7.0 CABOT STRAIT

7.1 SPECIES OF CONSERVATION INTEREST

The SOCI VEC for the Cabot Strait refers to those wildlife species that live at least part of their life cycle in the Cabot Strait, including the coastal environments of NS or NL, and that have been identified by federal or provincial laws and regulations as being "Endangered," "Threatened," "Vulnerable," or of "Special Concern," or listed by COSEWIC. The assessment of SOCI includes all such species, and their habitats, that could potentially be found within the vicinity of the Study Area and could potentially interact with the Project.

SOCI were collectively selected as a VEC because of the specific regulatory requirements of *SARA* and provincial endangered species laws and regulations. SOCI require special attention during the environmental assessment process as populations may be more sensitive to anthropogenic stressors than secure or non-threatened species. SOCI are also important indicators of ecosystem health and regional biodiversity, are of intrinsic value to the public and may have socio-economic value (*e.g.,* tourism related to whale and seabird watching). Marine and coastal species not considered SOCI are assessed in other VECs, including the Commercial Fisheries VEC (Section 7.2) and Marine Environment VEC (Section 7.3). SOCI are also assessed in the NL and NS sections of the EA (Sections 6.2 and 8.2, respectively).

7.1.1 SCOPE OF ASSESSMENT

7.1.1.1 Regulatory Setting

Both federal and provincial legislation protect SOCI and their habitat. *SARA*, the Newfoundland and Labrador *Endangered Species Act* (NL *ESA*), and the Nova Scotia *Endangered Species Act* (NS *ESA*) generally protect species listed as being extirpated, endangered or a threatened as well as the residences and critical habitats of those species.

At the federal level, *SARA* seeks "to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity and to manage species of special concern to prevent them from becoming endangered or threatened." A "wildlife species" under *SARA* is "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 (a) is native to Canada; or (b) has extended its range into Canada without human intervention and has been present in Canada for at least 50 years."

Key provisions protecting SOCI under *SARA* include:

- S. 32(1): "No person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species."

- S. 32(2): "No person shall possess, collect, buy, sell or trade an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species, or any part or derivative of such an individual."
- S. 33: "No person shall damage or destroy the residence of one or more individuals of a wildlife species that is listed as an endangered species or a threatened species, or that is listed as an extirpated species if a recovery strategy has recommended the reintroduction of the species into the wild in Canada."
- For listed wildlife species that are not an aquatic species or a species of birds that are migratory birds protected by the *Migratory Birds Convention Act*, 1994, ss. 32 and 33 only apply to federal lands unless an order is made.
- A recovery plan and an action plan must be prepared for a wildlife species listed as an extirpated species, an endangered species or a threatened species. [ss. 37, 47]
- S. 58: "No person shall destroy any part of the critical habitat of any listed endangered species or of any listed threatened species — or of any listed extirpated species if a recovery strategy has recommended the reintroduction of the species into the wild in Canada — if (a) the critical habitat is on federal land, in the exclusive economic zone of Canada or on the continental shelf of Canada; (b) the listed species is an aquatic species; or (c) the listed species is a species of migratory birds protected by the *Migratory Birds Convention Act*, 1994."

  "Critical habitat" in *SARA* means "means the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species."
- The prohibitions in ss. 32 and 33 only apply to federal lands unless an order is made for listed wildlife species that are not an aquatic species or a species of birds that are migratory birds protected by *the Migratory Birds Convention Act*, 1994.
- Section 61 provides for the protection of the critical habitat of listed endangered species and threatened species not located on federal land specified by an order.
- Protection of wildlife species not listed under *SARA* but listed by a provincial or territorial minister and their habitat on federal land is provided under ss. 36 and s. 60.
- A management plan must be prepared for a wildlife species listed as a species of special concern and its habitat. [s. 65]

A person may, however, be authorized by an agreement or a permit under s. 73 (or under another Act of Parliament or provincial legislation) to engage in an activity affecting a listed wildlife species, any part of its critical habitat, or the residences of its individuals provided that certain conditions are satisfied.

Ministerial notification is required under s. 79 if a project is likely to affect a listed wildlife species or its critical habitat. The person required to notify the minister must identify the adverse effects of the project on the listed wildlife species and its critical habitat and, if the project is carried out, must ensure that measures are taken to avoid or lessen those effects and to monitor them. The measures must be taken in a way that is consistent with any applicable recovery strategy and action plans.

ENL does not anticipate that any approvals under *SARA* will be required for marine species. Furthermore, no critical habitat of any endangered or threatened species has been identified in the Project area within the Cabot Strait.

Species listed in Schedule 1 of *SARA* will nevertheless be considered in this EA, and mitigation measures will be identified and carried out where there may be an interaction between a SOCI and the Project.

Migratory birds in general, including SOCI, are protected federally under the *MBCA*, which is administered by EC. The *MBCA* and Regulations provide protection to all birds listed in the CWS Occasional Paper No. 1, "Birds Protected in Canada under the *Migratory Birds Convention Act*". The Act and associated Regulations state that no person may disturb, destroy, or take/have in their possession a migratory bird (alive or dead), or its nest or eggs, except under authority of a permit. Migratory birds protected by the Act generally include all seabirds, except cormorants and pelicans, all waterfowl, all shorebirds, and most landbirds (birds with principally terrestrial life cycles) (EC 2012d).

Aquatic organisms in general, including SOCI, are protected federally under the *Fisheries Act*. The *Fisheries Act* and Regulations provide protection to all aquatic organisms in habitats defined as fish habitat, which includes spawning grounds and any other areas, including nursery, rearing, food supply and migration areas, on which fish depend directly or indirectly in order to carry out their life processes.

Key provisions protecting SOCI under the NL *ESA* include:

- S. 16(1): "A person shall not disturb, harass, injure, or kill an individual of a species designated as threatened, endangered or extirpated."
- S. 16(2): "A person shall not capture, possess, buy, sell or trade a specimen of a species designated as threatened, endangered or extirpated or part of it or anything derived from it."
- S. 16(3): "A person shall not disturb or destroy the residence of an individual of a species designated as threatened, endangered or extirpated."
- An area of land may be protected as "recovery habitat" and "critical habitat" for species designated as vulnerable, threatened, endangered or extirpated under s. 28.

A recovery plan must be prepared for species designated as threatened, endangered or extirpated whereas a management plan must be prepared for a species designated as vulnerable. Recovery and management plans are put in place to support and/or facilitate the recovery of the species. NLDEC coordinates the conservation and recovery of listed species.

The Minister may issue a permit to a person under s. 19 to engage in an activity affecting a designated species, the residence of a specimen of a designated species or critical or recovery habitat when certain prescribed conditions are met."

Similar protection exists under the NS *ESA*. Key provisions protecting SOCI under the NS *ESA* include:

- S. 13(1): "No person shall:

(a) kill, injure, possess, disturb, take or interfere with or attempt to kill, injure, possess, disturb, take or interfere with an endangered or threatened species or any part or product thereof;

(b) possess for sale, offer for sale, sell, buy, trade or barter an endangered or threatened species or any part or product thereof;

(c) destroy, disturb or interfere with or attempt to destroy, disturb or interfere with the specific dwelling place or area occupied or habitually occupied by one or more individuals or populations of an endangered or threatened species, including the nest, nest shelter, hibernaculum or den of an endangered or threatened species;

(d) contravene any regulation made with respect to a core habitat; or

(e) contravene an order made pursuant to Section 18."

> "Core habitat" means "specific areas of habitat essential for the long-term survival and recovery of endangered or threatened species and that are designated as core habitat pursuant to Section 16 or identified in an order made pursuant to Section 18."

- A recovery plan for species listed as endangered or threatened must be prepared. [s. 15(1)]
- A management plan for species listed as vulnerable must be prepared. [s. 15(10)]
- S. 18(1): "Where an endangered or threatened species is listed on a precautionary basis pursuant to Section 11, the Minister may make such order as, in the opinion of the Minister, with the advice of the Group, is necessary to control, restrict or prohibit activities that may adversely affect the endangered or threatened species, including activities that may adversely affect the core habitat of the endangered or threatened species."

The conservation and recovery of species assessed and listed under the NS *ESA* is coordinated by NSDNR (Wildlife Division).

7.1.1.2 Selection of Environmental Effects and Measurable Parameters

The environmental assessment of SOCI is focused on changes that would directly or indirectly affect a species at the population level. This environmental effect was chosen based on regulatory requirements as well as public concern regarding the at-risk status of these species.

The Project has the potential to affect SOCI through changes in their abundance, as well as the quantity and quality of their habitat, which could lead to a reduction in regional biodiversity. The specific concerns are habitat loss, degradation and/or avoidance of habitat by SOCI, as well as loss of individuals, which collectively could result in population decline. These effects could occur at any life stage, (*i.e.*, eggs, larvae, or adults).

The measurable parameters used for the assessment of the environmental effects presented above, and the rationale for their selection are provided in Table 7.1.1. The selection was based on professional judgment of the Study Team. The measurable parameters have a clear unit of measurement and are indicative of parameters that are important to SOCI populations.

Table 7.1.1 Measurable Parameters for Species of Conservation Interest

Environmental Effect	Measurable Parameter	Rationale for Selection of the Measurable Parameter
Change in SOCI Populations	Change in Habitat	• Interactions between the Project activities and areas used by SOCI could affect SOCI populations where they overlap.
	Change in Mortality Risk	• An increase in mortality could have an effect on the sustainability of endangered, threatened, and special concern (vulnerable) populations of SOCI.

7.1.1.3 Temporal and Spatial Boundaries

The temporal boundaries for the assessment of the potential environmental effects of the Project on SOCI include the periods of construction, and operation and maintenance. The effects will be greatest during construction, when ground work causes the majority of disturbance. Operation and maintenance would have the least potential to create adverse environmental effects on SOCI.

Construction of the Project will be carried out over approximately three years; however, the subsea cables will be deployed over a period of 2-3 months in 2016 within this broader construction window. Operation would begin following the completion of construction and will continue for the life of the Project.

The spatial boundaries for the environmental effects assessment of SOCI in the Cabot Strait are the same as for the Marine Environment VEC (Section 7.3), shown on Figure 7.1.1 and defined below.

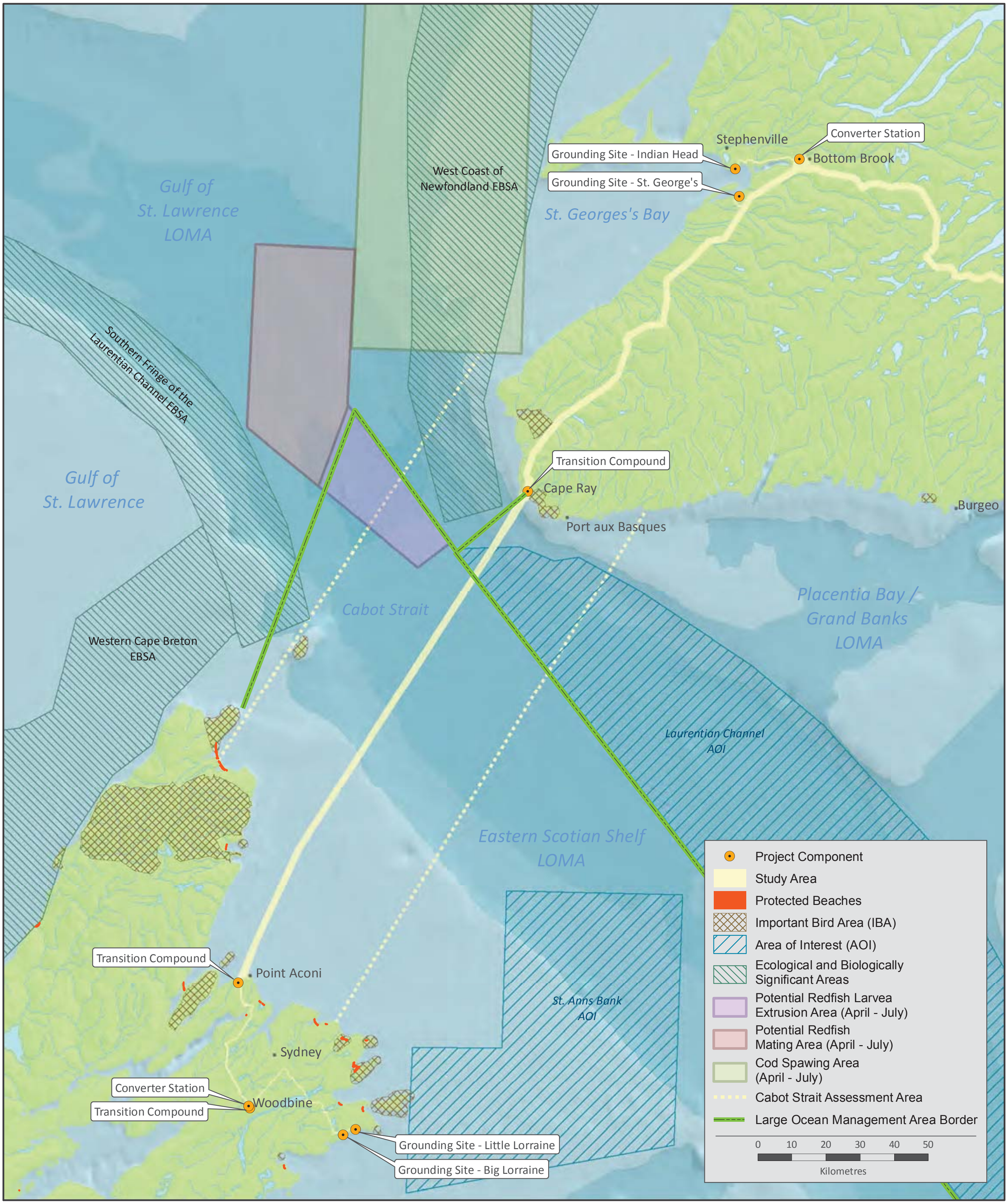
The area for the assessment of the SOCI VEC is the 2-km-wide Study Area that encompasses nearshore facilities on the island of Newfoundland side of the Cabot Strait, and extends across the Cabot Strait to NS. On the NS side, the Study Area is 500 m wide (Figure 7.1.1). The Study Area encompasses the Cabot Strait where cable deployment will take place, as well as the landfall and grounding sites in NL and NS. The Study Area is the maximum area where Project-specific environmental effects can be predicted and measured with a reasonable degree of accuracy and confidence.

The area for the assessment of cumulative environmental effects for SOCI in the Cabot Strait is defined as a 70-km-wide corridor centred on the subsea cable Study Area (Figure 7.1.1).

7.1.1.4 Threshold for Determining the Significance of Residual Environmental Effects

A **significant adverse residual environmental effect** on SOCI is defined as a Project-related environmental effect that meets any of the following criteria:

- One that results in a non-permitted contravention of any of the prohibitions stated in Sections 32 – 36 of *SARA* or in Section 16 of the NL *ESA* or Section 13 of the NS *ESA.* These prohibitions stipulate that it is an offence to kill, harm, injure, disturb, interfere with, harass, capture, buy, sell, offer for sale, barter, possess, trade, or take any individual belonging to a species that is designated as “Endangered,” “Threatened,” or “Extirpated.” Similarly, it is an offence to attempt the actions listed above, or to direct another to do them. It is also illegal to damage, disturb, or destroy the residence of an individual of an “Endangered” or “Threatened” species, or of an “Extirpated” species if reintroduction is recommended.
- One that is not in compliance with the objectives of recovery or management plans created under *SARA*, NL *ESA*, and/or NS *ESA*.
- One that alters the physical, chemical, or biological aspects of the marine habitat within the assessment boundaries, in quality or extent, in such a way as to cause a change or decline in the distribution or abundance of SOCI populations that are dependent upon that habitat, such that the likelihood of the long-term survival of those populations within the Cabot Strait and surrounding marine environments is substantially reduced as a result.
- Effects that cause direct mortality of individuals or communities such that the likelihood of the long-term survival of these SOCI populations within the Cabot Strait and surrounding marine environments is substantially reduced as a result.



Emera Newfoundland & Labrador

Coordinate System: UTM NAD 83 Zone 21

Scale: 1:1,500,000

Data Sources:
Department of Fisheries and Oceans
Department of Natural Resources
Geogratis- National Atlas

Date: 18/12/2012

FIGURE 7.1.1

Protected and Sensitive Areas
Cabot Strait

ENL065a

7.1.2 BASELINE CONDITIONS

The baseline conditions of SOCI in the Study Area were characterized using existing information and field data collected during 2011 and early 2012.

Table 7.1.2 lists those species considered within this VEC, as well as their designation under *SARA*, COSEWIC, NL *ESA* and NS *ESA*. This was determined based on an evaluation of habitat preferences, known distributions, the likelihood of occurrence in the Cabot Strait and potential for interaction with the Project. The following species are not carried forward in the assessment because it is unlikely that they would occur in the Study Area: beluga whale (St. Lawrence Estuary population), northern bottlenose whale, loggerhead sea turtle, northern wolfish, spotted wolffish, white shark, Ivory Gull, and Peregrine Falcon (anatum/tundrius subspecies).

Table 7.1.2 SOCI with Potential to Occur in the Study Area (Cabot Strait)

Common Name	Scientific Name	Designation			
		SARA[a]	COSEWIC	NL *ESA*	NS *ESA*
Marine Mammals					
Fin whale (Atlantic population)	*Balaenoptera physalus*	Special Concern	Special Concern	No Status[b]	No Status
Blue whale (Atlantic population)	*Balaenoptera musculus*	Endangered	Endangered	No Status	No Status
Beluga whale (St. Lawrence Estuary population)	*Delphinapterus leucas*	Threatened	Threatened	No Status	No Status
North Atlantic right whale	*Eubalaena glacialis*	Endangered	Endangered	No Status	No Status
Northern bottlenose whale (Scotian Shelf population)	*Hyperoodon ampullatus*	Endangered	Endangered	No Status	No Status
Harbour porpoise (Northwest Atlantic population)	*Phocoena phocoena*	Threatened Schedule 2	Special Concern	No Status	No Status
Humpback whale (Western North Atlantic population)	*Megaptera novaeangliae*	Special Concern	Not at Risk	No Status	No Status
Marine Reptiles					
Leatherback sea turtle (Atlantic population)	*Dermochelys coriacea*	Endangered	Endangered	No Status	No Status
Loggerhead sea turtle	*Caretta caretta*	No Status	Endangered	No Status	No Status
Diadromous Fishes					
American eel (catadromous)	*Anguilla rostrata*	No Status	Threatened	Vulnerable	No Status

Table 7.1.2 SOCI with Potential to Occur in the Study Area (Cabot Strait)

Common Name	Scientific Name	Designation			
Atlantic Salmon (Eastern Cape Breton pop.)	*Salmo salar*	No Status	Threatened	Not applicable	No Status
Marine Fishes					
Atlantic cod	*Gadus morhua*	Special Concern, Schedule 3	Non-active	No Status	No Status
Atlantic wolffish	*Anarhichas lupus*	Special Concern	Special Concern	No Status	No Status
Northern wolffish	*Anarhichas denticulatus*	Threatened	Threatened	No Status	No Status
Spotted wolffish	*Anarhichas minor*	Threatened	Threatened	No Status	No Status
White shark	*Carcharodon carcharias*	Endangered	Endangered	No Status	No Status
Birds					
Harlequin Duck (Eastern pop.)	*Histrionicus histrionicus pop. 1*	Special Concern	Special Concern	Vulnerable	Endangered
Barrow's Goldeneye (Eastern pop.)	*Bucephala islandica*	Special Concern	Special Concern	Vulnerable	Vulnerable
Peregrine Falcon *anatum/tundrius* subspecies	*Falco peregrinus* spp. *anatum/tundrius*	Special Concern	Special Concern	No Status	No Status
Piping Plover *melodus* subspecies	*Charadrius melodus* spp. *melodus*	Endangered	Endangered	Endangered	Endangered
Red Knot *rufa* subspecies	*Calidris canutus* ssp. *rufa*	Endangered	Endangered	Endangered	Endangered
Ivory Gull	*Pagophila eburnea*	Endangered	Endangered	Endangered	No Status

[a]*SARA* designations are within Schedule 1 unless otherwise noted
[b]NS indicates No Status
Source: *SARA* Public Registry

7.1.2.1 SOCI Information Sources

For each SOCI their status under *SARA*, NL *ESA*, NS *ESA,* and COSEWIC were determined through a review of the following sources:

- SAR Public Registry website (http://www.sararegistry.gc.ca/default_e.cfm);
- the NL SAR website (http://www.env.gov.nl.ca/env/wildlife/endangeredspecies/index.html);
- the NS SAR (http://www.speciesatrisk.ca/municipalities/sar_ns.htm); and
- the most recent COSEWIC status reports.

Current provincial S-ranks (sub-national, or provincial rarity or conservation status) and General Status ranks (national and provincial rankings that summarize current state and known trends in population distribution and size, and individual or habitat threats) were determined through a review of the most recently released information from the AC CDC and the CESCC, respectively (AC CDC 2012, CESCC 2011).

Primary habitat for each species, defined broadly as habitat that provides requirements for the survival of a species and/or defined critical/recovery habitat where applicable, was determined from known habitat associations and information from COSEWIC status reports, COSEWIC management plans, and other literature.

7.1.2.2 Protected and Sensitive Areas

There are two AOIs, or potential MPAs, within the Cabot Strait: the Laurentian Channel AOI and St. Anns Bank AOI. Both AOIs are located between the island of Newfoundland and Cape Breton (Figure 7.1.1). There are three LOMAs with boundaries that meet within the Cabot Strait: the Eastern Scotian Shelf LOMA; the Placentia Bay/Grand Banks LOMA; and the Gulf of St. Lawrence LOMA (Figure 7.1.1). These LOMAs have been established to form the basis for implementation of integrated management plans, including the identification of EBSAs as one component (DFO 2009a).

Three EBSAs have been identified, all within Gulf of St. Lawrence LOMA: the Southern Fringe of the Laurentian Channel; West Coast of Newfoundland; and Western Cape Breton (Figure 7.1.1) (DFO 2009b). The Study Area does not cross any of the EBSAs.

There are three sensitive marine areas located near the Study Area (Figure 7.1.1). These include: a cod spawning area; a potential redfish (*Sebastes* sp.) larvae extrusion area; and a potential redfish mating area (LGL 2005, LGL 2007). The cod spawning area is located west of the Port-au-Port Peninsula and is closed to groundfish fishing between April 1 and June 15. This area was originally established in 2002 and later resized (LGL 2007). Redfish mate during the fall (September to December), and have a larvae extrusion period extending from April until July. Two areas of the Cabot Strait, northwest of the Study Area, have been identified as sensitive due to the habitat requirements of redfish for these parts of the species' lifecycle. The Study Area does not cross any of these sensitive marine areas.

7.1.3 POTENTIAL PROJECT-VEC INTERACTIONS AND ENVIRONMENTAL EFFECTS

7.1.3.1 Potential Project-VEC Interactions

Table 7.1.3 lists potential interactions between SOCI and Project activities and physical works and ranks each effect as 0, 1, or 2 based on an assessment of the level of risk at the population level. Interactions ranked as 0 or 1 are discussed below, while those ranked as 2 are carried forward in the assessment.

Table 7.1.3 Potential Project Environmental Effects to SOCI in (Cabot Strait)

Project Activities and Physical Works	Potential Environmental Effect
	Change in SOCI Populations
Construction	
Grounding Facilities	2
Subsea Cables	2
Operation	
Subsea Power Transmission	2
Power Conversion	1
Maintenance	
Regular Inspection	1
Repair to Infrastructure	1
KEY 0 = No interaction. 1 = Interaction occurs; however, based on past experience and professional judgment, the resulting effect can be managed to acceptable levels through standard operating practices and/or through the application of best management or codified practices. No further assessment is warranted. 2 = Interaction occurs, and resulting effect may exceed acceptable levels without implementation of specified mitigation. Further assessment is warranted.	

No interactions with Project activities or physical works have been ranked as 0.

Operations activities associated with power conversion have the potential to interact directly with individuals and are ranked as 1.

During bipole operations the current flowing through the grounding facility is less than 1% of the current associated with monopole operation (100% of a single circuit current or approximately 1250A flowing through the grounding sites). EMFs produced in each mode of operation are proportional to the current flow. The system operates in the bipole mode most of the time and the associated grounding facility magnetic and electric fields in this mode are negligible.

Monopole system operations are expected to be infrequent and occur over short time periods, with an annual expected duty ranging between 40 and 120 hours. Monopole operations may occur following scheduled outages for maintenance or in the event of forced outages and equipment failure (*e.g.,* lightning strikes). In the case of failure, power transmission will occur across one pole or circuit at 50% capacity and the grounding site would be used temporarily to provide a current return path to ground. The metallic switch design feature provides a mechanism for an out-of-service conductor to be used as a metallic return, thereby reducing the extent of monopole grounding site operations.

Maintenance activities are rated as 1 as activities associated with inspection and repair of the subsea cables and grounding sites are expected to be infrequent, short in duration, and site-specific. As a result of project planning and design, the choice of materials, and the nature of the infrastructure, frequent repair of the subsea cables and/or the grounding site structures is not anticipated. Infrastructure inspection (*e.g.*, ROV surveys of the subsea cables) will occur at regular but infrequent intervals, likely on an annual schedule at the onset of Project operation and decreasing thereafter to once every few years. Inspections will also likely occur if there is a problem with power transmission in the subsea cables or at the grounding sites, and possibly after a severe storm. Vessels used for inspection purposes are expected to travel at reduced speeds during the ROV surveys and will adhere to the mitigation and requirements presented in Section 2.6.7. Habitat disturbance associated with ROV use has the potential to affect the marine environment, however, this will be intermittent, localized and of short duration. Potential emissions from HVdc subsea cables include electric and magnetic fields. Potential Project-VEC interactions with these emissions as well as with respect to vessel collisions (related to maintenance) are described in the following subheadings.

Any increase in ship traffic related to maintenance of the subsea cables will be negligible compared to current activity in the Cabot Strait. The potential for collisions with marine mammals will be mitigated by the relatively slow speed of vessels towing ROVs during inspection activities. Maximum vessel transit speed is expected to be approximately 19 km/hr (10 knots) (refer to Sections 2.6.6.1 and 2.8). This speed is less than a threshold speed of 26 km/hr (14 knots) below which serious injuries to whales will not likely occur (Vanderlaan and Taggart 2007). Furthermore, maintenance activities involving repairs to the cables would be infrequent, of short duration and localized.

In consideration of the nature of the interactions and the planned implementation of proven mitigation, as well as the limited spatial scale of potential effects relative to SOCI distribution and habitat, the potential environmental effects on SOCI from all Project activities and physical works that were ranked as 1 in Table 7.1.3 are rated not significant, and are not considered further in the assessment.

7.1.3.2 Potential Environmental Effects

Construction

The installation of subsea cables and construction of shoreline facilities have the potential to affect habitat of SOCI, or interact directly with individuals with the resultant potential for mortality. These interactions have therefore been ranked as 2 in Table 7.1.3 and are discussed further in this section.

SOCI selected for assessment include marine mammals (fin, blue, humpback, and North Atlantic whales), a marine turtle (leatherback), marine fish (Atlantic codand Atlantic wolffish), and marine and coastal birds (Barrow's Goldeneye, wintering/migrating populations of Harlequin Duck, Piping Plover and migrating population of Red Knot *rufa* subspecies.

<u>Grounding Facilities</u>

Preparation of the seabed during construction of the grounding facilities will not involve sidecast of materials or result in disposal of materials at sea. Potential effects will be mitigated by adhering to the requirements of the *Fisheries Act.* If the leveling of the seabed or dredging and infilling (*i.e.*, rock berms at the grounding sites) activities constitute a HADD, pursuant to Section

35(2) of the *Fisheries Act*, a habitat compensation plan may need to be developed in accordance with the DFO *Policy for the Management of Fish Habitat* and the no-net-loss guiding principle.

At the grounding sites a change in TSS may occur during dredging and leveling of the seabed, and during construction of rock berms. These activities will likely create a near-bottom turbidity plume comprised of fine silts and clays, which will be mitigated with the use of silt curtains. TSS levels vary naturally in coastal marine environments with lowest levels occurring calm conditions and increasing during periods of high rainfall as the wind and rain mixes the water column (Birch and O'Hea 2007). The effects of re-suspension of fine substrate in the water column and the associated decrease in water quality are anticipated to be low in magnitude, localized in geographic extent, short in duration, and reversible.

<u>Landfall Activities (HDD and cable pulling)</u>

There is some potential that activity at landfall locations on both sides of the Cabot Strait that may disrupt Piping Plover. In Newfoundland, critical habitat for this species is located on the eastern edge of the Study Area, at Cape Ray Beach within J.T. Cheeseman Provincial Park, approximately 1.7 km northeast of the landfall site (Figure 2.6.4) (EC 2012e). Piping Plovers were last recorded by the AC CDC at this site in 2003 (AC CDC 2012).

In NS, Piping Plovers may use the sand beach adjacent to the Point Aconi Generating Station, and within the Study Area, as a stop-over during fall migration. Although this beach is not considerd critical habitat it is located immediately adjacent to landfall activities. The closest identified critical habitat for Piping Plover in Cape Breton is approximately 18 km east of the Project Area, at Dominion Beach Provincial Park.

As discussed in Section 2.6, HDD will take place at both landfall locations. Additional activities will include cable pulling and burying the land cable that runs to the transition compounds. Due to the nature and duration of activity, HDD has the greater potential for interactions with SOCI as it involves the establishment of a drill pad, and drilling for a period of 8 to 12 months. Cable installation involves pulling the cable through the borehole to surface on land utilizing a hydraulic winch system anchored onshore.

In addition to initial clearing and construction of the drill pad, noise and lights during drilling operations have the potential to create a sensory disturbance to wildlife, such as Piping Plover, in adjacent undisturbed habitats. Wildlife may vacate areas in close proximity to the source of disturbance, or important functions such as foraging, breeding or rearing of offspring may be impaired. These effects can extend several hundred metres into the surrounding undisturbed habitat. For example, terrestrial bird monitoring studies conducted during the construction phase of the Confederation Bridge (Jacques Whitford 1997b) revealed that bird abundance was reduced by up to 35% within 200 m of a road construction site while the number of birds exhibiting evidence of successful breeding activity was reduced by up to 56%. This study noted that although the avifaunal community was not substantially changed as a result of exposure to sensory disturbance, certain species were more sensitive to disturbance than others.

Under certain conditions, such as nights with fog or mist, migrating birds may be attracted to and collide with lights or nearby structures, or circle around the lights until they become exhausted, making them easy prey for predators. Various factors affect the level of attraction to lights including intensity, spectral characteristics and the manner in which lights are placed in the environment. Typically more intense lights are more attractive to birds (Jones and Francis 2003).

Although critical habitat for Piping Plover has been identified on the western end of the Study Area, at Cape Ray Beach within J.T. Cheeseman Provincial Park (EC 2012e), this beach is approximately 1.7 km northeast of the landfall site location (Figure 2.6.4). The distance from the landfall activities, and implementation of mitigative measures towards noise will address potential effects on Piping Plover in this area. Although the landfall activities will occur directly adjacent to the beach used by Piping Plovers in Point Aconi, the beach is not considered critical habitat. Furthermore, the continuous operation of an active industrial site, the Point Aconi Generating Station, immediately adjacent to the beach, on the eastern side, has not precluded the site from being used as a migratory stop. Some avoidance may occur but it is expected that the beach will remain as a fall migratory stopover. In recognition of protection measures for Piping Plover, ENL will engage applicable regulatory departments following confirmation of Project design and schedule, and in advance of construction activities, to review final details and determine if additional mitigation programs are required. Noise is therefore not considered an issue of concern for landfall activities.

Interruption of long-shore transport of sediment through coastal development activities could also have a detrimental effect on Piping Plover if sand deposits to beaches in the Cape Ray area are affected. Installation of the cables in the nearshore, by HDD methods, will mitigate potential effects on sensitive coastal habitats including nearby beaches. Sediment transport and effects on Piping Plover critical habitat are therefore not an issue of concern. Since construction activities will avoid the sand beach adjacent to the Point Aconi Generating Station, there is no potential for interaction with Piping Plover.

If construction occurs during the winter season in ice-free areas near the Study Area at Cape Ray or the Point Aconi Generating Station, there is potential for interaction with SOCI waterfowl such as Barrow's Goldeneye and Harlequin Duck. This could result in displacement of birds for the duration of construction to adjacent ice-free areas with suitable habitat. However, the Management Plan for Harlequin Duck (EC 2007) notes that wide distribution of this species across eastern North America is an indicator that other habitat is available for this species. It is therefore expected that the species will make use of other nearby habitat until sensory disturbances have passed. The limiting factors and threats to Barrow's Goldeneye are not habitat loss or disruption, but rather risk of being limited by oil spills and bioacculmulation of environmental contaminants because the species congregates in relatively small geographic areas in important shipping corridors, and hunting on wintering grounds (Schmelzer 2006). As these are the main limiting factors, and because only a small number of birds have been documented at six sites in Newfoundland (Traytown Bay, Port Blandford, Spaniard's Bay, St. Mary's Bay, Stephenville Crossing and at the mouth of the Humber River near Corner Brook) (Schmelzer 2006), it is unlikely that Project activities will negatively affect populations.

Red Knot has some potential for frequenting the area from Cape Ray Beach to Grand Bay West during the species' southward migration in the fall (Garland and Thomas 2009, AC CDC 2012). The primary goal of the Red Knot Recovery Team in Newfoundland and Labrador is to ensure that there is sufficient habitat to support individuals during migration (Garland and Thomas 2009). Since Project activities will not destroy habitat, losses to migratory birds will not occur. However ENL is aware that disturbance from humans and development is also a concern for this species and for this reason and in recognition of additional protection measures associated with other SOCI (*i.e*., Barrow's Goldeneye, Harlequin Duck), ENL will engage applicable regulatory departments following confirmation of Project design and schedule, and in advance of construction activities, to review final details and determine if specific mitigation programs are required. Furthermore, ENL is willing to share information on opportunistic observations and sightings of these bird species to assist in gaining more insight into these populations.

No other bird SOCI have nesting habitat or are known to occur within the Study Area at the landfall locations (AC CDC 2012) or have been observed during coastal migration and shoreline surveys conducted for the Project to date.

<u>Vessel Collisions</u>

Installation of the subsea cables will require the operation of a moderately large vessel(s) in the Cabot Strait. Operation of such vessels within known marine mammal SOCI habitat has the potential of causing collisions. Large, slow-moving cetacean SOCI (blue whale, fin whale, humpback whale and north Atlantic right whale) are at greatest potential risk of vessel collisions (Laist *et al*. 2001), however collisions with sea turtles, such as the leatherback, are also considered a threat to their populations. The probability of vessel collisions will vary depending on whether the construction schedule coincides with migration periods. Vessels will be moving relatively slowly (maximum vessel transit speed is expected to be approximately 19 km/hr (10 knots) which reduces the likelihood of collisions. Therefore, blue whale, fin whale, humpback whale and north Atlantic right whale as well as sea turtles are not assessed further.

Any potential ploughing and/or trenching activities of the seabed will be undertaken with a slow-moving vessel with the primary source of vessel noise being generated by propeller cavitation, which would be considerably less than a vessel travelling at higher speeds (*i.e.*, what as would be expected of regular shipping traffic crossing the Strait (*e.g.*, NS-NL ferries and vessels entering or exiting the Gulf of St. Lawrence). Furthermore, any incremental noise would be temporary in any location as the cable-laying vessel moves along the route.

Cable Installation and Protection

There may be a temporary effect on habitat for benthic or demersal SOCI from the installation of subsea cables. Habitat quality may be reduced through potential increases in turbidity due to the suspension of sediments; however, this effect will be temporary given the expected limited amount of associated sediment and short duration of disturbance at any given location. The risk of bioaccumulation of toxins in SOCI is likely low, as most of the parameters analyzed in sediments (Section 7.3) were below the limits set by the CCME Interim Sediment Quality Guidelines (ISQGs) for marine sediments and the CEPA Disposal at Sea Limits. Any adverse environmental effect associated with sediment quality would primarily affect the proximal benthic communities (including macro-benthos and macro-invertebrates).

Acoustic emissions from activities associated with the Project are not likely to induce auditory injury or auditory fatigue in any species of marine mammal within the Study Area. A small number of harbour porpoises may be locally displaced from areas within the Study Area during construction of grounding facilities. However, because the Study Area does not include important foraging or breeding habitat for this species, the health of these marine mammals is not likely to be adversely affected. This species is not considered further in this assessment.

Preparation work and cable installation involving physical disturbance of substrates, including rocky substrates with macroalgae, and coral beds used by marine SOCI such as Atlantic cod and Atlantic wolffish for spawning, could result in direct mortality of eggs.

Considering the nature of the interactions and the planned implementation of proven mitigation, as well as the limited spatial scale of the potential effects relative to marine SOCI, the potential effects of construction activities are not expected to be significant.

Operation – Subsea Power Transmission

Activities associated with operation (subsea power transmission) have the potential to interact directly with individuals and are ranked as 2 and are discussed further in this section.

SOCI selected for assessment include marine mammals (fin, blue, humpback, and North Atlantic whales), a marine turtle (leatherback), and diadromous fishes (Atlantic salmon and American eel).

Electric Fields

Direct electric fields created by the energized conductor inside the subsea cable are physically blocked and thereby mitigated by cable sheathing and armouring and as a result not have the potential to affect marine organisms. As described in Section 2.7.3, induced electrical fields are created as charged particles and marine organisms swim through the increased magnetic field. The current state of knowledge indicates, however, that there is no unequivocal evidence of adverse effects.

Magnetic Fields

The primary emission from the HVdc subsea cables will be a magnetic field. The potential for environmental effects from the magnetic field markedly decreases with increased distance from the cables. The expected magnetic field that results from a 200 kV HVdc cable is about 50 μT at 1 m from the cable (National Grid 2011) but this diminishes rapidly to less then 6 μT at 4 m horizontally from the cable, and to less than 1 μT within the range of the geomagnetic field strength, at 10 m both vertically and horizontally from the cable. This is approximately equal to the magnetic field of the earth; depending on the orientation of the cable it will either augment or detract from the natural magnetic field of the earth. The scale of this effect is extremely small relative to distribution of habitat of marine organisms within the Cabot Strait (Figure 2.7.1).

A review of recent literature on the effects of magnetic fields on marine organisms (Normandeau *et al.* 2011, Hatch Acres 2006) present some important findings, some of which are summarized below:

- While some species are thought to be able to detect the magnetic fields of HVdc cables, no studies were found that described adverse effects resulting from magnetic fields.
- There is no conclusive evidence that magnetic fields, at the levels generated by HVdc cables, cause damage at the chromosomal or cell level.
- Species that are magnetosensitive (magnetic sense life functions include orientation, homing and navigation) and likely able to detect magnetic fields primarily from DC cables include sea turtles, Atlantic salmon, American eel and bluefin tuna, some marine mammals, and some decapod crustaceans.
- Effects of magnetic fields resulting from subsea cables are limited spatially (Figure 2.7.1) and therefore pose a limited risk.

Although magnetic field effects have not been published for all species listed in Table 7.1.2, Gill and Bartlett (2010) conducted a literature review on the potential environmental effects of electromagnetic fields on three fish species of conservation importance, namely Atlantic salmon (*Salmo salar*), sea trout (*Salmo trutta*) and European eel (*Anguilla anguilla*). They noted that salmon and eels use the earth's magnetic field for orientation and navigation during migration. Sea trout juveniles respond to both the earth's magnetic field and artificial magnetic fields. On the basis of their review, current knowledge suggests that migrating eels (and possibly salmonids) may detect magnetic fields in the immediate vicinity of subsea cables, particularly in shallow waters (<20 m). They note that it is unknown whether this potential sensitivity could represent a biologically significant effect.

American eel and Atlantic salmon, both of which migrate between freshwater and marine environments, are important species in the Project Area (refer to Sections 7.2 and 7.4). From the landfall site on the NL side of the Cabot Strait the subsea cables will be buried using HDD for approximately 450 m offshore to a water depth of approximately 22 m. Similarly, from the NS landfall site, HDD will be used to bury the cables for approximately 1 km offshore to a water depth of approximately 12 m.

Limited published research exists with respect to the potential biological effects on marine mammals from magnetic fields generated by the transmission of HVdc power through the submarine cables. Other information (Normandeau *et al.* 2011), however, has not substantiated these concerns. Although magnetic fields potentially generated by the subsea cables may be detectable by cetaceans that use the earth's magnetic field for navigation during migrations through the Cabot Strait, the magnetic fields emitted are limited spatially (Normandeau *et al*. 2011). The strength of the magnetic field markedly decreases with increased distance from the cables.

The geomagnetic sense of loggerhead turtles has been studied fairly extensively including critical early life stages. There are indications that this sense is critical for primary orientation to approach the general vicinity of a destination (*e.g.*, nesting beaches, feeding grounds), but that adjustment is accomplished by using olfactory and visual cues. Hatchlings exposed to low intensity pulsed magnetic fields swam randomly compared to control animals that swam easterly. Power cables placed in the immediate vicinity of nesting beaches could affect the ability of hatchlings to swim towards nursery grounds. It is assumed that any of the sea turtle species could be affected the same way (Normandeau *et al*. 2011). However, there are no known sea turtle nesting sites in the Cabot Strait.

Even though empirical data relating to effects of magnetic fields generated by HVdc subsea cables is limited (Normandeau *et al.* 2011), mitigation is planned by trenching cables (using depth) to diminish or negate potential effects. For approximately half of the crossing, in water depths less than 200 m, the subsea cables will be buried or protected with berms, which will reduce the potential for marine species to encounter higher magnetic fields close to the cables. In water depths greater than 200 m the cables may not be buried, however, it is likely they will naturally settle in soft sediments because of their weight (30 to 45 kg/m of cable) and/or due to sediment transport on the seabed.

Considering the lack of demonstrated effects and the limited spatial extent of magnetic fields associated with 200 kV HVdc cables in the literature, and combined with the mitigations by design (*e.g.* HDD, cable protection measures), the potential effects of magnetic fields on American eel and Altantic salmon are not expected to be significant.

7.1.4 MITIGATION OF PROJECT ENVIRONMENTAL EFFECTS

Standard mitigation associated with the installation of shoreline facilities and subsea cables includes:

- Compliance with provincial and federal legislation, permits, approvals and guidelines.
- Adherence to the Project Environmental Management Plan (requirements of the EPP).

- Siting of landfalls and grounding sites to avoid bird SOCI nesting sites and fall migration feeding grounds, when feasible.
- Silt curtains may be used during dredging of the grounding site and breakwater construction to minimize the transportation of suspended sediments.
- If required, a fish capture and relocation plan will be developed to ensure the safe removal of any fish trapped within the saltwater pond created during construction of the grounding elements. This plan will be referenced as a mitigative measure and will be available to DFO for review.
- Only the amount of lighting required for safe operation of construction activities will be installed. Lights that are not necessary for a particular function will be turned off, and exterior light will be shielded from above where the need is identified. Minimal security lighting will be maintained.
- Design of the grounding sites will consider ways to minimize the footprint of in-water structures such as the breakwater (*e.g.,* materials choice, construction methods).
- Use best management practices for reducing interaction with marine birds, including:
  - vessels travelling at reduced speeds to minimize underwater acoustic emissions and collision with marine mammals and marine reptiles;
  - restriction of boat traffic to construction zone, where feasible;
  - minimizing the use of ship's whistles; and
  - restricting night lighting where practical and safe to do so.
- Vessel speeds should not exceed 26 km/hr (14 knots), where practical to reduce potential for collisions.
- Vehicle bans (under the *Motorized Snow Vehicles and All-Terrain Vehicles Act* and Regulations) will be adhered to for the beaches in the Grand Bay West to Cheeseman Provincial Park Important Bird Area (IBA) to protect nesting Piping Plovers from disturbance and destruction.
- The timing of any construction activities in the shoreline/intertidal zone will consider Harlequin Ducks, Barrow's Goldeneye, and Red Knot, which may be utilizing the area near Cape Ray for wintering or migratory stopover purposes. Following confirmation of Project design and schedule, and in advance of construction activities, ENL will engage applicable regulatory departments to review final details and determine if specific mitigation programs are required.

7.1.5 CHARACTERIZATION OF RESIDUAL PROJECT ENVIRONMENTAL EFFECTS

Project-related residual environmental effects on SOCI populations in the Cabot Strait are anticipated to occur in respect to changes in mortality risk, habitat area, and habitat quality.

The only bird SOCI identified with potential breeding habitat at the landfall sites is Piping Plover, with historic nesting sites as close as the Cape Ray Beach, within the boundaries of the J.T. Cheeseman Provincial Park, and other sites to the east. While the beach within the park will be avoided, the landfall site is within several hundred metres of this area. Piping Plovers return from wintering grounds from early to mid-May, and generally leave the breeding grounds by early August. During this time period, indirect disturbance from nearshore landfall activities could result in avoidance. Timing of activities should consider this timetable, and monitoring should occur at the site to determine if Piping Plover attempt nesting at the historic nesting sites. The recent history of nesting at the site should be determined.

The historic Piping Plover nesting area at Cape Ray, with its associated salt marshes and mudflats, is also used by a large variety of shorebirds. It is also the likely location of the few historic records of Red Knot in this region. However, given the few records of Red Knot in this area during migration, it is unlikely that nearby construction activities in the nearshore at Cape Ray will have a measureable effect on the population or result in mortality of individuals.

If activities are planned in the nearshore/coastal environment in winter, monitoring will be undertaken to determine if Harlequin Duck or Barrow's Goldeneye use the areas. If the areas have not historically had regular use by these species in winter, then the area is not likely to be important to the survival of individuals of these species, and as such, one season of avoidance is not likely to have an adverse effect on the populations.

With the application of mitigation to reduce the potential for collisions of cable-laying and associated vessels with large whales and sea turtles (*e.g.,* and leatherback sea turtles), the likelihood for a residual environmental effect of mortality, especially for the cetacean species, is low. An assessment of the likelihood of encountering these species during construction can be completed once further information on the timing and frequency of vessel passage is determined.

Behavioural avoidance of high traffic areas by marine SOCI will likely reduce the incidence of vessel strikes to individuals, but is unlikely to displace marine SOCI from important foraging habitat that may be located outside of these traffic areas (Mayo and Marx 1990, Terhune and Verboom 1999, Nowacek *et al.* 2004). Reduced foraging efficiency and increased energy expenditure as a result of behavioural avoidance are expected to be minimal.

Installation of the subsea cables in the nearshore and offshore environments is unlikely to avoid all potential spawning areas of fish SOCI such as Atlantic cod and wolffishes. Given the small footprint of the Project relative to the Cabot Strait, and the low incidence of Atlantic cod within the Study Area during field investigations to date, any mortality is unlikely to have a significant residual environmental effect on Atlantic cod populations. Unmitigated installation of the subsea cables on the slopes of the Laurentian Channel could result in mortality of Atlantic wolffish. Atlantic wolffish spawn in shallow waters in fall, and eggs/larvae may then be present on the seafloor in fall to early winter (Kulka *et al*. 2007). Given the relatively small proportion of the available habitat that would be affected, installation activities are unlikely to result in a significant residual environmental effect on any of the wolffish populations. However, the process for finalizing the cable route will include additional work to characterize specific habitats potentially affected by cable installation as part of follow-up programs and Project permitting. Project routing that potentially affects identified critical habitat (or equivalent) for listed species will be reviewed with relevant authorities to explore mitigation options, including avoidance.

Elevated levels of TSS could cause adverse changes in water quality and habitat for marine fish populations, including SOCI. Change in TSS will be limited to construction activities such as dredging, sidecasting and leveling of the seabed floor and will likely create a near-bottom turbidity plume comprised of fine silts and clays in these locations. This is less likely to occur in Atlantic wolffish habitat, which is predominately comprised of hard, rocky or clay substrates along the slopes of the Laurentian Channel.. Once construction is complete however, concentrations of TSS in the water column are expected to return to background levels. The re-suspension of fine substrate in the water column and the associated decrease in water quality during construction is anticipated to be low magnitude, localized in geographic extent, short in duration, and reversible.

Given the low baseline concentrations of toxic chemical parameters in substrate samples, the risk of acute or chronic toxicity or bioaccumulation of toxins on SOCI populations from these sediments is low and therefore residual environmental effects of Project construction on sediment quality are not anticipated.

7.1.6 SUMMARY OF RESIDUAL ENVIRONMENTAL EFFECTS

Table 7.1.4 summarizes the residual environmental effects of the Project on SOCI.

Table 7.1.4 Summary of Project Residual Environmental Effects: SOCI (Cabot Strait)

CHANGE IN SOCI POPULATIONS
Mitigation – Construction
• Compliance to provincial and federal legislation, permits, approvals and guidelines. • Adherence to the Project Environmental Management Plan (requirements of the EPP). • Siting of landfall and grounding sites to avoid bird SOCI nesting sites and fall migration feeding grounds where feasible. • Install only the amount of lighting required for safe operation of construction activities. • Design of the grounding sites will consider ways to minimize the footprint of in-water structures such as the breakwater (*e.g.,* materials choice, construction methods). • Use best management practices for reducing interaction with marine birds, including: • vessels travelling at reduced speeds to minimize underwater acoustic emissions and collision with marine mammals and marine reptiles;

Table 7.1.4 Summary of Project Residual Environmental Effects: SOCI (Cabot Strait)

CHANGE IN SOCI POPULATIONS

  - restriction of boat traffic to construction zone where feasible;
  - minimizing the use of ship's whistles; and
  - restricting night lighting where practical and safe to do so.
- Vehicle bans (under the *Motorized Snow Vehicles and All-Terrain Vehicles Act* and Regulations) will be adhered to for the beaches in the Grand Bay West to Cheeseman Provincial Park Important Bird Area (IBA) to protect nesting Piping Plovers from disturbance and destruction.
- Vessel speeds should not exceed 26 km/hr (14 knots) where practical to reduce potential for collisions with marine mammals.
- The timing of any construction activities in the shoreline/intertidal zone will consider Harlequin Ducks, Barrow's Goldeneye, and Red Knot, which may be utilizing the area near Cape Ray for wintering or migratory stopover purposes. Following confirmation of Project design and schedule, and in advance of construction activities, ENL will engage applicable regulatory departments to review final details and determine if specific mitigation programs are required.

Assessment

	Residual Environmental Effects Characteristics							
	Direction	**Magnitude**	**Extent**	**Duration**	**Frequency**	**Reversibility**	**Environmental Context**	**Significance**
Construction	Adverse	Low	Local	Short term	Regular	Irreversible / Reversible	Undisturbed / Developed	Not Significant

Follow-up

- Upon selection of the route of the subsea cable, ENL will further characterize the geophysical and biological environment potentially affected by cable laying activities to identify and minimize or avoid potential interactions with SOCI. This work will be conducted to support regulatory permit processes.

KEY

Direction:
Positive.
Adverse.

Magnitude:
Low: Change in SOCI populations that do not affect the sustainability of populations within the Study Area.
Moderate: Change in SOCI populations that affect the sustainability of populations or results in the loss of individuals within the Study Area.
High: Change in SOCI populations that affect their sustainability within the Cabot Strait, and/or results in a substantial loss of individuals.

Geographic Extent:
Local: within the Study Area
Regional: within the Cabot Strait,

Duration:
Use quantitative measure; or
Short term: During Project Construction Phase.
Medium term: Duration Operation of Project.
Long term: Duration operation Project plus 10 years.
Permanent – will not change back to original condition.

Frequency:
Occasionally, once per month or less.
Occurs sporadically at irregular intervals.
Occurs on a regular basis and at regular intervals.
Continuous.

Reversibility:
Reversible.
Irreversible.

Environmental Context:
Undisturbed: Area relatively or not adversely affected by human activity;
Developed: Area has been substantially previously disturbed by human development or human development is still present.
N/A Not Applicable.

Significance:
Significant.
Not Significant.

7.1.7 ASSESSMENT OF CUMULATIVE ENVIRONMENTAL EFFECTS

In addition to the assessment of Project-related environmental effects presented above, an assessment of cumulative environmental effects was conducted in regard to other projects and activities that have potential to interact with the Project. For this SOCI VEC, the assessment area for cumulative environmental effects is a 70-km wide corridor centred on the Study Area for the subsea cables (Figure 7.1.1). In large measure, the effects of past and existing projects are reflected in the baseline conditions against which the Project is being assessed. Table 7.1.5 identifies the potential for overlap between the Project residual environmental effects and those of other current projects or activities for which modifications or expansions are planned or underway, and future projects that can reasonably be predicted, within the assessment area. Table 7.1.5 also ranks the potential cumulative environmental effects for SOCI as 0, 1, or 2 based on the degree of interaction with other projects or activities and the potential for overlapping effects with the Project.

Table 7.1.5 Potential Cumulative Environmental Effects to SOCI Populations (Cabot Strait)

Other Projects and Activities with Potential for Cumulative Environmental Effects	Potential Cumulative Environmental Effects
	Change in SOCI Populations
Port of Sydney Dredging and Infilling	1
Donkin Export Coking Coal Project	1
Marine Atlantic Inc. Passenger Ferry between NL and NS (Trans-Canada Hwy Ferry)	1
Commercial, Recreational, Subsistence, and Traditional Fishing	1
Existing Submarine Cables	1

KEY
0 = Project environmental effects do not act cumulatively with those of other projects and activities.
1 = Project environmental effects act cumulatively with those of other projects and activities, but the resulting cumulative effects are unlikely to exceed acceptable levels with the application of best management or codified practices.
2 = Project environmental effects act cumulatively with those of other projects and activities and the resulting cumulative effects may exceed acceptable levels without implementation of Project-specific or regional mitigation.

Cumulative environmental effects associated with the physical laying of the cables are expected to be temporary and only occur during the construction phase. Increased marine traffic and temporary benthic habitat disturbance during construction may result in marine SOCI avoidance of some areas of the Cabot Strait, and a temporary loss of habitat proximal to construction activities. Once the cables have been laid there would be no more Project-related marine traffic, except during periodic maintenance. Benthic habitat disturbed by the cable-laying is also expected to stabilize and be recolonized by marine organisms after construction.

Dredging associated with the Port of Sydney developments could have a cumulative effect on fish mortality within the Cabot Strait. SOCI, including mobile pelagic and demersal finfishes, will likely avoid construction activities from these projects due to the associated noise so direct mortality will be low.

Marine construction of the proposed Donkin Export Coking Coal Project will involve construction of a barge load-out facility and installation of a trans-shipment mooring that are scheduled to begin in 2014, with marine shipping activities to commence in 2016. The installation of the marine components of the Donkin project could contribute to cumulative effects on SOCI within the Cabot Strait, primarily through the loss of habitat associated with the barge load-out facility. Increased ambient marine sound levels from construction and operation are not expected to overlap with similar effects from the Project. No cumulative environmental effects on SOCI as a result of habitat disturbance or population changes in are anticipated with respect to the Maritime Link and the Donkin project.

There could be a cumulative effect on SOCI between the Marine Atlantic ferries and Project-related ship traffic associated with the installation of the subsea cables. The adverse cumulative environmental effects could include vessel underwater noise, potential collisions with marine mammals (including species of conservation concern), potential pollution from bilge water and the accidental release of hydrocarbons.

Acoustic emissions from ongoing marine traffic in the Cabot Strait may act cumulatively with acoustic emissions from vessels serving the Project. Overall, however, the contribution of acoustic emissions from Project activities are not likely to have adverse cumulative environmental effects on marine mammal SOCI because of the relatively short period for cable laying, anticipated to be approximately three months (refer to Section 2.6) and the relatively low speed of Project vessels.

Concerns related to cumulative effects on SOCI are primarily related to the potential increase in collisions between vessels and marine mammal SOCI, particularly whales. Most marine mammal-vessel collisions occur near the surface where acoustical reflection and propagation can limit the ability of the animals to hear and locate approaching vessels (Gerstein *et al*. 2005). Injuries to stranded ship-struck marine mammals suggest that large vessels are the principal source of injury. In most cases the marine mammals were not observed prior to collision or only at the last moment. Limited data suggest that vessel speeds below 26 km/h (14 knots) (which is near the average speed of the Marine Atlantic ferries) may be beneficial in reducing collisions with marine mammals (Laist *et al*. 2001). The maximum vessel transit speed is expected to be approximately 19 km/hr (10 knots) with a cable laying speed estimated to be approximately 0.5 km/hr (0.3 knots) (refer to Section 2.6.6.1). Based on the limited number of vessels associated with the Project, and their low speed, the cumulative adverse environmental effect on marine mammal and sea turtle SOCI is predicted to be not significant.

Adverse cumulative environmental effects on the SOCI could occur from accidental hydrocarbon spills and leaks (discussed in Section 10.6) and non-sanctioned bilge water disposal. Mitigation measures include prohibition of illegal dumping of bilge water/wastewater, and the rapid containment and cleanup of hydrocarbon spills. Discharges from the Project will comply with Annex 1 of the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) and Pollution Prevention Regulations of the *Canada Shipping Act*.

Commercial fishing is ongoing within the Cabot Strait and can result in mortality of marine SOCI. These activities have potential to cumulatively interact with Project-related effects to increase the risk of changes in SOCI populations. Historically, commercial fisheries have contributed to the decrease in fish populations; in some cases to endangered levels (COSEWIC 2010a, COSEWIC 2010b). Of particular concern is the risk to SOCI populations from bycatch of non-target species. Management of commercial fisheries includes exclusion zones; limited licensing; regulated seasons; size limits; quota limits; and best management practices for the reduction of bycatch. The seasons, size and quota limits for commercial fish species are determined through scientific studies which provide the data used to determine the amount of biomass that can be sustainably harvested. Best management practices to reduce bycatch include alteration of the trawl net to allow the efficient capture of appropriately sized target species, while allowing undersized and smaller species to pass through the net. Additional mitigation measures include Turtle Exclusion Devices, Bycatch Reduction Devices, and various other deflectors that are being used in select fisheries. Recreational, subsistence and traditional fisheries likely pose less of a risk to marine SOCI due to their relatively low intensity in comparison to commercial fishing.

Fishing activity also contributes to the effects of acoustic noise on SOCI, and increases the risk of potential for collisions with marine SOCI. As noted above, the acoustic emissions from Project activities are not likely to have adverse cumulative environmental effects on marine mammal SOCI because of the relatively short duration of cable-laying activities and the relatively low speeds of Project vessels. The potential for fishing vessel collisions with marine SOCI is expected to be low given the expected speeds and relatively small size of the vessels.

There are two active submarine telecommunication cables which make landfall in NS (DFO 2005a). They are the Atlantic Provinces Optional Cable Systems (APOCS) cables which run from Aspy Bay and Sydney Mines in Cape Breton to the island of Newfoundland (APOCS 1C and 2). There are also numerous inactive subsea cables that cross the Cabot Strait, with most landing in the Sydney Mines area. The installation of the Project cables and associated marine structures will have a minor cumulative effect with respect to changes to marine benthic habitat but will have no cumulative effect on populations of marine SOCI.

Mitigation measures listed in Table 7.1.4 combined with the appropriate mitigation from the Commercial Fisheries and Marine Environment VECs will be applied to reduce the cumulative effect on SOCI populations in the Cabot Strait.

7.1.8 DETERMINATION OF SIGNIFICANCE

Project-related construction and operation activities may result in adverse environmental effects which could result in a change in SOCI populations in the Cabot Strait that could persist over the life of the Project. The potential change in SOCI populations is attributable to direct and indirect disturbance/loss of habitat and increased mortality risk. With the implementation of proposed mitigation and environmental protection measures, the environmental effect of a change in SOCI populations is predicted to be not significant.

Considering the limited overlap between the Project and other existing projects and activities, combined with the proposed mitigation measures, the residual cumulative environmental effect of a change in SOCI populations is rated not significant.

In summary, residual environmental effects and cumulative effects on a change in SOCI populations are rated not significant.

7.1.9 FOLLOW-UP AND MONITORING

Upon selection of the route of the subsea cable, ENL will further characterize the geophysical and biological environment potentially affected by cable laying activities to identify and minimize or avoid potential interactions with SOCI. This work will be conducted to support regulatory permit processes.

In recognition of protection measures for Piping Plover ENL will engage applicable regulatory departments following confirmation of Project design and schedule, and in advance of construction activities, to review final details and determine if additional mitigation programs are required.

Upon final selection of the grounding facility locations, additional work will be undertaken to further characterize the sites.

With the implementation of proposed mitigation described for the SOCI VEC, and in consideration of the residual environmental effects rating criteria, no additional monitoring is planned at this time. Additional work and/or monitoring may be required pending the results of mitigation required for the Project.

7.2 COMMERCIAL FISHERIES

Commercial fisheries are important to the local and regional economy and traditions. The marine components of the Project may interact with local inshore and offshore fisheries around Point Aconi, NS, throughout the Cabot Strait, and around Cape Ray, NL. The Project may also interact with local inshore fisheries around the grounding sites. Commercial Fisheries is considered a VEC due to the potential for interactions with the Project; regulatory protection of fish and fish habitat; the importance of the fishery to the region; and stakeholder concerns. This VEC also includes consideration of Aboriginal Communal Commercial licence holders and marine aquaculture.

This VEC is closely linked to the assessment of the Marine Environment (*i.e.*, biological effects) (Section 7.3). Effects on Mi’kmaq licence holders participating in the commercial fisheries are included in the assessment of commercial fisheries. Food, social and ceremonial fisheries are addressed in Current Use of Lands and Resources for Traditional Purposes by the Mi’kmaq of Nova Scotia (Section 8.4).

Information provided throughout this section relies on baseline research undertaken by ENL to characterize the marine environment in the Project area. The information pertaining specifically to the interests of the Mi'kmaq was derived from a study conducted by the Unama'ki Institute of Natural Resources.

7.2.1 SCOPE OF ASSESSMENT

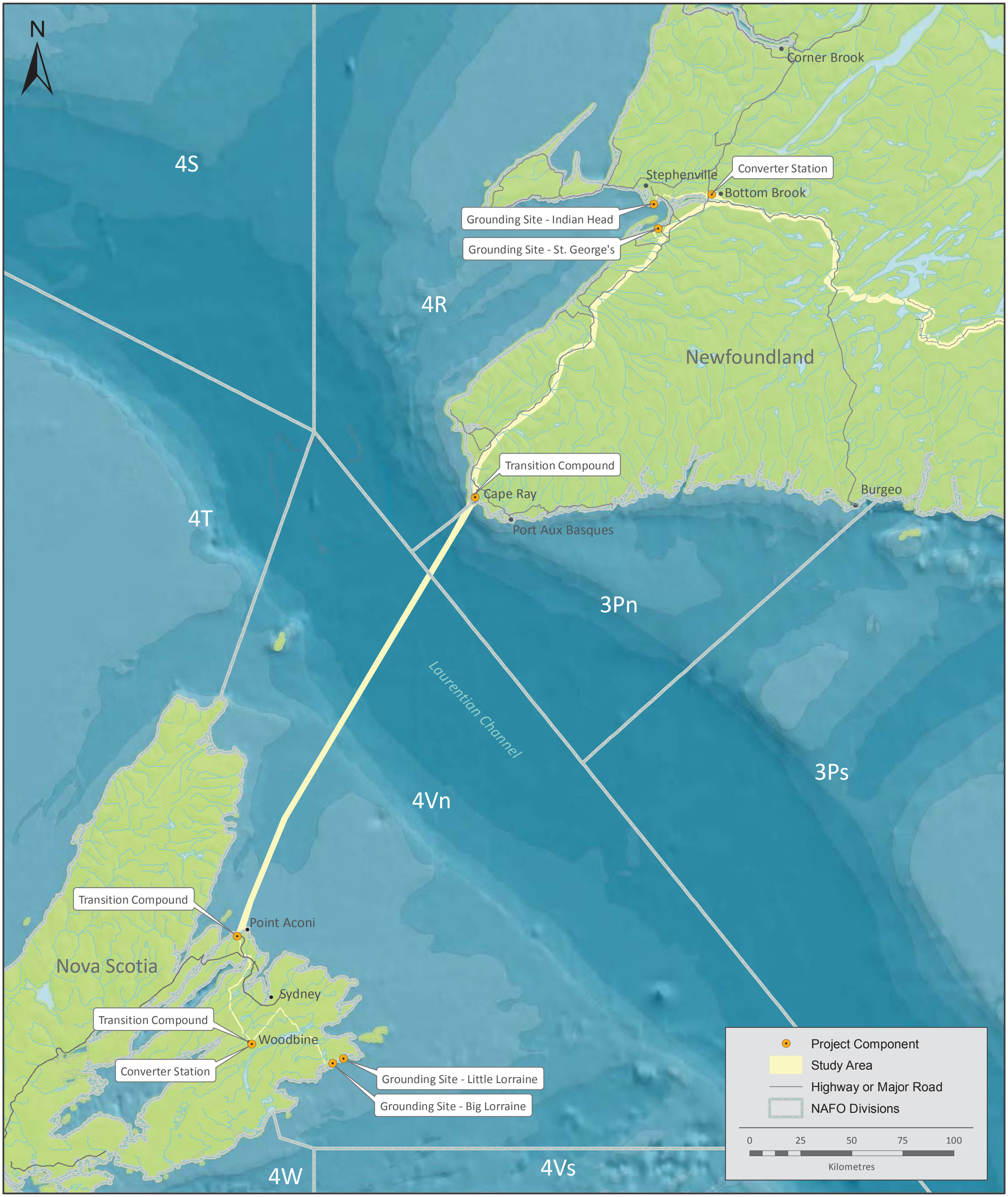
7.2.1.1 Regulatory Setting

The Project Study Area traverses Northwest Atlantic Fisheries Organization (NAFO) Divisions 4Vn, 3Pn, and 4R. Within these NAFO boundaries there are specific management areas including Lobster Fishing Areas (LFAs) and Crab Fishing Areas (CFAs). This assessment of the effects of the Project on commercial fisheries also draws upon catch records maintained by DFO for Statistical Districts 1, 4, 6, and 7 in Nova Scotian waters and Statistical Sections 39-43 for waters around the west coast of the island of Newfoundland. A summary of relevant fishing zones is provided in Table 7.2.1 and depicted on Figures 7.2.1 and 7.2.2.

Table 7.2.1 Fisheries Divisions within the Project Area

<table>
<tr><th>NAFO Fishing Division</th><th>Lobster Fishing Area (LFA)</th><th>Snow Crab Fishing Areas (CFA)</th><th>DFO Statistical Districts</th></tr>
<tr><td rowspan="4">4Vn</td><td rowspan="4">27</td><td rowspan="2">21</td><td>1</td></tr>
<tr><td>4</td></tr>
<tr><td rowspan="2">22</td><td>6</td></tr>
<tr><td>7</td></tr>
<tr><td rowspan="2">3Pn</td><td rowspan="2">12</td><td>11</td><td rowspan="2">39</td></tr>
<tr><td>OS8</td></tr>
<tr><td rowspan="4">4R</td><td rowspan="4">13</td><td>12B</td><td>40</td></tr>
<tr><td>12C</td><td>41</td></tr>
<tr><td rowspan="2">OS8</td><td>42</td></tr>
<tr><td>43</td></tr>
</table>

Provisions under the *Fisheries Act* protect fish and fish habitat including fisheries resources. The Maritime Provinces Fishery Regulations (1985) govern fishing activity in inland and adjacent tidal waters of the provinces of Nova Scotia, New Brunswick and Prince Edward Island. The Atlantic Fishery Regulations (1985) provide for the management and allocation of fishery resources off the Atlantic coast of Canada. Fish resources are managed through area closures, fishing quotas, fishing seasons and gear and vessel restrictions including, in the case of the lobster fishery a maximum number of traps permitted per licence holder (250-300). Other broad mechanisms for the protection of marine resources are provided in the federal *Oceans Act*.



Emera Newfoundland & Labrador

Coordinate System: WGS 94 Mercator

Data Sources: CEF, DFO, CHS, EDM

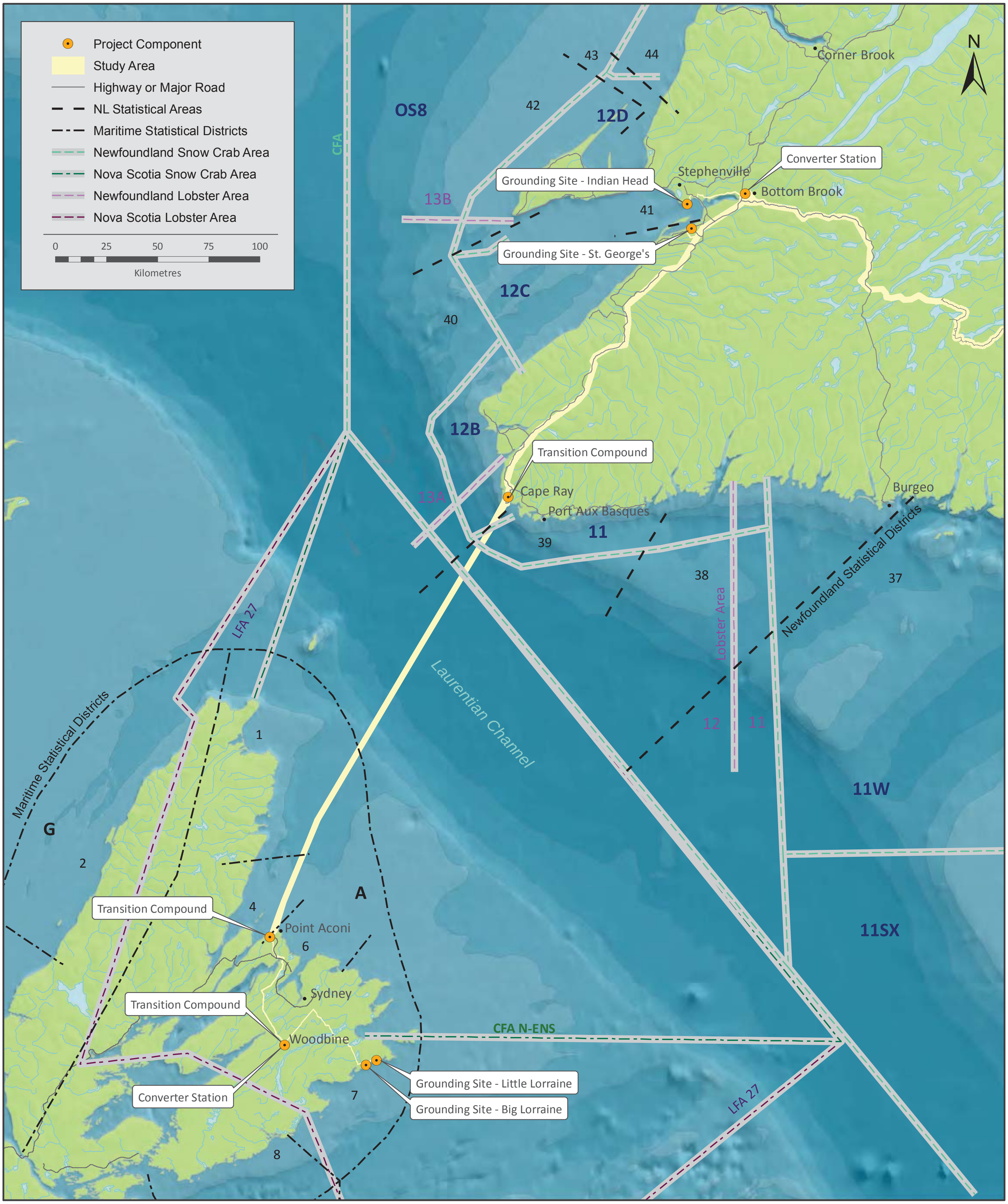
Scale: 1:2,500,000

Date: 18/12/2012

FIGURE 7.2.1

NAFO Divisons
Cabot Strait

ENL094 b



Emera Newfoundland & Labrador

Coordinate System: WGS 94 Mercator

Data Sources: CEF, DFO, CHS, EDM

Scale: 1:2,500,000

Date: 18/12/2012

FIGURE 7.2.2

Commercial Fisheries Administrative Boundaries
Cabot Strait

Note: Including Lobster Fishing Areas (LFAs), Snow Crab Fishing Areas (CFAs), and DFO Maritime and Newfoundland Statistical Districts

ENL-079 b

7.2.1.2 Selection of Environmental Effects and Measurable Parameters

The environmental assessment of commercial fisheries is focused on a change in net income of local commercial fish harvesters. Project interactions with the local fishery could potentially result in a change in net catch (*e.g.*, due to change in resource availability) or change in operating costs, both of which could affect net income of fish harvesters.

The measurable parameters used for the assessment of the environmental effects presented above and the rationale for their selection is provided in Table 7.2.2.

Table 7.2.2 Measurable Parameters for Commercial Fisheries

Environmental Effect	Measurable Parameter	Rationale for Selection of the Measurable Parameter
Change to Net Income of Local Commercial Fisheries	Change in resource availability (*e.g.*, fish mortality and/or dispersal of stocks)	• The placement of marine infrastructure may change the current fishing area that is available. This may result in a change in catch (*e.g.*, through less fishable area) or a change in operating costs (*e.g.*, increase in fuel costs and opportunity cost of labour to travel to other fishing areas) and displace local fish harvesters, potentially putting pressure on other areas for exploitation. Interference with fishing gear, navigation restrictions and constricted vessel movements can also increase operating costs. • A change in resource availability may also be related to dispersal of fish stocks as a result of construction noise and vibration and/or fish mortality. • Direct displacement of fish harvesters may occur during cable laying activities.
	Increased operating costs as a result of the Project	
	Change in available fishing area where currently fished	
	Potential conflict with fishing activities due to temporal disruption of access to fishery during construction	

7.2.1.3 Temporal and Spatial Boundaries

The temporal boundaries for the assessment of the potential environmental effects of the Project on commercial fisheries include the periods of construction and operation.

Effects on fisheries are most likely to occur within the regulated fishing seasons. Table 7.2.3 lists the key commercial fisheries and regulated seasons for major fisheries in both Cape Breton and southwestern Newfoundland. The timing of Project activities in relation to biologically sensitive periods for commercial species is addressed in the Marine Environment VEC (Section 7.3).

Table 7.2.3 Licenced Seasons for Commercial Fisheries (Cabot Strait)

Species	Area Location	Licence Season
Cape Breton		
Lobster	LFA 27	May15-July15
Rock Crab	LFA 27, 29, 30	August 15- December 31
Herring	Herring Fishing Area 17-21 (4Vn)	January 1 - December 31

Table 7.2.3 Licenced Seasons for Commercial Fisheries (Cabot Strait)

Species	Area Location	Licence Season
Mackerel	Mackerel Fishing Area 17-21(4Vn)	January 1 – December 31
Gaspereau	Coastal Fishing (4Vn)	March 14 – July 11
Snow Crab	CFA 20-22	April 16 - May 14
		July 23 - September 30
Scallops	SFA 29	September 15 - December 31
Whelk	LFA 27, 29, 30	September 15 - December 31
Sea Urchin	LFA 27	September – January
Southwestern Newfoundland		
Lobster	LFA 12	April 20 - July 30
	LFA 13	April 20 - July 5
Lumpfish	4R/3Pn	May 13 - June 12
Redfish	Unit 1 (4RST, 3Pn4Vn)	January to May
	Unit 2 (3Ps4Vs, 3Pn4Vn)	June to December
Snow Crab	CFA 11, 12B, 12C, OS8	April 5 - June 15
Squid	LFA 12, 13	July 7 - December 31
Turbot (Greenland Halibut)	4R/3Pn	April 24- December 15

Source: Penny pers. comm. 2011

The spatial boundaries for the environmental effects assessment of commercial fisheries are defined below:

- the Study Area for the assessment of commercial fisheries is defined as a 2 km wide corridor centered on the cable crossing route from the Point Aconi Generating Facility (NS) to Cape Ray (NL) (Figure 7.2.1); and
- the assessment area for cumulative environmental effects of commercial fisheries in the Cabot Strait is defined as a 70-km-wide corridor centred on the subsea cable (Figure 7.2.1).

7.2.1.4 Threshold for Determining the Significance of Residual Environmental Effects

A **significant adverse residual environmental effect** on commercial fisheries is defined as a Project-related environmental effect that results in an unmitigable or non-accommodated net financial loss to commercial fish harvesters. This may consist of a residual environmental effect that alters commercial fishing activities to an extent that results in the following outcomes:

- local fish harvesters being displaced or unable to use the areas traditionally or currently fished for all or most of a fishing season; and/or
- local fish harvesters experiencing a demonstrated net income loss for more than one year from fishing activities due to Project-related environmental effects.

7.2.2 BASELINE CONDITIONS

The Study Area incorporates two NAFO fishing areas (4Vn and 3Pn). One of the most important commercially harvested species is the snow crab; however, there are also major fisheries for lobster, rock crab, toad crab, northern shrimp, sea urchins, and sea scallops. The most abundant pelagic species found near the Study Area is Atlantic herring. Cod utilize the Sydney Bight and the slopes of the Laurentian Channel as overwintering grounds and migration routes.

Some commercial fish species are considered SOCI, which are assessed in Section 7.1.

Additional information on commercial fisheries is provided Section 4.

7.2.3 POTENTIAL PROJECT-VEC INTERACTIONS AND ENVIRONMENTAL EFFECTS

7.2.3.1 Potential Project-VEC Interactions

Table 7.2.4 ranks for each Project activity the potential effects on commercial fisheries as 0, 1 or 2 based on the level of interaction with the Project and the degree of environmental effects.

Table 7.2.4 Potential Project Environmental Effects to Commercial Fisheries

Project Activities and Physical Works	Potential Environmental Effects
	Change to Net Income of Local Commercial Licence Holders
Construction	
Grounding Facilities	2
Subsea Cables	2
Operation	
Subsea Power Transmission	1
Power Conversion	1
Maintenance	
Regular Inspection	1
Repair to Infrastructure	1

KEY
0 = No interaction
1 = Interaction occurs; however, based on past experience and professional judgment, the resulting effect can be managed to acceptable levels through standard operating practices and/or through the application of best management or codified practices. No further assessment is warranted.
2 = Interaction occurs, and resulting effect may exceed acceptable levels without implementation of specified. Further assessment is warranted.

7.2.3.2 Potential Environmental Effects

The installation of subsea cables as well as the development of the grounding facilities could potentially result in adverse environmental effects requiring mitigation; consequently these effects have been ranked as a 2, thereby requiring further assessment. Project interactions with operation and maintenance activities have been ranked as 1. Once the cables are installed, their location will be added to nautical charts, but there will be no fishing or anchoring restrictions over the cables. The cables will be buried in areas where mobile bottom fishing gear is historically most used (*e.g.*, more than 1 km offshore). Operation and maintenance of the subsea cables could potentially interact with commercial fisheries (*e.g.*, cable repair may lead to local interference with fishing activity); however, overall only minimal impacts on the marine environment and commercial fisheries are expected.

It is anticipated that the cable laying process and the construction of the grounding facilities will result in an interaction with the benthic marine community. By the use of HDD the cables will be routed underground from the landing site to emerge above the seabed within 1 km of the shoreline. Below water depths of approximately 200 m, the cables will be laid on the bottom. In water shallower than 200 m the cables will be ploughed into soft sediments or protected with a rock berm in hard substrate where they cannot be buried. Installation of the cables will result in a loss of benthic habitat and suspension of sediments and may also lead to direct mortality of non-motile benthic species within the cable path. Underwater noise and vibration may result in temporary and localized dispersion of fish stocks, thus potentially affecting catchability.

The construction of the grounding facilities in the nearshore environment may also result in a loss of benthic habitat and the suspension of sediments. Underwater noise and vibration may result in the localized dispersion of fish stocks, thus affecting catchability.

Marine construction traffic could potentially interfere with fishing gear and restrict fishing vessel navigation and fishing, particularly in the vicinity of the cable path and also at the grounding sites.

7.2.4 MITIGATION OF PROJECT ENVIRONMENTAL EFFECTS

The mitigation measures listed below will be implemented to reduce or eliminate potential adverse environmental effects on commercial fisheries:

- ENL will maintain ongoing consultation with fish harvesters during all Project phases, including cable laying operations, to reduce conflict with fishing activities; these discussions are currently underway.
- A Notice to Mariners and Notice to Shipping will be published to inform vessel operators of navigational hazards during construction and operations.
- Project vessels will comply with all applicable legislation, codes and standards of practice for safe navigation.
- Marine habitat will be protected as per mitigation described in Section 2.6.7

7.2.5 CHARACTERIZATION OF RESIDUAL PROJECT ENVIRONMENTAL EFFECTS

Cable-laying activity will be mainly concentrated within the Study Area (Figure 7.2.1) and is expected to continue for approximately two to three months. This will likely result in temporary displacement of fishing activity within local areas. A highly localized but permanent displacement of fishing activity will result from the construction of the grounding facilities. ENL will maintain ongoing consultation with fish harvesters during all Project phases to reduce conflict with fishing activities. A Notice to Mariners and Notice to Shipping will be published to inform vessel operators of navigational hazards during construction and operation. Licence holders traditionally fishing within the Study Area and within the maneuvering area of the Project vessels may be temporarily displaced as the vessels involved in laying and protecting the cables move through the area. This footprint represents a relatively small portion of NAFO fishing areas 4Vn, 3Pn, and 4R.

Ongoing consultation with the fishing community and charting of Project vessel routes during Project construction will serve to minimize the effects on navigation and interference with fishing gear.

7.2.6 SUMMARY OF RESIDUAL ENVIRONMENTAL EFFECTS

Table 7.2.5 summarizes the residual environmental effects of the Project on the commercial fisheries.

Table 7.2.5 Summary of Project Residual Environmental Effects: Commercial Fisheries (Cabot Strait)

CHANGE TO NET INCOME OF LOCAL COMMERCIAL FISHERIES								
Mitigation – Construction, Operation and Maintenance								
• Notice to Mariners and Notice to Shipping will be published to inform vessel operators of navigational hazards during construction and operations. • Project vessels will comply with all applicable legislation, codes and standards of practice for safe navigation. • ENL will maintain ongoing consultation with fish harvesters during all Project phases including cable laying operations to reduce conflict with fishing activities.								
Assessment								
	Residual Environmental Effects Characteristics							
Construction	**Direction**	**Magnitude**	**Extent**	**Duration**	**Frequency**	**Reversibility**	**Environmental Context**	**Significance**
	Adverse	Low	Local	Medium tern	Occasionally	Reversible / Irreversible	Undisturbed	Not Significant
Operation and Maintenance	Adverse	Low	Local	Permanent	Continuous	Reversible / Irreversible	Undisturbed	Not Significant
Follow-up								
• In consultation with local fish harvesters and DFO, and in NL with the Fisheries, Food and Allied Workers Union, ENL will implement a Fisheries Advisory Committee. This committee will assist in maintaining ongoing consultation with fish harvesters during all Project phases to avoid and/or minimize conflict with fishing activities and to communicate Project activities. Details regarding the Committee will be developed as the Project progresses. • Follow-up and monitoring associated with the Marine Environment VEC, related to commercial fisheries, will be developed in consultation with the fisheries representatives.								

Table 7.2.5 Summary of Project Residual Environmental Effects: Commercial Fisheries (Cabot Strait)

CHANGE TO NET INCOME OF LOCAL COMMERCIAL FISHERIES		
KEY ***Direction:*** Positive. Adverse. ***Magnitude:*** Low: 10% or less change in net income of commercial fish harvesters operating within the Study Area. Moderate: 10-50% change in net income of commercial fish harvesters operating within the Study Area. High: greater than 50% change in net income of commercial fish harvesters operating within the Study Area. Negligible: no measurable adverse effects anticipated. ***Geographic Extent:*** Local: within the Study Area.	***Duration:*** Use quantitative measure; or Short term: effects are measurable for days to a few months. Medium term: effects are measurable for many months to two years. Long term: effects are measurable for multiple years but are not permanent. Permanent – will not change back to original condition. ***Frequency:*** Occasionally, once per month or less. Occurs sporadically at irregular intervals. Occurs on a regular basis and at regular intervals. Continuous.	***Reversibility:*** Reversible: effects will cease during or after the Project is complete. Irreversible: effects will persist after the life of the Project, even after habitat restoration and compensation works. ***Environmental Context:*** Undisturbed: Area relatively or not adversely affected by human activity; Developed: Area has been substantially previously disturbed by human development or human development is still present. N/A Not Applicable. ***Significance:*** Significant. Not Significant.

7.2.7 CUMULATIVE ENVIRONMENTAL EFFECTS

In addition to the assessment of Project-related environmental effects presented above, an assessment of cumulative environmental effects was conducted in regard to other projects and activities that have potential to interact with the Project. For the Commercial Fisheries VEC, the assessment area for cumulative environmental effects in the Cabot Strait is defined as a 70-km-wide corridor centred on the subsea cable (Figure 7.1.1). In large measure, the effects of past and existing projects are reflected in the baseline conditions against which the Project is being assessed. Table 7.2.6 identifies the potential for overlap between the Project residual environmental effects and those of other current projects or activities for which modifications or expansions are planned or underway, and future projects that can reasonably be predicted, within the assessment area. Table 7.2.6 also ranks the potential cumulative environmental effects to commercial fisheries as 0, 1, or 2 based on the degree of interaction with other projects or activities and the potential for overlapping effects with the Project.

Table 7.2.6 Potential Cumulative Environmental Effects to Commercial Fisheries

Other Projects and Activities with Potential for Cumulative Environmental Effects	Potential Cumulative Environmental Effects Change to Net Income of Local Commercial Licence Holders
Port of Sydney Dredging and Infilling	1
Donkin Export Coking Coal Project	1
Marine Atlantic Inc. Passenger Ferry between NL and	1

Table 7.2.6 Potential Cumulative Environmental Effects to Commercial Fisheries

Other Projects and Activities with Potential for Cumulative Environmental Effects	Potential Cumulative Environmental Effects
	Change to Net Income of Local Commercial Licence Holders
NS (Trans-Canada Hwy Ferry)	
Commercial, Recreational, Subsistence, and Traditional Fishing	1
Existing Submarine Cables	1

KEY
0 = Project environmental effects do not act cumulatively with those of other projects and activities.
1 = Project environmental effects act cumulatively with those of other projects and activities, but the resulting cumulative effects are unlikely to exceed acceptable levels with the application of best management or codified practices.
2 = Project environmental effects act cumulatively with those of other projects and activities and the resulting cumulative effects may exceed acceptable levels without implementation of Project-specific or regional mitigation.

Recent dredging and infilling activities in Sydney Harbour, (*e.g.,* channel dredging and associated infilling completed at the end of 2011), have resulted in alteration and loss of fish habitat, which is being compensated under the DFO no-net-loss policy. Compensation completed to date to offset this habitat loss has included the creation of lobster habitat (artificial reefs) developed in consultation with local fish harvesters using Sydney Harbour. While this Project occurs within the assessment area for cumulative environmental effects, overlap between affected holders of lobster licences is expected to be minimal.

The Donkin Export Coking Coal Project will potentially result in fish habitat loss (proposed infill for wharf construction) and interference with fishing vessels during the construction and operation phase, which may potentially overlap temporally with Project-related marine construction activities. This Project could affect local fish harvesters in 4Vn and LFA 27 although it is not anticipated that fish harvesters operating in the area will also be affected by the Maritime Link, so cumulative effects will be minimal.

The Marine Atlantic passenger ferry service between the island of Newfoundland and Cape Breton could interact cumulatively with cable laying and associated vessel activity to interfere with ongoing commercial fishing activity in the Cabot Strait. The ferry route is marked on navigation charts and fish harvesters are accustomed to accommodating ferry transits as well as movements of other vessels in the Cabot Strait. Locations and activities of cable laying vessels will be identified and published by the Canadian Coast Guard through Notice to Shipping and Notice to Mariners so cumulative effects on the commercial fishery from interaction between the Project and ferry service will be minimal.

The effects of commercial fishing activities in the Cabot Strait on fish habitat (particularly benthos) and fish populations can interact cumulatively with effects from construction and operation of Project-related subsea structures. Commercial fishing activity is regulated by DFO to ensure sustainability of stocks. The Project will have a minor effect on benthic fish habitat during trenching, infilling and berming for portions of the cable route and construction activities at the grounding sites. Any Project-related loss or harmful alteration of fish habitat will be addressed through application under the *Fisheries Act,* as applicable, including the requirement to comply with no-net-loss provisions of DFO policy. With these regulatory provisions in place, the contribution of Project-related activities to any cumulative effects on commercial fish habitat or populations will be minimal.

The deployment of Project-related submarine cables in the Cabot Strait could interact with existing submarine cables to cause a cumulative effect on commercial fishing, (*e.g.,* fish avoidance of affected areas and potential gear loss). There are two active submarine telecommunication cables crossing the Cabot Strait (DFO 2005a), both operated by the Atlantic Provinces Optional Cable Systems (APOCS), which run from Aspy Bay and Sydney Mines in Cape Breton to Newfoundland (APOCS 1C and 2). There are also numerous inactive subsea cables that cross the Strait, most of which land in the Sydney Mines area. The installation of the Project cables and associated marine structures will have a minor cumulative effect with respect to changes to marine benthic habitat, and commercial fish harvesters will need to be aware of these additional subsea structures. However, since the new cables will be trenched or bermed in the relatively shallow waters that are routinely fished, there should be no impediment to fishing over the cables (although there will be minor restrictions at the infill footprint of the grounding sites). As with existing cables, the new Project-related subsea infrastructure will be located on marine charts thus allowing commercial fish harvesters to note any potential obstructions. Given these mitigation measures, cumulative effects on the commercial fishery from submarine cables will be minimal.

7.2.8 DETERMINATION OF SIGNIFICANCE

Construction of the grounding sites and the cable laying process could result in a minor reduction of net income to local commercial fish harvesters as well as Aboriginal Communal Commercial licence holders which could persist over the life of the Project. This reduction in net income would most likely be attributable to highly localized but permanent exclusion of fishing activity in the footprint of the grounding sites, and a temporary loss of access and alteration of habitat associated with cable laying activities. Given ongoing consultation with local fish harvesters, the proposed mitigation of potential effects to fisheries, and environmental protection measures for the marine habitat, the environmental effect of a change in net income of local commercial fish harvesters is predicted to be not significant.

Assuming the implementation of mitigation, habitat compensation measures, and regulatory controls required from ENL and other proponents, the potential for the Project to interact with other projects and activities to cause cumulative environmental effects for commercial fisheries is rated as not significant,

Overall, the residual adverse environmental effect on Commercial Fisheries VEC is rated not significant.

7.2.9 FOLLOW-UP AND MONITORING

In consultation with local fish harvesters and DFO, and in NL with the Fisheries, Food and Allied Workers Union, ENL will implement a Fisheries Advisory Committee. This committee will assist in maintaining ongoing consultation with fish harvesters during all Project phases to avoid and/or minimize conflict with fishing activities and to communicate Project activities. Details regarding the Committee will be developed as the Project progresses.

The Fisheries Advisory Committee is not intended to preclude ongoing discussions that will continue with the Mi'kmaq. Representation from the Nova Scotia Mi'kmaq will be invited through the KMKNO and the Native Council of Nova Scotia. Representation from the Newfoundland Mi'kmaq will be invited through the leadership of the Qalipu Mi'kmaq First Nation Band.

Follow-up and monitoring associated with the Marine Environment VEC, related to commercial fisheries, will be developed in consultation with the fisheries representatives.

With the implementation of proposed mitigation described for the Commercial Fisheries VEC, and in consideration of the residual environmental effects rating criteria, no additional monitoring is planned at this time. Additional work and/or monitoring may be required pending the results of mitigation required for the Project.

7.3 MARINE ENVIRONMENT

The Marine Environment VEC refers to all marine fish and fish habitat that Project-related activities may interact with. The federal *Fisheries Act* defines “fish” to represent all fish, shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals, and the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals. Therefore, all aquatic organisms in habitats defined as fish habitat are considered as fish in this assessment.

The revised federal *Fisheries Act* (2012, C-38) defines fish habitat as spawning grounds and any other areas, including nursery, rearing, food supply and migration areas, on which fish depend directly or indirectly in order to carry out their life processes. Fish habitat includes the physical (*e.g.*, substrate, temperature, flow velocity and volumes, water depth), chemical (*e.g.*, dissolved oxygen, pH, nutrients) and biological (*e.g.*, fish, benthic invertebrates, plankton, aquatic plants) attributes of the environment that are required by fish to carry out life cycle processes (*e.g.*, spawning, rearing, feeding, overwintering, migration) (DFO 2007a).

The Cabot Strait encompasses a number of marine habitat types, which are home to a diverse range of flora and fauna including: pelagic fish (*e.g.*, Atlantic herring); demersal fish (*e.g.*, Atlantic cod); commercial fish (*e.g.*, Atlantic and Greenland halibut); marine mammals (*e.g.*, humpback and fin whales);; crustaceans (*e.g.*, crabs, lobsters); and seaweeds (*e.g.*, Irish moss).

The Marine Environment was selected as a VEC because of:

- specific regulatory requirements of the *Fisheries Act*;
- the direct interaction between Project activities and marine habitats; and
- the intrinsic importance of marine populations (*e.g.*, commercial species) to the socio-economic component of the human environment.

Key Project activities that may interact with the Marine Environment VEC include preparation of the marine substrate, installation of the subsea cables and grounding facilities, and Project-related vessel traffic and operation. Effective Project planning and design and the application of known and proven mitigation measures during Project construction and operation will reduce adverse environmental effects of the marine environment. Potential environmental effects of accidents, malfunctions and unplanned events are discussed separately (Section 7.2). Species listed under *SARA* or considered at risk by COSEWIC are assessed within the SOCI VEC (Section 7.1).

7.3.1 SCOPE OF ASSESSMENT

This section defines the scope of the environmental assessment of the Marine Environment VEC in consideration of the nature of the regulatory setting, issues identified during public engagement, potential Project-VEC interactions, and existing knowledge.

While marine birds may be considered as a component of the Marine Environment VEC, they are discussed in Section 7.1.

7.3.1.1 Regulatory Setting

Marine fish, fish habitat, water quality and sediment quality are protected primarily through federal legislation and to some extent by provincial legislation. With respect to federal legislation, fish habitat is protected under the *Fisheries Act* and by the DFO Policy for the Management of Fish Habitat. This policy applies to all projects and activities in or near water that could "harmfully alter, disrupt or destroy fish habitat by chemical, physical, or biological means". Sections 20, 32, 35, and 36 of the *Fisheries Act* apply to the Project. Section 20 requires that fish passage be maintained at all times during construction and operation. Section 32 prohibits the destruction of fish by any means other than fishing. Section 35 protects fish habitat from harmful alteration, disruption or destruction (HADD), and Section 36 prohibits the deposition of deleterious substances in waters frequented by fish. DFO has overall responsibility for the administration of the federal *Fisheries Act*, except for Section 36 which is administered by EC.

Other federal legislation that also indirectly protects fish habitat includes *CEPA* administered by EC, Specifically, Disposal at Sea provisions of Part 7, Division 3 of *CEPA* stipulate that dredging and disposal in the marine environment requires a permit and that sediment be screened for potential chemical contaminants.

The Marine Environment VEC includes the marine flora and fauna species (and their habitat) that are located within the vicinity of the Project and are subject to regulatory protection under federal and provincial legislation*.* *SARA* and both the NL *ESA* and the NS *ESA* generally protect endangered species and their habitats from being interfered with, disturbed, or destroyed (further discussed in Section 7.1). ENL will comply with *MBCA* during project activities in the marine environment.

Acts, regulations and policies that are involved in the sustainability of species and their habitat in the marine environment include:

- *CEAA;*
- *Fisheries Act;*
- *Oceans Act;*
- *Canada Shipping Act:*
- Nova Scotia's Coastal Management Framework; and
- Coastal and Ocean Management Strategy and Policy Framework for Newfoundland and Labrador

Some legislation is aimed at protecting various species or groups of species while others focus on the preservation of the physical environment and the sustainability of sensitive habitats within the broader marine ecosystem.

7.3.1.2 Selection of Environmental Effects and Measurable Parameters

The environmental assessment of the Marine Environment VEC is focused on changes in populations of marine species.

The Project has the potential to change marine habitat through effects on water quality, sediment quality and the acoustic environment. If unmitigated, such effects could result in changes to marine populations (*e.g.*, adult fish, eggs and larvae, invertebrates, and marine mammals) through direct mortality or indirectly through alteration, destruction or disruption of habitat or changes in behaviour (*e.g.,* migration, feeding, and reproduction).

The measurable parameters used for the assessment of changes to marine populations and the rationale for their selection is provided in Table 7.3.1.

Table 7.3.1 Measurable Parameters for the Marine Environment

Environmental Effect	Measurable Parameter	Rationale for Selection of the Measurable Parameter
Change in marine populations	**Mortality** (loss of individuals attributable to the Project, as measured by number of individuals)	• Risk of mortality related to Project activities and operations.

	Fish HADD
	• Habitat area (m^2)
	• Water Quality
	• Compared against CCME aquatic guidelines for parameters such as:
	  • DO (mg/L), Temperature (Celsius), pH, Salinity (psu), and Specific Conductance(μS/cm)
	• Sediment Quality
	Compared against CCME sediment quality guidelines and *CEPA* disposal at sea sediment screening criteria for parameters such as:
	  • Trace metals (including mercury) (mg/kg), Cadmium (mg/kg), PCBs (mg/kg), PAH (mg/kg), and grain size.
		• Direct HADD of fish habitat is measured in area (m^2).
		• *Fisheries Act* and assessment for HADD authorization.
		• Disposal at Sea Regulations under *CEPA* specify sediment screening criteria for use in assessing the suitability of material for disposal at sea.
		• CCME Interim Sediment Quality Guidelines and Probable Effects Level are available as a basis against which to assess environmental effects.

	Underwater Acoustic Environment • Sound level in decibels, dB re 1 μPa • Presence/absence of marine mammals	• Increase in sound levels (magnitude, frequency, duration and character – tonal vs. impulse) above background levels as a result of increased vessel traffic may affect the marine ecosystem. • Presence or absence of marine mammals in the Study Area can be measured. • The Marine Mammal Regulations under the *Fisheries Act* prohibit the disturbance of whales and other marine mammals. • Section 32 (1) of *SARA* prohibits the harassment of a wildlife species listed as extirpated, endangered or threatened.

7.3.1.3 Temporal and Spatial Boundaries

The temporal boundaries for the assessment of the potential environmental effects of the Project on the Marine Environment VEC include the periods of construction, and operation and maintenance.

Construction of the Project will be carried out over approximately three years; however, the subsea cables will be deployed over a period of 2 – 3 months in 2016 within this broader construction window. Operation would begin following the completion of construction and will continue for the life of the Project. In general, the potential environmental effects of the Project on the Marine Environment VEC will peak during construction but diminish during operation.

The spatial boundaries include the Project Study Area and the Cabot Strait.

The Study Area is the maximum area where Project-specific environmental effects can be predicted and measured with a reasonable degree of accuracy and confidence. The Study Area for the assessment of the subsea cables is the 2 km-wide, 180-km long corridor which extends across the Cabot Strait between Newfoundland and Nova Scotia. The Study Areas for the two options for the grounding facilities in both provinces encompass Indian Head and St. George's, NL and in northeast Cape Breton County, Big Lorraine and Little Lorraine, NS (Figure 4.2.1).

The area used for the assessment of cumulative environmental effects is defined as a 70-km wide area centred on the Study Area for the subsea cables (Figure 7.1.1).

7.3.1.4 Threshold for Determining the Significance of Residual Environmental Effects

A **significant adverse residual environmental effect** on the Marine Environment VEC is defined as a Project-related environmental effect on general marine species that contravenes the requirements of the *Fisheries Act* and CEPA in such a way as to bring about any of the following results:

- A change in marine populations in such a way as to cause a decline in abundance or change in distribution of common and secure population(s) such that those populations will not be sustainable within the Cabot Strait. This change may result from an alteration of the quality or extent of the physical, chemical or biological components of the marine habitat within the assessment area, in such a way as to cause a change or decline in the distribution or abundance of a viable marine population that is dependent upon that habitat such that the likelihood of the long-term survival of these populations over one or more generations is substantially reduced.
- An unauthorized destruction of fish, including marine mammals, by any means other than fishing as per Section 32 of the *Fisheries Act*.
- An unmitigated or non-compensated net loss of fish habitat that is unauthorized as per Section 35 of the *Fisheries Act*.
- An unauthorized deposit of a deleterious substance in the marine environment as per Section 36 of the *Fisheries Act* and that is not authorized under the Disposal at Sea Regulations under *CEPA*.

7.3.2 BASELINE CONDITIONS

An overview of the offshore and nearshore habitat within the Cabot Strait is provided in Section 4 including a description of the following:

- seafloor features including sediment quality;
- tides and currents;
- wind and waves;
- temperature and salinity;

- ice; and
- ambient noise.

Eighteen distinct bottom types were identified within the Cabot Strait Study Area. Substrate types ranged from sandy-silt to sand across the Study Area. Bedrock was noted in the nearshore of the island of Newfoundland up to water depths of approximately 130 m and off NS at water depths of up to 37 m.

During all seasons there is a southerly surface flow of ocean currents from the Gulf of St. Lawrence through the Cabot Strait and offshore (Wu and Tang 2011). There is a constant year-round inflow of water into the Gulf of St. Lawrence through the Cabot Strait along each of the side slopes of the Laurentian Channel. During the summer and autumn there is a higher inflow along the NS slope and also a faster in-flow in the autumn along the NL slope. At the bottom of the Laurentian Channel there is a year-round outflow to the offshore area, with faster flows during the summer and autumn.

Maximum wind speeds of 72 km/h have been recorded in the area and are typically strongest during the months of November to February. Westerly winds predominate, with the highest velocities from the northwest and west during the winter months.

The Cabot Strait is characterized by frequent sounds from marine mammals and anthropogenic sounds, with distant shipping noise present at all times.

Marine fauna are varied and include benthic macrofauna, avifauna, mammals and sea turtles, and fish and shellfish. There are a number of SOCI that have the potential to occur in the Cabot Strait (Section 7.1).

Benthic habitats are also described for each landfall and grounding site, including a habitat classification (Table 7.3.2).

Table 7.3.2 Summary of Distinct Bottom Habitat Types Identified along the Cabot Strait Study Area

Benthic Habitat Type		Associated Fauna	Nearshore NS (shoreline to 20 m water depth)	NS Shelf	Laurentian Channel			NL Shelf	Nearshore NL (shoreline to 20 m water depth)
Type	Description				Slope - NS side (220 m to 360 m)	Channel	Slope - NL side (220 m to 360 m)		
1	Silt/mud/sand with bedforms	*Homarus americanus* Unidentified sea star Solitary tunicate *Echinarachnius* sp. *Crossaster* sp.	✓	✓					
2	Cobbles with discrete patches of muddy sand	Porifera *Crossaster* sp. *Homarus americanus* Sabellidae Ophiuridae Unidentified sea anemone	✓	✓					
3	Muddy sand with occasional patchy cobbles	Unidentified sea anemone *Solaster* sp. *Homarus americanus* *Cerianthus* sp.	✓	✓					
4	Soft mud above iceberg furrows	*Chionoecetes opilio* Pleuronectidae *Gorgonocephalus* sp. Decapoda Soft coral *Chionoecetes opilio*		✓					
5	Cobble reef	*Chionoecetes opilio* Decapoda Unidentified fish Ophiuridae Soft coral *Strongylocentrotus droebachiensis*		✓					

Table 7.3.2 Summary of Distinct Bottom Habitat Types Identified along the Cabot Strait Study Area

Benthic Habitat Type					Laurentian Channel				
Type	**Description**	**Associated Fauna**	**Nearshore NS (shoreline to 20 m water depth)**	**NS Shelf**	**Slope - NS side (220 m to 360 m)**	**Channel**	**Slope - NL side (220 m to 360 m)**	**NL Shelf**	**Nearshore NL (shoreline to 20 m water depth)**
6	Silt/mud with occasional patchy cobble (Iceberg furrows NS)	*Chionoecetes opilio*		✓					
		Unidentified sea anemone							
		Soft coral							
		Porifera							
		Sabellidae							
7	Deep mud	*Pennatula* sp.		✓	✓	✓			
		Pleuronectidae							
8	Deep mud - Pockmarks	*Anthoptilum* sp.			✓	✓			
		Soft coral							
		Nudibranchia?							
		Pennatula sp.							
9	Silt/mud with occasional patchy cobble (Iceberg furrows NL)	*Ceramaster granularis*				✓	✓		
		Porifera							
		Unidentified sea anemone							
		Soft coral							
		Ceramaster granularis							
		Porifera							
		Sabellidae							
10	Sand with bedforms	*Cerianthus* sp.					✓		
		Unidentified sea anemone							
		Hippasteria sp.							
11	Gravelly sand with occasional cobble	Filamentous red algae					✓		
		Ceramaster granularis							
		Sebastes sp.							
		Cerianthus sp.							
		Unidentified sea star							
12	Sand	*Cerianthus* sp.				✓	✓		

Table 7.3.2 Summary of Distinct Bottom Habitat Types Identified along the Cabot Strait Study Area

Benthic Habitat Type		Associated Fauna	Nearshore NS (shoreline to 20 m water depth)	NS Shelf	Laurentian Channel			NL Shelf	Nearshore NL (shoreline to 20 m water depth)
Type	Description				Slope - NS side (220 m to 360 m)	Channel	Slope - NL side (220 m to 360 m)		
		Ceramaster granularis *Astarte* sp.							
13	Gravelly sand	Filamentous red algae Porifera *Urticina* sp. *Hippasteria* sp. *Myxine glutinosa* Cottidae Crinoidea					✓		
14	Bedrock reef	Calcareous red algae Filamentous red algae *Agarum* sp. Unidentified sea star *Gadus morhua* *Metridium* sp. *Strongylocentrotus droebachiensis* *Asterias* sp.						✓	✓
15	Silt/mud with shell material	Filamentous red algae *Ceramaster granularis* *Hippasteria* sp. *Nothria* sp.						✓	
16	Rippled gravelly sand	Unidentified sea star Calcareous red algae Filamentous red algae *Raja* sp. Flustridae Crinoidea					✓	✓	✓

Table 7.3.2 Summary of Distinct Bottom Habitat Types Identified along the Cabot Strait Study Area

Benthic Habitat Type		Associated Fauna	Nearshore NS (shoreline to 20 m water depth)	NS Shelf	Laurentian Channel			NL Shelf	Nearshore NL (shoreline to 20 m water depth)
Type	Description				Slope - NS side (220 m to 360 m)	Channel	Slope - NL side (220 m to 360 m)		
		Echinarachnius sp. Ophiuridae *Nothria* sp. Unidentified sea anemone							
17	Cobbles with coralline algae	*Strongylocentrotus droebachiensis* Calcareous red algae Colonial tunicate *Nothria* sp. Ophiuridae						✓	
18	Rippled gravelly sand	Calcareous red algae Filamentous red algae *Agarum* sp. Unidentified sea star Unidentified gastropoda Buccinidae *Echinarachnius* sp.						✓	✓

7.3.3 POTENTIAL PROJECT-VEC INTERACTIONS AND ENVIRONMENTAL EFFECTS

7.3.3.1 Potential Project-VEC Interactions

Table 7.3.3 ranks for each Project activity the potential effects on the marine environment as 0, 1 or 2 based on the level of interaction with the Project and the degree of environmental effects.

Table 7.3.3 Potential Project Environmental Effects on the Marine Environment (Cabot Strait)

Project Activities and Physical Works	Potential Environmental Effect
	Change In Marine Populations
Construction	
Grounding Facilities	2
Subsea Cables	2
Operation	
Subsea Power Transmission	2
Power Conversion	2
Maintenance	
Regular Inspection	1
Repair to Infrastructure	1

0 = No interaction
1 = Interaction occurs; however, based on past experience and professional judgment, the resulting effect can be managed to acceptable levels through standard operating practices and/or through the application of best management or codified practices. No further assessment is warranted.
2 = Interaction occurs, and resulting effect may exceed acceptable levels without implementation of specified mitigation. Further assessment is warranted.

All activities associated with construction and operations are rated as 2, and are further discussed below.

Maintenance activities are rated as 1 since activities associated with inspection and repair of the subsea cables and grounding sites are expected to be infrequent, short in duration, and site-specific. As a result of project planning and design, the choice of materials, and the nature of the infrastructure, frequent repair of the subsea cables and/or the grounding site structures is not anticipated. Infrastructure inspection (*e.g.*, ROV surveys of the subsea cables) will occur at regular but infrequent intervals, likely on an annual schedule at the onset of Project operation and decreasing thereafter to once every few years. Inspections will also likely occur if there is a problem with power transmission in the subsea cables or at the grounding sites, and possibly after a severe storm. Vessels used for inspection purposes are expected to travel at reduced speeds during the ROV surveys and will adhere to the mitigation and requirements presented in Section 2.6.7. Habitat disturbance associated with ROV use has the potential to affect the marine environment, however, this will be intermittent, localized and of short duration.

For all Project activities ranked as 1 in Table 7.3.2 the potential environmental effects of the Project on the Marine Environment VEC, including cumulative environmental effects, are rated not significant.

7.3.3.2 Assessment of Potential Environmental Effects

This section presents an assessment of environmental effects for all Project activities ranked 2 in Table 7.3.2.

Construction

Installation of the subsea cables and construction of a grounding facility may affect marine habitat and the populations they support through a change in substrate, water quality or the acoustic qualities of the marine environment. During installation and construction activities, marine species may experience direct mortality or functional impairment, resulting in eventual mortality.

<u>Seabed Levelling – Pre and Post Installation</u>

Prior to placement of the cables, the seabed may require preparation in the form of leveling or infilling with clean rock to create a stable sub-grade beneath the cables and eliminate cable suspension. Following installation and inspection, further changes may be required to reduce areas of excessive suspension. The processes to level the seabed and construct protective rock berms will result in a change in the quality of the substrate and habitat as well as direct mortality of sessile benthic species in the footprint of the cable route. Requirements for leveling will come out of detailed cable installation and protection design and depends on the degree of free spans which are locations resulting in the suspension of cable. The objective of micrositing the cable during detailed design is to avoid areas of potential spans and therefore seabed leveling, however, if required it will be done using clean granular material and may be subject to *Fisheries Act* authorizations for HADD and Section 32 approval.

<u>Cable Protection</u>

In water depths less than 200 m, which is approximately 50 percent (90 km) of the total Cabot Strait crossing, the subsea cable will be protected in a trench or covered with a rock berm (Section 2.6). Burial of the subsea cables will temporarily disturb the benthic environment; however, as compared with other activities such as bottom trawling, anchoring or dredging, the effects of cable laying are minimal as they are temporal and not repetitive in nature. Sensitive habitats (*e.g.*, eelgrass, seagrass) may be directly disturbed or lost as a result of cable installation activities, however, the spatial scale of these potential impacts are very small relative to the habitat within the Cabot Strait.

During deployment of the subsea cables, primarily where the cable will be installed by trenching, total suspended solids (TSS) will increase locally and may affect the quality of fish habitat (AECOM and Intertek METOC 2011). High TSS levels are also expected to result from construction of the grounding sites. TSS levels vary naturally in coastal marine environments with lowest levels occurring calm conditions and increasing during periods of high rainfall as the wind and rain mixes the water column (Birch and O'Hea 2007).

Generally lower levels of dissolved oxygen are associated with high TSS values (Ntengwe 2006). Elevated TSS values have also been associated with high levels of stress in benthic invertebrates (Norton *et al*. 2002) and high levels of TSS can also affect fish. At high concentrations or during extended periods of exposure, environmental effects of suspended sediments on fish include: decreased feeding success; reduced ability to see and avoid predators; damaged gills; reduced growth rates; decreased resistance to disease or impaired development of embryos; and may impair reproduction for those species relying on visual cues as a part of courtship and mating. An increase in TSS will also reduce the amount of light reaching any submerged vegetation (Park 2007), thereby decreasing photosynthesis. Waters with high TSS levels are also associated with reductions in periphyton, primary producers that are sensitive indicators of environmental change (Birkett *et al*. 2007). Changes to surficial sediment chemistry could also occur as a result of bottom disturbance and re-suspension of existing sediments.

<u>HDD Activity</u>

In the nearshore environment (within 1 km of land), HDD will be used to install the cables beneath the seafloor (Section 2.6). HDD has minimal interference with nearshore marine habitats, as direct interaction with the seabed is avoided for the length of drilling (up to 1 km offshore of NS and up to 450 m offshore of NL. The HDD process requires a drilling fluid commonly referred to as drilling "mud" that serves to lubricate the drill bit and downhole assembly as well as to facilitate removal of cuttings from the drilling hole. For this Project the drilling mud will be water based with a bentonite additive to create the desired level of viscosity for cutting suspension and removal. Compared with common alternatives used such as oil-based (petroleum or synthetic) or polymer-based muds, the water-based bentonite offers advantages with respect to its lower environmental toxicity in the event of an accidental release. Despite the obvious toxicological benefits of selecting a water based mud over the alternatives, release of the mud could still adversely affect the marine environment through changes to water quality where the drill emerges from the seabed, however, effects are localized.

<u>Underwater Acoustics</u>

Increased underwater sound levels associated with the installation of subsea cables may also cause temporary behavioural changes in macro-invertebrates, fish, and marine mammals. Behavioural responses will likely result in slight changes of local distributions of these animals until the source is removed.

Ballast Water

Project vessels may contain water in ballasts that were filled in non-Canadian waters and which have the potential to introduce marine invasive species to the Cabot Strait.

Grounding Facility Construction

Construction of the grounding sites may affect marine habitat and the populations they support through a change in available substrate and size distribution; change in water quality; or change in the acoustic qualities of the marine environment. . During construction, dredging may be required in shallow water beneath the breakwater footprint and within the impoundment pond, which may result in direct mortality of non-mobile benthic species. At the grounding sites, dredging in shallow water may be required to level the seabed and to provide a suitable foundation for the rock berm, which is likely to cause direct mortality in the footprint of the berm. The TSS resulting from this activity can be controlled through standard mitigation, *e.g*., silt curtains, and choice of installation technique.

Operations – Subsea Power Transmission

The potential effects of operations of the cables and grounding facilities are described in terms of emissions.

Electric Fields

Direct electric fields created by the energized conductor inside the subsea cable are physically blocked and thereby mitigated by cable sheathing and armouring and as a result not have the potential to affect marine organisms. As described in Section 2.7.3, induced electrical fields are created as charged particles and marine organisms swim through the increased magnetic field. The current state of knowledge indicates, however, that there is no unequivocal evidence of adverse effects. Effects of direct electric fields are mitigated by design, however, induced electrical fields are discussed further in subsequent subsections.

Magnetic Fields

Magnetic fields are a common concern often associated with the operation of new subsea transmission lines (refer to Section 2.7.3). Much of the research into potential effects of magnetic fields associated with subsea power transmission cables has been directed towards understanding the effects of submerged HVdc cables on marine species, particularly elasmobranches (*i.e.*, sharks, rays, skates), which are known to rely on naturally occurring magnetic fields for navigation and detection of prey. Other marine fish species including decapod crustaceans (*e.g.* lobsters, crabs) have been researched to a lesser degree but results indicate they could experience an effect from magnetic fields as the epibenthic habitat they utilize, combined with relatively low mobility, would expose individuals to the highest field strengths from the cables. Depending on the amount of current carried by the cable, a magnetic field greater than the earth's geomagnetic field [*i.e.*, 52 microtesla (μT) in the Cabot Strait] may extend up to 10 m from a HVdc cable (Hatch Acres 2006). Since the strength of the magnetic field rapidly declines as a function of distance from the source, organisms will be exposed to magnetic fields only when they are in close proximity to the cable. Benthic species that live near the bottom would come in close proximity to the cable when foraging. Although the cables will not likely be buried in water depths greater than 200 m, it is likely that they will naturally settle in soft sediments because of the weight (30 to 45 kg/m of cable) and/or be covered due to sediment transport on the seabed. These effects are further discussed in subsequent subsections.

<u>Heat</u>

During operation of the subsea cables, heat will be given off as a result of internal resistance in the conductors (AECOM and Intertek METOC 2011). In general this is more significant for AC cables than for HVdc cables transmitting at equal rates (Ospar Commission 2009). The greatest change in temperature will occur in sediments immediately surrounding the cable, with heat dissipating quickly as distance increases from the cable. The rise in temperature is dependent on the type of cable, transmission rate and characteristics of the surrounding environment (thermal resistance of the sediment, water in the spaces of rock armouring, currents, *etc.*). A rise in temperature of 1.4°C 20 cm above a cable with a capacity of 166 MW was measured in the field (Opsar Commission 2009). There is evidence from the research synthesized by the Opsar Commission (2009) that various marine species can react to even minor increases in ambient temperatures. This increase in temperature may lead to changes in physiology, reproduction, and mortality risk of sessile benthic species. The community structure in the immediate vicinity may also change due to increased temperatures. Proposed cable protection measures, specifically trenching or covering with a berm, will mitigate heat emissions to some extent. As these effects are inherently localized and effectively mitigated by ambient ocean temperatures, they are not discussed further.

Operations – Power Conversion

Potential environmental effects on the marine environment from the operation of the grounding sites are most likely to occur during monopole system operations. This mode of operation (discussed in detail in Section 2.7.2) is expected to be infrequent and occur over short time periods, with an annual expected duty ranging between 40 and 120 hours. Monopole operations may occur following scheduled outages for maintenance or in the event of forced outages and equipment failure (*e.g.,* lightning strikes). In the case of failure, power transmission will occur across one pole or circuit at 50% capacity and the grounding site would be used temporarily to provide a current return path to ground. The metallic switch design feature provides a mechanism for an out-of-service conductor to be used as a metallic return, thereby reducing the extent of monopole grounding site operations. Potential environmental effects on the marine environment could occur from the operation of the grounding sites as a result of the related production of electrical fields, chemical electrolysis and heat production in the salt water impoundment. Each of these potential effects is discussed below and is based primarily on the Labrador-Island Transmission Link Environmental Impact Statement (Nalcor 2012).

Electric Fields

Current in the grounding element of the grounding site will produce a ground potential rise (GPR) in the area surrounding the grounding element. The magnitude of the GPR is dependent on the current and the resistivity of the surrounding medium (*e.g.*, seawater and local geology). The GPR gradient is the difference in voltage (volts) over a given distance which results in an electric field. The breakwater is designed to reduce the current such that the maximum voltage gradient in the water on the sea-side of the breakwater is 1.25 V/m (Hatch 2011). This design voltage gradient value is far less than the 5V/m gradient that may attract fish to an anode. Tetanus may occur at 20 V/m and mortality at 50 V/m (Hatch 2011). For this reason, the design of the breakwater will mitigate marine electrical field effects on the seaside of the breakwater. As these effects are mitigated by the design criteria, they are not discussed further.

Magnetic Fields

Magnetic fields are also produced at the grounding facility. Magnetic fields are created by flow of electrical current through a conductor and are therefore created when current is transmitted through the grounding line to the shore based grounding facility. Unlike the subsea cable carrying current across the Cabot Strait, the magnetic field that surrounds the grounding line conductor terminates at the grounding site grounding elements and is therefore limited spatially beyond this point in the marine environment. As mentioned throughout this report, the monopole mode of operations is limited with an expected annual duration of 40-120 hours so the resulting magnetic fields are limited temporally as well. The magnetic field generated at the grounding stations dissipates with distance as it does surrounding the subsea cable and discussed above.

The current flowing through the grounding facility during bipole operation is less than 1% of the current associated with monopole operation (100% of a single circuit current or approximately 1250A flowing through the grounding sites). EMFs produced in each mode of operation are proportional to the current flow. The system operates in the bipole mode most of the time, *i.e.,* except the anticipated 40 – 120 hours per year, and the associated grounding facility magnetic and electric fields in this mode are negligible. The potential effects are further assessed in subsequent subsections.

Chemical Electrolysis

Use of HVdc electrodes (or grounding elements) in seawater and associated release of electrical current into the seawater results in electrolysis at the operating electrode site anode which changes the chemistry of immediately surrounding waters and potentially affecting nearby marine habitat. The electrochemical oxidation at the anode forms oxygen and chlorine. Chlorine is unstable in seawater, and reacts with water molecules forming hypochlorous acid; in secondary reactions, hypochlorite, chloride, hypobromite, and bromide may be formed. Chloride and bromide are natural compounds of seawater and are considered harmless. Hypochlorite and hypobromite can lead to the formation of chloroform and bromoform, which are toxic in high concentrations; however, bromoform is the dominating organic halogen in natural seawater, and is produced by algae. A short distance from the electrode and on the sea side of the breakwater, the concentration of bromoform would be similar to natural levels (Hatch 2008). The chlorine selectivity (the part of the current resulting in the formation of chlorine) increases with low water temperature, high salinity, low pH (reflecting low seawater exchange), and high current density.

Hydrogen is commonly formed as the primary reduction reaction at the cathode. Electrolysis results in disassociation of water molecules and release of hydrogen gas, which enters the atmosphere through gas exchange.

In both cases, anode and cathode, adverse effects from chemical electrolysis products on the sea-side of the breakwater are not expected with tidal flushing and facility maintenance. These effects are further discussed in subsequent subsections.

<u>Heat</u>

Energy will be dissipated in the form of heat at the grounding facility. The heat produced will be directly proportional to the current and the resistivity of the surrounding medium. Tidal influence, change in salinity (freshwater influence) and sediment build-up in the grounding facility have the potential to affect heat transfer. Adverse effects on the sea-side of the breakwater are not expected with tidal flushing and facility maintenance. As these effects are inherently localized and effectively mitigated by ambient ocean temperatures, they are not discussed further.

7.3.4 MITIGATION OF PROJECT ENVIRONMENTAL EFFECTS

In addition to the standard mitigation presented in Section 2.6.7, the following mitigation will be implemented.

- Project components will be designed to minimize the area of disturbance to the extent feasible.
- HDD will be used to bury the subsea cables and thereby avoid mortality and disturbance in the nearshore marine environment at both landfall sites.
- Cable trenching depth will vary across the Cabot Strait but generally depth of the cable laying has inherent magnetic field mitigation value by increasing the vertical distance between cable and seabed.
- Use of fill material for the rock berms that is free of fines, debris and any substances that would be deleterious to the marine environment.
- Silt curtains will be used during grounding site dredging and breakwater construction to minimize the transport of suspended sediments by water currents.

- Work will comply with stipulations in the *Fisheries Act* authorizations for HADD and Section 32 approval. In particular, fish habitat compensation programs will be designed, if necessary, to comply with the DFO objective of no-net-loss of the productive capacity of fish habitat.
- Typical vessels utilized for cable laying activities have transit speeds of approximately 19 km/hr (10 knots) and cable laying speeds of approximately 0.5 km/hr (0.3 knots) which are slow and will result in minimizing underwater acoustic emissions and risk of collision with marine mammals and marine reptiles.
- Restriction of vessel traffic to construction zone where feasible.
- Minimizing the use of ship's whistles.
- Restricting night lighting where practical and safe to do so.
- Project vessels will comply with applicable legislation, codes and standards of practice for shipping, including the Ballast Water Control and Management Regulations under the *Canada Shipping Act* and the Canadian Ballast Water Management Guidelines, to reduce risk of introduction of marine invasive species.

Preparation of the seabed during cable installation and construction of the grounding facilities will not involve sidecast of materials or result in disposal of materials at sea. Potential effects will be mitigated by adhering to the requirements of the *Fisheries Act.* If the leveling of the seabed or dredging and infilling (*i.e.*, rock berms at the grounding sites) activities constitute a HADD, pursuant to Section 35(2) of the *Fisheries Act*, a habitat compensation plan may need to be developed in accordance with the DFO *Policy for the Management of Fish Habitat* and the no-net-loss guiding principle.

The Project will be designed such that GPR on the sea side of the rock berm during monopole operation for both grounding sites will be <1.25 V/m. This will reduce the potential for adverse environmental effects. This value is presented as a safe design value and voltage gradient (Alstom Grid 2010, CIGRE Working Group 1998, Electric Power Research Institute (EPRI) 1981, Kimbark 1971). This design value will be achieved through grounding site and electrode design, including parameters such as the size of the shoreline saltwater pond, size of the breakwater, grounding element type, number and spacing of grounding elements, and low resistivity surroundings to create a safe GPR gradient on the sea side of the breakwater (Nalcor 2012).

7.3.4.1 Fish Habitat Compensation Strategy

DFO has overall responsibility for the administration of the federal *Fisheries Act*, which establishes the necessary provisions to protect fish and fish habitat in Canadian marine and fresh waters. This responsibility includes the issuance of authorizations for any HADD of fish habitat associated with Project activities. Section 35(1) of the *Fisheries Act* protects fish habitat from HADD, while Section 35(2) allows DFO to authorize activities that will result in a HADD of fish habitat under specific conditions.

Fish habitat is further protected by the Policy for the Management of Fish Habitat (DFO 1986). This policy applies to all projects and activities in or near water that could “alter, disrupt or destroy fish habitats, by chemical, physical, or biological means”. This policy is based on the guiding principle of “no net loss” of fish habitat, with a focus on maintaining the productive capacity of existing or potential fishery resources. In applying this principle, the first preference of DFO is to avoid any HADD of fish habitat or loss of productive capacity. However, if a HADD is likely to occur, the application of appropriate mitigation measures should be implemented to minimize the HADD to the extent that is technically and economically feasible. Any residual HADD that cannot be mitigated will require the implementation of a fish habitat compensation plan.

Compensation is defined as "the replacement of natural habitat, increase in the productivity of existing habitat, or maintenance of fish production by artificial means in circumstances dictated by social and economic conditions, where mitigation techniques and other measures are not adequate to maintain habitats for Canada's fisheries resources" (DFO 1986). The overall goal of habitat compensation is therefore to maintain the productive capacity of affected fish habitat that supports local fishery resources.

Fish habitat compensation for the Project has considered the area and type of habitat that may be affected as well as the productive capacity of that habitat. Utilization of the area by various species and their different life stages, particularly those species which support a fishery or are an important forage fish for species that support a fishery have been considered. Preliminary compensation options have considered the DFO hierarchy as follows (from most to least preferred) although the primary focus will be to implement a meaningful and successful compensation program:

a) create habitat or increase the productive capacity of ‘like-for-like’ habitat in same ecological unit;

b) create habitat or increase productive capacity of ‘unlike’ habitat in same ecological unit;

c) create habitat or increase productive capacity of ‘unlike’ habitat in a different ecological unit; and

d) measures of last resort : artificial propagation, including seeding of cultured species; restoration of chemically contaminated sites; and deferred compensation.

Depending on the location and timing of Project activities, ENL will submit a detailed compensation plan to DFO outlining measures to offset any losses in fish habitat relevant to Section 35(2) of the *Fisheries Act* and the Policy for the Management of Fish Habitat. The plan will be developed in consultation with DFO and other stakeholders, including fish harvesters in

NL and NS, First Nations, and local environment stewards, who are familiar with the actual habitats, in order to achieve a well-organized, meaningful and successful plan.

Different Project components may require HADD approval depending upon the results of the proposed mitigative measures. ENL has identified that the potential residual environmental effects of Project-related construction activities on the marine environment, after the implementation of planned mitigation measures, could include loss or change of bottom habitat due to creation of rock berms at the grounding sites.The current schedule for construction of the grounding sites is 2015 and the footprint of each grounding site, at this point in the Project planning, is expected to be up to 30,000 m^2. Currently, several high-level options have been discussed as potential compensation strategies. These preliminary options are conceptual and subject to change as the final Project design evolves, and include:

- Reef Creation: placement of rock piles for the establishment of rocky reefs in nearshore, flat, soft bottoms to create a more biologically diverse and productive habitat. According to some lobster harvesters in St. George's Bay NL this type of hard bottom habitat, required by lobster, is limited. These rock piles would reproduce the same rocky sub-tidal habitat that may be lost due to construction of rock berms and infilling..

- Restoration/Creation of Eel Grass Beds: Transplanting and/or restoration of eelgrass from HADD areas to adjacent areas will be considered. Eel grass typically exists in sheltered areas in depths of 3 to 5 m so consideration will be given to the particularities of this species prior to transplant activities. If possible, a similar location on the lee side of the infill will be evaluated and individual plants, from healthy donor beds or seedlings will be used to initiate the process. Planting or broadcasting of seeds may also be considered. Restoration of any eel grass beds is possible by encouraging natural recolonization, under the assumption that once suitable conditions are established, eel grass will naturally re-colonize especially in coastal zones devoid of discharges from industrial, residential and agricultural areas. ENL is aware of the challenges of this type of compensation project and will refer to several technical guidance documents, and local and DFO Science advice, to assist in the appropriate restoration methods, selection of transplant sites, and acquisition of seeds and seedlings.

- Restoration/Creation of Algae Beds: Areas of fucoid growth (*i.e.,* brown algae such as gulfweed and rockweed and other macrophytes) provide very high levels of primary productivity, increase biodiversity and cover, and create three-dimensional habits for lobster, sea urchin and herring roe fisheries as well as other species of plants and animals. Selected areas will require investigation into potential limiting factors such as substrate type, light levels, currents and waves Site selection will look to areas with current low primary and secondary productivity. Rock mixtures will be placed on the substrate. Distribution and rock size to be incorporated will depend upon the restoration objectives. Rock size and spacing will be greater for objectives aimed at improving/creating habitat for adult lobster whereas a mixture of smaller rock and boulders will create a more diverse habitat, with interstitial spaces, for a diversity of crabs and various life stages of lobster. Either of the above rock mixtures would be appropriate for an objective of replacing the entire area with just macrophytes. ENL is aware that this type of work is still experimental however, studies in Halifax Harbour and St Margaret's Bay, NS have shown positive results for similar habitat restoration.

- Improving Estuarial Tidal Restrictions: Restricted openings in estuaries can limit tidal movements resulting in an estuary that does not completely fill during high tide and/or an estuary that does not fully empty on a low tide. This lack of a full tidal flow in an estuary limits the productivity of marine plants in the lower estuary, including the eel grass beds and macrophyte growth, leads to loss of saltmarshes, and can restrict fish passage. Limitations to primary productivity will also affect secondary productivity, physical habitat structure provided by macrophytes, and food for resident fish. A compensation program would consider placement of rocks to support the shoreline of the outlet channel, and channel work to increase width and depth. This would allow for a full increase and decrease in flood and ebb tide levels and could result in increased plant growth, both in density and in area, reinstatement of lost salt marsh, creation of fish spawning areas and adult fish feeding areas, as well as an overall increase, in numbers and diversity, of estuarial marine species. Preliminary surveys would need to be done to identify and confirm any restrictions in estuaries along the coastline adjacent to the Project. These surveys could be supplemented by input from local community and interest groups, anglers, and fish harvesters.

- Larval and Juvenile Lobster Seeding: A lobster seeding program in the Project Area may also be considered. This type of program would involve becoming part of a collaborative approach towards lobster resource enhancement research that would likely involve multiple stakeholders including fishing unions, fish harvesters, government, First Nations, academia, and other private and public sector partners. Lobster seeding can be used as a tool to enhance or stabilize lobster resources and can involve evaluating the use of larval stages for lobster seeding on the natural population, and/or initiation of a seeding program with interested fishing communities. This type of compensation program also has potential to increase scientific knowledge of lobster biology, coastal habitat structure, and ecosystem processes, and can introduce educational tools to better explain ecological processes to the fishing industry.

- Restoration of Orphaned/Abandoned Marine Coastal Sites: This type of compensation program would look at restoration of identified coastal sites. Restoration activities such as erosion protection measures, opening of restricted areas, and reflooding of salt marshes can restore damaged freshwater wetlands and shellfish beds, reopen fish passages, provide fish habitat, protect coastal archaeological sites, and help local communities deal with effects of climate change by making increasing resilience to storms surges, flooding, and sea-level rise.

Habitat compensation for the Project would only be undertaken as required to offset any net loss of the productive capacity of fish habitat. A mandatory HADD compensation monitoring program, which will be designed in consultation with DFO, will also be implemented to verify the anticipated enhancement in fish habitat and productivity.

7.3.5 CHARACTERIZATION OF RESIDUAL PROJECT ENVIRONMENTAL EFFECTS

7.3.5.1 Construction

Residual environmental effects on the Marine Environment VEC caused by construction activities are anticipated to occur in respect to: fish mortality, habitat area, water quality, sediment quality, and the acoustic environment.

Marine organisms may be put at risk; however, this environmental effect will be restricted to the relatively small footprint of the subsea cables and of the rock berms constructed at the grounding sites. A permit under Section 32 of the *Fisheries Act* will be obtained for any work with an associated risk of mortality to marine organisms.

There are minimal residual environmental effects from using HDD to bury the subsea cable in the nearshore marine environment as compared to burying the cable using trenching methods or placement of rock berms. Once drilling breaks through the seafloor, however, hydraulic pressure differences between the entry borehole on land and the exit borehole in the ocean may lead to a discharge of drilling mud containing bentonite, a drilling fluid lubricant. Bentonite is non-toxic and is easily dispersed in flowing water, but quickly settles in standing water. When bentonite is released in standing water it could interfere with respiration in fish or settle and cover egg masses on the seabed. With respect to this Project, however, any such releases will be short-lived, localized and dispersed with the currents in the Study Area, resulting in minimal environmental effects. Standard mitigation measures to minimize environmental effects from HDD are described in Section 2.6.7. Further mitigation may include the use of specialized equipment at the drill site to vacuum drilling mud from the borehole, thereby reducing the risk of it being released into the marine environment. Specialized mitigation will be evaluated following final design and siting of the exit location and characterization of benthic habitat.

Where rock berms are utilized to protect the subsea cables, benthic habitat may be created. This new habitat will provide hard substrate for colonization by epiphytic marine organisms and macrophytes, which could result in changes in local benthic communities. Numerous sessile organisms that do not exist on fine grained sediment, such as anemones, tunicates, sponges, bryozoans, hydroids and other species, will colonize the underwater structures. Marine seaweeds, which are important components of habitat for lobster and other commercially valuable marine organisms, will also quickly colonize the hard substrate of rock berms. These changes in benthic communities will attract other mobile species (*e.g.*, fish) for feeding and refuge, thereby increasing biomass in the Study Area (Pister 2009).

Studies have shown that one year after installation and burial of subsea cables, there is no visible change to the surface of the seafloor (Andrulewicz *et al.* 2003). Also, after one year there were no obvious changes in species composition, abundance, or biomass of the macrobenthos fauna present.

Most of the chemical parameters analyzed in sediment samples from the Study Area were below the limits set by the CCME Interim Marine Sediment Quality Guidelines (ISQG) and the limits established under *CEPA* Disposal at Sea Regulations. Given these low baseline levels, there is minimal risk of marine populations being exposed to acute or chronic toxicity due to re-suspended sediments. Therefore, adverse environmental effects associated with sediment quality are not anticipated.

There is a general trend from sediments with a high percentage of mud on the Nova Scotia side of the Laurentian Channel, to sediments with a high percentage of sand on the island of Newfoundland side (Table 7.3.2). Trenching and burial of the subsea cables will re-suspend sediments, which may be carried by the relatively weak currents in the Cabot Strait. This action could generate a sediment plume at lower depths which could result in adverse environmental effects related to elevated TSS levels. Modeling of sediment re-suspension and dispersion indicated that the TSS concentration is expected to be close to background levels (about 10 mg/L), within 1,000 m or less from the site of disturbance. TSS concentrations up to approximately 1,000 mg/L may be reached under natural conditions in coastal environments under windy conditions, however, there is no significant effect on herring eggs and larvae up to this concentration. During subsea cable-laying activities, temporary peaks in TSS concentrations of < 1,000 mg/L are expected to occur for short periods within limited areas.

At the grounding sites a change in TSS may occur during dredging and leveling of the seabed, and during construction of rock berms. These activities will likely create a near-bottom turbidity plume comprised of fine silts and clays, which will be mitigated with the use of silt curtains. The effects of re-suspension of fine substrate in the water column and the associated decrease in water quality are anticipated to be low in magnitude, localized in geographic extent, short in duration, and reversible.

Activities associated with laying of the subsea cables will create noise in the marine environment, however, there is no clear indication to what extent such noise will affect marine fauna (Ospar Commission 2009). There is considerable variation in the hearing ability of fish; therefore it is difficult to make general statements about the behaviour of many fish species relative to this activity. Although sound emissions from construction activities may cause fish to move out of the affected areas close to the source, it is generally accepted that low level underwater sound has little to no likelihood of causing any significant physical effects on marine fauna (Nalcor 2012, Ospar Commission 2009).

Construction activities at the grounding and landfall sites will produce high sound levels (*e.g.*, dredging and HDD, respectively). However, due to the limited area affected by such activities and the ability of fish to actively move away from intense sounds, the potential effect on fish populations is considered to be low.

The extent to which marine invertebrates react to sound is the subject of ongoing debate, although, it appears that they respond to vibrations rather than the pressure component of sound. Some of these species, *e.g.*, lobster, have statocysts (organs involved with balance) that apparently function as vibration detectors. Among the marine invertebrates, decapod crustaceans have been the most intensively studied and crustaceans appear to be most sensitive to low frequency sounds (*i.e.*, <1000 Hz) (Nalcor 2012).

The likely effects of construction activities on marine mammals include behavioural responses to various underwater sounds and potential temporary hearing impairment from vessel operations. It is unlikely that any direct mortality of marine mammals will result from Project vessels due to their low speed (0.5 km/hr, or 0.3 knots) when laying the cables and the short duration of this phase of the work (2 - 3 months) (Section 2.10).

Underwater noise associated with dredging will be temporary and infrequent. Further, the specific noise levels that will be generated from dredging operations will be dependent on the dredge method used. It is possible that dredging may be conducted from shore given the relative size and location of the dredging operation (*e.g.*, leveling of the seafloor and/or removal of unstable sediment for breakwater construction associated with grounding facilities). Shore-based dredging would eliminate vessel noise and underwater noise would be limited to bucket noise in the water column and on the seafloor. For shore-based or vessel-based dredging, there may be temporary and localized change in habitat use by marine fish and mammals that are able to detect a change in ambient underwater noise due to dredging operations, although given the magnitude of this operation, this effect is not likely to affect the health or well-being of these animals.

Acoustic emissions from activities associated with the Project are not likely to induce auditory injury or auditory fatigue in any species of marine mammal within the Study Area. A small number of harbour seals may be locally displaced from areas within the Study Area during construction of grounding facilities. However, because the Study Area does not include important foraging or breeding habitat for this species, the health of these marine mammals is not likely to be adversely affected. This species is not considered further in this assessment.

Behavioural avoidance of high traffic areas by marine mammals will likely reduce the incidence of vessel strikes, but is unlikely to displace marine mammals from important foraging habitat that may be located outside of these traffic areas (Mayo and Marx 1990; Terhune and Verboom 1999; Nowacek *et al*. 2004). Reduced foraging efficiency and increased energy expenditure caused by the Project are expected to be minimal. Masking of sounds produced by marine mammals, particularly baleen whales, may occur but the overall effects are expected to be minor given the slow speed and limited duration of vessel activity.

7.3.5.2 Operation

Operation of the subsea cables and grounding sites could have adverse, but different, environmental effects on marine populations as a result of power conversion and transmission. Only a small fraction of marine species have been directly studied for their response to magnetic or electric fields. Since the research has often focused on a particular species or a certain life history stage, there are many information gaps (*e.g.*, larval fish and invertebrates). Overall, studies that have examined responses of marine species to electric and magnetic fields from subsea power cables suggest a response (*e.g.*, Gill *et al.* 2009, Westerberg 2000) while others do not (*e.g.*, Andrulewicz *et al.* 2003). Nonetheless, even with some examples of responses, there is no definitive evidence of any positive or negative consequences at the individual, population, or ecosystem level.

Power Transmission – Magnetic Fields

The effects associated with power transmission are primarily related to magnetic fields (Section 2.7.3).

The Pacific Northwest National Laboratory designed and initiated experiments in tanks on the potential adverse environmental effects of magnetic fields on fish and invertebrates (Schultz *et al.* 2010). Electrical coils were placed in tanks to generate magnetic fields in the range of 100 to 3000 µT. This range was considered conservative as the actual field strengths associated with marine hydrokinetic (MHK) devices and their transmission cables could potentially be much lower. The experiments included short and longer-term exposures involving juvenile coho salmon (*Oncorhynchus kisutch*), Atlantic halibut (*Hippoglossus hippoglossus*), California halibut (*Paralicthys californicus*), rainbow trout (*Oncorhynchus mykiss*), and Dungeness crab (*Metacarcinus magister*). These species were selected on the basis of their ecological, commercial, and recreational importance and their potential to encounter an MHK device or transmission cable during part or all of their life cycle. The objectives of the experiments were to determine if the organisms experienced any physiological stress as indicated by markers such as changes in behaviour (*e.g.*, detection of magnetic fields, interference with feeding behaviour, avoidance, attraction) or development (*e.g.*, growth and survival from egg or larvae to juvenile).

Results from the past two years of experimentation at the Pacific Northwest National Laboratory (reported in Woodruff *et al.* 2011) indicate there is little evidence to suggest major detrimental effects to the species tested under high magnetic fields and extended exposure conditions. Although there were several developmental, physiological, and behavioural responses to high magnetic field exposure, the variation in responses between treatment and control groups (*i.e.*, no magnetic field exposure) were not statistically significant. In 2012, the Pacific Northwest National Laboratory plans to expand the research to include more species as well as to assess potential effects at the community and population levels. Behavioural testing will include species such as the American lobster (*Homarus americanus*) and an elasmobranch species (*e.g.*, shark, skate, ray) that are known to use the earth's magnetic field for navigation and/or prey detection.

DC induced electric fields are also generated by the flow of charged ions (*e.g.*, seawater, a moving organism) moving through a DC magnetic field. Electrosensitive fish are highly sensitive to DC electric field gradients as low as 5 nV/cm as they swim through them. The bioelectric fields that are produced by living organisms are primarily DC fields produced by ion gradients within the organism (although AC fields are also generated). While induced electric fields from undersea cables may not directly mimic bioelectric prey, conspecifics or predators, these resultant fields may affect the behaviour of electrosensitive species (*e.g.*, elasmobranches) (Normandeau *et al.* 2011).

The Caribbean spiny lobster (Panulirus argus) is one of the more studied decapod species with respect to effects of magnetic fields (Normandeau *et al.* 2011). Although this lobster species does not occur in the Cabot Strait and is dissimilar from the American Lobster in terms of morphology and some behaviours, both species undergo seasonal migrations and daily feeding excursions and both species are sensitive to the earth's magnetic field, using this sense both for both navigation and homing. The spiny lobster is always in contact with the seafloor and would therefore be exposed to the highest residual magnetic fields of any subsea power cable encountered. Exposure to a DC cable could potentially delay or alter migration patterns or interfere with homing capabilities. Atlantic lobster could also be similarly affected by DC cables. However, it should be noted that the subsea cables for the Project will be laid perpendicular to the depth contours of the Cabot Strait. This orientation will create less of an magnetic field impediment to migratory movements between shallow and deep waters by Atlantic lobster, and other resident fish populations, in the Cabot Strait.

The most likely effect of magnetic fields created by system operations is a behavioural change of the marine species. The field strength and subsequent change to the earth's geomagnetic field decreases exponentially with distance. Information cited in Normandeau *et al.* (2011) shows a field strength, incremental to geomagnetic fields, of 78 μT at the cable diminishing to 6 μT at 4 m and to less than 1 μT at a distance of 10 m from the cable (Figure 2.7.1). As previously described, Since the subsea cables will be naturally buried in soft sediments or in rock berms, which will weaken the source of magnetic fields, marine mammals are less likely to be affected as they are generally higher up in the water column.

Power Conversion – Magnetic Fields

Unlike with subsea cable transmission where the cables and associated magnetic field surrounding the cable extends across the Cabot Strait, the current at the grounding site flowing through the conductors terminates at the grounding elements so the decrease in magnetic field strength in the vicinity of the grounding elements is even more pronounced than with the cable. In both circumstances,adverse environmental effects are more likely to be experienced by proximate bottom-dwelling species such as crabs, lobsters and demersal fish species than for marine mammals that would normally be several hundred metres away from the source of electric or magnetic fields. Power Conversion – Electric Fields

The discharge of electrical current from the grounding site into the marine environment has the potential to result in adverse environmental effects. Direct observation has suggested a lack of electrode avoidance responses by invertebrates and fishes. Sandström (1996) reported no measurable differences in fish catches between a grounding site and two reference stations. Karoliussen and Tunold (1998) concluded that crabs occurring near graphite electrodes had bleached carapaces, likely due to exposure to chlorine produced during electrode electrolysis.

However, this observed colouration could be within this crab species' spectrum of natural colour variation (Nalcor 2012).

Faugstad *et al.* (2007) summarized environmental monitoring results of sea electrode installations at grounding sites in Scandinavia and elsewhere. At the Norwegian Skagerrak grounding site, marine sediments and mussels showed no adverse environmental effects. Video recordings of the Konti-Skan graphite electrodes showed that various marine organisms, such as crab and starfish, lived directly on the electrodes without any apparent disturbance. Fish close to the electrodes showed no reaction even at high electric fields. In addition, for this Project, mitigation measures will be implemented to reduce the electric and magnetic fields generated at the grounding sites to a safe GPR gradient of < 1.25 V/m on the sea side of the breakwater.

<u>Power Conversion – Chemical Electrolysis</u>The benthic flora and fauna near the Baltic Cable anode were studied over several years, before and after the anode installation. The organochlorine content, including bromoform, was analysed in blue mussels and pH levels at the electrode mesh surface. It was determined that the re-colonization of flora and fauna was normal; no organochlorines were detected in the mussels, and the pH level followed a normal variation for sea water. Likewise at the Kontek anode in Denmark, the concentration of halogen compounds was measured in the sediment and mussels, and no increased levels due to the presence of the anode were detected.

Extensive monitoring studies in 1989 near the electrodes of the New Zealand HVdc link found no unacceptable environmental effects after 24 years of operation.

It was concluded from these studies that there are no measurable environmental effects on marine flora and fauna in the vicinity of HVdc electrodes at grounding sites.

Summary

Overall, studies have not produced conclusive results of adverse environmental effects from electric, magnetic, or chemical emissionsin the marine environment. During operation, Project effects on marine species are predicted to be limited to localized avoidance, if any at all, as a result of electric and magnetic emissions and physical disturbance. The residual environmental effects on the Marine Environment VEC during operation and maintenance are predicted to be not significant.

7.3.6 SUMMARY OF RESIDUAL ENVIRONMENTAL EFFECTS

Table 7.3.3 summarizes the residual environmental effects of the Project on the Marine Environment.

The likely residual environmental effects of Project construction on the Marine Environment VEC include (i) increased seawater turbidity due to rock berm and grounding site construction and cable installation; and (ii) invertebrate, fish, and marine mammal behavioural responses to various Project-related underwater sounds. A fish habitat compensation plan will be implemented as additional mitigation, if required (Section 7.3.4), to replace any lost habitat in the marine environment as a result of Project construction activities. Considering the planned mitigation measures for Project construction and the potential for fish habitat compensation, any adverse residual environmental effects on the Marine Environment during construction are rated not significant.

Since the residual environmental effects from an increase in TSS are reversible, transient and of limited geographic scope and are not expected to adversely affect populations of marine organisms in the Study Area or The Cabot Strait, they are ranked as not significant.

Magnetic and induced electric fields from the subsea cables will have less of an adverse environmental effect where the cable is buried or covered with rock berms for protection. The cable will be protected in areas where the water depth is less than 200 m, which is approximately 90 km of the length of the subsea cable crossing the Cabot Strait; below this level (mostly in the Laurentian Channel) the depth of water will provide protection for the cable against natural forces (*e.g.*, waves, ice action, current). In addition, as a result of predominately soft sediments in water depths below 200 m within the Study Area (including Laurentian Channel), sediment transport processes along the seabed, and their inherent weight (30 to 45 kg/m of cable), the cables are likely to naturally bury. The residual environmental effects from operation at the grounding site (*e.g.*, changes to seawater chemistry and biotic impacts due to electrode electrolysis products and magnetic and electric field emissions) are rated as not significant. This determination is based on the predicted effects to be minimal in magnitude, localized in geographic extent, short in duration, and reversible.

Table 7.3.4 Summary of Project Residual Environmental Effects: Marine Environment (Cabot Strait)

CHANGE IN MARINE POPULATIONS
Mitigation - Construction
• Project components will be designed to minimize the area of disturbance to the extent feasible. • Cable trenching depth will vary across the Cabot Strait but generally depth of the cable laying has inherent magnetic field mitigation value by increasing the vertical distance between cable and seabed. • Typical vessels utilized for cable laying activities have transit speeds of approximately 19 km/hr (10 knots) and cable laying speeds of approximately 0.5 km/hr (0.3 knots) which are slow and will result in minimizing underwater acoustic emissions and risk of collision with marine mammals and marine reptiles. • If the leveling of the seabed or dredging and infilling (*i.e.*, rock berms at the grounding sites) activities constitute a HADD, pursuant to Section 35(2) of the *Fisheries Act*, a habitat compensation plan may need to be developed in accordance with the DFO *Policy for the Management of Fish Habitat* and the no-net-loss guiding principle. • Fill material for the rock berms (grounding sites) to be free of fines, debris and any substances that would be deleterious to the marine environment. • Silt curtains will be used during grounding site dredging and breakwater construction to minimize the transport of suspended sediments by water currents. • Following detailed design of the HDD exit location (*i.e.* drill short or drill through), mitigations such as altering drilling mud composition and the use of divers and/or suction equipment may be option depending on geological conditions and appropriate safe work conditions. The primary mitigation is ensuring control over the mud system and drill bit steering (telemetry system) allowing for proactive instead of reactive decisions. • Compliance with stipulations in in the *Fisheries Act* authorizations for HADD and Section 32 approval. In particular, habitat compensation programs will be designed, if necessary, to comply with the DFO objective of no-

Table 7.3.4 Summary of Project Residual Environmental Effects: Marine Environment (Cabot Strait)

CHANGE IN MARINE POPULATIONS

net-loss of the productive capacity of fish habitat.

- Use best management practices for reducing interactions with marine populations, including:
  - vessels travelling at reduced speeds to minimize underwater acoustic emissions and collision with marine mammals and marine reptiles;
  - restriction of vessel traffic to construction zone where feasible;
  - minimizing the use of ship's whistles; and
  - restricting night lighting where practical and safe to do so.
- Project vessels will comply with applicable legislation, codes and standards of practice for shipping, including the Ballast Water Control and Management Regulations under the *Canada Shipping Act* to reduce risk of introduction of marine invasive species.

Mitigation – Operation and Maintenance

- Bury the subsea cables by trenching or rock berms, where feasible, to minimize marine species from encountering the strongest magnetic fields.

Assessment

	Residual Environmental Effects Characteristics							
	Direction	**Magnitude**	**Extent**	**Duration**	**Frequency**	**Reversibility**	**Environmental Context**	**Significance**
Construction	Adverse	Low	Local	Short term	Sporadic	Reversible	Developed	Not Significant
Operations	Adverse	Low	Local	Long term	Continuous	Reversible	Developed	Not Significant

Follow-up

- ENL will develop a pre-construction study and monitoring program to verify potential effects of magnetic fields on migration of benthic organisms for relevant fisheries. An adaptive management approach will be taken to refine and optimize mitigation, if required.
- ENL will develop a pre-construction study and monitoring program to verify potential effects of emissions associated with the operation of grounding facilities. An adaptive management approach will be taken to refine and optimize mitigation, if required.

KEY

Direction:
Positive.
Adverse.

Magnitude:
Low: change in marine populations that do not affect the sustainability or biodiversity of populations within the Study Area.
Moderate: change in marine populations that affect the sustainability of populations or results in the loss of biodiversity within the Study Area.
High: Change in the population that affects their sustainability within the Cabot Strait and/or results in a loss of regional biodiversity with the Cabot Strait.

Geographic Extent:
Local: within the Study Area
Regional: within the Cabot Strait,

Duration:
Use quantitative measure; or
Short term: During the Project Phase.
Medium term: Duration of the Project.
Long term: Duration of the Project plus 10 years.
Permanent: Will not change back to original condition.

Frequency:
Occasionally, once per month or less.
Occurs sporadically at irregular intervals.
Occurs on a regular basis and at regular intervals.
Continuous.

Reversibility:
Reversible.
Irreversible.

Environmental Context:
Undisturbed: Area relatively or not adversely affected by human activity; includes Area of New Access.
Developed: Area has been substantially previously disturbed by human development or human development is still present.
N/A Not Applicable.

Significance:
Significant.
Not Significant.

7.3.7 ASSESSMENT OF CUMULATIVE ENVIRONMENTAL EFFECTS

In addition to the assessment of Project-related environmental effects presented above, an assessment of cumulative environmental effects was conducted in regard to other projects and activities that have potential to interact with the Project. For the Marine VEC, the assessment area for cumulative environmental effects is a 70-km wide corridor centred on the Project Study Area for the subsea cables. Table 7.3.5 identifies the potential for overlap between the Project residual environmental effects and those of other current projects or activities for which modifications or expansions are planned or underway, and future projects that can reasonably be predicted, within the assessment area. Table 7.3.5 also ranks for each Project activity the potential cumulative environmental effects as 0, 1, or 2 based on the degree of interaction with other projects or activities and the potential for overlapping effects with the Project.

Table 7.3.5 Potential Cumulative Environmental Effects to the Marine Environment (Cabot Strait)

Other Projects and Activities with Potential for Cumulative Environmental Effects	Potential Cumulative Environmental Effect
	change in marine populations
Port of Sydney Dredging and Infilling	2
Donkin Export Coking Coal Project	2
Marine Atlantic Inc. Passenger Ferry between NL and NS (Trans-Canada Hwy Ferry)	1
Commercial, Subsistence, and Traditional Fishing	2
Existing Submarine Cables	1

KEY
0 = Project environmental effects do not act cumulatively with those of other projects and activities.
1 = Project environmental effects act cumulatively with those of other projects and activities, but the resulting cumulative effects are unlikely to exceed acceptable levels with the application of best management or codified practices.
2 = Project environmental effects act cumulatively with those of other projects and activities and the resulting cumulative effects may exceed acceptable levels without implementation of project-specific or regional mitigation.

The effects of projects and activities on the Marine Environment VEC have the potential to interact cumulatively with the Project through increased acoustic emissions, increased TSS, artificial light, and habitat alteration, disruption or destruction.

Marine Atlantic provides daily service for the North Sydney-Port aux Basques route (two trips per day, *i.e.*, a ferry leaving and arriving at North Sydney per day), and from mid-June to late September a tri-weekly ferry service between Argentia, NL and North Sydney NS, both of which are part of the Trans-Canada Highway System. These ferries (4 in the fleet) are approximately 200 m in length. The *MV Atlantic Vision*, for example, is an ice class vessel that operates year-round, accommodates 800 persons (includes a crew of 118) and 531 cars, and travels up to 27 knots.

Ferry service across the Cabot Strait could have a cumulative environmental effect when combined with installation of subsea cables. The potential adverse cumulative effects include vessel-generated underwater noise, pollution from bilge water, collision with marine mammals (including species of conservation concern) and the accidental release of hydrocarbons.

Acoustic emissions associated with the existing ferry service may act cumulatively with noise from vessels serving the Project. The effects on marine mammals, however, should be minimal due to the relatively short duration for cable laying (approximately two to three months) (Section 2.10) and the relatively low speeds of Project vessels during cable laying (cable laying speed of approximately 0.5 km/hr, or 0.3 knots).

The primary concern related to cumulative effects is the possible increase in collisions between vessels and marine mammals. Most such collisions occur near the surface where acoustical reflection and propagation can limit the ability of the animals to hear and locate approaching vessels (Gerstein *et al.* 2005). Injuries to stranded ship-struck marine mammals suggest that large vessels are the principal source of injury. In most cases the marine mammals were not observed prior to collision or only at the last moment. Limited data suggest that vessel speeds below 26 km/h (14 knots) (which is near the average speed of the Marine Atlantic ferries) may reduce the possibility of collisions with marine mammals (Laist *et al.* 2001). Based on the limited number of vessels associated with the Project, and their low speed (maximum vessel transit speed is expected to be approximately 19 km/hr (10 knots) with a cable laying speed estimated to be approximately 0.5 km/hr (0.3 knots), the cumulative adverse environmental effect on marine mammals and sea turtles is predicted to be not significant.

There could also be adverse cumulative environmental effects resulting from accidental hydrocarbon spills and leaks (discussed in Section 10.6) and non-sanctioned disposal of bilge water. Mitigation measures include prohibition of illegal dumping of the bilge water/wastewater, and the rapid containment and cleanup of hydrocarbon spills. Discharges from Project vessels will comply with Annex 1 of the *International Convention for the Prevention of Pollution from Ships* (MARPOL 73/78) and Pollution Prevention Regulations of the *Canada Shipping Act.*

There are two active submarine telecommunication cables crossing the Cabot Strait (DFO 2005a), both operated by the Atlantic Provinces Optional Cable Systems (APOCS), which run from Aspy Bay and Sydney Mines in Cape Breton to Newfoundland (APOCS 1C and 2). There are also numerous inactive subsea cables that cross the Strait, most of which land in the Sydney Mines area. The installation of the Project cables and associated marine structures will have a minor cumulative effect with respect to changes to marine benthic habitat, but is not expected to have any measureable cumulative effect on marine populations.

Historically, commercial fishing operations in the Cabot Strait have pursued a variety of species (ground fish, pelagic species and invertebrates) using both stationary gear (traps, gillnets, and longlines) and mobile gear (trawls, purse seines, and scallop drags). Stationary gear normally does not have an effect on the bottom habitat, while mobile gear typically has the potential to impact marine benthos.

Modifications to mobile gear include reduction of the length of the ground gear and arrangements that reduce the number of contact points between the gear and the bottom (Valdemarsen *et al.* 2007). Since scallop dredges must have contact with the seafloor to function, their operation has a high probability to change the marine habitat. Benthic habitat affected by cable installation (trenching or berming) will be restored by either natural recolonization within a year or two or, if necessary, through directed habitat compensation projects in accordance with provisions of the *Fisheries Act*. The cumulative contribution of Project-related activities to changes in marine habitat from commercial fishing activity will be minimal, disappearing following natural regeneration of the benthos. Therefore, interaction between the Project and commercial fishing will not result in significant changes in the marine habitat.

There is potential for cumulative effects on populations of marine species through interaction between Project activities and commercial fisheries. Historically, commercial fisheries have contributed to an overall decrease in fish populations, in some cases to endangered levels (COSEWIC 2010a, COSEWIC 2010b). In recent times, however the fisheries have come under more rigorous government management including limited licensing; regulated seasons; size and quota limits; and best management practices for the reduction of bycatch. These management measures largely reflect science-based estimates of the amount of biomass that can be sustainably removed from the environment. Of particular importance to the control of bycatch has been the development of Turtle Exclusion Devices, Bycatch Reduction Devices, and various other deflectors that are being used in select fisheries.

As of October 2011, Sydney Ports Corporation initiated dredging of a navigation channel in Sydney Harbour to permit access by vessels requiring greater draft, and the development of a marine container terminal in the Sydport Industrial Park. Approximately 72 ha of land have been infilled to accommodate the future marine container terminal. The schedule for completion of this project depends on market conditions and is currently uncertain. Additionally, Provincial Energy Ventures (PEV) is proposing to deepen the approach to the PEV wharf facility at the former Sydney Steel Corporation docks which includes removal of bottom sediments over a 350,000 m^2 area. All dredged sediment will be disposed of within a newly constructed Confined Disposal Facility in Blast Furnace Cove on PEV-leased property. This work is scheduled to take place in 2012.

The dredging in Sydney Harbour could result in cumulative effects on the marine environment within the Cabot Strait. These dredging activities will harmfully alter, disrupt or destroy marine habitat and applications have been, or will be, made to DFO for HADD authorization. A habitat compensation project (a series of low-profile artificial rock reefs) has been completed in Sydney Harbour to offset lost habitat associated with the channel dredging and infill project, and similar initiatives will be undertaken for the PEV project as well. Any HADD associated with the marine components of the Maritime Link will also include compensation for no-net-loss of habitat. Therefore, the cumulative environmental effects will be limited to the temporary loss of marine habitat from these projects prior to the re-colonization of the dredged area and to the implementation of the fish habitat compensation project.

The dredging associated with the Port of Sydney developments, in combination with Project activities, could result in a cumulative increase in the risk of mortality for fish within the Cabot Strait. Any mortality of mobile pelagic and demersal finfishes will likely be low since they can avoid the effects of construction activities such as noise and SST. However, sessile or slow moving demersal fish and invertebrates will be less able to avoid construction areas and will likely suffer mortality as a result of crushing or smothering. The cumulative loss of sessile benthic species are expected to be authorized under Section 32 of the *Fisheries Act* and will not be significant.

The proposed Donkin Export Coking Coal Project is to be located at the existing Donkin Mine site on the Donkin Peninsula in Cape Breton and will involve underground mining, processing and transport of coal. Coal will be loaded onto 4,000 dwt barges which will be tugged 8.8 km from a barge load-out facility on the Donkin Peninsula to a trans-shipment facility in deeper water in Mira Bay where it will be loaded onto bulk carriers for transport to international markets. Marine construction is scheduled to begin in 2014 and will involve development of a barge load-out facility and installation of a trans-shipment mooring, with shipping activities to commence in 2016.

The development of the marine components of the Donkin coal project, in combination with the Maritime Link, could result in cumulative effects on the marine environment. The primary cumulative effect will be the loss of habitat associated with the barge load-out facility (to be compensated). Increased ambient marine acoustic levels from construction and operation will not overlap with similar effects from the Maritime Link. Therefore, with respect to the Donkin coal project, no cumulative effects on marine habitat or fish populations are anticipated.

Overall, any potential cumulative effects on the marine environment from interaction between the Maritime Link and other projects and activities within the assessment area are rated not significant. This determination is based on the predicted effects of the Project to be minimal in magnitude, localized in geographic extent, short in duration, and reversible.

7.3.8 DETERMINATION OF SIGNIFICANCE

The construction phase of the Project will result in a temporary, highly localized loss of productivity of the marine benthic habitat from the installation of the subsea cables and grounding facilities. Increased ambient marine sound levels from Project activities may result in minor habitat avoidance during the construction period in the Study Area. To mitigate the habitat altered during marine construction, ENL will obtain Authorization for HADD of fish habitat prior to conducting infilling operations. To compensate for the direct loss of benthic habitat, ENL may be required to create new habitat (or improve existing habitat) to meet DFO’s policy of no net loss under the *Fisheries Act*. The type and area of habitat to be created or enhanced will be detailed in a Habitat Compensation Agreement signed by both ENL and DFO. HADD compensation has been widely accepted as effective mitigation for harmful alteration of fish habitat.

In summary, any residual adverse environmental effects, including cumulative effects, related to a change in marine populations or marine habitat, during all phases of the Project, are rated not significant.

7.3.9 FOLLOW-UP AND MONITORING

ENL will develop a pre-construction study and monitoring program to verify potential effects of magnetic fields on migration of benthic organisms for relevant fisheries. An adaptive management approach will be taken to refine and optimize mitigation, if required.

ENL will develop a pre-construction study and monitoring program to verify potential effects of emissions associated with the operation of grounding facilities. An adaptive management approach will be taken to refine and optimize mitigation, if required.

With the implementation of proposed mitigation described for the Marine Environment VEC, and in consideration of the residual environmental effects rating criteria, no additional monitoring is planned at this time. Additional work and/or monitoring may be required pending the results of mitigation required for the Project.

7.4 CURRENT USE OF LAND AND RESOURCES FOR TRADITIONAL PURPOSES BY THE MI'KMAQ

This section assesses the effects of the Project on the current use of lands and resources in the Cabot Strait for traditional purposes by the Mi'kmaq of Nova Scotia. The current use of lands and resources for traditional purposes includes hunting and fishing for food and ceremonial purposes, other harvesting activities for subsistence, social, cultural, ceremonial, and medicinal purposes, as well as the use of sacred sites.

The Current Use of Land and Resources for Traditional Purposes by the Mi'kmaq was selected as a VEC due to the potential for the Maritime Link Project to interact with current use of land and resources for traditional purposes by the Mi'kmaq, as well as to satisfy federal and provincial regulatory requirements.

The Mi'kmaq of Nova Scotia possess knowledge of traditional and current hunting, trapping, fishing, gathering and other land and resource uses that can meaningfully contribute to Project-related research and the environmental assessment process.

The Project has potential to interact with current use of land and resources for traditional purposes by the Mi'kmaq of Nova Scotia in two distinct geographic areas/jurisdictions – Cape Breton and the Cabot Strait. This section focuses on potential environmental effects resulting from interactions between the Project and current Mi'kmaq land and resource use in the Cabot Strait Study Area. Potential Project interactions with Mi'kmaq land and resource use in the Study Area in Cape Breton, NS are assessed in Section 8.4.

The following VECs also have linkages with the VEC discussed in this section: SOCI VEC (7.1); Commercial Fisheries VEC (Section 7.2); Marine Environment VEC (Section 7.3); and the Archaeological and Heritage Resources VEC (Section 8.3).

7.4.1 SCOPE OF ASSESSMENT

7.4.1.1 Regulatory Setting

Section 16(1) of *CEAA* (1992) requires, *inter alia*, an assessment of the significance of the environmental effects of a project, and consideration of any mitigation measures that are technically and economically feasible. “Environmental effect” is a defined term under *CEAA*. It includes any change that the Project may cause to the environment on the current use of lands and resources for traditional purposes by Aboriginal persons. [s. 2(1) of *CEAA*] An environmental assessment conducted under *CEAA* must therefore assess the significance of any such effects and consider technically and economically feasible mitigation measures for such effects.

The Environmental Assessment Regulations pursuant to the NS *Environment Act* require that all provincial EAs identify and address the concerns of Aboriginal people regarding the adverse effects or the environmental effects of the proposed undertaking [Sections 9(1A)(xiii)-(xv)]. Furthermore, when formulating an EA decision, the Minister shall consider the concerns expressed by Aboriginal people, the steps taken by a proponent to address those concerns, and existing land use in the area of the undertaking [Sections 12(c), (d), and (g)].

In addition to the above, the federal and/or provincial governments may require that EAs for projects proposed in NS incorporate traditional and local knowledge gathered through an MEKS undertaken in accordance with the *Mi’kmaq Ecological Study Protocol*, ratified by the Assembly on November 22, 2007 (Assembly of Nova Scotia Mi’kmaq Chiefs 2007). An MEKS may be warranted for projects that are of a larger scope; located on Crown land; situated close to First Nations land; located in areas of known high archaeological significance; and/or situated in areas that have particular cultural significance for the Mi’kmaq of Nova Scotia (NSOAA 2011a). An MEKS was conducted for the Maritime Link Project by MGS according to the Protocol.

7.4.1.2 Selection of Environmental Effects and Measurable Parameters

The environmental assessment of current use of land and resources for traditional purposes by the Mi’kmaq is focused on change in current use of marine waters and resources for traditional purposes by the Mi’kmaq of Nova Scotia.

This environmental effect was selected due to the potential for the Project to alter or otherwise affect areas and resources currently used by Mi’kmaq people of NS for traditional purposes such as hunting, fishing, trapping, gathering, and/or cultural, spiritual, and ceremonial activities. As specified under *CEAA*, the focus of this VEC is on current use of land and resources for traditional purposes, although the MEKS also addresses past use and occupation by the Mi’kmaq of Nova Scotia.

The measurable parameters used for the assessment of the environmental effect presented above, and the rationale for their selection, are provided in Table 7.4.1.

Table 7.4.1 Measurable Parameters for Current Use of Land and Resources for Traditional Purposes by the Mi'kmaq of Nova Scotia

Environmental Effect	Measurable Parameter	Rationale for Selection of the Measurable Parameter
Change in Current Use of Marine Waters and Resources for Traditional Purposes by the Mi'kmaq of Nova Scotia	• Documented current use of land and resources for traditional purposes by the Mi'kmaq of Nova Scotia • Project effects on traditional land access • Change in habitat that could affect resource use for traditional purposes • Potential social and/or economic effects to the Mi'kmaq that may arise as a result of any change in the environment due to the Project	A key consideration in the assessment of environmental effects of the Project on this VEC is how the water and resources in the Cabot Strait are currently used by the Mi'kmaq for traditional purposes, including hunting, fishing, trapping and gathering, or for cultural, spiritual, or ceremonial purposes. *CEAA* requires consideration of potential social and/or economic effects to the Mi'kmaq that may arise as a result of any change in the environment due to the Project. The NS *Environment Act* requires consideration of existing land use in the area of the undertaking as well as consideration of any Mi'kmaq concerns regarding Project effects.

7.4.1.3 Temporal and Spatial Boundaries

The temporal boundaries for the assessment of the potential environmental effects of the Project on current use of land and resources for traditional purposes by the Mi'kmaq include the periods of construction and operation.

The spatial boundaries for the environmental effects assessment of current use of land and resources for traditional purposes by the Mi'kmaq are defined below and are generally consistent with the areas in the Cabot Strait that were considered in the MEKS for the analysis of traditional use activities.

The Study Area used for the assessment of this VEC is defined as the 2-km wide Cabot Strait Study Area (Figure 1.2.3). As Project components and activities that have the potential to interact with the current use of land and resources for traditional purposes by the Mi'kmaq are concentrated in the nearshore environment, for the purposes of this VEC, the Study Area extends from the NS shoreline to approximately 10 km offshore.

The part of the Cabot Strait used for cumulative environmental effects generally extends 5 km beyond the boundaries of the Study Area to the west and east, but does not extend beyond landfall south or north.

7.4.1.4 Threshold for Determining the Significance of Residual Environmental Effects

A **significant adverse residual environmental effect** on current use of land and resources for traditional purposes by the Mi'kmaq of Nova Scotia is defined as a Project-related environmental effect that results in a long-term, unmitigated loss of access to, or availability of, water and resources that are currently used by the Mi'kmaq of Nova Scotia for traditional purposes, such that these waters and resources cannot continue to be used by the Mi'kmaq at current levels within the Study Area for more than one year.

7.4.2 BASELINE CONDITIONS

The information presented in this section relies substantially on the results of the MEKS, as well as Mi'kmaq fisheries research conducted by UINR.

The Mi'kmaq have occupied the land and used the resources of NS, including the surrounding marine waters, for millennia, long before first European contact in the 16th century (NSMNH 1996b). The earliest evidence of Aboriginal habitation of Mainland Nova Scotia, found at the foot of the south slopes of the Cobequid Mountains at present day Debert, indicates that the area was occupied approximately 11,000 years ago by Paleo-Indian peoples.

At the time of first European contact, the territory of the Mi'kmaq comprised seven traditional political districts scattered across Atlantic Canada and the Gaspé Peninsula in Québec, including Unama'ki (*i.e.,* the Mi'kmaq term for Cape Breton). Prehistoric Mi'kmaq artifacts and archaeological sites dating as far back as the Archaic Period (9,000-2,500 years before present) have been recorded in Cape Breton. These include archaic and prehistoric discoveries at Grand River, Loch Lomond, Little Narrows, Belfry Lake, Fourchu Bay, Framboise Cove, Cow Bay, and Mira River.

Section 8.3 (Archaeological and Heritage Resources VEC) contain a further discussion of Mi'kmaq physical and cultural heritage with respect to archaeological context (*e.g.,* sites historically occupied by the Mi'kmaq).

There are five Mi'kmaq communities in Cape Breton: Membertou First Nation, Eskasoni First Nation, Waycobah First Nation, Wagmatcook First Nation, and Potlotek First Nation. An overview of these communities is presented in Table 7.4.2.

Table 7.4.2 Characteristics of Cape Breton Mi'kmaq Communities, 2011

Reserve	Size (ha)	Location	Total Population as of December 2011 (On and Off-Reserve)
Membertou First Nation			
Membertou #28B	45.2	1.6 km south of Sydney	1,288
Caribou Marsh #29	219.3	8 km southwest of Sydney	
Sydney #28A	5.1	1.6 km northeast of Sydney	

Table 7.4.2 Characteristics of Cape Breton Mi'kmaq Communities, 2011

Reserve	Size (ha)	Location	Total Population as of December 2011 (On and Off-Reserve)
Malagawatch #4 *	132.26	62.4 km southwest of Sydney	
Eskasoni First Nation			
Eskasoni #3	3,504.6	40 km southwest of Sydney	4,060
Eskasoni #3A	28.5	40 km southwest of Sydney	
Malagawatch #4 *	132.26	62.4 km southwest of Sydney	
Waycobah First Nation			
Whycocomagh #2	828.5	70.4 km west of Sydney	943
Malagawatch #4 *	132.26	62.4 km southwest of Sydney	
Wagmatcook First Nation			
Wagmatcook #1	319.7	51.2 km west of Sydney	761
Margaree #25	8	68.8 km northwest of Sydney	
Malagawatch #4 *	132.26	62.4 km southwest of Sydney	
Potlotek First Nation			
Chapel Island #5	592.5	68.8 km southwest of Sydney	665
Malagawatch #4 *	132.26	62.4 km southwest of Sydney	
* Malagawatch #4 is 661.3 ha in size, with 20% or 132.26 ha held by each of the following five Reserves: Chapel Island, Sydney, Eskasoni, Wagmatcook, and Whycocomagh.			

Source: CBU n.d.

7.4.2.1 Mi'kmaq Ecological Knowledge Study

The Project-specific MEKS identifies Mi'kmaq traditional use activities that have taken place or currently are taking place within the Study Area (referred to as the Project Site in the MEKS) and surrounding area (referred to as the Study Area in the MEKS), as well as any Mi'kmaq traditional ecological knowledge that presently exists with respect to those areas.

The two main components of the MEKS are:

- a study of past and present Mi'kmaq traditional land and resource use activities (using interviews as the key source of information); and
- a Mi'kmaq species significance analysis considering resources that are important for use by the Mi'kmaq.

As a first step to gathering traditional use data, the MGS MEKS team initiated dialogue and correspondence with the five Mi'kmaq First Nations in Cape Breton (refer to Table 7.4.2). Individuals who participate in traditional land use activities, or those who are knowledgeable of the land and resources, were identified and interviews arranged. For this MEKS 21 interviews were undertaken by MGS and 50 individuals provided information on past and present traditional use activities. All interviewees resided within or were from one of the five aforementioned Mi'kmaq communities in Cape Breton. All of the interviews were completed in accordance with the *Mi'kmaq Ecological Knowledge Study Protocol* (Assembly of Nova Scotia Mi'kmaq Chiefs 2007). In addition to interviews, a combination of desktop research and site visits was also used to identify past and present land and resource uses and features which are of particular importance to the Mi'kmaq people.

The MEKS concluded that the Mi'kmaq have historically undertaken traditional use activities – specifically fishing and hunting – in the Study Area and more broadly in the Cabot Strait, and that these practices continue to occur today in various locations and at various times of the year. Much of the following information is drawn from the Project-specific MEKS.

The findings of the MEKS indicate that the primary Mi'kmaq traditional use activity that currently takes place in the Cabot Strait within the vicinity of the Project is fishing, with lobster being the most fished species. Aside from fishing, seal hunting is the only other resource use that was identified for the Cabot Strait and within the Study Area. No gathering areas or cultural sites were identified within or adjacent to the Study Area.

Traditional Fishing

Fishing is an important traditional and commercial activity for the Mi'kmaq, and the lobster fishery is the most important traditional use activity identified in the MEKS within the Cabot Strait. In the Study Area, lobster fishing areas were identified in the coastal waters between Cape Dauphin and Point Aconi, from Florence to Point Aconi to Cape Dauphin, as well as locations farther offshore. The majority of lobster fishing activity in the Study Area was described by MEKS interviewees as fishing for commercial purposes. MEKS interviewees also indicated that almost all of the identified lobster fishing areas are currently fished by the Mi'kmaq.

The second most prevalent fishery is the eel fishery. Several eel fishing areas were identified in waters around Florence and from Mill Creek to McCreadyville to Point Aconi.

Cod, capelin, flounder, halibut, haddock, redfish, smelt, and mackerel were also identified as species that are fished in the Study Area. Eel, "devilfish" and pollock are additional species fished from the Study Area, but less frequently than lobster. Mackerel fishing areas were also reported offshore between Point Aconi and Table Head. Other species mentioned by informants as traditionally being fished, albeit to a relatively lesser degree than lobster and eel, are salmon, oyster, mussels, clam, rock crab and shrimp.

According to MEKS interviewees, the timeline classifications for fishing activities within the Study Area are almost equally divided between "current use" (*i.e.*, occurring within the last 10 years), "recent past" (*i.e.,* occurring 11-25 years ago), and "historic past (*i.e.*, occurring more than 25 years ago). Mi'kmaq fishing activity within the broader area was primarily classified as recent past by a small majority. Also by a slight margin, the second most common timeline classification reported for Mi'kmaq fishing activity was current use, followed closely by recent past. MEKS interviewees also noted several areas that have been in continuous use since at least the 1980s.

The majority of fishing areas identified in the Study Area were classified as harvest fisheries, although commercial fisheries, particularly for lobster, are also well-represented.

Traditional Hunting

As reported in the MEKS, the only species residing in the Cabot Strait and hunted from land was seal. MEKS interviewees reported current seal hunting areas in the Study Area.

Summary of Traditional Resource Use

The MEKS identified several resource and land/water use areas that continue to be utilized by the Mi’kmaq to varying degrees (Table 7.4.3). This listing includes land-based hunting and gathering activities in Cape Breton, as well as fishing in inland and nearshore marine waters.

Table 7.4.3 Resources of Traditional Importance to the Mi’kmaq in the Cabot Strait near the Study Area

Type of Use	Number of Areas	Number of Resources
Food/Sustenance	241	43
Medicinal/Ceremonial	24	15
Tools/Art	7	6

The eastern Cape Breton population of Atlantic salmon is designated as endangered by COSEWIC and the NS population of American eel is designated as threatened by COSEWIC. These and other SOCI are addressed in Section 7.1. With the exception of these two fish species, none of the other species identified by interviewees within the area are subject to conservation protection. All other species of plants and animals identified by MEKS interviewees are considered common and abundant throughout NS.

7.4.2.2 Mi’kmaq Fisheries of Unama’ki

The UINR prepared a background report that identified current fisheries undertaken by the Mi’kmaq of Unama’ki (Cape Breton). Associated research consisted of a literature review and compilation of Mi’kmaq ecological knowledge gathered through 17 interviews with Mi’kmaq commercial fish harvesters and traditional Mi’kmaq fish harvesters who fish for food, social, and ceremonial purposes.

The following excerpt from the UINR report provides some context regarding the different types of Mi’kmaq fisheries (*i.e.*, commercial and traditional) and their organization:

> *The Mi’kmaq fish for a diversity of species commercially and for traditional purposes around Nova Scotia. Recently acquired (2000) commercial access is in two [DFO] management areas of the Maritimes and the Gulf Regions as a result of the recognition of the Mi’kmaq Right and Title to aquatic resources for a moderate livelihood by the*

> *Supreme Court of Canada. These licenses are known as commercial communal. The licences are not individually owned but belong to the community governed by the Chief and Council. Each community designates a commercial fishing department who manages the daily activities of fishing fleets. Revenues are reinvested in the community. There are, however, several individuals with personal licenses and who benefit entirely from revenues generated through fishing activities. Revenues from commercial access comprise a significant portion of Band revenues and create the majority of employment opportunities for the community in the fishing sector and as administrative and field support.*
>
> *The most diverse fishery, however, is the Mi'kmaq traditional fishery. While little diversity current exists for the commercial fishing industry in the region, there are many more species that are relied upon by the Mi'kmaq for food, social and ceremonial requirements. Many of these species are fished under agreements known as Aboriginal Fisheries Strateg[ies] (AFS) between communities and [DFO]. Agreements vary by community.*

Commercial fishing seasons are set by DFO. They are specific and rarely vary between years, whereas harvest times for food, social and ceremonial species can vary depending on need (*e.g.*, personal consumption, ceremonies, feasts, wakes, *etc.*) and availability of the resource. In general, Mi'kmaq fishing within the Study Area occurs year-round, with the greatest diversity of fisheries occurring in the spring and summer months, and the lowest diversity during the fall and winter.

The interviewees identified 23 species of fish and six invertebrate species that are harvested by the Mi'kmaq of Nova Scotia for food, social, and ceremonial purposes; these include lobster, eel, Atlantic cod, Atlantic herring, flounder, haddock, pollock, redfish, smelt, scallop, shrimp, snow crab, sea urchin, swordfish, squid, silver hake, and bluefin tuna.

Similar to the results of the MEKS undertaken by MGS, UINR's findings also identify lobster as the most fished species in the Cabot Strait. Lobster fishing was mentioned by informants as occurring in the waters near Mill Pond, McCreadyville, and Point Aconi. A larger lobster fishing area that intersects the subsea cable route approximately 12 km north-northeast of Point Aconi was also noted. Species identified to a lesser degree include eel, cod, snow crab, "groundfish", mackerel, salmon, smelt, flounder and striped bass.

According to the UINR report, the majority (60%) of all fishing undertaken by the Mi'kmaq of Cape Breton were characterized by interviewees as current use activities, with the remainder classified equally as recent past use (20%) and historic past use (20%). Furthermore, the majority (54%) of fishing areas were categorized by interviewees as primarily for harvesting purposes, with 26% described as areas fished for commercial purposes and 20% identified as serving other purposes, including spawning areas, overwintering areas, and other areas known for concentrations of fish.

7.4.3 POTENTIAL PROJECT-VEC INTERACTIONS AND ENVIRONMENTAL EFFECTS

7.4.3.1 Potential Project-VEC Interactions

Table 7.4.4 ranks for each Project activity the potential effects on current use of land and resources for traditional purposes by the Mi'kmaq of Nova Scotia as 0, 1, or 2 based on the level of interaction with the Project and the degree of environmental effect.

Table 7.4.4 Potential Project Environmental Effects on the Current Use of Land and Resources for Traditional Purposes by the Mi'kmaq (Cabot Strait)

Project Activities and Physical Works	Potential Environmental Effects
	Change in Land and Resource Use for Traditional Purposes by the Mi'kmaq
Construction	
Grounding Facilities	2
Subsea Cables	2
Operation	
Subsea Power Transmission	1
Power Conversion	0
Maintenance	
Regular Inspection	1
Repair to Infrastructure	1
KEY 0 = No interaction 1 = Interaction occurs; however, based on past experience and professional judgment, the resulting effect can be managed to acceptable levels through standard operating practices and/or through the application of best management or codified practices. No further assessment is warranted. 2 = Interaction occurs, and resulting effect may exceed acceptable levels without implementation of specified mitigation. Further assessment is warranted.	

No Project activities during the construction phase received a ranking of 0 in Table 7.4.4.

There is minimal interaction expected between power transmission and infrastructure maintenance during the operational phase of the Project and current use of land and resources for traditional purposes by the Mi'kmaq. The majority of potential interactions are analogous to those affecting non-Mi'kmaq commercial fishing activity as described in the Commercial Fisheries VEC (Section 7.2). Therefore, with the application of proven mitigation and best management practices, the resulting effects on current use of land and resources are considered to be not significant.

The presence of grounding facilities associated with power transmission during Project operation may somewhat restrict Mi'kmaq access to their traditional seal hunting grounds and shoreline fishing areas. However, these facilities will occupy a very small footprint relative to the total area available for such activities and their presence is therefore expected to have only a negligible effect.

In consideration of the nature of the interactions and the planned implementation of known and proven mitigation, the potential environmental effects of power transmission and infrastructure maintenance on current use of land and resources for traditional purposes by the Mi'kmaq during any phase of the Project are rated not significant, and are not considered further in the assessment.

As indicated by the rankings of 2 in Table 7.4.4, the installation of subsea cables and construction of grounding facilities is expected to interact with the current use of land and resources for traditional purposes by the Mi'kmaq in such a way that, if unmanaged, could lead to significant environmental effects. Potential interactions between these Project activities and the VEC require further evaluation and are therefore assessed in the following section.

7.4.3.2 Potential Environmental Effects

Project construction activities have potential to affect Mi'kmaq land and resource use for current and future generations. Potential Project-related changes in marine habitats could affect traditional use by the Mi'kmaq. Restricted access to the Project site during construction could constrain Mi'kmaq fishing and hunting opportunities. During Project operation, the presence of the submarine cables could interact with Mi'kmaq fishing gear, while maintenance requirements could interfere with Mi'kmaq fishing and hunting activities.

Potential effects of any Project-induced change in the environment on heritage and archaeological resources in the Study Area that are of importance or concern to the Mi'kmaq are assessed in Section 8.3 (Archaeological and Heritage Resources VEC).

American eel is a species traditionally fished by the Mi'kmaq within the broader assessment area that extends 5 km beyond the Study Area boundaries. The species is designated as threatened by COSEWIC. Atlantic salmon is a species traditionally fished by Mi'kmaq that is designated as an endangered species by COSEWIC. Potential Project-related disturbances to fish and fish habitat as described in Section 7.2 and Section 7.3 (Commercial Fisheries VEC and Marine Environment VEC), could therefore have an adverse effect on Mi'kmaq use of these and other marine fishery resources. Installation of subsea cables and construction of the grounding facilities will be carried out primarily in the marine environment and therefore have potential to interact with traditional Mi'kmaq fishing activities in the Study Area.

The results of the Project-specific MEKS and the UINR fisheries report clearly indicate that the Study Area and waters are fished commercially by Mi'kmaq for lobster and that several species are fished for harvesting purposes, including eel, salmon, and other species. Moreover, the findings of the UINR report suggest that the subsea cable route is expected to traverse at least one known Mi'kmaq lobster fishing area located approximately 12 km north-northeast of Point Aconi. Potential environmental effects on fish, fish habitat, and commercial fishing activity could compromise an important source of income for the Mi'kmaq and thus have adverse socio-economic effects.

As described in Section 7.2, there is potential for fishery resources to be adversely affected by Project-related interactions with fish and fish habitat (*e.g.*, suspension of sediment; direct mortality of fish species; harmful alteration, disruption or destruction (HADD) of fish habitat;

underwater noise and vibration). Marine construction activities and related Project vessel traffic may interfere with Mi'kmaq fishing gear, conflict with the navigation of Mi'kmaq fishing vessels, and/or prevent Mi'kmaq fish harvesters and hunters from accessing their traditional fishing and hunting grounds.

Through early engagement with the Mi'kmaq (through KMKNO on behalf of the Assembly of Nova Scotia Mi'kmaq Chiefs) concern was expressed regarding the siting of Project components and associated activities that would interact with the Bras d'Or Lakes (St. Andrew's Channel). This alternative was eliminated based on this concern.

7.4.4 MITIGATION OF PROJECT ENVIRONMENTAL EFFECTS

Potential adverse effects on the Current Use of Land and Resources for Traditional Purposes by the Mi'kmaq VEC will be mitigated through implementation of the recommendation stated in the Project-specific MEKS report; accordingly, "the traditional use activities of the Mi'kmaq [will] be reflected upon in the overall environmental presentation."

As summarized below, additional mitigation measures proposed are broadly the same as those prescribed for other related VECs:

- Project effects on nearshore and offshore Mi'kmaq fisheries will be reduced through implementation of the mitigation measures outlined for the Commercial Fisheries VEC (Section 7.2) and the Marine Environment VEC (Section 7.3).
- Mitigation carried out in support of the biophysical environment for the SOCIVEC (Section 7.1) and the Marine Environment VEC (Section 7.3) will also be implemented to protect habitats and species of traditional importance to the Mi'kmaq; and
- The mitigation measures proposed for the Archaeological and Heritage Resources VEC (Section 8.3) will minimize potential Project effects on archaeological and heritage resources of importance to the Mi'kmaq.

7.4.5 CHARACTERIZATION OF RESIDUAL PROJECT ENVIRONMENTAL EFFECTS

Construction

Even with the application of mitigation measures, some traditionally important resources may be lost as a result of direct and indirect environmental effects associated with Project construction. In addition, construction activities may result in a temporary loss of access for traditional Mi'kmaq use, while shoreline development and construction of grounding facilities will lead to permanent loss of a small amount of land and resources that otherwise potentially could have been used for traditional purposes by the Mi'kmaq.

With the exception of American eel and Atlantic salmon, all other species identified in the MEKS as valuable for Mi'kmaq use are considered common and abundant throughout Nova Scotia. As noted previously, American eel is considered threatened by COSEWIC and Atlantic salmon is considered an endangered species in Nova Scotia. Although the MEKS did not identify any salmon fishing areas within the Study Area, fishing of this species is known to occur within the surrounding region, and eel was reported to be fished within both the Study Area and more broadly in Cape Breton. It is possible that unrecorded Mi'kmaq salmon fishing may presently occur within the Study Area, and there is also potential for the Study Area to be fished for eel and/or salmon in the future depending on species availability and interest. For these reasons disturbances to eel and salmon habitat could adversely affect Mi'kmaq use.

Several areas traditionally used for commercial lobster fishing were identified by MEKS interviewees. This is an important activity undertaken by the Mi'kmaq within the region that could be adversely affected by potential Project-related disturbances to lobster habitat or interference with Mi'kmaq fishing activities (*e.g.,* restricted access, entanglement with fishing gear, navigational conflicts). More generally, potential environmental effects on fish, fish habitat, and commercial fishing activity could disrupt Mi'kmaq traditional use activities as well as compromise an important source of income for Mi'kmaq, thus having adverse socio-economic effects. However, Project construction activities will be temporary and highly localized and alternative fishing areas – including nearshore and/or offshore lobster, eel, and salmon fishing areas – would remain available for Mi'kmaq use outside of the Study Area. It is recognized that displacement of fishing activity, even temporarily, could create conflicts with established patterns of fishing elsewhere.

During Project construction, current Mi'kmaq fishing activity will be subject to residual effects similar to those described for the Commercial Fisheries VEC (Section 7.2).

Fish habitat will be affected as a result of the construction of marine facilities. Application of armour stone to protect sections of the cables and grounding facilities may offset habitat loss. Habitat compensation will be carried out in consultation with DFO and local fish harvesters, including Mi'kmaq fish harvesters, to achieve no net loss of fish habitat. Effects on fish habitat are therefore considered to be reversible. The effects of noise, vibration and suspended sedimentation will be temporary and are not expected to disperse over long distances given the nature of the construction activities (*i.e.,* trenching, cable burial).

Activities associated with cable laying vessels will be mainly concentrated around the cable path over a two to three month period. Cable laying, once started, is a 24 hrs/day, 7 day/week operation and will occur for a period of 2 to 3 months between April and November of 2016. This will result in temporary displacement of Mi'kmaq fishing activity within the cable route. ENL will maintain ongoing consultation with fish harvesters during all Project phases, including the cable laying operation, to reduce conflict with fishing activities. A Notice to Mariners and Notice to Shipping will be published to inform vessel operators of navigational hazards during construction and operation. Mi'kmaq fish harvesters traditionally fishing near the cable route may be temporarily displaced during construction as the vessels involved in cable laying move through the area.

A highly localized but permanent displacement of Mi'kmaq fishing activity will result from the construction of the grounding facilities. However, the footprint of such a facility represents a relatively small portion of fishing grounds available to the Mi'kmaq within the surrounding area. It is recognized that displacement of fishing activity, even temporarily, could create conflicts with established patterns of fishing elsewhere, and this may need to be addressed by ENL in specific cases where there is a demonstrable effect.

Ongoing consultation with the Mi'kmaq fishing community and charting of Project vessel routes will serve to minimize the effects on navigation and interference with fishing gear.

Although cable installation and the construction of grounding facilities may be carried out in traditional Mi'kmaq seal hunting grounds, construction activities will be undertaken during periods of time when ice is not present in the Cabot Strait. Since construction will not overlap with seal hunting season, this activity is unlikely to be disrupted. Like other residents of Cape Breton and Nova Scotia in general, it is expected that Mi'kmaq will be positively affected by socio-economic benefits associated with Project-related expenditures and economic spinoffs, as well as potential employment, recruitment, and training initiatives during all phases of the Project.

In accordance with the single recommendation of the Project-specific MEKS report, "the traditional use activities of the Mi'kmaq [will] be reflected upon in the overall environmental presentation."

7.4.6 SUMMARY OF RESIDUAL ENVIRONMENTAL EFFECTS

Table 7.4.5 presents a summary of the environmental effects assessment and predictions of residual environmental effects resulting from interactions ranked as 2 on current use of land and resources for traditional purposes by the Mi'kmaq.

Table 7.4.5 Summary of Project Residual Environmental Effects: Current Use of Land and Resources for Traditional Purposes by the Mi'kmaq (Cabot Strait)

CHANGE IN CURRENT USE OF MARINE WATERS AND RESOURCES FOR TRADITIONAL PURPOSES BY THE MI'KMAQ
Mitigation – Construction, Operation and Maintenance

• As recommended in the Project-specific MEKS report, "the traditional use activities of the Mi'kmaq [will] be reflected upon in the overall environmental presentation."
• Mitigation associated with the following VECs will be implemented:
  ◦ SOCI VEC (Section 7.1);
  ◦ Commercial Fisheries VEC (Section 7.2);
  ◦ Marine Environment VEC (Section 7.3); and
  ◦ Archaeological and Heritage Resources (Section 8.3).

Table 7.4.5 Summary of Project Residual Environmental Effects: Current Use of Land and Resources for Traditional Purposes by the Mi'kmaq (Cabot Strait)

CHANGE IN CURRENT USE OF MARINE WATERS AND RESOURCES FOR TRADITIONAL PURPOSES BY THE MI'KMAQ								
Assessment								
	Residual Environmental Effects Characteristics							
Construction	**Direction**	**Magnitude**	**Extent**	**Duration**	**Frequency**	**Reversibility**	**Environmental Context**	**Significance**
	Adverse	Moderate	Local	Short term	Occasionally	Irreversible	Undisturbed	Not Significant
Operations	Adverse	Moderate	Local	Short term/ Long term	Occasionally/ Continuous	Irreversible	Undisturbed	Not Significant

Follow-up

- Upon final selection of the grounding facility location the MEKS will be amended to further characterize the sites.
- ENL will continue to engage with the Mi'kmaq of NS with respect to Mi'kmaq fisheries that interact with Project activities and components. Specifically, this could involve updating fisheries studies for the proposed grounding site in NS.

KEY

Direction:
Positive: condition is improving compared to baseline status

Adverse: negative change compared to baseline status

Neutral: no change compared to baseline status

Magnitude:
Negligible: no measurable adverse effects anticipated
Low: no net loss in the availability of or access to water and/or resources currently used for traditional purposes by the Mi'kmaq
Moderate: a nominal loss, or substantive loss that is compensated, in the availability of or access to water and/or resources currently used for traditional purposes by the Mi'kmaq
High: a non-compensated substantive and permanent loss in the availability of or access to water and/or resources currently used for traditional purposes by the Mi'kmaq

Geographic Extent:
Local: within the Study Area
Regional: 5 km beyond the boundaries of the Study Area to the west and east,

Duration:
Short term: effects are measurable for days to a few months

Medium term: effects are measurable for many months to two years

Long term: effects are measurable for multiple years but not permanent

Permanent: effects are permanent

Frequency:
Occasionally once per month or less.
Occurs sporadically at irregular intervals.
Occurs on a regular basis and at regular intervals.
Continuous.

Reversibility:
Reversible.
Irreversible.

Environmental Context:
Undisturbed: Area relatively or not adversely affected by human activity;
Developed: Area has been substantially previously disturbed by human development or human development is still present.
N/A Not Applicable.

Significance:
Significant.
Not Significant.

7.4.7 CUMULATIVE ENVIRONMENTAL EFFECTS

In addition to the assessment of Project-related environmental effects presented above, an assessment of cumulative environmental effects was conducted in regard to other projects and activities that have potential to interact with the Project. For the Current Use of Land and Resources for Traditional Purposes by the Mi'kmaq VEC, the assessment area for cumulative environmental effects extends five km east and west of the Study Area within the Cabot Strait. In large measure, the effects of past and existing projects are reflected in the baseline conditions against which the Project is being assessed. Table 7.4.6 identifies the potential for overlap between the Project residual environmental effects and those of other current projects or activities for which modifications or expansions are planned or underway, and future projects that can reasonably be predicted, within the assessment area. Table 7.4.6 also ranks for each Project activity the potential cumulative environmental effects as 0, 1, or 2 based on the level of interaction with other projects or activities and the degree of associated environmental effects.

Table 7.4.6 Potential Cumulative Environmental Effects on Current Use of Land and Resources for Traditional Purposes by the Mi'kmaq (Cabot Strait)

Other Projects and Activities with Potential for Cumulative Environmental Effects	Potential Cumulative Environmental Effects
	Change in Current Use of and Resources for Traditional Purposes by the Mi'kmaq
Port of Sydney Dredging and Infilling	1
Donkin Export Coking Coal Project	1
Marine Atlantic Inc. Passenger Ferry between NL and NS (Trans-Canada Hwy Ferry)	1
Commercial, Recreational, Subsistence, and Traditional Fishing	1
Existing Submarine Cables	1
KEY 0 = Project environmental effects do not act cumulatively with those of other projects and activities. 1 = Project environmental effects act cumulatively with those of other projects and activities, but the resulting cumulative effects are unlikely to exceed acceptable levels with the application of best management or codified practices. 2 = Project environmental effects act cumulatively with those of other projects and activities and the resulting cumulative effects may exceed acceptable levels without implementation of Project-specific or regional mitigation.	

Given that the majority of potential Project effects on Mi'kmaq fisheries in the Cabot Strait are similar to those affecting non-Mi'kmaq commercial fisheries in the area, potential cumulative interactions between the Maritime Link Project and the other projects identified in Table 7.4.6 are generally consistent with those assessed for the Commercial Fisheries VEC (Section 7.2).

Habitat loss associated with dredging and infilling activities in Sydney Harbour is being compensated to achieve no net loss of fish habitat. Compensation projects completed to date to offset this habitat loss have been developed in consultation with fish harvesters using Sydney Harbour. While this effect occurs near the Study Area, overlap between affected Mi'kmaq fish harvesters is expected to be minimal.

The Donkin Export Coking Coal Project will potentially result in fish habitat loss and interference with fishing vessels during the construction and operation phase, which may overlap temporally with Project-related marine activities. Similar to activities in Sydney Harbour, it is not anticipated that Mi'kmaq fish harvesters with traditional fishing grounds in the area affected by the Donkin Export Coking Coal Project will also be affected by the Maritime Link Project. Cumulative effects are therefore predicted to be minimal.

The Marine Atlantic passenger service between the island of Newfoundland and Cape Breton could interact cumulatively with cable laying and associated vessels to interfere with ongoing traditional Mi'kmaq fishing activity in the Cabot Strait. The ferry route is marked on navigation charts and fish harvesters are accustomed to accommodating ferry transits as well as movements of other vessels in the Cabot Strait. Locations and activities of cable laying vessels will be identified and published by the Canadian Coast Guard through Notice to Shipping and Notice to Mariners. For this reason, cumulative effects on the traditional Mi'kmaq fishery from interaction between the Project and ferry service will be minimal.

The effects of commercial fishing activities in the Cabot Strait on fish habitat (particularly benthos) and fish populations can interact cumulatively with effects from construction and operation of Project-related subsea structures. Commercial fishing activity is regulated by DFO to maintain the sustainability of commercial stocks. The food, social and ceremonial fishery is regulated by DFO and according to terms of agreement with individual Mi'kmaq communities. The Project will have a minor effect on benthic fish habitat during trenching and infilling for sections of the cable route and construction activities at the grounding sites. Any Project-related harmful loss or alteration of fish habitat will be addressed through application under the *Fisheries Act,* as applicable, including habitat compensation to comply with no-net-loss provisions of DFO policy. With these regulatory provisions in place, the contribution of Project-related activities to any cumulative effects on fish habitat or populations affecting the traditional fishery will be minimal.

The addition of Project-related submarine cables in the Cabot Strait could interact with existing submarine cables to cause a cumulative effect on traditional bottom fishing, (*e.g.,* fish avoidance of affected areas and potential gear loss). There are two active submarine telecommunication cables crossing the Cabot Strait (DFO 2005a), both operated by the Atlantic Provinces Optional Cable Systems (APOCS), which run from Aspy Bay and Sydney Mines in Cape Breton to NL (APOCS 1C and 2). There are also numerous inactive subsea cables that cross the Strait, most of which land in the Sydney Mines area. The installation of the Project cables and associated marine structures will have a minor cumulative effect with respect to changes to marine benthic habitat and traditional fish harvesters will need to be aware of additional subsea structures. However, since the new cables will be trenched or bermed in the relatively shallow waters that are routinely fished, there should be no impediment to fishing over them (although there will be minor restrictions at the infill footprint for the grounding sites). As with existing cables, the new Project-related subsea infrastructure will be located on marine charts thus allowing traditional fish harvesters to note any potential obstructions. Given these mitigation measures, cumulative effects on the traditional Mi'kmaq fishery from submarine cables will be minimal.

7.4.8 DETERMINATION OF SIGNIFICANCE

Construction activities for the Project may result in adverse effects which could result in a change in current use of marine waters and resources for traditional use by the Mi'kmaq, and this could persist over the life of the Project. The change in traditional Mi'kmaq water and resource use would be attributable to direct and indirect disturbance/loss of fishery resources and access restrictions. With the implementation of proposed mitigation and environmental protection measures, including the recommendation specified in the MEKS report (*i.e.,* consideration of Mi’kmaq interests and traditional use activities throughout the environmental planning process), the effect of a change in current use of marine waters and resources for traditional purposes by the Mi’kmaq is predicted to be not significant. Ongoing consultation with local Mi’kmaq representatives will provide feedback on the effectiveness of this mitigation and verify this prediction.

The potential cumulative environmental effects combined with the proposed mitigation measures, indicate that the residual cumulative environmental effect of a change in current use of marine waters and resources for traditional purposes by the Mi’kmaq is rated not significant.

In summary, residual environmental effects and cumulative effects on the current use of land and resources for traditional purposes by the Mi’kmaq are rated not significant.

7.4.9 FOLLOW-UP AND MONITORING

Upon final selection of the grounding facility location the MEKS will be amended to further characterize the sites.

ENL will continue to engage with the Mi’kmaq of NS with respect to Mi’kmaq fisheries that interact with Project activities and components. Specifically, this could involve updating fisheries studies for the proposed grounding site in NS.

With the implementation of proposed mitigation described for the Current Use of Lands and Resources for Traditional Purposes by the Mi’kmaq VEC, and in consideration of the residual environmental effects rating criteria, no additional monitoring is planned at this time. Additional work and/or monitoring may be required pending the results of mitigation required for the Project.