contemporary land use features (material remains of human activity occurring after 1960) may have considerable relevance to archaeological research, as described in the Historic and Heritage Resources Component Study (Stantec 2010a). Methodologically at least, no distinction was drawn during fieldwork between archaeological sites and sites of contemporary land use. Archaeological and contemporary sites were both recorded using the same methods and both reported to the PAO. Archaeological sites are assigned Borden numbers (e.g., "FhCe-1") in accordance with the Canadian Registry for archaeological sites, and contemporary sites are designated by ethnographic codes (e.g., "13F / 07 Ethno-03"). It should be noted that recording of contemporary sites is routine in Labrador, where there is abundant evidence for contemporary Innu and Settler land use that may reflect long-standing historic or even pre-contact land use patterns. In insular Newfoundland, contemporary land use is less likely to reflect traditional patterns, and usually such sites are not recorded.

2.4 Archaeological Potential Mapping

Archaeological potential mapping is based on data acquired through background and field research, and focuses on:

- mapping topographic and hydrographic features ("potential zones") of varying archaeological potential within the Study Areas;
- comparing field assessment effort and results to verify and rate archaeological potential for each Zone Type and thus define Zone Types of "High", "Medium" and "Low" archaeological potential within the Study Areas; and
- producing maps of relative archaeological potential for the Study Areas to assist in Project planning to reduce the potential of interaction with historic and heritage resources.

Previous archaeological potential mapping for the Project (Stantec 2010a) followed the methodology originally developed in 2000 to map archaeological potential along the Churchill River for the Lower Churchill Project (described in detail in Jacques Whitford / IELP 2001 and Stantec 2010a). Specific methods varied according to the base mapping available, but mapping for the Project Component Study employed the method used for 1:50,000 potential mapping in previous studies.

In the present study, archaeological potential has been mapped using similar criteria as the Labrador – Island Transmission Link: Historic and Heritage Resources component study (Stantec 2010a). However, the application of this method and the definitions of mapped zone types are substantially different. This is largely a function of the difference in scale. The 2011 Study Areas are substantially smaller than the Study Areas mapped previously, and are mapped at a much finer scale.

At this scale, the focus is on identifying and buffering known, specific archaeological site locations, and identifying zones in proximity to known sites that may have potential to yield further archaeological remains. The objective is to assist in planning further engineering work and, ultimately, construction, by identifying

locations where such work has greater or lesser risk of affecting historic and heritage resources, and those which may require monitoring or other cultural resource management activities prior to and during ground disturbance.

Consequently, potential mapping for this study focuses on four defined zone types (in contrast to the 12 mapped in previous studies). These four mapped zone types are as follows:

- zones with Known Historic and Heritage Resources, including archaeological and contemporary sites, whether recorded previously or during assessment of the Project;
- zones with High Potential for Historic and Heritage Resources, consisting of zones which have not yielded heritage resources within the cable landing and electrode Study Areas, but which are continuations of the same or similar landforms. In most instances, these zones are sufficiently large that it is neither practical (nor necessary) to assess them intensively in their entirety, but there is high potential for any development-related activities to affect historic and heritage resources. High-potential zones extend from, or surround, the locations of known historic and heritage resources;
- zones with Moderate Potential for Historic and Heritage Resources, consisting of landforms that have yielded historic and heritage resources elsewhere in the region but which, following field assessment in 2011, have yet to yield historic and heritage resources within the Study Areas. Although historic and heritage resources have not yet been identified within these moderate-potential zones, there is nevertheless risk that development activities may affect yet-to-be identified resources; and
- zones with Low Potential for Historic and Heritage Resources, consisting of landforms that have generally failed to yield sites during assessment both within the Study Areas and within the region as a whole. Most of these zones are considered to be low potential because of the severity of recent disturbance, high elevation, lack of soil, lack of level ground, or poor drainage. The risk of encountering historic and heritage resources during development activities within these zones is considered to be low.

2.5 Project Personnel

Roy Skanes, B.A., M.Phil (Archaeologist), has worked as a Consulting Archaeologist with Stantec Consulting Ltd. and its predecessor Jacques Whitford Environment Limited for the past 20 years and has been involved in archaeological and archival research since 1978. His research focus has been primarily on historical archaeology, with a large majority of his work directed toward study of habitation sites and fortifications dating to the 18th and 19th centuries. Mr. Skanes holds a B.A. in Anthropology (Archaeology and French) from Memorial University and a Masters degree with a specialization in archaeology from the University of St. Andrews, Scotland. He has worked extensively in Newfoundland and Labrador, Nova Scotia, Prince Edward Island, New Brunswick, Québec, Ontario and Alberta. Over the past 15 years, he has directed and / or acted as Team Leader for a number of Historic and Heritage Resources assessments for various projects on the Island and in Labrador, including assessments and excavations at Voisey's Bay, Labrador, along the corridor of the Trans Labrador Highway from Red Bay to Cartwright and from Cartwright Junction to Goose Bay, at five locations proposed for construction of short range radar sites in central and northern Labrador, and at a number of locations in the Churchill River valley and west and southwest Labrador for the proposed Lower Churchill Hydroelectric Generation Project. He also completed several Stage 1 Historic Resources Assessments in the Labrador Straits region for road and land development projects, and provided archaeological services during the relocation of a power line at Red Bay.

More recently, he directed assessments in northwest Labrador for a proposed mining project. He has also worked extensively with Aboriginal groups carrying out field research in Labrador.

Mr. Skanes held the Historic Resources Overview Assessment Permit, undertook field assessment, and co-authored this report.

Fred Schwarz, Ph.D. (Archaeologist), holds a B.A. in Anthropology from Memorial University, an M.A. in Archaeology from the University of Calgary and a Ph.D. in Archaeology from the University of Cambridge. He specializes in the archaeology and pre-history of the Newfoundland and Labrador interior. His research interests include predictive modelling and field investigation of pre-contact interior settlement in Newfoundland and Labrador, settlement patterns and the interpretation of interior adaptations and culture history in the region. Dr. Schwarz has been directing field research projects in Newfoundland and Labrador, Nova Scotia, and Latin America for 22 years. His work in Labrador has included scientific management of the Stage 1 Historic Resources Overview Assessment of the Churchill River Power Project from 1998 to 2000, which included a series of three training programs for Innu researchers. In addition, he has worked on numerous projects with, and for, Innu organizations and companies. In 1996, he directed the Regional Context Component of the Voisey's Bay Historic Resources Impact Assessment for the Mushuau Innu Band Council (in conjunction with the Labrador Inuit Association and Jacques Whitford). In 1997, he served as field consultant to the Innu History Commemoration Project for the Department of Canadian Heritage and directed the Archaeological Resource Inventory of *Akamiuapishku* Proposed National Park for Innu Nation and Parks Canada, eventually preparing the Human History Study of the proposed park in 2001. Since that time, he has also completed major assessments for Innu Environmental Limited Partnership, including the Historic Resources Study of Phase III of the Trans Labrador Highway, as well as assessments and research in the town of Sheshatshiu for the Sheshatshiu Innu Band Council. More recently, since 2006 he has undertaken several projects with Minaskuat Limited Partnership and Stantec, including archaeological potential mapping and field assessment of the LabMag Iron Ore project in western Labrador, and scientific management of historic resources assessment of the Lower Churchill Hydroelectric Generation Project and this Project. Dr. Schwarz undertook field assessment and co-authored this report.

Amber Frickleton is a GIS Technician with the Information Management team in Stantec's St. John's office. Her GIS experience includes serving maps on the internet through ArcIMS and ArcServer, relational database design and management, GPS data collection and post processing and grid modeling and analysis. Complementary skills include data management and statistical analysis. Miss Frickleton's work with Stantec has included work on a variety of projects including Aurora Energy uranium project, Labrador Iron Mine and this Project. Her work on these projects has involved a variety of tasks such as data analysis, map creation, data organization and quality control.

3.0 RESULTS

3.1 Background Research

3.1.1 Literature Review

The results of extensive research into the cultural / historical sequence for each of the regions in which the current Study Areas are situated (i.e., Southern Labrador, Northern Peninsula and Avalon Peninsula) was presented in Stantec 2010a and are not repeated here.

3.1.2 Previous Historic and Heritage Resources Research

3.1.2.1 Forteau Point (Southern Labrador)

Previous historic and heritage research at Forteau Point included survey (Auger and Stopp 1987, 1989) and test excavations at Overfall Brook (Stopp 2000), as well as assessment undertaken for the Lower Churchill Project in 1998 (IEDE / Jacques Whitford 2000). Four sites recorded prior to 2011 are within the Forteau Point GFIA (Figure 3-1).

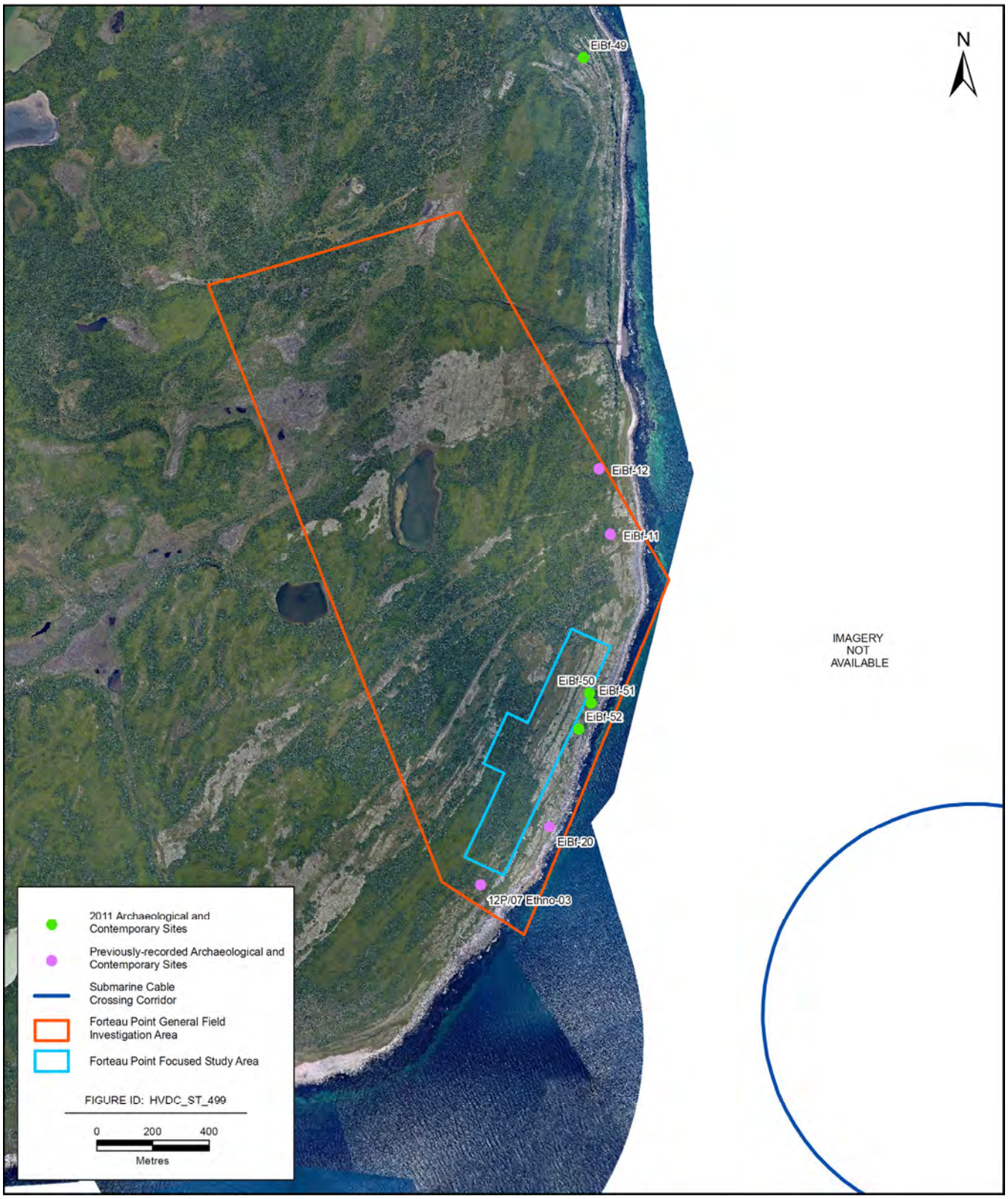
Dakota (EiBf-20)

This site was identified in 1998 (IEDE / Jacques Whitford 2000) while conducting close surface inspection of an eroding area near Forteau Point. A purple quartzite flake and tiny fragment of marine shell were found on the surface of a sandy terrace less than 15 m above sea level (asl). Subsequent sub-surface testing in this zone revealed no additional pre-contact material. The site, located within the Forteau Point GFIA, was revisited in 2011, and the original coordinates appear to be correct (Figure 3-1).

Overfall Brook 1 (EiBf-11)

EiBf-11 was initially identified in 1986 during an archaeological survey of southern Labrador (Auger and Stopp 1987, 1989). Testing at the time yielded undiagnostic, vari-coloured chert flakes, as well as a biface base similar to those recorded at the English Point site (McGhee and Tuck 1975). A radiocarbon date on wood charcoal found at Overfall Brook 1 yielded a result of 1,170 + - 90 BP (Beta 21249). Further testing in 1998 (Stopp 2000) yielded an assemblage of lithic materials consisting primarily of white chert flakes and quartzite. This site lies within the Forteau Point GFIA. It was concluded that the site was likely from the Late Pre-contact Period (Recent Indian) of occupation.

Figure 3-1 Forteau Point Study Area



Overfall Brook 2 (EiBf-12)

Not far from EiBf-11, an historic occupation was identified on the basis of a pair of stone foundations. In addition, a cobble feature was noted in an uplifted cobble formation (Auger and Stopp 1987, 1989; Stopp 2000). This site was visited in 2011 and new GPS coordinates were recorded. This site lies within the Forteau Point GFIA.

Wooden Duck (12P/7 Ethno-03)

In 1998 (IEDE / Jacques Whitford 2000), several test pits were excavated in the vicinity of this site, which included a contemporary cabin (still in use) and associated objects, including a wooden duck decoy lying just outside the front door. New coordinates were recorded in 2011, which place the site approximately 100 m further east than previously recorded. This contemporary site is located within the Forteau Point GFIA.

3.1.2.2 L'Anse au Diable (Southern Labrador)

L'Anse au Diable has seen extensive historic and heritage research since the 1940s. Many of these studies have contributed substantially to the culture / historical sequence known for the SOBI area (cf. McGhee and Tuck 1975). The Arrowhead Mine site, a relatively early Maritime Archaic Amerindian occupation, and the Graveyard site, a relatively late Maritime Archaic Amerindian occupation, both lie outside the Study Area. However, the Iceberg site, also a late Maritime Archaic Amerindian occupation, and the Wrinkle site, an early Palaeo-Eskimo occupation (McGhee and Tuck 1975), both lie within the Study Area. In total, three archaeological sites recorded prior to 2011 are within the L'Anse au Diable Study Area (Figure 3-2).

Iceberg (EjBe-19)

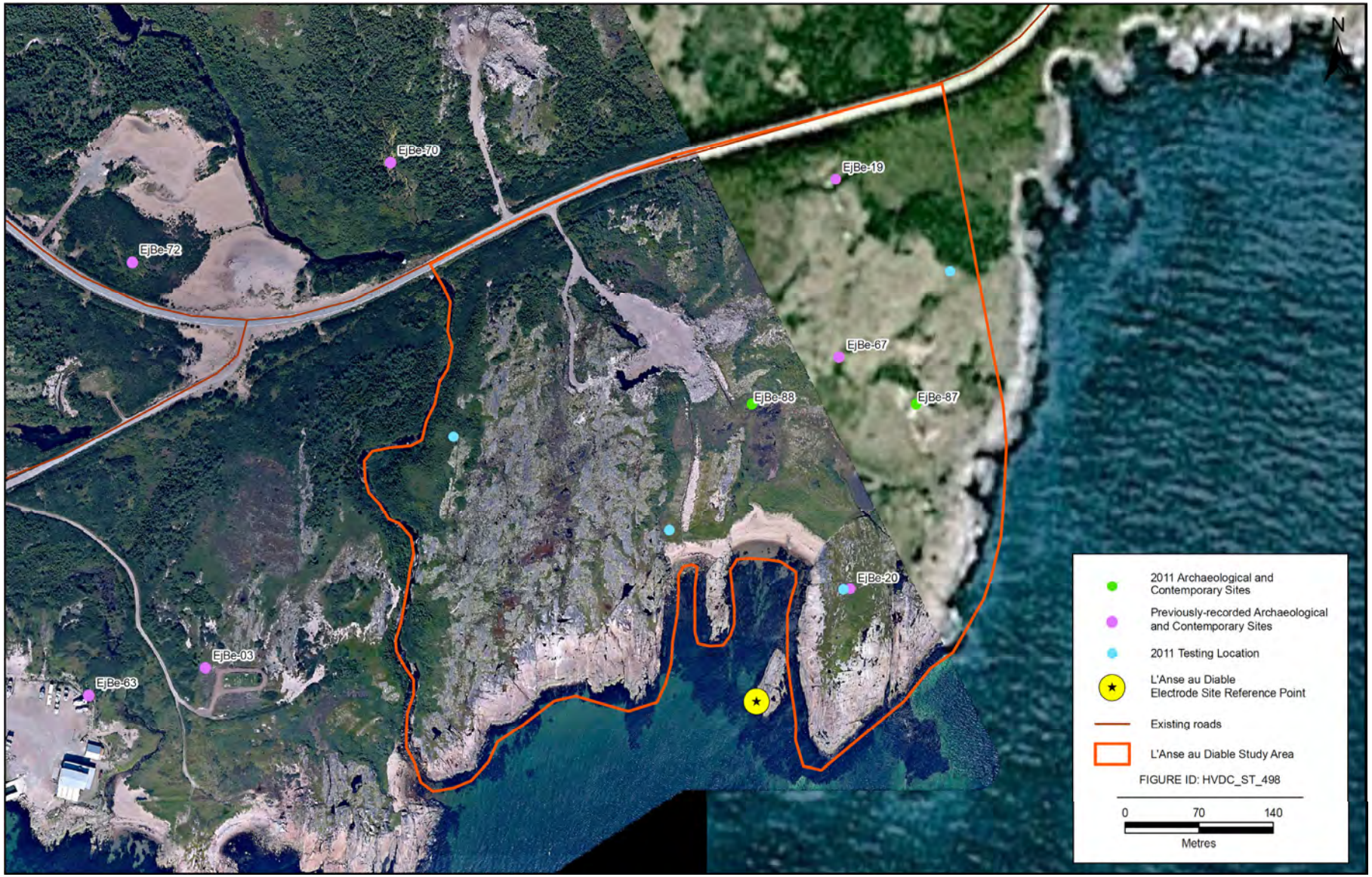
The Iceberg Site (EjBe-19), reported in 1974, corresponds to the site Elmer Harp named Diable-2 (Harp 1963; McGhee and Tuck 1975) In 1974, the site was first identified in a roadcut and associated blowouts on a terrace on the margins of an east-facing cove. The site was partially excavated in several discrete excavation areas (McGhee and Tuck 1975; Madden 1976), yielding an assemblage of lithic debitage and artifacts of black-streaked, translucent "Iceberg Chert" and white chert dated to the terminal Maritime Archaic Amerindian Period *ca*. 3,500 BP and the post-Archaic, Intermediate period, *ca*. 3,000 to 2,000 BP (Madden 1976).

Wrinkle (EjBe-20)

The Wrinkle Site (EjBe-20), first discovered in 1974, is said to have been located on the north slope of the rocky promontory, which forms the eastern boundary of the L'Anse au Diable Study Area (McGhee and Tuck 1975). The site, described as being approximately 20 m wide, yielded lithic debitage and artifacts attributable to the Early Palaeo-Eskimo (Groswater) occupation of Newfoundland and Labrador, dating *ca*. 2,800 to 2,100 BP. In addition to the lithic material recovered from the promontory, McGhee and Tuck (1975) noted two vaguely-defined boulder and sod structure ruins at the bottom of the sandy cove to the west.

Subsequent revisits to the site in the 1980s and 1990s (Auger and Stopp 1987, 1989; Skanes 2000) failed to relocate either the Groswater site or the nearby boulder and sod structures. In fact, Auger and Stopp (1987) reported the site as "destroyed".

Figure 3-2 L'Anse au Diable Study Area



Sandy (EjBe-67)

This site is situated on an open sandy terrace approximately 170 m west of the eastern shoreline and approximately 350 m to the west of the brook that defines the western boundary of the Study Area. Materials found at the site include a small scatter of quartz flakes, possibly of Maritime Archaic origin. Despite an extensive search, the site was not relocated in 2011, which is not too surprising, given the extremely exposed environmental setting of the Study Area and the resulting changes to the topography from wind and water erosion.

3.1.2.2 Shoal Cove (Northern Peninsula)

Previous historic and heritage research at Shoal Cove was limited to assessment undertaken for the Labrador – Island Transmission Link Project in 2009. No archaeological or contemporary sites were identified during that research. Large segments of the Shoal Cove FSA and GFIA have been extremely disturbed from gravel and sand extraction (Figure 3-3).

3.1.2.3 Dowden's Point (Conception Bay)

No historic and heritage resources research had been conducted at Dowden's Point prior to 2011 and no archaeological or contemporary sites were registered for this Study Area (Figure 3-4).

Figure 3-3 Shoal Cove Study Area

Figure 3-4 Dowden's Point Study Area

3.2 2011 Historic and Heritage Resources Research

3.2.1 Forteau Point

Assessment in 2011 focused on relocating sites recorded during previous investigations, as well as general field reconnaissance to assist in determining the archaeological potential of each Study Area. Reconnaissance was undertaken along the Overfall Brook hiking trail, on level terrain south of Overfall Brook, along the cliff edge at Forteau Point and across the expansive swale-and-ridge formation behind the cliff, as well as walking a transect through woods at the highest elevations above sea level within the GFIA, leading north toward Forteau. Although no subsurface testing was undertaken within this Study Area, reconnaissance nevertheless led to the discovery of four archaeological sites (Figure 3-1).

Chimney Head 1 (EiBf-49)

A single flake of Ramah chert was seen exposed along a clifftop footpath overlooking the Overfall Brook hiking trail. This stray find, identified at an elevation in excess of 45 m asl, is of indeterminate cultural affiliation. This site lies outside the Forteau Point Study Area.

Forteau Point Clifftop 1 (EiBf-50)

A 6 m^2 deflated scatter of glossy grey and black chert flakes was noted along the Overfall Brook hiking trail, as it follows the clifftop from Overfall Brook south and west toward Forteau Point. It is likely that *in situ* deposits extend beyond the exposed area. Though no diagnostic artifacts were noted, the chert is a fine, vitreous material with fine white spicules likely originating on the Island of Newfoundland, and the site is most likely of post-Maritime Archaic Amerindian date (i.e., after *ca*. 3,000 B.P.).

Forteau Point Clifftop 2 (EiBf-51)

A second, slightly larger (16 m^2), deflated scatter of quartzite flakes was noted along the clifftop a short distance south of Forteau Point Clifftop 1. In addition to the debitage, an endscraper of fine, glossy grey chert was also collected. This is a pre-contact site of indeterminate cultural affiliation, most likely pertaining to the Intermediate or Recent Indian periods of occupation and therefore of post-Maritime Archaic Amerindian date.

Forteau Point Clifftop 3 (EiBf-52)

The third clifftop lithic scatter encountered along the trail in 2011 is situated approximately 100 m southwest of the other two sites described above. Lithic material observed and collected from this 8 m^2 scatter consists entirely of white chert. Though clearly of pre-contact origin, more precise dating is again difficult. The use of white chert might relate this scatter to the terminal Maritime Archaic Amerindian or early Intermediate assemblages, such as the Graveyard or Iceberg sites at L'Anse au Diable (McGhee and Tuck 1975; Madden 1976). However, similar material is also found less than 1 km north of Forteau Point at Overfall Brook 1, seemingly dated to the Recent Amerindian Period (Stopp 2000).

Summary

Four pre-contact archaeological sites were recorded at Forteau Point during assessment in 2011, three of which are situated within the GFIA. These three sites were identified along the hiking trail atop the edge of the cliff

between 10 and 15 m asl. Each scatter is represented by a different type of lithic material, which could suggest they are chipping stations, though there may be associated habitation sites under turf-cover back from the cliff edge.

The well-preserved beach ridges rising from the present cliffs lie immediately behind the three clifftop lithic scatters recorded in 2011. Reconnaissance failed to identify any blowouts or other surface exposures on this swale-and-ridge formation, other than limited exposures in ATV trails. As a result, no archaeological sites were identified behind the present cliff edge. While it is likely that subsurface archaeological deposits are preserved on these relict beaches, they are too extensive to practically investigate by means of subsurface testing, unless testing activities can be targeted at more precise locations.

3.2.2 L'Anse au Diable

The centre of the L'Anse au Diable Study Area has been extensively disturbed by gravel extraction operations. Field reconnaissance in 2011 was focused on the sandy cove and flanking rocky headlands south of the gravel pit, and on the terraces overlooking the cove to the east. Sub-surface testing was undertaken in four locations: on a terrace overlooking the brook that defined the western edge of the Study Area; on the meadow south of the gravel pit; and on a terrace south of the archaeological site EjBe-19. In addition, several test pits were excavated on the eastern headland in an effort to relocate EjBe-20.

Assessment in 2011 easily identified the 1970s excavation areas, also encountering lithic material exposed in an overgrown bulldozer cut to the north of the excavated area. New GPS coordinates taken on the corners of the 1970s excavation units places the Iceberg site (EjBe-19) approximately 50 m northeast of its previously-recorded position.

Assessment in 2011, including excavation of four test pits near the crest of the rocky promontory, similarly failed to identify any evidence for the Groswater site (Wrinkle EjBe-20), though its location must clearly have been approximately 100 m northwest of the reported coordinates for the site, which positions the site in the cove. As well, no evidence for the boulder and sod structures reported for the area back from the cove was noted, though test pits were excavated in the meadow nearest the likely location. McGhee and Tuck (1975) noted that these features were indistinct and that testing them yielded no artifactual evidence. These features may not have been cultural at all, or if they were, they may since have been lost to erosion.

Two sites were recorded during field assessment of the L'Anse au Diable Study Area in 2011 (Figure 3-2).

Diable Cobble Hearth (EjBe-87)

A series of blowouts surround a rocky hummock approximately halfway between EjBe-19 and EjBe-20. Close surface inspection resulted in the discovery of a small cluster of cobbles and fire-cracked rock approximately 1 m in diameter in the middle of one of the blowouts. There was no sign of artifacts or lithic debitage exposed in the sand surrounding the hearth. Nevertheless, this is clearly a cultural feature, likely pre-contact but of indeterminate date and cultural affiliation.

Diable Ramah (EjBe-88)

A stray find of three flakes of Ramah chert were located in a sand blowout. Due to the limited number of lithics and the lack of any diagnostic artifacts, it is not possible to ascribe cultural affiliation or a period of occupation to these materials.

Summary

Subsurface testing at L'Anse au Diable was undertaken in four separate areas, but yielded no evidence for cultural material. Visual reconnaissance led to the discovery of two pre-contact archaeological sites within the L'Anse au Diable Study Area. In addition, the previously-recorded archaeological sites within the Study Area were revisited. Except for the Wrinkle site, which appears to have been situated on a rocky promontory, historic and heritage resources, both newly- and previously-recorded, are clearly associated with blown-out sandy ridges and terraces within this Study Area.

3.2.3 Shoal Cove

Assessment of Shoal Cove in 2011 focused on general reconnaissance to assist in determining archaeological potential within this Study Area. The FSA is dominated by an extensive recent dumping area behind the present beach, backed by elevated slopes and ridges that also appear to have been disturbed in the 20th and 21st centuries, presumably during highway construction. Occasional patches of tuckamore and boulder barrens flanking the highway appear to have escaped recent disturbance. The GFIA extends south of the highway to encompass poorly-drained terrain and the northern end of one large pond. Higher terrain within this broader area has also seen extensive disturbance from gravel extraction and/or garbage dumping. Field reconnaissance south of the highway encompassed borrow pits, several transects south from the road into boggy terrain, and the shoreline of the single large pond. Assessment north of the road encompassed the entirety of the shoreline and dumping area, as well as the tuckamore and boulder barrens closer to the highway. Sub-surface testing was limited to one line of test pits along an area of grassy meadow and angelica, which was clearly furrowed (and therefore had previously been gardened) but was not otherwise disturbed, and a second line of test pits on heath and tuckamore 1 m to 2 m above this.

One archaeological site was recorded within the Shoal Cove FSA in 2011. One contemporary site was identified to the south of the Shoal Cove GFIA (Figure 3-3).

Shoal Cove Mound (EiBd-03)

On the crest of the ridge north of the highway, an overgrown boulder mound feature measuring approximately 4 m x 5.5 m was noted. There is a hint of a small depression in the centre where a length of rebar has been driven in among the rocks. The boulders have a somewhat "loose" feel, and it is likely that this mound feature is of no great age. However, it does generally resemble the Maritime Archaic burial mound at L'Anse Amour dated to *ca.* 7,5000 BP.

Shoal Cove Pond (12P/07 Ethno 04)

The shoreline of the large pond at the southern edge of the Shoal Cove GFIA is generally low-lying and boggy, with little potential for settlement. However, a cluster of wooden posts was noted near the outflow of a brook

at the northern end of the pond, approximately 75 m outside the GFIA. These appear to have been footings for a small cabin or boat launch, and are likely less than 50 years old.

Summary

In 2011, 0ne archaeological site was recorded within the Shoal Cove FSA and one contemporary site was recorded just to the south of the GFIA.

3.2.4 Dowden's Point

Assessment of the Dowden's Point Study Area focused on general reconnaissance to assist in determining archaeological potential within this Study Area. Virtually the entire area is dominated by extensive disturbance caused by recent gravel and sand extraction and from construction of a railway line along the ridge adjacent to the ocean.

There are large areas of alder growth, indicating that ground disturbance took place within the last 50 years or so. A large gravel pit is still in operation at the east end of the Study Area.

Summary

Assessment of Dowden's Point confirmed that virtually the entire Study Area has been subject to extensive ground disturbance from gravel and sand extraction, and access road and railway construction. No archaeological or contemporary sites were recorded.

3.3 2011 Archaeological Potential Mapping Results

Archaeological potential mapping for each of the four Study Areas is presented below. Potential mapping results may be described and summarized as follows.

3.3.1 Forteau Point, Labrador

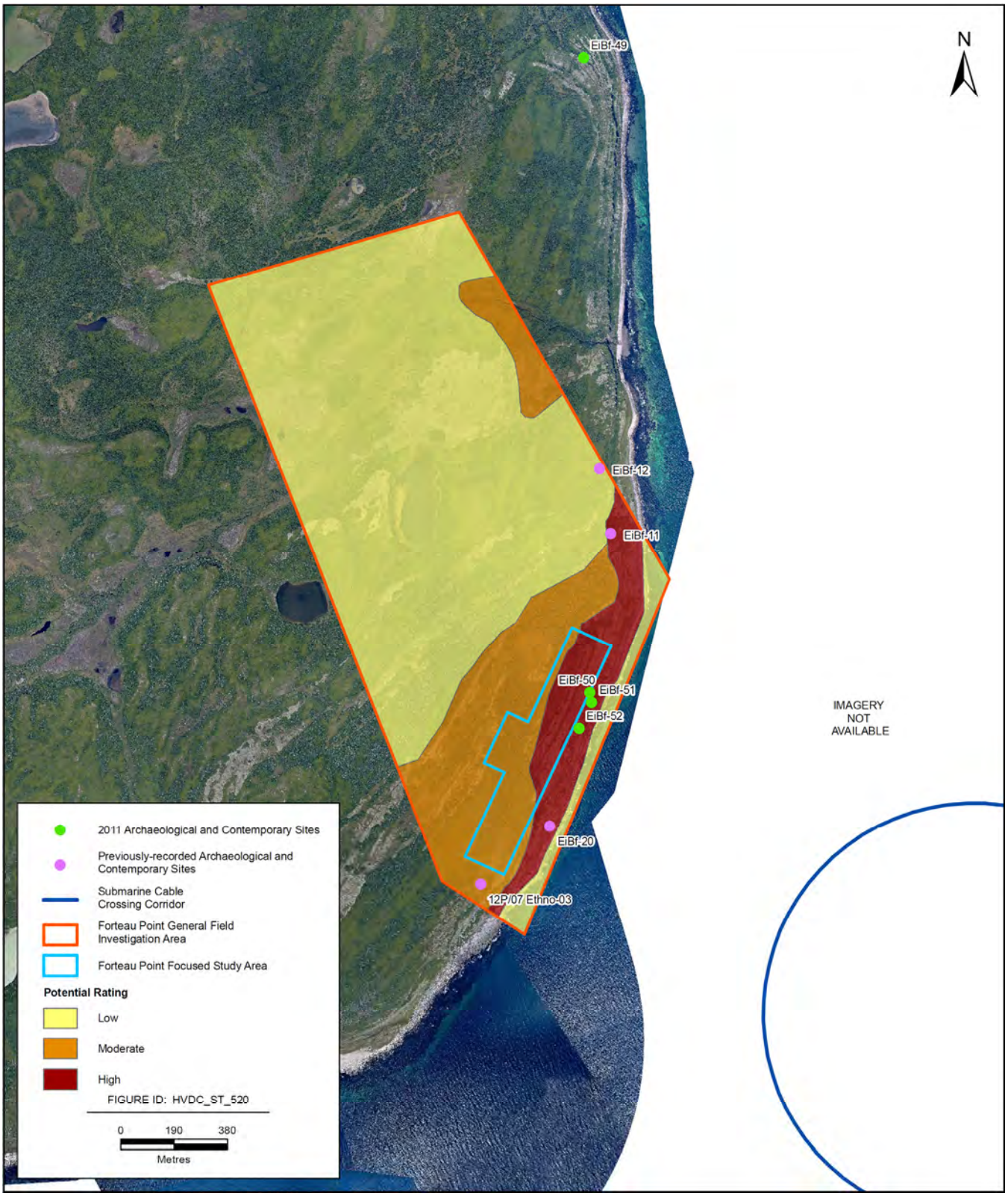
Four new archaeological sites were identified during field assessment at Forteau Point, three of which were within the GFIA. One other site was located approximately 1.5 km outside the GFIA. In addition, three other archaeological sites and one ethnographic site had previously been identified within the Forteau Point GFIA, all of which lie within 50 m of the shoreline. Three of these sites are located along the front of an extensive series of well-preserved relict beaches. All of this shoreline rises to an elevation of approximately 20 m asl and is rated as having High Potential for the presence of historic and heritage resources**.**

Former marine swale-and-ridge formations continue to higher elevations behind the present shoreline, at some distance from the known archaeological sites. While reconnaissance failed to identify historic and heritage resources in these areas, the higher elevations do have potential to yield archaeological remains. In southern Labrador, the earliest sites in the region are generally found at elevations of approximately 30 m asl, while the highest dated site in the region lies at approximately 40 m asl (Clark and Fitzhugh 1992). The zone of raised beaches lying behind and above the shoreline zone at Forteau Point is therefore rated as having Moderate

Potential for the presence of historic and heritage resources. Toward the northeast corner of the Forteau Point GFIA, a comparable localized zone of high-elevation marine terraces flanking Overfall Brook is similarly rated as having Moderate Potential.

The remainder of the Forteau Point GFIA is poorly-drained and/or lies at higher elevations than those associated with even the earliest pre-contact archaeological sites in Labrador. It is therefore deemed to have Low Potential for historic and heritage resources (Figure 3-5).

Figure 3-5 Forteau Point Study Area Historic and Heritage Resource Potential



3.3.2 L'Anse au Diable, Labrador

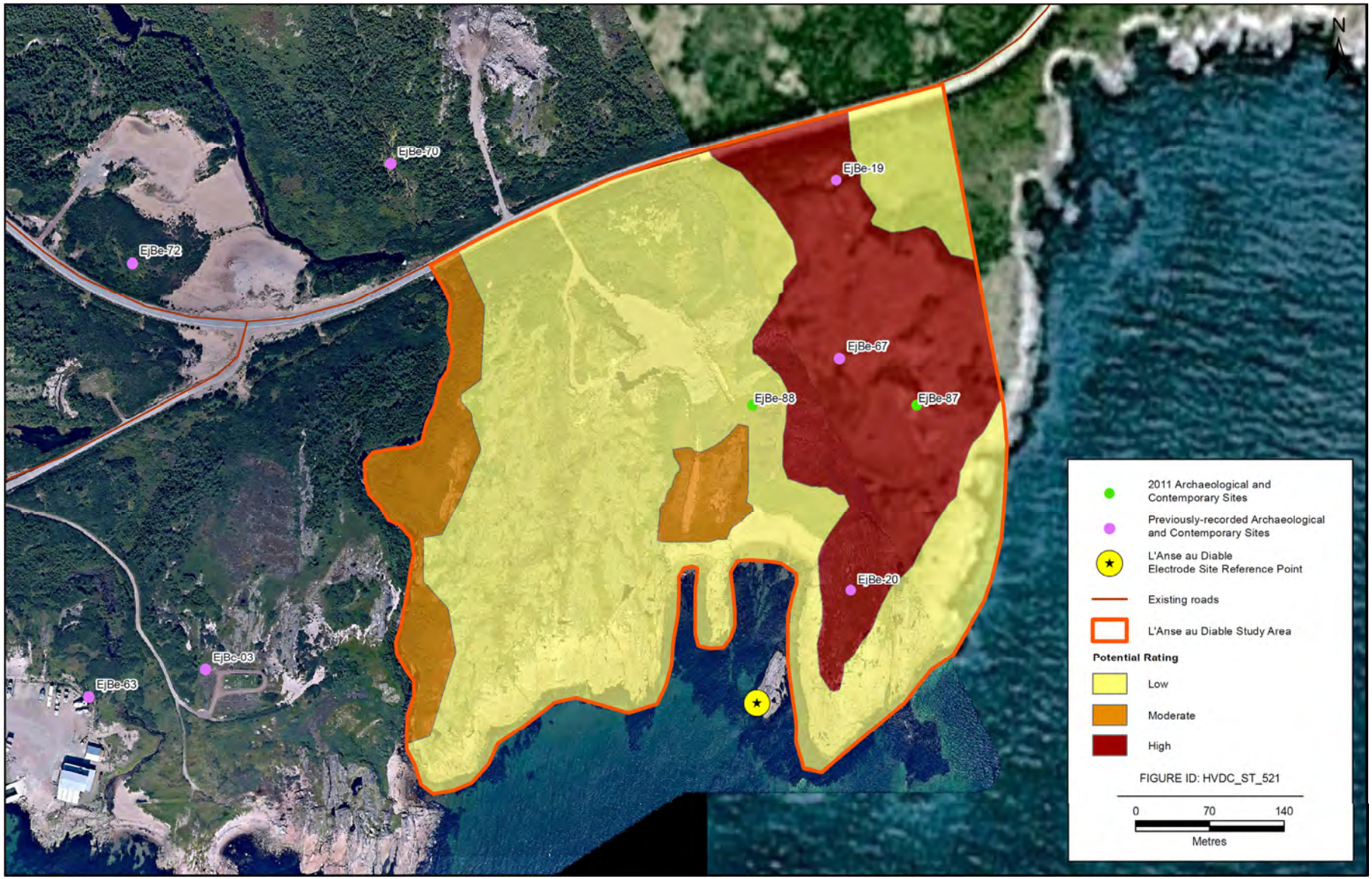
Two new archaeological sites were identified during field assessment of the L'Anse au Diable Study Area. In addition, three sites had previously been reported, one of them quite large. All of these sites are situated in the eastern portion of the Study Area, on a rocky headland or on sandy terraces and blown-out hummocks extending north from this headland on the margins of the small cove to the east. Virtually the entire eastern portion of the Study Area, encompassing all of these sites, is rated as having High Potential for the presence of historic and heritage resources**.**

Another blown-out hummock, similar to those which have yielded archaeological remains, is located south of the gravel quarry, immediately behind the beach. This series of blowouts is flanked to the east by a large sand dune seemingly of no great age or stability, and to the west by a level meadow. Sub-surface testing along the meadow yielded negative results, but it does have theoretical potential to yield archaeological remains. Consequently, this meadow, along with the neighboring blowout area, is rated as having Moderate Potential for the presence of historic and heritage resources.

A level, sandy terrace of variable width extends along the brook which forms the western boundary of the L'Anse au Diable Study Area. Sub-surface testing along this terrace yielded negative results, but it does have theoretical potential to yield archaeological remains. Consequently, this terrace is also rated as having Moderate Potential for the presence of historic and heritage resources.

The remainder of the L'Anse au Diable Study Area is poorly-drained, extensively-disturbed, or consists of bare rock. It is therefore deemed to have Low Potential for the presence of historic and heritage resources (Figure 3-6).

Figure 3-6 L'Anse au Diable Study Area Historic and Heritage Resource Potential



3.3.3 Shoal Cove

One site, potentially archaeological, was recorded within the Shoal Cove FSA during field assessment in 2011, and one contemporary site was identified on the shoreline of a pond approximately 75 m south of the GFIA. The High Potential landform on which it is located, a sandy point at the outflow of a small brook, likewise lies outside the Study Area and is therefore not mapped for potential. That portion of the lakeshore that lies inside the GFIA is poorly-drained and reconnaissance did not yield evidence for archaeological or ethnographic remains. It is nevertheless classified as having Moderate Potential because of its lakefront location.

The potential archaeological site, a boulder mound, is situated near the highest point of land within the FSA. The mound feature noted here may in fact be a product of recent disturbance, but because of its resemblance to archaeological boulder mound sites in Labrador, this feature and its immediate surroundings are, following the precautionary principle, rated as High Potential. In general, this ridge-top appears to be extensively disturbed, and the remainder of this landform is therefore not rated as High or Moderate Potential.

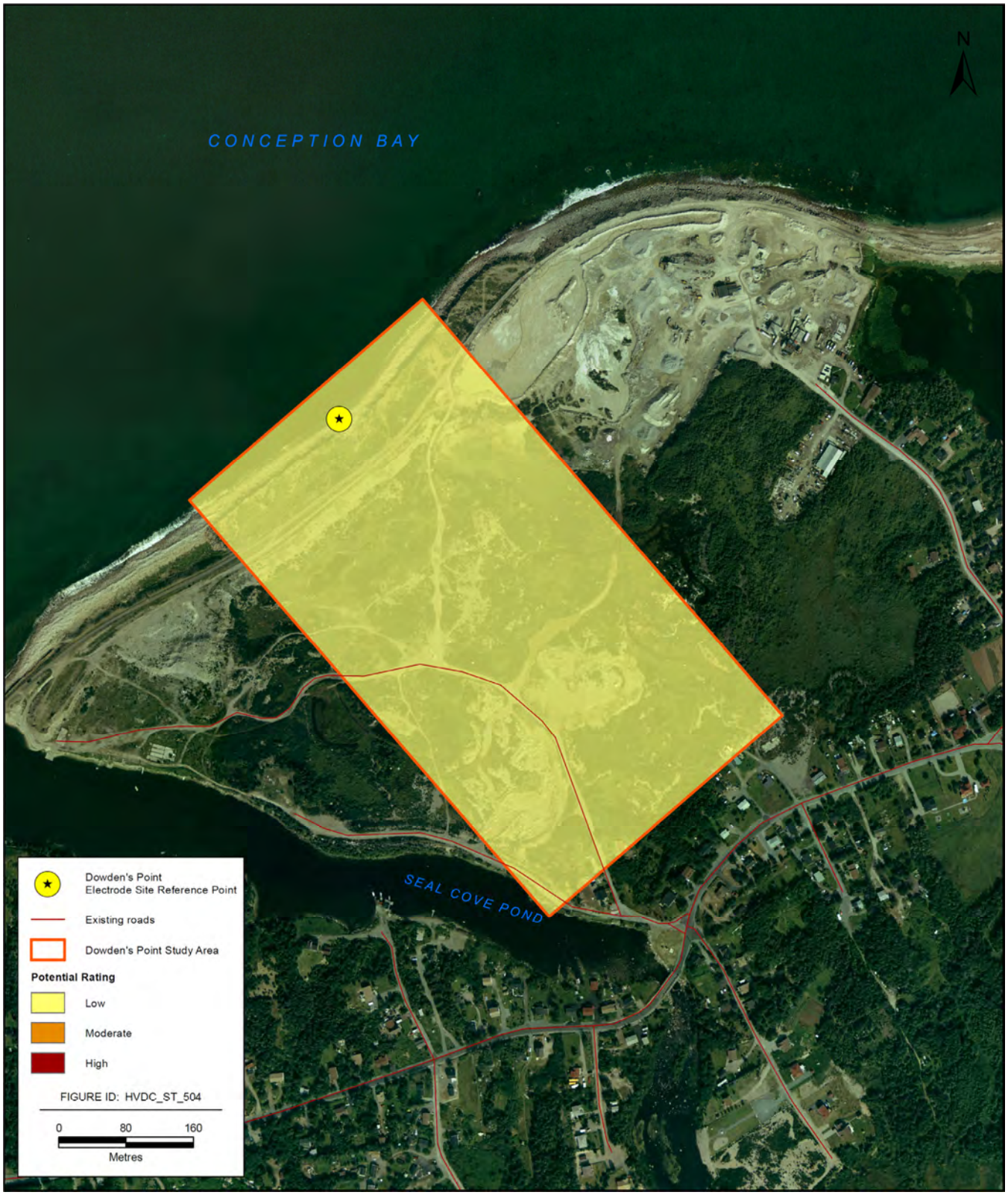
Subsurface testing in undisturbed tuckamore and along an historic vegetable garden yielded negative results. However, this undisturbed area does theoretically have potential to yield historic, and possibly even pre-contact, resources. This undisturbed area is therefore rated as having Moderate Potential for the presence of historic and heritage resources. The remainder of the Shoal Cove GFIA is either poorly-drained or extensively-disturbed. It is therefore deemed to have Low Potential for the presence of historic and heritage resources (Figure 3-7).

Figure 3-7 Shoal Cove Study Area Historic and Heritage Resource Potential

3.3.4 Dowden's Point, Newfoundland

No archaeological or contemporary sites were recorded at Dowden's Point during field assessment in 2011 and no sites had been recorded previously. There are therefore no areas of High Potential within the Dowden's Point Study Area. Extensive industrial disturbance across the entire Study Area appears to preclude *in situ* archaeological deposits anywhere within the Study Area, and there are therefore no landforms classified as Moderate Potential. The Dowden's Point Study Area is therefore classified as Low Potential for the presence of historic and heritage resources in its entirety (Figure 3-8).

Figure 3-8 Dowden's Point Study Area Historic and Heritage Resource Potential



4.0 SUMMARY

Nalcor Energy is proposing to develop the Labrador – Island Transmission Link, an HVdc transmission system extending from Central Labrador to the Island of Newfoundland's Avalon Peninsula. The proposed Project includes the installation and operation of marine cables across the SOBI, as well as shore electrodes at sites in the SOBI (Labrador side) and Conception Bay (Newfoundland). This report presents the results of detailed historic and heritage resources assessment undertaken in 2011 at the currently proposed SOBI cable landing sites at Forteau Point (Labrador) and Shoal Cove (Newfoundland), and at identified shore electrode locations at L'Anse au Diable (Labrador) and Dowden's Point (Newfoundland).

Field assessment involved compiling data on previously recorded archaeological and contemporary sites, as well as visual reconnaissance and sub-surface testing, and concluded with archaeological potential mapping. Following field assessment, four new archaeological sites were recorded at Forteau Point – three inside and one approximately 1.5 km outside the GFIA. Two new sites were recorded at L'Anse au Diable in addition to the three previously identified for that Study Area. Two new sites were recorded at Shoal Cove – one within the FSA and one just beyond the southern boundary of the GFIA. No sites were previously known for that area. No sites have ever been recorded at Dowden's Point and none were identified during assessment in 2011.

As a result of the field assessment, archaeological potential was mapped for each of the four areas. Four categories of potential have been mapped: Known Sites; High Potential; Moderate Potential; and Low Potential. Both Forteau Point and L'Anse au Diable in Labrador contain significant areas of High Potential and Moderate Potential for archaeological remains. Shoal Cove in Newfoundland contains small areas of High Potential and Moderate Potential. All of the Dowden's Point Study Area is rated as Low Potential.

These archaeological potential-mapping categories represent the relative potential of historic and heritage resources occurring at these sites.

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Labrador – Island Transmission Link

Strait of Belle Isle:
Ambient Noise and Marine Mammal Survey

Supplementary Report

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1.0 INTRODUCTION

Nalcor Energy is proposing to develop the *Labrador – Island Transmission Link* (the Project), a High Voltage Direct Current (HVdc) transmission system extending from Central Labrador to the Island of Newfoundland's Avalon Peninsula.

The environmental assessment (EA) process for the Project was initiated in January 2009 and is in progress. An Environmental Impact Statement (EIS) has been prepared by Nalcor Energy, and submitted for review by governments, Aboriginal and stakeholder groups and the public. In preparation for, and support of, the Project's environmental assessment, the Ambient Noise and Marine Mammal Survey (JASCO 2011) was completed to collect and present information on ambient noise and marine mammals in the Strait of Belle Isle (SOBI). In 2010, acoustic data were recorded at three locations along or near the two identified cable crossing corridors across the SOBI: (1) off Flower's Cove, Newfoundland; (2) near the middle of the SOBI; and (3) near L'Anse Amour, Labrador. Acoustic recorders were deployed and they recorded sounds at the three locations from June to August and from September to December 2010. The purpose of this Supplementary Report is to present the findings of an acoustic recorder that was not retrieved in December 2010, but was retrieved in June 2011. The data was analyzed and is presented in this report.

2.0 APPROACH AND METHODS

For detailed information on the study approach and methods refer to JASCO (2011).

2.1 Methods

In July 2011, two JASCO personnel (Eric Lumsden and Julien Delarue) returned to the Strait of Belle Isle to search for and grapple the recorders deployed at the Labrador and Newfoundland stations that could not be retrieved on the first attempt in December 2010. With the assistance of a side-scan sonar, JASCO successfully retrieved the Newfoundland recorder on July 14. Despite nearly 10 hours of grappling, the Labrador recorder was not recovered.

The results presented in Section 3.0 focus on the data collected at the Newfoundland station from the second deployment period and complement Section 3.2 of Strait of Belle Isle: Ambient Noise and Marine Mammal Survey report (JASCO 2011). The recorder was active from September 30 until December 17, 2010.

3.0 RESULTS AND ANALYSIS

Fin whales, humpback whales, and dolphins were detected at the Newfoundland Station. The number of detection days was considerably lower than at the Middle Station, which mirrors the observations made during the first deployment (see Table 3.1 in Jasco (2011)). The calling rates are not expected to differ between these two stations due to their proximity. Therefore, the lower number of acoustic detections at the Newfoundland Station can mainly be explained by a lower occurrence of cetaceans.

Similar to the Middle Station, ambient sound levels at the Newfoundland Station during Deployment 2 were higher than during Deployment 1.

Section 3.1 discusses the marine mammal detections, and Section 3.2 describes the ambient sound levels.

3.1 Acoustic Detections of Marine Mammal Vocalizations

Acoustic vocalizations of marine mammals at the Newfoundland Station during the second deployment period September to December are presented below.

Blue Whale (*Balaenoptera musculus*)
No blue whale calls were detected at the Newfoundland Station during Deployment 2.

Killer Whale (*Orcinus orca*)
No killer whale calls were detected at the Newfoundland Station during Deployment 2.

Humpback Whale (*Megaptera novaeangliae*)
Humpback whales were manually detected over 16 days from 3 October until 16 December 2010 (Figure 1), which was the latest humpback detection of the second deployment. Comparatively, there were 39 detection days at the Middle Station during the same deployment. Detections were more isolated in time than at the Middle Station, where a continuous period of detections occurred between 10 October and 8 November.

The decrease in detections around mid-November presumably coincides with the departure of humpback whales to Caribbean breeding grounds where they aggregate in winter (Katona and Beard 1990) although some individuals remained in the SOBI well into December.

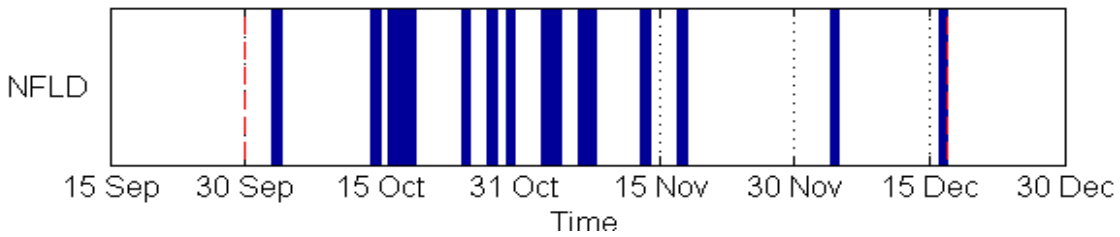

Figure 1. Occurrence of Manually Detected Humpback Calls at the Newfoundland Station, September to December 2010. Red dashed lines indicate recording start and end.

Dolphin (*Lagenorhynchus albirostris, L. acutus*)

Dolphins were detected over 14 days between 10 October and 8 December 2010 (Figure 2). Detections were relatively evenly distributed in time, except for a gap between November 12 and 23. Call counts were low as observed for the Middle Station (see Figure 3.23 in JASCO (2011)).

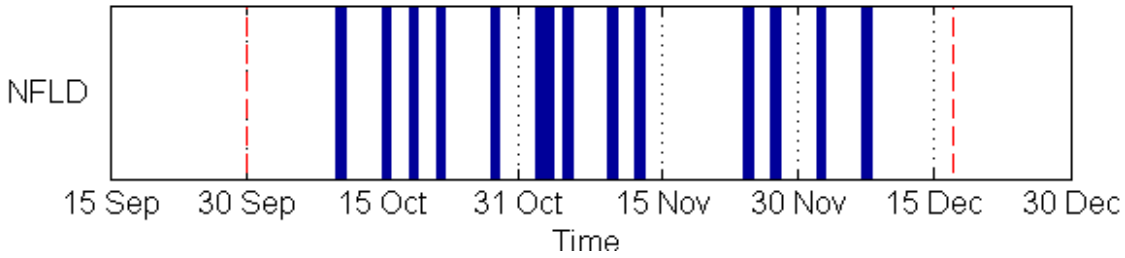

Figure 2. Occurrence of Manually Detected Dolphin Whistles, September to December 2010. Red dashed lines indicate recording start and end.

Fin Whale (*Balaenoptera physalus*)

Fin whale calls were detected on four different days between 4 October and 3 November (Figure 3). This is significantly less than at the Middle station where calls were detected on 32 days during a similar period (30 September – 8 November). Auto-detected call counts per file are shown in Figure 4. The manual detections are well matched by the auto-detections. The two peaks in auto-detections at the end of the deployment are due to impulsive, non-biological noise.

All detections consisted of songs, *i.e.*, stereotyped sequences of identical pulses separated by a constant interval (Watkins 1981). All songs were characterized by the 12-s pulse interval reported for the Gulf of St. Lawrence fin whales (Delarue *et al.* 2009). This is the same song that was detected at the Middle Station.

The automatic detections show a highly probable fin whale event on 16 November. However, a manual review of those events concluded that the impulses were not from fin whales because the onset was too impulsive and the calls did not have a downsweeping frequency modulation. Also, the spacing between the calls was too short (averaging 3 seconds), which is unlikely to be multiple (4) fin whales calling together.

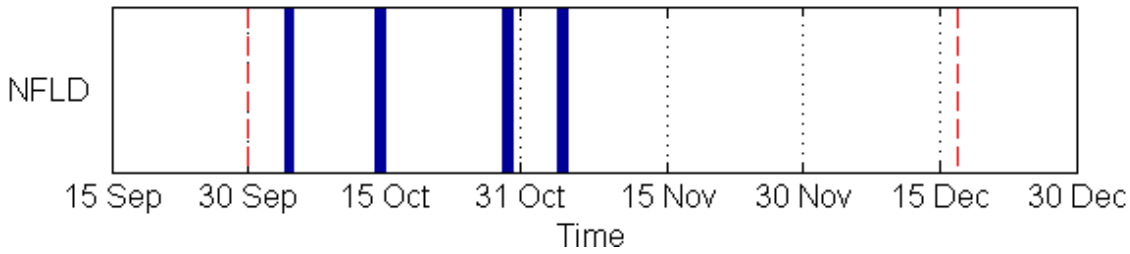

Figure 3. Occurrence of Manually Detected Fin Whale Calls, September to December 2010. Red dashed lines indicate recording start and end.

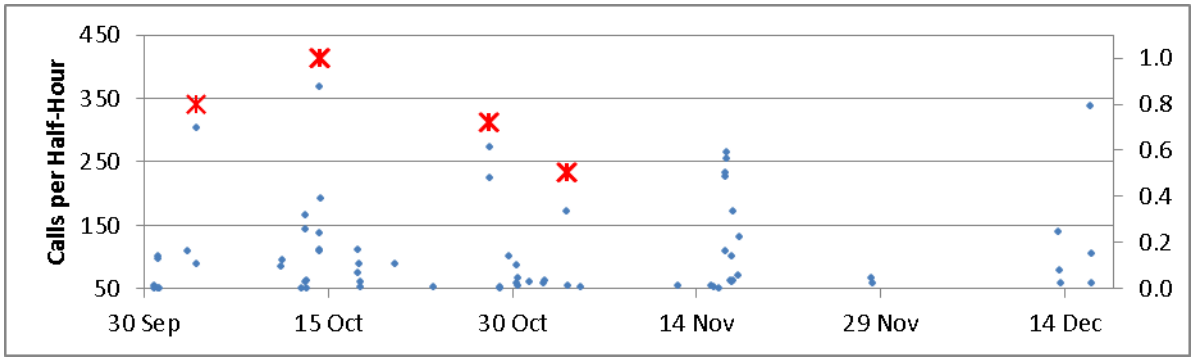

Figure 4. Fin Whale Automated Call Counts per 30-min Recording at the Newfoundland Station from September to December 2010 in the Strait of Belle Isle. The red crosses show the times at which fin whale calls were manually detected.

3.2 Ambient Sound Levels

The percentile plots of ambient sound levels are shown in Figure 5. The levels show a similar shape when compared to the summer deployment (see Figure 3.16 in JASCO 2011)). The 5th percentile is at or above limits of prevailing noise from the Wenz curves, which is expected due to fall storm activity. The remaining percentile curves are all well above the Wenz minimum limit of prevailing noise, indicating a dynamic environment near the Newfoundland Station. The 25th – 95th curves all show a rise in the range of 200 – 500 Hz which is characteristic of cavitation from shipping and boating. Similar to the Middle Station, the noise levels at the Newfoundland Station from September to December were 3-5 dB lower at frequencies up to 100 Hz, and 3-5 dB higher above 100 Hz, compared to the June to August deployment.

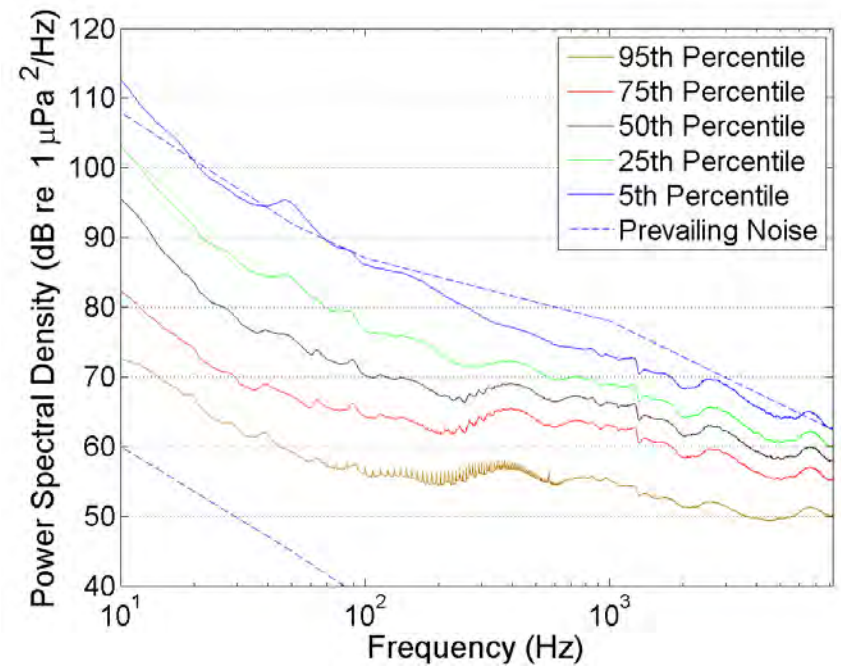

Figure 5: Percentile Plot of Ambient Sound Levels, Newfoundland Station, September to December 2010.

Figure 6 contains the band level plots for the Newfoundland Station for September to December 2010. The regular peaks in the 10 – 8192 and 10 – 100 Hz bands are attributed to tidal flow increasing noise levels. Similar to the summer period, the lunar variations in tidal flow can be seen to increase the noise levels approximately every two weeks (peaks October 5, October 20, November 6, November 21, December 6).

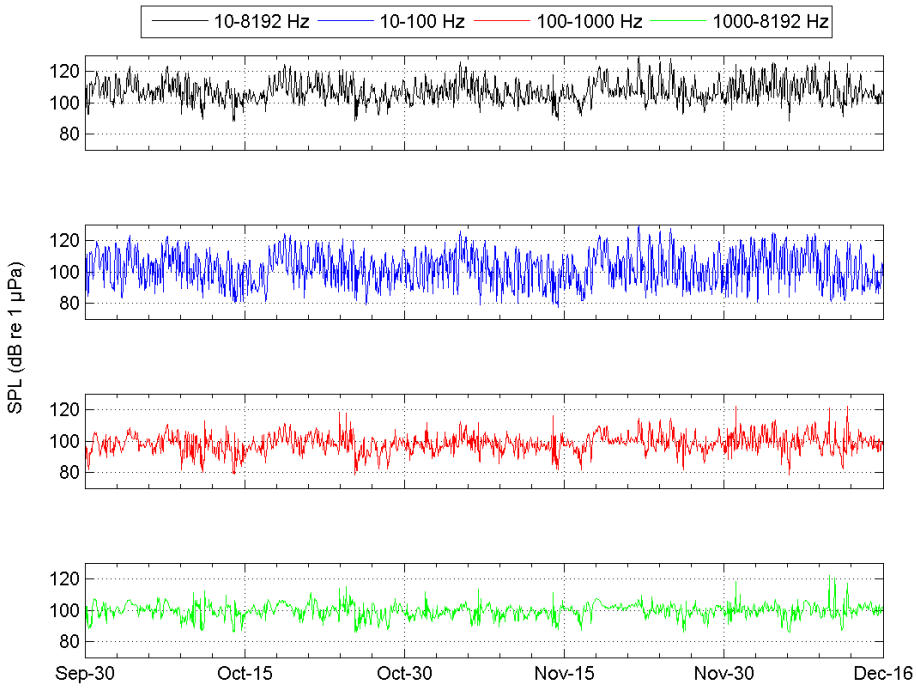

Figure 6: Band-level Ambient Noise Plots for Newfoundland Station, September to December 2010.

The spectrogram plot in Figure 7 shows the same daily and bi-weekly variations seen in Figure 6. The majority of the tidal noise is constrained to 100 Hz and below.

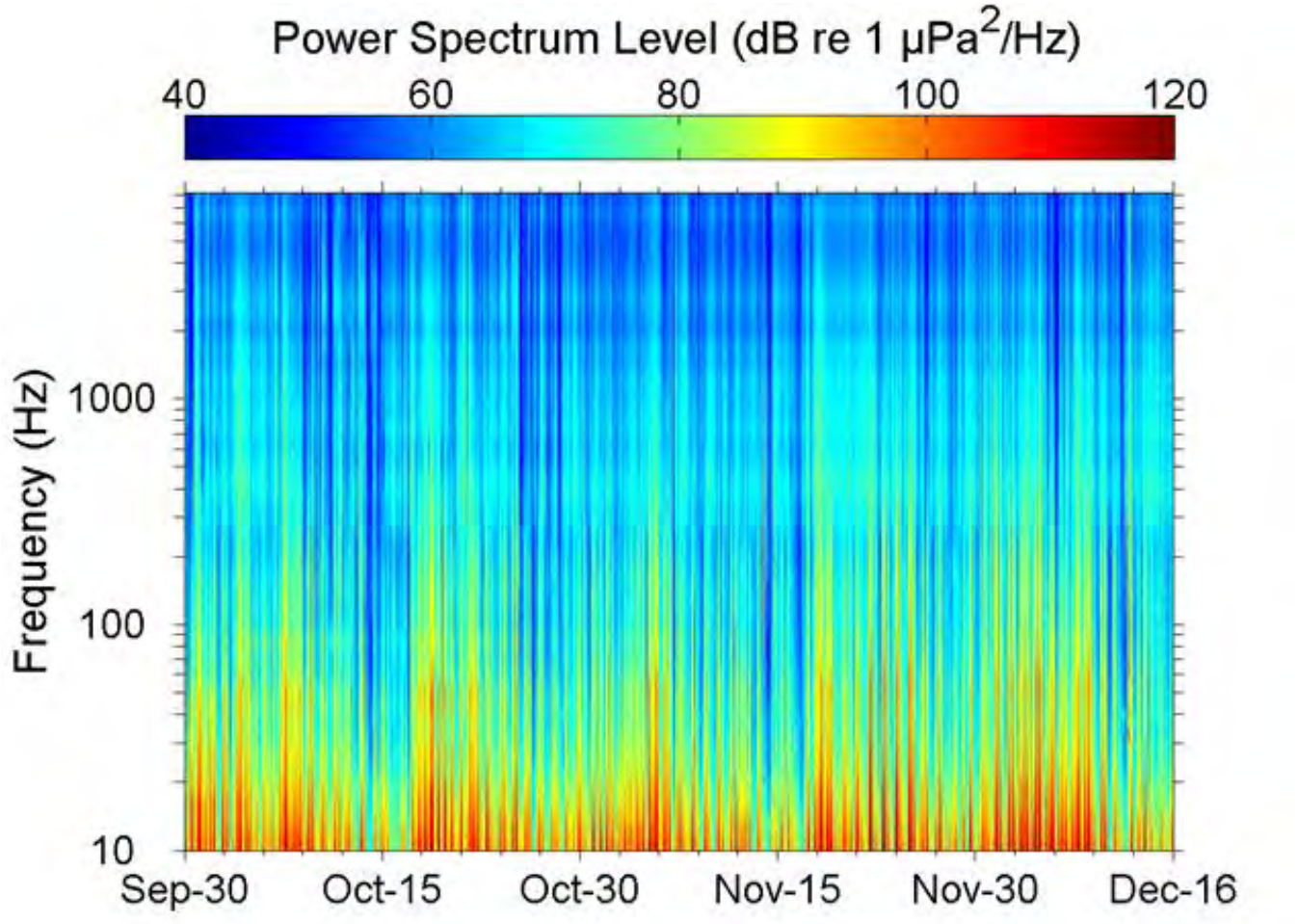

Figure 7: Spectrogram Plot of Ambient Noise Levels, Newfoundland Station, September to December 2010.

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