ZONAL REVIEW OF EMERA NEWFOUNDLAND AND LABRADOR MARITIME LINK ENVIRONMENTAL ASSESSMENT REPORT

Context

Fisheries and Oceans Canada's (DFO) Habitat Management Division is reviewing an Environmental Assessment (EA) for the proposed construction and operation of a new 500 megawatt (+/-200 kV) high voltage current transmission line, and associated infrastructure, from Granite Canal, Newfoundland, to Woodbine, Nova Scotia, to determine if the project is likely to result in negative impacts to fish and fish habitat. As a potential responsible authority under the *Canadian Environmental Assessment Act (CEAA)*, DFO is required to assess and make a determination of the significance of the environmental effects associated with the project. DFO Habitat Management has asked DFO Science to review both the draft and final EA reports.

The specific questions from Habitat Management to DFO Science were:

- Is the information provided in the report accurate and complete, especially in relation to sections:
  - 4.0 Environmental Setting - Subsection 4.2
  - 7.0 Cabot Strait - Subsections 7.1, 7.2 and 7.3
  - 10.0 Accidents and Malfunctions - Subsections 10.9
- Does the information provided support the scientific conclusions, especially in relation to the potential effects associated with electrical and magnetic fields (EMF)?
- What additional mitigation and monitoring could address these potential effects?

This Science Response Report results from two Zonal Science Response Processes: Review of Emera Newfoundland and Labrador Maritime Link Environmental Assessment Report: Part 1 – Review of Draft of November 6, 2012, and Review of Emera Newfoundland and Labrador Maritime Link Environmental Assessment Report: Part 2 – Review of Final of February 6, 2013). A disposition table that lists the proponent’s response to comments received from regulators during the initial review of the draft EA was also provided for consideration in the February review. DFO’s Science Response Process was used to review the draft and final EA reports (including disposition table) and provide input due to the short deadline for advice and the fact that the advice will contribute to a broader *CEAA* process.

The conclusion of the DFO Science review of the final EA is that the scientific content related to electromagnetic field predictions associated with the subsea cables and grounding stations is generally considered to be sound. However, the proposed location of the grounding station in St. George’s Bay, NL, remains a concern for Atlantic Salmon and American Eels. Although many of DFO Science’s comments on the draft EA have been addressed in the final EA and associated disposition table, some gaps remain for several key areas of concern. In particular, there continues to be insufficient characterization of: the biology and potential effects on sensitive species such as marine mammals, Leatherback Turtles and Atlantic Salmon; the potential effects of shore-based electrode and grounding facilities on sensitive migratory species (e.g., Atlantic Salmon), especially during monopolar operation; timing of all in-water activities in relation to the timing of peak migration and migrations routes for sensitive species such as marine mammals, Leatherback Turtles and Atlantic Salmon; and cumulative effects. These gaps impact DFO Science's ability to evaluate the validity of the EA conclusions and propose potential additional mitigation or monitoring.

Where specific mitigation and monitoring practices have been proposed to reduce uncertainty and risk, such as behavioural monitoring programs for electromagnetic sensitive species, sufficient monitoring, verification and enforcement processes may be necessary to ensure the effectiveness of these practises. Also, logistical challenges, likelihood of success, determination of significance of effects, and possible remediation actions associated with mitigation and monitoring programs should be clearly communicated.

Background

The role of the EA process is to support sustainable development by helping to eliminate or reduce the project's potential impact on the environment before it begins and ensure appropriate mitigation measures are applied once the project is initiated. The intent of the EA report is to fulfill the *CEAA* requirements for the construction and operation of the Maritime Link Project. Specifically, the document responds to the reporting requirements of a transitional screening-level assessment under the former *CEAA* (1992); an Environmental Preview Report under the Newfoundland and Labrador (NL) *Environmental Protection Act*; and a Registration for a Class 1 Undertaking under the Nova Scotia *Environment Act*. In addition, the EA report has been prepared with reference to the Environmental Assessment Guidelines, developed for the Project by the Governments of Canada, Newfoundland and Labrador, and Nova Scotia.

The Canadian Environmental Assessment Registry (project number 65713) includes more information on the proposed development project.

The majority of this Science Response focuses on the Study Area located within the Cabot Strait (Figure 1). The Cabot Strait is the largest of three outlets for the Gulf of St. Lawrence into the Atlantic Ocean, and represents an important migration area for Atlantic Salmon, American Eels, several pelagic species (Atlantic Herring, Mackerel, Bluefin Tuna), groundfish (Atlantic Cod), marine mammals and Leatherback Turtles, as well as a strategically important waterway and international shipping route linking the Atlantic Ocean with inland ports on the Great Lakes and the St. Lawrence Seaway.

The Cabot Strait Study Area is within the Placentia Bay/Grand Banks Large Ocean Management Area. It also traverses the Laurentian Channel Area of Interest within which planning for the establishment of an *Oceans Act* Marine Protected Area (MPA) is being undertaken.

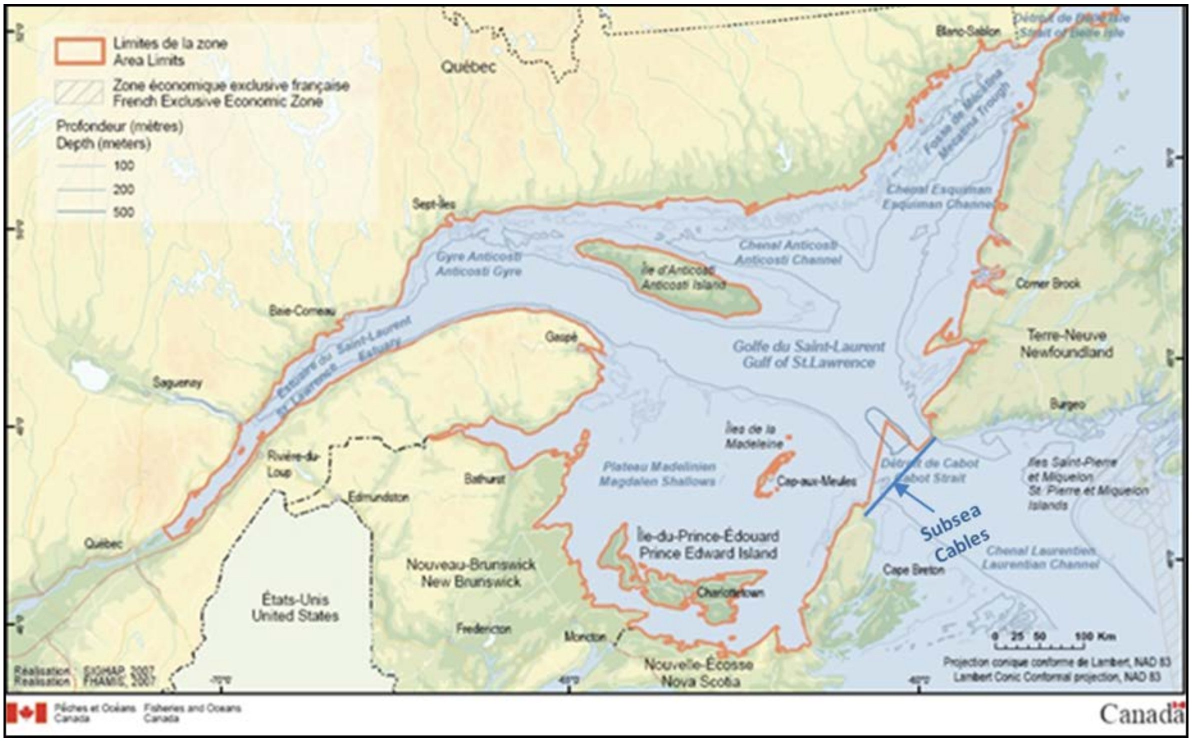

Figure 1. Study Area in relation to the Gulf of St. Lawrence and the Cabot Strait. Subsea cables will span approximately 180 km from Cape Ray, Newfoundland and Labrador, to Point Aconi, Nova Scotia.

Analysis and Response

The DFO Science review of the draft EA report follows, and a review of the final EA report (primarily in terms of the responses provided in the disposition table) can be found in Appendix 1.

General Comments

Science Branch (NL and Quebec Regions) recently conducted an SSRP (DFO 2012a) for the Labrador-Island Transmission Link Marine Environment and Effects Modelling Component Study. Given the similarities between the two proposed projects, much of the advice from the previous SSRP is applicable to the Maritimes Link EA, especially with respect to the impacts of EMF. Also, a Science Response has been developed for the Labrador-Island Transmission Link project Environmental Impact Statement but has not yet been published. Much of the advice from the Science Response related to the Labrador-Island Transmission Link project is also applicable to the Maritimes Link EA.

While the Gulf of St. Lawrence Large Ocean Management Area (LOMA) is referred to, the draft EA does not acknowledge that the Study Area and intended crossing route in the Cabot Strait falls within the Placentia Bay/Grand Banks LOMA. In addition, the intended route traverses the Laurentian Channel Area of Interest, within which planning for establishment of an *Oceans Act* MPA is being undertaken.

The draft EA report provides minimal information on the aquatic resources in the area. Many abundant and historical commercially important species migrate seasonally through Cabot Strait, while some overwinter in the area, and information for these species should be included in the EA report. Highly migratory species such as Atlantic Salmon and American Eel, in particular, could be potentially impacted by the project but are not adequately considered.

Some of the EA conclusions are high level and quite general and could better reflect the more detailed information contained within the various baseline studies. For example, the complexity associated with the baseline study on sediment dispersion modeling is not well presented in the EA.

In other cases, the information and analysis presented are overly complex. For example, information presented on 19 separate bottom habitat classes is too complex from a habitat classification perspective, and it is suggested that 4 classes may be all that is necessary (e.g., bedrock, cobble, sand and silt/mud).

The EA report should better acknowledge where data are sparse and conclusions are based on limited data. Also, when models are based on limited data, associated uncertainties need to be highlighted and, whenever possible, predictions/ projections from these models should be field tested.

There are inaccuracies in the EA report and the baseline study on “Fisheries in Cabot Strait” regarding aquatic resources in the area.

Several species in the Study Area (e.g., skates, rays, sharks, American Eel, and Atlantic Salmon) are considered to be magnetosensitive and/or electrosensitive species, and the conclusion that the effects of the underwater cable on their migrations and behavior will be minimal is not consistent with the degree of uncertainty.

Given the degree of uncertainty surrounding the long-term effects of EMF on species migrations, the cumulative impact of the Labrador-Island Link project and this project need to be discussed in the context of placing undersea cables and associated EMF across the two largest (of three) and unimpeded outlets for the Gulf of St. Lawrence into the Atlantic Ocean.

Although the EA report presents some limited information on pockmarks, given that these habitats can be easily destroyed by human activities and the widespread distribution of pockmarks throughout the Study Area, further analysis on the impacts that the project could have on these important areas is warranted, especially given that the one pockmark captured on video had high species richness (e.g., redfish, seapens, and corals).

Transitional areas such as slopes are known to support particularly diverse and productive ecosystems, and more effort on assessing the importance of these transitional areas in the context of broader regional biodiversity and productivity would be beneficial.

There are a variety of disturbances associated with the project that may occur at sensitive times or in key habitat areas, and the EA report should be more specific on how potential effects will be mitigated (i.e., temporal and spatial exclusion).

The list of references (Section 12.1) was not provided in the draft EA report, making access to background information difficult (e.g., experience from other parallel high-voltage, direct current (HVdc) cable projects).

Due to the tight timelines and previous commitments, not all appropriate scientific experts from NL Region were available for review of the draft EA report, and a comprehensive, detailed review of the draft EA report was not possible within the required timeframe. The biological and fisheries information contained within the draft EA report was reviewed primarily by the Maritimes (and Gulf) Region.

Physical Environment

Temperature and Salinity

For the Water Temperature and Salinity Section (Section 4.2.1.4, p.4.23), more complete information collected several times a year for the entire area are available from Atlantic Zone Monitoring Program (AZMP) program with data from 1999 to 2012.

Figure 4.2.4 needs a better explanation (e.g., is this an average over the Cabot Strait section, or at a given location) and a citation regarding the source.

Ocean Currents

Sections of the EA report that relate to ocean currents (p. 4.21, 7.52-53, 9.10-11) rely on the Wu and Tang (2011) technical report for their information on currents across the Cabot Strait. This is somewhat problematic as this report is based on model results that the authors acknowledge as one of their "less satisfactory results" in a subsequent publication (Wu et al. 2012). In particular, the description of the surface currents through the Cabot Strait flow uniformly southward and there exists an outward flow near the bottom, is not supported by observations and other modelling results. However, the reality is that the observations are not comprehensive and the other modelling results are not perfect, so there is no simple solution to this problem. That being said, this information, as presented in the EA report, does not have any significant effect on the project and replacing it with better information would not likely affect any of their conclusions or remedial measures. Thus, there is no need for significant modification of the document in these areas, although it is recommended that a comment to the effect that, "this information is based on circulation model output and is subject to uncertainty," be added to the EA report.

The summary should also cover tidal currents, seasonal-mean currents and extreme currents. The baseline study entitled "Metocean study for Cabot Strait" by Oceans Ltd. provides a much better and detailed description of ocean currents, and it is suggested that the authors of this EA report provide an improved (concise and complete) summary based on the Metocean study.

Seabed

The offshore survey indicates that the deepwater habitat contains many (754) pockmarks indicative of the escape of gas hydrates from the sediments. Some of these features also include active gas vents. Pockmarks are shallow, cone-shaped depressions in muddy, silt/clay sediments (King and MacLean 1970) that occur world-wide wherever suitable reducing sediments occur (Judd and Carzi 2002), potentially hosting a highly specialized fauna and providing significant contributions to regional diversity (Zeppilli et al. 2011). Although the EA report presents some limited information on pockmarks, given that these habitats can be easily destroyed by human activities and the wide spread distribution of pockmarks throughout the Study Area, further analysis on the impacts the project could have on these important areas is warranted, especially given that the one pockmark captured on video had high species richness (e.g., redfish, seapens, and corals).

The proponent does consider pockmarks from the perspective of geological hazards in relief that may require infill but does not evaluate the habitat or fisheries consequences of such infilling operations. This should be included in the assessment, as well as in the summary of the overall effects of the project on the environment. In addition, there is no evaluation of the risk of formation of new pockmarks for cables themselves. Gas efflux can occur very rapidly with explosive force that might damage or rupture the cables. The size, age and rate of formation of pockmarks should be assessed and this potential effect of the environment on the project should be considered in the assessment.

The draft EA report states on p 2.41 that a grapnel will be used to remove debris but, given that a grapnel doesn't always work, a small remotely operated vehicle (ROV) could be used to actually see if there was any debris present and to verify seabed conditions.

With respect to the use of horizontal directional drilling (HDD) (p. 2.44), there is reference to the use of water-based muds and possible effects. A routine problem associated with using any drill mud is that it contains large amounts of clay, and in this case bentonite, which has been known to increase flocculation (forming of large aggregates) and deposition if sediment is naturally occurring in suspension. Bentonite containing drill muds in high enough concentration can cause effects on filter feeders (Cranford et al. 1999). Although there may not be an issue at the proposed HDD sites, these possible effects are worth noting.

Given the reference to the Sidney Bight in the Geophysical Environment section (p. 4.25-4.26), and past attention towards potential oil and gas exploration and drilling in this area, consideration could be given to possible future interactions between various oil and gas related activities and the proposed project.

With respect to effects of construction (p. 7.44-7.48), there will be disturbance in the area of the cable route footprint. In any sandy environment, some of the seabed will be moving around and changes in flow patterns as a result of a cable will increase deposition and scour in areas where flow is reduced and increased respectively.

The baseline study related to sediment dispersion modeling was provided after the initial EA package and, therefore, was not fully assessed at that time.

Biological Environment

Marine Wildlife (Section 4.2.3.5)

Table 4.2.5 lists the abundant pelagic fish species with potential to occur in or near the Study Area (Cabot Strait) but needs to be updated to reflect the following information. Atlantic Mackerel are not in the Study Area year round. In terms of abundant species, Atlantic Bluefin Tuna should be added as they are abundant in this area at least in summer and fall. Also missing are important species that utilize the area as transients through the Cabot Strait (see "Species of Conservation Interest" section below for additional detail). For example, Atlantic Salmon smolts from various populations in Cape Breton, Gulf of St. Lawrence and south and west Newfoundland migrate out in May and June and adult Atlantic Salmon return in June to November. Also, American Eel elvers return to the Gulf of St. Lawrence, Cape Breton and Newfoundland in spring/summer and adult eels exit rivers to migrate to spawning grounds in fall and early winter. Haddock is misclassified as a pelagic species and should be placed with the groundfish/demersal species in Table 4.2-6. Pollock is a semi-pelagic species but is generally classified with those in Table 4.2-6.

Table 4.2-6 is a summary of abundant groundfish fish species with the potential to occur in or near the Study Area (Cabot Strait) but is in need of updating. First of all, it is unclear what this table is supposed to contain. It indicates that it is supposed to reflect the most abundant groundfish species with potential to occur in or near the Study Area (Cabot Strait) but then the most abundant species are not listed (see "Commerical Fisheries" section below for additional information). Missing in particular are: Atlantic Cod from the Laurentian South Designatable Unit (DU) (DFO 2011b) and Laurentian North DU (DFO 2011a); American Plaice Maritimes DU (DFO 2011d); redfish species (DOF 2011e); and Atlantic Wolfish (found in the deep waters of the Laurentian Channel) (Chouinard and Hurlbut 2011).

The EA report states (p. 4.39) that, "Field studies confirmed the presence of several of the above-listed marine species within the Study Area", but it does not reflect the fact that multiple

DFO led fish surveys have been carried out in the vicinity of the project (Clark and Emberly 2009, Horsman and Shackell 2009, Simon and Comeau 1994) and comprehensive lists of species have been published for this area that includes the proportion of stations in which fish species were found (Chouinard and Hurlbut 2011, Horsman and Shackell 2009). Also, the 4Vn resident Atlantic Cod population is found year-round in this area (Mohn et al. 2001).

Species of Conservation Interest (SOCI)

Table 4.2-8 (p. 4.41) lists fish SOCI potentially present in the Study Area (Cabot Strait) but, for completeness, should reflect several key pieces of information. Atlantic Cod was assessed as “special concern” prior to enactment of the Species at Risk Act (SARA) in April 1998 and as such is still listed under Schedule 3 of SARA. Subsequent Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assessments grouped Atlantic Cod into six DUs and assessed the DUs, which can be found in Cabot Strait at some point in their life cycle, as “endangered” (Laurentian North DU (4RS, 3Pn), Laurentian South DU (4T, 4Vn, 4VxW) (COSEWIC 2010a). Recovery Potential Assessments (RPAs) were completed for these DUs (DFO 2011a and DFO 2011b). Also, if the criteria for SOCI includes COSEWIC assessed species, then the list of species in Tables 4.2.8, 4.3.13 and 7.1.2.1 are missing several entries:

- COSEWIC assessed American Eel as one DU for eastern Canada and assessed it “special concern” in April 2006. In April 2012, COSEWIC reassessed American Eel, retained the single DU group and assessed its status as “threatened” (COSEWIC 2012).
- Atlantic Salmon have been assessed by COSEWIC as 16 DUs in Canada, of which a large number of these would migrate through the area of Cabot Strait (COSEWIC 2010b). Southern Gulf-Gaspe DU and all the Quebec DUs have been assessed as “special concern” except for the Anticosti Island DU, which was assessed as “endangered”. Two Atlantic Salmon DUs have rivers located in the area of the project, including the South Newfoundland DU (SFA 9-12), assessed as “threatened”, and the Eastern Cape Breton DU (SFA 19), assessed as “endangered”. This population includes all rivers within the eastern Cape Breton area located in DFO Salmon Fishing Area 19 (Gibson and Bowlby 2009; DFO 2012c). RPAs are in the process of being completed for these DUs.
- The Maritimes DU of American Plaice, comprises stocks located in NAFO Division 4RST (Gulf of St. Lawrence) and 4VsW (Scotian Shelf), and was assessed by COSEWIC as “threatened”. American Plaice are found in the area of the project year round and an RPA report is available for this species DU (DFO 2011d).
- Bluefin Tuna migrate through Cabot Strait and COSEWIC assessed the western Atlantic population as “endangered” and an RPA for this species is available (DFO 2011f).
- Redfish were assessed as “endangered” by COSEWIC and a redfish RPA is available (DFO 2011e).
- Winter Skate, although relatively rare in this area, has been recommended as “threatened” on the eastern Scotian Shelf (COSEWIC 2005).
- Thorny and Smooth Skate were recently recommended as having a status of “special concern” in this area.

With respect to seabed preparation and cable laying, this process should not impact any of these species on a population level, but care must be taken during the process to adhere to Section 32 of SARA which prohibits anyone to, "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".

For the fish species listed in Table 4.2-8, there has been no residence defined that could be destroyed by the seabed preparation process, though wolffish are thought to use burrows. No critical habitat has been defined for these species either.

Marine Mammals and Turtles

Information contained in the marine mammal sections is rather general and thinly covered from the perspective that species accounts are general, details on the duration and timing of project activities are only generally noted, and information on mitigation actions are vague and do not commit to restricting project activities during sensitive ecological times and in sensitive habitats thought to be important for several marine mammal species. The lack of detail in each of these areas of the draft EA report makes it impossible to appropriately evaluate and concur with the proponent's conclusion that there will be no significant impacts on marine mammals. It must be acknowledged by the proponent that these sections of the EA report are needed to evaluate any conclusions and, therefore, the information content in each must be of sufficient detail, appropriately linked, and synthesized from that perspective. If this can't be done for all species, then data gaps and uncertainties should be clearly presented.

Treatment of the Blue Whale information is not adequate. This is an endangered species that is listed as uncommon in the Study Area yet the passive acoustic monitoring (PAM) study seems to indicate a consistent presence of the species for significant portions of the year. Given the low abundance of the species and the related conservation concerns, a more comprehensive evaluation of potential negative project effects needs to be carried out, as well as more attention placed on ensuring that effective mitigation measures are implemented. An evaluation of older studies by Sergeant (1982) and Mitchell (1978), as well as more recent observations (Stenson *pers com*), documenting late fall and winter use of the Port Aux Basques area by Blue Whales needs to be included in greater detail (including information and possible consequences of winter ice entrapments).

In general, those parts of the Study Area important for Hooded and Grey Seal feeding and overwintering are lost in the generality of the text. This problem needs to be addressed by improving the presentation and synthesis of existing published data, some of which is referenced or mentioned in the draft EA report, but not presented in enough detail for proper project effects evaluation (this problem is not limited to just Grey and Hooded seals).

Harbour Seals are listed as uncommon in the Study Area but occur in relatively high densities in the vicinity of the proposed grounding sites in St. George's Bay near Flat Bay (Sjare et al. 2005). This species uses the coastal areas in this part of the Bay extensively and are known to breed in the vicinity (the area appears to be productive and is also important for salmon). Harbour Seals are particularly susceptible to disturbance during pupping and nursing periods. It is generally unknown how EMFs affect them. The bottom of St. George's Bay, and the Bay in general, is also frequented by other marine mammals species including Grey and Harp Seals and small cetaceans at various times of the year. This information needs to be included in the relevant sections of the final EA report.

The area that will be subject to cable laying activities falls directly within what is currently considered one of the most important habitats for Leatherback Turtles in Atlantic Canada, and likely the broader temperate Northwest Atlantic. Not only is the portion of the Cabot Strait where the proposed cable laying will occur a key foraging area for Leatherbacks (DFO 2011c), it also represents the area through which large numbers of this species enter and exit the Gulf of St. Lawrence. For Leatherbacks, large pelagic fish (e.g. Bluefin Tuna), cetaceans (e.g. Blue Whales), and other vulnerable species, the Cabot Strait is the gateway to productive foraging grounds in the Gulf of St. Lawrence. The southern Gulf of St. Lawrence has been identified as important habitat for Leatherbacks, with relatively large numbers of turtles feeding there during summer and fall.

The draft EA report focuses on the potential for cable laying vessels to contact turtles in the area. In contrast, another concern worth consideration is related to cable laying activities taking place over a 2-3 month period (as estimated in the EA), from the platform of a 100-150 m ship, which will presumably create significant ambient noise resulting from ploughing and trenching activities, etc. Such activities could potentially displace turtles from local preferred foraging areas, or discourage them from proceeding further into the Gulf of St. Lawrence. Also, if geomagnetic orientation is important to marine turtle navigation, as has been demonstrated in the primary literature many times (Lohmann et al. 2001 and 2004, Papi et al. 2000), including orientation to foraging areas (as the draft EA report rightly acknowledges), then it is possible that the very presence of an active cable dissecting the Cabot Strait could impact Leatherback orientation to key feeding areas (see “Electromagnetic Fields” section below for additional detail).

The final EA report should consider mitigation measures related to the temporal aspect of Leatherback foraging in the Cabot Strait/Gulf of St. Lawrence, including the potential for restricting cable laying activities to the period when most Leatherbacks are not present in the Gulf (mid-November through to the end of May).

Commercial Fisheries

The draft EA report (p. 4.38-4.52) provides lists of pelagic and groundfish species according to the Biodiversity Portrait of the St. Lawrence (Environment Canada 2002) but does not include the complete picture of fish distribution throughout the Study Area. For example, according to the Biodiversity Portrait of the St. Lawrence, American Plaice is broadly distributed throughout the Gulf of St. Lawrence and extends into Div. 3Ps near the northern terminus of the proposed link, with only a few stations scattered across Div. 4Vn (Figure 2). In reality, approximately 80% of the link traverses Div. 4Vn, which has actually been surveyed during the summer by DFO Maritimes Region since 1970, and the American Plaice distribution resulting from these surveys (Figure 3) presents a much different picture from what is presented in the draft EA report. The focus of these surveys was groundfish, but the scope of the survey was broadened to include invertebrate species in 1999. Survey coverage has primarily been restricted to depths less than 200 m. Since 2000, the ten most common fish species were American Plaice, Atlantic Cod, Witch Flounder, redfish, Thorny Skate, Atlantic Herring, Turbot, Capelin, White Hake and Striped Wolfish. The five most common invertebrates were Snow Crab, starfish, *Pandulus* shrimp, *Illex* squid and sea urchins. White Barracudina, which was the first species in a list of most abundant species in the EA report, was actually the 44th most common species in the summer research survey (including invertebrates). Another data source to consider in Div. 4Vn would be the 4Vn Sentinel Survey (Figure 4). Survey coverage was generally in the same areas as the summer Research Vessel (RV) survey. The spring 3Pn survey and the Unit 2 redfish surveys may also provide additional information for the EA. There are also additional surveys in the 4Vn area (Western Cape Breton) that could be included. In the DFO NL Region, there are several surveys conducted in the 3Pn4Vn areas that would be useful in terms of describing the marine environment (e.g., 3Psn multi-species surveys since 1973; 3Psn4Vsn summer surveys focusing on redfish 100+ fathoms 1994-1997, 2000, 2002; Groundfish Enterprise Allocation Council (GEAC) and DFO-GEAC surveys 3Psn4Vsn 1997-2001 and bi-annually thereafter). DFO Maritimes, NL, and Gulf Regions could be contacted directly for this information although some of the species distribution information mentioned above is available in the following references: Simon and Comeau 1994; Mohn et al. 2001; Moriyasu et al. 2001; Poirier 2001; Clark and Emberly 2009; Horsman and Shackell 2009; Chouinard and Hurlbut 2011; Clark and Emberly 2011; DFO 2012b; Emberley and Clark 2012.

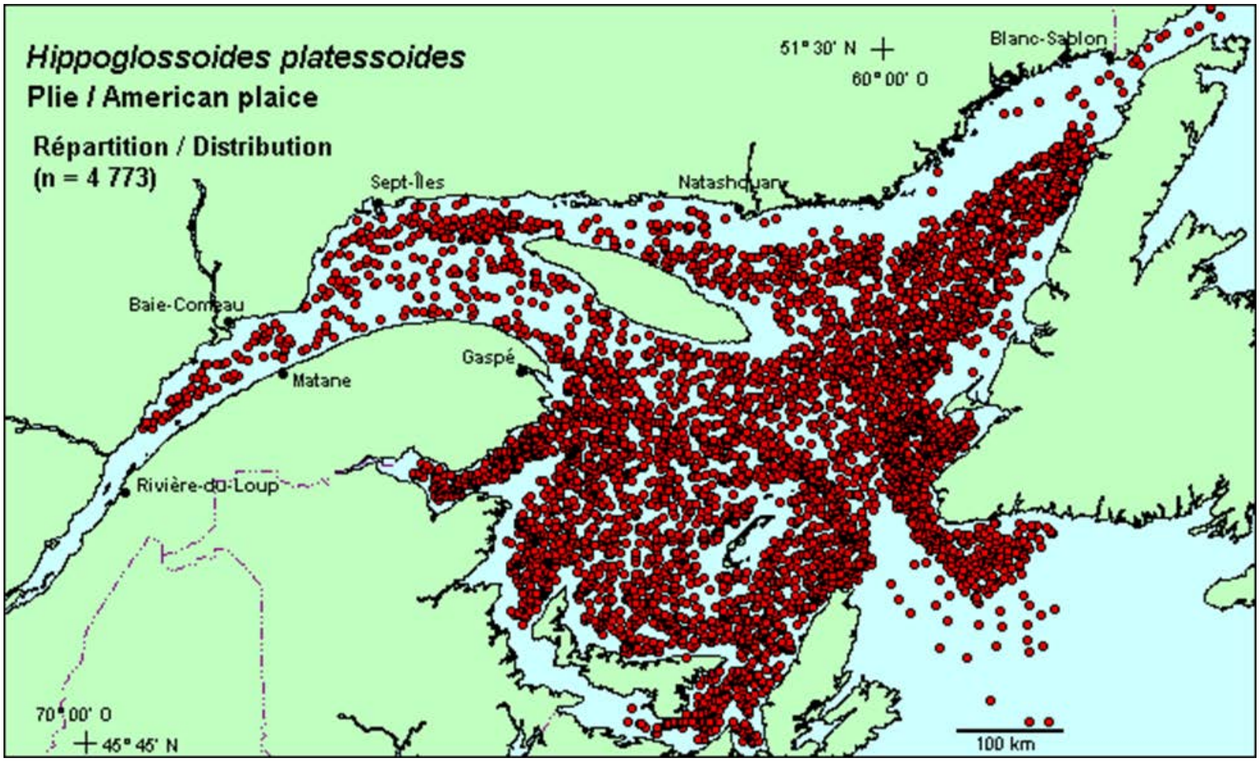

Figure 2. American Plaice Distribution from Biodiversity Portrait of the St. Lawrence (Environment Canada 2002).

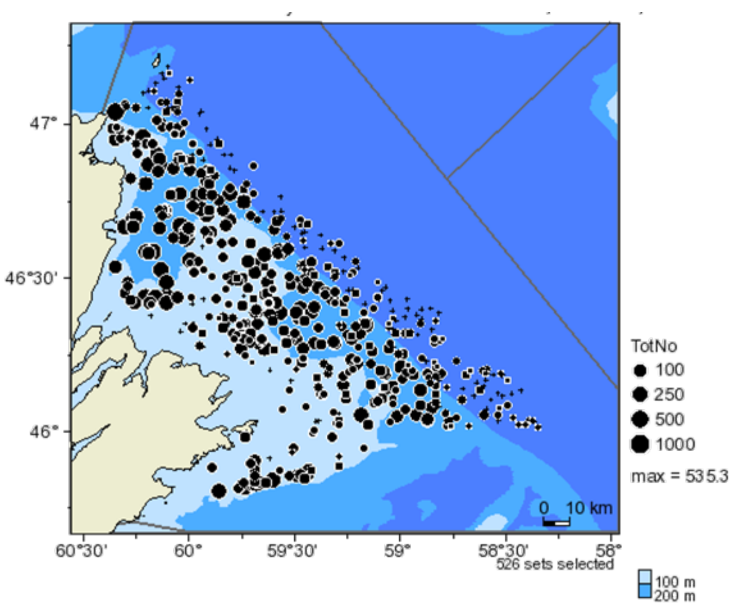

Figure 3. The American Plaice distribution resulting from DFO Maritimes Region summer research vessel surveys since 1970.

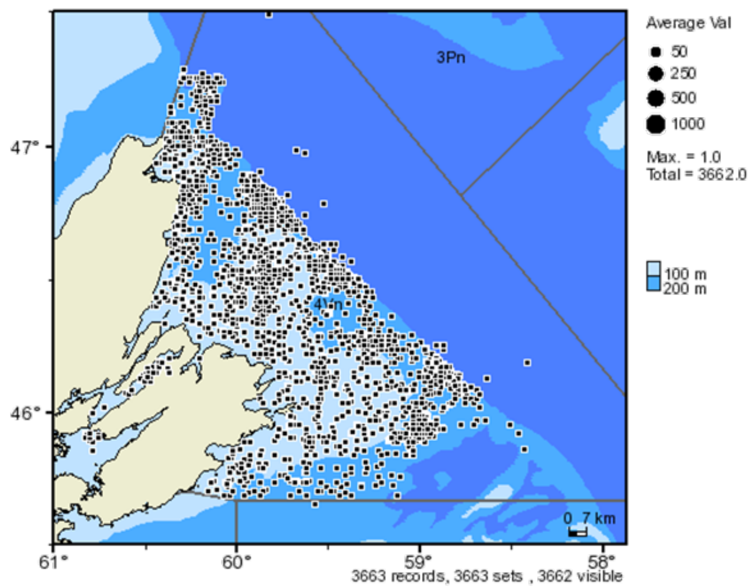

Figure 4. The American Plaice distribution resulting from DFO Maritimes Region 4Vn Sentinel Program.

The commercial fisheries in Div. 4Vn are described beginning on page 4.44. Bycatch species are not listed in any of the fisheries examined and the data series only extend from 2003 to 2008. This period is at a time of depressed groundfish fisheries and may not be indicative of the distribution of each species when catch rates (or markets) are more conducive of commercial fisheries. The Maritimes Region has positional information (latitude and longitude) for a subset of all groundfish fisheries back to 1986. These data are 'rolled up' into subtrips, which may provide only a single position for a days fishing if sets were within a prescribed distance. Still these data do provide distributional information albeit at a coarser scale than more recent information. Note that even the more recent data is rounded up to a scale of one nautical mile.

The second to last paragraph on p. 4.50 should indicate that the bait fishery includes catches of Gaspereau, generally as a bycatch.

Table 7.2-3 lists licensed seasons for commercial fisheries in the regional assessment area, but missing from this table are the coastal trapnets that catch pelagic fish including Gaspereau in the 4Vn area.

Fishing on 4T Herring has occurred in the past in 4Vn in late fall and early winter.

DFO concurs with the EA conclusion that since the cable will be laid perpendicular to isobaths, the cable's effects on seasonal movements of lobster should be minimized given that most lobsters will not cross over the cable during deep-shallow seasonal migrations. There is some along shore movement of snow crab so the effect of the cables on this species is less certain although trenching may mitigate these effects.

Although Section 7.2.3.2 (Potential Environmental Effects) does identify potential lobster mortality and temporary losses due to catchability, mitigation only seems to entail communication with fishermen and adherence to standard practices and there is no discussion on the perceived effectiveness of this mitigation or necessary follow-up monitoring. Follow-up monitoring could include monitoring via video or some other means to evaluate whether benthic animals are in the area and are moving away from the cable path during cable laying. Also, if cable laying within approximately 5 km of shore occurred in June or July, not only would there be lobster traps to deal with, but the cable route could include areas where some lobsters (e.g. small lobsters in crevices or burrows, molting or reproducing lobsters) may be less likely to get out of the way of the cable laying operation (including trenching or berming). Therefore, clarification is required to identify whether there will be a fishing exclusion zone during construction and/or after the cable is in place, and, if so, the dimensions of the exclusion zone.

Table 4.2-7 on p. 4.40 (Summary of Spawning and Hatching Periods for Principal Commercial Fisheries Species with the Potential to Occur in the Cabot Strait) should explicitly include planktonic larval lobster periods (post-hatch). Lobster eggs are likely hatched by August, but some late hatching may occur in September. Some lobster larvae will definitely be in the water column in September and possibly as late as early October.

Overall, considerations need to be given to mitigating disturbance on commercial species at sensitive times and within important habitat areas whenever possible. The vague treatment of project mitigation does not provide assurances that this will be done. Possible mitigation may include limiting particular project activities such that key habitat areas are protected during particularly sensitive times.

Underwater Acoustics

In terms of underwater acoustic environmental effects, a few stand out as extraordinary, unexpected, or requiring special treatment. Cable laying will require use of a large dynamically positioned vessel that will constitute a source of noise over an extended period of time at a quite slowly moving location (Section 2.6.6.1– p. 2.41). Radiated vessel noise levels would probably be roughly comparable to those of other large vessels commonly transiting the Cabot Strait area (some measurement-derived limits on source levels quoted in section 4.2.1.6 p. 4.23), but because of the nature of the cable laying process, the source would be rather persistent (total duration 2 – 3 months). It is also unclear whether the vessel will employ acoustic sub-bottom profiling to assist the cable laying process. Consideration needs to be given to the effects that a virtually stationary noise source could play in impeding marine mammal or fish migrations, or repelling fish from traditionally fished areas.

Bottom trenching (3.5 m deep) or ploughing will be required in the shallower areas (< 400 m deep section 2.6.6.2) on either side of the Laurentian Channel (cable will not be buried in deeper areas of Channel). Shore-based horizontal directional drilling (section 2.6.7.10) will be required to install the cable near-shore (1 km offshore NS terminus, 450 m offshore in NL section 2.6.6.3), which conceivably could produce local low level noise in the marine environment but probably not enough to be significant on the longer term. Although noise disturbance from shoreline construction and dredging activity may be relatively brief and is likely not significant from a marine mammal's short term well-being, it is a concern if important feeding or breeding activity is disrupted, particularly if the species of concern is the Blue Whale or any of the other threatened or endangered species. Cumulative, incremental degradation of key marine mammal habitat is a long term concern. From a marine mammal perspective, there is a need to mitigate the effects of underwater noise disturbance at sensitive times of the season or in key habitat areas whenever possible. The vague treatment of project mitigation in most cases, does not provide assurances that this will be done.

Some concern attends the establishment of the grounding facilities. While no blasting in the marine environment is planned as part of the project (p. 7.54), the area where the breakwater will be located may require dredging to remove any unstable silt or soft clay materials (Section 2.6.5.1 p. 240) and dredging is a known source of marine noise.

Electromagnetic Effects

Considerable scrutiny should be applied to potential electromagnetic effects of the power link since limited experience has been accumulated in regard to undersea DC power transmission.

A recent review of the potential effects of EMFs on marine organisms prepared for the U.S. Department of the Interior, Bureau of Ocean Energy Management, Regulation and Enforcement (Normandeau et al. 2011) concluded that while magnetic and electric senses have been reported for a wide range of marine taxa, and effects of EMFs at levels similar to those generated by both AC and DC marine transmission lines have been observed for some of them, there is a lack of consistent study methodology and the responses of populations have not been addressed. Nevertheless, Normandeau et al. (2011) were able to make some inferences about potential ecological effects based on the existing information and weight of evidence. These authors conclude that it is premature to require significant mitigations for EMF effects as further research is necessary and monitoring should be required for new installations. One might draw attention to environmental studies of Baltic Sea submarine power cables, some of which are fairly analogous to those proposed in the Maritime Link (Andrulewicz et al. 2003), as well as more recent HVdc cable-related studies cited in the draft EA report.

Section 2.4.2 states that two 180 km subsea cables will be installed operating at ± 200 kV DC each carrying 1250 A for a total bipolar mode power transfer of 500 MW. The two cables will be physically separated by 10 to 200 m (Section 2.7.3). Normally the cables will operate in bipolar mode (return current mainly or entirely through the cable of opposite DC polarity). Monopolar operation is also contemplated in which the non-polar cable operates as the principal ground return path. However, there will be short periods 40 to 120 hrs/annum (p. 7.47) in which, apparently, one cable will be completely removed from service and the full ground return current (1250 A) will be accommodated by a seawater ground return path. Two seaside ground return stations will be constructed to facilitate this and to accommodate small ground current imbalances in normal bipolar operation. Since electric fields will be much larger and magnetic fields will extend to longer ranges under monopolar operation, specific mitigation and enhanced monitoring may be required to ensure monopolar operation avoids particularly sensitive time periods (e.g., migrations time of electromagnetic [EM] sensitive species) and not exceed the total number of hours/annum estimated in the EA report. Also, it is important to remember that some residual current (< 125 A, p. 2.58) will flow through the ground system during normal bipolar operation.

Electromagnetic effects in seawater from sub-sea power transmission arise from both electric and magnetic fields external to the cables. Under bipolar operation the external return current electric fields will be quite small. Under the infrequent monopolar operation with seawater ground return, electric fields will be maximized. Since these are DC fields they will not be subject to electromagnetic “skin effect” and their magnitude will essentially constitute a DC conduction problem. DFO estimated the worst-case magnitude in the central Cabot Strait. Examining the geography of the grounding facilities it is apparent that the 1250 A monopole seawater return currents, ignoring any earth conduction and long path conduction counter-clockwise around Newfoundland, must pass through the Cape North – Cape Ray gap, flowing reasonably close to parallel to the axis of the Laurentian Channel as the proposed Newfoundland grounding station being located in St. Georges Bay. It seems reasonable to approximate this conductive gap of seawater by a water cross-sectional area of about 2.9×10^7 m^2 (65 km wide x 450 m deep). Assuming a total current of 1250 A, the approximate cross-sectional current density will be:

$$1250 \text{ A}/2.9 \times 10^7 \text{ m}^2 = 4.3 \times 10^{-5} \text{ A/m}^2$$

The resistivity of seawater at the average temperatures and salinities for Cabot Strait is about 0.30 Ω m. The electric field perpendicular to the Cabot Strait gap will therefore be about 4.3×10^{-5} A/m^2 x 0.30 Ω m = 13 µV/m. In general, most fish are relatively insensitive to electric fields < 5 – 10 V/m but as stated in section 7.3.5.2 (p. 7.55) some electro-sensitive fish (skates and rays in particular) are sensitive to electric field gradients as low as “5 nV/cm”, i.e. 0.5 µV/m

(Normandeau et al. 2011), over 20 times lower than those estimated above for Cabot Strait. In fact, the EA states in section 7.3.5.2 p. 7.55: “Operation of the subsea cables and grounding sites could have adverse environmental effects on marine populations as a result of power transmission and the generation of EMFs. A small fraction of marine species have been directly studied for magnetic or electric senses. Even for investigated species, work has often focused on a particular life history stage, such that sensory capabilities for certain stages (e.g., larval fish and invertebrates) are unknown. In studies that have examined responses of marine species to EMFs from subsea power cables, some 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, the question of any positive or negative consequences at the individual, population, or ecosystem levels is not yet known”. Given the uncertainties associated with this project it is difficult to adequately assess the potential environmental impacts. Therefore mitigation and monitoring plans should take this into account, especially given the sensitivity levels for especially electro-sensitive fish species. A study might be conducted into the prevalence of especially electro-sensitive marine organisms near the identified grounding sites. The measurements quoted above provide a starting point to predict general behavioral responses (Normandeau et al. 2011). Also, it is unclear whether marine mammals would react differently than fish or be otherwise threatened by high electric fields.

It should be noted that electro-sensitive fish sense very weak electric fields to locate prey so that the nature of the response is very different than the involuntary galvanotaxis response of fish to much larger fields (D’Agaro 2011). Also for electro-sensitive fish the time and spatial variability of the electric field would seemingly condition the response, while the weak electric fields remote from the grounding facilities should show very little time or spatial variability. In addition, slowly varying electric fields of comparable magnitude are known to occur naturally due to tidal flow through the earth’s magnetic field (5 to 50 µV/m) (Kalmijn 1971) and geomagnetic induction (1 – 5 µV/m even in the deep ocean) (Filloux 1977). In a study of natural geomagnetic induction in the Cape North area, there was strong indication of greatly enhanced electrical current flow in the Cabot Strait due to the funnelling effect of the narrow conductive passage (Cochrane and Hyndman 1974). In essence electro-sensitive fish will exercise their special sensory facilities in an already noisy environment, so any additional noise input from DC power transmission should be viewed within that context.

Electric fields proximate to the grounding facilities will be much higher than at remote locations. In the “Electric and magnetic fields” section (p. 7.47), in regard to the grounding facilities it is stated that, “The breakwater is designed to reduce or block the current such that the maximum voltage gradient in the water on the sea-side of the breakwater is 1.25 V/m.” This a high field, but generally less than required for a galvanotaxis response, but still of concern. The draft EA report (p. 7.56) states “Modelling results by Hatch (2011) suggest a potential zone of influence of 500 m for the EMF from the grounding sites during monopole operation of the Labrador-Island Transmission Link Project. A similar zone of influence is also anticipated for this Project.”

Another problem at grounding facilities is liberation of chlorine gas or soluble chlorine and bromine compounds at the anode (p. 2.58, Chemical Electrolysis in the Ponded Salt Water of the Grounding Site 7.48). In the draft EA report, this problem is dismissed as one of localized extent with reference to studies at other HVdc sites (p. 7.57). If an analysis was conducted to evaluate these effects, similar to advice from DFO’s review of the Labrador – Island Transmission Link, Marine environment and effects modelling component study (DFO 2012), it would be more appropriate to use seasonally adjusted temperatures that are closer to ambient.

The draft EA report correctly acknowledges that magnetic fields are produced in the vicinity of DC cables, but there seems to be some conflicting information with respect to the distance at which the magnitude of B-fields (i.e., magnetic fields) surrounding an undersea cable approach typical background levels. The draft EA report states (p. 7.9) that the magnitude of B-fields (i.e., magnetic fields) surrounding an undersea cable falls to background levels within 1 m of the cable (National Grid 2011), while on p 7.46 a 5 m distance (Hatch Acres 2006) is suggested. In relation to the statement in the Operation and Maintenance section (p. 7.46), “Depending on the amount of current carried by the cable, a magnetic field greater than the Earth’s geomagnetic field [i.e. 50 microtesla µT] may extend up to 5 m from a HVdc cable”, an independent calculation verified the EA findings that an infinite line source carrying 1250 A produces a field of 50 µT at exactly 5.0 m. A typical natural geomagnetic fluctuation of the order of 100 nanoteslas would correspond to the cable-produced (DC) field at a range of 2.5 km. However, in the usual bipolar cable operational mode, fields from opposing currents in the two parallel cables would rapidly cancel at distances the greater the cable separation (10 to 200 m), greatly restricting their spatial influence. Nevertheless, a variety of marine animals, including Atlantic Salmon, are believed to use the earth’s magnetic field for navigational purposes, so there is a legitimate concern. Although there is evidence that indicates underwater power cable induced EMFs are unlikely to have acute effects on crustacea (Bochert and Zettler 2004), there appears to be some uncertainty with regard to sublethal and behavioral effects (Gill 2005) and the third paragraph on p. 2.60 of the draft EA report seems to be an admission that there is some evidence of a behavioral effect. Locally enhanced magnetic fields can also induce anomalous electric fields in moving seawater and moving organisms (acknowledged in EA report).

The draft EA report (p 7.9) considers species that are magnetosensitive (magnetic sense life functions include: orientation, homing and navigation) and are likely able to detect EMFs. Although sea turtles, some marine mammals, and some decapod crustaceans are listed, the draft EA report does not list highly migratory species such as Atlantic salmon, American eel and Bluefin Tuna which are likely magnetosensitive migrants (as described in bottom paragraph of p. 7.9).

The potential for electrical field induction by a fish swimming over the cable is an important factor to consider. Studies cited in Normandeau et al. (2011) indicate that these effects may not be negligible and that fish behaviour may be affected since many species, particularly elasmobranchs, use EMFs for prey, predator, or mate detection. This may be particularly important for species that live and/or feed in close proximity to the bottom and for species with limited ranges such as Wolffish.

The draft EA report also states that, “As a result of the HDD depth of cable borehole, the potential environmental effects of EMFs will be minimized on eels and salmon migrating over the subsea cables in the coastal marine environments of both NL and NS” (p. 7.10), even though there is limited information or certainty to support this interpretation. Salmon and other diadromous fish may have to pass over the submerged cable in relatively shallow water as they near the coast.

There are 12 major salmon rivers that empty into Bay St. George on the west coast of Newfoundland (Redin and Mullins 1996). The potential effects of EMF and electrolysis products from the shorebased electrode facility in Bay St. George on the salmon runs to these rivers should be considered in this assessment.

The potential effects of placing the NS grounding site close to the outlet of the Bras D’or Lakes, which also has Atlantic Salmon rivers, warrants further consideration.

The possible effect of current fluctuations from changing loads is also worth considering as species may respond differently to rapidly fluctuating fields compared to static fields – not to mention complex induction effects associated with current fluctuations.

Overall, the draft EA report adequately highlights the possibility of electromagnetic effects and for the most part claims that such effects studied elsewhere have produced only minor and localized environmental effects. An independent literature survey could be conducted to determine if there are any well documented exceptions to this conclusion. Normandeau et al. (2011) is a good summary document of the potential environmental impacts of EMF associated with subsea cables and accurately reflects the uncertainty and limitations of the existing literature. Given the uncertainty associated with potential impacts, acceptable precautionary mitigation and monitoring programs should be implemented to minimize potential impacts. Baseline information will be important to determine whether mitigation has been effective and to help develop appropriate monitoring programs. The proponent may want to seek a partnership with the Ocean Tracking Network (OTN) to develop appropriate monitoring programs. Studies that assess the prevalence of especially electro or magnetically sensitive marine organisms near the identified grounding sites and provide stimulus-response research for these sensitive species would also be useful. Monitoring of behaviour of species of concern (e.g., marine mammals, Sea Turtles, Wolffish) or commercial interest (e.g., Lobster) should be considered as part of the monitoring program. Also, it is unclear whether marine mammals would react differently than fish or be otherwise threatened by high electric or magnetic fields.

Fate and Effects of Hydrocarbon Spills

Terrestrial and Marine Spills (Sections 10.6.4.1 and 10.6.4.2)

One potential type of hydrocarbon spill may involve a heavy equipment malfunction. The hazardous material in question would be hydraulic fluid from a ruptured hydraulic hose. Hydraulic fluids are usually in the form of mineral oils containing mostly alkanes. Alkanes are not expected to cause toxic effects to marine organisms. However, alkanes have the potential risk of coating the gills of fish thus affecting their respiration process which could lead to adverse effects. Natural processes, such as dilution and biodegradation acting on these components in the marine environment can limit their influence to a few weeks.

The report appears to cover the potential issues with accidental marine spills involving hydrocarbons. The most likely type of spills, based on the Environmental Assessment, would involve gasoline or diesel. Under natural weathering processes such as evaporation, photo-oxidation, dilution by spatial distribution, sedimentation, and biodegradation these types of spills would be naturally remediated within days or weeks. The impacts to the marine environment would be minimal. The potential impacts on marine life would be in the form of acute effects most likely from Benzene, Toluene, Ethyl Benzene and Xylenes (BTEX), the water soluble components found in gasoline and diesel. Gasoline chemical composition is mostly that of BTEX. Diesel contains a much smaller portion of BTEX compared to gasoline. Water temperature and sunlight are two factors that encourage evaporation and photo-oxidation and they are critical in determining the life span of BTEX in the marine environment. These components are usually non-detectable within 24-48 hr. after a spill has occurred.

Diesel contains other chemicals, such as naphthalene and methylated naphthalenes that can have potential impacts on marine life, however, these components, although having a longer life span in marine waters compared to BTEX, are not expected to inflict anything more than acute effects on marine life residing in the area of the spill. Other potential polycyclic aromatic hydrocarbons (PAHs) found in diesel consist of 3-ring structures such as, phenanthrene and anthracene. These chemicals are present in insignificant quantities in diesel and they are believed to have minimal effects on marine life. Large volume diesel spills will require more intense monitoring of these components during and after a spill. Diesel chemical composition mostly consists of alkanes, which are not expected to cause toxic effects to marine organisms.

Identification of Accidents and Malfunctions (Section 10.9.1)

This section refers to the potential impacts from a drilling fluid release during an accidental spill, tunnel collapse or the rupture of mud to the surface. The water-based drilling muds used in this case are considered to be less toxic compared to oil based drilling muds, therefore offering environmental advantages in terms of use. However, there is no mention of drill cuttings. The drill cuttings most likely contain metals such as lead (Pb), Nickel (Ni), Manganese (Mn), and Chromium (Cr). In the evident of a malfunction and release of drilling fluid and cuttings, these toxic metals would probably, initially be suspended with the water-based drilling mud in the water phase and evidentially over time settle to the seafloor where they would most likely be spatially distributed by sea currents. The impact of these metals on marine life will greatly depend on the levels detected in environmental compartments, which provide sites of adequate marine life exposure to produce toxic effects.

Conclusions

The scientific content related to EMF predictions associated with the subsea cables and grounding stations is generally considered to be sound. However, the proposed location of the grounding station in St. George's Bay, NL, remains a concern for Atlantic Salmon and American Eels. Although many of DFO Science's comments on the draft EA have been addressed in the final EA and associated disposition table, gaps remain in several key areas. In particular, there continues to be insufficient characterization of: the biology and potential effects on sensitive species such as marine mammals, Leatherback Turtles and Atlantic Salmon; the potential effects of shore-based electrode and grounding facilities on sensitive migratory species (e.g., Atlantic Salmon), especially during monopolar operation; timing of all in-water activities in relation to the timing of peak migration and migrations routes for sensitive species such as marine mammals, Leatherback Turtles and Atlantic Salmon; and cumulative effects. These gaps impact DFO Science ability to evaluate the validity of the EA conclusions and propose potential additional mitigation or monitoring.

Many abundant and historically commercially important species migrate seasonally through Cabot Strait, while some overwinter in the area, and available information for these species has not been fully integrated into the EA. Highly migratory species, such as Atlantic Salmon and American Eel, and several commercially important pelagic species, including Atlantic Herring, Mackerel and Bluefin Tuna, could be potentially impacted by the project but are not adequately considered. There are inaccuracies throughout this EA and the baseline study on "Fisheries in Cabot Strait" regarding fish populations occurring in the Study Area, and more complete biological information is available.

Pertinent marine mammal and sea turtle information existing in the literature is not presented in sufficient detail in the EA, and what is presented is not integrated with the limited data sets and observations provided. Although this is an issue throughout the document, it is most serious for SARA listed species particularly Blue Whales and Leatherback Turtles, as well as some fish species. The study area and adjacent areas are recognized as important travel corridors, feeding areas and summering areas for marine mammals and sea turtles; however, this is not adequately examined from a cumulative effects assessment perspective. A very narrow view of what comprises 'cumulative' effects is presented for marine mammals (essentially vessel collisions) and considers only limited and superficial interactions with other projects in the region - particularly in the case of gas industry activities. Given the importance of the Cabot Strait and the Strait of Belle Isle as transportation corridors, and other areas of the Gulf as feeding and summering areas for many species, more detail should be included on underwater noise sources of all types, vessel disturbances other than collisions, the uncertainties associated with EMF along some areas of the cable, and zones of high activity both temporally and spatially for this project as well as other projects in the region. To verify conclusions made by the proponents and to collect new and useful data on key marine mammal and turtle species, observers should be deployed on the cable vessels and perhaps on key support vessels as well. It is also important that the proponent acknowledges that the lack of data for some species and limited data sets for others affects the certainty of their conclusions.

In general, the EA should acknowledge important data gaps and how conclusions based on limited data have been modified (if at all) to take these uncertainties into account. Also, when models are based on limited data, associated uncertainties should be highlighted and, whenever possible, predictions/ projections from these models should be field tested.

Overall, the EA adequately highlights the possibility of electromagnetic effects and, for the most part, the review of literature suggests that such effects studied elsewhere have produced only minor and localized environmental effects. However, several species in the Study Area (e.g., skates, rays, sharks, American Eel, and Atlantic Salmon) are considered to be magnetosensitive and/or electrosensitive species, and the conclusion that the effects of the underwater cable on their migrations and behavior will be minimal is not consistent with the degree of uncertainty, recognizing that elasmobranches are an order of magnitude more sensitive than salmon. In addition, although the Study Area is recognized as an importance transit corridor for marine mammals, little information is presented on the electrosensitivity of marine mammals. Although the effects may not be as large an issue for mammals compared to some fish species, it still warrants evaluation. Given the uncertainty associated with potential impacts, acceptable precautionary mitigation and monitoring programs should be implemented to minimize potential impacts. Baseline information will be important to determine whether mitigation has been effective and to help develop appropriate monitoring programs.

The potential effects of placing the NL grounding site near important Atlantic Salmon rivers warrants further consideration given that salmon and other diadromous fish may have to pass within close proximity to the grounding station in relatively shallow water.

Cable laying activities could potentially displace Leatherback Turtles from local preferred foraging areas, or discourage them from proceeding further into the Gulf of St. Lawrence. Also, if geomagnetic orientation is important to marine turtle navigation and an active cable dissecting the Cabot Strait could impact Leatherback orientation to key feeding areas. The EA should consider mitigation measures related to the temporal aspect of Leatherback foraging in the Cabot Strait/Gulf of St. Lawrence, including the potential need for cable laying activities being restricted to the period when most Leatherbacks are not present in the Gulf (mid-November through to the end of May).

There are a variety of disturbances associated with the project that may occur at sensitive times or in key habitat areas, and the EA does not always present a clear plan for how potential effects will be mitigated (i.e., temporal and spatial exclusion). The vague treatment of project mitigation does not provide assurances that this will be done, and this needs to be addressed. Better information on the spatial and temporal extent of planned development activities would be beneficial in assessing potential impacts, identifying mitigation and developing monitoring plans. For example, consideration should be given to the avoidance of important/sensitive times and areas for commercial species/fisheries and species at risk (e.g., activity exclusion during lobster and crab fishing seasons).

Given the degree of uncertainty surrounding the long-term effects of EMF on species migrations, the cumulative impact of the Labrador-Island Link project and this project need to be discussed in the context of placing undersea cables and associated EMF across the two largest (of three) and unimpeded outlets for the Gulf of St. Lawrence into the Atlantic Ocean. In general, the cumulative effects assessment is of limited scope and does not consider potential interactions with future activities, such as future oil and gas exploration activities.

The proponent has indicated commitment to monitoring, but consideration should be given to what the thresholds for detrimental effects should be and what the potential management responses/ mitigation would be if monitoring indicates detrimental effects. Oftentimes, monitoring can provide information on future projects but does not result in additional post-projects mitigation.

Where specific mitigation and monitoring practices have been proposed to reduce uncertainty and risk, such as behavioural monitoring programs for electromagnetic sensitive species, sufficient monitoring, verification and enforcement processes may be necessary to ensure the effectiveness of these practises. Also, logistical challenges, likelihood of success, determination of significance of effects, and possible remediation actions associated with mitigation and monitoring programs should be clearly communicated.

To better understand the potential environmental effects of the project, additional studies are recommended, including:

- Assessing the prevalence of especially electro or magnetically sensitive marine organisms near the identified grounding sites;
- EMF stimulus-response research for potentially sensitive species;
- Assessment of the possible effect of current fluctuations from changing loads and potential species response to fluctuating fields compared to static fields;
- An evaluation of the environmental effects that the liberation of chlorine gas or soluble chlorine and bromine compounds may cause near the anodes;
- Analysis of the effects that the submerged cable in relatively shallow water may have on salmon and other diadromous fish migrations;
- Evaluation of whether benthic animals are in the area and are moving away from the cable path during cable laying (e.g., monitoring via video or some other means); and
- Behaviour monitoring of species of concern (e.g., marine mammals, sea turtles, Wolfish) or commercial interest (e.g., lobster) in relation to observed EMF fields.
- Further literature review and analysis may also be warranted in order to verify if there are any well documented exceptions to the EA conclusion that EM effects would produce only minor and localized environmental effects.

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Sources of Information

This Science Response Report results from two Zonal Science Response Processes: Review of Emera Newfoundland and Labrador Maritime Link Environmental Assessment Report: Part 1 – Review of Draft of November 6, 2012, and Review of Emera Newfoundland and Labrador Maritime Link Environmental Assessment Report: Part 2 – Review of Final of February 6, 2013).

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Appendix 1: DFO Review of Final EA

<table>
<tr><th></th><th>DFO Comments on Draft EA</th><th>Proponent Response</th><th>DFO Comments on Final EA and Disposition Table</th></tr>
<tr><td colspan="4">Characterization of Aquatic Resources</td></tr>
<tr><td>1</td><td>The draft EA provides minimal information on the aquatic resources in the area. Many abundant and historical commercially important species migrate seasonally through Cabot Strait, while some overwinter in the area, and information for these species should be included in the EA. Highly migratory species such as Atlantic Salmon and American Eel, in particular, could be potentially impacted by the project but are not adequately considered.</td><td>ENL believes that the information as provided in the EA Report is appropriate for a screening level assessment. More detailed information may be provided as part of the permitting process, as required.</td><td rowspan="2">A screening level assessment should characterize the ecosystem to an extent that the risk of proposed activities can be assessed fully. Although the EA has sufficiently characterized some aspects of the ecosystem, other aspects of the physical and aquatic environment, and the biology and life history of particularly sensitive and/or endangered species such as marine mammals (e.g., Blue Whale), Leatherback Turtles and Atlantic Salmon have not been adequately characterized, especially in relation to how the timing of particular construction and operational activities (e.g., cable laying and monopolar operation) overlaps with peak migration/reproductive periods and migratory routes. Without this information, it is not possible to provide an informed evaluation of the proponent's conclusions regarding potential project effects. For example, the acknowledgement that Blue Whale sounds are common throughout a large portion of the year is an important change in the text, which demonstrates the usefulness of more complete information to the evaluation of potential impacts. Without this level of comprehensive information</td></tr>
<tr><td>2</td><td>Treatment of the Blue Whale information is not adequate. This is an endangered species that is listed as uncommon in the Study Area yet the passive acoustic monitoring (PAM) study seems to indicate a consistent presence of the species for significant portions of the year. Given the low abundance of the species and the related conservation concerns, there needs to be a more comprehensive evaluation of potential negative project effects as well as more attention placed on ensuring that effective mitigation measures are available and implemented. An evaluation of older studies by (e.g., Sergeant 1982) and Mitchell (e.g., 1978) as well as more recent observations (Stenson 2012 pers com), documenting late fall and winter use of the Port Aux Basques area by Blue Whales needs to be included in greater detail. This should also include information and possible consequences of winter ice entrapments.</td><td>The assessment of blue whales has been updated in Section 7.1.</td></tr>
</table>

	DFO Comments on Draft EA	Proponent Response	DFO Comments on Final EA and Disposition Table
3	The area that will be subject to cable laying activities falls directly within what is currently considered one of the most important habitats for Leatherback Turtles in Atlantic Canada, and likely the broader temperate Northwest Atlantic. Not only is the portion of the Cabot Strait where the proposed cable laying will occur a key foraging area for Leatherbacks (DFO 2011c), it also represents the area through which large numbers of this species enter and exit the Gulf of St. Lawrence. For leatherbacks, large pelagic fish (e.g. Blue Fin Tuna), cetaceans (e.g. Blue Whales), and other vulnerable species, the Cabot Strait is the gateway to productive foraging grounds in the Gulf of St. Lawrence. The southern Gulf of St. Lawrence has been identified as important habitat for Leatherbacks, with relatively large numbers of turtles feeding there during summer and fall.	The assessment of leatherback turtles and other marine SOCI has been updated in Section 7.1.	(when available) throughout the document, it is not possible to provide an informed evaluation of the proponent's conclusions regarding potential project effects on numerous species and issues.
Evaluation of Effects on Aquatic Resources			
4	The EA focuses on the potential for cable laying vessels to contact turtles in the area. In contrast, another concern that should be taken into consideration is related to cable laying activities taking place over 2-3 months (as estimated in the EA), from the platform of a 100-150 m ship, which will presumably create significant ambient noise resulting from ploughing and trenching activities, etc. Such activities could potentially displace turtles from local preferred foraging areas, or discourage them from proceeding further into the Gulf of St. Lawrence. Also, if geomagnetic orientation is important to marine turtle navigation, as has been demonstrated in the primary literature many times (Lohmann et al. 2001 and 2004, Papi et al. 2000), including orientation to foraging areas (as the EA rightly acknowledges), then it is possible that the very presence of an active cable dissecting the Cabot Strait could impact Leatherback orientation to key feeding areas (see "Electromagnetic Fields" section below for additional detail).	Any potential ploughing and/or trenching activities of the seabed will be undertaken with a slow-moving vessel such that noise generated from propeller cavitation by the vessel, and the primary source for vessel noise, would be considerably less than a vessel travelling at higher speeds, 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, while cable installation activities will occur over 2-3 months across the 180-km span of the Cabot Strait at a speed of 0.5 km/hr (0.3 knots) and potential disturbance is	The proponent's comments pertaining to relatively weak electromagnetic fields having insignificant environmental effects on sea turtles given their location in the water column is a sound argument. While the proponent correctly explains that, at any given time, slower moving vessel will have limited spatial and temporal disturbance and make considerably less propeller cavitation noise than the faster moving vessels that would typically transit the area, the initial DFO comment has not been adequately addressed in the final EA. See also DFO Comments #3 and 8.

	DFO Comments on Draft EA	Proponent Response	DFO Comments on Final EA and Disposition Table
	The EA should consider mitigation measures related to the timing of Leatherback foraging in the Cabot Strait/Gulf of St. Lawrence, including the possibility of cable laying activities being restricted to the period when most Leatherbacks are not present in the Gulf (mid-November through to the end of May).	expected to be limited spatially and temporarily. The diet of Leatherback sea turtles consists of foraging for primarily gelatinous species that are planktonic, such as jellyfish, and located higher up in the water column. Therefore, it is less likely that a bottom-laid electrical cable with a relatively weak electromagnetic field will have significant environmental effects on sea turtles that swim higher up in the water column to feed on their preferred planktonic diet.	
5	The potential for electrical field induction by a fish swimming over the cable is an important factor to consider. Studies cited in Normandeau et al. (2011) indicate that these effects may not be negligible and that fish behaviour may be affected since many species, particularly elasmobranchs, use EMFs for prey, predator, or mate detection. This may be particularly important for species that live and/or feed in close proximity to the bottom and for species with limited ranges such as Wolffish.	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.	Given the uncertainty associated with this potential adverse effect to EMF sensitive species, if particular monitoring practices are proposed to reduce uncertainty, such as behavioural monitoring programs, sufficient monitoring, verification and enforcement processes may be necessary to ensure the effectiveness of these practises. Also, logistical challenges, likelihood of success, determination of significance of effects, and possible remediation actions associated with monitoring programs should also be clearly communicated.
6	The EA also states (p. 7.10) that, “As a result of the HDD depth of cable borehole, the potential environmental effects of EMFs will be minimized on eels and salmon migrating over the subsea cables in the coastal marine environments of both NL and NS,” even though there is limited information or certainty to support this interpretation. Salmon and other diadromous fish may have to pass over the submerged cable in relatively shallow water as they near the coast.	Section 7.1.3.2 has been updated to address this comment.	The two proposed grounding station locations for the Newfoundland side of the operation are both in St. George’s Bay. From a fish habitat perspective, this is considered to be a very sensitive site for the proposed grounding station. The updated Strategic Environmental Assessment for Western Newfoundland identified St. Georges Bay as the most ecologically sensitive site along the western coast of Newfoundland (CNLOPB 2013). This is

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7	There are 12 major salmon rivers that run into Bay St. George on the west coast of Newfoundland (Redin and Mullins 1996). The potential effects of electromagnetic radiation and electrolysis products from the shorebased electrode facility in Bay St. George on the salmon runs to these rivers should be considered in this assessment.	Sections 7.1 and 7.3 have been updated.	because of the extensive eel grass beds, the biodiversity and the numerous salmon rivers entering the bay. These sites are near the mouths of several scheduled Atlantic Salmon rivers. Because of the narrowing of the bay at these sites, out migrating juvenile and returning adult salmon will be forced near these proposed grounding sites. The population structure of salmon in St. George's Bay is unique because the proportion of two sea-winter and multi sea-winter virgin spawners is high compared to other Atlantic Salmon populations in Newfoundland and Labrador. DFO Science has consistently reported concern in annual stock assessments over the status of Atlantic Salmon in these rivers, specifically the two sea-winter and multi sea-winter components of the stock (Reddin 1996). Further American Eel, which have been designated as threatened by COSEWIC, also inhabit these rivers with juveniles and adults migrating through St. George's Bay annually. The grounding station will be used primarily when the system is operating in monopole. A recent review of the effects of EMF on Atlantic Salmon and Eels concluded that evidence for effects on migration is mixed and most likely to occur in shallow areas near the population's natal rivers (Gill and Bartlett 2010). Modeling studies for the Labrador Island Transmission Link commissioned by Nalcor clearly show that, under monopole operation, there will be electromagnetic fields (EMFs) generated beyond the seawall of the electrode pond (Hatch Inc. 2011). Because of the configuration of the Bay and the behavioural pattern whereby Atlantic Salmon and American Eels follow the shore when returning to their natal

	DFO Comments on Draft EA	Proponent Response	DFO Comments on Final EA and Disposition Table
			rivers, it was determined that they will be exposed to the generated EMFs if this operation occurs during the migration period. The proponent should model potential EMFs from the proposed grounding facilities and assess their effects as was done for the Labrador Island Transmission Link or provide a mitigation strategy that will ensure low risk to migrating eel and salmon. Without strong evidence that there is low risk to Atlantic Salmon and Eel populations, it is suggested that, if the grounding station is to remain in St. Georges Bay, it should be placed as far as possible from important salmon rivers, i.e. on the Indian Head side of the bay rather than the St. Georges side of the Bay.
8	The report states that the strength of the magnetic field decreases with increased distance from the cables. Can you provide more information on to what degree the field will decrease? It may be beneficial to show a map or diagram indicating the expected strength of the field at various distances from the cable.	A new figure (2.1.7) has been added to describe magnetic field.	It is unclear what value this figure adds given that it is based on an average of other EMF studies. It is recommended that the figure focus on presenting the estimated EMFs associated with the Maritime Link project.
9	The EA correctly acknowledges that magnetic fields are produced in the vicinity of DC cables but there seems to be some conflicting information with respect to the distance at which the magnitude of B-fields (i.e., magnetic fields) surrounding an undersea cable approach typical background levels. The EA states (p. 7.9) that the magnitude of B-fields (i.e., magnetic fields) surrounding an undersea cable falls to background levels within 1 m of the cable (National Grid 2011), while on p 7.46 a 5 m distance (Hatch Acres 2006) is suggested. In relation to the statement in the Operation and Maintenance section (p. 7.46), “Depending on the amount of current carried by the cable, a magnetic field greater than the Earth’s geomagnetic field [i.e. 50 microtesla µT] may extend up to 5 m from a HVdc cable.”, an independent calculation verified the EA findings that an infinite line source carrying	Comment noted. The distance within which the resultant magnetic field returns to the earth's geomagnetic field strength depends on various parameters such as system configuration (monopole vs. bipole); cable seperation distance, magnitude and direction of current flow on each cable and alignment of the cables with respect to the earth's geomagnetic field. For these reasons, different projects or study references have a range of results. Figure 2.7.1	

	DFO Comments on Draft EA	Proponent Response	DFO Comments on Final EA and Disposition Table
	1250 A produces a field of 50 µT at exactly 5.0 m. A typical natural geomagnetic fluctuation of the order of 100 nanoteslas would correspond to the cable-produced (DC) field at a range of 2.5 km. However, in the usual bipolar cable operational mode fields from opposing currents in the two parallel cables would rapidly cancel at distances greater the cable separation (10 to 200 m) greatly restricting their spatial influence. Nevertheless, a variety of marine animals, including Atlantic Salmon, are believed to use the earth's magnetic field for navigational purposes so this appears to be a legitimate area for concern. Although there is evidence which indicates that underwater power cable induced EMFs are unlikely to have acute effects on crustacea (Bochert and Zettler 2004), there appears to be some uncertainty with regard to sublethal and behavioral effects (Gill 2005) and the third paragraph on p. 2.60 of the EA seems to be an admission that there is some evidence of a behavioral effect. Locally enhanced magnetic fields can also induce anomalous electric fields in moving seawater and moving organisms (acknowledged in EA).	was added to the EA as a summary of the studies on effects of magnetic fields reviewed in the BOEMRE report (Normandeau et al. 2011).	
10	Cable laying will require use of a large dynamically positioned vessel that will constitute a source of noise over an extended period of time at a quite slowly moving location (Section 2.6.6.1– p. 2.41). Radiated vessel noise levels would probably be roughly comparable to those of other large vessels commonly transiting the Cabot Strait area (some measurement-derived limits on source levels quoted in section 4.2.1.6 p. 4.23) but because of the nature of the cable laying process, the source would be rather persistent (total duration 2 – 3 months). Consideration needs to be given to the potential effects that a virtually stationary noise source could play in marine mammal or fish migrations, or displacing fish from traditionally fished areas.	The cable laying speed of the vessel will be influenced by weather, water depth, and cable design. While the maximum transit speed of Project vessels is approximately 19 km/hr (10 knots) the vessel speed while laying cable is estimated at approximately 500 m/hr (0.3 knots). The cable laying speed is relatively low but not stationary. As the cable laying vessel travels across the Cabot Strait, only a small proportion of the entire Strait will be occupied by the vessel at any one time.	The proponent response does not adequately address DFO advice related to the potential effects that a virtually stationary noise source could play in marine mammal or fish migrations, or displacing fish from traditionally fished areas. Just because vessel speeds are slow does not necessarily mean there is no risk for collision; data cited indicates that the threat is reduced but is still there and more variable. Given blue whale population in the order of 300 animals, the even the potential of a strike is important to mitigate as much as possible. Turtles and whales are feeding on dense aggregates of patchily distributed prey that are

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11	Bottom trenching (3.5 m deep) or ploughing will be required in the shallower areas (< 400 m deep section 2.6.6.2) on either side of the Laurentian Channel (cable will not be buried in deeper areas of Channel). Shore-based horizontal HDD (section 2.6.7.10) will be required to install the cable near-shore (1 km offshore NS terminus, 450 m offshore in NFLD section 2.6.6.3), which conceivably could produce local low level noise in the marine environment but probably not enough to be significant on the longer term. Although noise disturbance from shoreline construction and dredging activity may be relatively brief and is likely not significant from a marine mammal's short term well-being; however, it is a concern if important feeding or breeding activity is disrupted, particularly if the species of concern is the Blue Whale or any of the other threatened or endangered species. Cumulative, incremental degradations of key marine mammal habitat is a long term concern. From a marine mammal perspective, there is a need to mitigate the effects of underwater noise disturbance at sensitive times of the year or in key habitat areas whenever possible. The vague treatment of project mitigation in most cases, does not provide assurances that this will be done.	Any potential ploughing and/or trenching activities of the seabed will be undertaken with a slow-moving vessel such that noise generated from propeller cavitation by the vessel, and the primary source for vessel noise, would be considerably less than a vessel travelling at higher speeds, 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). Sections 7.1.3.2 and 7.3.3.2 have been updated to include a temporary incremental increase in noise levels as the cable laying vessel proceeds along the route.	only seasonally abundant. A 2-3 month disruption in this opportunity to feed and to move as necessary is potentially serious and would need to be mitigated. To do so, adequate information on project planning needs to be available to evaluate the proponent's conclusions that project activities are short duration (i.e. temporary) and, therefore, do not represent a significant impact. Appropriate potential cumulative impact need to be taken into consideration here. Given our general lack of species specific knowledge regarding the behavioural responses of marine mammals and turtles (including some that are SARA species) to anthropogenic noise and other types of disturbance in the marine environment, the need for observers on project vessels should not be ruled out. Consideration should be given to the use of observers on the cable vessels and perhaps on key support vessels as well. See also Comment #4 above.

Sources of Information

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