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4.0 EXISTING MARINE PHYSICAL AND BIOLOGICAL ENVIRONMENT

The Project Area includes EL 1151, EL 1152, and EL 1155 and the marine environment between and surrounding these three licences, as well as a straight-line transit corridor between the western edge of the Project Area and the Port of St. John's. Physical features of the marine environment are described in the following sections. The spatial boundaries for the Project Area and Study Area are defined in Section 2 and illustrated on Figure 2-1.

This section provides an overview of the physical and biological environments in which the Project is located and is intended to provide a regional perspective of the existing environment. Information presented herein will be used to help identify key factors that may interact with the Project and require further assessment as valued components (VCs) in Section 6. The existing regional environment is described below at different scales and specificity, depending on the information requirements in the Environmental Impact Statement Guidelines and/or relevance to the EIS. This section relies substantially on information provided in existing publications and assessment and monitoring reports that characterize the Project and Study Areas. Previous EAs and Strategic Environmental Assessments (SEAs) for the offshore Newfoundland and Labrador region are the key sources of existing information, and include, but are not limited to:

- Husky Delineation/Exploration Drilling Program for Jeanne d'Arc Basin Area, 2008-2017, Environmental Assessment (LGL 2007a)
- Environmental Assessment of StatoilHydro Canada Ltd. Exploration and Appraisal/ Delineation Drilling Program for Offshore Newfoundland, 2008-2016 (LGL 2008a)
- Eastern Newfoundland Strategic Environmental Assessment (Amec 2014)
- White Rose Extension Project (Husky Energy 2012a)

Updated background information (e.g., commercial fisheries, seabirds, corals and sponges) was also incorporated into this section.

4.1 Marine Physical Environment

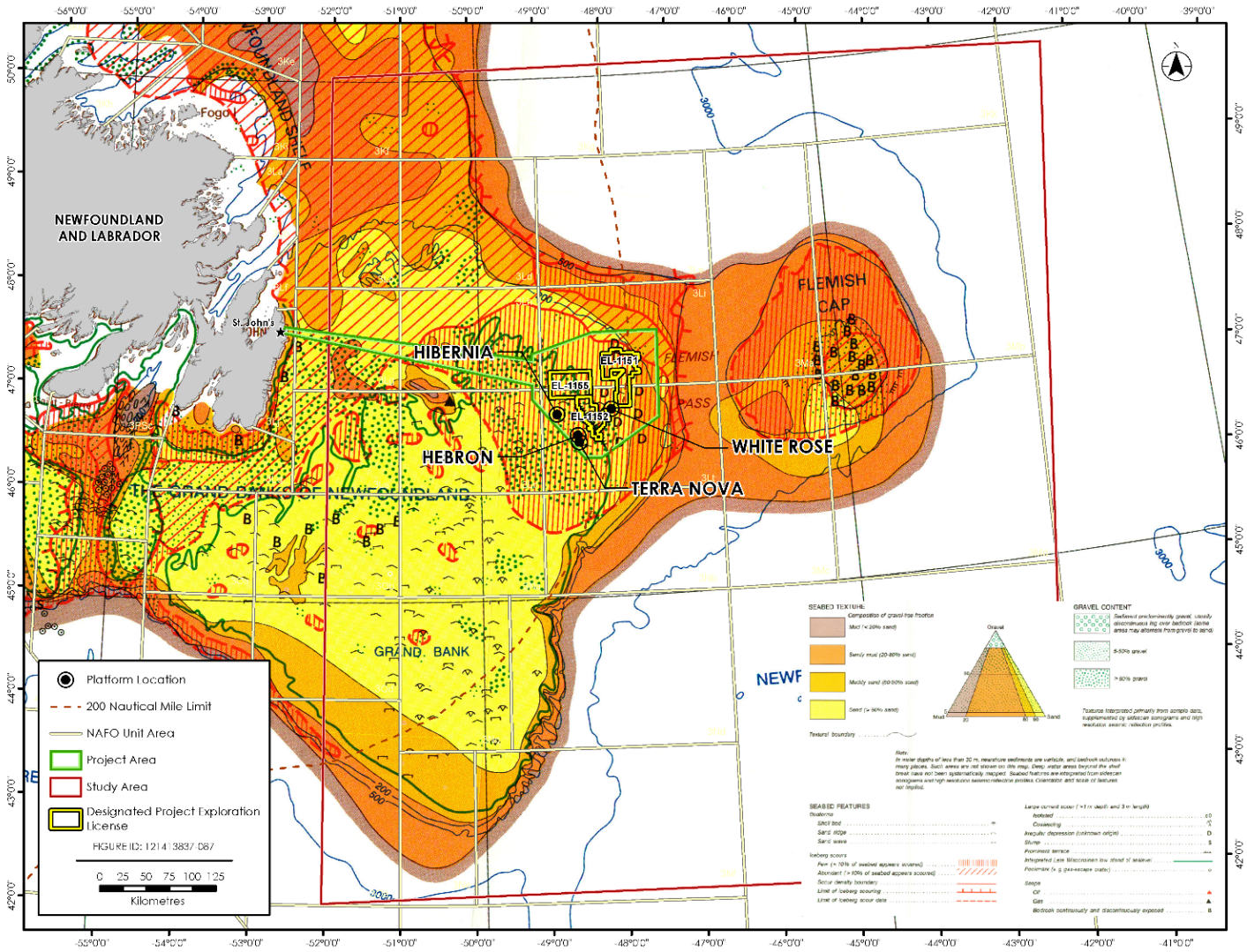
4.1.1 Marine Geology

The White Rose field is located on the margin of the Jeanne d'Arc Basin (northeast margin of Grand Bank) within the Grand Banks. The Grand Banks is a broad continental shelf extending approximately 450 km eastward from Newfoundland (Tankard and Welsink 1987). Grand Bank is the largest of a series of shallow outer shelf banks that together form the Grand Banks of Newfoundland, an area of 100,000 km². The Grand Banks are separated from the Newfoundland coast by irregular inner shelf bathymetric lows of the Avalon and St. Pierre channels.

The surficial and shallow geology of Grand Bank reflects episodes of Pleistocene glaciation, relative sea level change and marine shelf sedimentation (Sonnichsen and King 2005; Shaw 2006; Shaw et al. 2006; King 2010). Ice-contact and ice-proximal deposits are known to occur on parts of the northeast Grand Banks (e.g., Fader and Miller 1986; Sonnichsen and King 2005). The extents of recent shelf glaciations are uncertain; however, the margins of the banks are known to have been affected by exposure and inundation during glacio-eustatic relative sea level changes.

Repeated advances and retreats of Laurentide and Newfoundland glacial ice across the Grand Banks to the edge of the continental shelf began at approximately 1 million years (mega annum) before present (Piper 2005), as documented by the presence of prominent seafloor till ridges of the Sackville Moraine complex at the shelf margin (Huppertz and Piper 2009). Sedimentation on the Grand Banks substantially increased during these periods of widespread shelf-crossing glaciation (Piper 2005), at which time large volumes of suspended sediments were transported to the slope edge and reworked by storm waves and shallow ocean currents. Pro-glacial Quaternary sediments were deposited in the Flemish Pass in the form of eastward-prograding muds of hemipelagic and proglacial plume origin, minor thin-bedded turbidite sands, and thick-bedded mass-transport deposits (Piper and Campbell 2005).

During the last glacial maximum, the ice margin probably only reached as far as the mid-shelf, before retreating from the area 15,000 years ago (Huppertz and Piper 2009). At this time much of the outer Grand Banks was exposed above sea level (Shaw 2006). The marine geology of the Grand Banks is illustrated in Figure 4-1. ELs 1151, 1152, and 1155 are in an area of predominantly sand (>90 percent sand). Less than 10 percent of the seabed appears scoured by icebergs. EL 1152 has patches of gravel (5 to 50 percent). The marine geology in the Flemish Pass is predominantly sandy mud (20 to 80 percent sand).



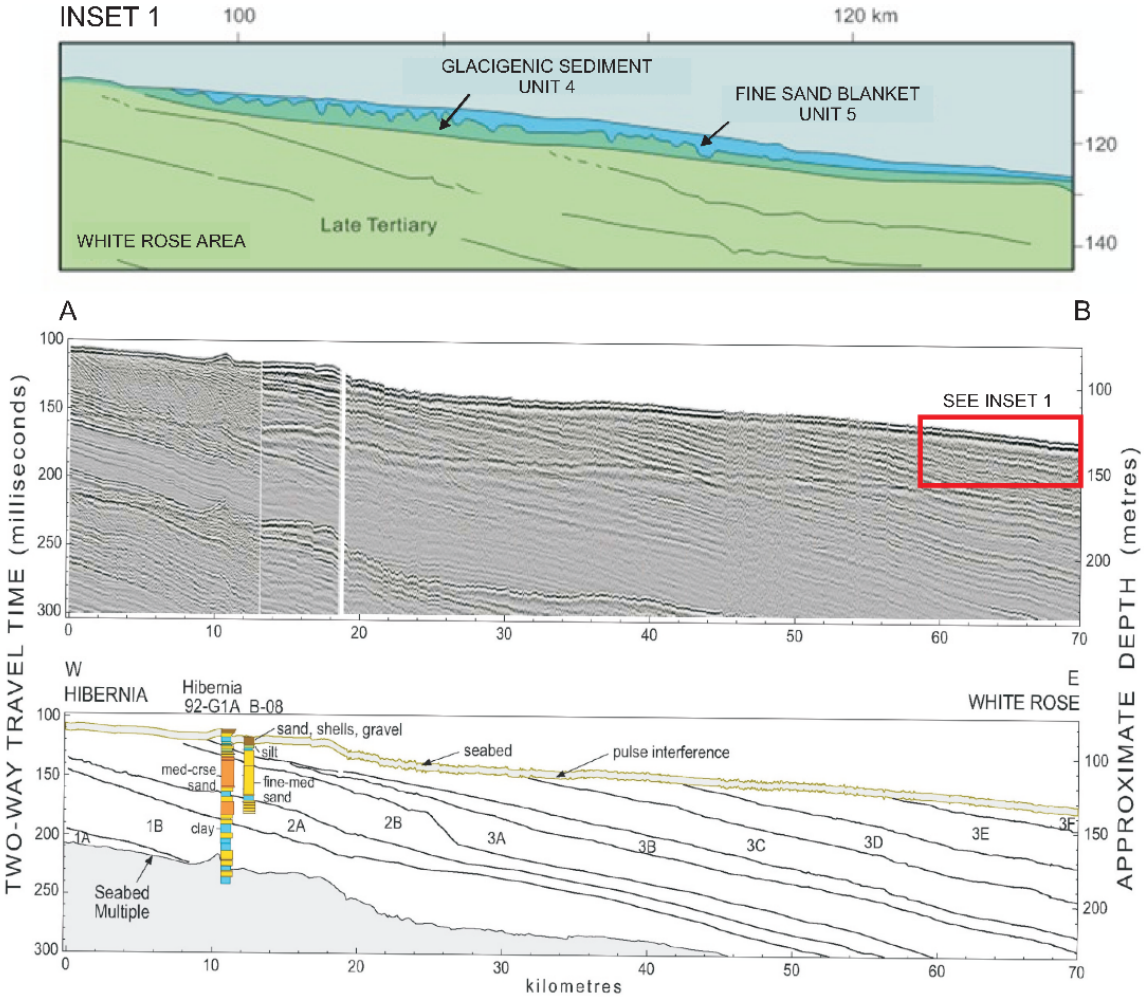
Source: Cameron and Best 1985

Figure 4-1 Geology of the Grand Banks and Flemish Pass and Cap

Mechanical reworking of seafloor and sub-seafloor shelf and upper slope sediments has been occurring throughout the Quaternary due to scouring and grounding icebergs produced from local calving along the Grand Banks ice margins, and more recently by icebergs carried southwards by the Labrador Current from Baffin Bay. Grounding and scouring icebergs created curvilinear scour marks and grounding pits that influenced buried topography. Icebergs still affect the modern seafloor. Substantial efforts have been made to quantify the rate of present-day scouring by icebergs. Repetitive mapping surveys and comparisons have been conducted with the aim of identifying new scour events that can be used to estimate the frequency of modern scouring events. Some of this work has been conducted within the White Rose field, using observed iceberg scouring events. A scour event, named 88-01, was inferred to have occurred between April 2 and 13, 1988, to the north-northeast of the White Rose field. The resultant scour mark was imaged with side scan sonar and studied in detail. Scour mark depth ranged from 0.5 to 1.1 m, with widths of 20 to 35 m (Banke 1988; Woodworth-Lynas 1989). Since that exercise, repetitive mapping surveys have been conducted over portions of the seafloor within the region (e.g., Terraquest Associates 1998), which attempted to identify new scour marks formed during the interval between surveys.

Regional estimates of the minimum scouring frequency are on the order of 2×10^{-4} scour events/km²/year (Banke 1989), but this estimate does not consider short-term grounding events or scouring icebergs. Sonnichsen et al. (2005) estimate the scour frequency on the Grand Banks to be 2.7×10^{-4} scour events/km²/year. The GSC-A-, C-CORE- and FJGI-derived scour frequency estimates based on comparisons of recent site survey and repetitive mapping data (including multibeam sonar) with older side scan datasets (C-CORE 2001a; Fugro Jacques Geosurveys Inc. (FJGI) 2004). Estimates reported by C-CORE (2001b) related specifically to the White Rose field are on the order of 1×10^{-3} scours/km²/year.

The near-surface stratigraphy (less than 15 m sub-seafloor) near White Rose reflects episodes of Quaternary glaciation, as well as associated relative sea level changes, and varying degrees of reworking by scouring icebergs. Near-surface deposits comprise thin Adolphus Sand (Unit 5; marine sand) overlying proglacial and glacial sediments of the Grand Banks Drift (Unit 4; glacial deposits) (see Figure 4-2). Geotechnical borehole investigations have characterized the near-surface glaciogenic deposits as highly heterogeneous and consisting variously of dense to very dense sand and gravel (with cobbles), silty sand and sandy silt, and stiff clay (e.g., FJGI 2001, 2005). The buried surface of the Grand Banks Drift is highly irregular, suggestive of numerous iceberg scour marks formed perhaps by periods of frequent and heavy ice grounding during phases of lower relative sea level. It is also possible that the irregular topography reflects channel erosion. The near-surface deposits are characterized by high lateral variability of soil properties. Partially cemented sands have been encountered in places, potentially resulting from consolidation, desiccation and cementation by meteoric groundwater diagenesis during phases of sub-aerial exposure (e.g., Sonnichsen and King 2005).



Source: From Sonnichsen and King 2005, in Husky Energy 2012a
Note: The shallow stratigraphy is comprised of the Upper Parallel Reflection Sequence (Unit 3), overlying the Clinoform Reflection Sequence (Unit 2) and Lower Parallel Reflection Sequence (Unit 1). In the White Rose field, Unit 3 strata are truncated near the seafloor, and overlain by glacial deposits (Unit 4) with a veneer of marine sand (Unit 5)

Figure 4-2 Near-surface Profile Schematic (INSET 1) and Geological Society of Canada Seismic Reflection Profile from Hibernia to White Rose with Stratigraphic Interpretation

Further offshore, the truncated, dipping marine strata of the Upper Parallel Reflection Sequence are overlain by undifferentiated glacial till deposits of the Grand Banks Drift (Unit 4) and a thin surficial blanket of marine Adolphus Sand (Unit 5).

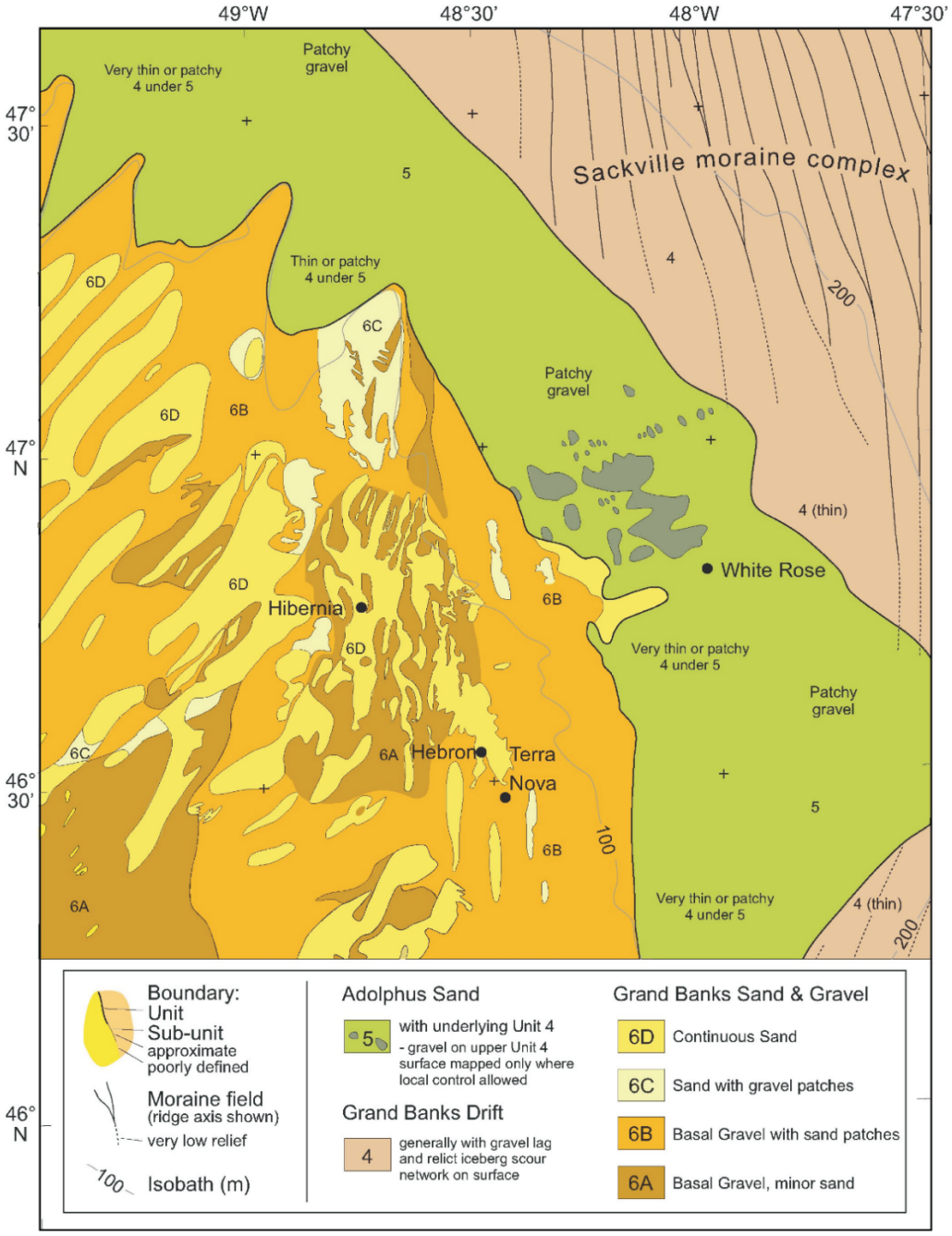
Regions of northeast Grand Bank that are shallower than the present approximately 110 m bathymetric contour were sub-aerially exposed during the late-Wisconsin sea level lowstand, approximately 15,000 years ago (Sonnichsen and King 2005). Sea level subsequently rose, the surficial sediments were reworked, and the result was a relatively thin (average 1 to 3 m) veneer of sand and gravel that overlies the truncated Tertiary Banquereau Formation (Fader and King

1981; Stoffyn-Egli et al. 1992), or glaciogenic sediment, where present. The reworked coarse-grained sediments comprise the Grand Banks Sand and Gravel. The overlying Adolphus Sand, which blankets the ELs aroundWhite Rose field, was derived from erosive transgression of the bank top, and deposited in a shallow shoreface environment. The ELs around White Rose field now lies in water depths greater than 115 m. The regional surficial sediment distribution, interpreted by Sonnichsen and King (2005), is illustrated in Figure 4-3.

Surficial sediments in the ELs around White Rose are comprised of a blanket of fine- to medium-grained Adolphus Sand, which overlies a coarser, irregular substrate of Grand Banks Sand and Gravel (a basal transgressive deposit) (McElhanney 1981, 1982; Nortech Jacques Whitford 1998; FJGI 1999a, 1999b, 2000a, 2000b, 2005). The Adolphus Sand transitions westward into the reworked Grand Banks Sand and Gravel, and eastward into partially exposed glacial deposits of the Grand Banks Drift (glacial till comprised of poorly sorted gravelly and sandy mud) in the nearshore section of the vessel transit route (see, for example, Figure 4.2 in Amec 2014) and eastward of the White Rose field (Figure 4-3).

The seafloor in ELs around the White Rose field is relatively smooth and dips gently northeastward. The thickness of surficial Adolphus Sand appears to vary from 0 m to occasionally greater than 3 m, depending on the irregularity of the underlying surface. Side scan sonar mosaics display a mottled seafloor appearance, with some of the 'outcrops' of the underlying sands and gravels suggestive of linear and circular patterns that are perhaps the surface expression of large, buried, relict ice scour marks. The study area for the Eastern Newfoundland SEA (Amec 2014) overlaps with the Study Area for this Project. The primary seabed features of the SEA study area include sand ridges and waves, shell beds, iceberg scouring, pockmarks, and seabed depressions of unknown origin (Amec 2014).

Other seafloor features include marks made by the dragging of otter trawl doors during fishing activities, anchor chain marks and well sites from previous drilling activities. Otterboard trawl marks were well defined during surveys in 1981 and 1982 (McElhanney 1981, 1982). Previous interpretations of biota identified from seafloor photographs have suggested that the seafloor is stable, with relatively little sediment transport occurring in the region (McElhanney 1982). This conclusion is supported by the results of site surveys (FJGI 1999a, 1999b, 2000a, 2000b), which clearly display anchor marks from old drilling programs, preserved in sand after 15 to 20 years.



Source: from Sonnichsen and King 2005, in Husky Energy 2012a
Note: The post-glacial relative sea level low-stand was approximately 110 m below present, with the paleo-shoreline at the transition from sediment Unit 6A (dark brown) to Unit 5 (green). The present White Rose field is situated in a former shallow-water shoreface environment at the relative sea level low-stand, which is blanketed by marine sands (Unit 5).

Figure 4-3 Distribution of Surficial Sediments for Northeastern Grand Bank

4.1.2 Atmospheric Environment

The Grand Banks region area experiences weather conditions typical of a marine environment with the surrounding waters having a moderating effect on temperature. In general, marine climates experience cooler summers and milder winters than continental climates and have a much smaller annual temperature range. A marine climate tends to be fairly humid, resulting in reduced visibilities, low cloud heights, and significant amounts of precipitation.

The climate of the area is very dynamic, being largely governed by the passage of high- and low-pressure circulation systems. These circulation systems are embedded in, and steered by, the prevailing westerly flow that typifies the upper levels of the atmosphere in the mid-latitudes; this arises because of the normal tropical to polar temperature gradient. The mean strength of the westerly flow is a function of the intensity of this gradient; therefore, the flow is considerably stronger in the winter months than during the summer months, due to an increase in the south to north temperature gradient.

During the winter months, an upper level trough tends to lie over Central Canada and an upper ridge over the North Atlantic resulting in three main storm tracks affecting the region: one from the Great Lakes Basin, one from Cape Hatteras, North Carolina and one from the Gulf of Mexico. These storm tracks, on average, bring eight low pressure systems per month over the area. The intensity of these systems ranges from relatively weak features to major winter storms. Studies (Archer and Caldeira 2008) have shown that a poleward shift of the jet stream, and consequential storm tracks, exist at a rate of 0.17 to 0.19 degrees/decade in the northern hemisphere. This shift has been related to an increase in the equator-to-pole temperature gradient. McCabe et al. (2001) obtained similar results, finding that there has been a decrease in mid-latitude cyclone frequency and an increase in high-latitude cyclone frequency. McCabe et al. (2001) found that storm intensity has increased in both the high and mid-latitudes.

By summer, the main storm tracks have moved further north than in winter. Low-pressure systems are less frequent and much weaker. With increasing solar radiation during spring, there is a general warming of the atmosphere that is relatively greater at higher latitudes. This decreases the north-south temperature contrast, lowers the kinetic energy of the westerly flow aloft and decreases the potential energy available for storm development. Concurrently, there is a northward shift of the main band of westerly winds at upper levels and a marked development of the Bermuda-Azores sub-tropical high-pressure area to the south. This warm-core high-pressure cell extends from the surface through the entire troposphere. The main track of the weaker low-pressure systems typically lies through the Labrador region and tends to be oriented from the west-southwest to the east-northeast.

With low pressure systems normally passing to the north of the region in combination with the northwest sector of the sub-tropical high to the south, the prevailing flow across the Grand Banks is from the southwest during the summer season. Wind speed is lower during the summer and the incidence of gale or storm force winds relatively infrequent. There is also a corresponding decrease in significant wave heights.

The prevailing south-westerly flow during the late spring and early summer tends to be moist and it is relatively warmer than the underlying surface waters on the Grand Banks.

Rapidly deepening storms are a problem south of Newfoundland near the warm water of the Gulf Stream. Sometimes these explosively deepening oceanic cyclones develop into a "weather bomb", defined as a storm that undergoes central pressure falls greater than 24 mb over 24 hours. Hurricane force winds near the center, the outbreak of convective clouds to the north and east of the center during the explosive stage, and the presence of a clear area near the center in its mature stage (Rogers and Bosart 1986) are typical of weather bombs. After development, these systems will either move across Newfoundland or to the east of Newfoundland producing gale to storm force winds from the southwest to south over the Grand Banks.

Tropical systems are discussed in Section 4.1.2.7.

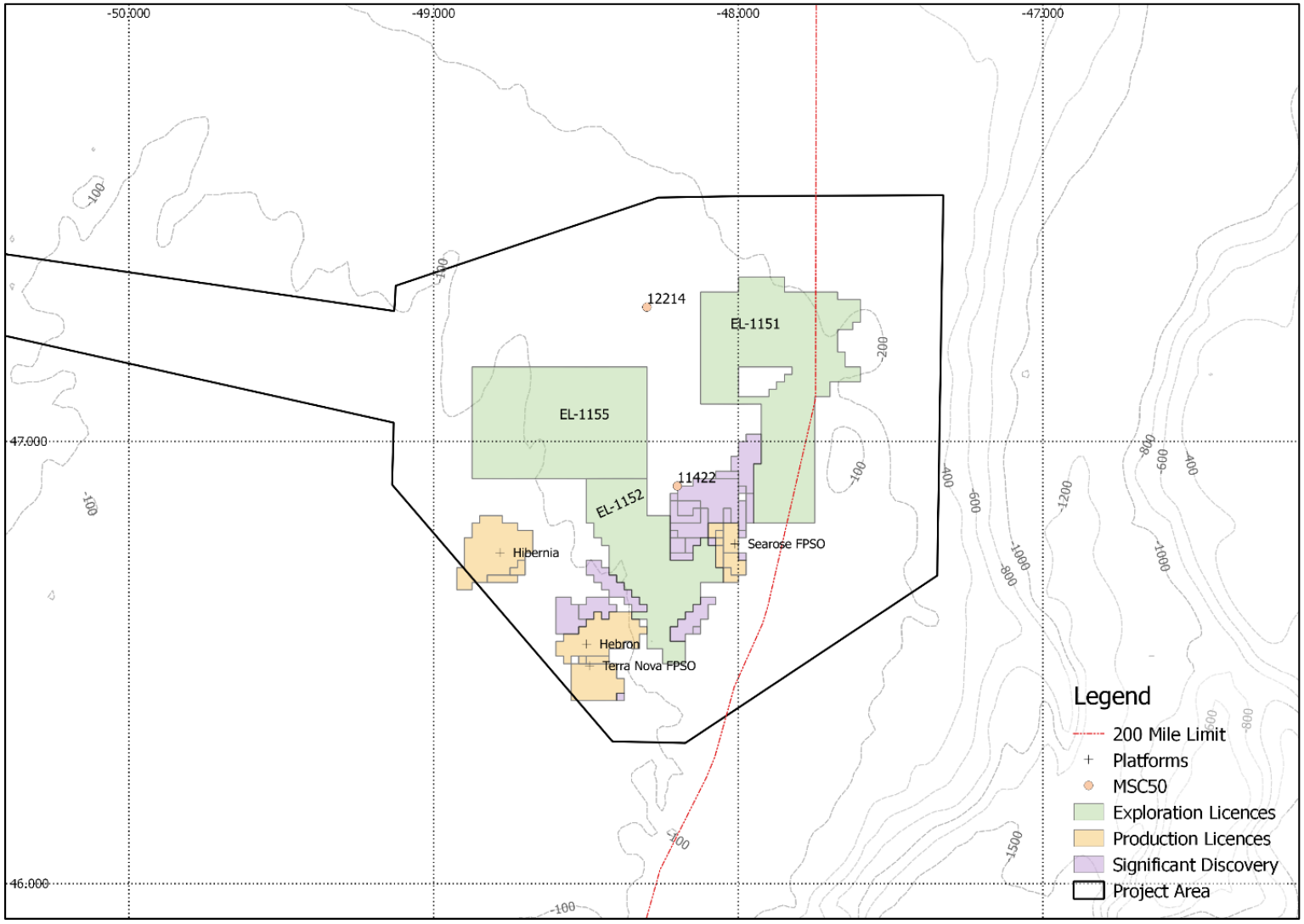
4.1.2.1 Wind Climatology

The MSC50 North Atlantic wind and wave climatology data base source locations are shown in Figure 4-4. The MSC50 data base consists of continuous wind and wave hindcast data in 1-hour time steps from January 1954 to December 2013, on a 0.1° latitude by 0.1° longitude grid. Winds from the MSC50 data set are 1-hour averages of the effective neutral wind at a height of 10 m (Harris 2007). Grid points 12214 and 11422 were chosen to represent conditions within the area of interest. Wind statistics were also compiled using MANMAR data from several offshore platforms located in the region.

The Project Area experiences predominately southwest to west winds throughout the year. There is a strong annual cycle in the wind direction. West to northwest winds which are prevalent during the winter months begin to shift counter-clockwise during March and April, resulting in a predominant southwest wind by the summer months. As autumn approaches, the tropical-to-polar temperature gradient strengthens and the winds shift slightly, becoming predominately westerly again by late fall and into winter.

Low pressure systems crossing the area are more intense during the winter months. As a result, mean wind speeds tend to peak during this season. Wind speed typically increases with increasing heights above sea level. Mean wind speed statistics are provided in Table 4.1. Wind roses of the annual wind speed for Grid Points 12214 and 11422 are presented in Figures 4-5 and 4-6, respectively. As indicated in Table 4.1, wind speeds are consistent for all four grid points in each month.

Extreme wave and wind data are presented in Sections 4.1.3.5 and 4.1.3.6, respectively.

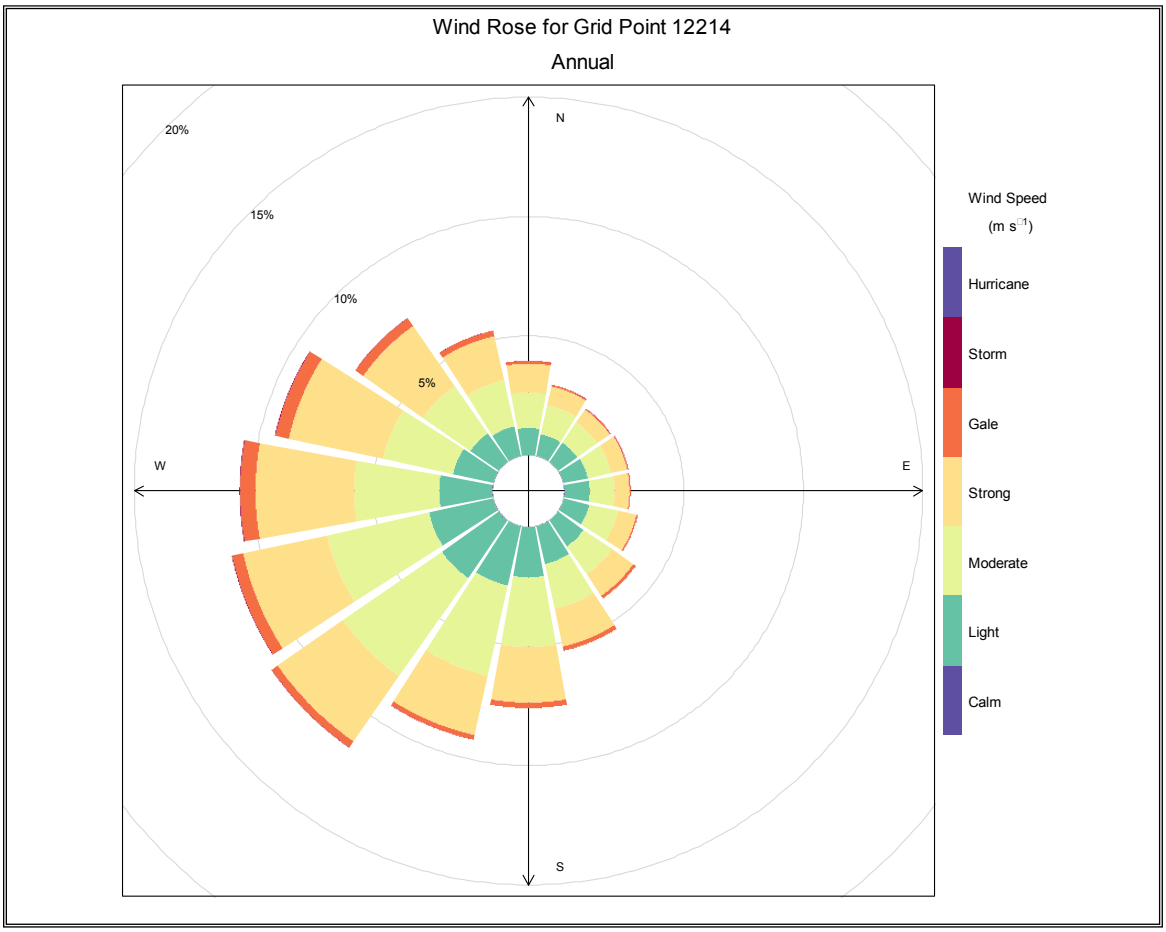


Source: Oceans Ltd. 2016a

Figure 4-4 Climate Data Source Locations in Project Area

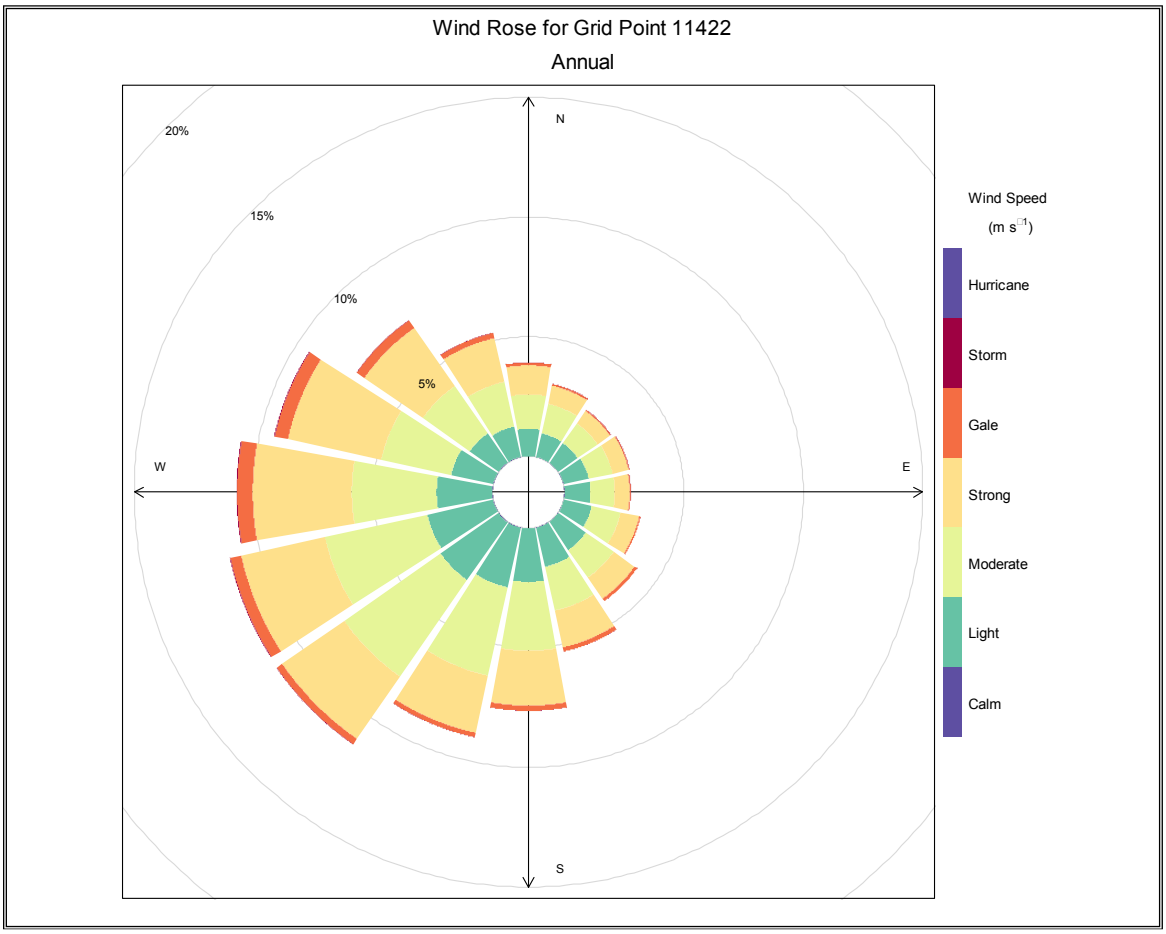
Table 4.1 Mean Wind Speed (m/s) Statistics

Month	MSC50 Grid Point 12214	MSC50 Grid Point 11422	*ICOADS*	*SeaRose FPSO*	*Terra Nova FPSO*	Glomar Grand Banks	GSF Grand Banks	Henry Goodrich	Hibernia
January	11.2	11.1	14.4	11.8	13.6	12.9	13.1	15.4	16.0
February	11.1	11.0	14.0	11.7	13.6	11.9	12.9	15.3	15.9
March	10.0	9.9	13.0	10.8	12.5	11.9	12.2	14.0	14.7
April	8.4	8.3	11.8	10.2	11.5	11.4	11.8	12.7	13.7
May	7.1	7.0	10.5	8.4	10.2	9.7	11.1	11.8	12.4
June	6.6	6.6	10.3	8.2	9.6	9.4	9.7	11.6	11.6
July	6.2	6.1	9.9	8.6	9.4	9.5	9.9	11.1	11.6
August	6.5	6.4	9.5	9.4	9.1	8.4	9.0	9.8	10.7
September	7.6	7.5	10.3	10.1	10.2	10.3	9.7	10.4	11.7
October	9.0	8.9	11.9	11.2	11.6	12.8	10.9	12.2	13.5
November	9.7	9.6	12.5	11.5	12.0	11.0	12.0	12.7	14.2
December	10.8	10.7	14.0	12.1	13.5	12.6	13.1	14.4	15.6
Source: Oceans Ltd. 2011, 2016a									



Source: Oceans Ltd. 2016a

Figure 4-5 Annual Wind Rose for MSC50 Grid Point 12214



Source: Oceans Ltd. 2016a

Figure 4-6 Annual Wind Rose for MSC50 Grid Point 11422

4.1.2.2 Air and Sea Temperature

The atmosphere is coldest in the month of February with a mean monthly air temperature of -0.3°C, and warmest in August with a mean monthly air temperature of 14.6°C. Sea surface temperature is warmest in August with a mean monthly temperature of 13.9°C and coldest in February and March with mean monthly temperatures of 0.4°C. The mean sea surface temperature is cooler than the mean air temperature from March to August, with the greatest difference occurring in the month of July. From September to February, sea surface temperatures are warmer than the mean air temperature. The colder sea surface temperatures from March to August have a cooling effect on the atmosphere, while relatively warmer sea surface temperatures from September to February tend to warm the overlying atmosphere.

4.1.2.3 Precipitation

Precipitation can come in three forms and are classified as liquid (drizzle, rain), freezing (freezing drizzle or freezing rain), or frozen (snow, snow pellets, snow grains, ice pellets, hail, ice crystals).

The migratory high- and low-pressure systems transiting the temperate middle latitude of the Northern Hemisphere cause a variety of precipitation types in their paths. The frequency of precipitation type for the Project Area was calculated using data from the ICOADS data set, with each occurrence counting as one event. Precipitation statistics for these regions may be low due to a fair weather bias. That is, ships tend to either avoid regions of inclement weather, or simply do not report during these events.

The frequency of precipitation type (Table 4.2) shows that annually, precipitation occurs 17.9% of the time. Winter has the highest frequency of precipitation with 28.3% of the observations reporting precipitation. Snow accounts for the majority of precipitation during the winter months, accounting for 16.0% of the occurrences of winter precipitation. Summer has the lowest frequency of precipitation with a total frequency of occurrence of only 11.1%.

Table 4.2 Percentage Frequency (%) Distribution of Precipitation for ICOADS Data Set (1986 to 2015)

Month	Rain/Drizzle	Freezing Rain/ Drizzle	Rain/Snow Mixed	Snow	Thunder storm	Hail	Total
January	11.8	0.3	0.4	18.0	0.0	0.1	30.6
February	9.7	0.7	0.2	19.2	0.0	0.0	29.9
March	9.9	1.0	0.1	12.6	0.0	0.0	23.7
April	11.3	0.3	0.1	3.8	0.0	0.0	15.7
May	11.5	0.1	0.0	0.7	0.0	0.0	12.2
June	11.5	0.0	0.0	0.0	0.1	0.0	11.7
July	10.1	0.0	0.0	0.0	0.1	0.0	10.2
August	11.1	0.0	0.0	0.1	0.1	0.0	11.3
September	11.3	0.0	0.0	0.0	0.1	0.0	11.4
October	15.7	0.0	0.0	0.4	0.1	0.0	16.2
November	15.7	0.0	0.2	3.2	0.0	0.0	19.2
December	13.0	0.2	0.3	10.7	0.0	0.1	24.3
Winter	11.5	0.4	0.3	16.0	0.0	0.1	28.3
Spring	10.9	0.5	0.1	5.8	0.0	0.0	17.2
Summer	10.9	0.0	0.0	0.0	0.1	0.0	11.1
Autumn	14.2	0.0	0.1	1.2	0.1	0.0	15.5
Total	11.8	0.2	0.1	5.7	0.0	0.0	17.9

Source: Oceans Ltd. 2016a

Freezing precipitation occurs when rain or drizzle aloft enters negative air temperatures near the surface and becomes super-cooled so that the droplets freeze upon impact with the surface. This situation typically arises ahead of a warm front extending from low pressure systems passing west

of the area. The month of March has the highest frequency of freezing precipitation; occurring approximately 1% of the time.

4.1.2.4 Icing

Spray icing can accumulate on vessels and shore structures when air temperatures are below the freezing temperature of water and there is potential for spray generation. In addition to air temperature, icing severity depends on water temperature, water salinity, wave conditions, and wind speed which influence the amount of spray and the cooling rate of droplets. A review of the spray icing hazard is provided by Minsk (1977). The frequency of potential icing conditions and its severity was estimated from the algorithm proposed by Overland et al. (1986) and subsequently updated by Overland (1990):

$$PPR = \frac{V_a\ (T_f - T_a)}{1 + 0.3(T_w - T_f)}$$

PPR = Icing Predictor (m°Cs-1)
Va = Wind Speed (ms-1)
Tf= Freezing point of seawater (usually -1.7°C or -1.8°C)
Ta = Air Temperature (°C)
Tw = Sea temperature (°C)

These algorithms are based primarily on reports from vessels that were 20 to 75 m in length. The algorithm generates an icing predictor based on air temperature, wind speed, and sea surface temperature, which was empirically related to observed icing rates of fishing vessels in the Gulf of Alaska. This method will provide conservative estimates of icing severity in the Study Area as winter sea surface temperatures are colder and wave conditions are lower in the Study Area compared to the Gulf of Alaska where the algorithm was calibrated (Makkonen et al. 1991). Based on the above algorithm, the terminology and associated vessel icing rates for freezing spray forecasts are shown in Table 4.3. These rates and terminology are used when forecasting freezing spray on the Grand Banks.

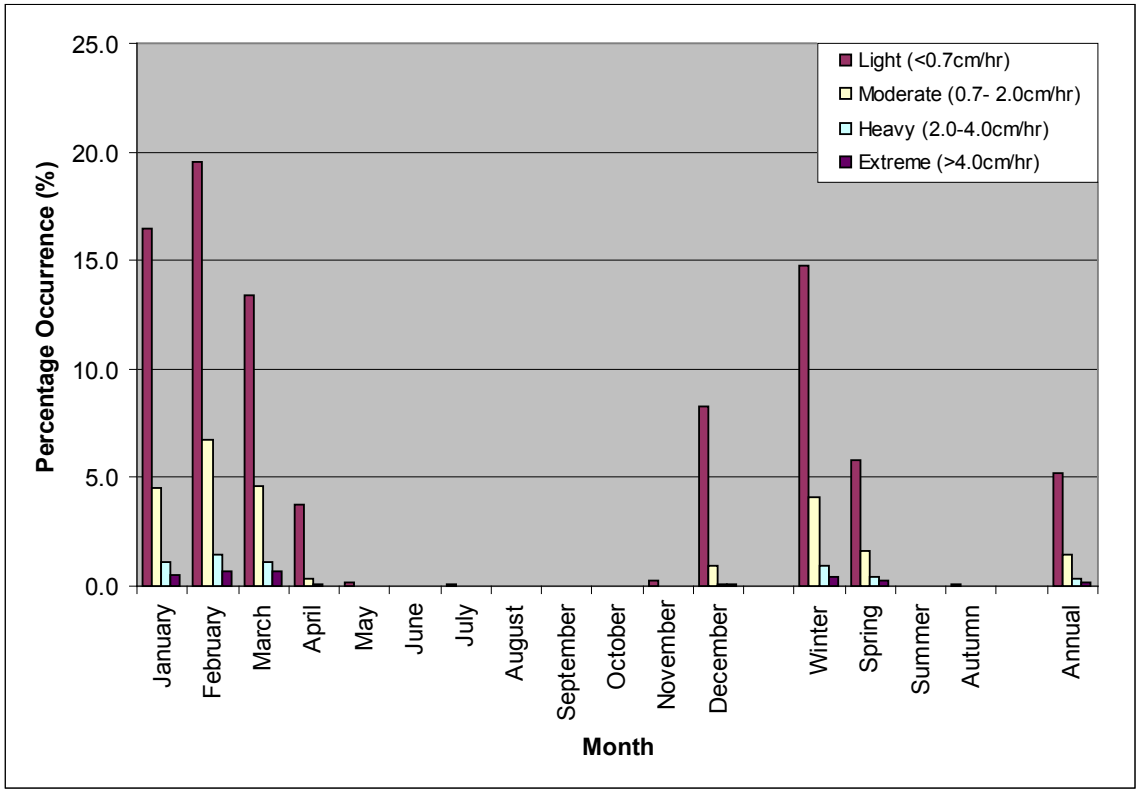
Table 4.3 Intensity of Freezing Spray

Intensity Term	Icing Rate (centimetres (cm) per hour)
Light	less than 0.7 cm/hr
Moderate	0.7 to 2.0 cm/hr inclusive
Heavy	2.0 – 4.0 cm/hr
Extreme	greater than 4.0 cm/hr

Potential icing rates were computed using wind speed and air sea surface temperature observations from the MANMAR data set. A total of 67,197 observations were used to calculate the percentage frequency of icing occurrence and severity for area. Monthly, seasonal, and annual summaries are presented in Table 4.4 and monthly frequency is illustrated in Figure 4-7.

Table 4.4 Frequency of Occurrence of Potential Spray Icing Conditions

	None (0cm/hr)	Light (<0.7cm/hr)	Moderate (0.7- 2.0cm/hr)	Heavy (2.0-4.0cm/hr)	Extreme (>4.0cm/hr)
January	77.4	16.5	4.5	1.1	0.5
February	71.5	19.5	6.8	1.5	0.7
March	80.2	13.4	4.6	1.1	0.7
April	95.9	3.7	0.3	0.0	0.0
May	99.8	0.2	0.0	0.0	0.0
June	100.0	0.0	0.0	0.0	0.0
July	99.9	0.0	0.0	0.0	0.0
August	100.0	0.0	0.0	0.0	0.0
September	100.0	0.0	0.0	0.0	0.0
October	100.0	0.0	0.0	0.0	0.0
November	99.8	0.2	0.0	0.0	0.0
December	90.6	8.3	0.9	0.1	0.1
Winter	79.9	14.8	4.1	0.9	0.4
Spring	92.0	5.8	1.6	0.4	0.2
Summer	100.0	0.0	0.0	0.0	0.0
Autumn	99.9	0.1	0.0	0.0	0.0
Annual	92.9	5.2	1.4	0.3	0.2



Source: Oceans Ltd. 2016

Figure 4-7 Frequency of Occurrence of Potential Spray Icing Conditions

Potential sea spray icing conditions start during the month of November with a frequency of icing potential of just 0.2%. As temperatures cool throughout the winter, the frequency of icing potential increases to a maximum of 19.5% in February. Extreme sea spray icing conditions were calculated to occur 0.7% during February and March. Icing potential decreases rapidly after February in response to warming air and sea surface temperatures, and by May the frequency of icing conditions is only 0.2%.

4.1.2.5 Visibility

Visibility is defined as the greatest distance at which objects of suitable dimensions can be seen and identified. Horizontal visibility may be reduced by any of the following phenomena, either alone or in combination:

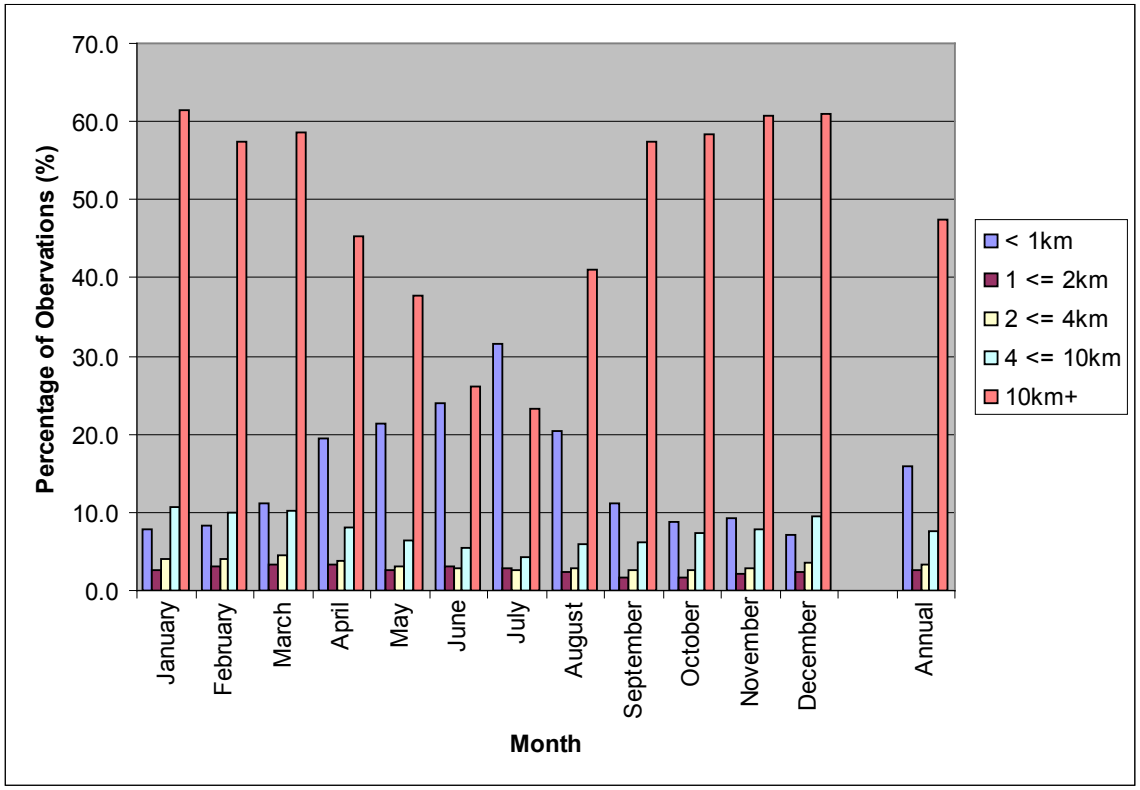
- fog (visibility less than 1 km)
- mist (visibility less than 10 km)
- haze
- smoke
- liquid precipitation (e.g., drizzle)
- freezing precipitation (e.g., freezing rain)

- frozen precipitation (e.g., snow)
- blowing snow

During the winter months, the main obstruction is snow; however, mist and fog may also reduce visibilities at times. As spring approaches, the amount of visibility reduction attributed to snow decreases. As the air temperature increases, so does the occurrence of advection fog. Advection fog forms when warm moist air moves over cooler waters. By April, the sea surface temperature south of Newfoundland is cooler than the surrounding air. As warm moist air from the south moves over the colder sea surface, the air cools and its ability to hold moisture decreases. The air will continue to cool until it becomes saturated and the moisture condenses to form fog. The presence of advection fog increases from April through July. The month of July has the highest percentage of obscuration to visibility, most of which is in the form of advection fog, although frontal fog can also contribute to the reduction in visibility. In August, the temperature difference between the air and the sea begins to decrease and by September, the air temperature begins to fall below the sea surface temperature. As the air temperature drops, the occurrence of fog decreases. Reduction in visibility during autumn and winter is relatively low and is mainly attributed to the passage of low-pressure systems. Fog is the main cause of the reduced visibilities in autumn, and snow is the main cause of reduced visibilities in the winter. September and October have the lowest occurrence of reduced visibility since the air temperature has, on average, decreased below the sea surface temperature and it is not yet cold enough for snow.

Fog also occurs as relatively warm rain falls through cooler air beneath a frontal surface. Typically, the base of the cloud layer lowers as the air becomes saturated and condensation occurs. If the cloud base reaches the surface, frontal fog occurs. Most frequently, frontal fog occurs ahead of a warm front associated with a frontal disturbance. As the front moves through, clearing of the fog may occur but frequently, frontal fog gives way to advection fog in the warm sector of a low pressure system. Typically, fog clears as drier air is adverted into the region from continental source regions to the west.

A plot of the frequency distribution of visibility from the ICOADS data set is presented in Figure 4-8. This figure shows that obstructions to vision can occur in any month. Annually, 47.4% of the observations had reduced visibilities less than 10 km.



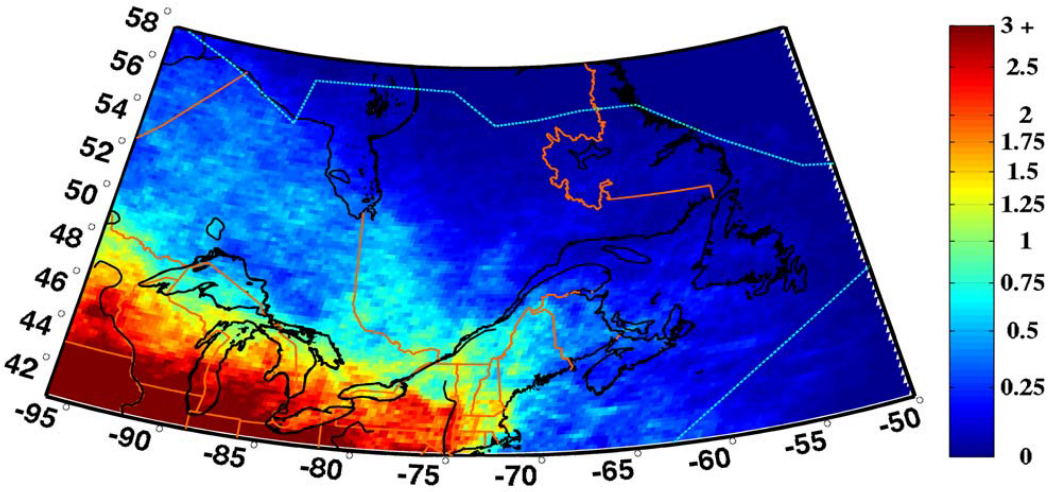
Source: Oceans Ltd. 2016a

Figure 4-8 Monthly and Annual Percentage Occurrence of Visibility from the ICOADS Data Set (1986 to 2015)

4.1.2.6 Lightning

The southern coast region of Newfoundland has a longer lightning season than other locations in Newfoundland (Burrows and Kochtubajda 2010). Offshore Newfoundland (and the Island of Newfoundland) has a very low average flash density (Figure 4-9 (Burrows and Kochtubajda (2010)).

Given its location, there is no specific information on lightning activity for the Project Area. Land-based lightning statistics for locations in Newfoundland and Labrador are provided in Table 4.5. There is a very low average flash density (flashes per square kilometre per year) in the NL Offshore (Environment Canada 2015a).



Source: Burrows and Kochtubajda 2010
Note: Light blue irregular lines around the periphery are the approximate 70% detection efficiency as of 1 November 2008

Figure 4-9 Average Flash Density (flash km²/year) for Eastern Canada, 1999 to 2008

Table 4.5 Lightning Activity in Newfoundland and Labrador as Reported by the Canadian Lightning Detection Network (1999 to 2013)

City	Area (km²)	Total Lightning Strikes from 1999 to 2013	Average Number of Days with lightning (within 25 km)
Labrador City	38.83	2,231	8.1
Grand Falls-Windsor	54.48	2,747	7.6
Corner Brook	148.30	2,334	7.5
Goose Bay	305.80	1,133	6.8
Gander	104.20	2,579	6.7
Conception Bay South	59.27	644	4.6
Mount Pearl	15.76	580	4.2
Paradise	29.24	590	4.2
St. John's	446.06	566	4.1
Source: Environment Canada 2015a			

4.1.2.7 Tropical Systems

The hurricane season in the North Atlantic basin normally extends from June through November, although tropical storm systems occasionally occur outside this period. While the strongest winds typically occur during the winter months and are associated with mid-latitude low pressure

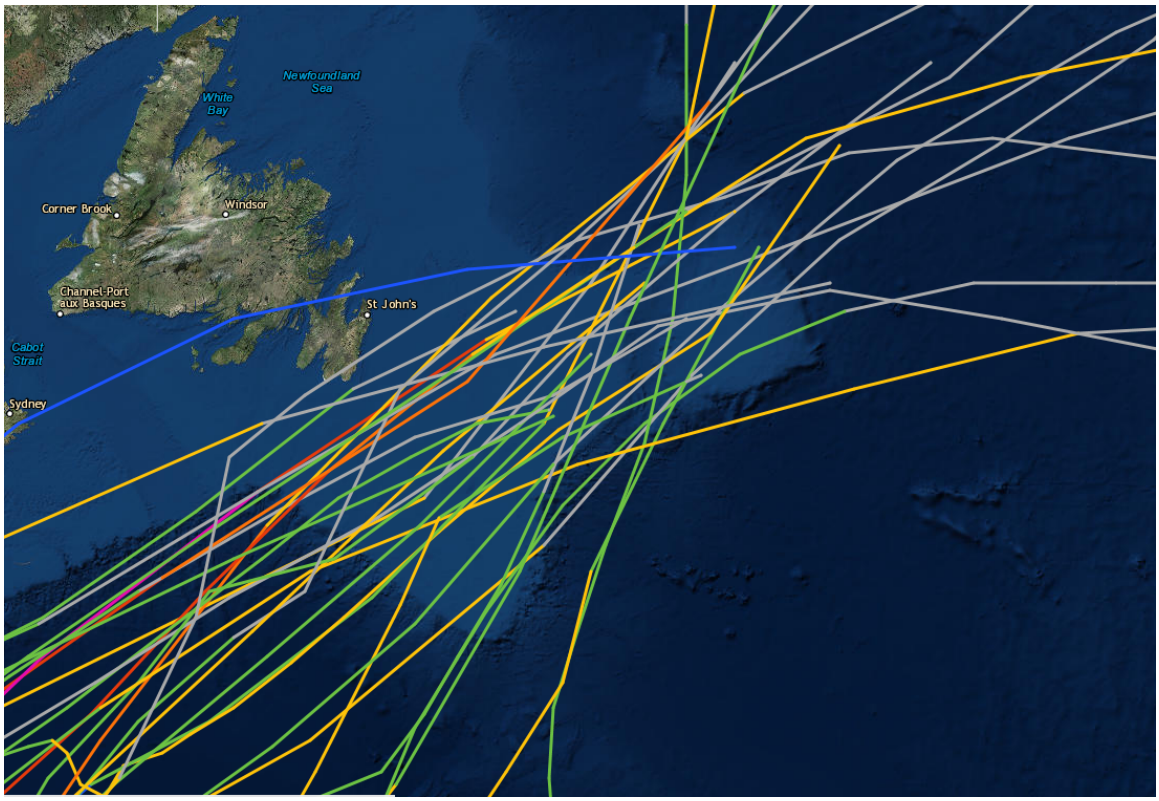
systems, storm force winds may occur at any time of the year, because of tropical systems. Once formed, a tropical storm or hurricane will maintain its energy as long as a sufficient supply of warm, moist air is available.

Tropical storms and hurricanes obtain their energy from the latent heat of vaporization that is released during the condensation process. These systems typically move east to west over the warm water of the tropics. However, some of these systems turn northward and make their way towards Newfoundland and the Project Area. Since the capacity of the air to hold water vapour is dependent on temperature, the hurricanes begin to lose their tropical characteristics as they move northward over the colder ocean waters. By the time these weakening cyclones reach Newfoundland, they are usually embedded into a mid-latitude low and their tropical characteristics are usually lost.

There has been a noticeable increase in the number of hurricanes that have developed within the Atlantic Basin during the last 15 years. This increase in activity has been attributed to naturally occurring cycles in tropical climate patterns near the equator called the tropical multi-decadal signal (Bell and Chelliah 2006). Because of the increase in tropical activity in the Atlantic Basin, there has also been an increase in tropical storms or their remnants entering the Canadian Hurricane Centre Response zone. There is little change in the five-year trend for hurricanes coming within the Project Area, although the unusually high number of tropical storms in 2005 may be skewing the results for the 2001 to 2005 period.

A considerable number of tropical cyclones which move into the mid-latitudes transform into extratropical cyclones. On average, 46% of tropical cyclones which formed in the Atlantic transform into extratropical cyclones. During this transformation, the system loses tropical characteristics and becomes more extratropical in nature resulting in an increase in size which produces large waves, gale to hurricane force winds and intense rainfall. The likelihood that a tropical cyclone will undergo transition increases toward the second half of the tropical season; with October having the highest probability of transition. In the Atlantic, extratropical transition occurs at lower latitudes in the early and late hurricane season and at higher latitudes during the peak of the season (Hart and Evans 2001).

Between 1947 and 2015, 30 tropical systems have passed within 278 km of 46.9°N; 47.9°W; the tracks are shown in Figure 4-10. On occasion, these systems still maintain their tropical characteristics when they reach Newfoundland. Seven Category 1 and one Category 2 hurricanes crossed within 278 km during the period. The most intense of these storms was Hurricane Gladys which crossed at 12Z on October 3, 1975 with maximum sustained wind speeds of 43.7 m/s and a central pressure of 960 mb. Hurricane Gladys underwent extratropical transition over the following hours and moved northeast of the area as an extratropical storm with wind speeds of 38.6 m/s.



Source: Oceans Ltd. 2016

Figure 4-10 Storm Tracks of Tropical Systems Passing within 278 km of 46.9°N, 47.9°W (1967 to 2015)

4.1.3 Physical Oceanography

4.1.3.1 Bathymetry

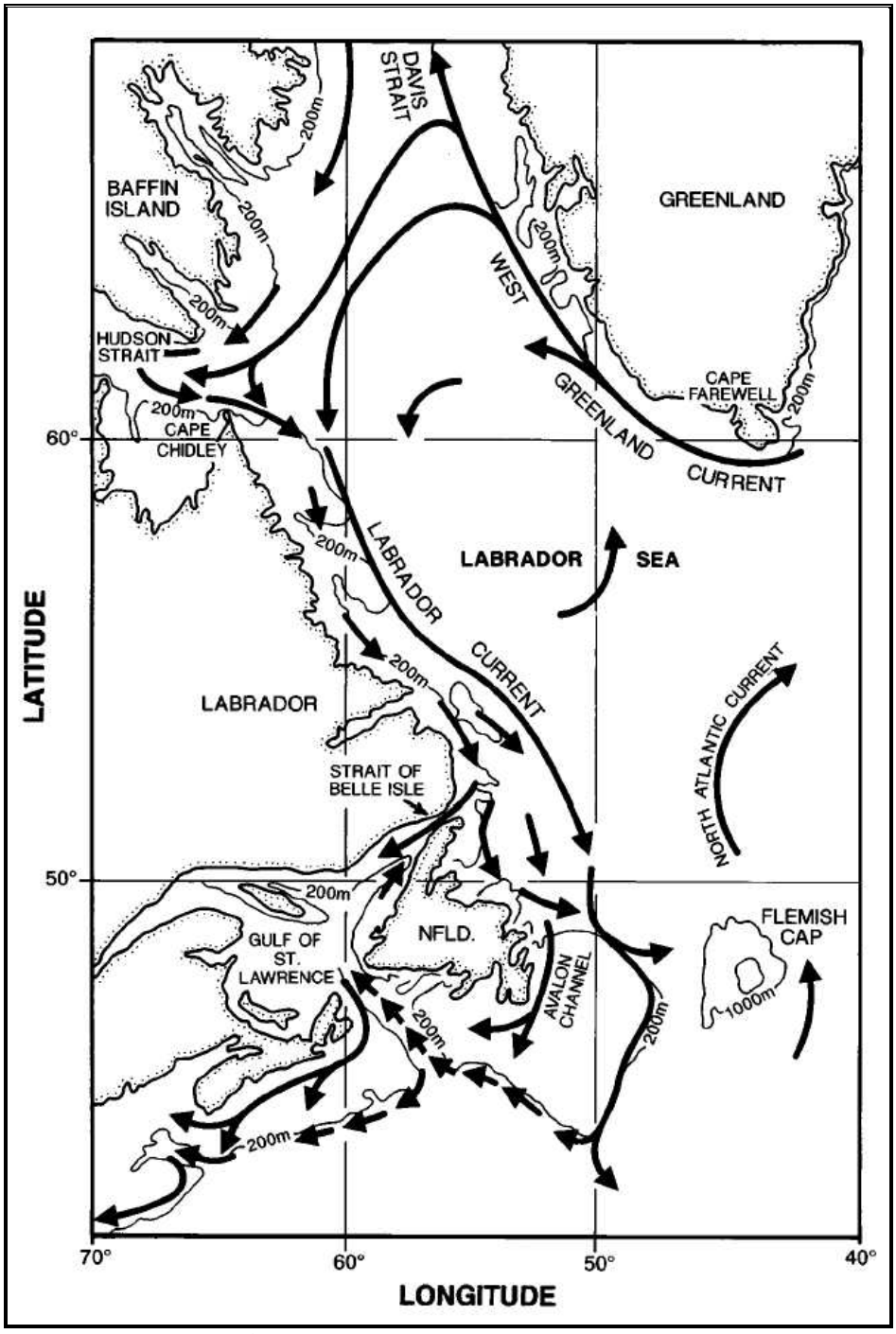
The Grand Banks has an average depth of approximately 75 m. The existing production fields are in water depths ranging from 75 m (Hibernia) to 125 m (White Rose). The Grand Banks extend approximately the 200 m depth contour; the Flemish Pass reaches to depths of almost 1,300 m. On the eastern side of the Flemish Pass, water depth rises to approximately 130 m on the Flemish Cap. There are numerous canyons in the Study Area but south of the Project Area, with water depths of between approximately 2,000 m to 4,000 m. Further south, the Southeast Shoal rises to approximately 40 to 50 m water depth. To the north, the Sackville Spur has water depth to 1,000 m. Further north, the Orphan Basin reaches 1,200 to 3,500 m in depth (Amec 2014).

4.1.3.2 Ocean Currents

The Study Area is the northeast Newfoundland Shelf, the western side of the Flemish Pass, and the deep water in the Flemish Pass. The large-scale circulation off the coast of Newfoundland and Labrador is dominated by well-established currents that flow along the margins of the Continental Shelf. The two major current systems in the area are the Labrador Current and the North Atlantic Current (Colbourne and Foote 2000). The Labrador Current is the main current in the Study Area and it transports sub-polar water to lower latitudes along the Continental Shelf of eastern Canada. This current follows the shelf break with relatively low variability compared to the mean flow. Over the Grand Banks a weaker current system is observed where the variability often exceeds that of the mean flow. The major currents off the coast of Newfoundland and Labrador are illustrated in Figure 4-11.

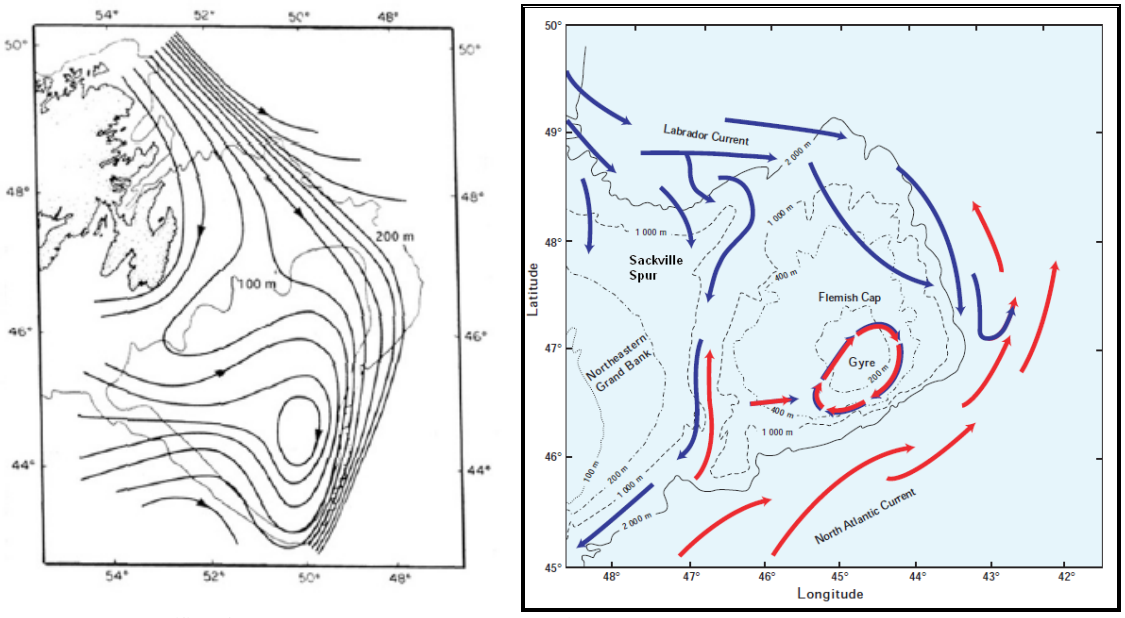
The Labrador Current consists of two major branches. The inshore branch of the Labrador Current is approximately 100 km wide (Stein 2007) and is steered by the local underwater topography through the Avalon Channel. The stronger offshore branch flows along the shelf break over the upper portion of the Continental Slope. The offshore branch passes between the 400 and 1,200 m isobaths (Lazier and Wright 1993). This branch of the Labrador Current divides east of 48°W, resulting in part of the branch flowing to the east around Flemish Cap and the other flowing south around the eastern edge of the Grand Banks and through the Flemish Pass. Within the Flemish Pass the width of the Labrador Current is reduced to 50 km wide with average speeds of about 30 cm/s (Stein 2007). This flow transports cold, relatively low salinity Labrador Slope water into the region. To the southeast of the Flemish Cap the North Atlantic Current transports warmer, high salinity water to the northeast along the southeast slope of Grand Bank and the Flemish Cap (Figure 4-11). The current over the shelf moves southward then west along the shelf break creating a gyre over the southeast Grand Banks (Figure 4-12). The westward flow of the Labrador Current around the Tail of the Bank is influenced by the Gulf Stream and slope waters.

The volume transport of the Labrador Current is variable from year to year. Han et al. (2010) found that the transport decreased by 6.3 Sv from the early to late 1990s and increased by 3.2 Sv from the late 1990s to the early 2000s. They found that the multi-year changes in the Labrador Current transport appeared to be primarily barotopic and positively correlated with the North Atlantic Oscillation at zero lag implying a fast response of the regional circulation to the atmospheric forcing variability.



Source: Colbourne 1997, in Oceans Ltd. 2016a

Figure 4-11 Major Ocean Circulation Features in the Northeast Atlantic

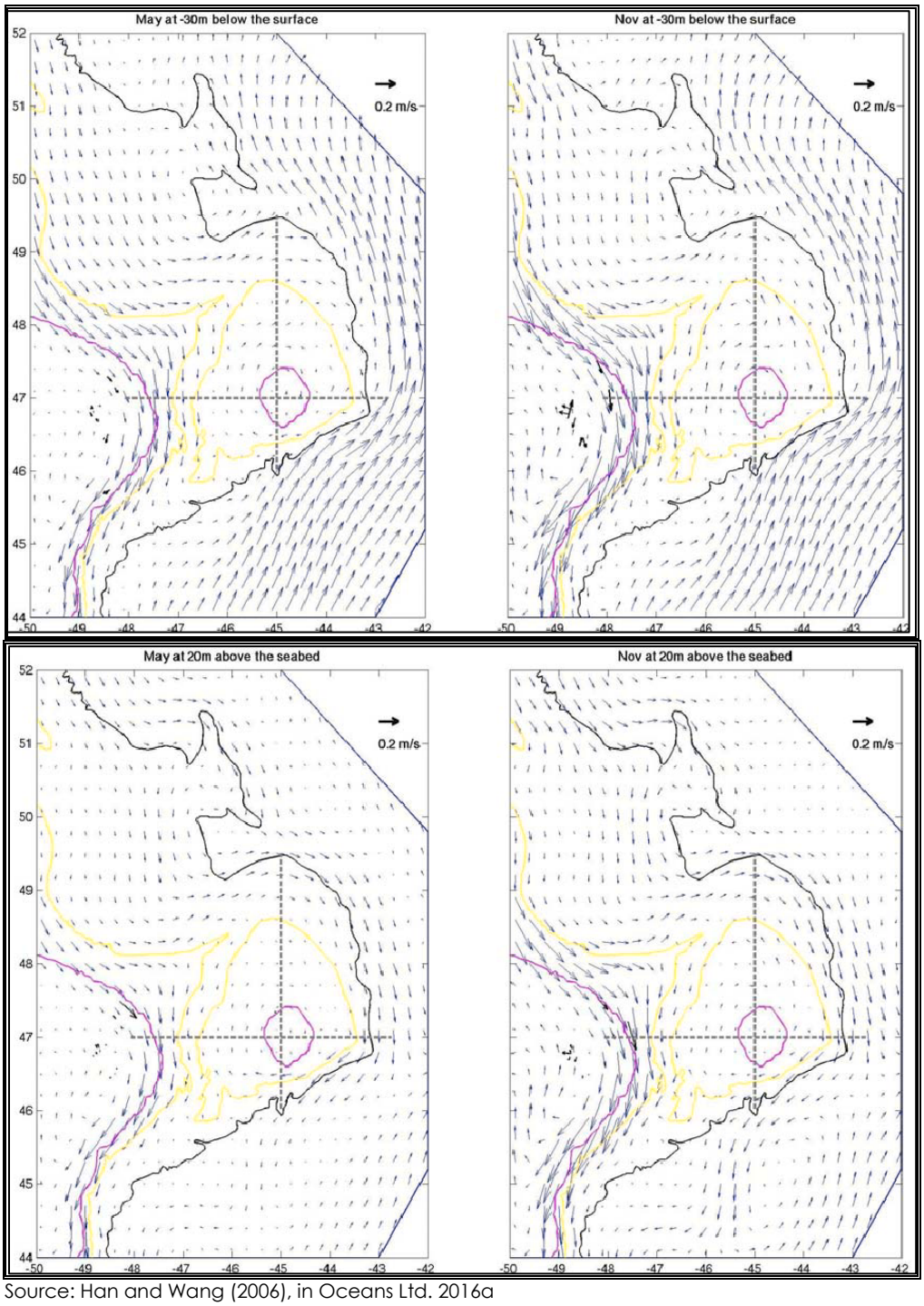


Source: modified from Calbourne and Foote 2000, in Oceans Ltd. 2016a

Figure 4-12 The Major Circulation Features around the Grand Banks, Flemish Cap and Sackville Spur

The outer branch of the Labrador Current exhibits a distinct seasonal variation in flow speeds (Lazier and Wright 1993), in which mean flows are a maximum in October and a minimum in March and April. This annual cycle is reported to be the result of the large annual variation in the steric height over the continental shelf in relation to the much less variable internal density characteristic of the adjoining deep waters. The additional freshwater in spring and summer is largely confined to the waters over the shelf. In summer, the difference in sea level between the shelf and open ocean is 0.09 m greater than in winter (Lazier and Wright 1993). This difference produces a greater horizontal surface pressure gradient and hence, stronger mean flows.

Han and Wang (2006) found that the circulation over the Newfoundland Shelf and its northeast slope is dominated by flows toward the equator associated with the inshore and offshore Labrador Current. Their model study supported a significant seasonal cycle in the current regime with strong flows during the fall/winter and weak flows in spring/summer. This is demonstrated in Figure 4-13, which shows the model currents near the surface (30 m) and near the bottom (20 m) above the ocean floor, for the months of May and November.



Source: Han and Wang (2006), in Oceans Ltd. 2016a

Figure 4-13 Modelled Currents at 30 m below the Surface (top) and 20 m above the Seabed (bottom) in May (left) and November (right)

The maximum speed of currents illustrated in Figure 4-13 was 37.8 cm/s at a depth of 76 m. The mean speed varied between 10.0 cm/s at 76 m at MSC50 Grid Points 12214 and 35.8 cm/s at 26 m in EL 1155. The currents on the northeast Newfoundland Shelf area are mainly toward a southerly direction with fluctuations from southeast to southwest at different locations.

Statistics for the mean and maximum current speeds and average velocities are presented in Table 4.6.

Table 4.6 Mean and Maximum Current Speeds and Average Velocities

Area-Mooring	Depth (m)	Maximum Speed (cm/s)	Mean Speed (cm/s)	Mean Velocity (cm/s)	Direction
EL 1151	35	77.4	30.5	13.5	South-southeast
	95	51.6	15.1	7.4	Southeast
	150	44.9	12.5	6.4	Southeast
EL 1155	26	71.1	35.8	15.9	Southwest
	48	38.0	22.2	21.6	Southwest
Current Meter 12244	22.5	49.3	11.9	4.3	Southeast
	76	37.8	10.0	3.2	Southeast
	136	42.3	10.6	3.7	Southeast
Source: Modified from Oceans Ltd. 2016a					

4.1.3.3 Tides

Astronomical tides are highly predictable. From an extended measurement at any selected site, the major astronomical constituents can be determined and used to accurately predict tidal heights. Over the Grand Banks, the largest tidal constituent is the lunar semidiurnal, with amplitude of approximately 40 cm. The other major semidiurnal and diurnal constituents are lower in amplitude; each constituent has a value of approximately 10 to 15 cm (Godin 1980, in Husky Energy 2012a). The tides on the Grand Banks are mixed, mainly semidiurnal with two high tides and two low tides occurring each day. The successive highs (and lows) are usually not the same height. A typical tidal range is 1 m (Husky Energy 2010).

Tidal information for the Grand Banks comes from a tidal study carried out by the BIO in 1983-84. BIO collected data at eight sites over a period of six months on the Grand Banks, and along its edge (Petrie et al. 1987, in Husky Energy 2012a). There are currently no permanent gauges in the Project Area (Amec 2014).

4.1.3.4 Wave Climatology

The wave climate of the Grand Banks is dominated by extra-tropical storms, primarily during October through March. Severe storms may, on occasion, occur outside these months. Storms of tropical origin may occur during the early summer and early winter, but most often from late

August through October. Hurricanes are usually reduced to tropical storm strength or evolve into extra-tropical storms by the time they reach the area, but they are still capable of producing storm force winds and high waves.

During autumn and winter, the dominant direction of the combined significant wave height[1] is from the west. This corresponds with a higher frequency of occurrence of the wind wave during these months, suggesting that during the late fall and winter, the wind wave is the main contributor to the combined significant wave height. During the months of March and April, the wind wave remains predominately westerly while the swell begins to come from a southerly direction, resulting in the vector mean direction of the combined significant wave heights being south-westerly. A mean south-westerly direction for the combined significant wave heights during the summer months is a result of a mainly south-westerly wind wave and a south-westerly swell. As winter approaches again, during the months of September and October, the wind wave will veer to the west and become the more dominant component of the combined significant wave height. This will result in the frequency of occurrence of the combined significant wave heights being westerly once again.

Wave statistics were also compiled from wave data measured in and near the Project Area. Most significant wave heights lie between 1.0 and 3.0 m. There is a gradual decrease in frequency of wave heights above 3.0 m and only a small percentage of the wave heights exceed 7.0 m. Significant wave heights within the Project Area peak during the winter months having a mean monthly significant wave height of 4.2 m in January. The lowest significant wave heights occur in the summer, with July having a mean monthly significant wave height of 1.7 m for both MSC50 Grid Points. Mean significant wave height statistics are provided in Table 4.7, with maximum combined significant wave height statistics provided in Table 4.8.

Table 4.7 Mean Significant Wave Height Statistics (m)

Month	MSC50 Grid Point 12214	MSC50 Grid Point 11422	Terra Nova	White Rose (2003-2007)	White Rose (2007- 2015)
January	4.2	4.2	3.8	4.9	4.1
February	3.9	3.9	3.8	4.5	4.1
March	3.4	3.4	3.5	4.3	3.5
April	2.8	2.8	2.5	2.7	2.7
May	2.2	2.2	2.2	2.6	2.2
June	1.9	1.9	1.9	2.6	1.9
July	1.7	1.7	1.7	2.4	1.7
August	1.8	1.8	1.7	2.3	1.8

[1] The expected value of the characteristic wave height that would be generally observed. It is generally accepted that the combined significant wave height is the average height of the highest one-third of the waves

Month	MSC50 Grid Point 12214	MSC50 Grid Point 11422	Terra Nova	White Rose (2003-2007)	White Rose (2007- 2015)
September	2.4	2.4	2.2	2.8	2.3
October	3.0	3.0	3.1	3.8	3.1
November	3.4	3.4	3.2	3.8	3.3
December	4.0	4.0	3.8	4.2	4.0
Source: ISDM data base and MSC50 data base, in Oceans Ltd. 2011, 2016a					

Table 4.8 Maximum Combined Significant Wave Height Statistics (m)

Month	MSC50 Grid Point 12214	MSC50 Grid Point 11422	Terra Nova	White Rose (2003-2007)	White Rose (2007- 2015)
January	12.7	12.8	12.5	12.2	14.9
February	15.1	14.8	14.7	11.9	11.7
March	11.2	11.1	9.7	12.8	9.6
April	10.9	10.8	9.7	11.0	8.6
May	10.7	10.3	7.4	10.9	6.6
June	10.2	10.0	6.5	9.2	5.6
July	6.3	6.1	4.9	8.5	5.0
August	8.5	9.0	8.0	9.3	7.3
September	13.3	12.1	12.6	11.1	12.9
October	12.0	12.0	10.6	12.2	10.3
November	11.5	11.5	10.2	11.2	10.7
December	13.7	13.6	11.7	11.1	11.1
Source: ISDM data base and MSC50 data base, in Oceans Ltd. 2011, 2016a					

Combined significant wave heights of 10.5 m or more have occurred in each month between September and April in the MSC50 data for the grid points within the Project Area, with the highest waves occurring during the month of February. The highest significant wave height of 15.1 m in the MSC50 data set for the grid points within the Project Area occurred on February 15, 1982. The highest combined significant wave height of 14.9 m occurred on January 4, 2014, in the White Rose field. While the maximum significant wave heights tend to peak during the winter months, a tropical system could pass through the area and produce higher than average wave heights during any month.

4.1.3.5 Extreme Waves

The annual and monthly extreme value[2] estimates for significant wave height for return periods of 1-year, 10-years, 25-years, 50-years and 100-years are given in Table 4.9. The annual 100-year extreme significant wave height ranges from 14.8 to 14.9 m. The highest extreme significant wave height occurs during the month of February with an extreme height ranging from 15.0 to 15.1 m.

Table 4.9 Extreme Significant Wave Height Estimates (m) for Return Periods of 1, 10, 25, 50 and 100 Years

Month	Grid Point 12214 Significant Wave Height (m)					Grid Point 11422 Significant Wave Height (m)				
	1	10	25	50	100	1	10	25	50	100
JAN	9.2	11.8	12.7	13.4	14.0	8.9	11.8	12.7	13.3	14.0
FEB	8.4	12.2	13.4	14.2	15.1	8.2	12.1	13.2	14.1	15.0
MAR	7.0	9.9	10.8	11.5	12.2	6.9	10.0	10.9	11.6	12.3
APR	5.6	8.6	9.5	10.2	10.9	5.4	8.6	9.6	10.3	11.0
MAY	4.5	7.3	8.2	8.9	9.6	4.3	7.2	8.1	8.7	9.4
JUN	3.8	6.1	6.9	7.4	8.0	3.6	6.1	6.9	7.4	8.0
JUL	3.4	5.3	5.9	6.3	6.8	3.3	5.3	5.9	6.3	6.8
AUG	3.8	6.4	7.3	7.9	8.5	3.6	6.7	7.6	8.3	9.0
SEP	5.2	9.5	10.9	12.0	13.0	4.9	9.2	10.5	11.5	12.5
OCT	6.1	10.1	11.3	12.3	13.2	6.0	10.0	11.3	12.2	13.1
NOV	7.4	10.6	11.6	12.4	13.1	7.1	10.4	11.4	12.1	12.8
DEC	8.8	11.7	12.7	13.4	14.0	8.7	11.6	12.5	13.2	13.8
ALL	10.8	12.9	13.7	14.3	14.9	10.7	12.8	13.6	14.2	14.8
Source: Oceans Ltd. 2016a										

4.1.3.6 Extreme Winds

The calculated annual and monthly values for each grid point for 1-hour, 10-minutes and 1-minute wind extremes are presented in Table 4.10 to Table 4.12. The annual 100-year extreme 1-hour wind speed was determined to range from 32.1 to 32.2 m/s. Monthly, the highest extreme winds occur during February with a 100-year extreme wind estimate ranging from 31.6 to 31.7 m/s.

[2] The annual extreme value estimate is the highest value expected annually and uses all the data for the analysis; the monthly extreme value is the highest value expected in the month and only uses data from that month for the analysis.

Table 4.10 1-hr Extreme Wind Speed Estimates (m/s) for Return Periods of 1, 10, 25, 50 and 100 Years

	Grid Point 12214 Wind Speed 1-hr (m/s)					Grid Point 11422 Wind Speed 1-hr (m/s)				
Month	**1**	**10**	**25**	**50**	**100**	**1**	**10**	**25**	**50**	**100**
JAN	22.5	26.4	27.9	28.9	30.0	22.5	26.4	27.8	28.8	29.9
FEB	22.2	27.2	29.0	30.4	31.7	22.3	27.2	29.0	30.3	31.6
MAR	20.3	24.8	26.4	27.6	28.9	20.4	24.8	26.3	27.5	28.7
APR	18.0	22.4	24.0	25.2	26.3	18.0	22.5	24.0	25.2	26.4
MAY	15.5	19.7	21.2	22.3	23.4	15.5	19.6	21.0	22.1	23.1
JUN	14.4	18.1	19.4	20.5	21.5	14.4	18.4	19.8	20.8	21.8
JUL	13.3	16.4	17.5	18.4	19.2	13.4	16.7	17.9	18.8	19.7
AUG	14.6	19.7	21.5	22.9	24.2	14.6	20.7	22.9	24.5	26.2
SEP	17.2	23.2	25.3	26.9	28.5	17.1	22.6	24.5	25.9	27.4
OCT	18.6	23.8	25.7	27.1	28.5	18.5	23.6	25.4	26.8	28.2
NOV	19.9	24.2	25.7	26.9	28.0	19.9	24.3	25.8	27.0	28.1
DEC	21.7	26.2	27.8	29.0	30.2	21.8	26.4	28.0	29.3	30.5
ALL	25.3	28.8	30.2	31.2	32.2	25.2	28.8	30.1	31.1	32.1
Source: Oceans Ltd. 2016a										

Table 4.11 10-minute Extreme Wind Speed Estimates (m/s) for Return Periods of 1, 10, 25, 50 and 100 Years

	Grid Point 12214 Wind Speed 10-min (m/s)					Grid Point 11422 Wind Speed 10-min (m/s)				
Month	**1**	**10**	**25**	**50**	**100**	**1**	**10**	**25**	**50**	**100**
JAN	23.8	28.0	29.5	30.7	31.8	23.9	28.0	29.5	30.6	31.7
FEB	23.6	28.8	30.7	32.2	33.6	23.6	28.8	30.7	32.1	33.4
MAR	21.5	26.3	28.0	29.3	30.6	21.6	26.3	27.9	29.2	30.4
APR	19.1	23.7	25.4	26.7	27.9	19.1	23.8	25.5	26.7	28.0
MAY	16.5	20.9	22.4	23.6	24.8	16.5	20.7	22.2	23.4	24.5
JUN	15.2	19.2	20.6	21.7	22.7	15.3	19.5	20.9	22.0	23.1
JUL	14.1	17.4	18.6	19.5	20.4	14.2	17.7	19.0	20.0	20.9
AUG	15.4	20.8	22.8	24.2	25.7	15.5	22.0	24.3	26.0	27.7
SEP	18.3	24.5	26.8	28.5	30.2	18.1	23.9	25.9	27.5	29.0
OCT	19.7	25.2	27.3	28.7	30.2	19.6	25.0	27.0	28.4	29.8
NOV	21.1	25.6	27.3	28.5	29.7	21.1	25.7	27.3	28.6	29.8
DEC	23.0	27.8	29.5	30.7	32.0	23.1	28.0	29.7	31.0	32.3
ALL	26.8	30.5	32.0	33.1	34.1	26.8	30.5	31.9	33.0	34.0
Source: Oceans Ltd. 2016a										

Table 4.12 1-minute Extreme Wind Speed Estimates (m/s) for Return Periods of 1, 10, 25, 50 and 100 Years

Month	Grid Point 12214 Wind Speed 1-min (m/s)					Grid Point 11422 Wind Speed 1-min (m/s)				
	1	10	25	50	100	1	10	25	50	100
JAN	27.4	32.2	34.0	35.3	36.6	27.5	32.2	33.9	35.2	36.4
FEB	27.1	33.2	35.4	37.0	38.7	27.2	33.2	35.3	36.9	38.5
MAR	24.8	30.3	32.2	33.7	35.2	24.9	30.2	32.1	33.6	35.0
APR	22.0	27.3	29.3	30.7	32.1	22.0	27.4	29.3	30.7	32.2
MAY	19.0	24.0	25.8	27.2	28.5	18.9	23.9	25.6	26.9	28.2
JUN	17.5	22.1	23.7	24.9	26.2	17.6	22.4	24.1	25.4	26.6
JUL	16.2	20.0	21.4	22.4	23.4	16.3	20.4	21.9	23.0	24.1
AUG	17.8	24.0	26.2	27.9	29.5	17.8	25.3	27.9	29.9	31.9
SEP	21.0	28.2	30.9	32.8	34.8	20.9	27.5	29.9	31.6	33.4
OCT	22.7	29.1	31.4	33.1	34.8	22.6	28.8	31.0	32.7	34.4
NOV	24.3	29.5	31.4	32.8	34.2	24.3	29.6	31.5	32.9	34.3
DEC	26.5	31.9	33.9	35.4	36.8	26.6	32.2	34.2	35.7	37.2
ALL	30.8	35.2	36.8	38.1	39.3	30.8	35.1	36.7	38.0	39.2
Source: Oceans Ltd. 2016a										

4.1.3.7 Water Mass Structure

There are three major water masses in the Study Area: the Labrador Current Water between the surface and approximately 400 m, the Labrador Sea Water with a depth range between 200 and 1,500 m, and the North Atlantic Deep Water with a depth range between 1,500 and 4,000 m. The Labrador Sea Water and the North Atlantic Deep Water are nearly homogeneous with little or no seasonal variability in water properties. The Labrador Sea Water is an intermediate layer water mass with temperatures between 2°C and 4°C and salinities between 34.86 and 35 practical salinity units (psu). The North Atlantic Deep Water is characterized by its high salinity (34.9 to 34.97 psu) and low temperatures (2°C to 3.5°C).

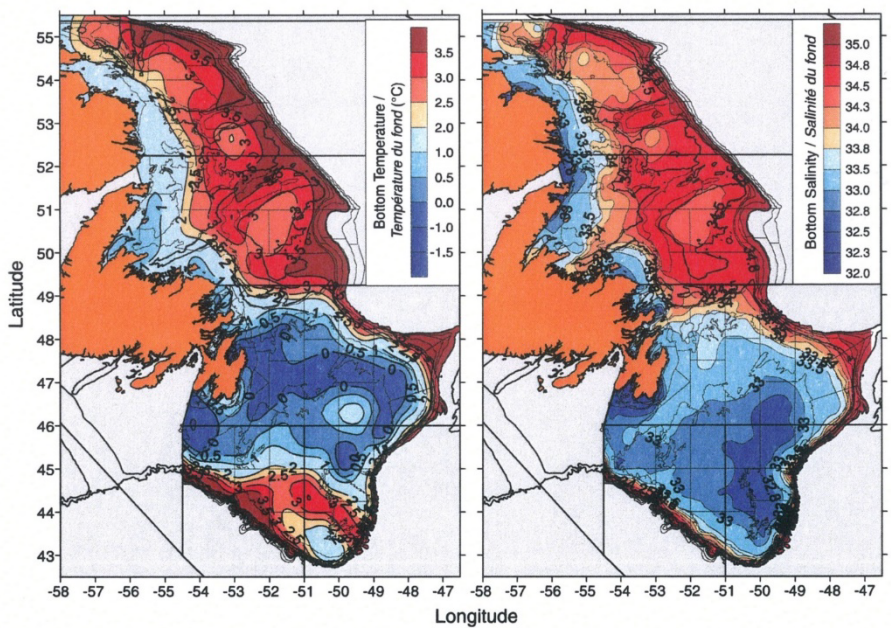
On the northeastern edge of the Grand Banks the water structure is characterized by three identifiable features. The first feature is the surface layer which is exposed to interaction with the atmosphere. The surface layer experiences temperature variations from sub-zero values in January to above 15°C in the summer and early fall. The salinity of the surface layer is strongly affected by wave action and local precipitation. During the summer the stratified surface layer extends to a depth of 40 m or more. During the winter the surface stratification disappears and the water column becomes well mixed due to atmospheric cooling and mixing processes from wave action.

The second feature of the water structure is the Cold Intermediate Layer (Petrie et al. 1988). In areas where the water is deep enough, this layer of cold water is trapped during summer between

the seasonally heated upper layer and warmer slope water near the seabed (Colbourne 2002). Its temperatures range from less than -1.5°C to 0°C (Petrie et al. 1988; Colbourne et al. 1997) and salinities vary within 32 and 33 psu. It can reach a maximum vertical extent of over 200 m (Colbourne 2004). The Cold Intermediate Layer is the residual cold layer that occurs from late spring to fall and is composed of cold waters formed during the previous winter season. It becomes isolated from the sea surface by the formation of the warm surface layer during summer, and disappears again during late fall and winter due to the intense mixing processes that take place in the surface layer from strong winds due to the intense mixing processes that take place in the surface layer from strong winds, high waves, and atmospheric cooling.

Positive bottom temperatures are found south of 46°N. The variability in temperature and salinity in the Cold Intermediate Layer have been the subject of systematic research (Colbourne 2004; Colbourne et al. 1997; Colbourne and Foote 2000). These studies suggest that the water properties on the Grand Banks experience notable temporal variability. Colbourne (2004) explains that bottom temperatures ranged from near record lows during 1991 to very high values in the late 1990s. The areal coverage of the Cold Intermediate Layer was highest on the Newfoundland Shelf during years 1972, 1984 and 1991 (Colbourne 2004).

Bottom temperature and salinity maps were produced by Colbourne et al. (2007) by trawl-mounted conductivity, temperature, and depth (CTD) data from approximately 700 fishing tows during the fall of 2005. These maps are presented in Figure 4-14; this figure shows that the Cold Intermediate Layer (blue area to the north of 46°N) is still present near the bottom over much of the Grand Banks.



Source: from Colbourne et al. 2007, in Oceans Ltd. 2016a

Figure 4-14 Bottom Temperature and Salinity Maps Derived for the Trawl-mounted CTD Data

During the last 50 years there have been three warming periods in the Labrador Sea: 1960 to 1971, 1977 to 1983, and 1994 to present. In 1994, the Labrador Sea water filled the entire central part of the Labrador Sea basin within the depth range of 500 to 2,400 m (Yashayaev and Clarke 2006). The warming trend since 1994 has caused the water to become warmer, saltier, and more stratified; thus making it more difficult for winter renewal of Labrador Sea Water to take place. Unusual warming took place in 2004 believed to have originated from waters transported north and west by the North Atlantic Current and the Irminger Current (Yashayaev and Clarke 2006).

4.1.3.8 Temperature, Salinity and pH

Temperature and salinity data from historical measurements[3] were extracted from the Bedford Institute of Oceanography archive.

In the Project Area, the surface waters were warmest during the months of July to September with mean temperatures ranging from 9.31°C to 10.17°C. The coldest temperatures were in February and March, with mean temperatures of -1.1°C and -0.7°C, respectively (Table 4.13). The mean salinities ranged between 31.69 psu in August and 33.07 psu in March (Table 4.13). At a depth of 50 m, the mean temperatures ranged between -1.14°C in February to 1.69°C in December. The mean salinities ranged between 32.75 psu in September and 33.07 psu in January. At a depth of 100 m, the mean temperatures ranged between -1.37 in September and 0.33°C in January. The salinity had a standard deviation of less than 0.20 and mean salinity values that ranged from 33.09 psu in February to 33.54 psu in January.

Table 4.13 Mean Monthly Temperature and SalinityStatistics from Historical CTD Data

Month	Temperature (°C)				Salinity (psu)			
	0 m	50 m	100 m	200 m	0 m	50 m	100 m	200 m
January	-0.07	-0.21	0.27	-	33.22	33.49	33.70	-
February	-	-	-	-	-	-	-	-
March	-	-	-	-	-		-	-
April	-0.41	-1.20	-1.36	-	32.53	32.6	32.84	-
May	1.07	-0.47	-1.29	-0.61	32.56	32.82	33.05	33.56
June	4.55	-0.05	-0.85	1.74	32.52	32.91	33.15	34.12
July	6.41	-0.85	-1.58	-	31.79	32.74	33.08	-
August		-		-	-	-	-	-

[3] The temperature and salinity data were extracted from the Bedford Institute of Oceanography Hydrographic Database; 1914 to 2009.

Month	Temperature (°C)				Salinity (psu)			
	0 m	50 m	100 m	200 m	0 m	50 m	100 m	200 m
September	8.09	-0.91	-1.32	-0.25	31.78	32.80	33.28	33.85
October	10.40	-0.82	-1.35	-	31.48	32.78	33.21	-
November	4.52	1.29	-0.23	1.16	32.46	32.92	33.42	34.06
December	2.26	0.32	-0.86	-	32.43	32.81	33.38	-
Overall	4.00	0.08	-0.81	1.01	32.43	32.86	33.20	34.00
Source: modified from Oceans Ltd. 2016a								

Marine water pH ranged between 7.5 and 8.5 worldwide (Canadian Council of Ministers of the Environment 1999). pH recorded during the White Rose Environmental Effects Monitoring (EEM) (both near-field and 28 km to the northwest and northeast of the *SeaRose FPSO* has ranged from 6.3 to 8.1 in 2010 (collected in mid-October), 7.77 and 8.04 in 2012 (collected in late August), and 8.03 and 8.18 in 2014 (collected in early November) (Husky Energy 2011, 2013, 2015).

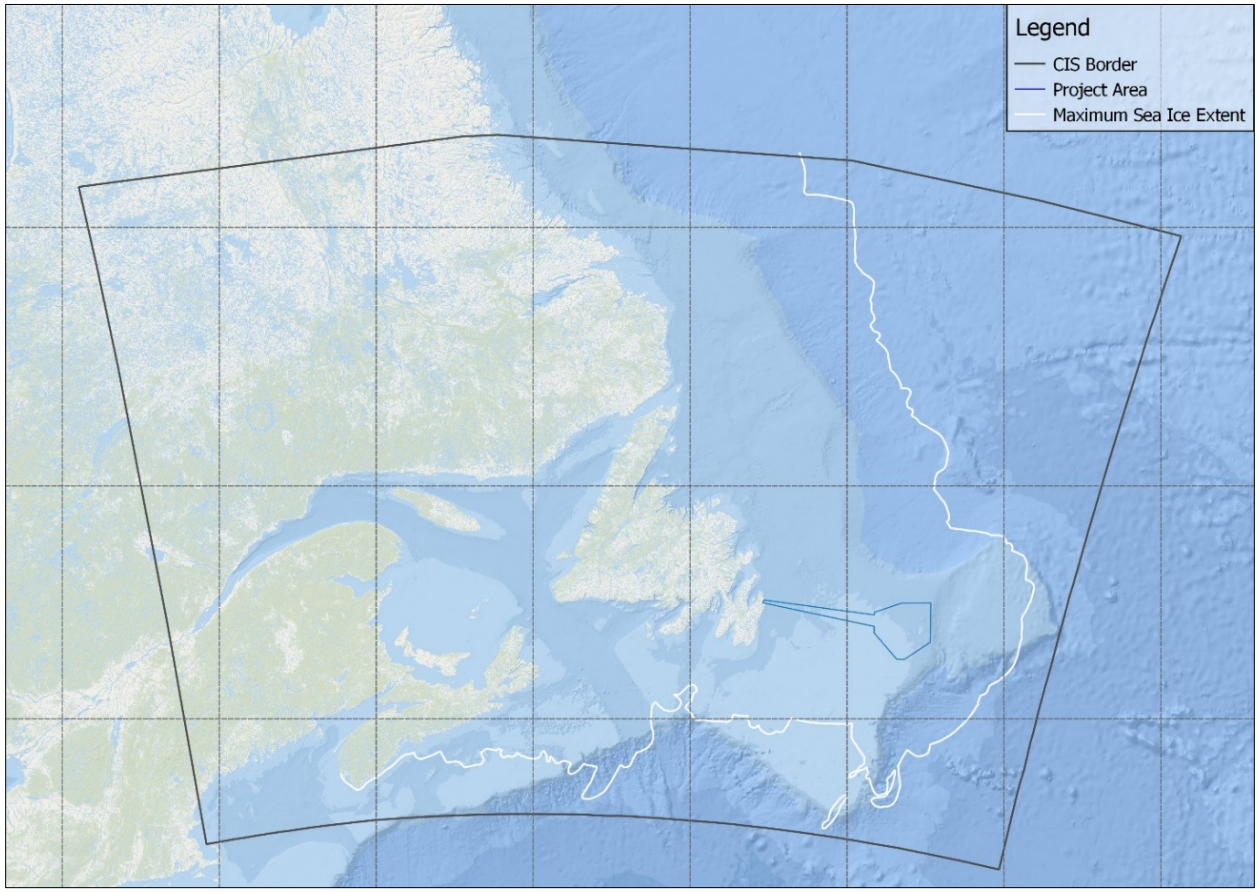
4.1.4 Sea Ice and Icebergs

The following is adapted from Oceans Ltd. (2016).

Sea ice and iceberg incursions are not an annual event in the Project Area. However, the area has been subject to both sea ice and iceberg incursions every few years over the past 30 years of records. The Canadian Ice Service (CIS) maintains a data base of sea ice conditions in digital format.

4.1.4.1 Maximum Sea Ice Extent

The maximum sea ice extent (Figure 4-15) was calculated from weekly GIS files obtained from the CIS. The maximum sea ice extent represents the maximum extent over the entire data base from January 1970 to December 2015. No ice was reported beyond this extent in the entire data base.



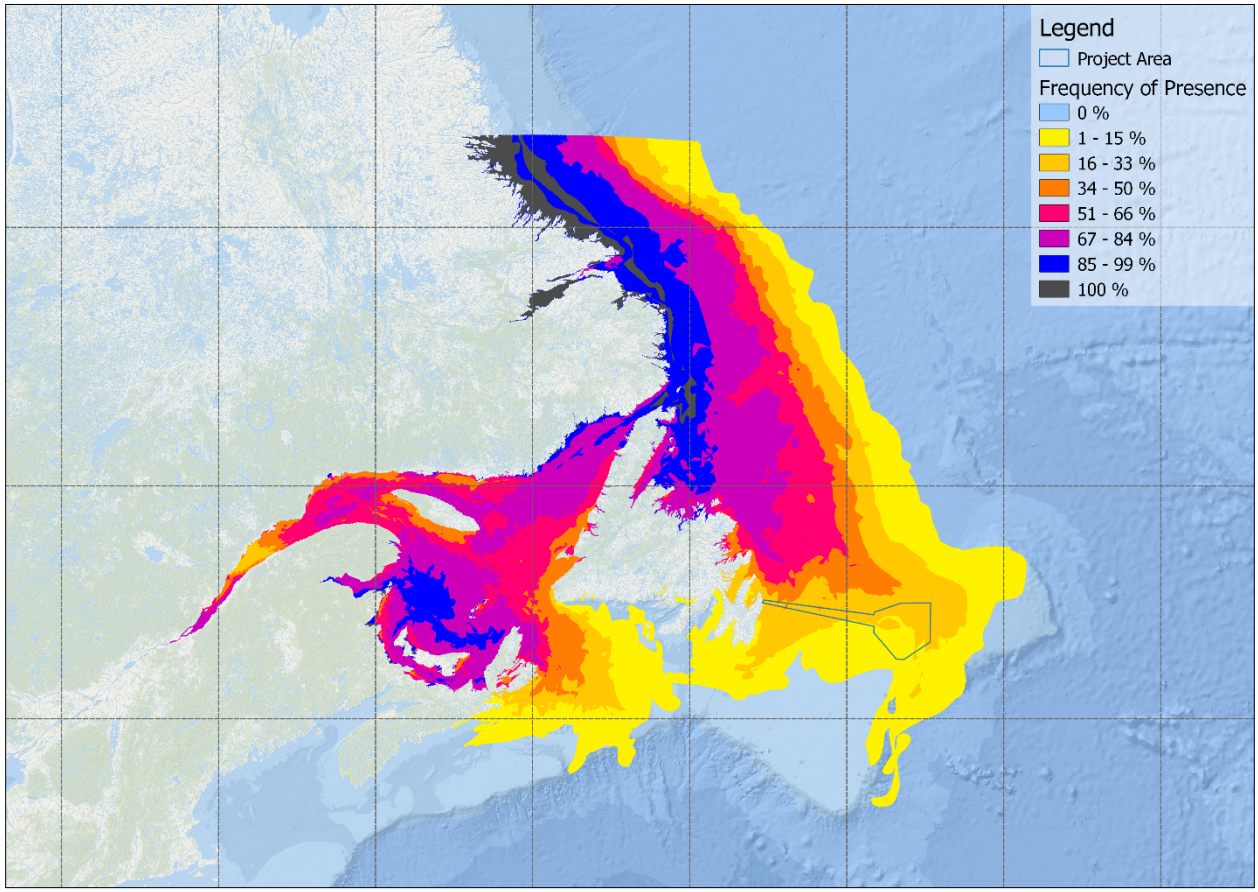
Source: Oceans Ltd. 2016a

Figure 4-15 Maximum Sea Ice Extent

The "Frequency of Presence of Sea Ice (%)" charts below consider the likelihood of total concentration of ice greater than or equal to 1/10 throughout the course of a year and give an idea of the likelihood that ice will occur at a particular location for the date provided.

The charts below can be interpreted as the "odds of encountering sea ice for the dataset". The charts depict above normal extent (1% to 33%)[4], near normal extent (34% to 66%) and below normal extent (67% to 99%). The 0% line represents the maximum extent of sea ice, beyond it no ice was reported in the dataset; the 100% line represents the minimum extent of sea ice, within it there has always been ice reported in the dataset (Environment Canada 2001). Ice frequency in the Project Area ranges from 1% to 33% (Figure 4-16).

[4] 1 to 33 percent of the time you will likely always find sea ice, and 67 to 99 percent of the time you may find sea ice. So in the Project Area, there is a high likelihood that you will not observe much sea ice



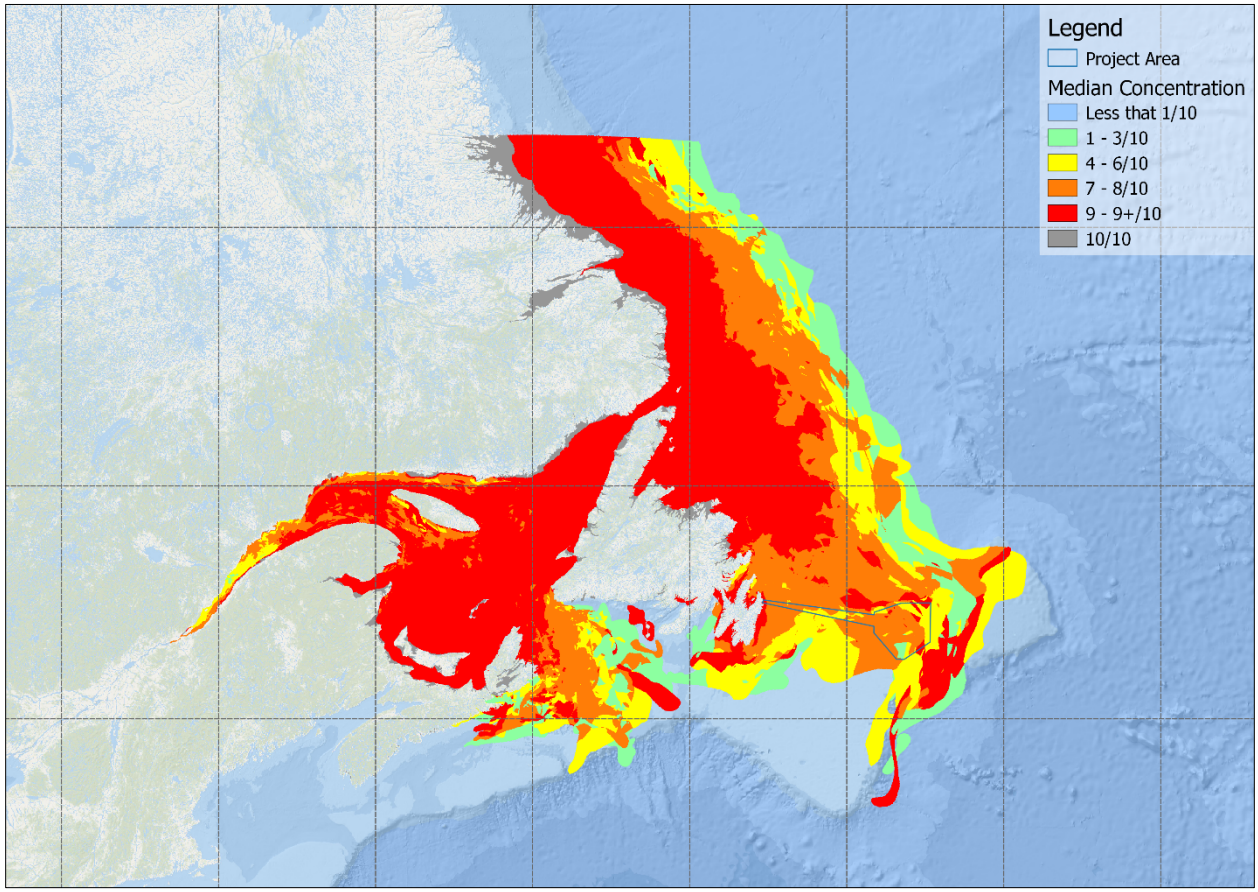
Source: Oceans Ltd. 2016a

Figure 4-16 Frequency of Presence of Sea Ice for the week of March 19 (1981 to 2010)

A weekly analysis of the Canadian Ice Service's Frequency of Presence of Sea Ice for the period of 1981 to 2010[5] was determined for the region. These results are presented in Figure 4-17. Analysis shows that the region is primarily affected by sea ice beginning the week of January 15 and lasting until the week beginning May 14.

The "Median of Ice Concentration" data base considers total concentration of ice on a weekly period from November 12 to August 27. The charts do not represent any real ice season but rather a statistical composite of all available seasons. The charts represent the statistical "normal" ice concentration for the appropriate date (Environment Canada 2001). The 30-year median concentration of sea ice reaches its maximum over the Project Area the week of March 19 with 64.7% of the region covered in 7/10ths or greater sea ice (Figure 4-17).

[5] Dataset is updated every 10 years



Source: Oceans Ltd. 2016a

Figure 4-17 Median Concentration of Sea Ice for the week of March 19 (1981 to 2010)

4.1.4.2 Icebergs

The principal origin of icebergs is the 100 tidewater glaciers of West Greenland. Between 10,000 and 15,000 icebergs are calved each year, primarily from 20 major glaciers between the Jacobshaven and Humboldt glaciers. These glaciers account for 85% of the icebergs that reach the Grand Banks. Of the remaining icebergs, 10% come from the East Greenland glaciers and 5% from the glaciers and ice shelves of Ellesmere Island.

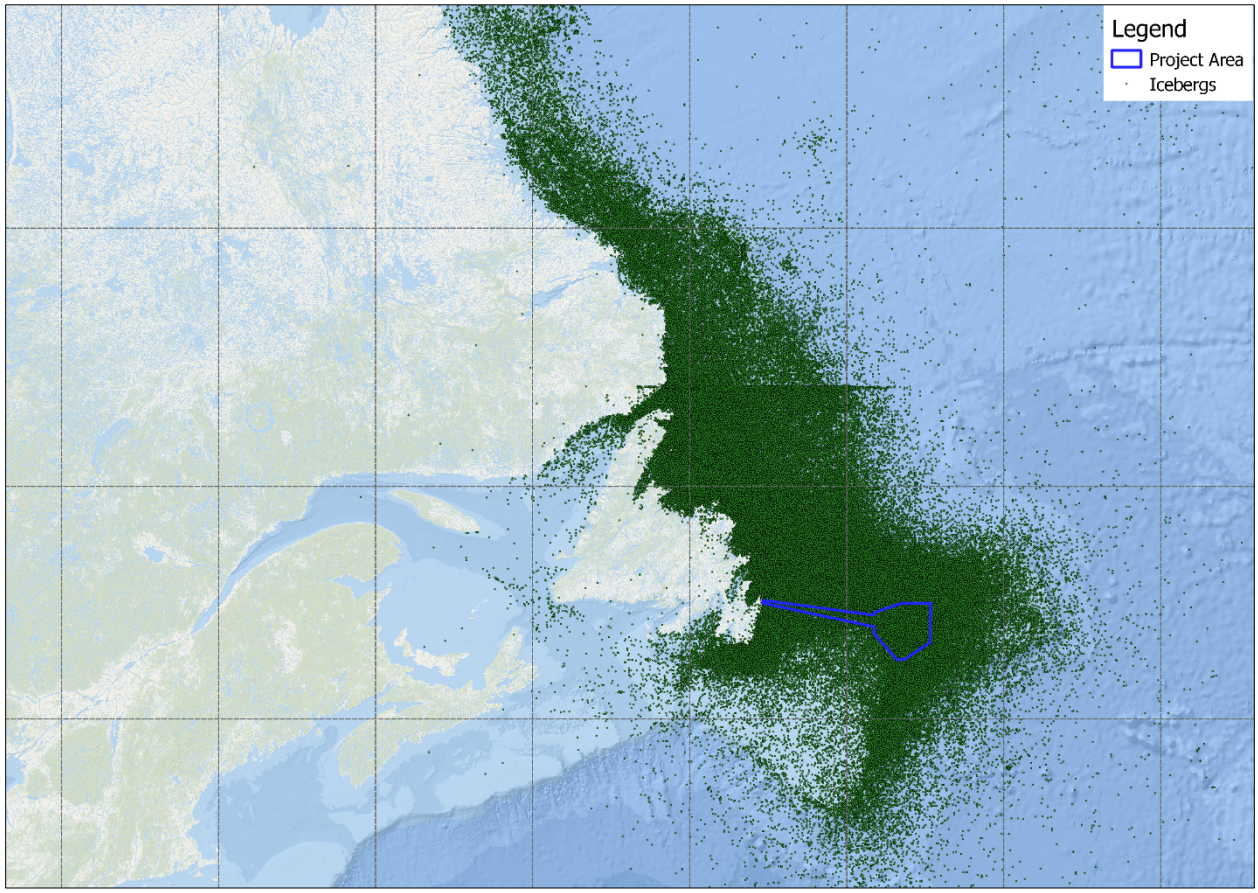
The International Ice Patrol (IIP) Iceberg Sightings Data Base from 1960 to 2015 was used as the primary data source in this analysis (National Snow and Ice Data Center 2015). These data were supplemented with the 2003 to 2010 PAL Environmental Services Division annual ice reports for the Grand Banks Joint Operators (Petro-Canada/Suncor, Hibernia Management and Development Company Ltd., and Husky Energy).

Overall there is a good distribution of iceberg sightings in the Project Area ranging from 1,140 in 1972 to zero in other years. Icebergs have been observed within the Project Area for each month of the year. The peak in iceberg sightings is during the months of April and May, with a total of

5,647 and 5,224 recorded sightings between 1960-2015, respectively. Duplicate sightings of the same iceberg were eliminated from the data set so that only the initial sighting was counted.

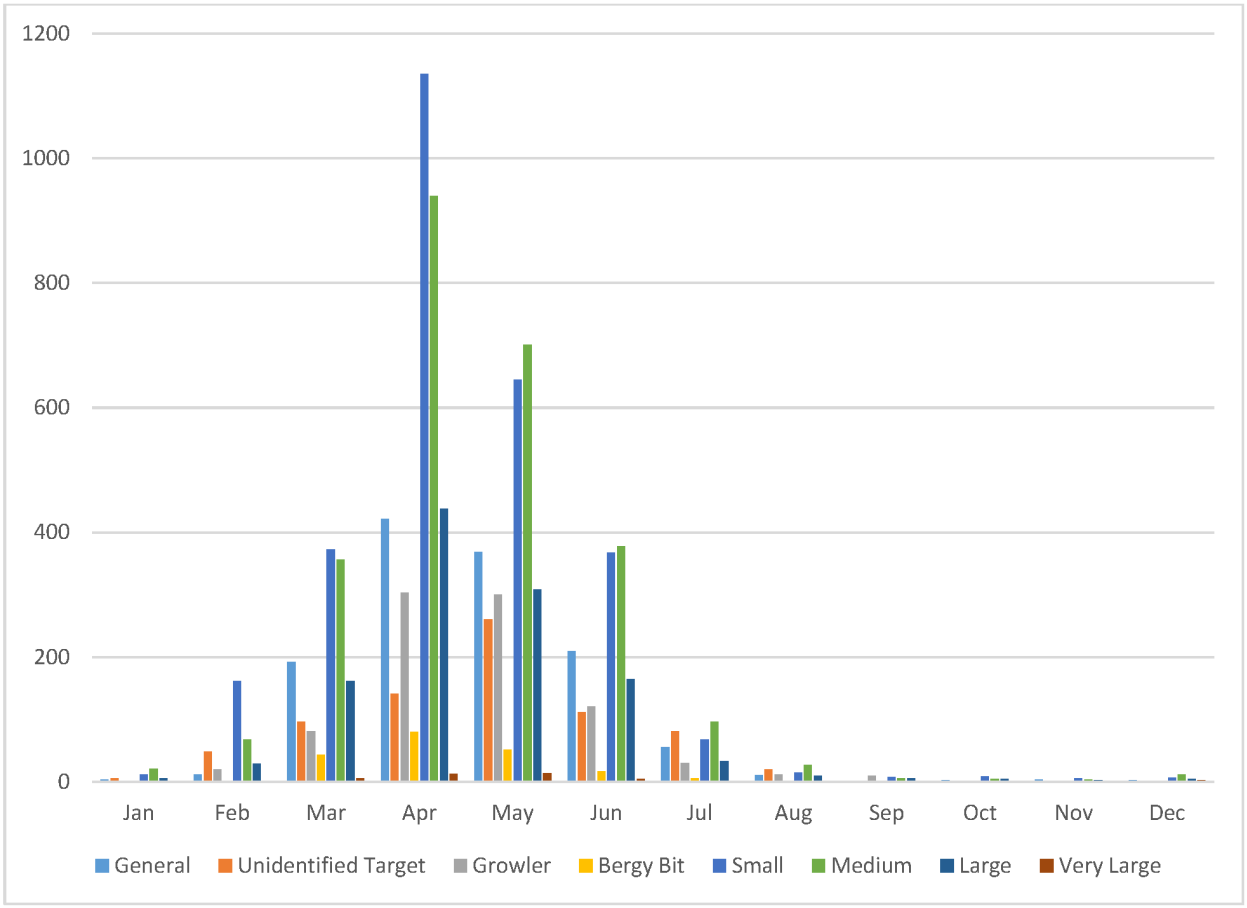
The positions of all icebergs within the region from 1960 to 2015 are indicated in Figure 4-18. Over the 55 years studied, there have been 18,169 icebergs sightings inside the Project Area. The highest number of icebergs on the field occurred in 1972, with 1,140 iceberg sightings. The second highest was in 1993, when there were 708 icebergs sighted. The mean number of iceberg sightings within the Project Area is 195. Environmental factors such as iceberg concentration, ocean currents, and wind determine how icebergs drift through the area.

A monthly analysis (Figure 4-19) shows that icebergs have been spotted within the region from January to September and they are most prominent during the month of May. The most prominent icebergs are small (see Table 4.14), accounting for 28.0% of observed icebergs within the region. Large icebergs occur 11.3% of the time and very large occur 0.5% of the time. All iceberg reports were included in this analysis, regardless of the number of times they were reported.



Source: Oceans Ltd. 2016a

Figure 4-18 Locations of Iceberg sightings for 1960 to 2015 (from IIP data)



Source: IIP, in Oceans Ltd. 2016a

Figure 4-19 Iceberg Size by Month

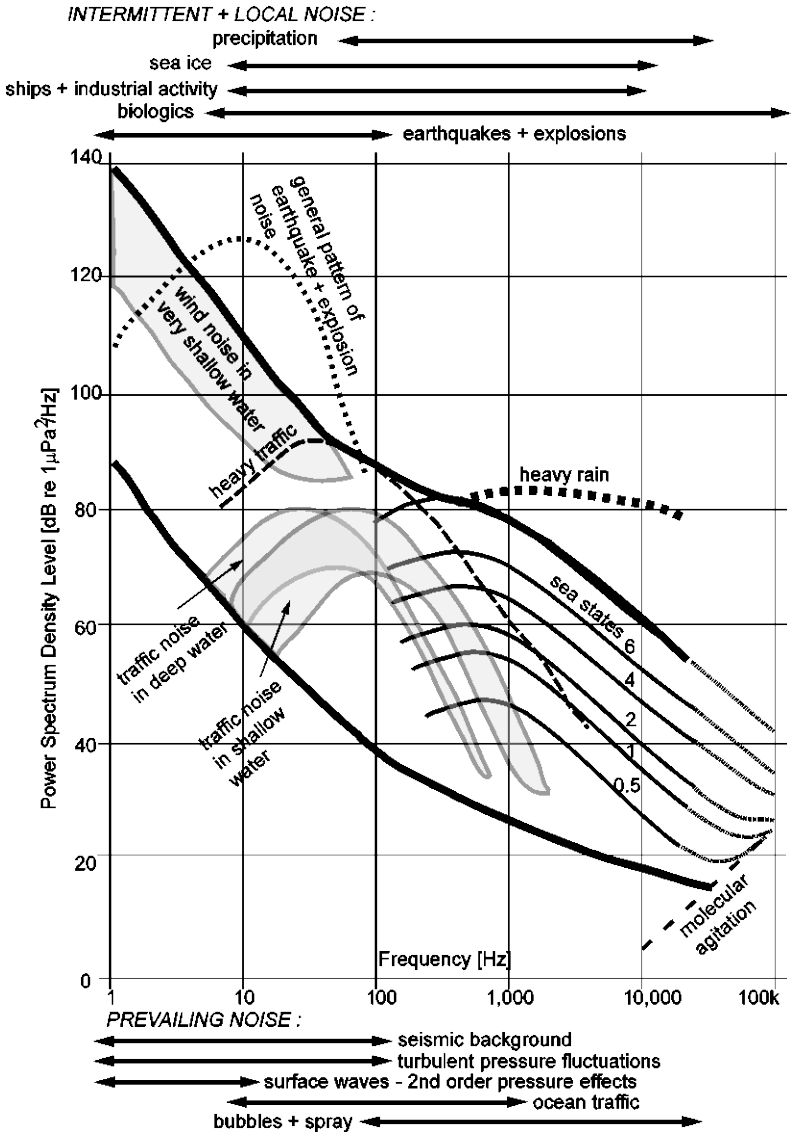
Table 4.14 Iceberg Size

Category	Height (m)	Length (m)	Approx. Mass (T)
Very Large	>75	>200	<10 Million
Large	46 to75	121 to 200	2 to 10 Million
Medium	16 to 45	61 to 120	100,000 to <2 Million
Small	5 to 15	15 to 60	100,000
Bergy Bit	1.0 to <5	5 to <15	10,000
Growler	<1.0	<5	1,000
Source: MANICE 2005, Oceans Ltd. 2016a			

The distribution of the small through large icebergs is fairly even over the Project Area. As a probable result of their size, the very large icebergs tend to follow to bathymetric contours and as a result, very few are found towards the western side of the Project Area.

4.1.5 Acoustic Environment

Contributors to the acoustic environment include biological (fish, marine mammals), anthropogenic (shipping, surveys, oil and gas activities), and physical (wind, waves and precipitation) sources. A major contributor to the acoustic environment in the ocean is vessels. Different vessels generate different sound levels depending on the size, type, load, generating power, speed, and age; however, the primary sound sources are propeller cavitation and dynamic positioning systems on the vessel. Natural and anthropogenic-related sound levels are illustrated in Figure 4-20.



Source: Wenz1962, in Husky Energy 2010

Figure 4-20 Bandwidths of Typical Sources of Ambient Noise

The only known study of acoustic baseline within the Study Area was undertaken for the Flemish Pass Exploration Drilling Program EIS (Statoil 2017). An acoustic recorder was deployed in the Flemish Pass from June-October 2014 and from May-September 2015 to characterize the baseline soundscape. The Statoil (2017) EIS simplifies the discussion of the existing soundscape into five frequency bands. These five bands are identified in Table 4.15, with corresponding classifications of known biologic, anthropogenic, and natural geologic/physical sources.

Table 4.15 Frequency Bands and Noise-generating Mechanisms

Band Name and Frequency Range	Sound Source Type		
	Biologic	**Anthropogenic**	**Geologic/Physical**
Very low frequency: 1045 Hz	Fin, blue, Bryde's, Omura's whales	Geophysical pulses	Earthquakes
Low frequency: 45-225 Hz	Fish, baleen whales, pinnipeds	Geophysical pulses, large vessels	-
Mid frequency: 225-2,250 Hz	Baleen whales, fish, pinnipeds	Smaller vessels, large vessels at close range, DP	Wind and wave action
High frequency: 2,250-18,000 Hz	Whistles, sperm whale clicks, baleen song, shrimp	Naval sonar, cavitation bubbles, chains	Sediment movement, rain
Very high frequency: >18,000 Hz	Echolocation clicks	Communicating and positioning devices, naval sonar	-

Source: Statoil 2017
Note: "-" symbol means that the corresponding sound source does not have significant energy within that specific band.

Four identifiable sources of sound were found during the study that may have long-term effects on the soundscape: fin whales; platforms; geophysical surveys; and ambient sound. These sources are described below:

- Fin whales, present from October to March on the Grand Banks, raise the total sound level in the 10 to 45 Hz band by 5 to 10 dB in the winter. Whales close to a recorder can temporarily increase the one-minute sound levels to 130 or 140 dB re 1 µPa (Statoil 2017).
- Activities associated with oil and gas increased the SPL in the band of approximately 40 to 225 Hz by 15 to 20 dB at ranges of 35 km from a collection of three production platforms and is a continuous noise source that cause permanent elevations in the background sound levels (Statoil 2017). Data were discussed for seven recorders that provide the best available information on the existing sounds levels, one of which, Station 18, was in 80 m of water, 35 km from the Hibernia platform and within the Husky Project Area. Magnitude and distribution of SPLs (measured at 110 to 120 dB re 1 µPa continuously at Station 18) are likely due to the platform and support vessel sounds from the Hibernia production platform (Statoil 2017).

- Geophysical surveys, one of the most intense sound sources in the ocean, were detected at recorders positioned 100 km from the survey and were still a dominant sound source, with energy up to 1 kHz reported (Statoil 2017).
- Ambient noise (i.e., wind, waves, precipitation) is higher in the winter, with an increase of median sound levels by 3 to 5 dB due to higher wind spends and storm; with a peak frequency for wind noise being 200 to 2,000 Hz (Statoil 2017).

4.1.6 Climate Change

As reported in the Climate Change Projections report for Newfoundland and Labrador (Finnis 2013), the atmospheric concentration of greenhouse gases is growing, global and provincial temperatures rising, and there is an increasing number of hurricanes and tropical storms hitting the province. This also leads to the increase in sea levels, storm intensity, sea surface temperatures, and number of icebergs observed.

Temperatures for Newfoundland and Labrador are projected to rise by 2°C and 3°C by the mid-21st century, meaning fewer days with frost and a shorter winter (Finnis 2013). Precipitation events on average will be more intense, with the average amount of precipitation per event increasing approximately 5% across all seasons (Finnis 2013).

Sea levels are rising and expected to continue to rise into the future due to increased ocean temperature as well as the melting of glaciers and major sheet ice (e.g., ice covering Greenland and Antarctica) (Church 2011, in Husky Energy 2012a). The global mean sea-level projection for the largest emissions scenario (modelled using RPC8.5) at 2100 is 74 cm (James et al. 2014). Using this model, the predicted median sea-level change project for 2081 to 2100 for St. John's, Newfoundland is 66.5 cm (James et al. 2014).

Increased storm intensity may result in higher associated peak wave heights and more frequent occurrence of extreme wave events; however, climate simulations for the next century show almost no change in peak significant wave heights for the western North Atlantic, consistent with recent trends in observed data (Husky Energy 2012a). With increase temperature, more tropical storms can be expected to survive farther north, bringing with them higher waves during the tropical storm season.

The mean daily maximum and mean daily minimum sea surface temperatures from ICOADS were calculated for each winter and summer season from 1980 to 2010 (Husky Energy 2012a). An analysis of sea surface trends over the past 30 years indicates a gradual rise in sea surface temperatures. The annual mean daily maximum sea surface temperature over the 30-year period has risen at a rate of 0.0123°C, while the annual mean daily minimum sea surface temperature has risen at a rate of 0.05°C (Husky Energy 2012a).

Since the early 2000s, the number of observed icebergs has increased in the North Atlantic Ocean (Rudkin et al. 2005). This may be a result of increased sea and air temperatures but may also be a product of improved technologies for observing glacial sources. Should sea and air temperatures

increase north of the Grand Banks, the number of icebergs would likely increase, initially due to increased calving of glaciers and ice islands (Husky Energy 2012a).

4.2 Marine Biological Environment

The marine biological environment includes descriptions of plankton, marine plants, benthic communities, marine fish, marine mammals, sea turtles, marine birds, corals, sponges, and special areas. Species at risk and species of conservation concern (SOCC) are discussed as applicable within each biological group and are also summarized Section 4.2.8. Descriptions of species life histories and ranges are provided in Appendix D.

As described in the physical environment section, the Grand Banks has an average depth of approximately 75 m, with with some areas of the banks reaching up to 210 m. On the Grand Banks the cold Labrador Current mixes with the warm Gulf Stream, causing an upwelling of nutrients, creating a highly productive area with rich primary productivity and high species diversity. As a result of this mixing of currents, gyres are formed over the southern Grand Banks and Flemish Cap, which provide areas of high primary production that in turn provides feeding opportunities for marine mammals, seabirds, and fish (Park and Mercier 2014).

The benthic community of the Southeast Shoal has been noted as the most productive on the Grand Banks due to high benthic biomass, abundance, and diversity of endemic species. The exceptionally high benthic biomass estimates indicate the community is possibly significant on a global scale (Coughlan 2002). This area is located approximately 200 to 250 km south of the Project Area.

The Grand Bank's Southeast Shoal represents nursery grounds for multiple species of groundfish such as American plaice, Atlantic cod, and yellowtail flounder and a reproductive ground for striped wolffish, as well as species of invertebrates such as blue mussels and wedge clams (DFO 2007a). The southern Grand Banks, the Southeast Shoal in particular, has been identified as an area of high whale concentration. The presence of whales can be attributed to an abundance of prey, of which capelin has been recognized as an important food source (Templeman and Davis 2006).

Marine mammal sightings have been recorded through out the year with abundance being highest during late summer. Many species of marine mammals appear seasonally on the southern Grand Bank.

4.2.1 Plankton

Plankton are small organisms that primarily passively move through aquatic ecosystems, drifting with currents and other oceanographic processes (see Section 4.1.3.7 for a description of the water mass structure). Taxa in this group consist of microscopic marine plants (phytoplankton), invertebrates (zooplankton), the eggs and larvae of fish (ichthyoplankton), bacteria, fungi, and viruses (Amec 2014). Plankton are the largest group of organisms in the ocean in terms of both

biomass and diversity, and play a foundational role in the marine environment as the base layer of most food webs. Plankton are also the mechanism by which nitrogen and carbon are absorbed into the marine environment from the atmosphere. They create a biological pump in which CO_2 is consumed in the surface waters, resulting in a reduced partial pressure and the absorption of atmospheric CO_2, which plays a key role in climate regulation.

4.2.1.1 Bacterial Communities

Bacterial communities consist of prokaryotes (single-celled organisms including bacteria and archaea) which make up the smallest free-living cells in any pelagic ecosystem. Bacteria can have a variety of energy sources with some using light as their primary energy source (photoautotrophs), or auxiliary source (photoheterotrophs), however most bacteria use organic material as an energy source (heterotrophs) (DFO 2011a, in BP 2016). Since most bacteria are secondary producers and rely on organic material for energy, their abundance can be correlated to the abundance of phytoplankton communities. Sources of organic material include phytoplankton, including waste exuded from plankton cells, cell autolysis, viral lysis, and organic material released from grazers feeding on phytoplankton (DFO 2011a, in BP 2016).

The highest concentration of bacteria is found in the upper surface layer of the water column where the highest abundance of phytoplankton is also found. However, bacteria exist throughout the water column, below the photic zone, relying on dissolved organic matter for energy.

Bacteria, specifically heterotrophic bacteria, are natural microbial agents which can remediate hydrocarbon contamination in the marine environment. Crude oil can be found naturally in the marine environment from natural seeps in the ocean floor (ASM 2011, in BP 2016). Certain microbes in the marine environment have evolved to use hydrocarbons as an energy source (ASM 2011, in BP 2016).

4.2.1.2 Phytoplankton

Phytoplankton are microscopic plant-like organisms which, at the base of the marine food web, influence production of all higher trophic levels in an ecosystem (Worcester and Parker 2010, in BP 2016). Phytoplankton are distinctive among ocean biota in that they derive their energy from sunlight and from nutrients in the surrounding water (DFO 2011a, in BP 2016). The seasonal interaction of these limiting factors results in a spring and fall bloom in the northwest Atlantic. The dominant bloom in the northwest Atlantic is the spring bloom, which usually occurs in April or May (Maillet et al. 2004, in Amec 2014; Harrison et al. 2013, in Amec 2014). The spring bloom occurs when the strengthening sun interacts with the well-mixed, nutrient-dense surface waters creating prime conditions for phytoplankton growth. As the summer progresses, a thermocline develops which creates a barrier to the transport of nutrients from cold, deep water. Fall winds and cooler temperatures lead to mixing of the surface layer and the breakdown of the thermocline, allowing nutrients to recharge and facilitate a second somewhat weaker bloom (Maillet et al. 2004, in Amec 2014).

There has been an observed shift in the abundance, timing, and duration of some phytoplankton species in the Northwest Atlantic. This shift included a decrease in overall abundance in the 1970s, a return to maximum levels in the 1990s, and a subsequent decline since then (Maillet et al. 2004, in Amec 2014; Head and Sameoto 2007, in Amec 2014). These changes are correlated with the Northern Atlantic Oscillation (Harrison et al. 2013, in Amec 2014) whereby an intensification of northwestern atmospheric flows cause increased mixing and sea ice extent and colder, fresher ocean conditions. These conditions are also correlated with an increased nutrient flux, which triggers higher primary productivity, and in turn, secondary productivity (zooplankton) (Maillet et al. 2004, in Amec 2014).

The distribution of phytoplankton (primary producers) on the Grand Banks is controlled largely by upwelling and enhanced vertical mixing on the slopes shelf break and thermal gradients between the shelf and slope waters (Anderson and Gardner 1986; Templeman 2007, in Amec 2014). The most productive areas are typically in the waters on the shelf and the shelf break over the shelf slope. Areas of relatively high production across the Northwest Atlantic include the Southeast Shoal and the Tail of the Grand Banks (Templeman 2007, in Amec 2014).

4.2.1.3 Zooplankton

Zooplankton are small animals that may be suspended and drift in the water column, or undergo vertical diurnal migration. They serve as the link between primary producers (phytoplankton) and the larger organisms in the marine environment (Breeze et al. 2002, in BP 2016). Most marine species consume zooplankton at some stage of their life cycle, from large baleen whales to small anemones (Breeze et al. 2002, in BP 2016). Zooplankton can be divided into three main categories based on size:

- microzooplankton (0.02 to 0.2 mm in length), which includes ciliates, tintinnids, and the eggs and larvae of larger taxa;
- mesozooplankton (0.2 to 2 mm in length), which includes copepods, larvaceans, pelagic molluscs, and larvae of benthic organisms; and
- macrozooplankton (>2 mm), which includes larger and gelatinous taxa such as euphausids (krill), tunicates and salps.

The abundance of zooplankton on shelf waters follows a similar pattern as phytoplankton populations, which is their primary food source. In eastern Canadian offshore waters, zooplankton peak after the spring bloom and decline later in summer. Species such as *C. finmarchicus* return to shelf waters each spring to reproduce and feed on phytoplankton. Once this food source is sufficiently depleted, they abandon the shelf environment and descend to deep-water overwintering sites (Head et al. 2013, in Amec 2014).

Surveys of the Grand Banks and Newfoundland Shelf indicate a north-south gradient in total zooplankton biomass, with production declining from inshore areas to the shelf edge depending on the year (Dalley and Anderson 1998, in Amec 2014). However, taxa-specific distributions vary. For example, jellyfish are predominantly found in inshore areas and on the northern Grand Banks

(Dalley and Anderson 1998, in Amec 2014), while *C. hyperboreus* are confined mostly to the outer shelf and slope waters (Maillet et al. 2004, in Amec 2014). Similarly, euphausids (krill), an important prey species for marine mammals (Plourde and McQuinn 2009, in Amec 2014), have the highest densities in slope waters and offshore regions (e.g., the Laurentian Channel) (Maillet et al. 2004, in Amec 2014). The main zooplankton taxa found on the Grand Banks from a survey conducted by Dalley et al. (2001) during 1997 is provided in Table 4.16.

Table 4.16 Main Zooplankton Taxa from Invertebrate Zooplankton 1997 Survey on the Newfoundland Shelf and Grand Banks

Rank	Taxa/Taxon	% Total Zooplankton
1	Copepods	86.8
2	Cladocerans	5.2
3	Limacina	3.0
4	Larvaveans	2.3
5	Bivalve larvae	1.1
6	Tomopteris	0.4
7	Cnidarians	0.2
8	Euphausids	0.2
9	Chaetognaths	0.1
10	Snow crab	0.1
11	Hyperids	0.0
12	Mysids	0.0
13	Other Zooplankton	0.6
Source: Dalley et al. 2001, in Amec 2014		

4.2.1.4 Ichthyoplankton

Ichthyoplankton include the planktonic eggs and larvae of fish. For the ease of discussion and convenience, the eggs and larvae of shellfish are included here, although they are not true ichthyoplankton. Ichthyoplankton, as well as other early planktonic life stages of marine animals, are collectively referred to as the meroplankton since they are planktonic for only a portion of their life cycle (NOAA 2007, in BP 2016).

Common species observed in the meroplankton during surveys include Atlantic cod, American plaice, sand lance, redfish, capelin, lanternfish, alligatorfish, sculpin, snailfish, white hake, haddock, wolffish, witch flounder, yellowtail flounder and Greenland halibut (Dalley et al. 2000, in Amec 2014).

Spawning periods of many species are synchronized with plankton blooms to provide access to seasonal abundance of food supplies. Ichthyoplankton typically exhibit passive movement and

are often entrained in oceanographic features such as gyres, upwelling zones, and thermoclines (Bradbury et al. 2008, in Amec 2014, Ings et al. 2008, in Amec 2014, and Frank et al. 1992, in Amec 2014). Ichthyoplankton densities along the Northeast Newfoundland Shelf and the Grand Banks can vary by orders of magnitude (Dalley and Anderson 1998; Bradbury et al. 1999, in Amec 2014) and community structure can differ by year, season, and location (Frank et al. 1992; Dalley and Anderson 1998; Bradbury et al. 2008, in Amec 2014). Assemblages on the Northeast Newfoundland Shelf are largely dominated by capelin (73.5%), sand lance (11.3%), lanternfish (5.9%) and Arctic cod (3.4%) (Table 4.17). Squid larvae were also noted for being widespread across the Grand Banks and Newfoundland Shelf and occurred in 67% of samples. Some species are generally distributed on the inner Shelf north of the Grand Banks (e.g., blennies, sculpins, squid, snailfish and alligatorfish) while others are found predominantly over the Grand Banks (sand lance and hake; Dalley and Anderson 1998, in Amec 2014).

Table 4.17 Relative Overall Abundance of Dominant Fish Species caught in the International Young Gadoid Pelagic Trawl during the Pelagic 0-group Survey (1997-1998).

Species	Scientific Name	Relative Abundance (%)	Average Incidence (%)
Capelin	*Mallotus villosus*	73.5	51.1
Sand lance	*Ammodytes* sp.	11.3	36.4
Lanternfish	Myctophidae	5.9	2.5
Arctic cod	*Boreogadus saida*	3.4	56.2
Squid	Cephalopoda	3.1	67.1
Alligatorfish	*Aspidophoroides monopterygius*	0.9	60.3
Sculpin	Cottidae	0.8	47.9
Shanny/Blenny	Stichaeidae	0.4	12.9
Atlantic cod	*Gadus morhua*	0.2	33.5
Redfish	*Sebastes* sp.	0.2	17.7
Wolffish	*Anarhichas* sp.	0.1	28.8
Snailfish	*Liparis* sp.	0.1	15.6
American plaice	*Hippoglossoides platessoides*	0.1	10.6
Haddock	*Melanogrammus aeglefinus*	0.1	7.2
Witch flounder	*Glyptocephalus cynoglossus*	<0.1	4.9
Greenland halibut	*Reinhardtius hippoglossoides*	<0.1	4.9
Hake	*Urophycis* sp.	<0.1	3.4
Yellowtail flounder	*Limanda ferruginea*	<0.1	0.8
Source: Dalley and Anderson 1998, in Amec 2014; Dalley et al. 1999			

4.2.2 Benthic Habitat

The existing benthic habitat characterization is based on benthic surveys, including DFO research vessel (RV) surveys within the Project Area as well as the SEA in Eastern Offshore Newfoundland (Amec 2014). As described in Section 2.7.5, Husky has conducted eight post-baseline EEM programs within and adjacent to the White Rose field since 2004 (2004, 2005, 2006, 2008, 2010, 2012, 2014, and 2016). Information from the White Rose EEM program is particularly relevant as it falls within the Project Area and includes an analysis of the benthic community and habitat.

The Grand Banks has an average depth of approximately 75 m. The Grand Banks extend approximately the 210 m depth contour; the Flemish Pass reaches to depths of almost 1,300 m. Han and Wang (2006) found that the circulation over the Newfoundland Shelf and its northeast slope is dominated by flows toward the equator associated with the inshore and offshore Labrador Current. Their model study supported a substantial seasonal cycle in the current regime, with strong flows during the fall/winter and weak flows in spring/summer. As a result of strong currents, there is little sediment deposition in the Flemish Pass (Morin and Pereira 1987, in JWEL 2002a) as suspended particles are swept by near-bottom current velocities of 18 cm/s from the deep slope component of the Labrador Current (Kennard et al. 1990, in JWEL 2002a). The Flemish Pass floor sediments are predominantly sandy mud (20% to 80% sand) (Amec 2014) and are flat-lying, thickening westwards while the proportion of fine-grained sediments increases eastward (see Figure 4-1). Surficial sediments in the Jeanne d'Arc Basin are comprised of a blanket of fine- to medium-grained Adolphus Sand, which overlies a coarser, irregular substrate of Grand Banks Sand and Gravel (McElhanney 1981, 1982; Nortech Jacques Whitford 1998; FJGI 1999a, 1999b, 2000a, 2000b, 2005) (see Figure 4-1). The Adolphus Sand transitions westward into the reworked Grand Banks Sand and Gravel, and eastward into partially exposed glacial deposits of the Grand Banks Drift. Previous interpretations from seafloor photographs have suggested that the seafloor is stable, with relatively little sediment transport occurring in the region (McElhanney 1982). This conclusion is supported by the results of site surveys (FJGI 1999a, 1999b, 2000a, 2000b), which clearly display anchor marks from old drilling programs, preserved in sand after 15 to 20 years.

The range of depths, currents, and substrate types in the Study Area supports a variety of infaunal and epifaunal benthic species including sand dollars, anemones, clams, sea cucumbers, bryozoans, corals, ascidians, urchins, hydroids, polychaete worms, and several crab species. Photographic/video drift surveys along the Flemish Pass and slope and identified epibenthic megafauna totaling 570 taxa (Beazley et al. 2013). Results indicate the most abundant groups in the Flemish Pass were sponges/demosponges, cnidaria, ophiuroids, shrimp and echinoderms.

Spatial variability in benthic invertebrate communities occurs over small scales (within meters) on the Grand Banks (Schneider and Haedrich 1991, in Husky Energy 2012a). This spatial heterogeneity is largely driven by differences in microhabitat (e.g., water depth, substrate grain size composition, water mass properties), as well as disturbance and the temporal variability in abundance of some macrofaunal species (Kenchington et al. 2001, in Husky Energy 2012a). When disturbance events (i.e., storms, fishing gear) alter the seafloor, epifaunal and infaunal organisms are exposed and

vulnerable to predation by larger organisms (e.g., snow crab). After a disturbance event, the community will undergo a process of ecological succession as it rebuilds and stabilizes.

Grain size has been strongly correlated with abundance, species richness and diversity for several benthic communities (DeBlois et al. 2005). For example, in areas with coarser grain size, there were fewer short-lived polychaetes, amphipods, cumaceans (crustaceans), brittle stars and softcorals (Kenchington et al. 2001, in Husky Energy 2012a). The estimated benthic biomass for Northwest Atlantic Fisheries Organization (NAFO) Divisions 3LNO, which includes a section of the Study Area, is 230.6 tonnes/km² (Table 4.18), in comparison to a total benthic biomass of 98.5 tonnes/km² in the less productive NAFO areas of 2J and 3K that are located further north.

Commercial fish surveys during Husky EEM programs have found that the northern shrimp (*Pandalus borealis*) was the most abundant epibenthic species, followed by sea urchin (Echinoidea spp.) and sand dollar (Clypeasteroida spp.) (Husky 2009, in Husky Energy 2012a). Less common but present were soft-shell clam (*Mya arenaria*), snow crab (*Chionoecetes opilio*), toad crab (*Hyas araneus* and *Hyas coarctatus*), Iceland scallop (*Chlamys islandica*) and sea star (Asteroidea spp.). These surveys found minor differences in the benthic communities that occur in mainly sandy substrate and communities occurring in mainly gravel substrate, particularly for the less abundant taxa.

Table 4.18 Estimates of Mean Benthic Biomass in NAFO Divisions

Benthic Group	3LNO Biomass (t/km²)	2J3K Biomass (t/km²)
Echinoderms	144.8	70.6
Molluscs	62.2	16.4
Polychaetes	11.9	8.8
Other	11.8	2.7
Total Biomass	230.6	98.5

Source: Bundy et al. 2000, in Husky Energy 2012a
Note: Total biomass does not include shell weight of molluscs

Polychaetes were found to be the most abundant benthic invertebrate during EEM programs conducted since 2004 (Husky 2005, 2006, 2007, 2009, 2011, in Husky Energy 2012a). Many of these polychaetes are deposit feeders (e.g., Spionidae and Cirratulidae families), although there are also predatory polychaetes such as *Exogene hebes*. Sand dollars were the most common echinoderm and occur in densities as high as hundreds per square meter in areas with suitable habitat (i.e., loosely packed sediment, grain size less than 230 µm, high turbulence). Green sea urchins and brittle stars were also common. Common bivalves included the propeller clam (*Cyrtodaria siliqua*) and the chalky macoma (*Macoma calcarea*). Gammarid amphipods, cumacea and isopod species were the most common crustaceans.

Benthic organisms present within the Project ELs are indicated in Table 4.19. Approximately 119 benthic organisms were identified during the 2014-2015 DFO RV survey. As shown in Table 4.19, the benthic organisms within the ELs are similar among the three licence areas, which is expected given the homogeneity of the benthic habitat.

4.2.2.1 Environmental Effects Monitoring Results

During consultation on the Project Description, DFO suggested the EEM results most comparable to exploration drilling (one well per site) are from the 2004 EEM program, since it was the first year after drilling began (Husky 2005). The results of the most recent (2014) EEM Program (Husky Energy 2017) are also summarized below as they illustrate that after 10 years and more than 40 wells, the effects of routine Project activities are still consistent with predictions in the 2000 EIS (Husky Oil Operations Limited 2000).

Examination of sediment quality is standard in many EEM programs (e.g., Hurley and Ellis (2004) and references therein; Bjørgesaeter and Gray (2008); Netto et al. (2009); Pozebon et al. (2009); Santos et al. (2009)). The White Rose EEM program examines potential project effects on sediment chemistry, sediment toxicity and benthic community structure. These three sets of measurements are collectively known as the Sediment Quality Triad (Chapman 1992). The assessment of effects at White Rose is based on the change in relationships between Sediment Quality Triad variables and distance from the development. Distance to the nearest drill centre is used to assess drilling effects at the whole-field level. Occurrence above or below the range of values observed during baseline sampling (2000) is used to assess effects from individual drill centres.

In 2004, the White Rose field consisted of three drill centres (Northern, Southern, and Central). Sediment samples were collected along an eight-arm transect, around each drill centre and around two potential future drill centre locations. Few project-related effects were noted for the 2004 EEM Program. For sediment, no project-related effects were noted for metals other than barium. There was evidence that drilling activity elevated concentrations of hydrocarbons and barium near the Northern and Southern drill centres and that fines and sulphur concentrations may also have been elevated near these drill centres; no contamination was noted at the Central drill centre (Table 4.20).

Table 4.19 Benthic Organisms Collected during Research Vessel Surveys in Exploration Licences 1151, 1152 and 1155

Species	Licence			Species	Licence		
	EL1151	EL1152	EL1155		EL1151	EL1152	EL1155
Amphipod	x	x		Mussel, Blue	x		
Annelid	x			Mysid	x	x	
Arrow Worm Chaet.	x			Mysid Gnat.	x	x	
Atlantic Gymnast	x	x		Nudibranch	x	x	
Barnacle	x	x		Polychaete	x	x	
Basket Star Gorg.Arct.	x	x		Poraniomorpha Borealis	x	x	
Basket Star Gorgo.	x			Pseudoarchaster Parelii	x	x	
Bivalve	x	x		Pteraster Pulvillus	x	x	
Bivalve Ast. Cren.				Sand Dollar Cylp.	x	x	x
Bivalve Asta. Sp.	x	x		Sand Dollar Ech.			
Bivalve Mesod. Arc.	x			Sand Dollar Ech. Par.	x	x	x
Bivalve Yol. Myal.				Scopelosaurus (Ns)	x		
Bivalve Musc. Nig.	x			Scyphozoan	x	x	x
Brittle Star Oph. Acul.	x	x		Sea Anemone	x	x	x
Brittle Star Oph. Sar.	x	x		Sea Asterian Rubans	x	x	
Brittle Star Ophiact.		x		Sea Cucumber			
Brittle Star Steg. Nod.	x	x		Sea Cucumber Cucu.		x	
Brotulids(Bythitids) Ns	x			Sea Cucumber Cucu. Fro.	x	x	
Bryozoan	x	x		Sea Cucumber Hol.	x	x	
Bryozoan Ect. Or Ent.	x	x		Sea Cucumber Psol. Fab.	x	x	
Chiton				Sea Cucumber Psol. Pha.	x		

Species	Licence			Species	Licence		
	EL1151	EL1152	EL1155		EL1151	EL1152	EL1155
Clam Mya.Tru.	x			Sea Cushion Star	x	x	
Clam Myidae	x	x		Sea Devils (Ns)		x	
Clam, Bank	x			Sea Mouse Aphro.	x	x	
Clam, Soft Shell				Sea Porania		x	
Copepod				Sea Potato		x	
Coral Alyconacean-Soft	x	x	x	Sea Raven	x		
Coral Antipatharian		x		Sea Rigid Cushion Star	x	x	
Coral Gorgonia-No Skelet	x	x		Sea Spider	x	x	
Coral Gorgonia-Skeleton	x	x	x	Sea Star	x	x	
Coral Pennatulid Sea Pen		x		Sea Star Cross. Pap.	x	x	x
Coral Pennatulid-Sea Pen	x	x		Sea Star Cteno. Crisp.	x	x	
Coral Scleractinian	x	x		Sea Star Henr. Sp.	x	x	x
Coral Unknown	x			Sea Star Lept. Pol.	x	x	x
Echinoid	x	x		Sea Star Lept. Sp.	x		
Euphausiid	x	x		Sea Star Pteraster Sp.		x	
Euphausiid Mega.Nor.	x			Sea Star Sand Sifting	x	x	
Feather Star	x	x		Sea Star Sol. End.	x	x	
Gammarid	x	x		Sea Star Solas.			
Gammarid (Suborder)	x	x	x	Sea Star Solas. Sp.	x	x	
Gastropod	x	x		Sea Tadpole			
Gastropod Gast.	x		x	Sea Urchin Ech.		x	
Hairworm				Sea Urchin Stro. Dro.	x	x	x

Species	Licence			Species	Licence		
	EL1151	EL1152	EL1155		EL1151	EL1152	EL1155
Hydrozoan	x	x		Sea Urchin Stro. Pal.	x		
Hyperiid Hyper.Med.				Sea Urchin Stro. Sp.	x	x	
Hyperiid Par. Lib.		x		Searobins (Ns)			
Hyperiid (Family)	x	x	x	Seasnail, Gelatinous	x		
Hyperiid (Suborder)	x	x	x	Seasnail, Kelp (Greenland)	x		
Invertebrate (Ns)	x			Seasnails (Ns)	x	x	
Isopod	x	x		Seasnails Lip. Sp.			
Lamp Shell	x	x		Sipunculid	x		
Lamp Shell Brach.	x	x		Snail, Moon	x	x	
Lamp Shell Hem. Psi.	x			Snake, Blenny	x	x	
Lepidion	x			Sponge	x	x	x
Malacostracan Mun. Sp.		x		Tromikosoma	x	x	
Malacostracan Munid. Cur.	x	x		Tunicate, Sessile	x	x	
Malacostracan Ste. Scu.	x	x		Whelk Bucc.	x	x	
Mollusc	x			Whelk Bucc. Sp.	x	x	
Mussel Myt.	x			Whelk Col. Sp.	x	x	
x = species occurs within the EL				Whelk Nept. Sp.			

Table 4.20 Total Petroleum Hydrocarbons and Barium with Distance from Source at White Rose Development

Location	Year of Study	Distance from Source (m)	TPH (mg/kg)	Barium (mg/kg)
White Rose (Husky Energy 2001, 2005)	2004	300 to 750 750 to 2,500 2,500 to 5,000	8.99 to 275.9 <3 to 22.2 <3 to 6.9	190 to 1,400 120 to 470 140 to 230
	2000	300 to 750 750 to 2,500 2,500 to 5,000	<3 <3 <3	140 to 180 140 to 210 150 to 210

Source: Husky Energy 2017
Notes: TPH (total petroleum hydrocarbon) includes C_6-C_{32} hydrocarbons. This range is reported for comparison to other offshore operations.

Sediment contamination at the Northern and Southern drill centres did not extend beyond the 9 km zone of influence predicted by drill cuttings modelling (Hodgins and Hodgins 2000). Hydrocarbons were detected between 5 and 8 km from source. Barium concentrations were elevated beyond background levels to approximately 2 km from source. An increase in fines and sulphur concentrations were limited to within 1 km from source. None of the sediment samples were toxic to bacteria or the marine amphipod.

In 2004, there was little evidence of effects on benthic invertebrate communities as measured by abundance, biomass, and diversity indices. Total and relative abundance of a particularly sensitive amphipod may have been affected by drilling around the Southern drill centre to within 2 km from source.

4.2.2.2 Environmental Effects Monitoring Results

The White Rose field currently consists of five drill centres housing more than 40 wells and the EEM collects sediment samples from 53 stations within the White Rose field and from two EEM reference areas. To monitor effects on commercial fish species, American plaice and snow crab are collected from within the White Rose field from four EEM reference areas. The spatial extent of contamination measured in 2014 was within original EA predictions in that hydrocarbon contamination extended to 5.8 km from source, barium contamination extended to 1 km from source, and the percent of fines in sediment extended to 0.7 km from source. All but three of 53 samples were non-toxic to bacterial bioluminescence, and all but two were non-toxic to amphipod survival. There was no correlation with toxicity of samples and distance from active drilling centres. No sample was assessed as toxic to both bacterial luminescence and amphipod survival. Evidence of effects on total benthic community abundance continued to be marginal, with only a few stations affected and no detectable gradient of effects. As noted in previous EEM reports, the spatial extent of effects on benthic invertebrates at White Rose is generally consistent with the literature on effects of contamination from offshore oil developments. Zones of influence of project contaminants and effects on benthic community indices and taxa have not increased in severity or extent over time.

Sediment samples collected for the White Rose EEM are analyzed for benthic invertebrate communities (among other components). Sampling occurs directly within EL 1151 (Station 4, a reference station 27.8 km northeast from the *SeaRose FPSO*) and EL 1152 (Station 19, a reference station 27.8 km southwest from the *SeaRose FPSO*). Sediment cores are collected such that the substrate surface remains intact. The substrate is similar throughout the White Rose field, as evidenced for the cores for Station 4 (in EL 1152), Station 19 (in EL 1151), and Station 2 (approximately 3 km northwest of the *SeaRose FPSO*) (Figure 4-21). As indicated in Table 4.21, most of the species collected at Stations 4 and 19 are common throughout the White Rose Field and other reference areas.

Figure 4-21 Sediment Cores from Stations 4, 19, and 2 Collected during the 2014 White Rose EEM Sediment Survey

Table 4.21 Benthic Invertebrates Identified during White Rose 2014 EEM Sediment Survey

		STATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CLASS	**FAMILY**	**SPECIES**																			
ANTHOZOA	Actinaria	Anemone indet.				2						1	1								
POLYCHAETA	Ampharetidae	Ampharetidae indet A	1	5	1	1	1					2	1		3	1	1		1		
	Ampharetidae	Ampharete sp. (juv.)	1			1	8	10	3	13	6	11	3		28	11	8	14	7	4	
	Capitellidae	Capitella capitata		1		21	2		1		1	6	2	10	1	2	8		2	1	
	Cirratulidae	Chaetozone setosa	2	1	1	114		2	2	5	4	3			9	4		5	15		7
	Dorvilleidae	Parougia caeca				4				2					2			1			
	Maldanidae	Euclymene zonalis.	1	1	3	12	8	1	1	6	3	2	1		2	1		1	3	2	
	Maldanidae	Praxillella praetermissa	4	8	3	8	5	7	2	8	3	4	1	2		4	3	7	3	3	
	Nephtyidae	Nephtys ciliata	2	2	4	2	1	2			2	1	2	1	1	2	2	2		1	1
	Nereidae	Nereis zonata				5				1											
	Opheliidae	Ophelia limacina	12	9	28		6	3	15	6	17	3	8	2		27	14	1	1	15	8
	Orbiniidae	Scoloplos armiger	48	49	15	1	60	10	9	31	56	41	51	8	2		36	6	3	14	12
	Oweniidae	Galathowenia oculata			2	37	3	1	26		1	2	1			2			1		
	Paraonidae	Aricidea catherinae	63	88	51	10	71	54	21	56	43	93	44	88	1	29	138	6	6	49	20
	Paraonidae	Aricidea nolani				9			9				1				3	1			
	Paraonidae	Paraonis fulgens				10															
	Pholoidae	Pholoe minuta					2			4	2				6	4		1	3	1	2
	Phyllodocidae	Eteone longa	1	7	5	7	3	4	1	3	4	7	12	2	3	10	11	4	11	5	3

		STATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CLASS	**FAMILY**	**SPECIES**																			
	Sabellidae	Euchone incolor				15										1	1	1			
	Sphaerodoridae	Sphaerodoropsis minuta	3	1	2	2	3	1	1		1	1	1		4	1		1	4		
	Spionidae	Polydora juv.	2	1	7		3	2	8	2	3	4	7		3	5		3		2	
	Spionidae	Prionospio steenstrupi	92	131	73	102	80	83	78	66	84	163	123	101	183	125	128	68	155	44	21
	Spionidae	Spio armata	1			15	3	3	1		3	3	5		4	1					
	Spionidae	Spio filicornis	1					1					2	2	1	4	1		1		
	Spionidae	Spio limicola .		1		5	6	17	2	8	2	5	26	1	2	5	10	1	3	1	
	Spionidae	Spio sp.				67							3		2						
	Syllidae	Exogone hebes	4	5	1	18	97	4	7	7	6	2			1	2	3	1			86
	Terebellidae	Laphania boecki	2	8	6		7	2	5	4	9	5	1		6	6	5		3	2	3
	Terebellidae	Polycirrus sp.		3	1	1	4		4	4	5	2	1	1	2	2	1				
OLIGOCHAETA		Marine Oligochaete A	40	60	54	84	57	33	51	43	19	42	50	94	12	34	61	21	50	24	144
		Marine Oligochaete B	1	4	3	1	6	5	7	2	7	2		1	2	9	3	2	4	3	
NEMERTEAN		Nemertean Indet. A														1					
CUMACEA	Leuconidae	Eudorellopsis deformis		1	2		1		1		1		1		1		1			1	5
TANAIDACEA	Paratanaidae	Leptognatha sp.	22	8	50	6	15	4	28	14	6	10	12	5		9	24	8	16	15	27
AMPHIPODA		Amphipoda indet. A		1				1			2	1		2		2		1	1	1	2
AMPHIPODA	Phoxocephalidae	Phoxocephalus holbolli	1	3		16	1	1					1	5			3	1		1	
AMPHIPODA	Pontoporeiidae	Priscillina armata	3					1					2	1							10
GASTROPODA	Lepitidae	Lepeta caeca	1		2	1	1			6	2	1		1							

		STATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CLASS	**FAMILY**	**SPECIES**																			
	Trochidae	Moelleria costulata				6															
	Trochidae	Margarites groenlandica	1			5			2						1						
	Turridae	Curtiloma decussata	1	1	1	5		1	2		1		1	1	1		1				
PELECYPODA	Astartidae	Astarte borealis				8	2			1	1					1			2		1
	Tellinidae	Macoma calcarea (includes juvs.)	36	87	82	16	51	23	9	18	67	77	52	48	12	25	70	19	36	34	
	Thyasiridae	Thyasira flexuosa	9	3	1		4	1		4	6	4	7		11	3	4	3	1		
ECHINOIDEA	Echinarachnidae	Echinarachnius parma	6	2	2	2	1	4		1	3	2	2	4	2	2	1	2	1	4	3
	Ophiuridae	Ophiura robusta		2		4		2	1			1	3	1					1		

		STATION	20	21	22	23	24	25	26	27	28	29	30	31	C1	C2	C3	C4	C5
CLASS	**FAMILY**	**SPECIES**																	
ANTHOZOA																			
POLYCHAETA											1		1	1	1		1		
	18	1	5	7	1			11			13	16	10	41	8	10	7	12	5
	9				6			1	5	2		1		2	3	2	2	2	11
	12		2	9	1			3	1			1	1	14	7	21	11	10	15
	8			1										1	2	9	3		5
		1	1	1	3			1	1	2	2	4	1	10	6	3	6	5	
		2		2	3			7	5	4	3	6	8		1	1	2		
	4			2					1	1	1	1	3	6		3	4	4	

		STATION	20	21	22	23	24	25	26	27	28	29	30	31	C1	C2	C3	C4	C5
CLASS	**FAMILY**	**SPECIES**																	
	1		8	2	16			22	4	6	6	12	13		8		4	20	13
	1	6	33	2	27			42	48	20	23	56	106	2	3				
													2	2	2	2	2	1	4
		8	72	22	162			87	88	153	35	42	64	3	4	1		13	
			1		3			2	2	12	7								
																	1		
	18		1	3					2	2	1		2	10	6	20	11	8	2
	7	2	3	3	8			3	10	9	5	6	10	12	2	13	3	4	5
	17			2										6	1		2	1	6
	4		5	2	1							5	2	1	7	22	12	3	3
	1	2		2	2			2	1	2	1	7	8	14	4	6	1	1	6
	82	15	80	127	104			108	116	145	140	110	152	248	151	203	112	105	
	1		2							2							1		
	23		1	1							1	2				1	1		3
	2	2	4	7	7			2	7	3	13	8	34	9	1				
			1						1					1					
				1	2			4	1		3	2	2	2	1	3	1	1	
		1	12		3			6	7		1	9	2	3			3	5	
			3	2	1				2	4	6	6	15					2	
OLIGOCHAETA	17	8	19	16	54			39	21	15	20	24	57	33	30	33	28	22	30
	3		4	1	3			3	3	2	1	2	1	1	1	3	2	1	
NEMERTEAN			2										1		3		1		
CUMACEA			2	3					3	2		1	2			2	1	2	

		STATION	20	21	22	23	24	25	26	27	28	29	30	31	C1	C2	C3	C4	C5
CLASS	**FAMILY**	**SPECIES**																	
TANAIDACEA		4	4	17	22			19	3	19	13	15	27	2	15		1	4	
AMPHIPODA	1	7		2						2			1	5		1			
AMPHIPODA					1			1	3	2	2	3	5					1	
AMPHIPODA					3														
GASTROPODA																			2
			1	1								4	1		1	1	1		
PELECYPODA										1									
	57		28	47	68			54	62	86	48	87	109	73	14	85	27	12	21
	8		4	3	2			1	3	2	1	4	3	16	2	3	7	5	15
ECHINOIDEA			2	3	3			2	8	2	2	1	1	2		1		3	

		STATION	N1	N2	N3	N4	NA1	NA2	NA3	NA4	S1	S2	S3	S4	S5	SWRX1	SWRX2	SWRX3	SWRX4
CLASS	**FAMILY**	**SPECIES**																	
ANTHOZOA	Actinaria	Anemone indet.																	
POLYCHAETA	Ampharetidae	Ampharetidae indet A				1													
	Ampharetidae	Ampharete sp. (juv.)	4	11	2	17		2	7	9	25	21	16	17	24	11	6	3	4
	Capitellidae	Capitella capitata	1	3	3	7	12	10	2	6	17	3	7	3	28	1			
	Cirratulidae	Chaetozone setosa	4		1	9	8	2	3	4	12	5	27	2	23	2	3	3	5
	Dorvilleidae	Parougia caeca				1	15	2		2	1	4	1	3	13		1		
	Maldanidae	Euclymene zonalis.	2	5	1	1	1	2	3	2	5	20	3	3	2	6	5	5	
	Maldanidae	Praxillella praetermissa	1						2	1		2	3	4		4	3	3	3
	Nephtyidae	Nephtys ciliata	1	1	1	6	4	1	3	2	2	3	4	2	6	2	5	1	1
	Nereidae	Nereis zonata				2	2												
	Opheliidae	Ophelia limacina	14	1		1		3	4	9	4	9	2	3		12	10	18	11
	Orbiniidae	Scoloplos armiger	85	89	2				1	8	2	2	63	4		35	7	2	46
	Oweniidae	Galathowenia oculata	1	1		2			1	1		5	1		2	4	2		1
	Paraonidae	Aricidea catherinae	58	61		1			7	10			32	14		11	10	19	83
	Paraonidae	Aricidea nolani																	
	Paraonidae	Paraonis fulgens																	

		STATION	N1	N2	N3	N4	NA1	NA2	NA3	NA4	S1	S2	S3	S4	S5	SWRX1	SWRX2	SWRX3	SWRX4
CLASS	**FAMILY**	**SPECIES**																	
	Pholoidae	Pholoe minuta		1	2	34	68	31	3	1	1	13	21		40	3	5	1	3
	Phyllodocidae	Eteone longa	7	11	8	16	5	10	1	3	16	5	12	9	10	2	3	2	3
	Sabellidae	Euchone incolor				7	3	3	3	4	5	1	1	1	17	1			
	Sphaerodoridae	Sphaerodoropsis minuta	1	7	1	8		3	2		4	9	8		10	2	1	6	2
	Spionidae	Polydora juv.	8	3	5	25	8	2	2	1	2	9	1	5	4	4	2	10	3
	Spionidae	Prionospio steenstrupi	145	207	46	247	39	74	82	50	131	166	203	159	231	112	101	183	117
	Spionidae	Spio armata		3		1						2							
	Spionidae	Spio filicornis			1	10			1		4	5			5		1		
	Spionidae	Spio limicola .	4	18	5	33		2	2		10	15	6	3	1		2	2	1
	Spionidae	Spio sp.													1				1
	Syllidae	Exogone hebes	3	1	2	4						2	5	2			1		1
	Terebellidae	Laphania boecki	4	3	1	2			2		3	3	5	1		12	8		4
	Terebellidae	Polycirrus sp.	7	5									2		3	3	4		1
OLIGOCHAETA		Marine Oligochaete A	42	23	43	28	18	47	28	19	28	51	40	42	28	34	16	11	40
		Marine Oligochaete B	4	3				6	2	3	1	6	1	2	1	6	2	5	5
NEMERTEAN		Nemertean Indet. A					3	12	1		1	3	1	4	2	1	2		
CUMACEA	Leuconidae	Eudorellopsis deformis						2				1	3	1		2	1		
TANAIDACEA	Paratanaidae	Leptognatha sp.	8	6				3	17	14		3	6	4		11	30	10	12

		STATION	N1	N2	N3	N4	NA1	NA2	NA3	NA4	S1	S2	S3	S4	S5	SWRX1	SWRX2	SWRX3	SWRX4
CLASS	**FAMILY**	**SPECIES**																	
AMPHIPODA		Amphipoda indet. A													2				
AMPHIPODA	Phoxocephalidae	Phoxocephalus holbolli	3														1		
AMPHIPODA	Pontoporeiidae	Priscillina armata																	
GASTROPODA	Lepitidae	Lepeta caeca	1			3	2						11	2	2				
	Trochidae	Moelleria costulata				1													
	Trochidae	Margarites groenlandica																	
	Turridae	Curtiloma decussata		3								4	1				4		
PELECYPODA	Astartidae	Astarte borealis																	
	Tellinidae	Macoma calcarea (includes juvs.)	82	63	12	86	104	76	61	20	39	45	96	62	113	11	60	127	70
	Thyasiridae	Thyasira flexuosa	7	2	2	14	10	10	5		13	9	8	2	13	4	6		
ECHINOIDEA	Echinarachnidae	Echinarachnius parma		1		2		1	3	4	3	2	3	1		4	3	2	
	Ophiuridae	Ophiura robusta																10	

4.2.3 Corals and Sponges

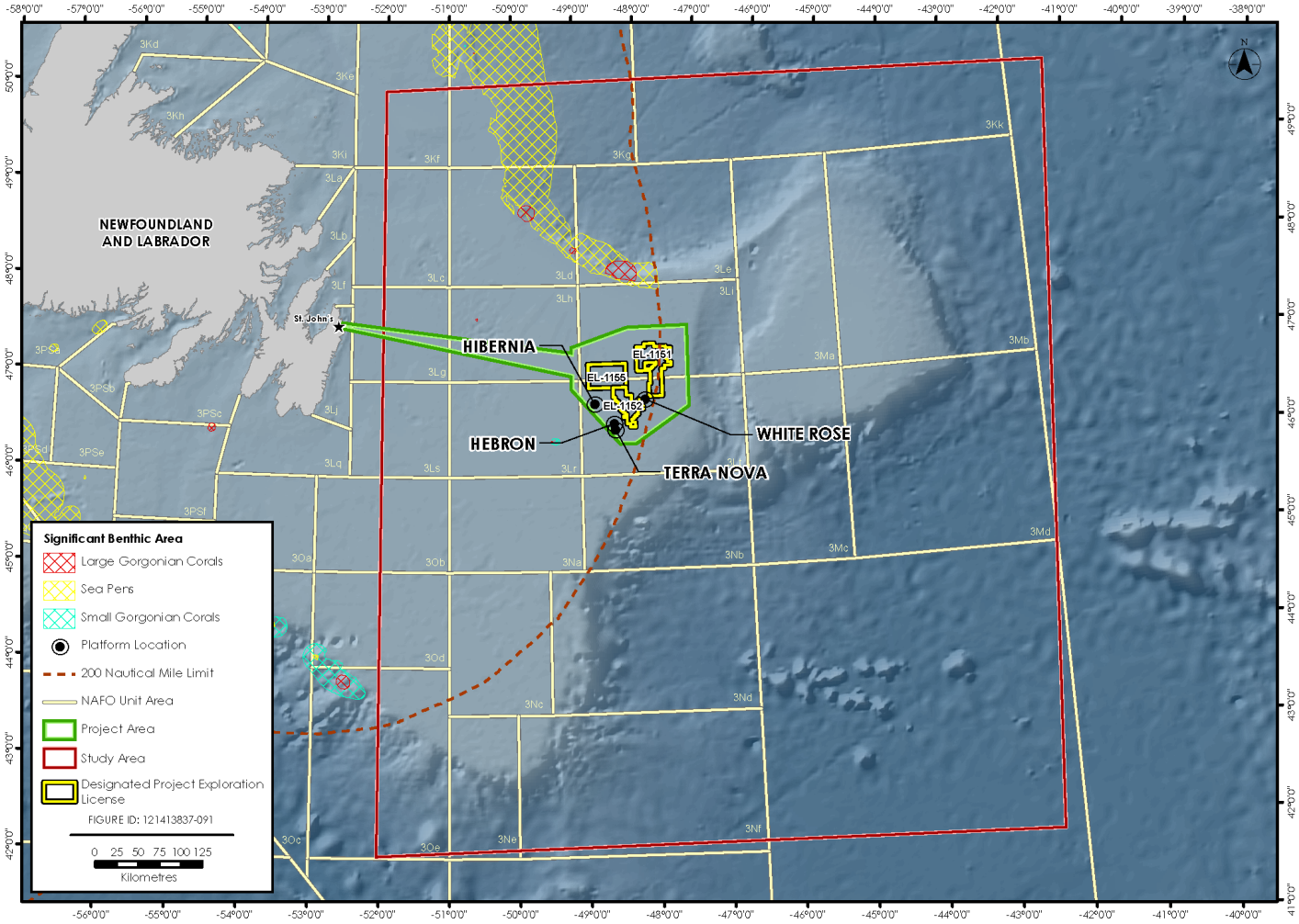
Corals and sponges are marine benthic invertebrates that attach themselves to bottom substrates and filter-feed on suspended particles in the water column. Corals and sponges provide various ecological functions. Dense aggregations of corals and sponges can alter bottom currents and provide a niche space for other organisms, increasing the biodiversity of the area (Beazley et al. 2013). In particular, corals and sponges provide marine fish and invertebrate protection from strong currents and predators and can serve as nursery areas for larval and juvenile life stages, feeding areas, breeding and spawning areas, and resting areas (Campbell and Simms 2009, in BP 2016). Corals and sponges also contribute to biogeochemical processes, including nutrient cycling between the sea bottom and the water column (Kenchington et al. 2012, in BP 2016). Slow growth rates, longevity, variable recruitment, and habitat-limiting factors make corals and sponges particularly vulnerable to direct physical impacts and limit recovery (DFO 2013d, in BP 2016).

There are two major groups of cold-water corals offshore Newfoundland: hard/stony corals (*Scleractinia*) and octocorals or soft corals (*Alcyonacea*). Unlike tropical corals that are true reef-building corals in shallow waters and contain symbiotic algae, sub-Arctic corals can live at depths without the influence of sunlight and can occur in solitary or reef formations. Most corals require a hard substrate to attach to, although some species can anchor themselves into soft sediments (ACZISC 2011, in BP 2016).

In general, cold-water corals are poorly studied, in part due to their inaccessibility as most species are found at water depths greater than 200 m on continental slopes, canyons, or seamounts (DFO 2011a, in BP 2016).

Deep-water corals and sponges located within the Study Area include stony corals, black wire and gorgonian corals, soft corals, sea pens, and sponges. These organisms help increase habitat complexity and provide habitat to a variety of juvenile fish and invertebrate species. Many corals, sea pens, and sponges have been documented within the Study Area, and are typically more abundant on the slopes of the Grand Banks, Flemish Cap ((at 600 to 1,300 m (Murillo et al. 2011, in Amec 2014)), and within certain areas of the Flemish Pass (Murillo et al. 2012, 2016; Beazley et al. 2013).

DFO has recently delineated significant areas of cold-water corals and sponges within Canada's Atlantic and eastern Arctic marine waters (DFO 2017b). As part of the Sustainable Fisheries Framework, they have also defined Significant Benthic Areas (SBAs) as a regional habitat that contains sponges (Porifera), large and small gorgonian corals (Alcyonacea), and/or sea pens (Pennatualacea) as a dominant and defining habitat feature (DFO 2017b). Kernel Density Estimation, Species Distribution Modelling, and observations of taxa were used to delineate SBAs. Figure 4-22 depicts SBAs for sponges, sea pens, and large and small gorgonian corals for the Newfoundland and Labrador Shelves region within the Canadian EEZ.

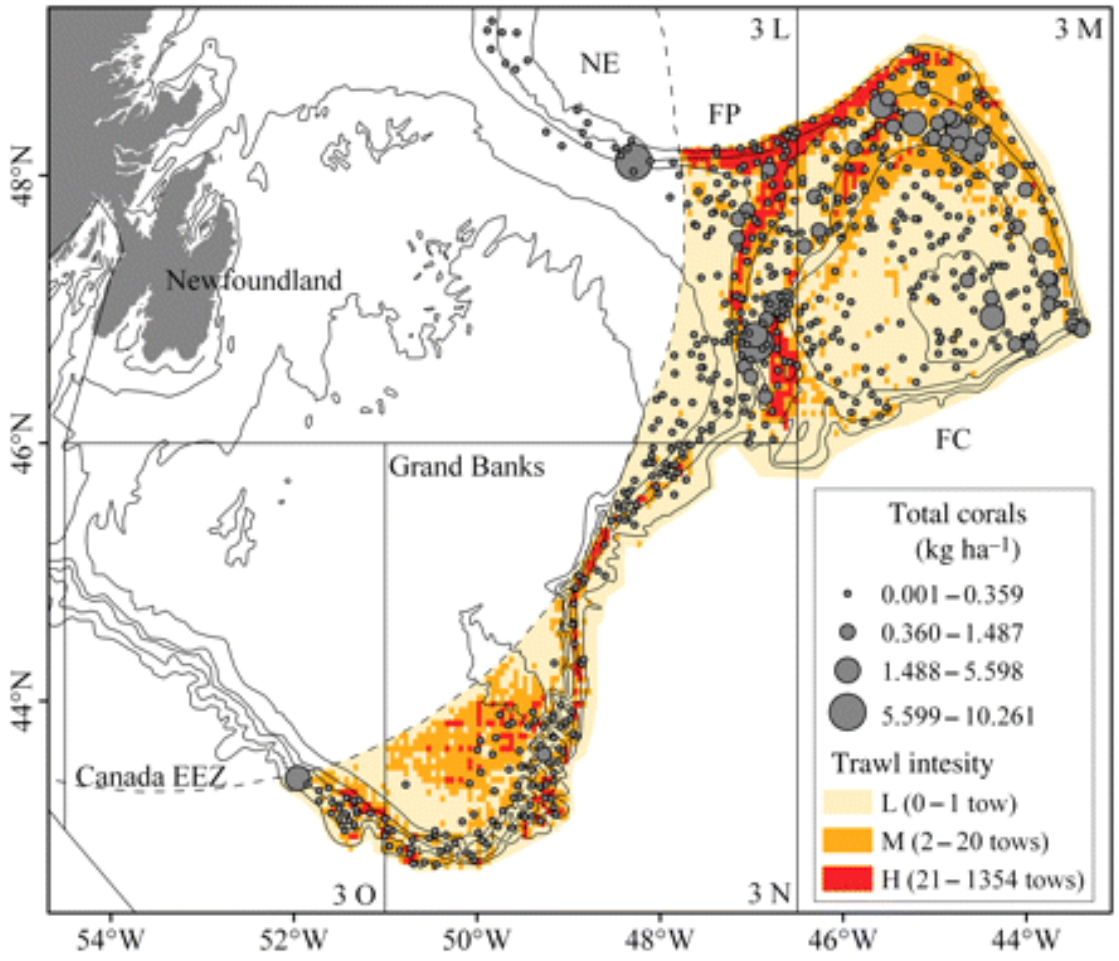


Source: DFO 2017b

Figure 4-22 Significant Benthic Areas for Sea Pens, Large and Small Gorgonian Corals for the Newfoundland and Labrador Shelves Region

Kenchington et al. (2016) and DFO (2017b) provide a full overview of the modelling methods used in determining these areas. Within the Study Area, SBAs for sea pens and large and small gorgonian corals can be found along the northern slope of the Grand Banks, directly north of the Project Area. SBAs for these same species can also be found within the Study Area along the Tail of the Bank area of the Grand Banks. There are no SBAs within the Project Area.

The slopes of the Grand Bank and Flemish Cap are important areas for sea pens, large gorgonians (along the northern Flemish Pass) and black corals (Knudby et al. 2013, in Amec 2014). The Flemish Cap and Flemish Pass also provide habitat for aggregations of sponges (NAFO 2011, in Amec 2014). The highest average coral biomass occurred between 600 and 900 m depth along the northeastern slope of the Grand Banks, in the Flemish Pass, and around the Flemish Cap (Figure 4-23).



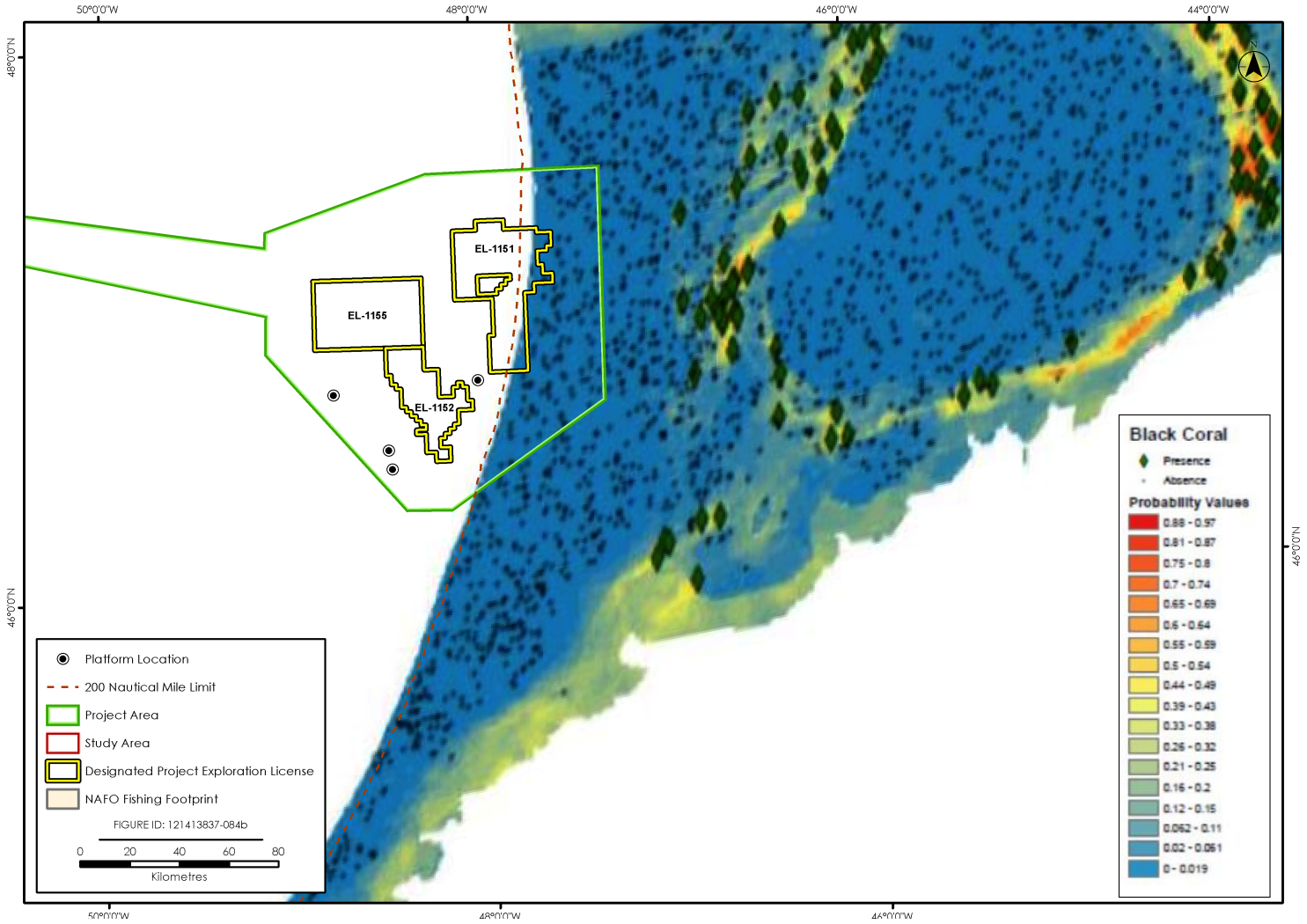
Source: Beazley et al. 2013
L, Lightly–never trawled (0–1 tow per cell); M, moderately trawled (2–20 tows per cell); H, heavily trawled (21–1,354 tows per cell). FC, Flemish Cap; FP, Flemish Pass; NE, northeastern slope of the Grand Banks.

Figure 4-23 Total Deep-water Coral Biomass per Swept Area (kg/ha) Recorded during Spanish/European Union Groundfish Surveys

The coral diversity of the Flemish Pass, Flemish Cap, and northeastern slope of the Grand Banks includes 21 species of Alcyonaceans (including soft corals and gorgonian sea fans), 11 species of sea pens (*Pennatulacea* spp.), two species of cup corals (*Scleractinia*), and three species of black coral (*Antipatharia* spp.) (Murillo et al. 2011, in Amec 2014). The coral diversity of the Flemish Pass alone includes 22 species of coral. Alcyonaceans (including soft corals and gorgonian sea fans), were the most abundant. (Beazley et al. 2013).

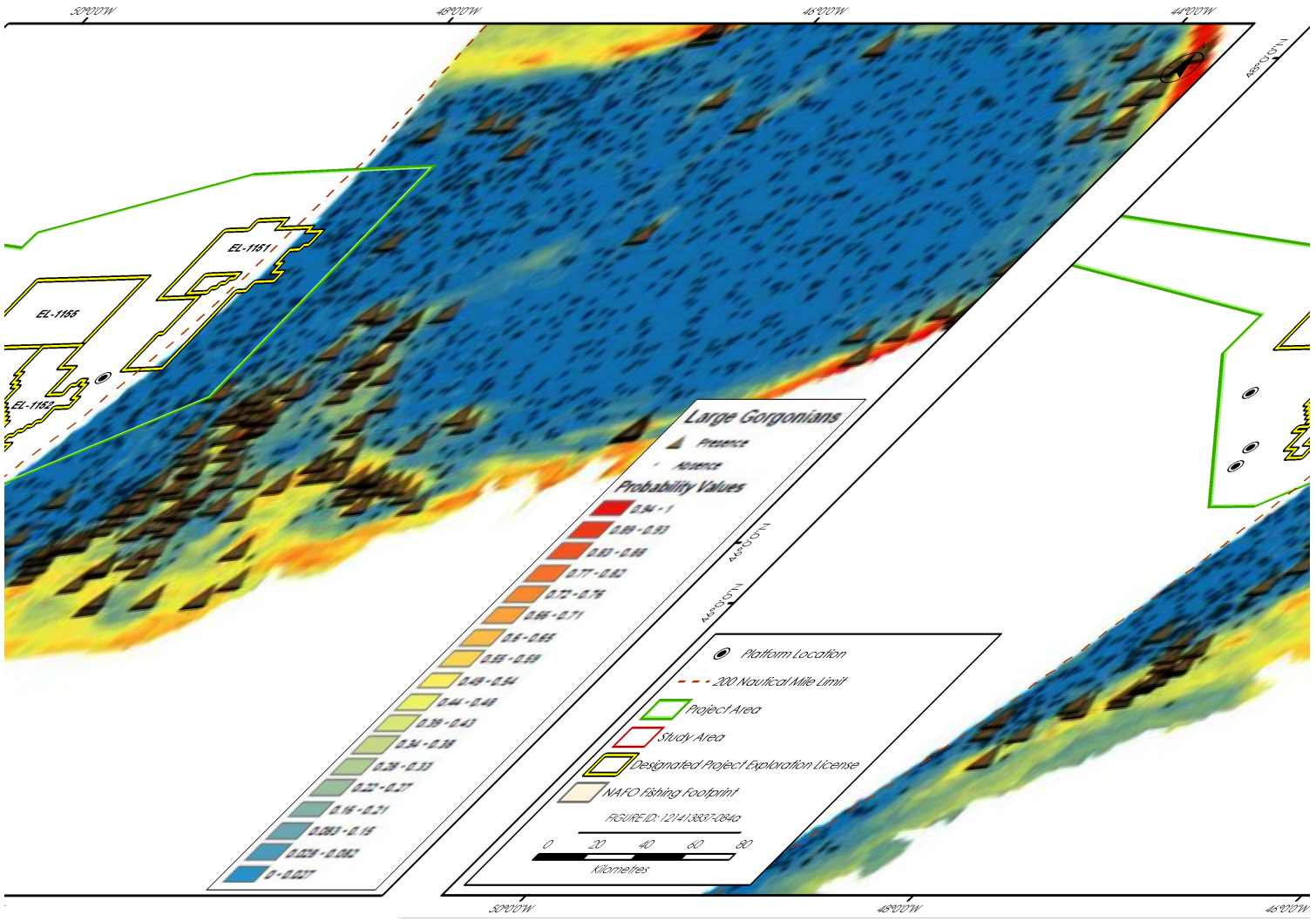
Sea pens and cup corals are commonly found on soft mud substrates while black corals, soft corals and sea fans are found attached to hard substrates such as bedrock and gravel. NAFO modelling has indicated that the slopes of the Flemish Cap and the Tail of the Grand Banks are important for sea pens. Black corals are found at their highest densities in the Flemish Pass, the northern Flemish Cap and Tobin's Point (Orphan Knoll), while important areas for sea pens are aggregated in the Flemish Pass, the northern Flemish Cap and in one location on the Tail of the Grand Banks. Sponges are more widely distributed and high densities can be found along the eastern slopes of the Grand Banks, around the Flemish Cap and along the northern slopes of the Area. Section 4.2.9 describes several Special Areas within the Study Area that provide important habitat for corals and sponges, including the NAFO closure areas identified in Section 4.2.9.3.

NAFO has established protected areas for corals and sponges (see Section 4.2.9.3) that prohibit bottom trawling (NAFO 2011). In 2013, the NAFO Working Group on Ecosystem Science and Assessment released a report on the spatial distribution of black and gorgonian corals and sea pens in the NAFO Regulatory Area (NRA) (Figures 4-24 to 4-26, respectively) based on modelling. The results from this model show that areas of the Flemish Pass either have corals and sea pens present in them or have a high probability of supporting these organisms (NAFO 2013). Murillo et al. (2015) found that at depths of 500 to 900 m, the various coral species that existed on the slopes of the Grand Banks and Flemish Cap, descending into the Flemish Pass, included black coral (*Stauropathes arctica*), cup coral (*Flabellum alabastrum*), sea pen (*Funiculina quadrangularis*), soft coral (*Heteropolypus sol*), and small gorgonian coral (*Acanella arbuscular*). Within the 800 and 1,200 m depth, species included sea urchin (*Phormosoma placenta*), sea stars (*Bathybiaster vexillifer*), and the sea pens *Funiculina quadrangularis*, *Anthoptilum grandiflorum*, *Halipteris finmarchica*, and *Pennatula aculeate*). Between 700 and 1,400 m, the area was characterized by a high biomass of large sponges from the order Astrophorida (Murillo et al. 2015).



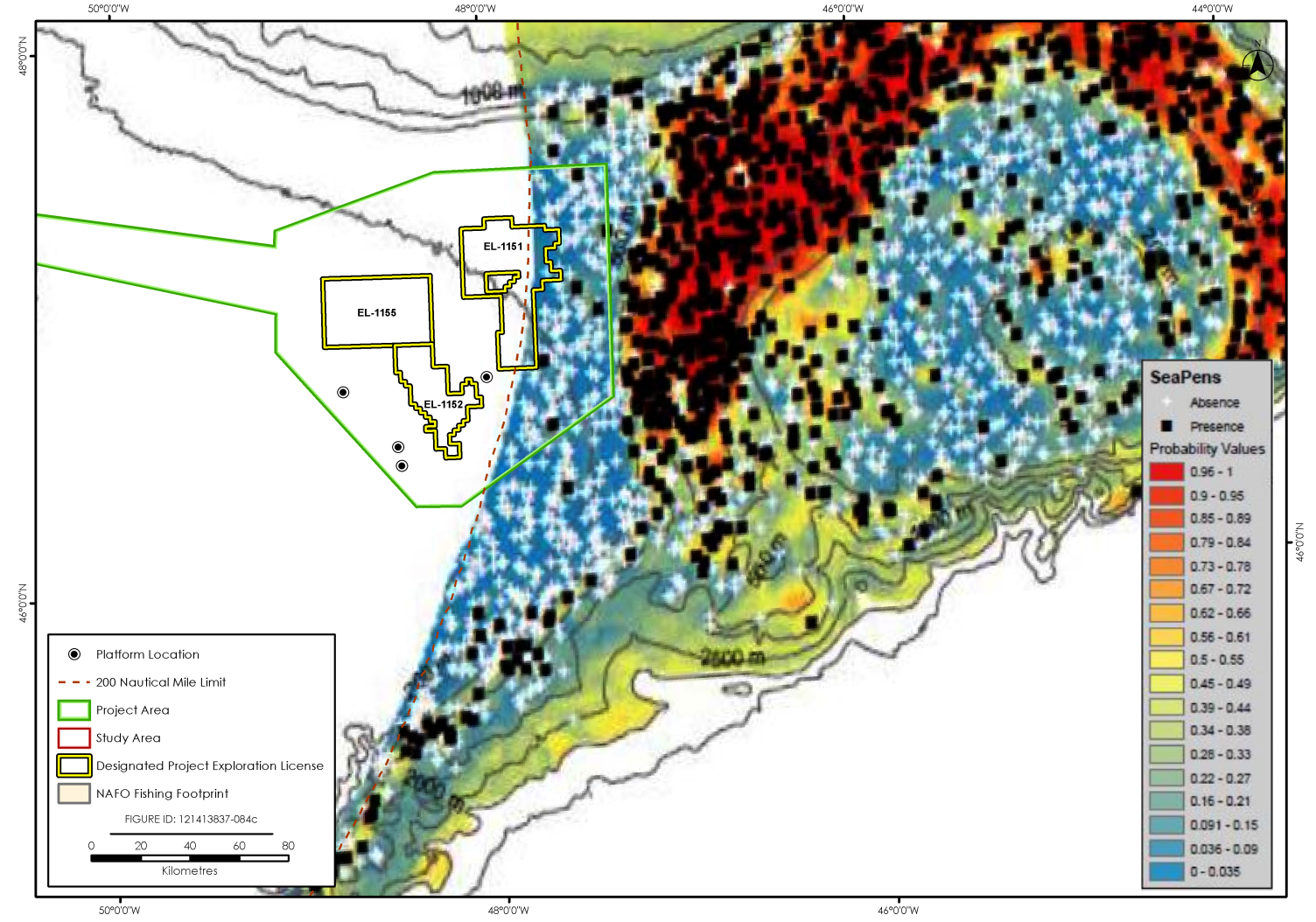
Source: NAFO 2013

Figure 4-24 Black Corals in the NAFO Regulatory Area



Source: NAFO 2013

Figure 4-25 Gorgonian Corals in the NAFO Regulatory Area



Source: NAFO 2013

Figure 4-26 Sea Pens in the NAFO Regulatory Area

4.2.4 Marine Fish

Fish and shellfish species common to the Study Area include both pelagic and demersal finfishes, as well as commercially important macroinvertebrates such as shrimp and crab. For purposes of discussion, fish common to the Study Area are separated into groundfish, pelagics, and invertebrates and summarized in Sections 4.2.4.1 to 4.2.4.3, respectively. The selection of fish for inclusion in the tables is based on habitat preferences across life-history stages, available distribution mapping, and catch data for species within the Study Area.

Table 4.22 lists the 25 most abundant fish species (by weight) in the Study Area.

Table 4.22 Species Collected During DFO Research Vessel Surveys in the Study Area, 2014 and 2015

Year	2015		2014	
Total Weight Landed (kg)	**113,020**		**73,469**	
Species	**Weight Caught (kg)**	**Percent of Total Weight (%)**	**Weight Caught (kg)**	**Percent of Total Weight (%)**
American plaice	9,241	8.18	5,932	8.07
Atlantic cod	5,683	5.03	8,859	12.06
Atlantic halibut	276	0.24	190	0.26
Atlantic wolffish	509	0.45	337	0.46
Capelin	1,791	1.58	3292	4.48
Greenland halibut	1,527	1.35	913	1.24
Longhorn sculpin	91	0.08	51	0.07
Longfin hake	606	0.54	66	0.09
Marlin spike	93	0.08	112	0.15
Northern wolffish	201	0.18	163	0.22
Redfish	61,436	54.36	26,074	35.49
Roughhead grenadier	1,414	1.25	734	1.00
Roundnose grenadier	302	0.27	34	0.05
Sand lance	863	0.76	4,454	6.06
Sea Raven	67	0.06	43	0.06
Silver Hake	540	0.48	1,062	1.45
Shrimp (*Pandalus* spp.)	1,238	1.10	1,998	2.72
Shrimp (*Argis spp.*	285	0.25	212	0.29
Shorthorn sculpin	79	0.07	33	0.05
Snow crab	288	0.25	321	0.43
Spotted wolffish	145	0.13	230	0.31

Year	2015		2014	
Total Weight Landed (kg)	**113,020**		**73,469**	
Species	**Weight Caught (kg)**	**Percent of Total Weight (%)**	**Weight Caught (kg)**	**Percent of Total Weight (%)**
Thorny skate	4,404	3.90	3,037	4.13
White Hake	335	0.30	176	0.24
Witch Flounder	893	0.79	466	0.63
Yellowtail flounder	10,487	9.28	5,166	7.03
Source: DFO 2017 Notes: collected using a Campelen 1800 Shrimp Trawl (lined)				

4.2.4.1 Groundfish

Table 4.23 summarizes the species distribution of groundfish of potential commercial, recreational, or Aboriginal (CRA) value that may occur in the Study Area. Species life history summaries are provided in Appendix D, while life history summaries for species at risk and SOCC groundfish are provided in Section 4.2.4.4. Previous environmental assessments in the region (Amec 2014; Husky Energy 2012a) have been drawn on extensively in compiling the life history information.

4.2.4.2 Pelagic Fish

Table 4.24 summarizes the species and distribution of pelagic fish of CRA value with potential to occur near the Study Area. Species life history summaries are provided in Appendix D, while life history summaries of species at risk and SOCC species are provided in Section 4.2.4.4. Previous environmental assessments in the region (Amec 2014; Husky Energy 2012a) have been drawn on extensively in compiling the following life history information.

4.2.4.3 Invertebrates

Table 4.25 summarizes the species and distribution of invertebrate species of CRA value that are likely to occur in the Study Area. Species life history summaries are provided in Appendix D. Previous environmental assessments in the region (Amec 2014; Husky Energy 2012a) have been drawn on extensively in compiling the following life history information.

Table 4.23 Groundfish of Commercial, Recreational or Aboriginal Value with Potential to Occur in the Study Area

Common Name	Scientific Name	Potential for Occurrence in the Study Area[1]	Timing of Presence	Timing of Spawning
Acadian redfish[2]	*Sebastes fasciatus*	High	Year-Round	September to December
American plaice[2]	*Hippoglossoides platessoides*	High	Year-Round	April
Atlantic cod[2]	*Gadus morhua*	Moderate	Year-Round	Peaks during spring
Atlantic halibut	*Hippoglossus*	Moderate	Year-Round	December to June
Atlantic wolffish[2]	*Anarhichas lupus*	High	Year-Round	September to December
Barndoor skate	*Dipturus laevis*	Moderate	Year-Round	Winter
Cusk[2]	*Brosme*	Low	Year-Round	May to August
Deepwater redfish[2]	*Sebastes mentella*	High	Year-Round	September to December
Haddock	*Melanogrammus aeglefinus*	Moderate	Year-Round	January to June
Greenland halibut	*Reinhardtius hippoglossoides*	Moderate	Year-Round	July to October
Monkfish	*Lophius americanus*	Moderate	Year-Round	April to September
Northern wolffish[2]	*Anarhichas denticulatus*	High	Year-Round	October to December
Pollock	*Pollachius virens*	Low	Year-Round	September to March
Roughhead grenadier[2]	*Macrourus berglax*	High	Year-Round	Winter and early spring, potentially year-round.
Roundnose grenadier[2]	*Coryphaenoides rupestris*	High	Year-Round	Year-round
Sculpin	*Triglops* spp.	High	Year-Round	Fall to late winter
Smooth skate[2]	*Malacoraja senta*	Moderate	Year-Round	Year-round
Spotted wolffish[2]	*Anarhichas minor*	High	Year-Round	June to November
Thorny skate[2]	*Amblyraja radiate*	High	Year-Round	September to January
White hake[2]	*Urophycis tenuis*	Moderate	Year-Round	Spring to early summer
Witch flounder	*Glyptocephalus cynoglossus*	Moderate	Year-Round	March to June
Yellowtail founder	*Limanda ferruginea*	Moderate	Year-Round	April to June

Source: Scott and Scott 1988; Anderson et al. 1999; Kulka et al. 2003; Maddock-Parsons 2006; DFO 2009b, 2010a, 2010b; COSWEIC 2010a, 2011; Healey 2010; NOAA 2013a, 2013b, 2013c; Amec 2014.

Note:
1. This qualitative characterization is based on expert opinion and an analysis of understood habitat preferences across life-history stages, available distribution mapping, and catch data for each species within the Study Area.
2. Species at risk or SOCC.

Table 4.24 Pelagic Fish Species of Commercial, Recreational, or Aboriginal Value with Potential to Occur in the Study Area

Common Name	Scientific Name	Potential for Occurrence in the Study Area[1]	Timing of Presence	Timing of Spawning[3]/Birthing[4]
Albacore tuna	*Thunnus alalunga*	Moderate	July to November	Outside Study Area[3]
Atlantic bluefin tuna[2]	*Thunnus thynnus*	Moderate	June to October	Outside Study Area[3]
Atlantic herring	*Clupea harengus*	Low	Year-round	Spring or Fall[3]
Atlantic mackerel	*Scomber scombrus*	Low	Winter	June and July[3]
Atlantic Salmon[2]	*Salmo salar*	Moderate	June to August	Outside Study Area[3]
American eel[2]	*Anguilla rostrata*	Moderate	March to July - glass eels on the Grand Banks	Outside Study Area[3]
Blue shark[2]	*Prionace glauca*	Moderate	June to October	Spring to Fall[4]
Capelin	*Mallotus villosus*	High	Year-round	June to August[3]
Porbeagle shark[2]	*Lamna nasus*	Moderate	Year-round	Spring[4]
Shortfin mako shark[2]	*Isurus oxyrinchus*	Low	July to October	Outside Study Area[4]
Swordfish	*Xiphias gladius*	Moderate	July to October	Outside Study Area[4]
White shark[2]	*Carcharodon carcharias*	Low	July to October	Outside Study Area[4]

Source: Scott and Scott 1988; Stokesbury et al. 2005; DFO 2012a; NOAA 2013a, 2013b, 2013c, 2013d, 2013e, 2013f; Amec 2014

Note: 1 This qualitative characterization is based on expert opinion, and an analysis of understood habitat preferences across life-history stages, available distribution mapping, and catch data for each species within the Study Area.

2 Species at risk or SOCC.

Table 4.25 Invertebrate Species of Commercial, Recreational or Aboriginal Value with Potential to Occur in the Study Area

Common Name	Scientific Name	Potential for Occurrence in the Study Area[1]	Timing of Presence	Timing of Spawning
American lobster	*Homarus americanus*	Low	Year-round	July to September
Atlantic surf clam	*Spisula solidissima,*	Low	Year-round	June to August
Propeller clam	*Cyrtodaria siliqua*	High	Year-round	Spring
Green sea urchin	*Strongylocentrotus droebachiensis*	High	Year-round	March to April
Atlantic sea scallop	*Placopecten magellanicus*	Low	Year-round	Late Summer to Fall
Iceland scallop	*Chlamys islandica*	Moderate	Year-round	April and May
Northern shrimp	*Pandalus borealis*	High	May to September	April and May
Snow crab	*Chionoecetes opilio*	High	Year-round	Summer to Fall

Source: Kenchington et al. 2001; DFO 2013a; Amec 2014
Note: 1. This qualitative characterization is based on expert opinion and an analysis of understood habitat preferences across life-history stages, available distribution mapping, and catch data for each species within the Study Area.

4.2.4.4 Fish Species at Risk and Species of Conservation Concern

SOCC include all species listed as endangered, threatened, vulnerable or of special concern under Committee on the Status of Endangered Wildlife in Canada (COSEWIC), the federal *Species at Risk Act* (SARA). Species at risk includes only those species listed under Schedule 1 of SARA as *endangered or threatened*.

There are four fish species at risk and 20 separate SOCC that may occur within the Study Area (Table 4.26). Detailed descriptions for species at risk and SOCC species are provided in Appendix D. Previous environmental assessments in the region (Amec 2014; Husky Energy 2012a) have been drawn on extensively in compiling the following life history information.

Table 4.26 Fish Species at Risk and Species of Conservation Concern with Potential to Occur in the Study Area

Common Name	Scientific Name	SARA Status[1]	COSEWIC Designation[1]	Potential for Occurrence in the Study Area[2]	Timing of Presence
Acadian redfish (Atlantic population)	*Sebastes fasciatus*	Not Listed	Threatened	High	Year-round
American eel	*Anguilla rostrata*	Not Listed	Threatened	Moderate	March to July - glass eels on the Grand Banks
American plaice (Newfoundland and Labrador population)	*Hippoglossus platessoides*	Not Listed	Threatened	High	Year-round
Atlantic bluefin tuna	*Thunnus thynnus*	Not Listed	Endangered	Moderate	June to October
Atlantic cod (Newfoundland and Labrador population)	*Gadus morhua*	Not Listed	Endangered	Moderate	Year-round
Atlantic salmon[3] (South Newfoundland population)	*Salmo salar*	Not Listed	Threatened	Moderate	June to August
Atlantic wolffish	*Anarhichas lupus*	Special Concern (Schedule 1)	Special Concern	High	Year-round
Basking shark (Atlantic population)	*Cetorhinus maximus*	Not Listed	Special Concern	Low	Year-round
Blue shark (Atlantic population)	*Prionace glauca*	Not Listed	Special Concern	Moderate	June to October
Cusk	*Brosme brosme*	Not Listed	Endangered	Low	Year-round
Deepwater redfish (Northern population)	*Sebastes mentalla*	Not Listed	Threatened	High	Year-round
Northern wolffish	*Anarhichas denticulatus*	Threatened (Schedule 1)	Threatened	High	Year-round
Porbeagle shark	*Lamna nasus*	Not Listed	Endangered	Moderate	Year-round
Roughhead grenadier	*Macrourus berglax*	Not Listed	Special Concern	High	Year-round

Common Name	Scientific Name	SARA Status[1]	COSEWIC Designation[1]	Potential for Occurrence in the Study Area[2]	Timing of Presence
Roundnose grenadier	*Coryphaenoides rupestris*	Not Listed	Endangered	High	Year-round
Shortfin mako	*Isurus oxyrinchus*	Not Listed	Threatened	Low	July to October
Smooth skate (Laurentian-Scotian population)	*Malacoraja senta*	Not Listed	Special Concern	Moderate	Year-round
Smooth skate (Funk Island Deep population)	*Malacoraja senta*	Not Listed	Endangered	Moderate	Year-round
Spiny dogfish (Atlantic population)	*Squalus acanthias*	Not Listed	Special Concern	Low	Year-round
Spotted wolffish	*Anarhichas minor*	Threatened (Schedule 1)	Threatened	High	Year-round
Thorny skate	*Amblyraja radiata*	Not Listed	Special Concern	High	Year-round
White shark	*Carcharodon Carcharias*	Endangered (Schedule 1)	Endangered	Low	July to October
White hake	*Urophycis tenuis*	Not Listed	Threatened	Moderate	Year-round
Winter skate (Eastern Scotian Shelf-Newfoundland Population	*Leucoraja ocellata*	Not Listed	Endangered	Low	November to March

Sources: Modified from Husky Energy 2012a and BP 2016
Notes:

1. The *Species at Risk Act* establishes Schedule 1 as the official list of wildlife species at risk. However, note that while Schedule 1 lists species that are *extirpated*, *endangered*, and *threatened*, the prohibitions do not apply to SOCC or those on Schedule 2 or 3 regardless of status.
2. This qualitative characterization is based on expert opinion, and an analysis of understood habitat preferences across life-history stages, available distribution mapping, and sightings data for each species within the Study Area.
3. See Section 4.3.2.7 for a detailed discussion on the Atlantic salmon populations.

Species at risk were identified as those species with a potential occurrence in the Study Area and listed under Schedule 1 of SARA as *endangered* or *threatened*. The Act establishes Schedule 1 as the official list of wildlife species at risk and affords protection to all species listed as *extirpated*, *endangered*, or *threatened*. Once listed, measures to protect and recover a listed wildlife species are implemented.

Four species at risk may occur in the Study Area, northern, spotted, qnd Atlantic wolfish (DFO 2015a) and white shark.

The northern wolffish was listed in May 2001 along with the spotted wolffish. On July 11, 2018 proposed critical habitat was identified for the northern wolffish and the spotted wolffish (DFO 2018a). The northern Grand Banks encompasses an area designated as critical habitat for both northern and spotted wolffish, which overlaps the Study Area. The proposed spotted wolffish critical habitat overlaps the Project Area (Figure 4-27).

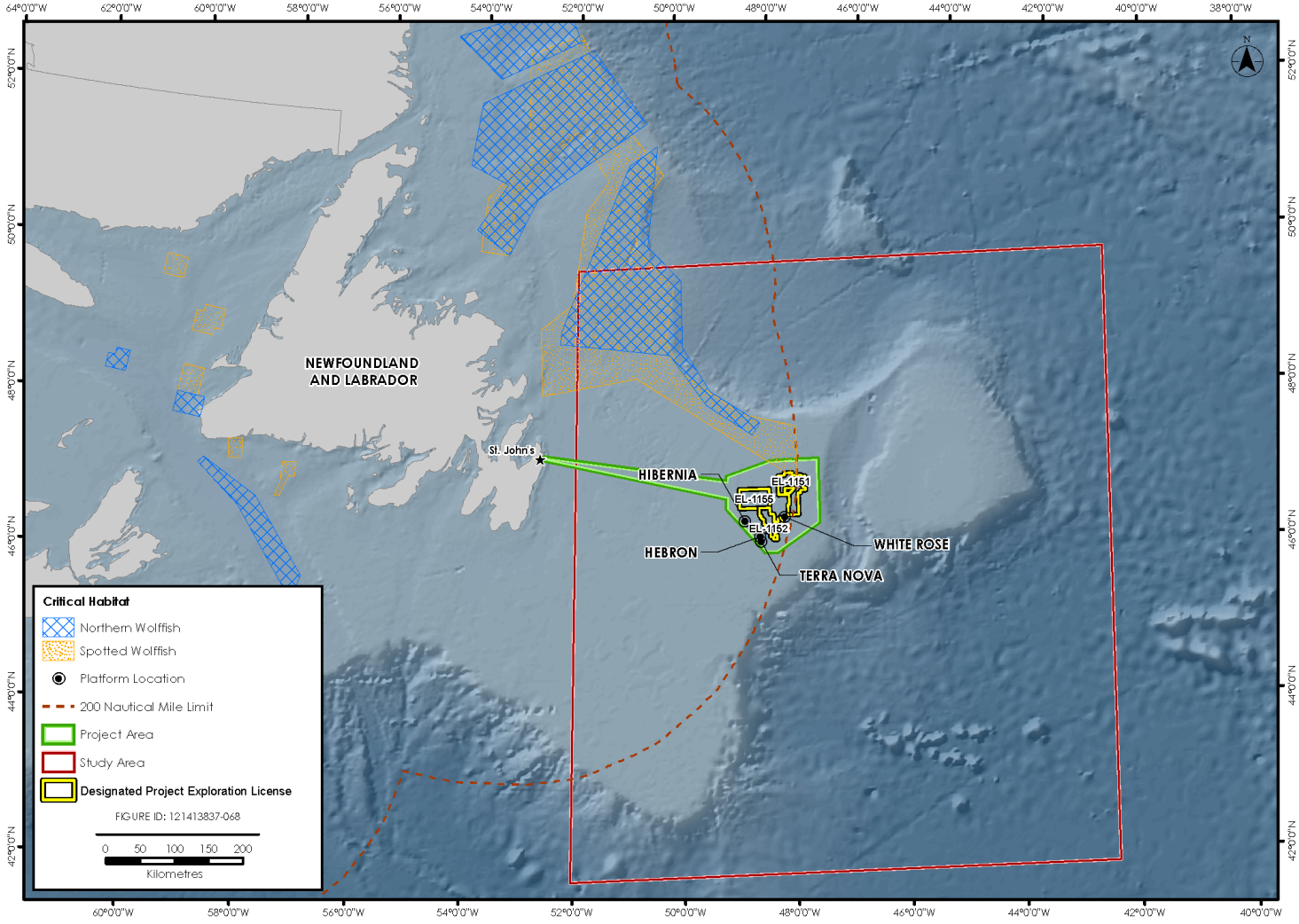


Figure 4-27 Nothern Wolffish and Spotted Wolffish Proposed Critical Habitat

The critical habitat for wolffish was delineated using the Area of Occurrence approach based on the number of wolffish present at sea bottom temperature and depth. A proposed recovery strategy for northern wolffish and spotted wolffish and a management plan for the Atlantic wolffish have been prepared to promote wolffish population growth and recovery (DFO 2018a). As noted in the recovery strategy, a combination of natural and human-induced mortality have caused the wolffish populations to decline. The leading cause of human-induced mortality is the incidental capture of wolffish in many fisheries. Starting in 2003-2004, it became a requirement to release wolffish caught as incidental bycatch in Canadian waters; however, a significant portion of fishing mortality for wolffish occurs outside Canada's EEZ, where there is no requirement to release wolffish and bycatch is thought to be unreported (DFO 2018a). Other threats to wolffish in eastern Canadian waters include: the accidental release of petrochemicals, dissolved metals, and other solids during oil and gas activities; seismic exploration; and, ocean dumping (DFO 2018a).

The Atlantic population of white shark (*Carcharodon Carcharias*) was listed as endangered in 2006. While no recovery strategy is in place for the white shark, the protections under SARA will be consistent with the white shark's status as vulnerable under the International Union for Conservation of Nature, and its protection under the Convention on International Trade in Endangered Species of Flora and Fauna.

An additional 21 SOCC are listed in Table 4.26; these species are listed under SARA as special concern or listed by COSEWIC.

4.2.5 Marine Mammals

There are three groups of marine mammals that can be found within the Study Area: the mysticetes (toothless/baleen whales), odontocetes (toothed whales), and phocids (seals).

Table 4.27 presents information on the timing of marine mammals with potential to occur in the Study Area, including seven species of mysticetes, twelve species of odontocetes, and four species of phocids.

Individual species maps are provided in Appendix D and use data from the Ocean Biogeographic Information System (OBIS). This dataset combines marine mammal data from a variety of sources including but not limited to the following:

- Bureau of Land Management (BLM) Cetacean and Turtle Assessment Program (CETAP);
- Canadian Wildlife Services – Environment Canada (CWS-EC) Eastern Canada Seabirds at Sea (ECSAS), which includes records of opportunistic marine mammal sightings;
- Programme Intégré de recherches sur les oiseaux pélagiques (PIROP) surveys in the Northwest Atlantic (1965 to 1992), which includes records of opportunistic marine mammal sightings;
- DFO Maritimes Region Cetacean Sightings; and
- United States (US) National Oceanic and Atmospheric Administration (NOAA) Northeast Fisheries Science Center (NEFSC) surveys.

Table 4.27 Marine Mammals with Potential to Occur in the Study Area

Common Name	Scientific Name	SARA Status[1]	COSEWIC Designation	Potential for Occurrence in the Study Area[2]	Timing of Presence
***Mysticetes* (Toothless or Baleen Whales)**					
Blue whale (Atlantic population)	*Balaenoptera musculus*	Endangered (Schedule 1)	Endangered	Low	Year- round (highest concentrations from June to September)
Fin whale (Atlantic Population)	*Balaenoptera physalus*	Special Concern (Schedule 1)	Special Concern	High	Year- round (highest concentrations from June to October)
Humpback whale (Western North Atlantic population)	*Megaptera novaeangliae*	Not Listed (Special Concern on Schedule 3)	Not at Risk	High	Year- round (highest concentration in summer)
Minke whale (North Atlantic subspecies)	*Balaenoptera acutorostrata acutorostrata*	Not Listed	Not at Risk	High	Year- round (highest concentration from May to October)
North Atlantic right whale	*Eubalaena glacialis*	Endangered (Schedule 1)	Endangered	Low	May to September
Sei whale (Atlantic population)	*Balaenoptera borealis*	Not Listed	Data Deficient	Low to Moderate	May to September
***Odontocetes* (Toothed Whales)**					
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	Not Listed	Not at Risk	Moderate to High	Year- round (highest concentration from June to October)
Bottlenose dolphin	*Tursiops truncatus*	Not Listed	Not at Risk	Low	May to September
Harbour porpoise (Northwest Atlantic subspecies)	*Phocoena phocoena phocoena*	Not Listed (Threatened on Schedule 2)	Special Concern	Low	Year- round (highest concentration from May to October)
Killer whale (Northwest Atlantic/Eastern Arcticpopulation)	*Orcinus orca*	Not Listed	Special Concern	Low	Year- round (highest concentration from June to October)
Long-finned pilot whale	*Globicephala melas*	Not Listed	Not at Risk	High	Year-round

Common Name	Scientific Name	SARA Status[1]	COSEWIC Designation	Potential for Occurrence in the Study Area[2]	Timing of Presence
Northern bottlenose whale (1: 2: Davis Strait-Baffin Bay-Labrador Sea population)	*Hyperoodon ampullatus*	2: Not Listed	2: Special Concern	Low	Year-round
Risso's Dolphin	*Grampus griseus*	Not Listed	Not at Risk	Low	Year-round
Sowerby's beaked whale	*Mesoplodon bidens*	Special Concern (Schedule 1)	Special Concern	Low	Year-round
Short-beaked common dolphin	*Delphinus delphis*	Not Listed	Not at Risk	High	July to October
Sperm whale	*Physeter macrocephalus*	Not Listed	Not at Risk	Low	Year- round (highest concentration from June to October)
Striped dolphin	*Stenella coeruleoalba*	Not Listed	Not at Risk	Low	July to October
White-beaked dolphin	*Lagenorhynchus albirostris*	Not Listed	Not at Risk	Moderate to High	Year- round (highest concentration from June to October)
Phocids (Seals)					
Grey Seal	*Halichoerus grypus*	Not Listed	Not at Risk	Low to Moderate	February to March
Harbour Seal (Atlantic subspecies)	*Phoca vitulina ssp. concolor*	Not Listed	Not at Risk	Low	Year-round
Harp Seal	*Pagophilus groenlandicus*	Not Listed	Not at Risk	Moderate to High	December to June
Hooded Seal	*Cystophora cristata*	Not Listed	Not at Risk	Low to Moderate	December to April

Sources: Modified from Husky Energy 2012a and BP 2016
Notes:

1. The *Species at Risk Act* establishes Schedule 1 as the official list of wildlife species at risk. However, note that while Schedule 1 lists species that are extirpated, endangered, and threatened, the prohibitions do not apply to SOCC or those on Schedule 2 or 3 regardless of status.
2. This qualitative characterization is based on expert opinion, and an analysis of understood habitat preferences across life-history stages, available distribution mapping, and sightings data for each species within the Study Area.

Data have been collected from various sources over the years, including sightings from fishing and whaling in the 1960s and 1970s, opportunistic observer programs on fishing vessels, and scientific expeditions by DFO, non-governmental organizations, and Dalhousie University research teams. While the figures found in Appendix D may provide some insight into the long-term presence, distribution, and hotspots of occurrence for these species, they should not be used to predict animal presence or assume expected occurrence patterns. Survey efforts were not consistent across the pooled studies or across the represented geographical area, and a lack of sightings does not necessarily represent a lack of species presence in an area. The data presented have been collected from external organizations and have not undergone comprehensive quality control as part of this EIS.

Over the last two decades there have been several studies of marine mammal sightings within the Study Area. Wiese and Montevecchi (1999) recorded 34 sightings of 282 marine mammal individuals during six round-trip surveys aboard a supply vessel travelling from St. John's to Jeanne d'Arc Basin. The majority of sightings were of humpback whales (11 sightings totaling 13 individuals). There were also sightings of minke and fin whales (eight and seven sightings, respectively). Most small cetacean sightings were of Atlantic white-sided dolphins (seven sightings totaling 250 individuals). There was also a sighting of three killer whales recorded on August 24, 1999. Lang and Moulton (2004, in Husky Energy 2012a) reported 20 sightings of marine mammals during a June to July 2004 research cruise from the southern Grand Banks, around Orphan Basin, and across the northern Grand Banks; long-finned pilot whale was the most frequently sighted species (six sightings), although there were also several sightings of unidentified baleen whales and dolphins, as well as Atlantic white-sided dolphin and fin whale. In the adjacent Orphan Basin, several years of monitoring during seismic and controlled source electromagnetic (CSEM) surveys during 2004 to 2008 have also yielded hundreds of sightings of marine mammals.

Orphan Basin has much greater water depths than Jeanne d'Arc Basin and different species have been more frequently encountered in the Orphan Basin. For example, deep-diving sperm whale, northern bottlenose whale and Sowerby's beaked whale were identified on several occasions in the Orphan Basin, and there have also been sightings of blue whale, bottlenose dolphin and striped dolphin in the Orphan Basin (Moulton et al. 2005, 2006a, Abgrall et al. 2008b, in Husky Energy 2012a).

4.2.5.1 Mysticetes (Baleen Whales)

Nearly all species of baleen whales were depleted during commercial whaling; but, some populations, including North Atlantic humpback whales, are showing signs of recovery (IWC 2016). All the species of baleen whales occurring in eastern Newfoundland presumably migrate to lower latitudes during winter months, although a small number of animals appear to remain in Newfoundland waters year-round. Most baleen whales arrive in the nearshore waters in late spring or early summer and the more abundant species remain until September or October (Figure 4-28). They feed primarily on capelin, but also feed on krill, squid, herring, and sand lance. The whales follow the migration of capelin and are common around inshore Newfoundland during

the summer. Most whales have moved offshore and have begun to migrate south by late October (Lien 1985, in Husky Energy 2012a).

During the summer of 2007, DFO conducted a large-scale aerial survey of marine megafauna in the Canadian waters of the Northwest Atlantic Ocean as a component of the larger Trans North Atlantic Sighting Survey (TNASS), which extends from the US to the UK. The Canadian portion of the survey covered the Labrador Shelf, Grand Banks, Gulf of St. Lawrence, and Scotian Shelf, thus providing full coverage of the Atlantic Canadian coast. The most commonly sighted species during the Newfoundland portion of this survey was the humpback whale, followed by fin and minke whales (Lawson and Gosselin 2009). It was noted that few small cetaceans were sighted in the Newfoundland and Labrador strata despite good sighting conditions and considerable survey effort. This lack of sightings may have stemmed from the late arrival of cetaceans in the Newfoundland and Labrador region in 2007, as reported by fisheries officers, fishers and tour operators, and the fact that more marine mammal sightings were recorded in later months of the survey (Lawson and Gosselin 2009).

Six species of baleen whales may occur in the Study Area, three of which are listed under Schedule 1 of SARA (blue whale, fin whale, and North Atlantic right whale) (Table 4.28); these species at risk are discussed further in Section 4.2.5.4 with life history summaries provided in Appendix D.

4.2.5.2 Odontocetes (Toothed Whales)

Twelve species of toothed whales may occur in the Study Area (Figure 4-29), four of which are listed under Schedule 1 of SARA and/or are listed by COSEWIC (harbour porpoise, killer whale, northern bottlenose whale (including a potential new population in the Sackville Spur region of the Study Area (Sierra Club Canada 2016)), and Sowerby's beaked whale); these species at risk and SOCC are discussed further in Section 4.2.5.4 with life history summaries provided in Appendix D. Species of toothed whales are expected to occur within the Study Area year-round, with abundances generally higher during summer months, June to October (Table 4.28).

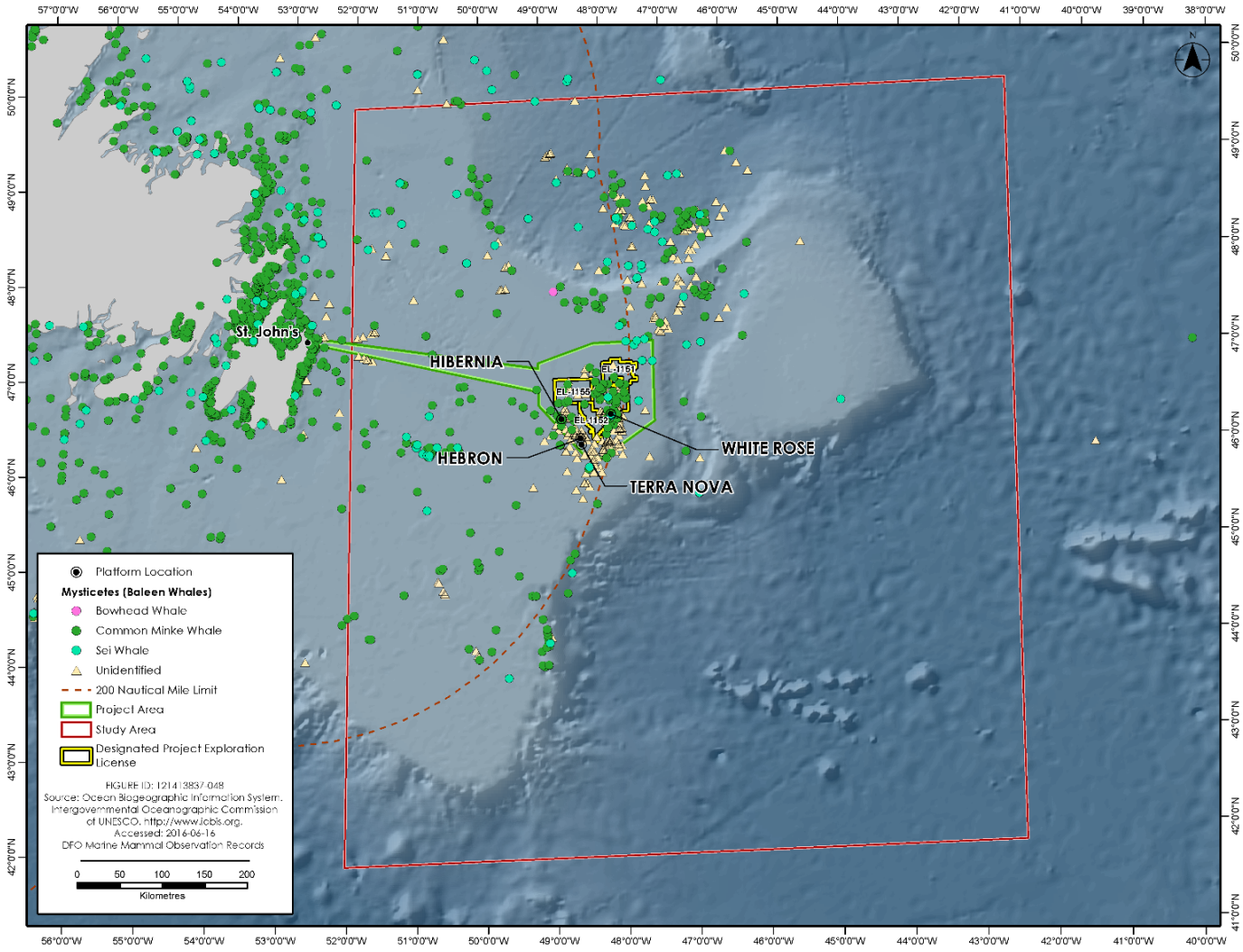


Figure 4-28 Mysticete Sightings in the Study Area (2004 to 2014)

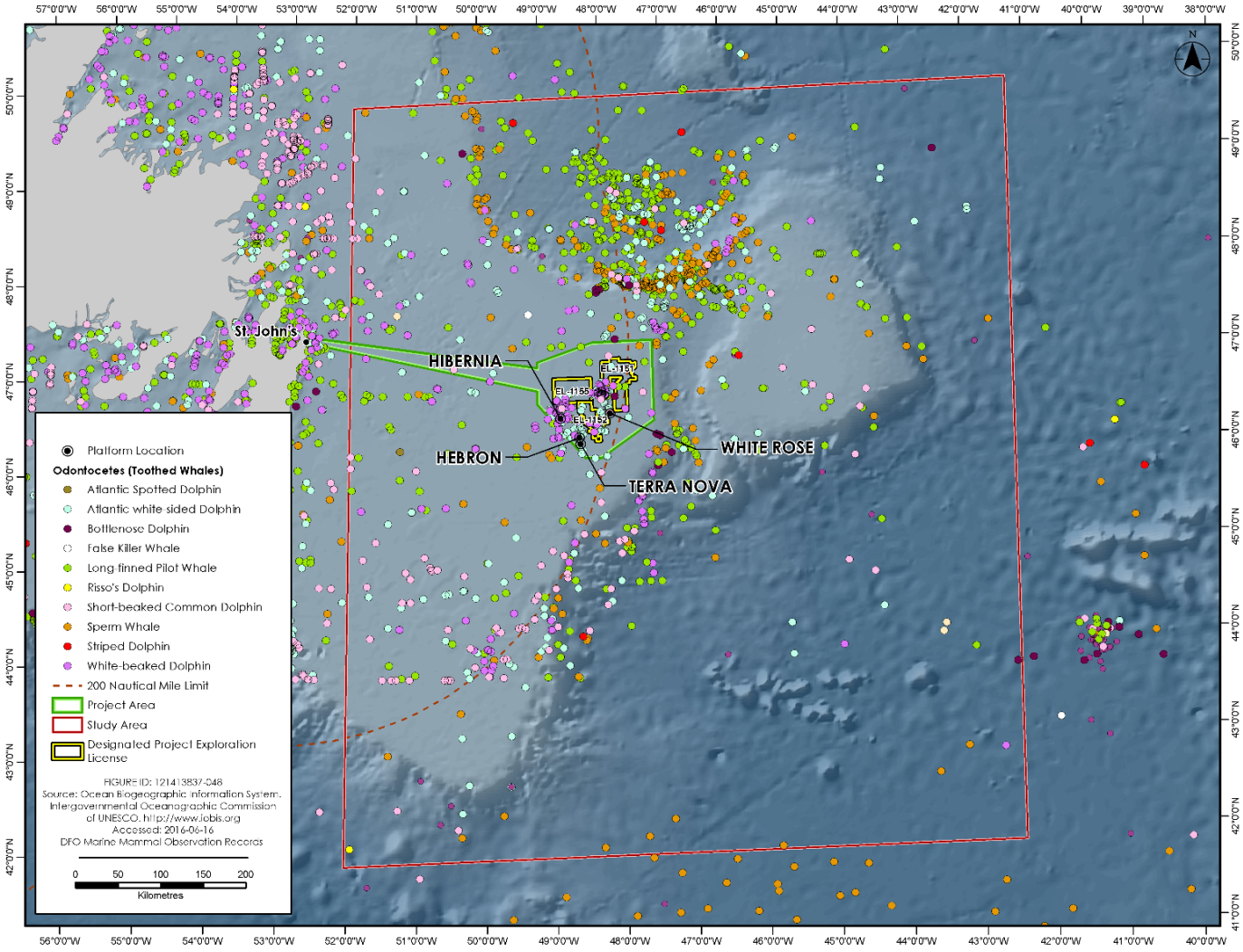


Figure 4-29 Odontocete Sightings in the Study Area (2004 to 2014)

Table 4.28 Marine Mammals Species at Risk or of Conservation Concern with Potential to Occur in the Study Area

Common Name	Scientific Name	SARA Schedule 1 Status	COSEWIC Designation	Potential for Occurrence in the StudyArea[2]	Timing of Presence
***Mysticetes* (Toothless or Baleen Whales)**					
Blue whale (Atlantic population)	*Balaenoptera musculus*	Endangered	Endangered	Low	Year- round (highest concentrations from June to September)
Fin whale (Atlantic Population)	*Balaenoptera physalus*	Special Concern	Special Concern	High	Year- round (highest concentrations from June to October)
North Atlantic right whale	*Eubalaena glacialis*	Endangered	Endangered	Low	May to September
***Odontocetes* (Toothed Whales)**					
Harbour porpoise (Northwest Atlantic subspecies)	*Phocoena phocoena*	Not Listed	Special Concern	Low	Year- round (highest concentration from May to October)
Killer whale (Northwest Atlantic/Eastern Arctic population)	*Orcinus orca*	Not Listed	Special Concern	Low	Year- round (highest concentration from June to October)
Northern bottlenose whale (1: Scotian Shelf population/ 2: Davis Strait-Baffin Bay-Labrador Sea population)	*Hyperoodon ampullatus*	1: Endangered 2: Not Listed	1: Endangered 2: Special Concern	High	Year-round
Sowerby's beaked whale	*Mesoplodon bidens*	Special Concern	Special Concern	Low	Year-round
***Phocids* (Seals)**					
None Listed					

Sources: Modified from Husky Energy 2012a and BP 2016
Notes:

1. The *Species at Risk Act* establishes Schedule 1 as the official list of wildlife species at risk. However, note that while Schedule 1 lists species that are extirpated, endangered, threatened and of special concern, the prohibitions do not apply to SOCC or those on Schedule 2 or 3 regardless of status.
2. This qualitative characterization is based on expert opinion, and an analysis of understood habitat preferences across life-history stages, available distribution mapping, and sightings data for each species within the Study Area.

4.2.5.3 Phocids

Four species of seals may occur in the Study Area (Table 4.28). Several fish species (primarily cod, capelin, sand lance and halibut) and invertebrates (generally squid and shrimp) are consumed by seals, but diets can vary considerably across seasons, years, seal species, and geographic regions (Hammill and Stenson 2000). Life history summaries are provided in Appendix D.

Harp and hooded seals generally migrate from Arctic waters to the Grand Banks area in late fall to feed, before moving to more inshore/coastal icepack to pup and breed (March). Migration back to Arctic waters begins in early spring (April/May) (Park et al. 2011). Grey seals generally overwinter inshore, migrating offshore in late winter (February/March). These two species represent the bulk of seal population within Newfoundland waters. (Hammill et al. 1999). Harbour seals are most commonly observed along the coast of Newfoundland. A relatively sedentary species, adults generally remain within 20 miles (32 km) during their life (Frost 1997). Based on the populations distribution and sedentary life, there is a very low potential for interaction with the offshore component of the Project.

4.2.5.4 Marine Mammal Species at Risk and Species of Conservation Concern

Marine mammal species at risk/SOCC are limited to those that are listed as *endangered*, *threatened*, or of *special concern* under Schedule 1 of SARA or by COSEWIC. There are seven marine mammal at risk and SOCC species that may be present in the Study Area (Table 4.28). Figure 4-30 shows the locations of marine mammal SOCC sightings in the Study Area from 2004 to 2014. Life history summaries are provided in Appendix D. Species at risk were identified as those species with a potential occurrence in the Study Area and listed under Schedule 1 of SARA as endangered or threatened. SARA establishes Schedule 1 as the official list of wildlife species at risk and affords protection to all species listed as extirpated, endangered, or threatened. Once listed, measures to protect and recover a listed wildlife species are implemented.

Seven species at risk or SOCC may occur in the Study Area: blue whale; fin whale; North Atlantic right whale; harbor porpoise; killer whale; northern bottlenose whale and Sowerby's beaked whale. At the time of writing, recovery strategies were available for blue whale (Beauchamp et al. 2009), fin whale (DFO 2016a), the North Atlantic right whale (DFO 2014a), northern bottlenose whale (DFO 2016a) and Sowerby's beaked whale (DFO 2016b). A discussion of these recovery strategies is provided in Appendix D.

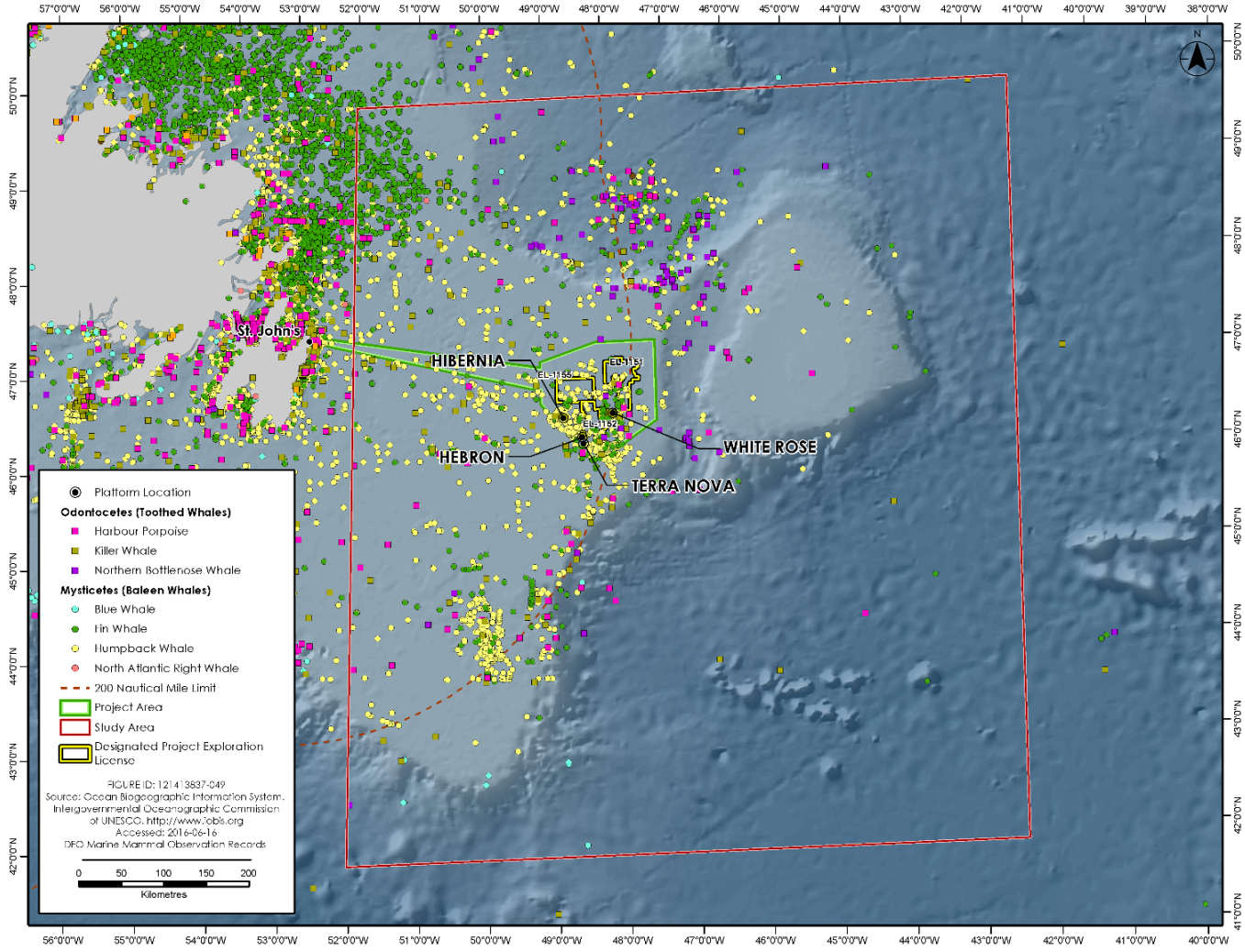


Figure 4-30 Sightings of Marine Mammal Species of Conservation Concern in the Study Area (2004 to 2014)

4.2.6 Sea Turtles

Three species of sea turtles may be found migrating and foraging within the Study Area (Table 4.29), with the endangered leatherback sea turtle the most likely to occur. Both leatherback and loggerhead sea turtles are seen with some regularity off Newfoundland in summer and fall (Goff and Lien 1988; Witzell 1999; Ledwell and Huntington 2009, in Husky Energy 2012a). Less is known about the distribution of Kemp's ridley sea turtle in eastern Canada, but it is considered rare.

Table 4.29 Sea Turtle Species with Potential to Occur in the Study Area

Common Name	Scientific Name	SARA Status	COSEWIC Designation	Potential Occurrence in Study Area[1]	Timing of Presence
Leatherback sea turtle[2]	*Dermochelys coriacea*	Endangered (Schedule 1)	Endangered	Moderate	June to November
Loggerhead sea turtle	*Caretta caretta*	Endangered (Schedule 1)	Endangered	Low	June to October
Kemp's ridley turtle	*Lepidochelys kempii*	Not Listed	Not Listed	Low	June to October

Source: Modified from Husky Energy 2012a and BP 2016
Note:

1. This qualitative characterization is based on expert opinion, and an analysis of habitat preferences across life-history stages, available distribution mapping, and sightings data for each species within the Study Area.
2. An order proposing amendments to Schedule 1 has been prepared but not yet approved. Once approved, this order would separate the Leatherback into two populations and include leatherback under Schedule 1. As of December 2016, this table is current as presented.

Figure 4-31 depicts sea turtle sightings recorded in the Study Area from 2004 to 2014. Life history summaries are provided in Appendix D.

Two of the three species of sea turtles that may occur in the Study Area (Table 4.29) are listed under Schedule 1 of SARA and by COSEWIC (leatherback sea turtle and loggerhead sea turtle). Life history summaries are provided in Appendix D.

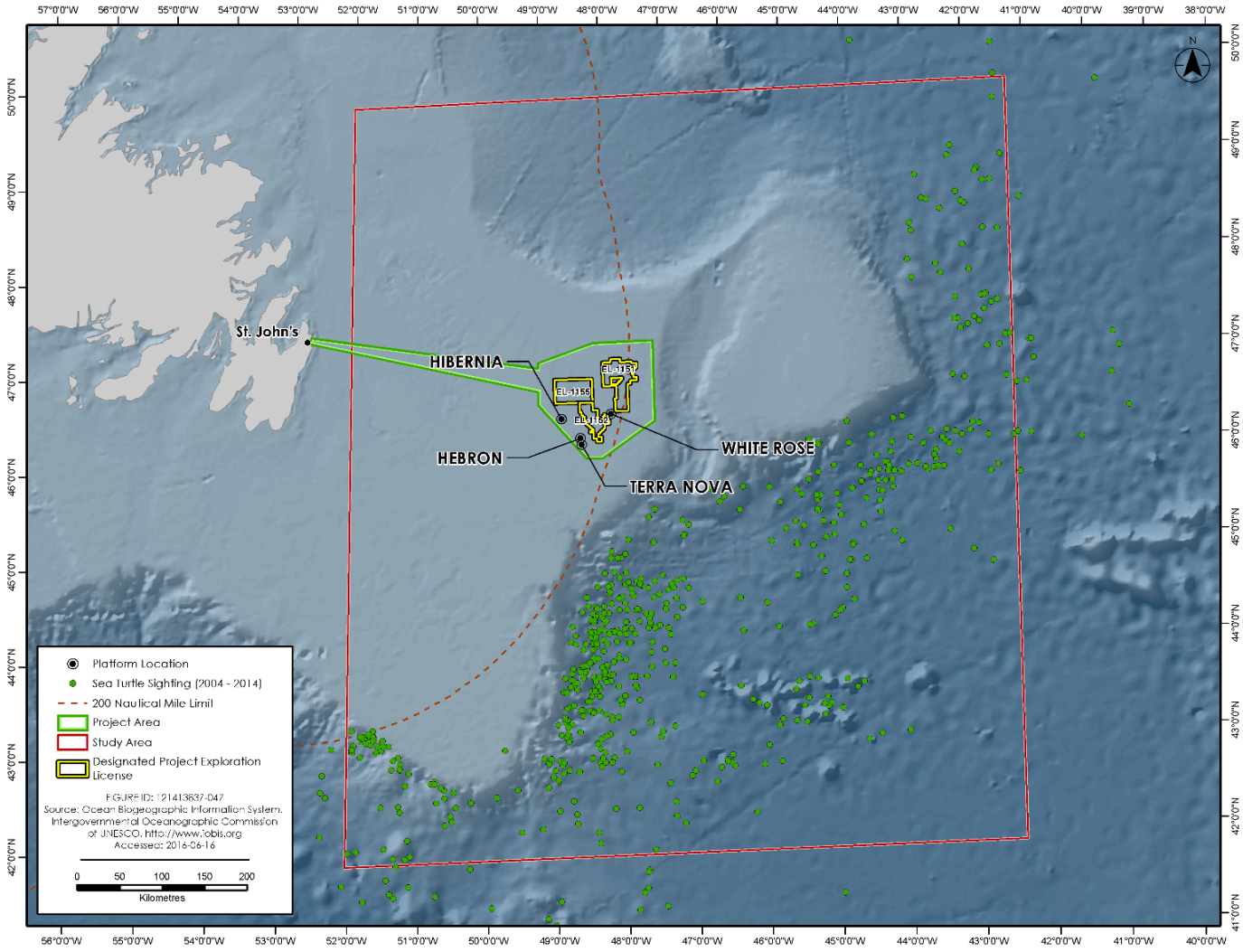


Figure 4-31 Sea Turtle Sightings in the Study Area (2004 to 2014)

The leatherback sea turtle is the largest and most widely distributed of all marine turtles. In the Northwest Atlantic, they can be found in both the shelf and offshore slope waters as well as in the Gulf of St. Lawrence (COSEWIC 2012f, in BP 2016). Data comprised of satellite tracking studies and sighting information indicate that the species is present in Atlantic Canadian waters from April to December with the highest densities from July to September. Generally, the species distribution shifts from the southwest to the northeast as the foraging period progresses (COSEWIC 2012f, in BP 2016). The species can be found in relatively high densities in the shelf waters off Cape Breton Island, off the south coast of Newfoundland, the southern Gulf of St. Lawrence, as well as in offshore slope waters including the Northeast Channel (LGL 2014). The Atlantic population of the leatherback turtle is cautiously considered stable containing approximately 15,000 females (Government of Canada 2016). There is a draft recovery strategy for leatherback sea turtle (DFO 2015b).

Loggerhead sea turtles migrate to Atlantic Canadian waters during the spring months and return south for the winter. They are known to breed as far north as Virginia with the largest breeding colony in North America in Florida (COSEWIC 2010e, in BP 2016). Recent findings have determined that not all loggerheads leave the area during the winter months. Telemetry data have shown that some sea turtles move east and northeast during the winter (COSEWIC 2010e, in BP 2016). Based on observations, loggerhead sea turtles are found mostly within the 20°C to 25°C water temperature contours with loggerheads absent when temperatures were below 15°C (Brazner and McMillan 2008, in Husky Energy 2012a). Generally, they are associated with the warm waters of the Gulf Stream in Atlantic Canada and are common off the Scotian Shelf, Georges Bank, and the Grand Banks from July through October (Brazner and McMillan 2008, in Husky Energy 2012a).

4.2.7 Migratory Birds

4.2.7.1 Introduction

This section describes the presence, distribution, and seasonal abundance of migratory birds in association with the waters off eastern Newfoundland. Emphases are given to summarizing the occurrences of marine birds in association with offshore waters of the Study Area but information on the nearshore and coastal environment is also provided. Descriptions of migratory bird species at risk and other SOCC are provided in Section 4.2.7.5.

4.2.7.2 Data Sources

Information on the distribution and abundance of marine birds in association with the waters off eastern Newfoundland was primarily obtained from the PIROP and ECSAS databases (EC-CWS 2016). Seabird observations within these databases are from ship-based surveys and mapped per season (see Appendix D), including spring (March, April, and May), summer (June, July, and August), fall (September, October, and November), and winter (December, January, and February). Data from the ECSAS (2006 to February 2016) and PIROP (years 1966 to 1992) were integrated into common maps, despite variances in the survey methods, to convey information on the relative distribution and abundance of seabirds. Species were either mapped individually

or combined into guilds or taxonomic groups depending on their abundance and distribution in the Study Area. Individually mapped species included dovekie, northern fulmar, northern gannet, and black-legged kittiwake. Guilds and taxonomic groups were used to convey patterns for other species and included cormorants, gulls (other than black-legged kittiwake), jaegers, phalaropes, murres, other alcids (i.e., other than dovekie and murres), shearwaters, skuas, storm-petrels, terns, and waterfowl. Information on the spatial distribution and timing of PIROP and ECSAS survey effort is provided in Figure 4-32. As illustrated by Table 4.30, survey effort varies with season and more effort has been directed at certain locations in the waters off eastern Newfoundland than others. ECSAS and PIROP survey effort has been relatively lower in winter compared to summer, spring, and fall. Waters on the continental shelf have received more survey effort than those associated with the abyssal plain (Figure 4-32).

Additional information on the densities of seabirds in association with the Newfoundland and Labrador Shelves was obtained from Fifield et al. (2009), which presents results from a 3.5-year offshore seabird monitoring program. This program was intended to assess seabird abundance and distribution in areas of eastern Canada with oil industry activity. Data from Fifield et al. (2009) were collected as part of the larger ECSAS initiative, which used distance sampling methods to account for varying seabird detectability. Most of the surveys were conducted from either oil industry supply ships or DFO research/fishery patrol vessels with a small number of surveys conducted from ferries, cargo vessels, seismic ships, or sailboats (Fifield et al. 2009). Although data from this study is encompassed in the larger ECSAS database, it has been referenced here to provide a comparison between the Newfoundland and Labrador Shelves to other waters of the Northeast (particularly the Scotian Shelf and the Gulf of St. Lawrence). Unlike the data that were summarized by Fifield et al. (2009), ECSAS data obtained from EC-CWS cannot be used to calculate densities because they have not been corrected for detectability.

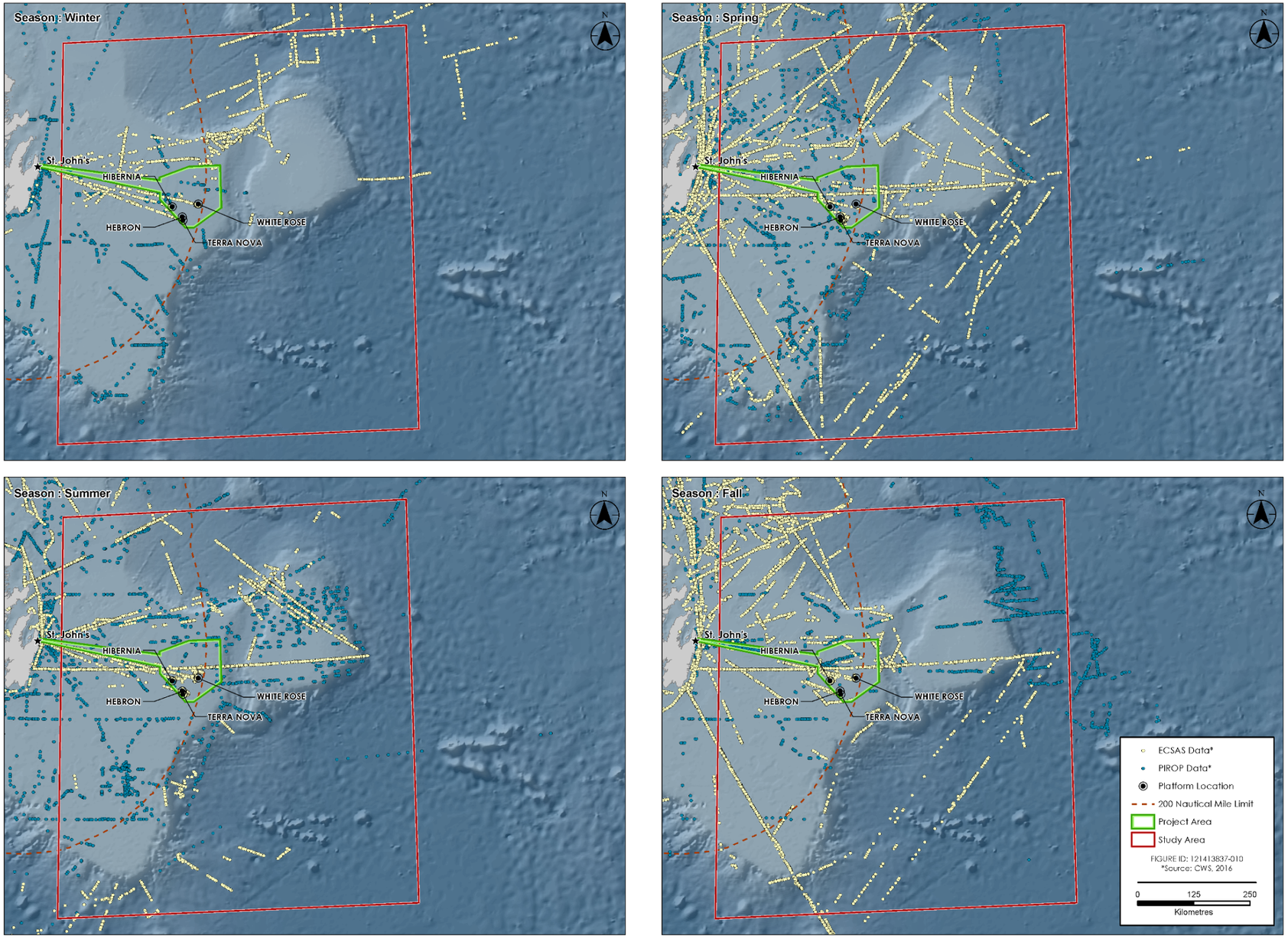


Figure 4-32 Seasonal ECSAS and PIROP Survey Effort on the Grand Banks

Table 4.30 Birds of the Eastern Newfoundland Offshore Area and Adjacent Coast[1]

Common Name	Species Name	SARA Schedule 1	COSEWIC	NL ESA	Potential to Occur in Study Area[2]
Pelagic Seabirds					
Northern Fulmar	*Fulmarus glacialis*	-	-	-	Likely
Cory's Shearwater	*Calonectris diomedea borealis*	-	-	-	Likely
Great Shearwater	*Puffinus gravis*	-	-	-	Likely
Sooty Shearwater	*Puffinus griseus*	-	-	-	Likely
Manx Shearwater	*Puffinus puffinus*	-	-	-	Likely
Wilson's Storm-Petrel	*Oceanites oceanicus*	-	-	-	Likely
Leach's Storm-Petrel	*Oceanodroma leucorhoa*	-	-	-	Likely
Northern Gannet	*Morus bassanus*	-	-	-	Likely
Pomarine Jaeger	*Stercorarius pomarinus*	-	-	-	Likely
Parasitic Jaeger	*Stercorarius parasiticus*	-	-	-	Likely
Long-tailed Jaeger	*Stercorarius longicaudus*	-	-	-	Likely
Great Skua	*Stercorarius skua*	-	-	-	Likely
South Polar Skua	*Stercorarius maccormicki*	-	-	-	Likely
Black-legged Kittiwake	*Rissa tridactyla*	-	-	-	Likely
Dovekie	*Alle alle*	-	-	-	Likely
Common Murre	*Uria aalge*	-	-	-	Likely
Thick-Billed Murre	*Uria lomvia*	-	-	-	Likely
Razorbill	*Alca torda*	-	-	-	Likely
Atlantic Puffin	*Fratercula arctica*	-	-	-	Likely
Neritic Seabirds					
Great Cormorant	*Phalacrocorax carbo*	-	-	-	Unlikely
Double-Crested Cormorant	*Phalacrocorax auritus*	-	-	-	Unlikely
Black-headed Gull	*Larus ridibundus*	-	-	-	Unlikely
Bonaparte's Gull	*Larus philadelphia*	-	-	-	Unlikely
Ring-billed Gull	*Larus delawarensis*	-	-	-	Likely
Herring Gull	*Larus argentatus*	-	-	-	Likely
Iceland Gull	*Larus glaucoides*	-	-	-	Likely
Glaucous Gull	*Larus hyperboreus*	-	-	-	Likely
Great Black-backed Gull	*Larus marinus*	-	-	-	Likely
Lesser Black-backed Gull	*Larus fuscus*	-	-	-	Likely

Common Name	Species Name	SARA Schedule 1	COSEWIC	NL ESA	Potential to Occur in Study Area[2]
Laughing Gull	*Leucophaeus atricilla*	-	-	-	Likely
Sabine's Gull	*Xema sabini*	-	-	-	Likely
Ivory Gull	*Pagophila eburnea*	Endangered	Endangered	Endangered	Likely
Caspian Tern	*Hydroprogne caspia*	-	-	-	Likely
Common Tern	*Sterna hirundo*	-	-	-	Likely
Arctic Tern	*Sterna paradisaea*	-	-	-	Likely
Black Guillemot	*Cepphus grylle*	-	-	-	Likely
Waterfowl, Loons, and Grebes					
Red-throated Loon	*Gavia stellata*	-	-	-	Unlikely
Common Loon	*Gavia immer*	-	-	-	Unlikely
Pied-billed Grebe	*Podilymbus podiceps*	-	-	-	Unlikely
Canada Goose	*Branta canadensis*	-	-	-	Unlikely
American Green-winged Teal	*Anas crecca*	-	-	-	Unlikely
American Black Duck	*Anas rubripes*	-	-	-	Unlikely
Mallard	*Anas platyrhynchos*	-	-	-	Unlikely
Blue-winged Teal	*Anas discors*	-	-	-	Unlikely
Northern Shoveler	*Anas clypeata*	-	-	-	Unlikely
American Wigeon	*Anas americana*	-	-	-	Unlikely
Ring-necked Duck	*Aythya collaris*	-	-	-	Unlikely
Greater Scaup	*Aythya marila*	-	-	-	Unlikely
Lesser Scaup	*Aythya affinis*	-	-	-	Unlikely
Common Eider	*Somateria mollissima*	-	-	-	Unlikely
Harlequin Duck	*Histrionicus histrionicus*	Special Concern	Special Concern	Vulnerable	Unlikely
Long-tailed Duck	*Clangula hyemalis*	-	-	-	Unlikely
Black Scoter	*Melanitta nigra*	-	-	-	Unlikely
Surf Scoter	*Melanitta perspicillata*	-	-	-	Unlikely
White-winged Scoter	*Melanitta fusca*	-	-	-	Unlikely
Common Goldeneye	*Bucephala clangula*	-	-	-	Unlikely
Barrows Goldeneye	*Bucephala islandica*	Special Concern	Special Concern	Vulnerable	Unlikely
Bufflehead	*Bucephala albeola*	-	-	-	Unlikely
Common Merganser	*Mergus merganser*				Unlikely
Red-breasted Merganser	*Mergus serrator*	-	-	-	Unlikely
Shorebirds					
Black-bellied Plover	*Pluvialis squatarola*	-	-	-	Unlikely
American Golden-Plover	*Pluvialis dominica*	-	-	-	Unlikely

Common Name	Species Name	SARA Schedule 1	COSEWIC	NL ESA	Potential to Occur in Study Area[2]
Semipalmated Plover	*Charadrius semipalmatus*	-	-	-	Unlikely
Piping Plover (*melodus* subspecies)	*Charadrius melodus melodus*	Endangered	Endangered	Endangered	Unlikely
Killdeer	*Charadrius vociferus*	-	-	-	Unlikely
Greater Yellowlegs	*Tringa melanoleuca*	-	-	-	Unlikely
Lesser Yellowlegs	*Tringa flavipes*	-	-	-	Unlikely
Willet	*Tringa semipalmata*	-	-	-	Unlikely
Hudsonian Godwit	*Limosa haemastica*	-	-	-	Unlikely
Spotted Sandpiper	*Actitis macularius*	-	-	-	Unlikely
Hudsonian Whimbrel	*Numenius phaeopus*	-	-	-	Unlikely
Ruddy Turnstone	*Arenaria interpres*	-	-	-	Unlikely
Red Knot rufa ssp.	*Calidris canutus rufa*	Endangered	Endangered	Endangered	Unlikely
Sanderling	*Calidris alba*	-	-	-	Unlikely
Semipalmated Sandpiper	*Calidris pusilla*	-	-	-	Unlikely
Least Sandpiper	*Calidris minutilla*	-	-	-	Unlikely
White-rumped Sandpiper	*Calidris fuscicollis*	-	-	-	Unlikely
Pectoral Sandpiper	*Calidris melanotos*	-	-	-	Unlikely
Purple Sandpiper	*Calidris maritima*	-	-	-	Unlikely
Dunlin	*Calidris alpina*	-	-	-	Unlikely
Buff-breasted Sandpiper	*Tryngites subruficollis*	-	Special Concern	-	Unlikely
Short-billed Dowitcher	*Limnodromus griseus*	-	-	-	Unlikely
Red-necked Phalarope	*Phalaropus lobatus*	-	Special Concern	-	Likely
Red Phalarope	*Phalaropus fulicarius*	-	-	-	Likely
Landbird SOCC[3]					
Short-eared Owl	*Asio flammeus*	Special Concern	Special Concern	Vulnerable	Potential during nocturnal migration
Peregrine Falcon	*Falco perigrinus anatum/tundrius*	Special Concern	Special Concern	Vulnerable	
Bank Swallow	*Riparia riparia*	-	Threatened	-	
Gray-cheeked Thrush	*Catharus minimus*	-	-	Vulnerable	
Olive-sided Flycatcher	*Contopus cooperi*	Threatened	Threatened	Threatened	
Bobolink	*Dolichonyx oryzivorus*	-	Threatened	-	

Common Name	Species Name	SARA Schedule 1	COSEWIC	NL ESA	Potential to Occur in Study Area[2]
Notes: 1 Excludes rare transients/vagrants, except for SOCC that are known to occasionally occur (e.g., Buff-breasted Sandpiper). 2 Spatial boundaries of the Study Area are shown in Figure 2-1; potential occurrence considers known spatial and temporal use of the waters near the Study Area; Unlikely: generally restricted to coastline and nearshore waters; Likely: regular occurrence in offshore waters and may be expected to occur in the Study Area during the breeding season (i.e., for feeding), migration, and/or overwintering. 3 Following Amec (2014), landbird SOCC are listed if they are known to migrate over the offshore area, except those that migrate during the day because these are unlikely to become disoriented by marine artificial lighting.					

Additional information on migratory birds was also obtained regarding the Eastern Newfoundland Offshore Area SEA (Amec 2014) and references therein, including:

- Information on the locations of seabird colonies off Eastern Newfoundland and the types and abundances of species they support from the Canadian Wildlife Service (EC-CWS 2013).
- Data on seasonal and spatial trends in seabird abundance from the ECSAS program from 2010 to 2013 (ECSAS 2013) and on the seasonal trends in abundance for offshore seabirds from 2006 to 2009 from the Offshore Seabird Monitoring Program (Fifield et al. 2009).
- Information on Important Bird Areas (IBA 2013).
- Information from the Wildlife Division and the Parks and Natural Areas Division of the Newfoundland and Labrador Department of Environment and Conservation on the presence of Species at Risk in coastal habitats of Eastern Newfoundland.
- Information on additional sightings of rare species from the e-Bird database (e-Bird 2013).

Additional sources of information used for this assessment include the environmental assessment for the White Rose project (Husky Energy 2012a), the Shelburne Basin Venture Exploration Drilling Project Environmental Impact Statement (Shell 2014), and other publicly available documents.

4.2.7.3 Seasonal Distribution and Abundance of Marine Birds

In the following sections and Appendix D, migratory bird species are either discussed individually or combined into guilds or taxonomic groups depending on their abundance and distribution in the Eastern Newfoundland Offshore Area. Discussion of the distribution and abundance of seabird observations made during ship-based surveys is considered with respect to the locations of large colonies, with more detailed information on the location of colonies and the types and abundances of species they support provided in Section 4.2.7.4. Figures showing the seasonal distribution and abundance of marine birds are provided in Appendix D. For this assessment, migratory birds are arranged into four groups: 1) seabirds (including both pelagic and neritic species), 2) waterfowl (including loons and grebes), 3) shorebirds, and 4) landbirds (Table 4.30).

4.2.7.3.1 Seabirds

Throughout the year large numbers of breeding marine birds and millions of migrating birds from the southern hemisphere and northeastern Atlantic can be found in the waters off eastern Newfoundland (Brown 1986; Lock et al. 1994; Gjerdrum et al. 2008, 2012). The waters off eastern Newfoundland support a diverse seabird assemblage that includes cormorants, gannets, phalaropes, gulls, terns, alcids (auks), jaegers, skuas, fulmars, petrels and shearwaters. Seabirds may be classified as either pelagic or neritic depending on the time and activities they spend at sea compared to land. Pelagic seabirds are marine species, feeding and resting at sea and only coming to land to breed, usually on rocky cliffs and islands. There are approximately 19 species of pelagic seabirds that occur in offshore waters of eastern Newfoundland (Table 4.30), including shearwaters, storm-petrels, gannets, jaegars, skuas, kittiwakes, dovekie, murres, and other alcids. Neritic seabirds typically feed in shallow coastal waters and return to land to rest at night. Some neritic species, such as terns and gulls, have the potential to be found in offshore areas of eastern Newfoundland, including the *endangered* ivory gull. Most neritic seabirds are more commonly found in coastal waters and therefore are infrequent visitors of the Study Area. The presence of these species is highest in summer because some, such as terns, migrate to more southern areas for the winter.

The distribution of seabirds tends to be concentrated at shelf edges and areas where currents mix which create productive environments (Husky Energy 2012a). For example, the food resources of the Grand Banks support many locally breeding birds which nest along the coast of southeastern Newfoundland and forage in more offshore waters during and after the nesting season. Seabirds require more than a single year to become sexually mature and many of the non-breeding juvenile seabirds, especially northern fulmar and black-legged kittiwake, are present on the Grand Banks year-round (Husky Energy 2012a). Less information is available about the occurrence of birds in the deeper waters away from the shelf and slope, such as in the southeastern portion of the Study Area. However, such habitats are typically less productive and support fewer numbers and varieties of seabirds than the shelf and slope (Husky Energy 2012a).

Seabird diversity peaks during the spring and summer when northern hemisphere breeders have returned to their breeding grounds and southern hemisphere breeders have returned from their winter breeding season to spend the summer in more northern waters (Fifield et al. 2009). During the summer, species assemblages are dominated by shearwaters, storm-petrels, northern fulmars, and gulls (Fifield et al. 2009) while significant numbers of overwintering alcids, gulls, and northern fulmars can be found in Atlantic Canadian waters during the fall and winter (Brown 1986). Additional information on the seasonal distribution and abundances of seabirds is provided in the following sections.

4.2.7.3.2 Spring

According to Fifield et al. (2009), the highest densities of seabirds on the Newfoundland and Labrador Shelves occur in spring (Table 4.31). During this time, seabird densities in waters off eastern Newfoundland are considerably greater than on either the Scotian Shelf - Gulf of Maine or the Gulf of St. Lawrence (Table 4.31). Data from Fifield et al. (2009) indicate that murres are particularly abundant in the spring, followed by northern fulmars, large gulls, black-legged kittiwakes, dovekies, and other alcids (Table 4.31). ECSAS and PIROP data obtained for the Project indicate that particularly high concentrations of great shearwater, northern fulmar, and dovekie have been recorded in the Study Area during spring. Other abundant species include Leach's storm-petrel, murres, black-legged kittiwake, and herring gull. The diversity and abundance of species observed at this time of year reflects the lingering presence of species overwintering on the Newfoundland and Labrador Shelves but which breed in more northern areas (e.g., dovekie), the presence of species that breed in the South Atlantic but migrate to the North Atlantic during the austral winter (e.g., great shearwater), and the return of those that breed in the area (e.g., Leach's storm-petrel).

4.2.7.3.3 Summer

Seabirds are present throughout the waters off eastern Newfoundland during the summer months and are often encountered in relatively high abundance. Data from Fifield et al. (2009) suggest that the abundance of seabirds on the Newfoundland and Labrador Shelves is higher in summer than in waters of the Scotian Shelf - Gulf of Maine or the Gulf of St. Lawrence (Table 4.31). The majority of the global population of Great Shearwater migrates to the Grand Banks and eastern Newfoundland to moult and feed during summer months after nesting in the Southern Hemisphere (Husky Energy 2012a). PIROP and ECSAS datasets indicate that great shearwater is the most abundant species in waters of the Study Area during the summer months. Data also indicate that Northern fulmar and storm-petrels are relatively abundant, in addition to lesser numbers of sooty shearwater, black-legged kittiwake, Atlantic puffin, and common murre. The offshore distribution of birds that breed in nearby areas during summer months (e.g., Leach's storm-petrel) is restricted as they become central-place foragers while attending nests and chicks. At-sea observations in the Study Area are not necessarily indicative of species' abundance within the broader region at this time. The highest densities and diversity of marine birds are found from July to September (Brown 1986; Lock et al. 1994). During this period, non-breeding, summering species (e.g., great shearwater) are joined by post-breeding, local nesters and their fledglings that have moved offshore from nesting colonies (e.g., Leach's storm-petrel and black-legged kittiwake).

Table 4.31 Seasonal Weighted Median (and range) of Seabird Densities (birds/km²) in each of the Marine Ecoregions of Atlantic Canada (from Fifield et al. 2009)

Species	Season	Scotian Shelf - Gulf of Maine	Gulf of St. Lawrence	Newfoundland and Labrador Shelves
All Seabirds	Spring	7.92 (0.68 to 25.37)	3.10 (0.37 to 4.52)	14.30 (1.89 to 31.77)
	Summer	8.30 (1.73 to 148.56)	5.27 (2.21 to 14.31)	11.51 (0.34 to 48.78)
	Fall	4.23 (0.97 to 21.18)	11.57 (7.41 to 12.11)	9.24 (0 to 46.73)
	Winter	7.67 (4.39 to 29.44)	-	9.53 (2.31 to 45.12)
Northern Fulmars	Spring	0.75 (0 to 4.24)	1.19 (0 to 1.61)	1.00 (0 to 22.44)
	Summer	0.15 (0 to 1.64)	0.64 (0 to 4.19)	0.48 (0 to 24.17)
	Fall	0.30 (0 to 3.31)	0.27 (0.17 to 0.39)	0.65 (0 to 7.59)
	Winter	1.08 (0 to 12.37)	-	1.91 (0 to 36.77)
Shearwaters	Spring	0 (0 to 0.46)	0 (0 to 0)	0 (0 to 6.30)
	Summer	1.78 (0.29 to 84.02)	0.24 (0 to 0.87)	0.12 (0 to 16.39)
	Fall	2.20 (0 to 18.40)	5.06 (0.20 to 8.27)	0.80 (0 to 31.57)
	Winter	0 (0 to 3.74)	-	0 (0 to 7.20)
Storm-Petrels	Spring	0 (0 to 1.36)	0.12 (0 to 0.12)	0.08 (0 to 6.66)
	Summer	0.78 (0 to 12.74)	0 (0 to 0.21)	0.17 (0 to 8.46)
	Fall	0.02 (0 to 1.47)	0 (0 to 0)	0.26 (0 to 4.41)
	Winter	0 (0 to 0)	-	0 (0 to 0.04)
Northern Gannets	Spring	0.40 (0 to 1.03)	0.94 (0 to - 0.94)	0 (0 to 2.75)
	Summer	0 (0 to 1.69)	0.42 (0 to 1.37)	0 (0 to 3.31)
	Fall	0.19 (0 to 2.83)	2.42 (0.88 to 2.42)	0 (0 to 0.83)
	Winter	0.04 (0 to 0.22)	-	0 (0 to 0)
Large Gulls	Spring	1.22 (0 to 21.33)	0.34 (0 to 0.64)	0.74 (0 to 23.43)
	Summer	0.08 (0 to 8.39)	0.40 (0.16 to 1.70)	0.16 (0 to 9.38)
	Fall	0.58 (0 to 2.86)	0.93 (0.28 to 0.93)	0.13 (0 to 4.51)
	Winter	0.62 (0 to 2.31)	-	0.95 (0 to 20.83)
Black-legged Kittiwakes	Spring	0.06 (0 to 3.74)	0.50 (0 to 0.50)	0.72 (0 to 7.06)
	Summer	0 (0 to 0.76)	0.14 (0 to 2.34)	0.38 (0 to 7.87)
	Fall	0.11 (0 to 1.39)	0.79 (0.15 to 5.81)	0.05 (0 to 14.81)
	Winter	1.96 (0 to 21.31)	-	2.45 (0 to 19.93)
Dovekies	Spring	0.71 (0 to 36.98)	0 (0 to 0)	0.59 (0 to 32.10)
	Summer	0 (0 to 2.68)	0 (0 to 0.25)	0.18 (0 to 47.62)
	Fall	0 (0 to 0.25)	0.10 (0.10 to 4.37)	0.20 (0 to 35.76)
	Winter	2.13 (0 to 10.93)	-	0.93 (0 to 11.20)

Species	Season	Scotian Shelf - Gulf of Maine	Gulf of St. Lawrence	Newfoundland and Labrador Shelves
Murres	Spring	0.88 (0 to 4.37)	0.74 (0 to 2.33)	3.73 (0 to 12.49)
	Summer	0.06 (0 to 2.60)	0.65 (0 to 4.62)	1.79 (0 to 46.57)
	Fall	0 (0 to 0.14)	0 (0 to 0.11)	0.07 (0 to 11.59)
	Winter	0.61 (0 to 7.71)	-	3.05 (0 to 15.21)
Other Alcids	Spring	0.14 (0 to 1.53)	0.20 (0 to 0.20)	0.25 (0 to 9.36)
	Summer	0.04 (0 to 0.91)	0.11 (0 to 4.03)	0.13 (0 to 13.06)
	Fall	0.05 (0 to 0.65)	0.04 (0.04 to 1.12)	0 (0 to 3.16)
	Winter	0.37 (0 to 4.69)	-	0.36 (0 to 3.45)
Source: Modified from Shell 2014				

4.2.7.3.4 Fall

Seabird concentrations in waters off eastern Newfoundland during the fall are lower than during spring and summer months but comparable to winter (Table 4.31). Data from Fifield et al. (2009) indicate that seabird concentrations on the Newfoundland and Labrador Shelves during fall months are greater than that on the Scotian Shelf but less than that of the Gulf of St. Lawrence (Table 4.31). The species and abundances of seabirds observed in offshore waters of eastern Newfoundland during fall reflect migrating species, the departure of adults and newly fledged young from local seabird colony sites, and an influx of wintering species. ECSAS and PIROP data indicate that the most abundant species during the fall are black-legged kittiwake and northern fulmar; dovekie, great shearwater, and murres are also relatively abundant. Data from Fifield et al. (2009) indicate that shearwaters and northern fulmars are the most abundant seabirds on the Newfoundland and Labrador Shelves at this time of year, followed by storm-petrels and dovekies (Table 4.31).

4.2.7.3.5 Winter

Although data indicate that seabird concentrations off eastern Newfoundland are lower during winter months compared to spring and summer, the area supports hundreds of thousands of birds during this season, including those that migrate to the area from the Arctic and subarctic of eastern Canada and from Greenland (Husky Energy 2012a). The waters of eastern Newfoundland support relatively high concentrations of seabirds during winter compared to other eastern Canadian waters. Data from Fifield et al. (2009) indicate that seabird concentrations on the Newfoundland and Labrador Shelves during winter are higher than those on the Scotian Shelf (Table 4.31). Murres, black-legged kittiwakes, and northern fulmars are the most abundant species at this time of year; but, large gulls, dovekies, and other alcids are also common (Table 4.31). PIROP and ECSAS data obtained for the Project indicate that relatively high concentrations of black-legged kittiwake are present in the Study Area during the winter, along with the northern fulmar, dovekie, murres, and great black-backed gull. The diversity and abundance of species found in waters off eastern Newfoundland between December and February primarily reflects the overwintering presence of birds that migrate to the region from more northern latitudes and the presence of year-round residents.

4.2.7.3.6 Waterfowl (including loons, and grebes)

Waterfowl may be broadly categorized as dabbling ducks (primarily inland breeders) and diving ducks (most of which are considered "sea ducks" as they spend much of the non-breeding season at sea). Although loons and grebes are technically not waterfowl, they have similar life histories and are therefore included here for this assessment. There are approximately 24 species of waterfowl, loons, and grebes that regularly occur in association with coastal waters of eastern Newfoundland including harlequin duck and barrows goldeneye, both of which are designated as *special concern* under SARA and as *vulnerable* under the Newfoundland and Labrador *Endangered Species Act* (NL ESA) (Table 4.31).

A variety of waterfowl, loons, and grebes are present in the waters of eastern Newfoundland throughout the year, but they are likely to be infrequent visitors to the Study Area. Sea ducks (particularly scoters, common eider, and long-tailed duck are the most abundant waterfowl recorded in the Study Area during PIROP and ECSAS surveys, with most records being from the fall (Figure 31 in Appendix D). Waterfowl generally nest near fresh water, except for eiders which nest on coastal islands where fresh water is available and raise their broods in coastal waters. Outside of the breeding season, seaducks are typically found in coastal waters, over reefs and banks where benthic prey is accessible. They often occur in large flocks ("rafts") in coastal waters from autumn to spring (Lock et al. 1994). The waters associated with the Witless Bay Islands are particularly important for sea ducks during fall and large wintering congregations of up to 25,000 eiders can be seen between the Cape Freels coastline and nearby Wadham Islands (Amec 2014). Other major wintering areas for Common Eider and other sea ducks include Grates Point, Cape St. Francis, Mistaken Point, Cape St. Mary's, and Placentia Bay (Amec 2014).

4.2.7.3.7 Shorebirds

Many shorebirds nest in wetland or upland habitats and use coastal stopover sites for feeding and resting during migration. However, species such as willet and piping plover raise their young in coastal environments. Most shorebirds forage along coastal beaches, exposed mud flats or salt marshes during migration, with high concentrations of birds often occurring in association with sites that provide an abundant food source. The exception is the purple sandpiper that primarily uses exposed rocky shorelines during migration and overwintering. Stopover sites can be crucial to the survival of shorebird species as they provide important energy reserves that are necessary for undertaking long, uninterrupted flights (COSEWIC 2007). Unlike other shorebirds with coastal associations, phalaropes typically forage offshore in areas where upwelling brings plankton to the surface. There are approximately 24 species of shorebirds that regularly occur in association with the waters off eastern Newfoundland. These include red knot and piping plover, both of which are listed as *Endangered* at the provincial and federal levels, as well as buff-breasted sandpiper and red-necked phalarope, which are listed as species of *special concern* by COSEWIC (Table 4.31).

4.2.7.3.8 Landbirds

Landbirds may occur in the marine environment during migration and can occur in coastal areas at any time of the year. Six landbird species at risk/SOCC have been identified that have potential to migrate over offshore waters during nighttime: short-eared owl, peregrine falcon, bank swallow, gray-cheeked thrush, olive-sided flycatcher, and bobolink. Additional landbird species at risk are present in eastern Newfoundland (e.g., red crossbill *percna* subspecies); however, following the approach taken by Amec (2014) these species are not included in Table 4.31 because they do not migrate over offshore waters, or they migrate during the day and are therefore unlikely to be vulnerable to disorientation from marine artificial lighting.

4.2.7.4 Significant Areas of Bird Habitat

While marine birds can be found throughout the waters of eastern Newfoundland, certain areas are of importance and support relatively high abundances. In the marine environment, birds are often associated with areas with upwelling and where mixing of water regularly occurs, such as the shelf edge. Many coastal areas support colonies of breeding seabirds and some bays provide important overwintering and migration habitat. Although the coastline of eastern Newfoundland is outside the Study Area used for this assessment, there are several areas that are known to provide important habitat for marine birds along the coastline, including Important Bird Areas (IBAs), designated seabird reserves, and colonies of marine birds (Figure 4-33). These areas are discussed in the following sections.

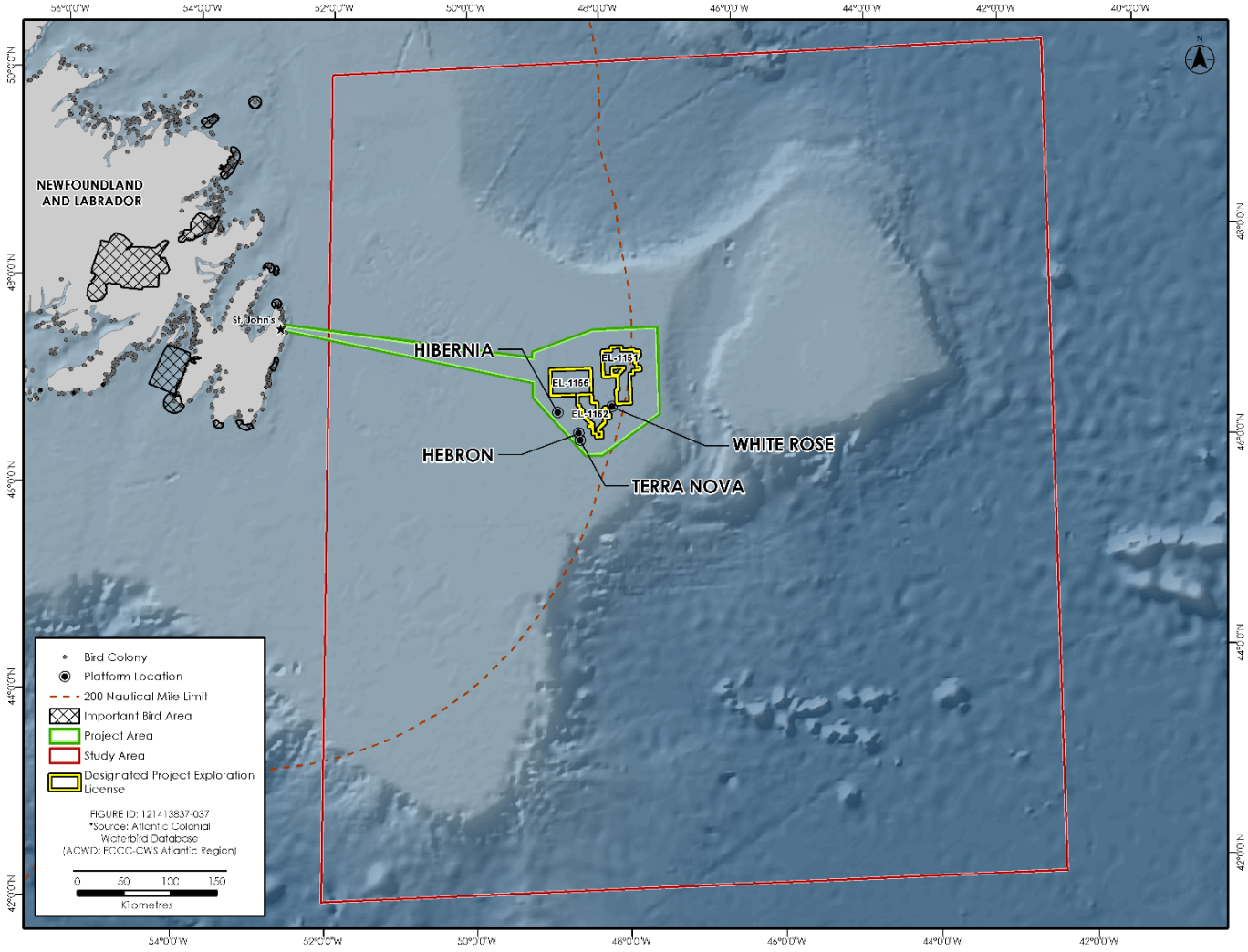


Figure 4-33 Important Bird Areas and Seabird Colony Locations

4.2.7.4.1 Important Bird Areas

IBAs are discrete areas that support nationally or globally important groups of birds. The IBA program is coordinated by BirdLife International and administered in Canada by the Canadian Nature Federation and Bird Studies Canada (IBA 2013). The criteria used to identify important habitat are internationally standardized and are based on the presence of species at risk, species with restricted range, habitats holding representative species assemblages, or a congregation of a significant proportion of a species' population during one or more season (IBA 2013). IBAs are not legally protected but are often found within areas that have been designated as protected areas by federal or provincial authorities. Although there are a total of 17 IBA sites associated with eastern Newfoundland (Figure 4-34, Table 4.32); none of these are located in the offshore environment or overlap with the Study Area.

Table 4.32 Important Bird Areas in Eastern Newfoundland

IBA Name	Description and Significance
Funk Island (NF004)	Located approximately 60 km from shore in Northeastern Newfoundland, and with an area of 135.18 m², Funk Island supports a very large concentration of nesting seabirds, including a globally significant common murre population, as well as large numbers of northern gannets. Funk Island is also a provincially protected Seabird Ecological Reserve, and access to the island is restricted to persons conducting approved scientific research.
Wadham Islands and adjacent Marine Area (NF013)	Located 40 km from shore (15 km from Fogo Island), the Wadham Islands are composed of 7 main islands and several smaller rocks and shoals within a 159.23 km² area. This IBA supports a globally significant number of wintering Common Eiders (approximately 25,000 were recorded in a 1995 survey). Many seabirds nest on the Wadham Islands, including large numbers of Atlantic puffin, Leach's storm-petrel and razorbill.
Cape Freels Coastline and Cabot Island (NF025)	Located at the head of Bonavista Bay and including several small islands and shoals offshore, this 334.48 km² IBA supports a large number of nesting common murres, and a few pairs of razorbills. Atlantic puffins have been reported as breeding here in the past, although none were recorded in recent EC-CWS surveys. As well, up to 25,000 wintering Common Eiders have been reported in the waters between the Cape Freels coastline and Wadham Islands.
Terra Nova National Park (NF017)	This large park (655.56 km²) is situated on the inner reaches of Bonavista Bay. Much of the area is forested, but there are numerous lakes and wetlands, and a significant coastal component. The Park supports numerous forest species, including two subspecies with restricted ranges: the federally-listed red crossbill (*percna ssp*.) and ovenbird (*furvoir ssp*.). Shorebirds can be seen on the flats at the outlet of Big Brook, as well as Newman Sound. These areas are also frequented by gulls and waterfowl. At least six tern colonies, totaling between 1,000 and 1,500 pairs, are known in the park; these colonies include both common and Arctic terns.
Grates Point (NF019)	This IBA, on the northern tip of the Bay de Verde Peninsula separating Trinity Bay from Conception Bay, has an area of 66.55 km² and supports a large number of wintering common eiders; typically around 2,800 individuals, although as many as 12,000 have been recorded. Other species frequenting this IBA in the winter include black-legged kittiwake, thick-billed murre and dovekie. In the summer months, Atlantic puffin and northern gannet are found in the area.

IBA Name	Description and Significance
Baccalieu Island (NF003)	Located 5.5 km from the northern tip of the Avalon Peninsula, this IBA has an area of 45.22 km² and, like Funk Island, is a provincially designated Seabird Ecological Reserve. Baccalieu Island has the greatest seabird abundance and diversity in Eastern North America and supports the largest known population of Leach's storm-petrels in the world, comprising 70% of the North American population. Significant breeding populations of Atlantic puffin, black-legged kittiwake and northern gannet also occur here, as well as smaller numbers of common murre, thick-billed murre, razorbill, black guillemot, northern fulmar, herring gull, and great black-backed gull.
Cape St. Francis (NF021)	Located on the Avalon Peninsula at its northern tip, and with an area of 70.21 km², this IBA is a known congregating area for common eiders in the winters, with up to 5,000 individuals recorded. Purple sandpipers regularly occur along the rocky shoreline in the wintertime.
Quidi Vidi Lake (NF022)	This lake is situated within the St. John's city limits and is fed by the Virginia River and Rennies River. The IBA has an area of 7.0 km². From late fall to early spring, the lake is important as a daytime resting site for gulls, including significant numbers of herring, great black-backed, Iceland, glaucous and common black-headed gulls. Ring-billed, mew and lesser black-backed gulls have also been recorded on occasion. Waterfowl including American black ducks, mallards and northern pintails are common here in the winter, subsisting on food handouts from people.
Witless Bay Islands (NF002)	This IBA, which has a total area of 62.08 km² and includes four small islands off the east coast of the Avalon Peninsula, is also a provincially designated Seabird Ecological Reserve. These islands support a globally significant colony of breeding seabirds, including more than half of the eastern North American population of Atlantic puffins, as well as large numbers of Leach's storm-petrels, common murres, black-legged kittiwakes and herring gulls. Great black-back gulls, northern fulmars, thick-billed murres, razorbills and black guillemots also nest in smaller numbers. Most of the colonies are located on Great Island, Gull Island, and Green Island. The smaller Pee Pee Island hosts small colonies of herring gull and great black-backed gull, along with a small number of Atlantic puffins. During the fall migration, the surrounding marine area is important to sea ducks including white-winged scoter, surf scoter, long-tailed duck, and common eider.
Mistaken Point (NF024)	Located near the southeastern corner of the Avalon Peninsula, Mistaken Point has an area of 102.77 km² and is a provincially designated Ecological Reserve because of its rich fossil deposits. This IBA is an important wintering area for common eiders, with as many as 12,000 birds recorded. This area is also important for wintering shorebirds including the purple sandpiper which occurs here in significant numbers, and small numbers of ruddy turnstone that overwinter regularly at this site, far north of its usual wintering range. Black-legged kittiwake, common murre and razorbill breed at Mistaken Point.
Cape St. Mary's (NF001)	This IBA, also a provincial Seabird Ecological Reserve, has an area of 329.39 km² and is located at the entrance to Placentia Bay on the southwestern Avalon Peninsula. Significant numbers of northern gannet, common murre and black-legged kittiwake nest here, as well as smaller populations of thick-billed murre, razorbill, great cormorant, and double-crested cormorant. Herring gull, great black-backed gull and black guillemot have also been reported nesting at Cape St. Mary's. In the winter, large numbers of migrating sea ducks occur here, including scoters, common eider, long-tailed duck, and the eastern population of harlequin duck (SARA: *special concern*).

IBA Name	Description and Significance
Placentia Bay (NF028)	This IBA, including the eastern half of Placentia Bay between the Avalon and Burin peninsulas in southeastern Newfoundland and extending out 25 km from shore, has a total area of 1398.05 km². It is an exceptional feeding area for seabirds during the summer capelin spawning season. More than 100,000 shearwaters have been recorded during a survey, consisting of mostly great and sooty shearwater, with smaller numbers of manx shearwater. Large numbers of other species breeding in nearby Cape St. Mary's feed here, including northern gannet, black-legged kittiwake, Atlantic puffin, thick-billed murre and common murre. Pomarine and parasitic jaegers may also be found in large numbers, kleptoparasitizing foraging kittiwakes. In the winter, more than 1,000 common eiders regularly congregate in the area.
Cape Pine and St. Shotts Barren (NF015)	Located on the southern tip of the Avalon Peninsula, this 57.4 km² IBA attracts large, possibly globally significant numbers of American golden-plover during their fall migration (August to mid-October). Dozens of whimbrel are also seen during fall migration.
Corbin Island (NF030)	Located at the southeast corner of the Burin Peninsula, this 5.25 km² IBA supports a colony of an estimated 100,000 Leach's storm-petrels. Historically, colonies of herring gull, great black-backed gull, black guillemot, and black-legged kittiwake have also been reported.
Middle Lawn Island (NF031)	Off the southern tip of the Burin Peninsula, Middle Lawn Island is a small, rugged island within the 4.17 km² IBA. This island supports the largest, and one of the few, known colonies of manx shearwaters in North America. As many as 100 pairs have been reported breeding on the island, with another 300 non-breeding individuals estimated to occur. Large numbers of Leach's Storm Petrels breed on the island, and nesting black guillemot, herring gull and great black-backed gull have been reported. Middle Lawn Island is part of the Lawn Islands Archipelago, which is a provisional Seabird Ecological Reserve.
Green Island (NF032)	Located midway between the Burin Peninsula and the French islands of St. Pierre and Miquelon, this IBA has an area of 5.61 km². It supports a large colony of Leach's storm-petrels. Common and Arctic terns have been reported breeding on this island, as well as very small numbers of herring gull. Spotted sandpipers have been reported on the island during the summer months. While not confirmed, manx shearwaters and black guillemots are suspected to breed on the island.
Bay du Nord Wilderness Reserve and Middle Ridge Wildlife Reserve (NF018)	This large (3804.04 km²) IBA is composed of two large inland reserves in southeastern Newfoundland. It is an upland plateau with extensive barrens, heaths and wetlands, supporting several species of breeding waterfowl including Canada goose, American black duck, green-winged teal, common goldeneye and common merganser. There is evidence that the eastern population of harlequin duck (SARA: *special concern*). May breed on Bay du Nord River. The Newfoundland (*welchii*) subspecies of rock ptarmigan, which is a restricted-range species, is believed to breed in small numbers in this IBA.
Source: Adopted from Amec (2014); Sources: Important Bird Areas of Canada (IBA 2013); Atlantic Canada Colonial Waterbird database (EC-CWS 2013)	

4.2.7.4.2 Wilderness and Ecological Reserves

Although not within the boundaries of the Study Area, four designated Seabird Ecological Reserves occur along the coast of eastern Newfoundland: Witless Bay, Baccalieu Island, Cape St. Mary's, and Funk Island. All these areas have also been identified as IBAs. The Lawn Islands Archipelago (which includes Middle Lawn Island) was named as a provisional Seabird Ecological Reserve in 2009 and has been provided interim protection until the site assessment process has been completed (Government of Newfoundland and Labrador 2009, in Amec 2014). The provincial Seabird Ecological Reserve Regulations prohibit or limit industrial development and other activities that can cause disturbance to breeding seabirds, including limitations on hiking, boat traffic and low-flying aircraft near the colonies during the breeding season, and prohibition of ATVs at all times (Amec 2014).

4.2.7.4.3 Migratory Bird Colonies

The eastern coast of Newfoundland supports several important seabird colonies. The locations and abundances of species associated with the larger seabird colonies are available in Figure 4-34 and Table 4.33, respectively; but additional smaller colonies also occur along the eastern coast of Newfoundland. Many of the seabird colonies are located on islands but some species nest on inaccessible mainland cliffs or on sandy beaches and peninsulas. Some species arrive at the colonies as early as February (black-legged kittiwakes) and March (northern gannet), and egg-laying commences in mid to late May and into June. The young of most species depart the colony by July to August, and as late as November for Northern Gannets (Amec 2014). Seabirds occurring in the region are generally long-lived with low fecundity, delayed recruitment, and low rates of population growth (Amec 2014).

4.2.7.4.4 Other Areas

Several Ecologically and Biologically Significant Areas (EBSAs) have also been identified within the Placentia Bay Grand Banks Large Ocean Management Area. Among the criteria for selection and ranking of these important areas was their importance to marine bird and mammal biodiversity, density and importance to reproduction and survival. A discussion of key relevant characteristics of EBSAs that were identified as possessing important attributes to marine mammals and birds is provided in Section 4.2.9; for seabirds, these are primarily important offshore feeding areas.

Table 4.33 Important Seabird Colonies in Eastern Newfoundland

Nesting Areas and Important Bird Areas[1]	Fulmars and Shearwaters		Storm-Petrels	Gannet	Alcids (Auks)					Gulls				Terns
	Northern Fulmar	Manx Shearwater	Leach's Storm-petrel	Northern Gannet	Common Murre	Thick- billed Murre	Razorbill	Black Guillemot[2]	Atlantic Puffin	Herring Gull	Great Black-backed Gull	Ring- billed Gull	Black- legged Kittiwake	Common and Arctic Terns[3]
Storehouse Islets			100							1 -100[3]	1 -100[3]			48
Little Fogo Islands			38,000		15		265	290	12,015	506	67		110	
Funk Island	85			9,043	470,000	250	200		2,000	150	75		100	
Small Island, Wadham Island			1,038				273		6,190		1 -100[3]			
Coleman Island			5,000				10		950		1 -100[3]	101 -500[3]		85
Pigeon Island (NDB)									120					28
Ladle Island			20							1 -100[3]	1 -100[3]			
Penguin Island, South			7,800						1,500	101 -500[3]	101 -500[3]			80
Cabot Island, South					10,000		4			1 -100[3]	1 -100[3]			
Pound Island			1,000							101 -500[3]	101 -500[3]			
Shag Islands			1,700											200
Little Denier Island			1,300						1,000	1 -100[3]	1 -100[3]		101 -500[3]	
Copper Island			10							1 -100[3]	1 -100[3]			
Green Island, Trinity Bay									1,277	>1000[3]	1 -100[3]	101 -500[3]		
Cape Bonavista									120					

Nesting Areas and Important Bird Areas[1]	Fulmars and Shearwaters		Storm-Petrels	Gannet	Alcids (Auks)					Gulls				Terns
	Northern Fulmar	Manx Shearwater	Leach's Storm-petrel	Northern Gannet	Common Murre	Thick- billed Murre	Razorbill	Black Guillemot[2]	Atlantic Puffin	Herring Gull	Great Black-backed Gull	Ring- billed Gull	Black- legged Kittiwake	Common and Arctic Terns[3]
Spillars Point									250				501-1000[3]	
North Bird Island									1,000	101 -500[3]			1 – 100[3]	
Elliston Point Island									400	101 -500[3]				
Bird, South			50						1,000	101 -500[3]	1 -100[3]		1 -100[3]	
Duck Island, Trinity Bay									3,000	101 -500[3]				
Baccalieu Island	13		4,623,911	2,157	1,440	73	1,500	143	75,000	180	9		5,096	
Flatrock													1,644	
Torbay													115	
Freshwater Bay													2,747	
Gull Island, Witless Bay	7		170,000		3,496		294	2	140,429	1,881	33		4,530	
Green Island, Witless Bay	1		20		250,000	242	170		9,300	100	20		2,188	
Pee Pee Island, Witless Bay									1,850	present	present			
Great Island, Witless Bay	10		134,000		4,656		117	3	174,500	1,640	28		6,710	
Ship Island	10									101 -500[3]	1 -100[3]			
The Drook									50					
Mistaken Point					84		72						4,170	
Cape Pine Head					9		189		259				575	
Western Head					27		7							

Nesting Areas and Important Bird Areas[1]	Fulmars and Shearwaters		Storm-Petrels	Gannet	Alcids (Auks)					Gulls				Terns
	Northern Fulmar	Manx Shearwater	Leach's Storm-petrel	Northern Gannet	Common Murre	Thick- billed Murre	Razorbill	Black Guillemot[2]	Atlantic Puffin	Herring Gull	Great Black-backed Gull	Ring- billed Gull	Black- legged Kittiwake	Common and Arctic Terns[3]
Cape St. Mary's	9			14,696	15,484	1,000	100						10,000	
Iron Island			10,000							101 -500[3]	1 -100[3]			
Corbin Island			100,000							1 -100[3]				
Swale Island			88											
Middle Lawn Island		13	8,773							1 -100[3]				
Lawn Island, Offer			224							1 -100[3]	1 -100[3]			
Green Island, Fortune Bay			103,833											
Brunette Island (north of Harbour Breton)							50			1 -100[3]	1 -100[3]			
Pass Island			100								1 -100[3]		1 -100[3]	

Notes:
1. Adopted from Amec (2014); original data obtained from the Atlantic Canada Colonial Waterbird database maintained by Environment Canada - Canadian Wildlife Service (EC-CWS 2013), unless otherwise noted.

2. Black Guillemot numbers are likely to be underestimates due to the loose colony distribution and solitary nature of the species.

3. Data obtained from Thomas et al. (2011, in Amec 2014). These numbers are reported as individual birds, not breeding pairs. Common and Arctic Terns are combined, as the two species cannot be reliably distinguished from aerial surveys.

4.2.7.5 Species at Risk and Species of Conservation Concern

Several species at risk and other SOCC are known to occur in association with waters off eastern Newfoundland for breeding, migration, and overwintering purposes; but only Ivory Gull and Red-necked Phalarope are considered likely to occur within the offshore waters of the Study Area (Table 4.34). Other marine bird species at risk and SOCC associated with eastern Newfoundland are restricted to coastal habitats and nearshore waters and are unlikely to occur in the Study Area (i.e., harlequin duck, barrows goldeneye, piping plover, red knot, and buff-breasted sandpiper). Six landbird species at risk/SOCC have potential to migrate over offshore waters during nighttime: short-eared owl, peregrine falcon, bank swallow, gray-cheeked thrush, olive-sided flycatcher, and bobolink. Additional landbird species at risk are present in eastern Newfoundland (e.g., red crossbill percna subspecies (*Loxia curvirostra percna*)); but, following the approach taken by Amec (2014), these species are not included here because they do not migrate over offshore waters, or they migrate during the day and are therefore unlikely to be vulnerable to disorientation from marine artificial lighting. Information on the status and life history requirements of ivory gull and red-necked phalarope are provided in Appendix D.

Although the assessment is focused on species designated under the federal SARA and provincial *Endangered Species Act* that are likely to frequent the waters off eastern Newfoundland, it is recognized that SOCC not assessed by COSEWIC or protected under federal or provincial legislation may be present in the Project Area. This potentially includes the Bermuda petrel (*Pterodroma cahaw*) and white-tailed tropicbird (*Phaethon lepturus*), which are listed by International Union for Conservation of Nature (IUCN). The Bermuda petrel is listed as "Endangered" by IUCN and nests exclusively in Bermuda, with a population of 142 mature adults (BirdLife International 2016). They are thought to move north into the Atlantic following the warm waters on the western edges of the Gulf Stream in the non-breeding season and may occur within the Project Area. Recent IUCN assessment considers the white-tailed tropicbird as a species of "Least Concern" and are considered widespread and abundant (BirdLife International 2017). The Bermudan population of the white-tailed tropicbird is the largest in the Atlantic, with approximately 3,500 breeding pairs, typically found over pelagic waters and the coast in the tropics and subtropics (BirdLife International 2017) but has been reported in the Project Area in the fall and winter months (Mejías et al. 2017). Four additional marine-associated bird species classified on the IUCN Red List of Threatened Species as "Vulnerable" are known to occur in the Study Area; the long-tailed duck, black-legged kittiwake, Atlantic puffin, and Leach's storm-petrel; colonies of these species are listed in Table 4.33.

Table 4.34 Bird Species at Risk and Species of Conservation Concern of the Eastern Newfoundland Offshore Area and Adjacent Coast

Common Name	Species Name	SARA Schedule 1	COSEWIC	NL ESA	Potential to Occur in Study Area[1]
Pelagic Seabirds					
Ivory Gull	*Pagophila eburnea*	Endangered	Endangered	Endangered	Likely
Waterfowl, Loons, and Grebes					
Harlequin Duck	*Histrionicus histrionicus*	Special Concern	Special Concern	Vulnerable	Unlikely
Barrows Goldeneye	*Bucephala islandica*	Special Concern	Special Concern	Vulnerable	Unlikely
Shorebirds					
Piping Plover (melodus subspecies)	*Charadrius melodus melodus*	Endangered	Endangered	Endangered	Unlikely
Red Knot rufa ssp	*Calidris canutus rufa*	Endangered	Endangered	Endangered	Unlikely
Buff-breasted Sandpiper	*Tryngites subruficollis*	-	Special Concern	-	Unlikely
Red-necked Phalarope	*Phalaropus lobatus*	-	Special Concern	-	Likely
Landbird SOCC[2]					
Short-eared Owl	*Asio flammeus*	Special Concern	Special Concern	Vulnerable	Potential during nocturnal migration
Peregrine Falcon	*Falco perigrinus anatum/tundrius*	Special Concern	Special Concern	Vulnerable	
Bank Swallow	*Riparia riparia*	-	Threatened	-	
Gray-cheeked Thrush	*Catharus minimus*	-	-	Vulnerable	
Olive-sided Flycatcher	*Contopus cooperi*	Threatened	Threatened	Threatened	
Bobolink	*Dolichonyx oryzivorus*		Threatened	-	

Notes:
1 Spatial boundaries of the Study Area are shown in Figure 2-1; potential occurrence considers known spatial and temporal use of the waters near the Study Area; Unlikely: generally restricted to coastline and nearshore waters; Likely: regular occurrence in offshore waters and may be expected to occur in the Study Area during the breeding season (i.e., for feeding), migration, and/or overwintering.

2 Following Amec (2014), landbird SOCC are listed if they are known to migrate over the offshore area, except those that migrate during the day because these are unlikely to become disoriented by marine artificial lighting.

4.2.8 Species at Risk and Species of Conservation Concern

Descriptions of species at risk and SOCC have been provided in the applicable preceding sections. Species at risk have a status on Schedule 1 under SARA and SOCC are species designated under COSEWIC and which have the potential of being listed in the future under SARA. The Act aims to prevent wildlife species from becoming extinct, and to secure the necessary actions for their recovery. The Act establishes Schedule 1 as the official list of wildlife species at risk, classifying species as being extirpated, endangered threatened, or a special concern. Once a species is listed, the measures to protect and recover a species are implemented (Species at Risk Public Registry 2016).

COSEWIC was established in 1977 to provide Canadians with a single, scientifically sound classification of wildlife species at risk of extinction. In 2003, with the advent of SARA, COSEWIC was established as an independent body of experts responsible for identifying and assessing wildlife species considered being at risk.

Table 4.35 summarizes the complete list of species at risk and SOCC that may be found within the Study Area.

Table 4.35 Species at Risk and Species of Conservation Concern with Potential to Occur within the Study Area

Common Name	Scientific Name	SARA Schedule 1 Status	COSEWIC Designation[1]
Marine Fish			
Acadian redfish (Atlantic population)	*Sebastes fasciatus*	Not Listed	Threatened
American eel	*Anguilla rostrata*	Not Listed	Threatened
American plaice (Newfoundland and Labrador population)	*Hippoglossus platessoides*	Not Listed	Threatened
Atlantic bluefin tuna	*Thunnus thynnus*	Not Listed	Endangered
Atlantic cod (Newfoundland and Labrador population)	*Gadus morhua*	Not Listed	Endangered
Atlantic salmon[2] (South Newfoundland population)	*Salmo salar*	Not Listed	Threatened
Atlantic wolffish	*Anarhichas lupus*	Special Concern	Special Concern
Basking shark (Atlantic population)	*Cetorhinus maximus*	Not Listed	Special Concern
Blue shark (Atlantic population)	*Prionace glauca*	Not Listed	Special Concern
Cusk	*Brosme brosme*	Not Listed	Endangered
Deepwater redfish (Northern population)	*Sebastes mentalla*	Not Listed	Threatened

Common Name	Scientific Name	SARA Schedule 1 Status	COSEWIC Designation[1]
Northern wolffish	*Anarhichas denticulatus*	Threatened	Threatened
Porbeagle shark	*Lamna nasus*	Not Listed	Endangered
Roughhead grenadier	*Macrourus berglax*	Not Listed	Special Concern
Roundnose grenadier	*Coryphaenoides rupestris*	Not Listed	Endangered
Shortfin mako	*Isurus oxyrinchus*	Not Listed	Threatened
Smooth skate (Laurentian-Scotian population)	*Malacoraja senta*	Not Listed	Special Concern
Smooth skate (Funk Island Deep population)	*Malacoraja senta*	Not Listed	Endangered
Spiny dogfish (Atlantic population)	*Squalus acanthias*	Not Listed	Special Concern
Spotted wolffish	*Anarhichas minor*	Threatened	Threatened
Thorny skate	*Amblyraja radiata*	Not Listed	Special Concern
White shark	*Carcharodon Carcharias*	Endangered	Endangered
White hake	*Urophycis tenuis*	Not Listed	Threatened
Marine Mammals			
Blue whale (Atlantic population)	*Balaenoptera musculus*	Endangered	Endangered
Fin whale (Atlantic Population)	*Balaenoptera physalus*	Special Concern	Special Concern
North Atlantic right whale	*Eubalaena glacialis*	Endangered	Endangered
Harbour porpoise (Northwest Atlantic subspecies)	*Phocoena phocoena phocoena*	Not Listed (Threatened on Schedule 2)	Special Concern
Killer whale (Northwest Atlantic population)	*Orcinus orca*	Not Listed	Special Concern
Northern bottlenose whale (1: Scotian Shelf population/ 2: Davis Strait-Baffin Bay-Labrador Sea population)	*Hyperoodon ampullatus*	1: Endangered 2: Not Listed	1: Endangered 2: Special Concern
Sowerby's beaked whale	*Mesoplodon bidens*	Special Concern	Special Concern
Sea Turtles			
Leatherback sea turtle	*Dermochelys coriacea*	Endangered	Endangered
Loggerhead sea turtle	*Caretta caretta*	Endangered	Endangered
Migratory Birds			
Ivory Gull	*Pagophila eburnea*	Endangered	Endangered
Harlequin Duck	*Histrionicus histrionicus*	Special Concern	Special Concern

Common Name	Scientific Name	SARA Schedule 1 Status	COSEWIC Designation[1]
Barrows Goldeneye	*Bucephala islandica*	Special Concern	Special Concern
Piping Plover (melodus subspecies)	*Charadrius melodus melodus*	Endangered	Endangered
Red Knot rufa ssp	*Calidris canutus rufa*	Endangered	Endangered
Buff-breasted Sandpiper	*Tryngites subruficollis*	-	Special Concern
Red-necked Phalarope	*Phalaropus lobatus*	-	Special Concern
Short-eared Owl	*Asio flammeus*	Special Concern	Special Concern
Peregrine Falcon	*Falco perigrinus anatum/tundrius*	Special Concern	Special Concern
Bank Swallow	*Riparia riparia*	-	Threatened
Olive-sided Flycatcher	*Contopus cooperi*	Threatened	Threatened
Bobolink	*Dolichonyx oryzivorus*		Threatened

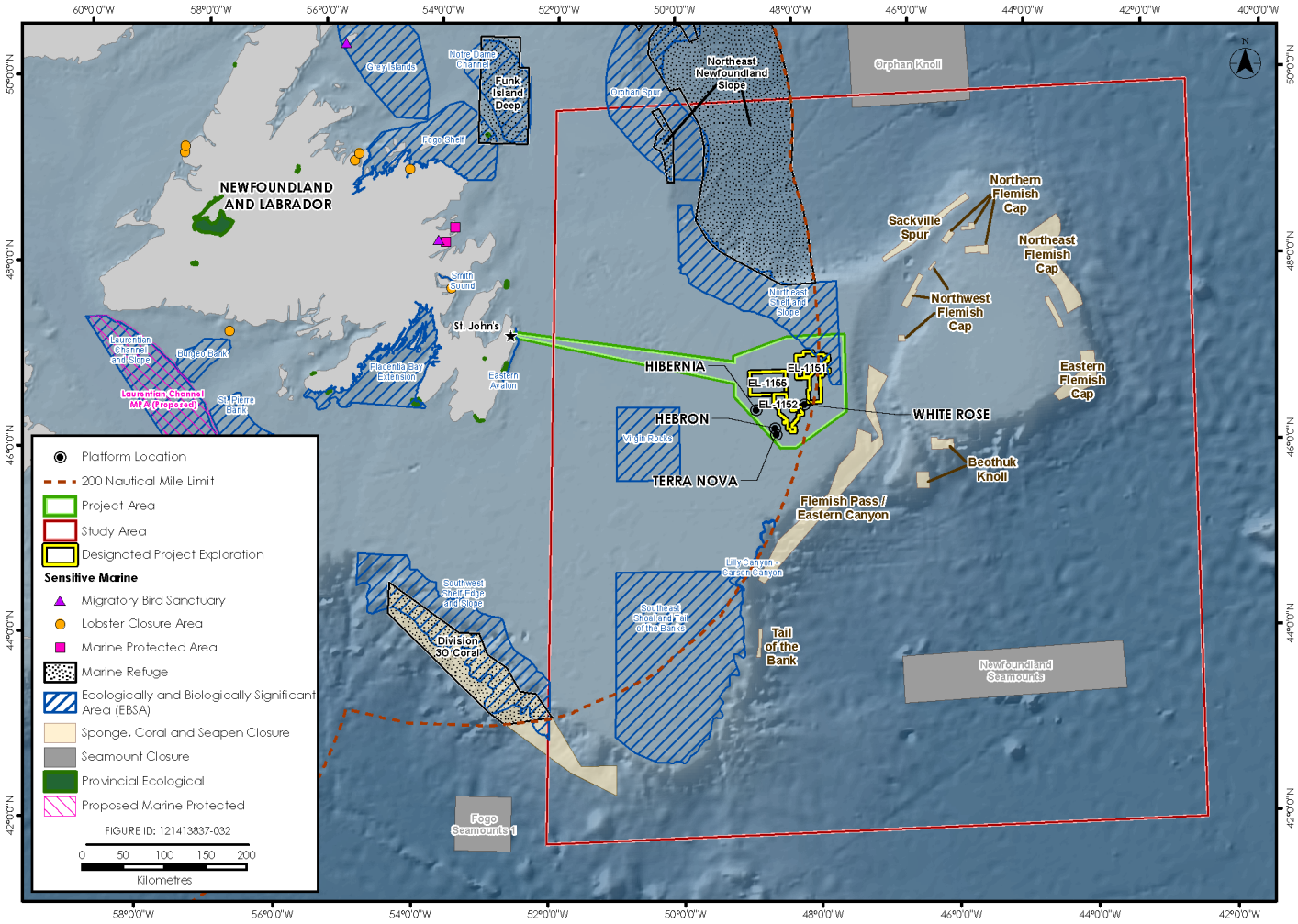
Notes:
1 SOCC are listed as endangered, threatened, or of special concern by COSEWIC, but not listed in Schedule 1 of SARA or under the NL ESA.
2 See Section 4.3.2.7 for a detailed discussion on the Atlantic salmon populations.

4.2.9 Special Areas

Special areas identified within the Study Area are illustrated in Figure 4-34 and are discussed in the following sections. Special areas include EBSAs, Vulnerable Marine Ecosystems (VMEs), NAFO closure areas, and marine refuge areas. There are no designated Marine Protected Areas within the Study Area. There are seven Lobster Area closures along the coast of the Island of Newfoundland that are designated as Marine Refuges; however, these are located outside of the Study Area and not included in the discussion below.

4.2.9.1 Ecologically and Biologically Sensitive Areas

As part of the Integrated Management Plan for Placentia Bay-Grand Banks Large Ocean Management Area (PBGB-LOMA), DFO has identified EBSAs in the area that may require specific management measures. EBSAs are identified according to pre-established criteria, including uniqueness, aggregation, fitness consequences, resilience, and naturalness (DFO 2004a). In total, 11 EBSAs have been identified within the PBGB-LOMA and ranked in terms of significance to determine the best candidate(s) for a Marine Protected Area (DFO 2007a). Five of these eleven EBSAs are located within the Study Area (Figure 4-34): Southeast Shoal and Tail of the Banks; Southwest Shelf Edge and Slope; Northeast Shelf and Slope; Lily Canyon-Carson Canyon; and Virgin Rocks. In the ranking scheme for DFO priorities, the Southeast Shoal and Tail of the Banks EBSA was given the highest ranking, and the Southwest Shelf Edge and Slope EBSA ranked third. The other three EBSAs within the Study Area were ranked in the bottom 4 of the 11 (DFO 2015c). Details on these five EBSAs are provided below.



Source: updated with data from NAFO 2015.

Figure 4-34 Special Areas in and Near the Study Area

4.2.9.1.1 Southeast Shoal and Tail of the Banks Ecologically and Biologically Significant Area

The Southeast Shoal and Tail of the Banks EBSA is an area east of 51°W and south of 45°N, extending to the edge of the Grand Banks (DFO 2007a). This EBSA is located within the Study Area and 122 km southwest of the Project Area. The Southeast Shoal is notable for having the warmest bottom water temperatures on the Grand Banks and a well-defined gyre that drives high rates of primary production (CPAWS 2009) and supports reproducing populations of groundfish and capelin (Walsh et al. 2001; Fuller and Myers 2004). This area was the most recently exposed area on the Grand Banks, as it was formerly beach habitat, and the last part of the area to remain above sea level during the last glacial period. It is unique in that it contains the only shallow, sandy offshore shoal in the PBGB-LOMA, as well as relict populations of blue mussel, wedge clam and capelin associated with beach habitats, and has the highest benthic biomass on the Grand Banks. In their characterization, DFO (2007a) noted the Southeast Shoal has:

- the only known offshore spawning site for capelin (NAFO Division 3NO)
- the single nursery area of the entire stock of yellowtail flounder
- a spawning area for several groundfish species (American plaice, yellowtail flounder, and Atlantic cod)
- an important nursery area for NAFO Division 3NO cod and American plaice
- an area that attracts large aggregations of marine mammals (especially humpback and northern bottlenose whales) and marine birds due to presence of forage species
- an area with the dense concentrations of Atlantic wolffish
- an area that has supported the highest density of American plaice on the Grand Banks since the mid-1990s

Because of these features, it has been ranked first in priority among the 11 EBSAs. This EBSA has a dynamic sandy bottom habitat that is subject to regular disturbance by wave action and is thus less sensitive to disturbance. Fishing has greatly altered the ecosystem and DFO (2007a) concluded that ecosystem and community resilience in the Southeast Shoal area has been diminished and is likely sensitive to further disturbance.

4.2.9.1.2 Southwest Shelf Edge and Slope Ecologically and Biologically Significant Area

The Southwest Shelf Edge and Slope is an EBSA that is located from 55°W to 52°W along the southwestern shelf edge of the Grand Bank to the 2,000 m isobaths (DFO 2007a). This EBSA is located just partly within the Study Area and 359 km southwest of the Project Area. This area is highly productive due to upwelling processes and is an important marine area on the Grand Banks because of the high coral species richness, groundfish biomass, and seabird diversity (Kulka and Miri 2003; Ollerhead et al. 2004; Edinger et al. 2007). Cetaceans and leatherback sea turtles are known to congregate in the area to feed (CPAWS 2009). NAFO closed a 14,040-km² area (NAFO Division 3O) to fishing from 2007 to 2012 to allow for research on the ecology and protection of deep-water corals from the effects of fishing. In their EBSA characterization, DFO (2007a) noted this EBSA:

- supports northernmost population of haddock in Northwest Atlantic, and this population spawns along edge of Southwest slope during spring
- has high diversity of cold-water coral species and increased habitat structure and complexity due to the presence of these corals
- greatest diversity of groundfish on the Grand Bank
- high biomass of groundfish
- monkfish, pollock and white hake only occur along the Southwest Slope and within the Laurentian Channel within the PBGB-LOMA
- supports Atlantic cod population and migratory route, and historically was area of high density
- important spawning area for redfish species
- has highest density of pelagic seabirds feeding within the PBGB-LOMA
- cetaceans and leatherback sea turtles aggregate in this area to feed, particularly during summer

It is ranked third of the 11 identified EBSAs in terms of DFO's priorities within the PBGB-LOMA. DFO (2007) also noted in their ranking of this EBSA that high fishing effort in this area, as well as high rates of coral bycatch, indicate this system has been heavily impacted by human activities.

4.2.9.1.3 The Northeast Shelf and Slope Ecologically and Biologically Significant Area

The Northeast Shelf and Slope EBSA is located on the northeastern Grand Banks, starting at the Nose of the Bank, from 48°W to 50°W, and from the edge of the shelf (e.g., 200 m depth contour) to the 1,000 m depth contour. This EBSA is located partially within the Project Area and entirely within the Study Area. This EBSA is not considered unique but supports feeding aggregations of spotted wolffish (DFO 2016c) and Greenland halibut populations, contains two important coral areas at Tobin's Point and Funk Island Spur, and is a known feeding area for marine mammals, particularly harp seals (in the vicinity of the Sackville Spur west), hooded seals (in the vicinity of the Sackville Spur East), and pilot whales (CPAWS 2009; DFO 2016c). In their EBSA ranking assessment, DFO (2007a) noted that the Northeast Shelf and Slope EBSA characteristics include:

- aggregations of spotted wolffish in spring (listed as threatened under SARA)
- high concentrations of Greenland halibut in spring
- aggregations of marine mammals

This EBSA is ranked ninth of the 11 identified EBSAs as a priority by DFO.

4.2.9.1.4 Lily Canyon-Carson Canyon Ecologically and Biologically Significant Area

Lily Canyon-Carson Canyon is an EBSA that extends from 44.8°N to 45.6°N along the 200 m depth contour of the southeast slope of the Grand Banks. This EBSA is located within the Study Area and 64 km south of the Project Area. It contains Lilly Canyon and Carson Canyon, two areas where upwelling occurs due to wind (storms) as well as mixing of cold and warmer waters (CPAWS 2009). This area is variably productive, but at times can be highly productive and is strongly influenced by the Labrador Current. The area is biologically important due to the abundance of Iceland

scallop, as well as feeding and overwintering of marine mammals (Ollerhead et al. 2004; CPAWS 2009). In their ranking of this EBSA, DFO (2007a) noted the area has:

- high concentrations of Iceland scallop
- aggregations of marine mammals year-round for feeding and overwintering
- deeper parts of canyons are relatively undisturbed by human activities

It is ranked eighth of the 11 identified EBSAs in terms of DFO's priorities within the PBGB-LOMA. The area is assigned an overall low ranking in terms of uniqueness since other canyons occur throughout the Grand Banks, and because Iceland scallop are known to occur elsewhere.

4.2.9.1.5 Virgin Rocks Ecologically and Biologically Significant Area

The Virgin Rocks EBSA is located in the northern central area of the Grand Banks, and comprises the area from 46°N to 46.8°N and from 50°W to 51°W. This EBSA is located within the Study Area and 64 km west of the Project Area. The area is known to have exposed rocks (as shallow as 3.6 m) near the middle of the bank, a habitat that does not occur elsewhere on the Grand Bank, and supports several fish species (Ollerhead et al. 2004) as well as marine birds. An estimated 1,000 to 2,000 common eiders commonly overwinter near the Virgin Rocks (CPAWS 2009). The site has high plankton productivity as well as dense kelp beds in the rocky shallow subtidal (CPAWS 2009). In their assessment, DFO (2007a) noted that the Virgin Rocks EBSA:

- is considered geologically unique in the PBGB-LOMA, because large, nearly exposed rocks occur offshore
- supports aggregations of capelin and marine birds
- provides spawning and breeding habitat for Atlantic cod, American plaice, and yellowtail flounder, although these species are known to spawn elsewhere (CPAWS 2009)

The Virgin Rocks EBSA is ranked lowest in priority of the 11 identified EBSAs, largely because historical intensive fishing has resulted in the decline of several of the traditionally abundant species in the area, thereby reducing the resiliency of the area.

4.2.9.2 Vulnerable Marine Ecosystems

NAFO has identified VMEs with the goal of managing deep-sea fisheries and the potential environmental effects that such fishing could have. NAFO uses criteria that have received general consensus internationally (e.g., the Food and Agriculture Organization (FAO) of the United Nations International Guidelines for the Management of Deep-Sea Fisheries in the High Seas) (NAFO 2008). Several VMEs have been designated by NAFO in the PBGB-LOMA, including many of the canyons along the shelf edge, seamounts, and knolls, the Southeast Shoal, cold seeps, carbonate mounds and hydrothermal vents. However, to date, the focus for identifying candidate VMEs have been areas that are currently fished (i.e., benthic data available), or that are currently technically feasible for fishing (NAFO 2008). The defined VMEs will likely be subject to additional management measures aimed to protect the high biodiversity of these areas (NAFO 2016a).

The five criteria for VME identification include: uniqueness or rarity; functional significance of the habitat; fragility; life history traits of component species; and structural complexity of the habitat. Specifically, sessile, or slow-moving benthic organisms such as corals, sponges, and bivalves were identified by NAFO (2008) as important habitat-forming organisms. These species increase habitat structure and complexity as well as the number of microhabitats and niches, thereby attracting greater concentrations of fish and other species. Many of these cold-water coral species and large sponges are slow-growing organisms that are fragile and vulnerable to fishing disturbance, and this was also considered in selecting VMEs.

The following VMEs identified by NAFO occur within the Study Area.

4.2.9.2.1 Canyons

Canyons are distinctive features of the seafloor that are known to be important habitats for many species and communities, as they typically extend from 200 to 2,000 m depth and occur over the continental shelf. Canyon habitat can support diverse communities, including cold-water corals and deep-sea fishes (Gordon and Fenton 2002). NAFO has identified 13 canyons that occur within the Study Area: Denys Canyon; Cameron Canyon; Jackman Canyon; Guy Canyon; Hoyles Canyon; Kettle Canyon; Clifford Smith Canyon; Lilly Canyon; Carson Canyon; and Unnamed Canyons 1, 2, 3, and 4 (Figure 4-34). The ecological functions and services provided by canyons are not well understood, but research from well-studied canyons along the East Coast of Canada (i.e., the Gully on the Scotian Shelf) suggest that deep-water areas support a rich, diverse community (Gordon and Fenton 2002), ranging from corals and sponges to deep-water fishes and marine mammals such as the northern bottlenose whale in the Gully, off Nova Scotia (Whitehead et al. 1997; Strain and Yeats 2005; Edinger et al. 2010).

4.2.9.2.2 Seamounts and Knolls

Seamounts are defined as an elevation in the seafloor of 1,000 m or more, and can be peaked or flat at the top, and can occur as one alone, or as a chain of seamounts. Seamounts have been recognized as ecologically important features that support habitat-structuring communities such as coral and sponges, and attract aggregations of deep-sea fishes, as well as their predators. Seamounts may also be important for the mating and spawning of some species. The Newfoundland Seamounts, a chain of seamounts, occurs entirely within the Study Area and 217 km southeast of the Project Area (Figure 4-34). Beothuk Knoll, located southwest of Flemish Cap and approximately 60 km from the nearest EL occupies 183 km² of the Project Area (Figure 4-34). Although there has been very little study of Beothuk Knoll to date, there is evidence of cold-water corals and aggregations of deep-sea fishes such as redfish at this site (Power 1997; NAFO 2008).

4.2.9.3 NAFO Coral, Sponge, and Seapen Closure Areas

The existence of cold water corals has been acknowledged for several years; however, until recently, location, extent, diversity, and ecological role of these species had been relatively unknown (DFO 2015d). Coral areas can be important habitats for protection from currents and

predators, nurseries for young fish, as well as feeding, breeding, and spawning areas for numerous species. DFO has developed the Coral and Sponge Conservation Strategy for Eastern Canada to identify the current state of knowledge of coral and sponges in this region, provide international and national context for coral conservation, and outline existing research and conservation efforts in this area (DFO 2015d). This strategy includes the identification of DFO and NAFO closures zones in areas of important coral and sponges. There are no DFO closure zones within the Study Area, but there are coral closures designated by NAFO.

In 2007, a Coral Protection Zone in Division 3O was closed by NAFO to all bottom-contact fishing gear; an additional 11 important coral and sponge zones were closed in 2010 and one in 2013 around the Flemish Cap (DFO 2015d; NAFO 2016a). These 13 closure areas are described in Table 4.36 and shown in Figure 4-34.

Table 4.36 Northwest Atlantic Fisheries Organization Closure Areas

Location	Management Measures	Feature	Area (km^2)
Seamount VME Closures			
Newfoundland Seamounts	Restrictions on bottom impacting gear	Seamount	15,410
Orphan Knoll	Restrictions on bottom impacting gear	Isolated topographic high	15,780
Sponge, Coral and Seapen VME Closures			
3O Coral Area Closure	Closed to all bottom impacting gear	Coral and sponge	14,040
Tail of the bank	Closed to all bottom impacting gear	High densities of coral and sponge	140
Flemish Pass/Eastern Canyon	Closed to all bottom impacting gear	High densities of coral and sponge	5,600
Beothuk Knoll	Closed to all bottom impacting gear	High densities of coral and sponge	310
Eastern Flemish Cap	Closed to all bottom impacting gear	High densities of coral and sponge	1,350
Northeast Flemish Cap	Closed to all bottom impacting gear	High densities of coral and sponge	2,870
Sackville Spur	Closed to all bottom impacting gear	High densities of coral and sponge	980
Northern Flemish Cap	Closed to all bottom impacting gear	High densities of coral and sponge	260
Northern Flemish Cap	Closed to all bottom impacting gear	High densities of coral and sponge	100
Northern Flemish Cap	Closed to all bottom impacting gear	High densities of coral and sponge	133
Northwest Flemish Cap	Closed to all bottom impacting gear	High densities of coral and sponge	40
Northwest Flemish Cap	Closed to all bottom impacting gear	High densities of coral and sponge	330
Northwest Flemish Cap	Closed to all bottom impacting gear	High densities of coral and sponge	70
Beothuk Knoll	Closed to all bottom impacting gear	High densities of coral and sponge	340
Source: NAFO 2016a			

All of the Sponge and Seapen VME Closure areas are located within the larger Study Area, except for the 3O Coral Area Closure VME, which is 333 km southwest of the Project Area and only partially included in the Study Area. The Seamount VMEs are located outside the Project Area; the Newfoundland Seamount VME is located entirely within the Study Area and is 284 km southeast of the Project Area. Only a portion of the Orphan Knoll is located within the Study Area and is 275 km

north of the Project Area. The locations of the VME NAFO Closure Areas are indicated on Figure 4-34.

4.2.9.4 Marine Refuges

As of December 21, 2017, marine refuges have been identified throughout Canadian waters as fisheries management measures to provide marine refuge to fish and marine mammals and their habitat and qualify as other effective area-based conservation measures. There are five marine refuges within the Newfoundland and Labrador Shelves bioregion, including: Hopedale Saddle; Hawke Channel; Northeast Newfoundland Slopes; Funk Island Deep; and Division 3O Coral (see Figure 4-34). These areas are protected as a means of long term conservation of biodiversity (DFO 2016d). Table 4.37 lists the marine refuges, their reason for protection, and proximity to the Project Area.

Table 4.37 Marine Refuge Areas and their Proximity to the Project Area

Name	Reason for Protection	Closed to	EBSA Co-occurance	Approx. Size (km^2)	Distance to Project Area (km)	Overlap with Project Area (%)
Division 3O Coral Closure	Protect coral and sponges	Prohibits all bottom fishing acitivities	Southwest Shelf Edge and Slope	10,422	333	0
Funk Island Deep Closure	Conserve benthic habitat and Atlantic cod	Botton trawl, gillnet and longline	Notre Dame Channel and Fogo Shelf	7,274	229	0
Hawke Channel	Conserve bethic habitat and Atlantic cod	Botton trawl, gillnet and longline	Labrador Margin Trough	8,837	546	0
Hopedale Saddle Closure	Protect corals and sponges and contribute to the long-term conservation of biodiveristy	All bottom-contact fishing activities	Outer Shelf Nain Bank, Labrador Slope, and Hopedale Saddle	15,411	889	0
Northeast Newfoundland Slope Closure	Protect corals and sponges and contribute to the long-term conservation of biodiversity	All bottom contact fishing activities	Orphan Spur	46,833	63	0

Source: DFO 2017c

4.2.9.5 South Grand Bank Preliminary Representative Marine Area

The southern Grand Bank has been identified as an area of ecological importance in offshore Newfoundland and Labrador. A large portion of the area has been identified by Parks Canada as a Preliminary Representative Marine Area (Fuller and Myers 2004). This is the first step in achieving the designation of a National Marine Conservation Area. The Southern Grand Bank was highlighted as a Preliminary Representative Marine Area due to its physical and geographical characteristics, including the southeast shoal (EBSA). This area is known as a feeding area for whales, a breeding area of capelin and to have known to have several species of corals present (Fuller and Myers 2004).

4.3 Socio-economic Environment

The Study Area has several users and activities to consider, including commercial fisheries, marine shipping, marine research, other oil and gas operations, and Department of National Defence (DND).

4.3.1 Commercial Fisheries

This section describes commercial fisheries trends within offshore Newfoundland and Labrador, including current commercial fisheries within both the Project and Study Area. There are no known Aboriginal food, social, and ceremonial (FSC) fisheries in offshore Newfoundland and Labrador; but communal commercial licences have been issued to five Aboriginal groups within Newfoundland and Labrador (D. Ball, pers. comm. 2016). Background information on communal commercial fishing by Indigenous groups is provided in Section 4.3.2.

Commercial fisheries consist of those wild fisheries harvested by Canadian enterprises within Canada's Exclusive Economic Zone (EEZ), and by both Canadian and non-Canadian vessels outside of the EEZ, managed by NAFO.

4.3.1.1 Information Sources

The descriptions of the existing commercial fishing environment for offshore Newfoundland and Labrador are based primarily on data derived from the DFO time series catch and effort datasets for the period of 2012 to 2016, the latest available year for validated data. These data represent all catch reported as landed within Newfoundland and Labrador in both weight (kg) and value (Canadian dollars). For this EIS, fish landings are converted from kilograms to tonnes for display in figures and tables. For indicating activity and absolute or relative abundance, weight is the most useful measure for year to year comparison. Values (for the same quantity of harvest) may vary annually with species, negotiated prices, changes in exchange rates, and other fluctuating market conditions. This information is provided at both the NAFO Division and Unit Area (UA) level to allow for analysis of more specific areas of Offshore Newfoundland and Labrador. These UAs overlap with portions of both the Project Area and Study Area, and as such will serve as the basis

for the information in this section. The UAs that encompass these two areas are listed below and shown in Figure 2-1:

- Project Area UAs: 3Lg; 3Lh; 3Li; 3Lj; 3Lr; and 3Lt
- Study Area UAs: 3Kf; 3Kg; 3Kk; 3Lc; 3Ld; 3Le; 3Lg; 3Lh; 3Li; 3Lj; 3Lr; 3Ls; 3Lt; 3Ma; 3Mb; 3Mc; 3Md; 3Mm; 3Na; 3Nb; 3Nc; 3Ne; 3Nf; 3Ob; 3Od; and 3Oe

The information presented in this report is based on data that meets DFO confidentiality requirements, and represents a general overview of fishing activity in a given location and time of year.

Along with commercial catch data, DFO also provides geospatial data to allow the general locations of domestic fish harvesting to be displayed. For this series, offshore Newfoundland has been divided into a series of 6x4 nm grid cells. While all commercial fisheries data indicate the fisheries management UAs in which the harvest occurred, a portion of the catch is specifically geo-referenced by latitude and longitude, which allows plotting of past harvesting locations to indicate fishing activities in relation to Project activities and structures.

While the DFO datasets capture reported Canadian and Canada-landed catches, catches by foreign vessels landed outside Canada are not included. For foreign fisheries, primarily outside the EEZ boundary, STATLANT datasets for 2012 to 2016 are used (NAFO 2015b), and include data for NAFO-managed harvests by Canadian fishers and non-Canadian NAFO states at the fisheries management Division level within the NRA. The Study Area consists mainly of NAFO Divisions 3LMN and some of Divisions 3O and 3K. As with the Canadian catch data, the NAFO STATLANT data are presented in tonnes.

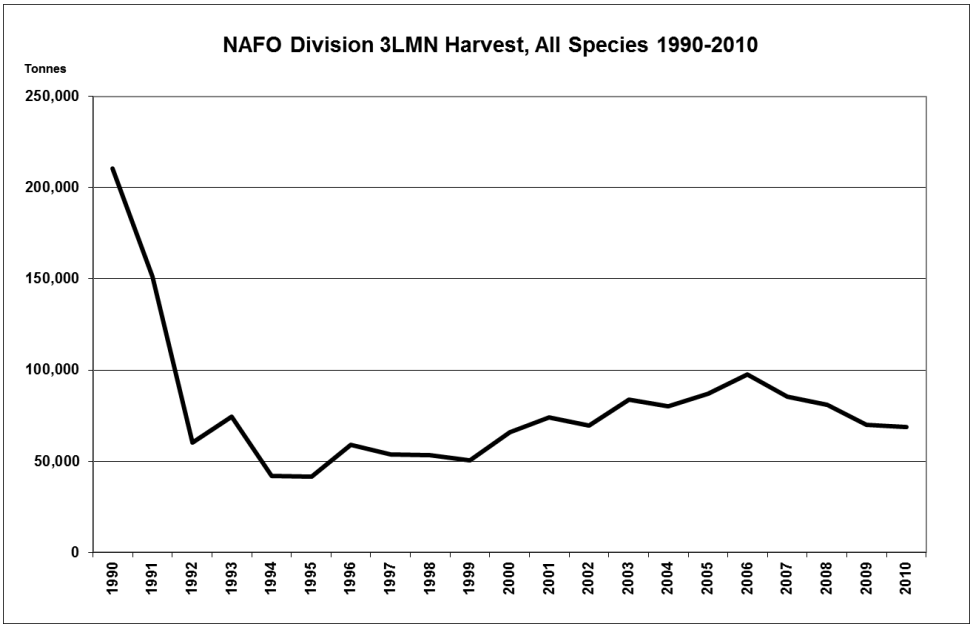
Also consulted for the commercial fisheries description were DFO species management plans, quota reports, scientific research reports and studies.

4.3.1.2 Historic Overview of Domestic Fisheries (Eastern Grand Banks)

Fishing in Newfoundland and Labrador has been an important activity since the colonization of the island. For many decades before 1992, most of the harvesting in the offshore areas of the eastern Grand Banks was for groundfish, taken by large stern otter trawlers harvesting Atlantic cod, redfish, American plaice, and several other species. In 1992, with the acknowledgement of the collapse of several of these groundfish stocks, a harvesting moratorium was declared; directed fisheries for Atlantic cod, American plaice, witch flounder, and has not been removed in all areas. Currently, northern shrimp and snow crab are the principal catches by most fish harvesters in the Study Area, although some areas have since been placed under a moratorium due to declining stocks (see Section 4.3.1.6).

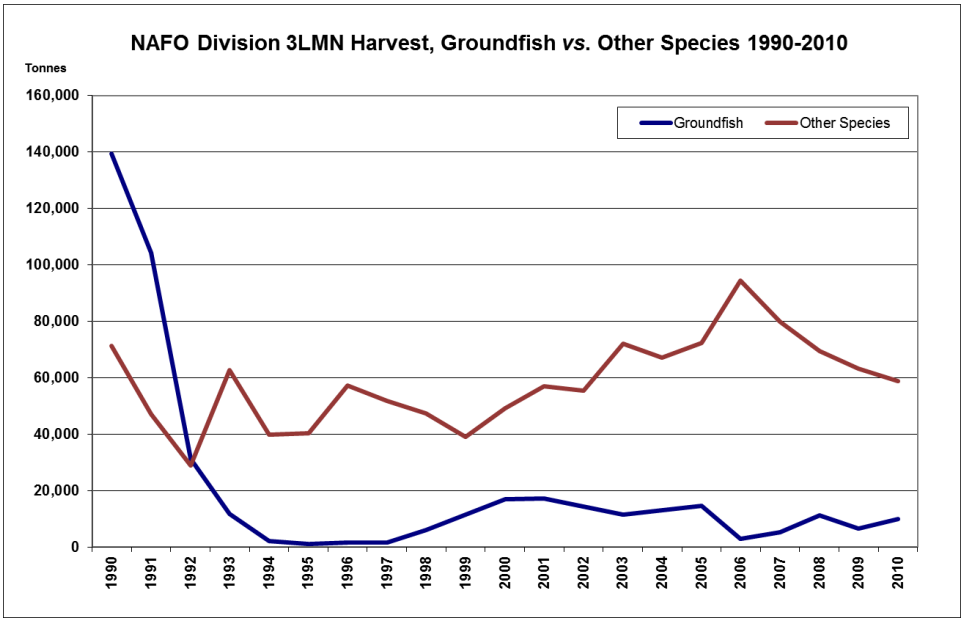
The historic quantity of fish landings in NAFO divisions 3LMN between 1990 and 2010 is illustrated in Figures 4-35 and 4-36. Groundfish landings are compared against landings of other species to

show trends that the offshore fishery has taken since the collapse of Atlantic cod and the emergence of the shellfish industry as a principal fishery for Newfoundland and Labrador.



Source: Husky 2012a

Figure 4-35 Northwest Atlantic Fisheries Organization Divisions 3LMN Harvest, All Species, 1990 to 2010

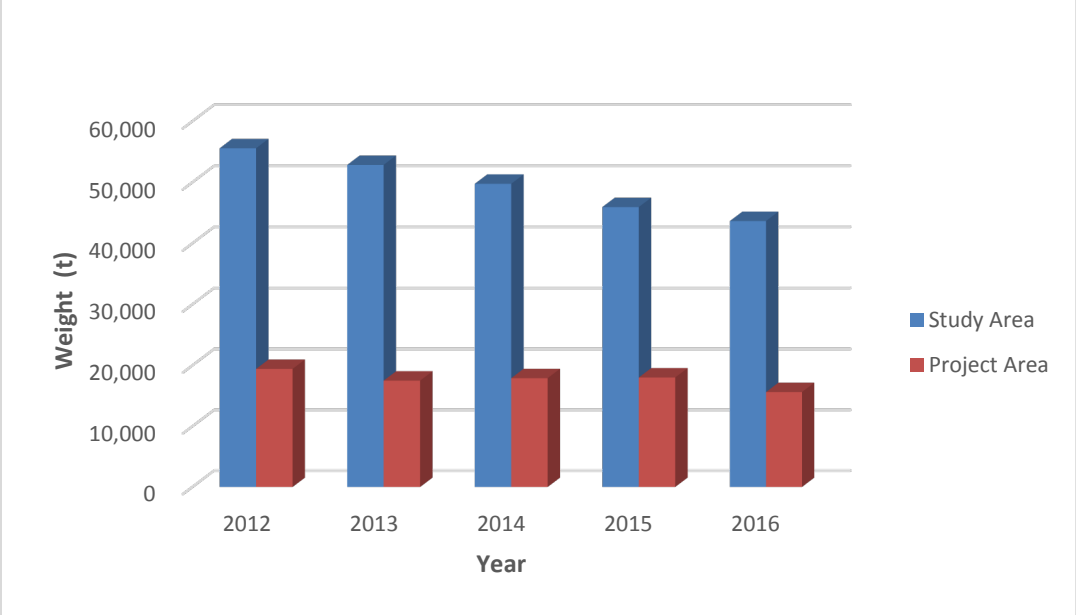


Source: Husky 2012a

Figure 4-36 Northwest Atlantic Fisheries Organization Divisions 3LMN Harvest, Groundfish vs. Other Species, 1990 to 2010

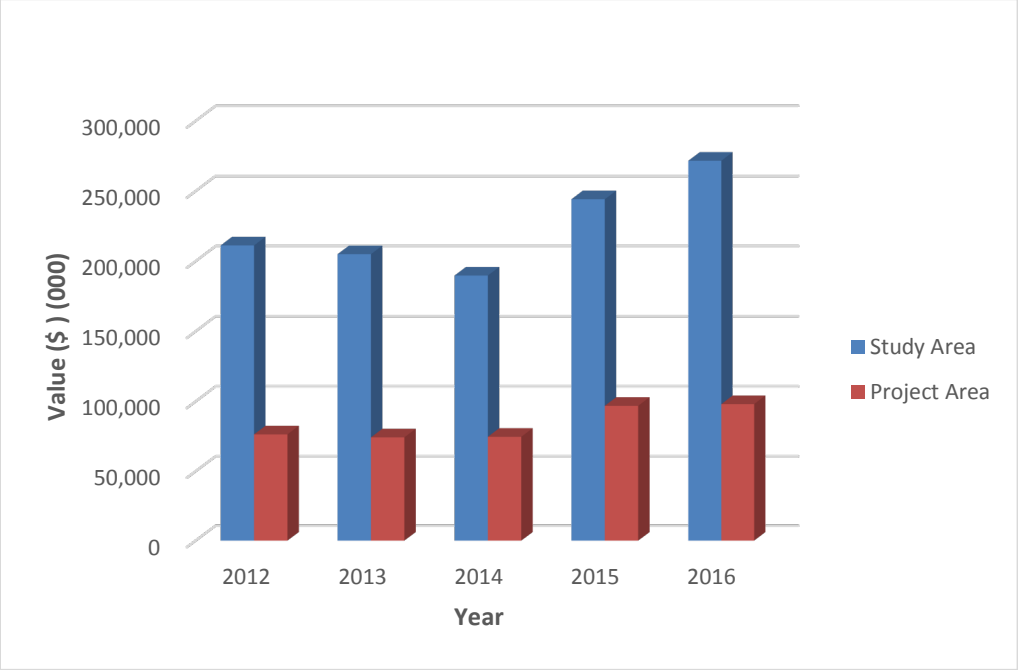
4.3.1.3 Current Domestic Fisheries within the Study Area

Between 2012 and 2016, there was some fluctuation in total fisheries landings (all species combined) in the Study Area and overall landings have gradually declined from a total harvest of 55, 581 t in 2012, to approximately 43, 664 t in 2016 (Figure 4-37). However, landed value was the highest in 2016 (Figure 4-38). Commercial fisheries within the Project Area has also seen a similar trend, with total weight declining from 19, 436 t in 2012 to 15, 639 t in 2016, but total value at its highest in 2016. The change in total weight harvested throughout these years can potentially be related to fisheries closures that have occurred in the area for species such as northern shrimp (see Section 4.3.1.6). The changes in value are less certain and can be linked to external market factors that could be alternating the value for certain species, such as snow crab. The fish species harvested in the greatest quantity within the Project Area and Study Area are listed in Table 4.38.



Source: DFO 2016e

Figure 4-37 Quantity of Harvest by Year, All Species, 2012 to 2016



Source: DFO 2016e

Figure 4-38 Value of Harvest by Year, All Species, 2012 to 2016

Table 4.38 Offshore Harvest within the Project Area and Study Area by Species, 2012 to 2016 Annual Total, Quantity (t)

Species	2012	2013	2014	2015	2016	Total
Project Area						
Crab, Queen/Snow	16,335	16,699	17,224	17,726	14,784	82,768
Northern Shrimp, *Pandalus borealis*	2,886	533	334	0	0	3,753
Cod, Atlantic	215	283	361	300	854	2,013
Study Area						
Crab, Queen/Snow	25,632	25,315	26,186	25,466	24,632	127,231
Northern Shrimp, *Pandalus borealis*	7,978	7,820	3,290	644	538	20,270
Turbot/Greenland Halibut	2,181	1,845	1,843	1,510	1,847	9,226
Cod, Atlantic	215	283	361	300	854	2,013
Swordfish	114	0	139	0	146	399
Atlantic Halibut	336	31	15	163	496	1,787
Hake, White	0	34	0	0	0	34
Redfish	14	10	1	1	2	27
Shark, Mako	3	0	5	0	4	12
Grenadier, Rough-Head	7	0	0	0	0	7
Notes:						
Landings data provided by DFO are data that have been approved for public release in accordance with DFO confidentiality policies. This does not provide all fishing activity within the given area, but shows publicly available information. No commercial fishery for northern shrimp in the Project Area in 2015 and 2016 due to the closure of the commercial shrimp fishery in NAFO Division 3L.						

The principal commercial fisheries in the Study Area are northern shrimp and snow crab, which have been dominant in total landings after the collapse of groundfish stocks. Within the boundaries of the Study Area, northern shrimp and snow crab have collectively made up approximately 96% of all landings by weight and 99% by value between 2012 and 2016 (Table 4.39). The remaining fisheries are primarily groundfish, consisting of flounder and turbot (Greenland halibut), along with smaller quantities of large pelagic species (e.g., swordfish, tunas). There is also some fishing activity for deep-sea clams and bivalves.

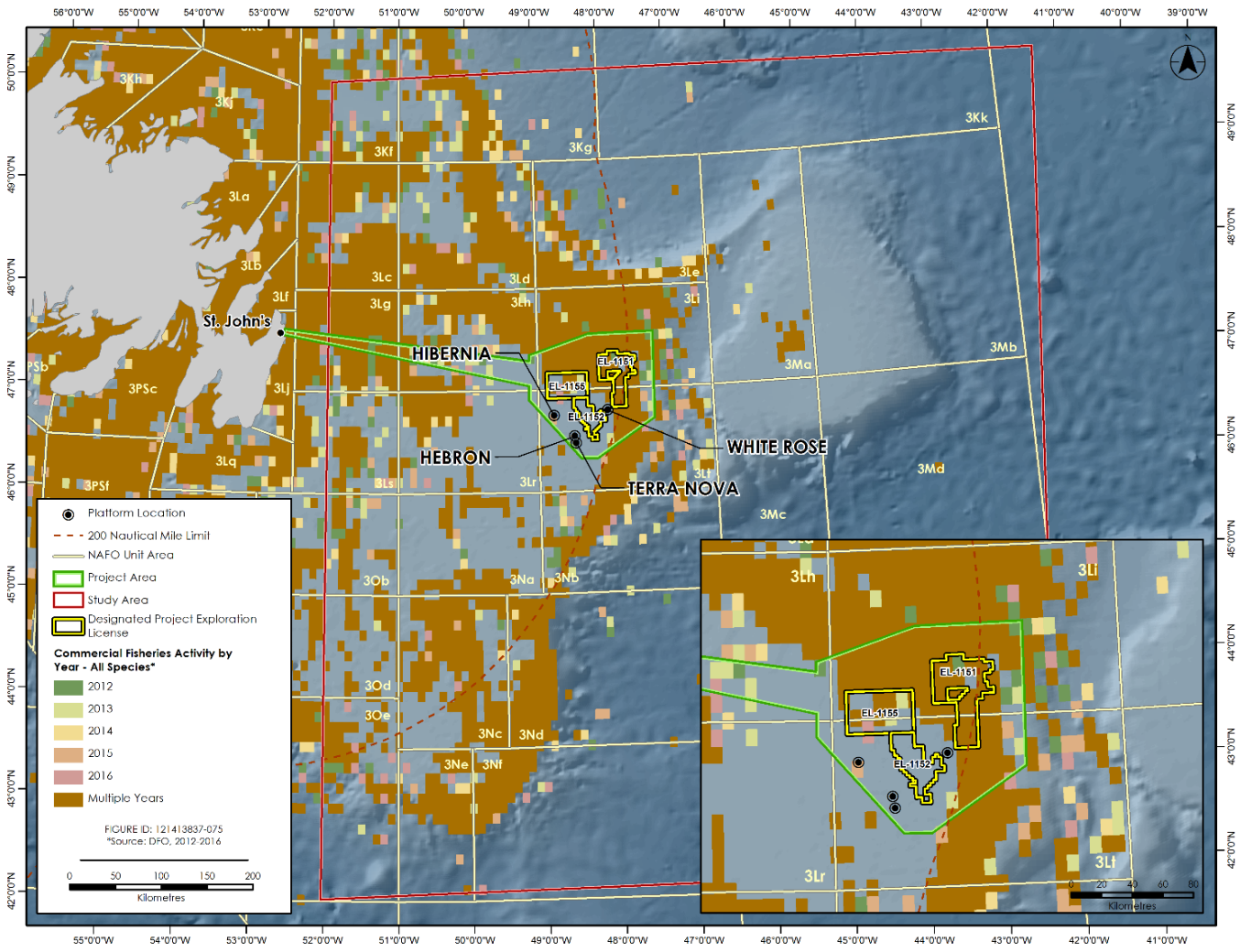
Table 4.39 Percentage Weight and Value, all Species, Project and Study Area, 2012 to 2016

Species	Weight (t)	% Weight	Value ($)	% Value
Project Area				
Crab, Queen/Snow	82,768	93.4866	424,927,720	97.4475
Shrimp, *Pandalus borealis*	3,753	4.2394	8,662,804	1.98662
Cod, Atlantic	2,013	2.2740	2,467,709	0.56591
Total	88,535		436,058,233	
Study Area				
Crab, Queen/Snow	127,231	79.8849	655,264,285	89.1401
Northern Shrimp, *Pandalus borealis*	20,270	12.7267	41,968,483	5.70926
Turbot/Greenland Halibut	9,226	5.7930	31,214,736	4.24636
Cod, Atlantic	2,013	1.2641	2,467,709	0.3357
Swordfish	399	0.2507	3,586,199	0.48786
Atlantic Halibut	47	0.0296	505,275	0.06874
Hake, White	34	0.0213	31,405	0.00427
Redfish	27	0.0172	20,214	0.00275
Shark, Mako	12	0.0076	33,008	0.00449
Grenadier, Rough-Head	7	0.0047	2,031	0.00028
Total	159,268		735,094,659	
Source: DFO 2016e				

4.3.1.4 Location and Timing of Harvest

The geo-referenced harvesting locations in relation to the Study Area and Project Area for 2012 to 2016, for all species during all months, are shown in Figure 4-39. The plots delineate the important harvesting areas within the offshore Newfoundland and Labrador region. As illustrated, much of commercial fishing effort within offshore Newfoundland and Labrador is concentrated on or near the shelf edge (crab) and slope (shrimp), at water depths between 200 and 500 m. Historical records of landing locations from year to year indicates a high level of consistency for commercial fishing.

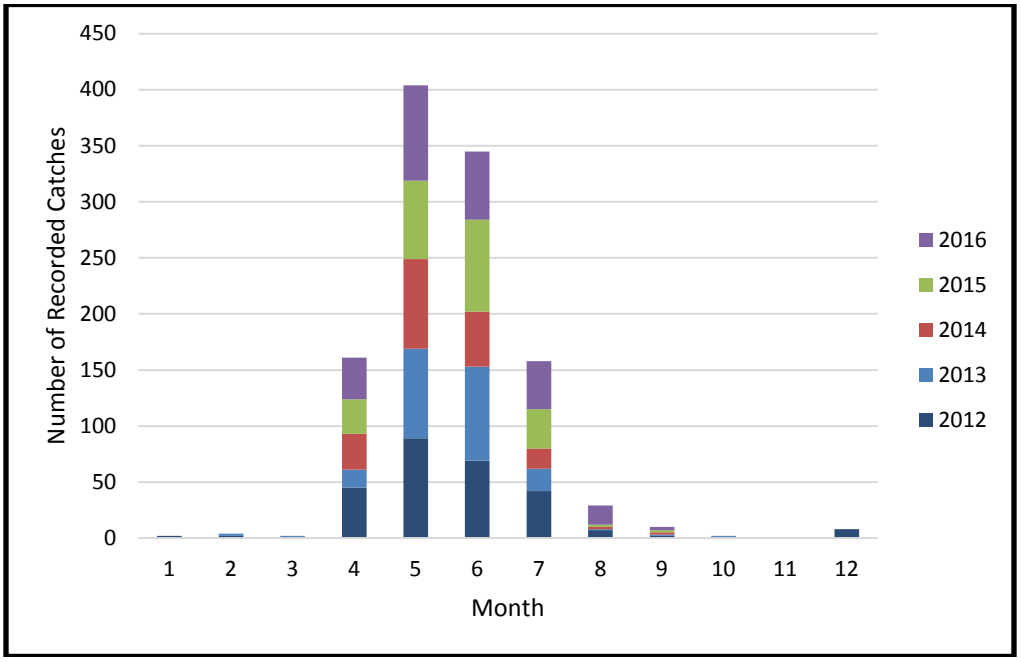
Domestic commercial harvesting locations by species group are shown in Section 4.3.1.6. Within the Project Area, northern shrimp and snow crab are the dominant commercial species, while there is little domestic activity for groundfish or pelagic species.



Source: DFO 2016e

Figure 4-39 Domestic Harvesting Locations, All Species, All Months, 2012 to 2016

While confidentiality policies prevent DFO from releasing the total weight for some recorded catches in their commercial catch and effort datasets, the total number of registered catches for each month of the year are still recorded. The number of recorded catches for each month between 2012 and 2016 for both the Project Area and Study Area are displaed in Figures 4-40 and 4-41, respectively. These outline the seasonal trends in the offshore fisheries, and when the highest level of fishing effort takes place in offshore Newfoundland and Labrador. As shown in the figures, a large proportion of fishing activity takes place between the months of April and August, but there is some activity year-round.



Source: DFO 2016e

Figure 4-40 Seasonality of Offshore Fishing Activity within the Project Area, all Species, 2012 to 2016

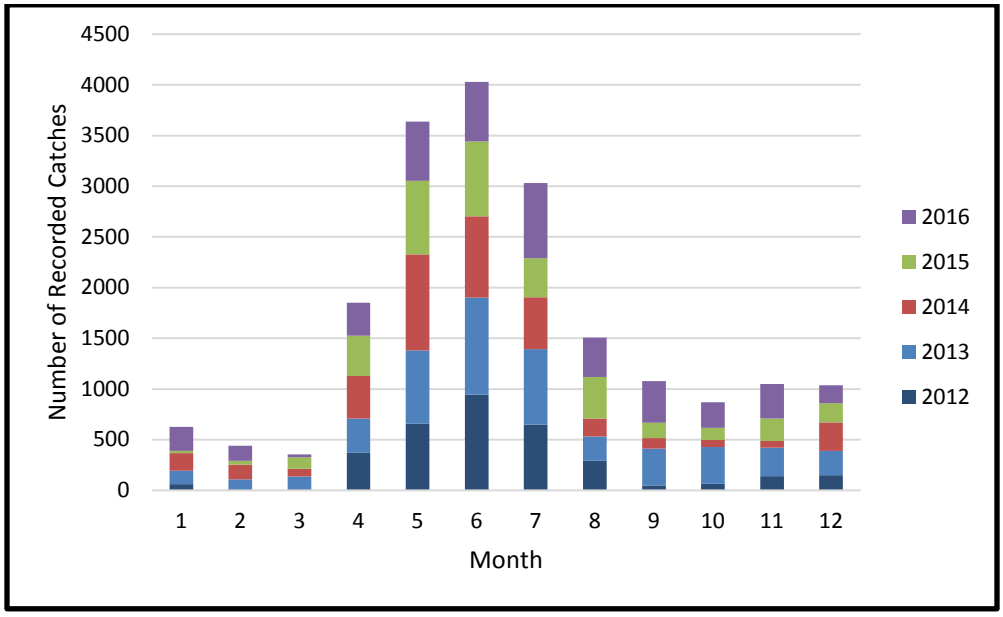


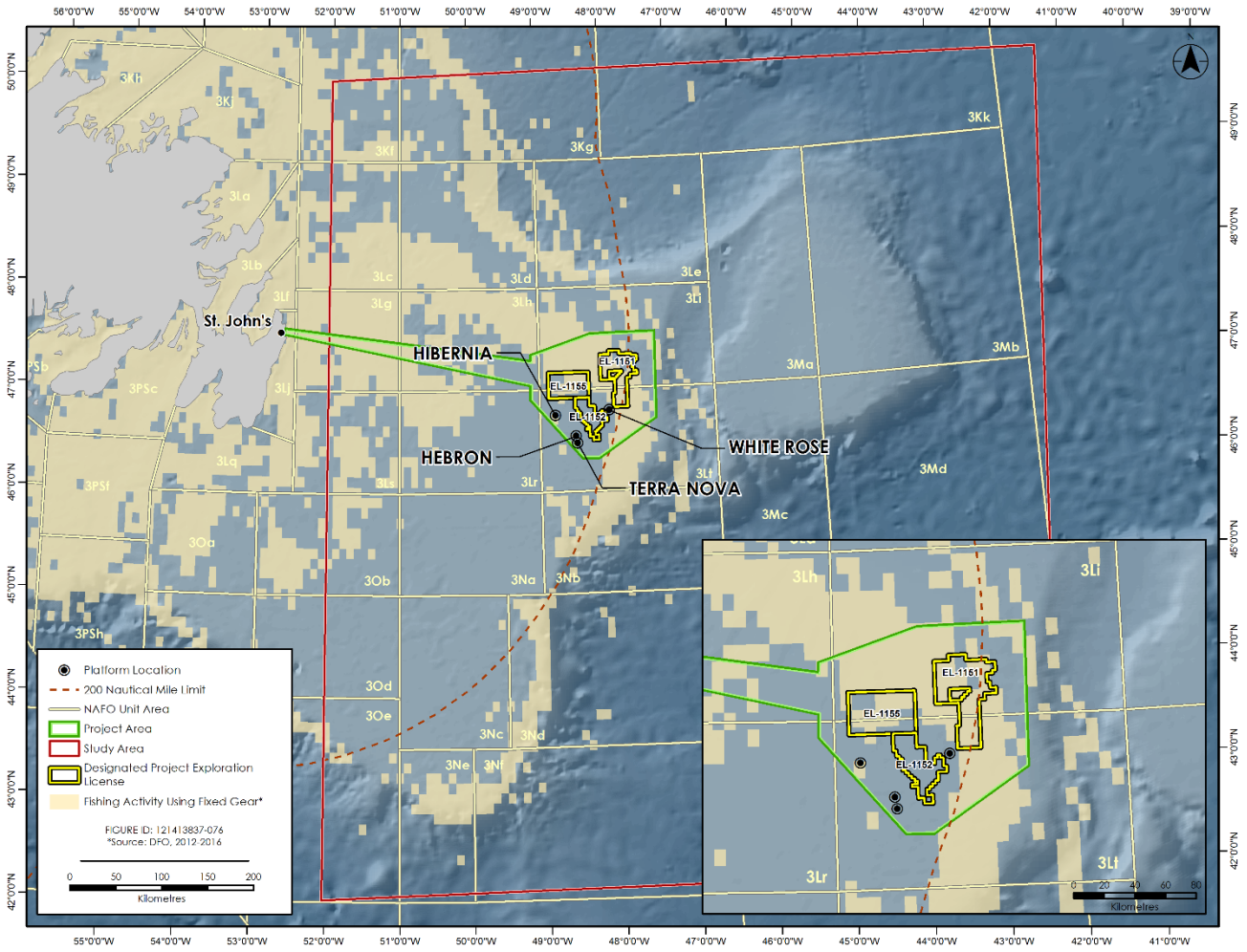
Figure 4-41 Seasonality of Offshore Fishing Activity within the Study Area, all Species, 2012 to 2016

4.3.1.5 Fishing Gear and Vessels

Commercial fishing gear used in offshore Newfoundland and Labrador are unique to the species that is being harvested except for groundfish. Crab pots are used in the snow crab fishery, shrimp trawls for northern shrimp, and dredges for deep-sea clams and bivalves. Groundfish are typically harvested using a combination of stern otter trawls, mobile or fixed gillnets, or longlines (e.g. baited hooks). Longlines are also used for the small quantity of large pelagic fish (tuna, swordfish) harvested within the Study Area.

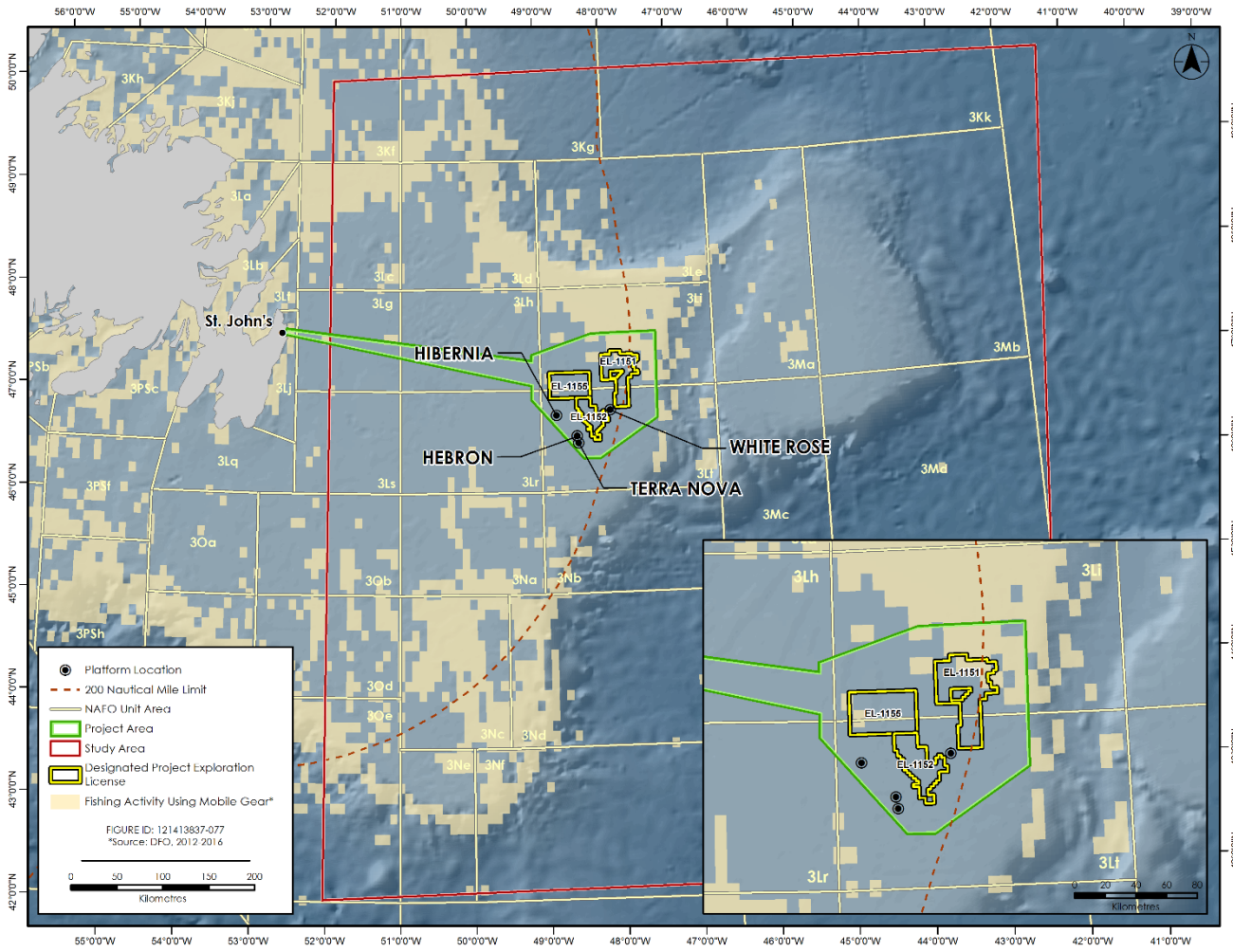
The locations of fixed and mobile gear harvesting locations for the 2014 commercial fishing season are shown in Figures 4-42 and 4-43. Most harvesting locations within the Project Area are using fixed gear, mainly crab pots. Mobile gear, such as trawls and seines are more commonly used in the traditional groundfish fishing areas along the northeast and southeast corners of the Grand Banks. Mobile gear found near the slopes of the Flemish Pass are usually part of fisheries for deeper water fish such as halibut.

Most of the harvest in the Study Area is taken by fishing vessels that are either mid-size (35 to 65 feet long) or large (greater than 125 feet). The largest vessels are primarily harvesting clams, groundfish and shrimp, while the midsize vessels are used mainly for crab and shrimp, although all vessel sizes harvest some groundfish. A brief overview of the main gear types used in offshore Newfoundland is provided below.



Source: DFO 2016e

Figure 4-42 Fixed Gear Domestic Harvesting Locations, All Species, 2012 to 2016



Source: DFO 2016e

Figure 4-43 Mobile Gear Domestic Harvesting Locations, All Species, 2012 to 2016

4.3.1.5.1 Crab Pots

Crab pots are typically set on the seabed in strings buoyed at the surface. These pots generally have a radar reflector, known as a highflyer, attached at one end, and a large buoy at the other. Depending on weather conditions, crab pots may be left unattended for weeks at a time. Fishers will generally try to leave approximately 36.5 m (20 fathoms) on the seabed between each pot. The distance between the typical highflyer and end-buoy of a 50 to 60-pot string of crab gear is approximately 1.8 to 2.3 km.

4.3.1.5.2 Hydraulic Dredges

Used for deep sea clams, these boat-based dredges are dragged along the sea bottom by the ship. Sea water is pumped through a large hose in front of the dredge as it is pulled along the sea floor. The jets of water temporarily fluidize the sand and allow the dredge to go through, picking up the clams.

4.3.1.5.3 Shrimp Trawls

Shrimp harvesting within offshore Newfoundland and Labrador uses mobile shrimp trawls. These are modified stern otter trawls, for both inshore and offshore vessels, though some use beam trawls. The minimum mesh size for trawls used in the shrimp fishery is 40 mm (DFO 2016f).

4.3.1.5.4 Stern Otter Trawls

These are large bottom-tending nets towed behind vessels, most of which are approximately 46 to 61 m in length. These trawls are primarily used for groundfish, but the mesh size is dependent upon target species. Technical measures introduced by Canada and NAFO to deal with management of collapsed flatfish off eastern Newfoundland included a minimum mesh size for otter trawls (145 mm, 155 mm square mesh in some fisheries and 300 mm for skate in Canada; 130 mm, 280 mm for skate in the NRA) (Gibson et al. 2015). After filling with fish, the net is winched aboard, emptied and re-deployed.

4.3.1.5.5 Gillnets

These nets are used mainly on the Atlantic coast to catch a variety of groundfish and pelagic fish species. They can either be mobile, or fixed to the seabed at various depths. In offshore Newfoundland, these nets are mostly fixed to the bottom by weights, with buoys at the surface to indicate ownership. The mesh size for gillnets vary, depending on the species that is being targeted, and by-catch of other species can be common when using this gear type.

4.3.1.6 Description of Principal Fisheries

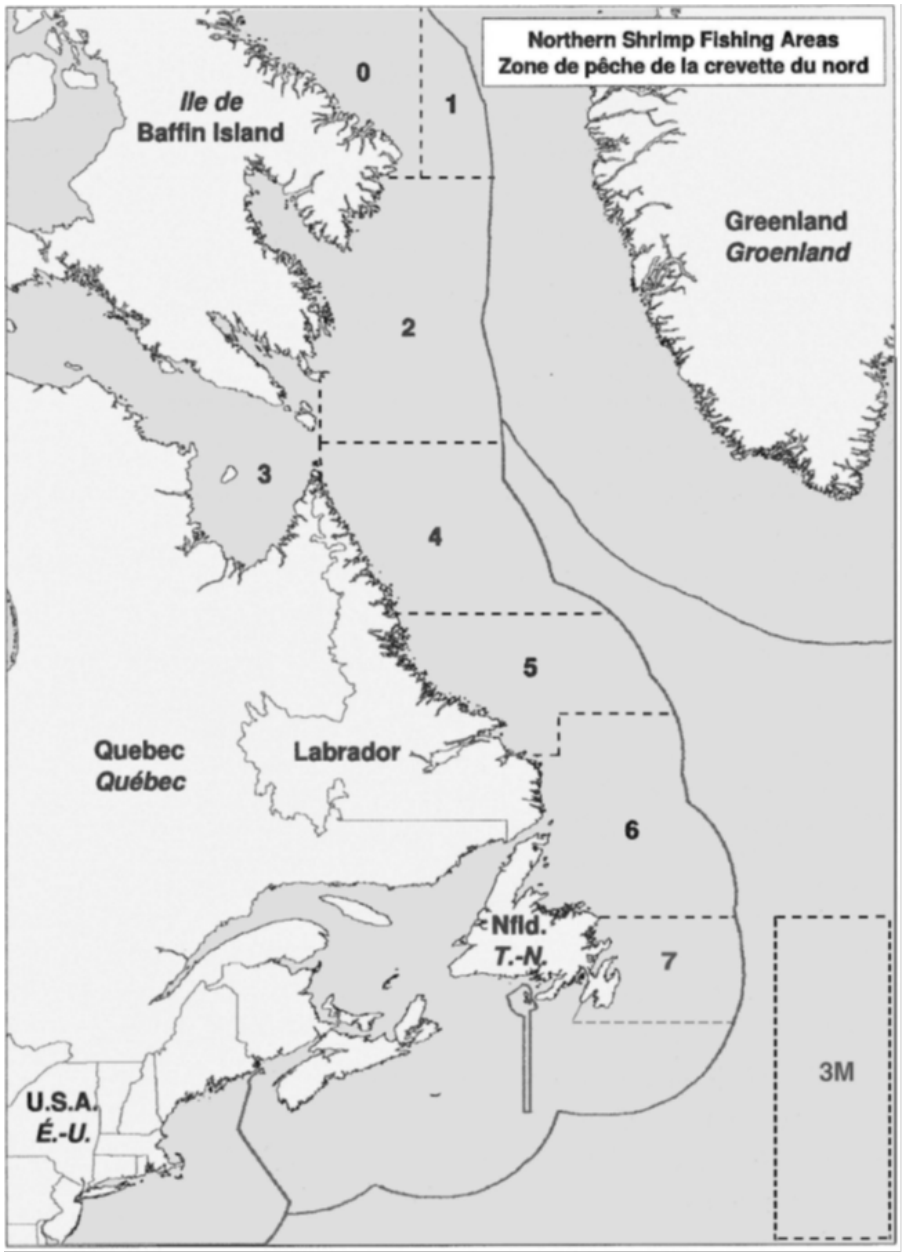
The following sections provide more details about the principal fisheries in the Study and Project Areas.

4.3.1.6.1 Northern Shrimp

Northern shrimp has been one of the largest fisheries in offshore Newfoundland and Labrador based on quantity of harvest and represents the primary shrimp resource in the North Atlantic. The fishery began in the 1970s off the coast of Labrador and became one of the key fisheries during the 1990s, after the collapse of groundfish stocks (DFO 2009a). The fishery operates both an inshore and offshore fleet and is conducted in shrimp fishing areas (SFA) along the eastern coast of Canada (see Figure 4-44). Historically, SFAs 2, 4, 5, and 6 have been the primary fishing grounds. A moratorium on shrimp fishing within SFA 7 has been in place since 2015. The Study Area overlaps areas of SFAs 6, 7, and 3M (DFO 2009a). Domestic harvesting locations for northern shrimp are shown in Figure 4-45, which illustrate the decrease in intensity and extent of the fishery within the Project Area in recent years.

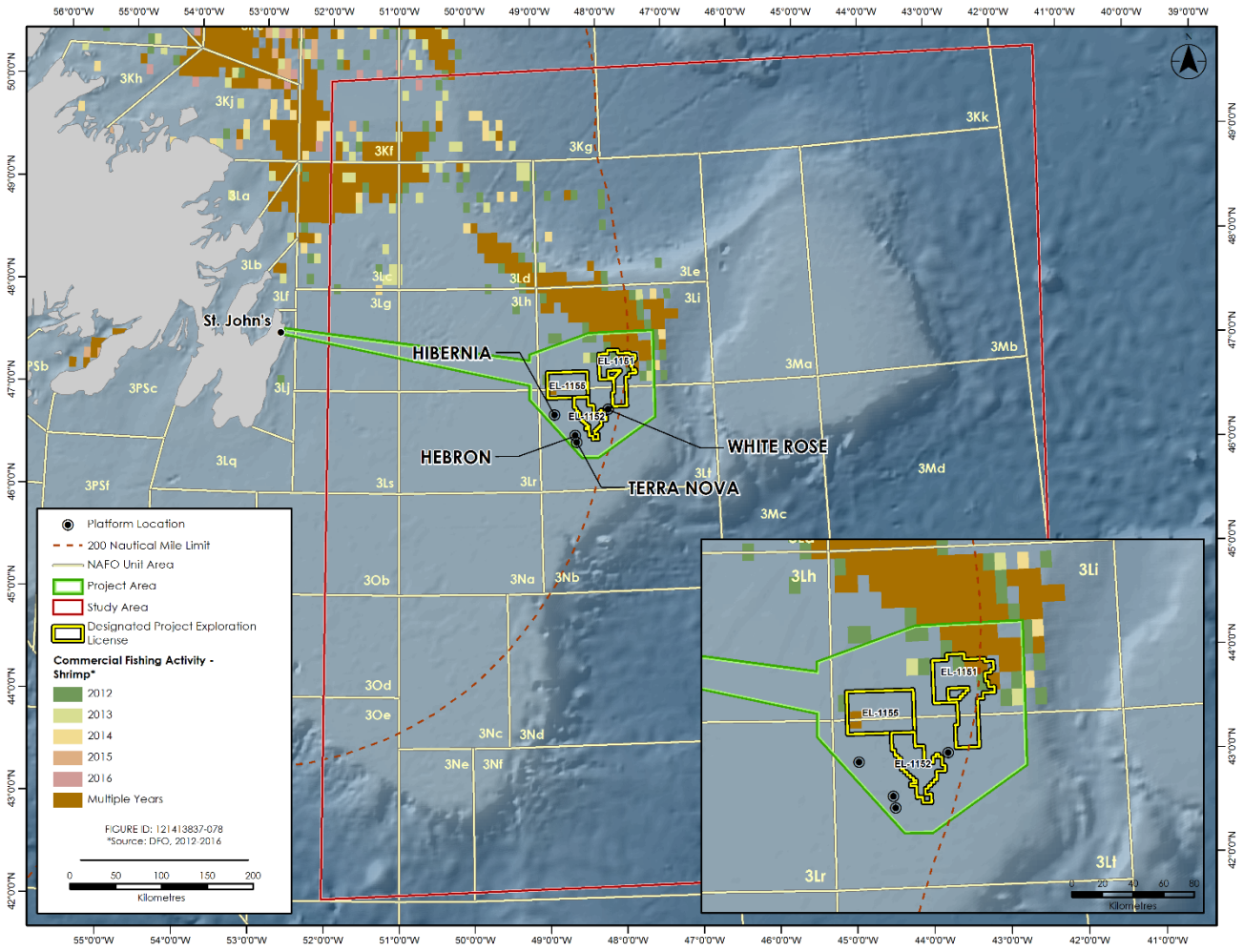
Shrimp have been harvested year-round in the Study Area by larger trawlers in the past (Husky Energy 2012a). The summer months (June to August) are historically the most important times for fishing (see Figures 4-46 and 4-47).

Relevant quotas for northern shrimp in relation to the Study Area for 2015 are shown in Table 4.40, while quotas for northern shrimp from 2010 to 2016 are shown in Table 4.41 to indicate the changes that have taken place in recent years with the domestic fishery. Quotas have been declining since 2010, with the greatest change occurring with the removal of quotas from SFA 7 (Division 3L) in 2015 (DFO 2016f). Overall, the quota for northern shrimp in 2017 for NAFO Divisions 2J, 3K and, 3L (7,061 t) was 90% less than the quota that was set out in 2012 (70,244 t).



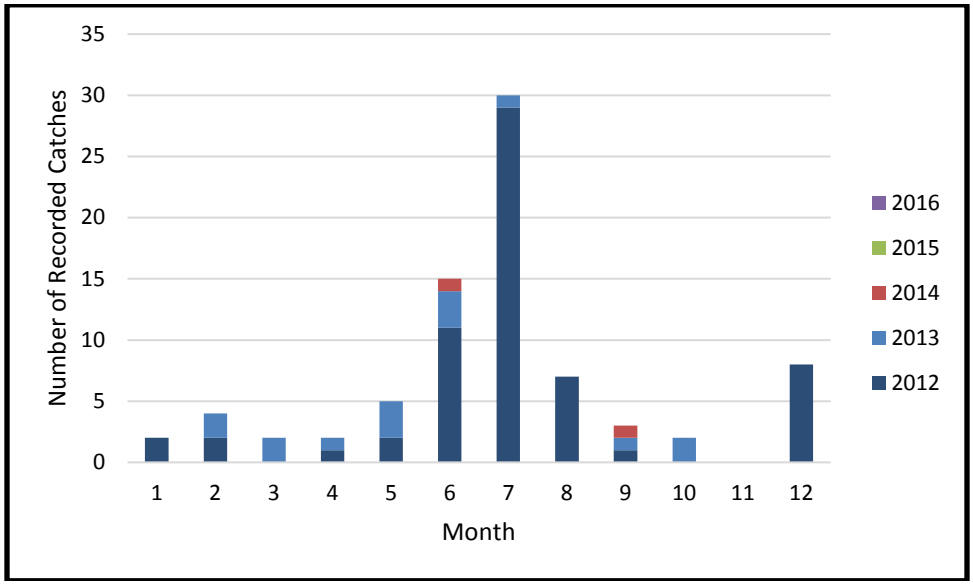
Source: DFO 2009

Figure 4-44 Shrimp Fishery Management Areas 0 to 7 and 3M



Source: DFO 2016e

Figure 4-45 Domestic Harvesting Locations, Northern Shrimp, 2012 to 2016



Source: DFO 2016e

Figure 4-46 Northern Shrimp Harvest by Month within the Project Area, 2012 to 2016

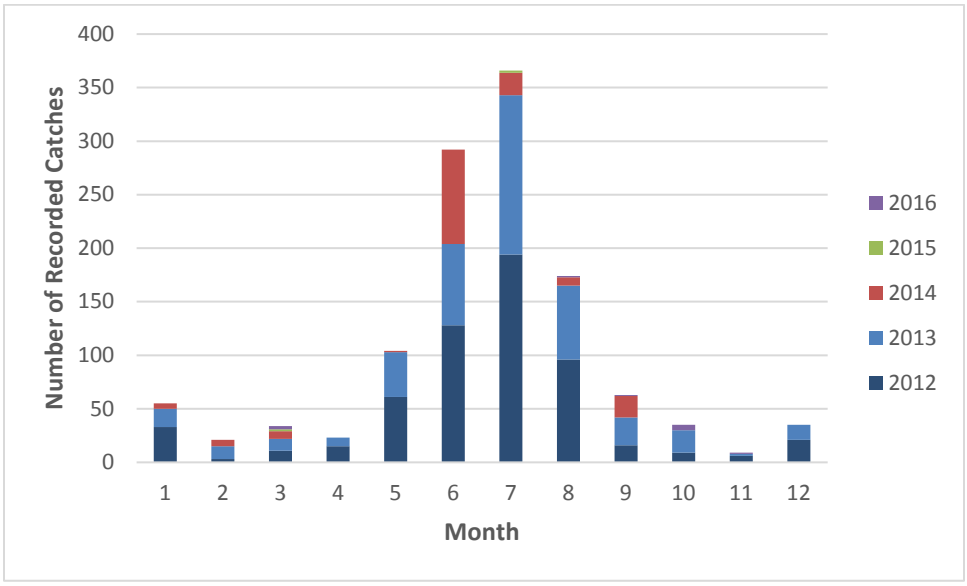


Figure 4-47 Northern Shrimp Harvest by Month within the Study Area, 2012 to 2016

Table 4.40 Northern Shrimp Quotas and Harvest within the Study Area, 2017

Licence Category/Quota Definition	Quota (Tonnes)	Taken (Tonnes)	% Taken	Date Closed (dd/mm/yyyy)
Area 6 (2J3K) - 3K Fishers North of 50'30 <65'	790	508	64%	March 31st, 2018
Area 6 – Fishers South of 50'30	2,529	2,763	109%	November 17th, 2017
Area 6 – 3L Fishers	1,311	1,126	86%	March 31st, 2018
Total	4,630	4,397		
Source: DFO 2016e				

Table 4.41 Northern Shrimp Quotas (tonnes) within Divisions 2J3KL, 2012 to 2016

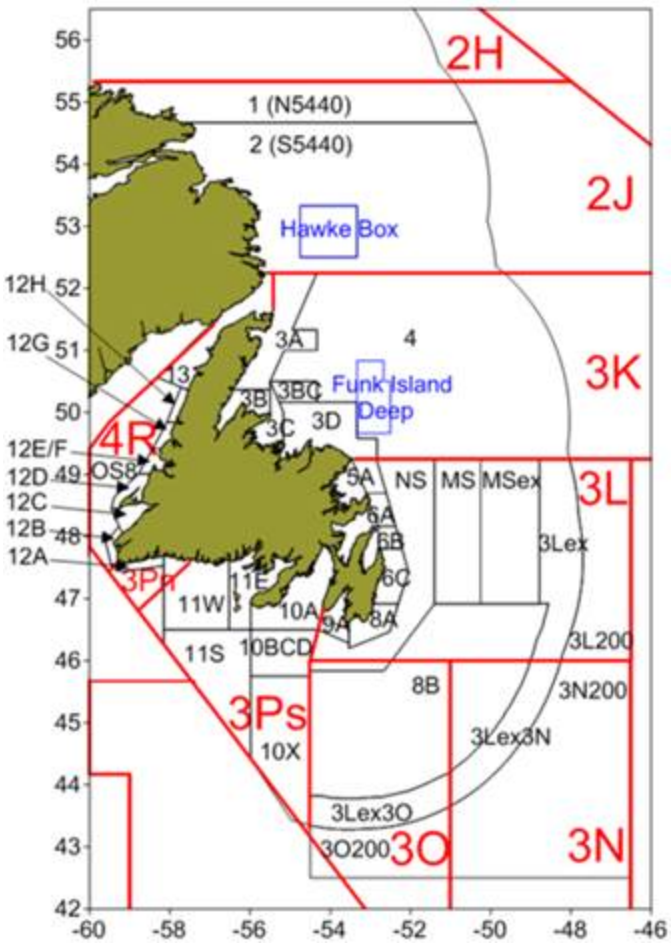
SFA (NAFO)	2012	2013	2014	2015	2016	2017	Total
SFA 6 (2J)	34,204	28,630	10,942	24,096	5,796	2,431	106,099
SFA 6 (3K)	26,040	26,254	20,383	19,916	12,161	4,630	109,384
SFA 7 (3L)	10,000	3,818	1,415	0	0	0	15,233
Total	70,244	58,702	32,740	44,012	17,957	7,061	230,716
Source: Adapted from Husky 2012a; DFO 2016g Note: There has been no directed fishery in 3L schedules for 2018							

Northern shrimp (see Section 1.3.6 in Appendix D) have become a species of concern for both the domestic and international fishing industry. According to DFO's most recent assessment of the northern shrimp stock in SFA 6, the total fishable biomass index declined 16 percent from 104,000 t in 2016 to 87,300 t in 2017. This current level of fishable biomass is the lowest level from 1996 to 2017 (DFO 2018b). The female spawning stock biomass also declined from approximately 65,000 t in 2016, to 52,700 t in 2017, representing a 19 percent decrease (DFO 2018b). As a result of this decline in the resource, the federal government imposed a reduction of the northern shrimp quota in SFA 6 by approximately 42% from 48,196 t in 2015, to 27,825 t for the 2016/2017 season (FFAW-Unifor 2016; DFO 2016f). This was subsequently cut again by 63% to 10,400 t for the 2017/2018 season (DFO 2018b).

Within the NAFO regulated areas (3LMNO and 3M), shrimp quotas are much lower due to stock status. Fishing efforts were reduced in 3M by 50% in 2010, and a moratorium was placed on the stock in 2011 due to low levels of recruitment. The latest assessment by NAFO indicates that the stock is still experiencing poor recruitment levels and is likely to remain low. As a result, there is still a moratorium placed on 3M (NAFO 2017). The stock in 3LNO has also been placed under a moratorium, with no directed fishery occurring in 2015. NAFO's most recent assessment of the 3LNO stock has suggested that the stock will likely remain below levels allowing for a fishery to take place, and no directed fishery within SFA 7 has been scheduled for 2016 (NAFO 2017).

4.3.1.6.2 Snow Crab

The snow crab fishery is a fixed gear (crab pots) fishery, based on total allowable catch quotas, and the offshore area is split into multiple crab management areas (CMA), shown in Figure 4-48.



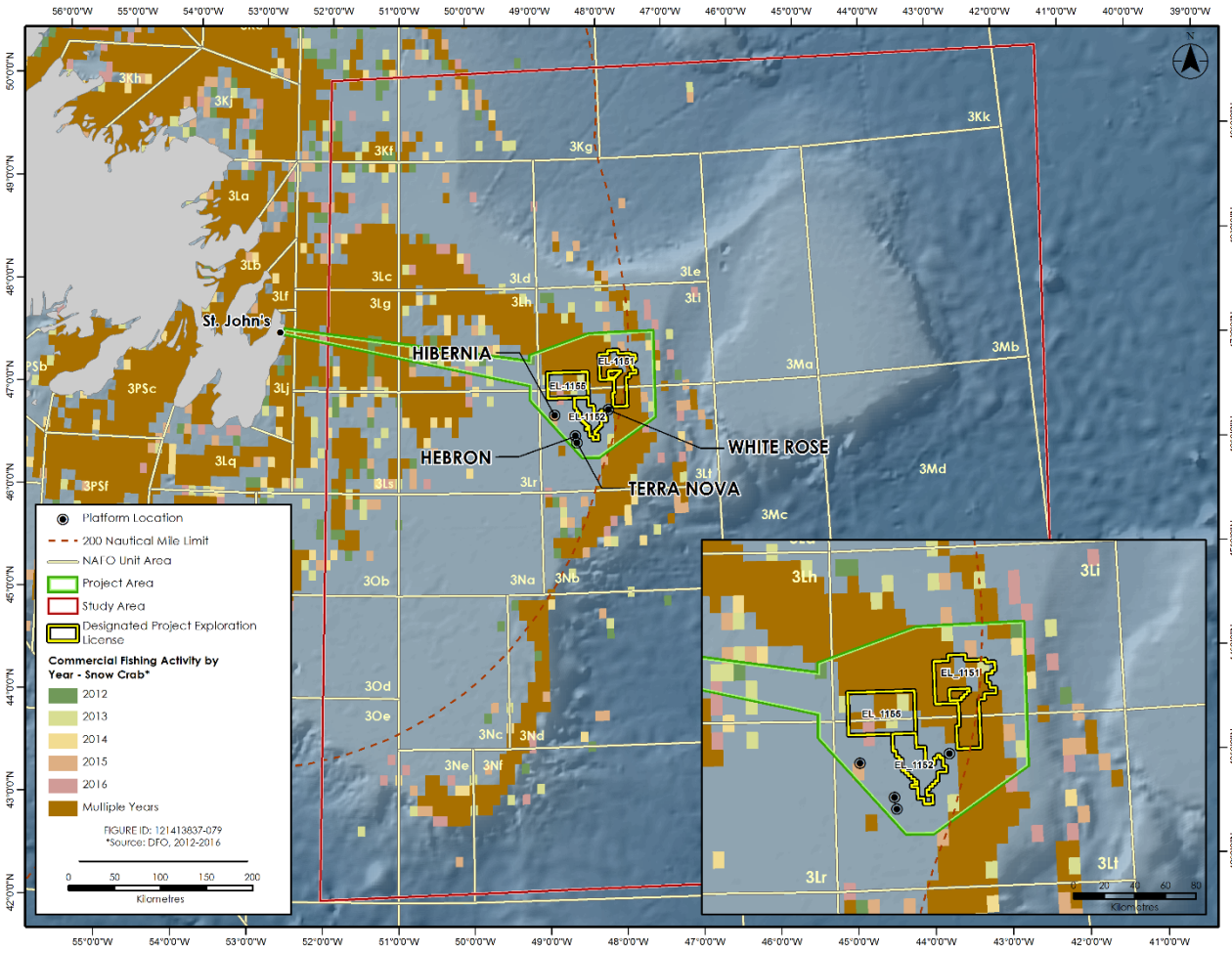
Source: DFO 2016h

Note: Black lines indicate Crab Management Areas; blue boxes indicate trawling and gillnetting closures.

Figure 4-48 Newfoundland and Labrador Crab Management Areas

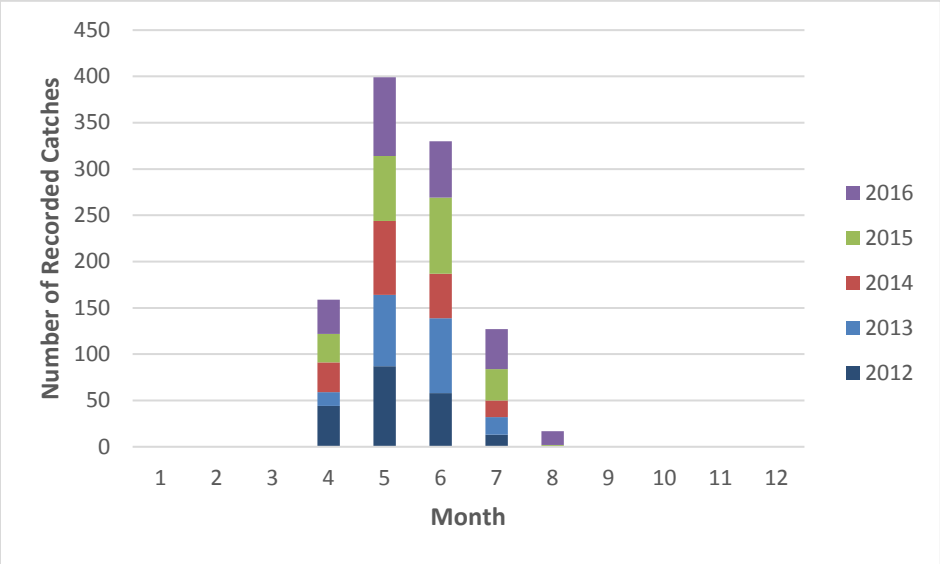
Snow crab represents a large portion of the fishing effort in offshore Newfoundland and Labrador and is one of the primary species fished within the Project and Study Areas (see Figure 4-49). Typically, the primary fishing months fall within April to August (see Figures 4-50 and 4-51).

Within each NAFO area there are multiple CMAs, each with its own fleet sectors based on vessel size, quotas, and different start and end dates. Quotas for portions of NAFO units 3L and 3N that are relevant to the Study Area are shown in Table 4.42.



Source: DFO 2016e

Figure 4-49 Domestic Harvesting Locations, Snow Crab, 2012 to 2016



Source: DFO 2016e

Figure 4-50 Snow Crab Harvest by Month within the Project Area, 2012 to 2016

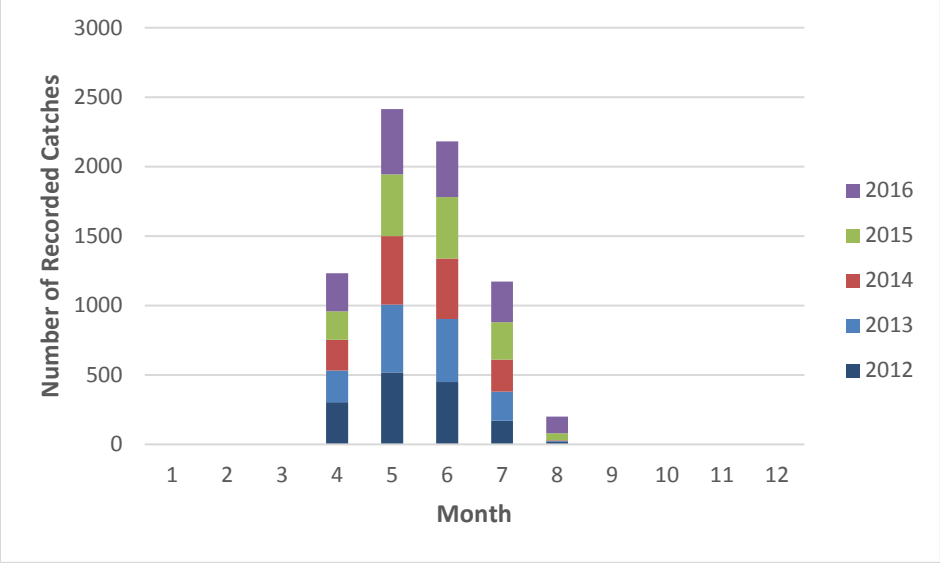


Figure 4-51 Snow Crab Harvest by Month within the Study Area, 2012 to 2016

Table 4.42 Relevant 3L/3N Snow Crab Quotas and Harvest Within the Study Area, 2017

Licence Category/Quota Definition	Quota (Tonnes)	Taken (Tonnes)	% Taken	Date Closed (dd/mm/yyyy)
3L Supplementary Large				
Midshore (MS)	1,261	1,307	104	07/08/2017
Midshore Extended (MSX)	3,024	3,177	105	07/08/2017
Outside 170 & Inside 200 miles (3LX)	2,117	2,239	106	07/08/2017
Outside 200 miles (3L200)	985	927	94	07/08/2017
3L Supplementary Small				
Midshore (MS)	3,036	3,300	109	07/08/2017
Southern Avalon Outside of 50 miles (8B)	640	593	93	07/08/2017
8B Exploratory (8BX)	80	35	44	07/08/2017
3N Supplementary Large				
Outside 200 miles (3N200)	1,011	571	56	07/08/2017
Source: DFO 2016h				

Snow crab (see Section 1.3.7 in Appendix D) stocks have also undergone fluctuations in recent years, with landings in many CMAs beginning to decline, and the fishery in offshore 3LNO becoming the primary area for snow crab aggregation, as opposed to 3K. Total landings of snow crab peaked in 2009 at 53,500 t, and then declined to 34,000 t in 2017, their lowest observed levels in two decades. Landings in NAFO Divisions 2HJ have remained low, at less than 2,000 t for the past four years (DFO 2018c), which can partially be explained by the natural range and distribution of snow crab; however, snow crab landings in NAFO Division 3K declined by 66 percent since 2009 to their lowest observed level in two decades to (5,450 t) (DFO 2018c). Landings in NAFO Divisions 3LNO were approximately 18,050 t in 2017, the lowest level in two decades. Total mortality of crab due to predation in this area has been increasing since 2009, and is now at or near its highest level in recent years (DFO 2018c). The total exploitable biomass of snow crab has been in decline since 2013 and is now at its lowest observed levels (DFO 2018c)).

Overall, future recruitment of snow crab is expected to be poor, with warming oceanographic conditions predicted to have a negative impact on recruitment (DFO 2018c). Recruitment throughout all areas has been low, and is expected to remain low in the future. (Mullowney et al. 2018).

4.3.1.6.3 Groundfish

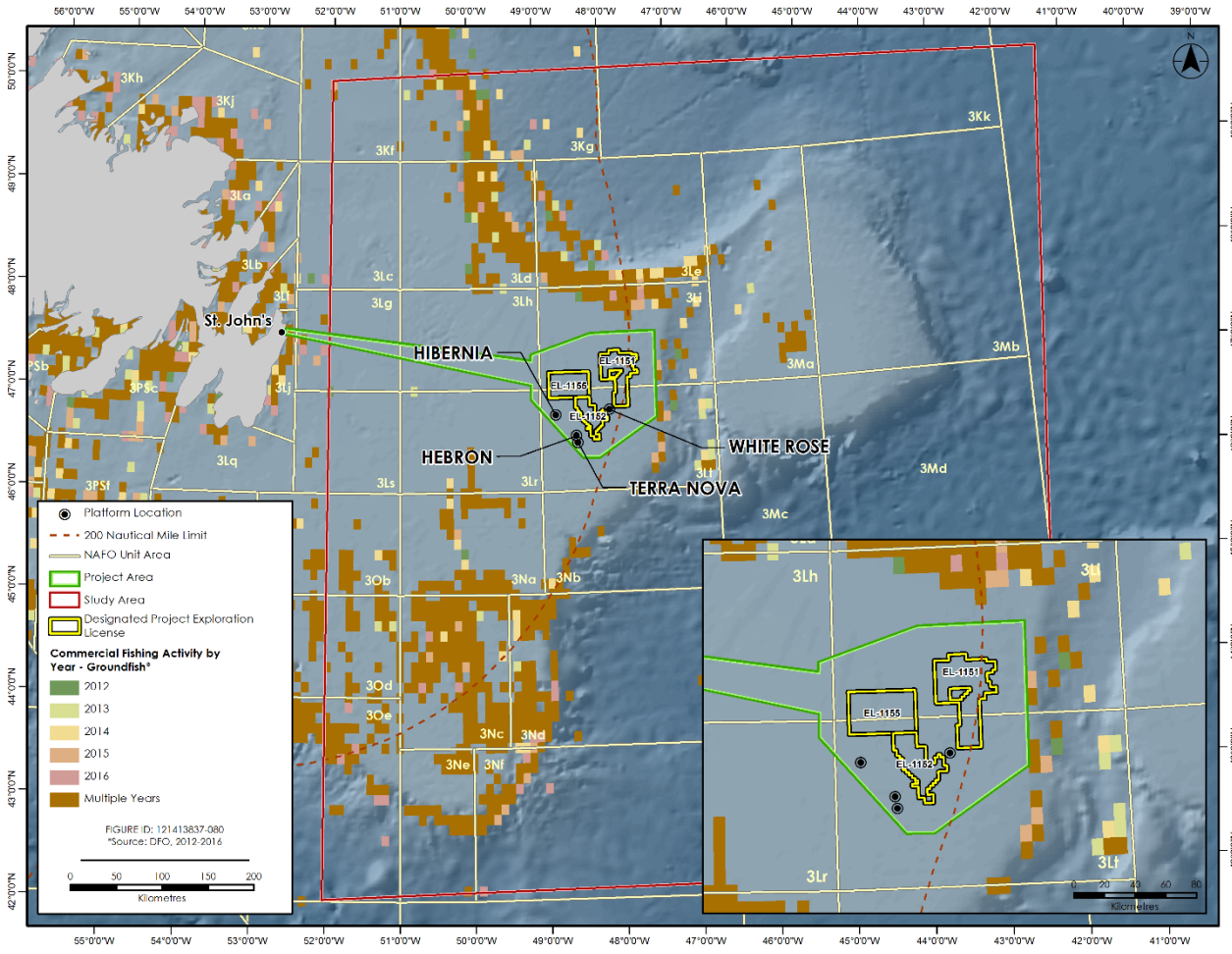
Of the available fisheries landings information provided by DFO, groundfish harvests were modest, comprising approximately 6.3% of commercial landings in the Study Area by weight, and 4.5% by value, between 2011 and 2015 (see Table 4.43). Many groundfish species are harvested together, either by a directed fishery or as by-catch fisheries. Historically, the main species targeted in the groundfish fisheries have been yellowtail flounder and turbot (Greenland halibut). Atlantic halibut has also been a targeted species due to its high market value. Cod harvest within the Study Area has remained consistent over those years, while the landings of grenadier and redfish have declined substantially. The list of groundfish species that recorded landings in the Study Area between 2011 and 2016 is shown in Table 4.43.

The domestic harvesting locations for groundfish are shown in Figure 4-52. The majority of groundfish harvesting locations take place to the north and south of the Project Area, concentrated on the northern and southern portions of the Grand Banks. Groundfish harvesting that has taken place within the Project Area has been concentrated within small portions of the Flemish Pass, and on the edges of the Flemish Cap, likely for deepwater species such as Halibut and Grenadier. Figure 4-53 and 4-54 show the timing of groundfish harvests for 2012 to 2016. Unlike some fisheries such as crab, which are concentrated to the summer months, groundfish harvesting effort is spread throughout most of the year. However, the summer months are still the most productive for harvesting activities.

Table 4.43 Offshore Groundfish Harvest (t) within the Study Area, 2012 to 2016

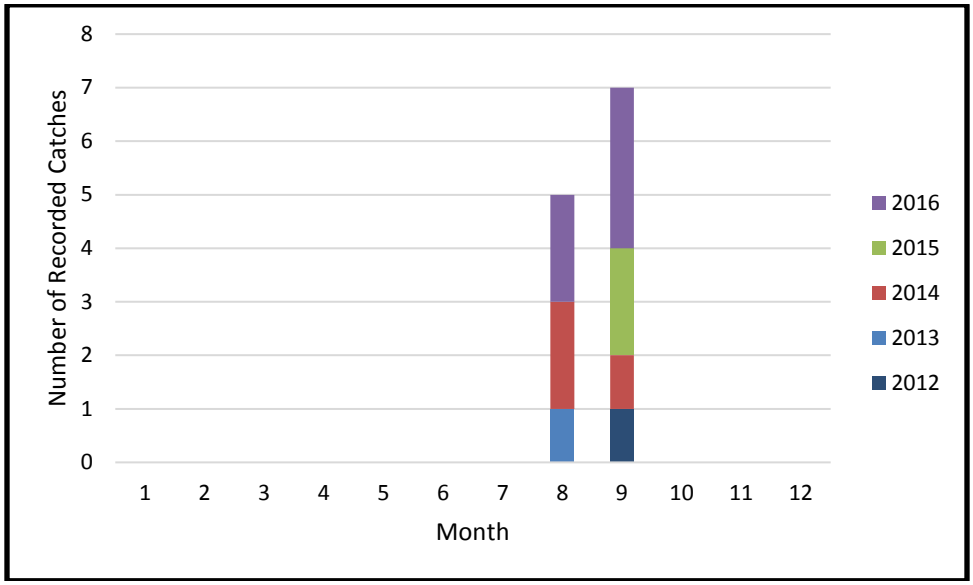
Species	2012	2013	2014	2015	2016	Total
Turbot/Greenland Halibut	2,181	1,845	1,843	1,510	1,847	9,226
Cod, Atlantic	215	283	361	300	854	2,013
Atlantic Halibut	0	31	15	0	0	47
Hake, White	0	34	0	0	0	34
Redfish	14	10	1	1	2	27
Grenadier, Rough-Head	7	0	0	0	0	7
Skate	1	0	0	0	0	1
Greysole/Witch	1	0	0	0	0	1
Haddock	0	0	0	0	0	0
American Plaice	0	0	0	0	0	0
Yellowtail Flounder	0	0	0	0	0	0
Cusk	0	0	0	0	0	0
Monkfish (American Angler)	0	0	0	0	0	0
Grenadier, Round-Nose	0	0	0	0	0	0
Catfish (Striped /Wolffish)	0	0	0	0	0	0

Source: DFO 2016e
Notes:
0 indicates data that supressed due to DFO confidentiality policies
Numbers may not total exactly due to rounding.



Source: DFO 2016e

Figure 4-52 Domestic Harvesting Locations, Groundfish, 2012-2016



Source: DFO 2016e

Figure 4-53 Offshore Newfoundland and Labrador Groundfish Harvest by Month within the Project Area, 2012 to 2016

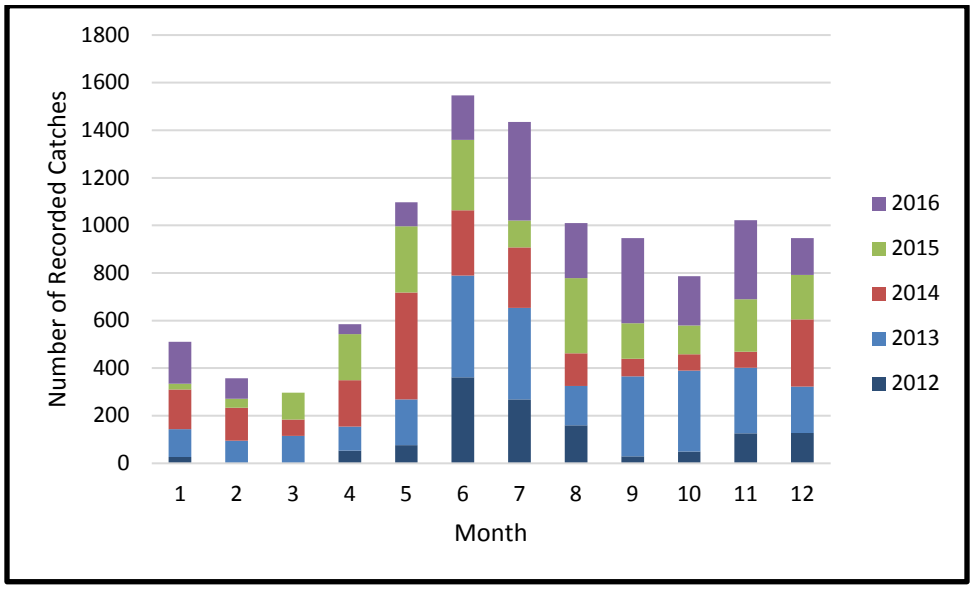


Figure 4-54 Offshore Newfoundland and Labrador Groundfish Harvest by Month within the Study Area, 2012 to 2016

3LNO yellowtail flounder is managed by NAFO, and is considered a straddling stock as it occurs both within and outside Canada's EEZ and the NRA. The latest (2015) stock assessment of yellowtail flounder by NAFO determined that the stock has a low risk of exceeding its fishing limit, and is projected to maintain a high population moving forward (NAFO 2015b).

Atlantic cod have been under a moratorium since the collapse of the groundfish stocks in the early 1990s. The most recent assessment of NAFO division 2J3KL Atlantic cod by DFO indicates that while the stock has increased over the past decade, it remains within the critical recovery zone (DFO 2016i). There is still a high level of uncertainty surrounding the stock recovery and whether a commercial fishery will be reinstated for the species. The potential exists for a commercial cod fishery to be reinstated during the temporal scope of the Project; however, industry representatives remain cautious, indicating that the species needs to show further recovery before it can be considered (CBC 2016).

Other groundfish species that are currently under moratoria include American plaice, witch flounder, grenadier, and haddock. Their status is shown in Table 4.44.

Table 4.44 Status of Existing Groundfish Moratoria in Offshore Newfoundland and LabradorSpeciesCpecies

	Stock	Managing Authority	Last Year of Assessment	Result
Atlantic Cod	2J3KL	DFO	2016	No timeline for commercial fishery
	3NO	NAFO	2015	No directed fishery for 2016-2018
American plaice	3LNO	NAFO	2016	No directed fishery for 2017-2018
	3M	NAFO	2014	No directed fishery for 2015-2017
Witch Flounder	3NO	NAFO	2015	1,000 t quota for 2015 (3NO)
	3KL	NAFO	2016	No directed fishery for 2017-2019 (3KL)
Grenadier	Subarea 0, 2, 3	DFO	2010	No recommendations available
Haddock	3LNO	DFO	2014	No recommendations available
Sources: DFO 2014b; NAFO 2015a				

Three species of redfish (Acadian, golden, and deepwater) occur in the waters of offshore Newfoundland and Labrador, and all three are managed together as a single unit in each management area (DFO n.d.). Redfish are typically located at water depths below 200 m and are found along the northeast slope of the Grand Banks. NAFO collectively manages the stocks of all three species of redfish in Divisions 3KLMNO. The stock in Division 3K is jointly managed with the Northeast Atlantic Fisheries Commission (NAFO 2015). The commercial stock for redfish in 3LN was placed under moratorium in 1998 but re-opened in 2010. Catches for redfish in 3LMN reached 6,000 t in 2013, the highest level in 20 years. Stocks in 3M have remained relatively stable over the years, but there is still a high level of uncertainty regarding the health of the 3O stocks (NAFO 2015).

Greenland halibut is managed by NAFO for stocks in Divisions 3LMNO. In 2010, NAFO adopted a Management Strategy Evaluation for the fishery, which looked at a survey-based harvest control rule to set quotas for the species. This rule is based on multiple variables and science to determine the appropriate quotas. This will be assessed on an annual basis. The most recent TAC for 2017 was 10,966 t (NAFO 2017).

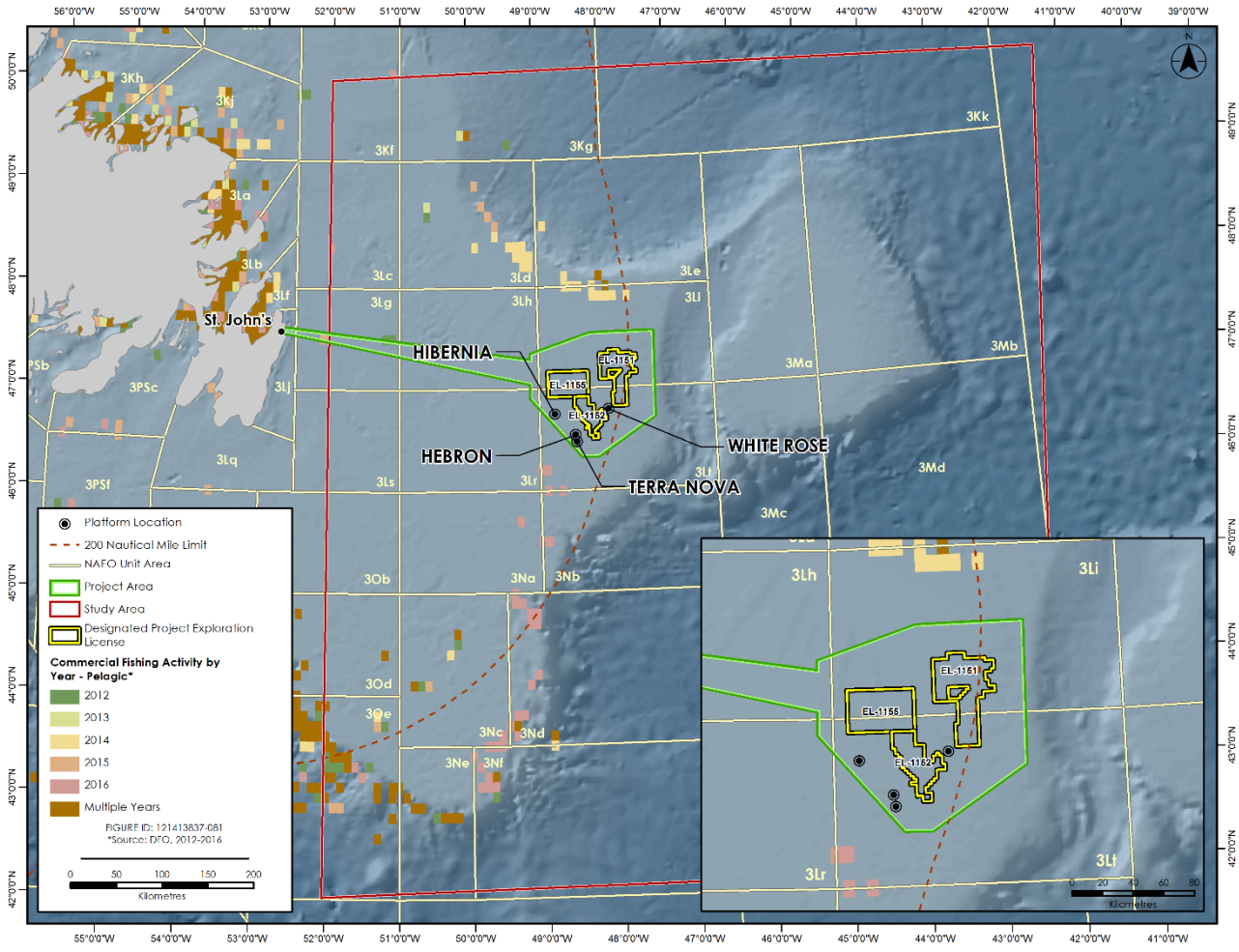
4.3.1.6.4 Pelagics

While there are a number of pelagic species that exist in offshore Newfoundland and Labrador, and some species such as capelin and herring are important species either commercially or ecologically (see Section 4.2.4), there have been no pelagic fishing activity within the Project Area in recent years. Figure 4-55 shows domestic harvesting location for pelagic species and illustrates that all commercial fishing activity occurs outside the Project Area.

4.3.1.1 International Fisheries

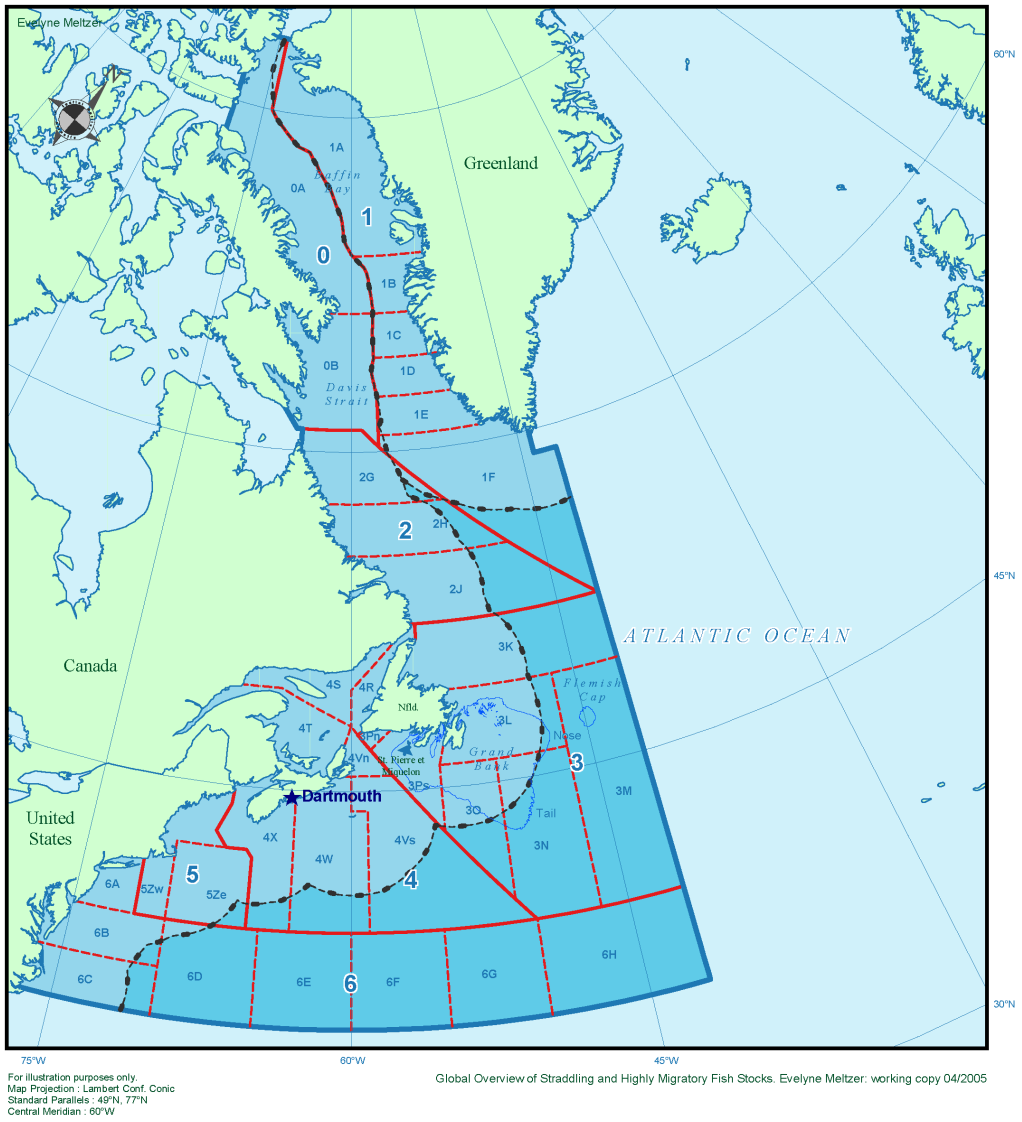
Multiple NAFO Convention nations take part in the harvesting of fish stocks in waters adjacent to Canada's EEZ. The primary fishing areas typically take place in NAFO divisions 3LMNO, and harvesting takes place within the NAFO Regulatory Area (NRA) (see Figure 4-56). The NRA is approximately 2,707,895 km² and comprises approximately 40% of the NAFO Convention Area (which spans the NAFO areas adjacent to the EEZs of Canada, the United States, St. Pierre et Miquelon, and Greenland). This figure shows the boundaries for Regional Fisheries Management Organizations (RMFO); however, NAFOs regulatory authority is restricted to waters within the NRA (NAFO 2016c).

The principal fisheries harvested by NAFO states typically include northern shrimp and groundfish species, mainly Greenland halibut and yellowtail flounder. Redfish has become an important commercial fishery for various states. The data indicate that other than Canadian ships, several other nations including vessels from Denmark, Iceland, Cuba, Faroe Islands, Portugal, Norway, and Russia fish in the NRA. United States data are not included in the NAFO STATLANT database. These data indicate that Canadian fleets have consistently been harvesting more than any other NAFO state within the NRA (Figure 4-57).



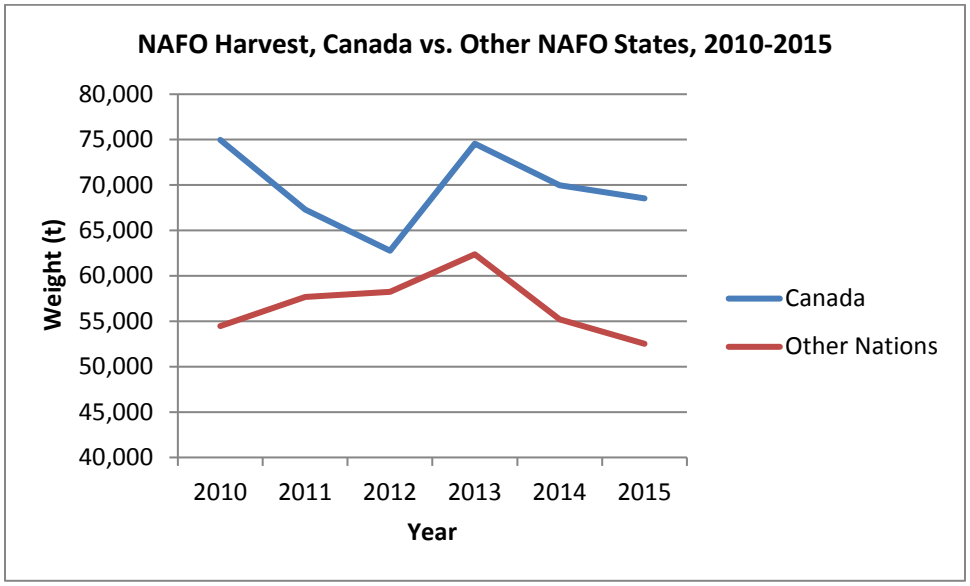
Source: DFO 2016e

Figure 4-55 Domestic Harvesting Locations, Pelagics, 2012 to 2016



Source: DFO 2005

Figure 4-56 NAFO Regulatory Area



Source: NAFO 2016b

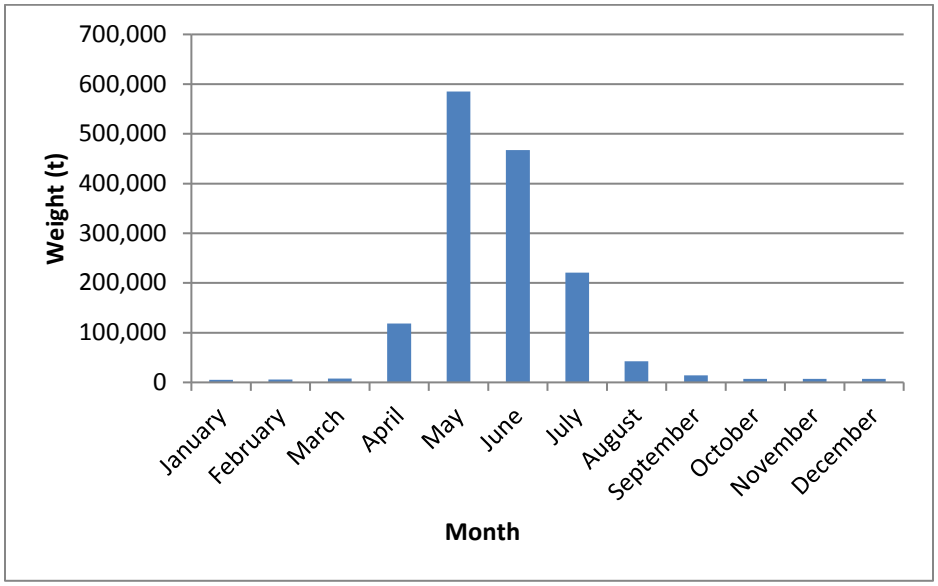
Figure 4-57 International Harvest from Divisions 3LMNO, Canadian vs. International fleets, NAFO Managed Stocks, 2010 to 2015

Fish catch data are sourced from the NAFO STATLANT 21A database, which provides fishing information in relation to year, species, unit area, country, and weight. The total catch recorded by NAFO for divisions 3LMNO, between 2012 and 2015, are listed in Table 4.45. Based on the data provided, the largest concentration of fishing activity is directed in Division 3L, which overlaps with the Project Area (see Figure 2-1). 3M and 3N have similar levels of harvesting activity, while 3O has lower intensity.

Table 4.45 International Fish Catches by NAFO Division (t), 2012 to 2016

NAFO Division	2012	2013	2014	2015	2016	Total
3L	66,443	69,712	65,733	65,285	54,040	408,292
3M	25,885	27,609	26,024	21,930	23,633	149,161
3N	17,888	24,971	19,073	14,033	21,930	119,532
3O	10,977	14,627	14,649	16,174	13,488	81,791
Total	129,442	124,972	121,193	136,919	125,190	758,776
Source: NAFO 2016b						

The seasonality of harvesting effort from International fleets within Divisions 3LMNO is illustrated in Figure 4-58. Between all species harvested internationally, most of the harvest occurs during late spring into late summer, with little activity occurring during the fall and winter months.



Source: NAFO 2016b

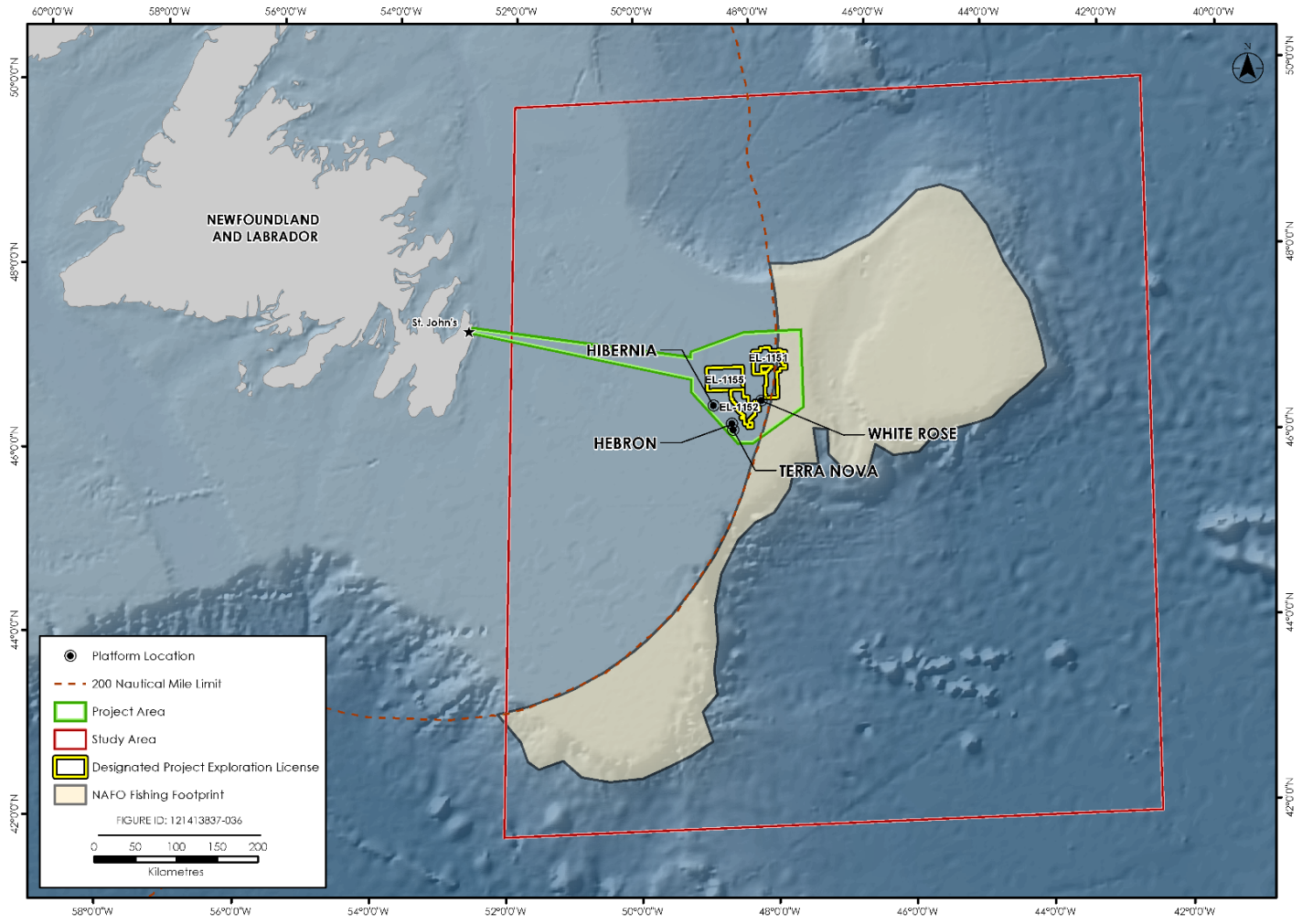
Figure 4-58 International Harvest by Month, Divisions 3LMNO, All Species, 2012 to 2016

A list of 15 species that have had the highest landings based on quantity from 2012 to 2016 is presented in Table 4.46. Although there are valuable commercial species that are harvested in smaller quantities, snow crab, redfish, Atlantic cod, and capelin have been harvested in the greatest volume in recent years. Other commercially important species include Greenland halibut, yellowtail flounder, Atlantic halibut, and several species of sharks, tuna, and rays.

During 2007, the United Nations General Assembly made a request that regional fisheries management organizations, such as NAFO, regulate bottom fisheries whose activities can cause adverse impacts to vulnerable marine ecosystems. This prompted the Fisheries Commission to create new conservation and enforcement measures, which included the mapping of bottom fishing activities within the NRA. The subsequent submissions by NAFO states on where they were conducting bottom fishing activities provided the data necessary for the mapping (and adoption) of the NAFO fishing footprint (see Figure 4-59). This footprint is approximately 120,048 km² and depicts where bottom fishing activities take place (NAFO 2016c, 2016d).

Table 4.46 Primary Harvested Species by Quantity (t), Divisions 3LMNO 2012 to 2016

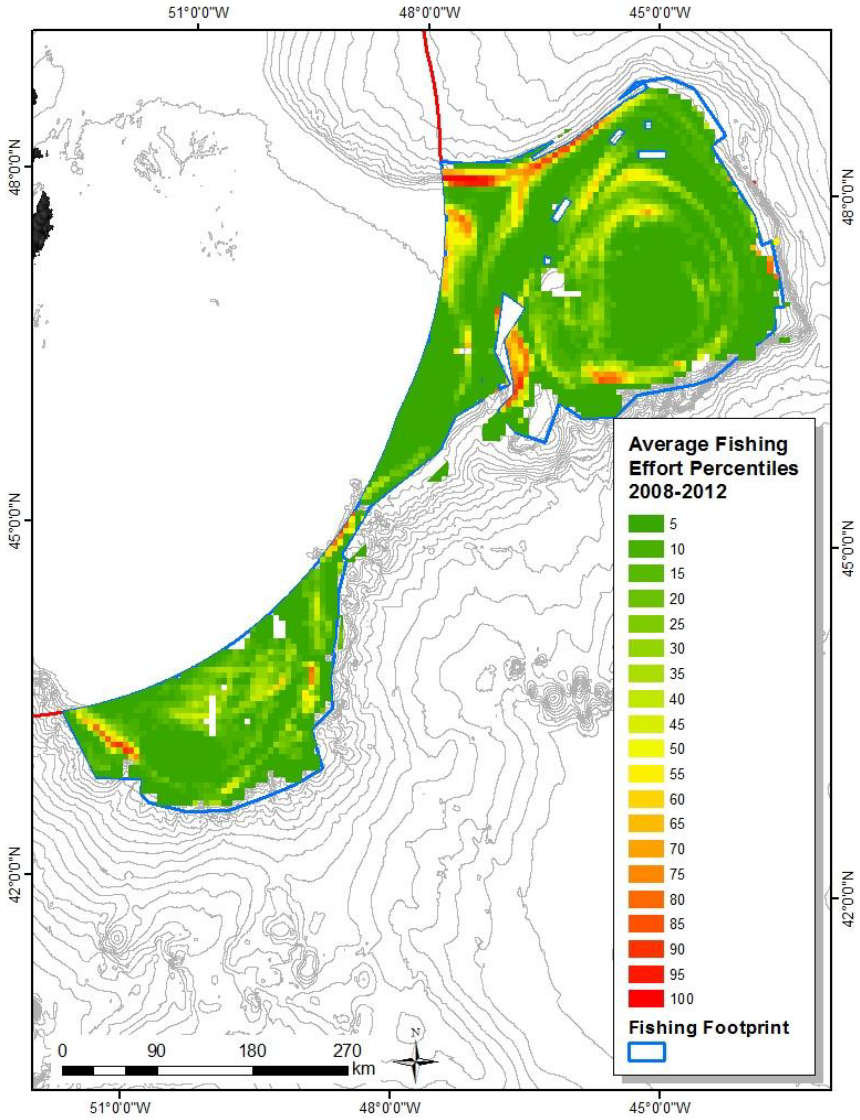
Species	2012	2013	2014	2015	2016	Total
Queen Crab	41,930	42,494	42,348	42,158	29,484	198,414
Northern Prawn	48,327	44,134	37,828	40,892	8,185	179,366
Capelin	22,240	23,695	23,149	25,072	19,916	114,072
Atlantic Redfishes (ns)	18,557	20,797	19,718	23,530	23,296	105,898
Atlantic Cod	13,073	18,720	19,528	17,730	18,017	87,068
Greenland Halibut	12,151	11,477	12,843	11,749	10,917	59,137
Yellowtail Flounder	3,214	10,537	7,970	6,894	6,826	35,441
Skates (ns)	4,476	4,406	4,552	3,394	3,526	20,354
Atlantic Herring	3,385	5,459	4,455	5,184	651	19,134
Great Blue Shark	6,345	6,940	3,315	0	2,354	18,954
American Plaice	1,490	2,455	1,635	1,336	1,194	8,110
Surf Clam	0	276	0	766	6,944	7,986
Pink Shrimps	1,259	636	2,604	0	0	4,499
Witch Flounder	568	601	707	747	830	3,453
Atlantic Halibut	399	544	875	842	746	3,406



Source: NAFO 2016c; 2016d

Figure 4-59 NAFO Fishing Footprint

NAFO has also kept records of ship locations during bottom fishing activities, using a vessel monitoring system as part of their conservation and enforcement measures. This has allowed tracking and mapping of fishing intensity and confirmation of the effectiveness of fishery closure areas. The intensity of bottom fishing activities in the NAFO Fishing Footprint between 2008 and 2012 is illustrated in Figure 4-60.



Source: NAFO 2014

Figure 4-60 Intensity of Bottom Fishing Activities in the NAFO Fishing Footprint between 2008 and 2012

Areas near the Sackville Spur, and sections of the Flemish Pass have been the most heavily fished (NAFO 2014).

4.3.2 Indigenous People and Community Values

The EIS Guidelines identified five Indigenous Groups in Newfoundland and Labrador to be considered in the assessment (Figures 4-61 to 4-65). In addition to the Newfoundland and Labrador Indigenous groups previously engaged for the Husky Exploration Drilling Project (the Project) environmental assessment, in May 2017 the CEA Agency identified an additional 36 Indigenous groups in New Brunswick, Nova Scotia, Prince Edward Island, and Quebec (Figure 4-65) that harvest Atlantic salmon (for food, social and ceremonial (FSC) purposes and/or harvest swordfish (*Xiphias gladius*) under communal commercial fishing licences.

Information presented in this section of the EIS characterizes the baseline conditions for Indigenous peoples to facilitate an evaluation of effects described in paragraph 5(1)(c) of CEAA 2012, specifically:

- *health and socio-economic conditions*,
- *physical and cultural heritage*,
- *the current use of lands and resources for traditional purposes, or*
- *any structure, site or thing that is of historical, archaeological, paleontological or architectural significance*.

The following sections provide an overview of the history and current socioeconomic conditions of each Indigenous community, focused on aspects that may have potential to interact with the Project. For example, given the Project is in the marine environment, the description of current land and resource use for traditional purposes (i.e., 5(1)(c)(iii) of CEAA 2012) focuses on marine-associated species of importance to Indigenous peoples. This discussion includes consideration of FSC fishing and commercial communal fishing.

Indigenous peoples have traditionally relied on fishing both for sustenance and for trade for centuries – it is a way of life for many Indigenous communities. The right to fish traditionally and for a moderate livelihood in Canada is protected under the *Constitution Act*, 1982 (Section 35). This right has been affirmed in various Supreme Court of Canada decisions, such as the "Sparrow decision" (1992), and the "Marshall decision" (1999). The Minister of Fisheries and Oceans issues two types of communal fishing licenses to Indigenous groups, which allow fishing for either FSC or commercial purposes. These licenses are held under the name of the Indigenous community, not under the name of a specific individual.

In 1992, DFO introduced the Aboriginal Fisheries Strategy to provide a regulatory framework for FSC fishing. After conservation, fishing for FSC purposes takes precedence over other fisheries, including commercial and recreational fisheries. Given the social, spiritual, and cultural value of FSC fisheries, it reflects the very nature of Indigenous culture.

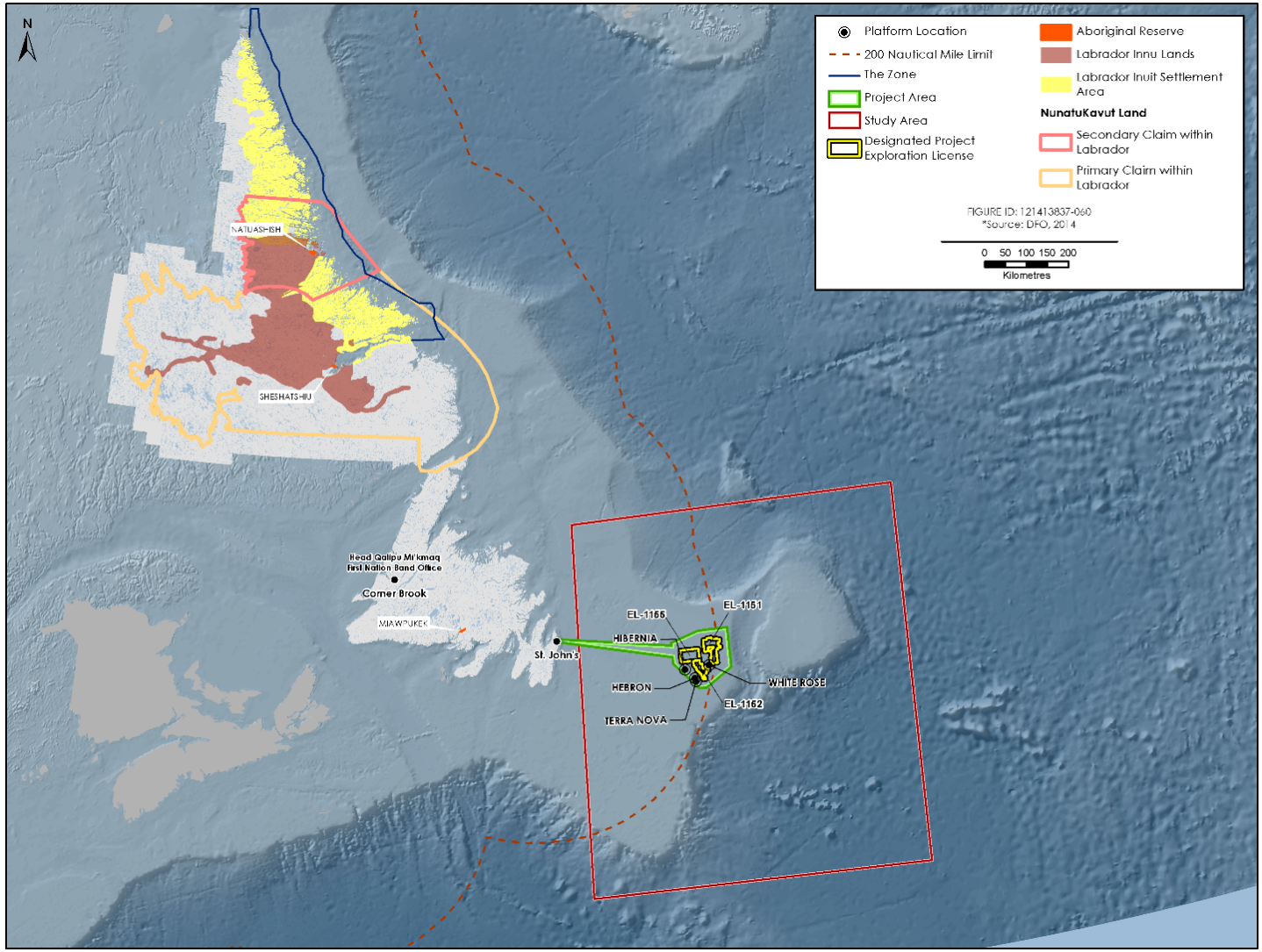


Figure 4-61 Indigenous Communities within Newfoundland and Labrador

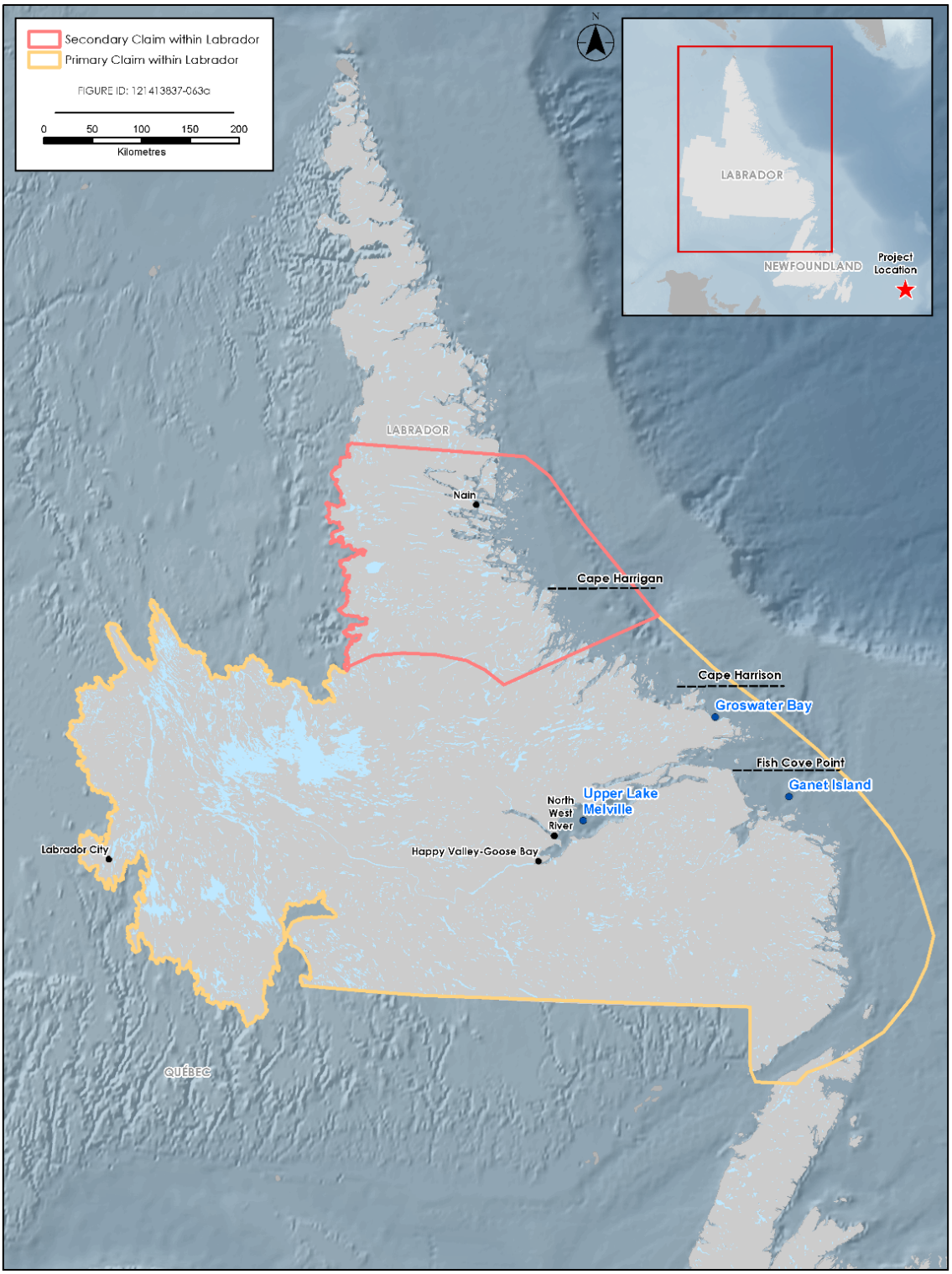


Figure 4-62 NunatuKavut Community Council Fishing Areas

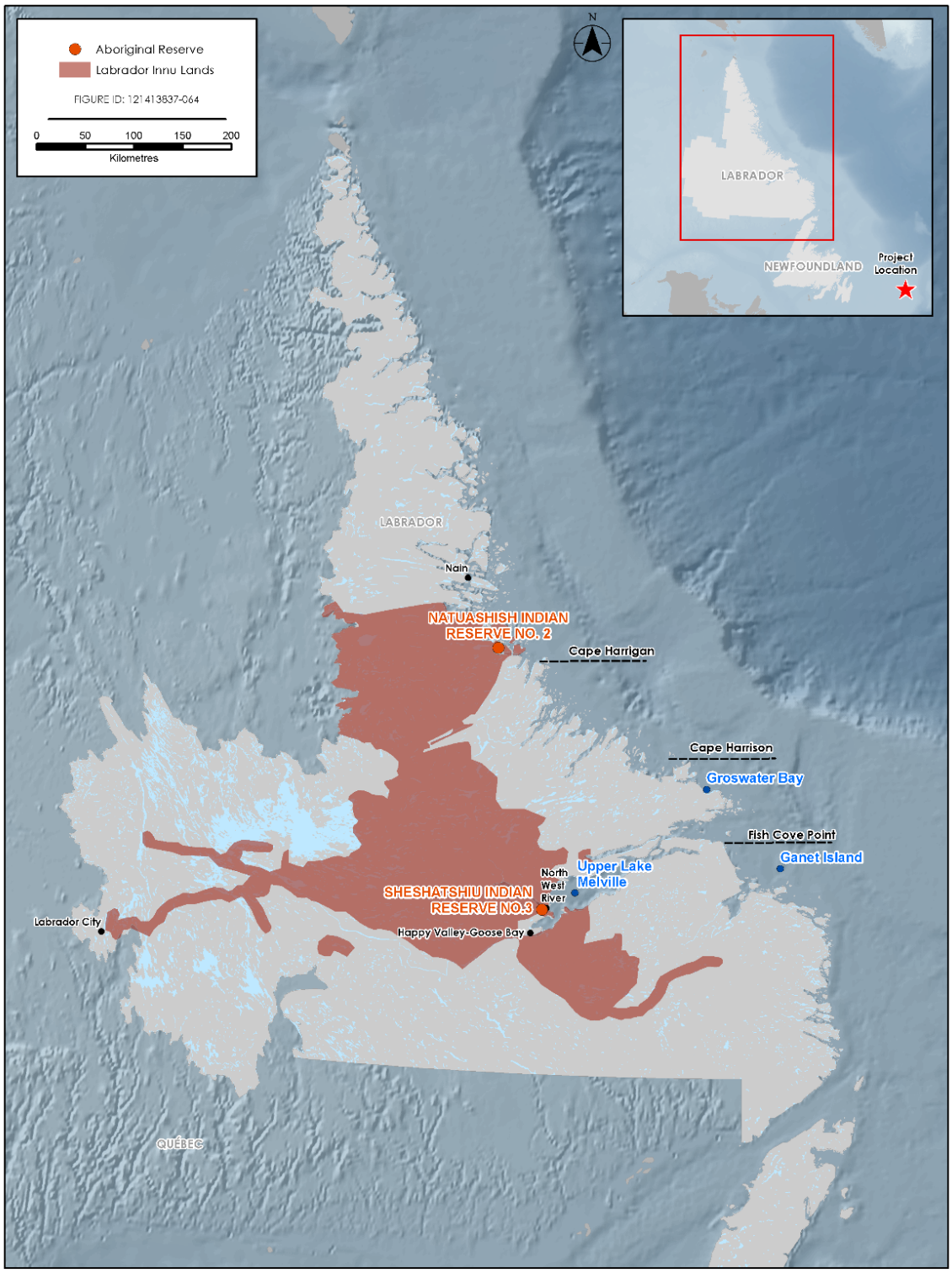


Figure 4-63 Innu Nation Fishing and Sealing Areas

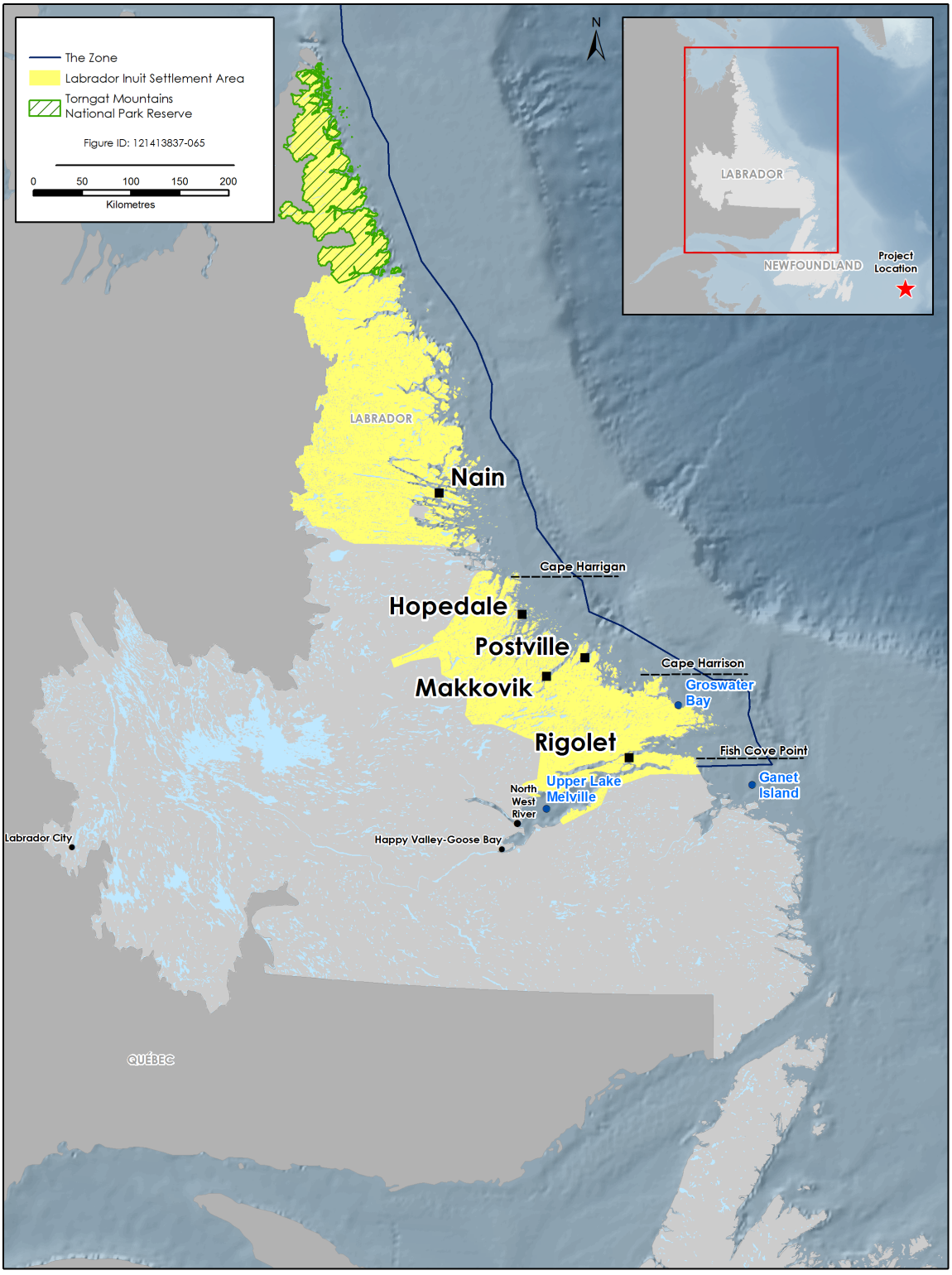


Figure 4-64 Nunatsiavut Government Fishing and Sealing Areas

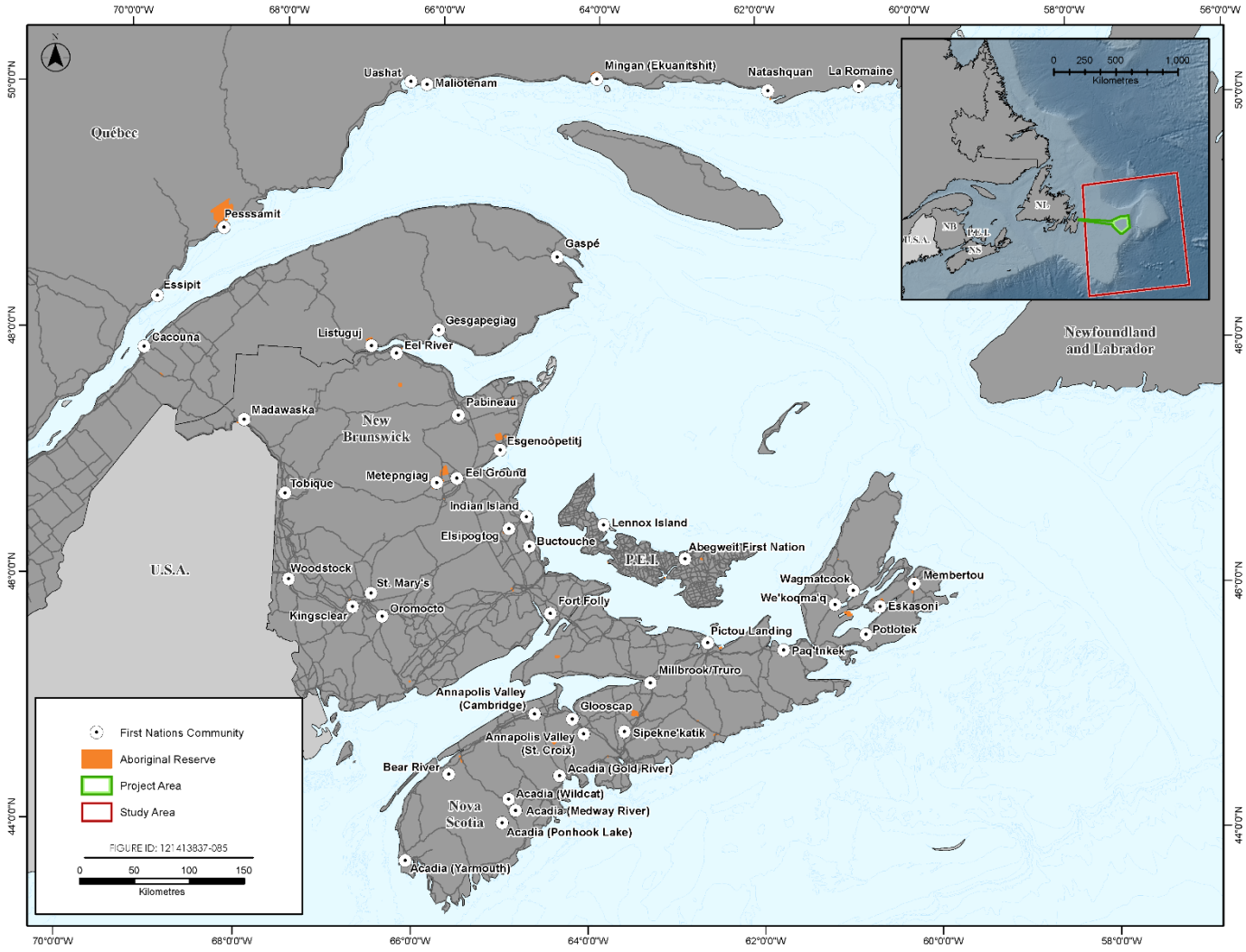


Figure 4-65 Indigenous Groups in NB, NS, PEI, and QC

DFO implemented the Marshall Response Initiative (MRI) from 2000 following the Supreme Court of Canada's 1999 Marshall decision, to provide increased Indigenous access to the commercial fishery through the issuance of commercial communal licenses. In 2007 the MRI was replaced by the Atlantic Integrated Commercial Fisheries Initiative (AICFI) to sustain the public investment made to the Indigenous commercial fishery through the MRI. It provided the 34 Mi'kmaq and Wolastoqiyik (Maliseet) First Nations affected by the Marshall decision with capacity-building support for the successful management of Indigenous commercial communal fisheries and effective Indigenous participation in fisheries co-management (DFO 2012b, DFO 2012c).

Since the inception of the MRI and AICFI initiatives, the value of the commercial communal fisheries has grown and is anticipated to continue to grow. In the Atlantic region, commercial communal fisheries contribute $100 million to the Indigenous fishery. The commercial communal fisheries comprise a high percentage of sole source revenue for many of the Indigenous communities. Community ventures, social programs, and benefits are often funded from revenue generated by the commercial communal fisheries; therefore, there is potential that impacts to commercial communal fisheries may be broader than direct and indirect economic impacts to communities.

Through ongoing engagement and consultation with Indigenous communities on this Project and other offshore exploration drilling programs, it has been communicated that Indigenous interests and concerns extend beyond potential interactions and effects on commercial communal and FSC fishing practices. Several species which could occur in the Eastern Newfoundland offshore area (and potentially interact with Project activities) are culturally or spiritually significant to Indigenous peoples. These may include species which have been traditionally used for food, medicinal, social or ceremonial purposes and also hold cultural value but also species which have ecological value as biological components contributing to overall ecosystem sustainability, which, if adversely impacted, could potentially indirectly affect asserted or established Aboriginal and treaty rights.

4.3.2.1 Approach and Key Information Sources

Baseline conditions described below provide information about the demographics of each community and, where available, socio-economic conditions focusing primarily on economic opportunities derived from fisheries-related activities. The nearest Indigenous community to the Project Area is the Qalipu Mi'kmaq community of Glenwood, located approximately 346 km from the Project Area. The nearest reserve land belongs to Miawpukek First Nation, which is located 460 km from the Project Area. Given the Project activities and components will be located a considerable distance from Indigenous communities, activities, and other known interests, Project activities and Indigenous communities' activities are unlikely to overlap geographically. The discussion of baseline conditions is therefore focused on marine and migratory species of interest to Indigenous communities, including information about harvested species, seasonal information, and presence within the Study Area.

A variety of sources were considered, including:

- Meetings and correspondence with Indigenous communities (including correspondence between Indigenous communities and the Agency)
- Community websites
- Publicly-available reports and studies, such as recent environmental assessments (e.g., Scotian Basin Exploration Drilling Project and Flemish Pass Exploration Drilling Projects) and associated traditional use information to support other resource development project assessments and supplemental information responses.

Where limited information was available on aspects of individual Indigenous communities, such as community health or land and resource use, more general information has been provided at the regional or provincial level.

Given Husky and BP Canada concurrently prepared their EISs for their respective exploration programs in accordance with EIS Guidelines, Husky and BP will be using the same Indigenous community baseline profiles for their respective EISs. Draft community profiles were provided to each Indigenous group for review and feedback, and many responded with comments that have been incorporated below, to the extent possible.

4.3.2.2 Newfoundland and Labrador Indigenous Groups

The EIS Guidelines specify five Newfoundland and Labrador Indigenous communities for engagement and inclusion in the EIS:

- Labrador Inuit (Nunatsiavut Government)
- Labrador Innu (Innu Nation)
- NunatuKavut Community Council (NCC)
- Qalipu Mi'kmaq First Nation
- Miawpukek First Nation

Community profiles are provided for each Indigenous community in Table 4.47.

Table 4.47 Newfoundland and Labrador Indigenous Groups Community Profiles

Community Indicator	Description
Labrador Inuit (Nunatsiavut Government)	
Location and Proximity to Project Area	The Labrador Inuit's traditional territory extends from Cape Chidley in the north, to south of Groswater Bay and west to the Labrador-Quebec border. The Labrador Inuit Settlement Area is approximately 816 km from the Project Area.
General Overview	Following three decades of land claims negotiations between the Labrador Inuit Association (LIA) and the Governments of Canada and Newfoundland and Labrador, the Nunatsiavut Government, an Inuit regional self-government, was established. On December 1, 2005 the *Labrador Inuit Land Claims Agreement* (LILCA) came into effect which sets out the details of land ownership, resource-sharing, and self-government within the established Labrador Inuit Settlement Area (LISA), and provides for harvesting rights in and outside the LISA. Labrador Inuit Lands are approximately 15,800 km^2 in area, within the LISA boundary. The Nunatsiavut Government represents over 2,524 Labrador Inuit beneficiaries living in five Inuit communities: Nunainguk (Nain), Agvitok (Hopedale), maggovik (Makkovik), KipukKak (Postville) and Tikigiaksaugusik (Rigolet) (Nunatsiavut Government 2017; Sikumiut Environment Management Ltd. 2011). There are 7,133 Labrador Inuit Canada-wide. The Project does not overlap with any of the lands covered by this treaty.
Health and Socio-economic Conditions	The Labrador Inuit communities are accessible and serviced for half the year (from July to November) by ferries operated by the Government of Newfoundland and Labrador and Nunatsiavut Group of Companies (NGC) and regional airlines such as Air Borealis (Statoil 2017). There are schools within each community, administered by the Newfoundland and Labrador English School District. Emergency services are provided to each community through Royal Canadian Mounted Police (RCMP) detachments and volunteer fire brigades in Nain, Rigolet, Makkovik and Hopedale (Nalcor Energy 2011). Each community is visited by a physician every four to six weeks. Dominant industries for the Labrador Inuit include public administration, health care and social assistance, mining and tourism (Nalcor Energy 2011). Major employers are the Torngat Fish Producers Co-op, NGC, the Inuit Community Governments and the Voisey's Bay Mine / Mill (Nalcor Energy 2011). As described in more detail below, the Nunatsiavut Government hold several commercial communal licences for a variety of fish and marine species. In Nain, there is a fisheries operation base for the processing of char and turbot (Nalcor Energy 2011). In Postville, employment has been created through the crab, shrimp, and turbot fishery (Town of Postville 2003). There is also a fish plant in Makkovik.

Community Indicator	Description
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	The Labrador Inuit, descendants of the prehistoric Thule, are hunters drawn to Labrador for the large number of whales and wildlife, with the earliest ancestors living primarily along the north coast (Nunatsiavut Government 2017). They are culturally and linguistically part of the Inuit peoples who occupy the Arctic and parts of the sub-Arctic from Alaska east across northern Canada, Greenland and the Arctic edges of the former Soviet Union and are the most southern expansion of this culture (Nexen Energy ULC 2018). Pre-contact Inuit lifestyle included harvesting during all seasons for food, clothing, shelter and tools and seasonal migration to follow animals and fish which they depended on (Nexen Energy ULC 2018). From the late 19th century to the early part of the 20th century, Inuit became involved in the market economy and began to earn income from industries focused on trapping and seal hunting, as well as fishing for char, cod, and salmon (Nexen Energy ULC 2018). There are approximately 1,800 known archaeological sites within the land claim area (Torngasok 2013). There are no known sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	The Labrador Inuit undertake current land and resource use activities on their traditional lands within the LISA. These activities include: hunting for seals, birds, rabbits, caribou, and moose; fishing; ice fishing; and trapping and gathering (Sikumiut Environmental Management Ltd. 2009). Traditional food has important value beyond market criteria, due to its cultural, social, and nutritional qualities, representing an integral part of the Inuit lifestyle (Nexen Energy ULC 2018). Hunting of migratory birds is also an important part of their harvest (Sikumiut Environmental Management Ltd. 2008). Following the ice break-up in the spring, the Inuit also hunt or net harp, ringed, harbour, grey and bearded seals in the outer island areas and in the bays (VBNC 1997). The Labrador Shelf area is fished extensively for crab, rock cod, cod, Arctic char, sculpins, mussels, winkles, and sea urchins (Sikumiut Environmental Management Ltd. 2008). Although there is no commercial salmon fishery, an Indigenous traditional fishery for Atlantic salmon exists in Labrador.
Commercial Communal Fishing	The Nunatsiavut Government hold several commercial communal licences for groundfish, Greenland halibut, seal, scallop, snow crab, shrimp and Arctic char. Groundfish licences are held for NAFO Divisions 2GHJ, 3KL and Greenland halibut may be harvested in 2+3K and 3LMNO (Nexen Energy ULC 2018). Seal licences permit harvesting in Sealing Areas 4 through 33, Atlantic-wide. Scallop licences are issued for Scallop Area 1 off the coast of Northern Labrador, and snow crab licences are issued for Snow Crab Areas 1 and 2 and an Exploratory licence for NAFO 2H (Nexen Energy ULC 2018). Northern shrimp licences are held for Shrimp Areas 4 and 5. The Nunatsiavut Government also has a commercial communal Arctic char licence for the area from Cape Rouge to Cape Chidley in Northern Labrador.

Community Indicator	Description
Food, Social, Ceremonial Fishing	The Nunatsiavut Government hold two FSC licences including for trout, salmon, Arctic char, seal and smelt. These species may be harvested in the Upper Lake Melville Area and in the LISA. As per the LILCA (Chapter 13 – Fisheries Chapter of the Agreement), beneficiaries have the right to harvest at any time of the year throughout the LISA for any species or stock of fish or aquatic plant, up to the quantity needed for their FSC purposes. In addition, despite the commercial salmon fishery being closed in Labrador, there is an Aboriginal traditional fishery for Atlantic salmon. The Nunatsiavut Government holds FSC licences for species that may migrate between the Project area and the LISA.
Asserted or Established Aboriginal and / or Treaty Rights	The Labrador Inuit have established Aboriginal rights under Section 35 of the *Constitution Act* 1982, and beneficiaries of the LILCA have treaty rights within the LISA as set out in the Agreement, including the right to harvest species throughout the LISA. In addition, the Agreement allows for a negotiated arrangement for Beneficiaries residing in Labrador, outside of LISA to harvest for food social and ceremonial purposes in tidal waters of Upper Lake Melville, outside of LISA (12E area).
Labrador Innu (Innu Nation)	
Location and Proximity to Project Area	Innu Nation claim Aboriginal rights and title to most of Labrador and parts of Quebec. The Labrador Innu reside primarily in two communities: Sheshatshiu in Central Labrador and Natuashish on the North Coast (Statoil 2017). Small numbers of Innu also reside in Happy-Valley Goose Bay, Labrador (Statoil 2017). The Labrador Innu land claim is approximately 696 km from the Project Area.
General Overview	In September 2008, the Government of Newfoundland and Labrador and Innu Nation announced the signing of the *Tshas Petapen* ("New Dawn") Agreement. This Agreement resolved key issues between Innu Nation and the Province related to the Innu land claim, as well as impacts and benefits related to past and proposed hydroelectric developments in western and central Labrador (Statoil 2017). Since that time, the provincial and federal governments and the Innu Nation have completed detailed agreements on tripartite Labrador Innu Land Rights Agreement-in-Principle (AIP), which was signed by all three parties in 2011 (Labrador and Aboriginal Affairs Office undated). In 2017, the population of the Innu of Labrador was approximately 2,700 (Nexen Energy ULC 2018). Sheshatshiu, located on the south bank of North West River, formed part of the community of North West River until 1979, at which time the Innu established a separate community which is now a reserve with an elected Chief and Band Council. The community of Natuashish was formed following the Innu's relocation from the previous community at Utshimassit (Davis Inlet) and is a now reserve with an elected Chief and Band Council. The Project does not overlap with any lands claimed by the Labrador Innu.

Community Indicator	Description
Health and Socio-economic Conditions	Sheshatshiu and Natuashish are relatively small communities that offer services and infrastructure to their members and residents. Sheshatshiu, the largest Innu community in Labrador, is 40 km by road from Happy Valley-Goose Bay and accessible year-round. The Natuashish community is approximately 300 km north of Happy-Valley Goose Bay and only accessible by plane or boat. Within Sheshatshiu, an elementary-secondary school, Sheshatshiu Innu School, accommodates approximately 400 students from kindergarten to grade 12 (Innu Education Inc. 2014). The community of Natuashish also has a school, the Mushuau Innu Natuashish School, accommodating approximately 450 students from kindergarten to grade 12 (Innu Education Inc. 2014). Both schools are administered by the Innu School Board. The RCMP provides emergency services to both communities. In Sheshatshiu, the RCMP and Health Canada have collaborated to establish a Sheshatshiu Crisis Intervention Team to support members of the community in times of crisis (Nalcor Energy 2011). There is a fire hall with two fire fighting vehicles in Natuashish (Nalcor Energy 2011). The Labrador Grenfell Regional Health Authority provides health and community services to both communities. In Sheshatshiu, the Health Authority and the Sheshatshiu Innu Health Commission operate a community health clinic with basic trauma and resuscitation equipment (Statoil 2017). In Natuashish, the Health Authority, in partnership with Mushua Innu Health Commission, operate a community health clinic with an emergency room bed, basic trauma and resuscitation equipment and a defibrillator (Statoil 2017). The Innu Business Development Centre was created to establish businesses and contribute to Innu communities. Innu Nation has invested in a variety of businesses including accommodation and food services, aircraft services, arts, entertainment, recreation, automotive, construction, waste management, forestry and tourism. As described in more detail below, Innu Nation holds several commercial communal licenses for a variety of fish and marine species. Ueushuk Fisheries Ltd., hold a mid-shore groundfish license for various areas and a shrimp license.
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	The Labrador Innu are descendants from Algonkian-speaking hunter-gathers (Heritage Newfoundland and Labrador 2018). Traditionally, the Labrador Innu were a nomadic people; however, following the establishment of Innu settlements in the 1960s, traditional land use and harvesting practices changed considerably. In terms of culture and language, the Innu are the easternmost group of a very widespread people known as the Cree (Heritage Newfoundland and Labrador 2018). Labrador Innu culture and heritage are focused on their relationship to game animals, particularly caribou, which are the focus of their philosophical and religious beliefs (Heritage Newfoundland and Labrador 2018). Nearly 500 Innu archaeological sites are known to be throughout Northern, central and Western Labrador. These sites are generally in inland and coastal areas and were often discovered in relation to developments such as communities, roads, railway, and mining areas. There are no known sites in or near the Project Area.

Community Indicator	Description
Current Use of Lands for Traditional Purposes	The Labrador Innu undertake current land and resource use activities on their traditional lands within Labrador (headwaters of Eagle River; the area bounded by Winnokapau Lake, Smallwood Reservoir, Seal Lake and Nipishish Lake; Shipiskan Lake, Snegamook Lake, and Shapio Lake) and parts of Quebec. These activities include: hunting for caribou, black bear, and small game; fishing; trapping; and gathering of wild foods. Hunting of migratory birds such as geese, eider ducks, and turrs is also an important aspect of their harvest. Important bird harvesting areas include near the Trans Labrador Highway, west of Churchill Falls, and the Labrador Shelf (Sikumiut Environmental Management Ltd. 2008). Innu also hunt seal in the spring, summer, and fall (VBNC 1997).
Commercial Communal Fishing	Innu Nation holds several commercial communal licenses for groundfish, mackerel, capelin, shrimp, and halibut. Innu Nation hold licenses for groundfish in NAFO 0, 2GHJ, 3KL, groundfish (mobile gear) in NAFO 2GHJ, 3KL, mackerel and capelin in Fishing Areas 1 to 11, and shrimp in Shrimp Area 4. Ueushuk Fisheries Limited hold a mid-shore groundfish license for various areas for harvesting of a variety of species. Ueushuk Fisheries Ltd. also hold a shrimp license for Shrimp Areas 6 and 7.
Food, Social, Ceremonial Fishing	Innu Nation holds several FSC licences for Sheshatshiu and Natuashish for salmon, Arctic char, and trout. The Natuashish fishing area includes all tidal waters of Labrador extending north and east from Cape Harrigan and south and east of Anaktalik Bay. The license is restricted to these areas and within the 12-nautical mile limit. The Sheshatshiu fishing area includes all tidal waters of Labrador extending from Fish Cove Point, north to Cape Harrison, including Lake Melville and the inland waters of Little Lake and Grand Lake in Upper Lake Melville. The licence is restricted to these areas and within the 12-nautical mile limit. Despite the commercial salmon fishery being closed in Labrador, there is an Aboriginal traditional fishery for Atlantic salmon.
Asserted or Established Aboriginal and / or Treaty Rights	Innu Nation asserts Aboriginal rights to land and resources within Labrador and to resources along the Labrador coast, including the right to hunt, fish, and gather throughout its traditional territory.
NunatuKavut Community Council (NCC)	
Location and Proximity to Project Area	The NunatuKavut Community Council (NCC) claims traditional territory that extends from Central to Southeastern Labrador. NCC members primarily reside in southern and central Labrador, particularly along the southeast coast. The territory is approximately 492 km from the Project Area.

Community Indicator	Description
General Overview	Originally established as the Labrador Metis Association in 1985, the NCC is the governing body, representing a membership of over 6,000 Inuit of south and central Labrador, collectively known as the Southern Inuit of NunatuKavut (NCC 2013). The NCC has asserted a land claim, covering most of Central and Southeastern Labrador (NCC 2013). To date, this claim has not been accepted for negotiation by the federal or provincial governments. Members primarily reside in Cartwright, Paradise River, Charlottetown, Pinsent's Arm, William's Harbour, Black Tickle / Domino, Norman Bay, Port Hope Simpson, St. Lewis, Mary's Harbour and Lodge Bay (Statoil 2017; Russell 2018). Census data are not available for NCC members as a group. In 2016, the population of these communities range from 15 (Paradise River) to 572 (Cartwright), with five communities (Paradise River, Pinsent's Arm, William's Harbour, Norman Bay and Lodge Bay) having fewer than 100 people (Martin et al. 2012). The Project does not overlap with any lands claimed by the NCC.
Health and Socio-economic Conditions	The Trans Labrador Highway (TLH) serves the southeast coast of Labrador. Most communities are accessibly by road via the TLH (Nalcor Energy 2011), while some communities are only accessible by plane or boat. During the winter months, a 1,500 km winter trail system connects Southern Labrador to all communities in Labrador and provides the only transportation link for many otherwise unconnected coastal communities (Nalcor 2011). Some communities have road access, airstrips, basic municipal services (i.e., waste removal and water supply) and nursing clinics while others do not (Martin et al. 2012). Health, policing, and education services also vary. RCMP travel to communities periodically from locations such as Mary's Harbour and Cartwright (Martin et al. 2012). Most communities have schools, but Paradise River, William's Harbour, Pinsent's Arm and Lodge Bay do not. Students from Pinsent's Arm and Lodge Bay travel to St. Mary's All Grade School in Mary's Harbour (Martin et al. 2012). Many of the communities have medical clinics, operated by Labrador-Grenfell Regional Health Authority. Clinics typically provide primary health care services and are staffed with nurses (Nalcor Energy 2011). Generally, a physician and dentist visit each community every six weeks. The NCC is invested in seasonal and year-round businesses including hotels, motels, bed and breakfasts, convenience stores and gas bars (Martin et al. 2012). As described in more detail below, the NCC holds several commercial communal fishing licenses for a variety of fish and marine species. The major employer in southern Labrador communities is the fishery. Employing hundreds of individuals, the Labrador Fisherman's Union Shrimp Company has processing facilities in Cartwright, Charlottetown, Pinsent's Arm, Mary's Harbour and L'Anse au Loup (Labrador Shrimp Company 2014). NDC Fisheries Limited hold quotas for 450,000 lbs. of snow crab as well as shrimp quotas and is required to hire NunatuKavut members as crew.

Community Indicator	Description
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	In the 17th Century, contact was made between the Labrador Inuit and Europeans. In southern Labrador, these interactions were based on the trade with seasonal fishers and whalers (Statoil 2017). As early as 1775, the first generation of people of mixed descent between the Labrador Inuit and European fur traders appeared (Nalcor Energy 2010). Over time, the population grew, and settlements were established throughout central and southern Labrador (Nalcor Energy 2010). In terms of culture, NCC members' practices and resources are focused on the lands and waters of Labrador. There are no known heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	Members of the NCC place a strong emphasis on the importance of traditional food. The core areas traditionally used by NCC members for current land and resource use activities are focused on central and southeastern Labrador, including the Churchill River Valley and extending from the Sandwich Bay region, south to Port Hope Simpson and Williams Harbour, and west to the area of the Paradise and Eagle rivers (Nalcor Energy 2011). These activities include: hunting for caribou, moose, bear, hare and porcupine; fishing; trapping marten; and plant harvesting. Hunting of migratory birds such as sea duck and turr, is also an important aspect of their harvest. Important bird harvesting areas include the islands of the Backway, Table Bay, and St. Peter's Bay (Statoil 2017). The NCC establishes annual Spring Bird / Egg Harvest and Conservation Guidelines, which specify the opening and closing of dates, the seasonal take of birds and gull eggs that may be harvested per household, and any associated restrictions (NCC 2013). Members of NCC also harvest marine mammals, with seals providing income and a source of meat and oil (Russell 2018).
Commercial Communal Fishing	The NCC holds several commercial communal licenses for groundfish, shrimp, snow crab, capelin, herring seal, scallops, and toad crab. NDC Fisheries (Nunacor) also holds several commercial communal licenses and operates enterprises for groundfish in NAFO 2GHJ, 3KL, and 4RS, scallop in Scallop Areas 1 and 2, shrimp in Shrimp Area 6 as well as for whelk, northern shrimp, snow crab, capelin, herring and toad crab in southern Labrador. The NCC also holds two seal harvesting licenses in Seal Fishing Areas 4 to 33 (Atlantic-wide).
Food, Social, Ceremonial Fishing	The NCC holds several FSC licences including for salmon, trout, Arctic char, Atlantic cod, rock cod, herring, scallop, whelk, smelt and seal. Fishing areas are Fish Cove Point and Cape Charles in Labrador and Upper Lake Melville but is restricted to these areas and within the 12-nautical mile limit. NCC members also fish throughout central and southeastern Labrador, Happy Valley-Goose Bay, Grand Lake and its tributaries, Sebaskachu Bay and Sebaskachu River, Mud Lake, Traverspine River, the mouths of Caroline Brook, McKenzie River, and lakes south of the Churchill River for Atlantic salmon. Despite the commercial salmon fishery being closed in Labrador, there is still an Aboriginal traditional fishery for Atlantic salmon.
Asserted or Established Aboriginal and / or Treaty Rights	The NCC asserts Aboriginal and treaty rights to land and resources within Labrador and to resources along the Labrador coast, including the right to hunt, fish, and gather throughout its traditional territory.

Community Indicator	Description
Qalipu Mi'kmaq First Nation	
Location and Proximity to Project Area	Qalipu Mi'kmaq First Nation members live in 67 communities in Newfoundland, with satellite administrative offices in Glenwood, Grand Falls-Windsor, and St. George's. The Nation's central administrative office is in Corner Brook (Qalipu First Nation 2016). Qalipu Mi'kmaq First Nation communities are approximately 413 km from the Project Area.
General Overview	In 2008, the Government of Canada and the Federation of Newfoundland Indians (FNI) signed the Agreement of Recognition of the Qalipu Mi'kmaq Indian Band to establish a landless band for the Mi'kmaq of Newfoundland (INAC 2017). The Qalipu Mi'kmaq do not have any recognized Aboriginal or treaty rights. The Agreement is not a treaty within the meaning of section 25 and section 35 of the *Constitution Act*, 1982. The signed Agreement initiated the enrolment process, with approximately 25,000 applications received within the first year (Qalipu First Nation 2016). The Qalipu Mi'kmaq First Nation have not signed treaties with the Crown and there is no land base associated with the Qalipu First Nation. In September 2011, the Qalipu was established as an Indian band under the *Indian Act* and 23,877 members were found eligible and registered as founding members (Qalipu First Nation 2016). The Project does not overlap with the 67 communities inhabited by members.
Health and Socio-economic Conditions	Because Qalipu members live in over 60 communities in Newfoundland, consolidated information and services, economic conditions, and community health is not readily available. Members access services and programs provided by municipal and provincial agencies, private businesses and services agencies in communities and regions where they reside. Economic and corporate development are led by the Qalipu Development Corporation (QDC) (Qalipu First Nation 2016). Qalipu First Nation has several wholly-owned commercial enterprises including Mi'kmaq Commercial Fisheries Incorporated (MCF), Qalipu Management Services Incorporated (QMS), Qalipu Marine Holdings (QMH) and Qalipu Project Support Services Limited (QPSS). Business partnerships have been negotiated and implemented between Qalipu and several different construction firms. Marine Contractors Inc. Qalipu was created as a partnership between Qalipu and Marine Construction to enable Qalipu to bid on civil construction opportunities from Emera NL. Other business entities are Qalipu Project Support Services, Qalipu Safety and Industrial Supply, and Eastern Door Logistics. In 2016-2017, the Band earned revenues of $10.2 million and had total expenditures of $9.6 million (Qalipu First Nation 2017). As described in more detail below, the Qalipu Mi'kmaq First Nation and MCF hold several commercial communal fishing licenses for a variety of fish and marine species. Additionally, the Qalipu Mi'kmaq First Nation and the Miawpukek First Nation (MFN) have developed a joint fisheries initiative, Mi'kmaq Alsumk Moiwimsikik Koqoey Association (MAMKA). MAMKA also hold commercial communal licenses for different fish and marine species.

Community Indicator	Description
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	Historical evidence demonstrates that the Mi'kmaq were living in Newfoundland by the 16th century; by the 17th century there are increasing historical references (Heritage Newfoundland and Labrador 2018). From 1600 to 1700, Mi'kmaq families hunted, fished, and trapped along Newfoundland's southwest coast to Placentia Bay (Pastore 1998). Families would travel back and forth between Cape Breton and Newfoundland (Pastore 1998). In the early 19th century, their range further expanded to include most of the interior of Newfoundland, for hunting and trapping purposes (Pastore 1998). Limited publicly-available information exists on historic and cultural Qalipu sites; however, one has been identified (seal rocks near the Town of St. George's on the west coast (St. George's Indian Band 2017). Currently, there are 21 known Mi'kmaq archaeological sites in interior and coastal Newfoundland between the Port au Port peninsula and Clarenville (Inside Newfoundland and Labrador Archaeology 2013). In terms of culture, Qalipu First Nation's practices and resources are focused on the lands and waters of the Island of Newfoundland. There are no known heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	The Qalipu undertake current land and resource use activities on their traditional lands which are extensive areas of land, sea, and water. These activities include hunting for caribou, moose, partridge and snowshoe hares, fishing, and harvesting of wild berries (Emera Newfoundland and Labrador 2013). Hunting of marine and migratory birds such as turr is also considered an important traditional activity. The harvesting of seals and groundfish is of lesser importance, but still practiced (Emera Newfoundland and Labrador 2013).
Commercial Communal Fishing	The Qalipu hold several commercial communal licenses for lobster, snow crab, mackerel, herring, squid, scallops, capelin, whelk, shrimp, eel, smelt and bait. Lobster fishing licenses are for LFA 4B, 13A, and 13B and snow crab licenses are for Snow Crab Areas 4, 12, 12C, 12E and 12F. MAMKA also holds several commercial communal licenses for snow crab, herring, capelin, lobster, and bait. MAMKA also holds a commercial communal scallop license.
Food, Social, Ceremonial Fishing	No information is available for FSC licenses for the Qalipu Mi'kmaq First Nation.
Asserted or Established Aboriginal and / or Treaty Rights	At this time, BP is unaware of the Qalipu expressing any asserted or established Aboriginal and/or treaty rights.
Miawpukek First Nation (MFN)	
Location and Proximity to Project Area	Miawpukek Mi'kamawey Mawi'omi First Nation (MFN) is comprised of one reserve, located at the mouth of the Conne River on the south coast of Newfoundland and Labrador (BP 2017; Statoil 2017). The Miawpukek First Nation community is approximately 224 km from the Project Area.

Community Indicator	Description
General Overview	Samiajij Miawpukek is approximately 224 km south of Gander with an area of 1666 ha (BP 2017). According to traditional oral history, the Samiajij Miawpukek community was established in 1870. It was officially designated as Samiajij Miawpukek Indian Reserve under the *Indian Act* in 1987 (Miawpukek First Nation 2017). In 2013, MFN signed a Self-Government Agreement-in-Principle with the provincial government, giving them the opportunity to govern their internal affairs and assume greater responsibility and control over decisions that affect their community. The Agreement is not considered a treaty or a land claims agreement within the meaning of sections 25 and 35 of the *Constitution Act*, 1982; however, it is an important component to self-government for the Miawpukek First Nation (Government of Newfoundland and Labrador 2013). The registered population of the Miawpukek First Nation is more than 3,000 individuals, with nearly 28% living on-reserve (INAC 2017). The Project does not overlap with the reserve lands.
Health and Socio-economic Conditions	The MFN community is accessible year-round by road. In 2017, a new school was opened in the community, accommodating 180 students from kindergarten to grade 12. The school also houses a dental office and daycare center. Since 1975, MFN has been providing health services to the community. The Conne River Health and Social Services (CRHSS) designs and delivers a range of community-based programs such as a medical clinic, wellness center, youth center and nutrition center (CRHSS 2008). The MFN community owns and operates small businesses such as Christmas tree farms, hunt camps and small fisheries, and the Miawpukek Gas Bar and Convenience Store (INAC 2012). The MFN has partnered with several outside communities and corporations in ventures including tourism and aquaculture (INAC 2012). The MFN also owns and operates the Jipuijij'kuei Kuespem Nature Park which provides camping, kayak / canoe rentals, walking trails and float plane charters (Explore Newfoundland and Labrador 2010). As described in more detail below, the MFN hold several commercial communal licenses for a variety of fish and marine species.
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	Some historical evidence exists demonstrating that the Mi'kmaq were living in Newfoundland by the 16th century, and by the 17th century there are increasing historical references (Heritage Newfoundland and Labrador 2018). From 1600 to 1700, Mi'kmaq families hunted, fished, and trapped along Newfoundland's southwest coast to Placentia Bay (Pastore 1998). Families would travel back and forth between Cape Breton and Newfoundland (Pastore 1998). In the early 19th century, their range expanded to include most of the interior of Newfoundland, for hunting and trapping purposes (Pastore 1998). Currently, there are 21 known Mi'kmaq archaeological sites in interior and coastal Newfoundland between the Port au Port peninsula and Clarenville (Inside Newfoundland and Labrador Archaeology 2013). In terms of culture, Miawpukek First Nation's practices and resources are focused on the lands and waters of the Island of Newfoundland. There are no known sites in or near the Project Area.

Community Indicator	Description
Current Use of Lands for Traditional Purposes	The Mi'kmaq continue to use extensive areas of land, sea, and water for recreational and subsistence purposes such as hunting for caribou, moose, partridge and snowshoe hares; fishing; and harvesting of wild berries (Emera Newfoundland and Labrador 2013). Hunting of marine and migratory birds such as turr is also an important traditional activity. The harvesting of seals and groundfish is of lesser importance (Emera Newfoundland and Labrador 2013).
Commercial Communal Fishing	The MFN holds several commercial communal licenses for groundfish, capelin, herring, mackerel, snow crab, squid, swordfish, scallop, bluefin tuna and other tuna species, and seal. MFN has nine enterprises that permit access to NAFO 3KL, three tuna licenses permitting access to 3LN, and one seal license permitting access to Seal Fishing Areas 4-33 (Atlantic-wide). The First Nation also holds licenses for sea cucumber and whelk in NAFO 3Ps. In addition, MFN holds tuna and swordfish licenses for the Scotia-Fundy region.
Food, Social, Ceremonial Fishing	The MFN holds several FSC licenses for scallop, lobster, mackerel, herring, rainbow trout, brook trout, cod, eels, smelt, capelin, seals (harp, grey, and harbor), snow crab, whelk, and redfish.
Asserted or Established Aboriginal and / or Treaty Rights	The MFN continue to assert Aboriginal rights, including the right to hunt, fish, and gather.

4.3.2.3 Mi'kmaq of the Maritime Provinces

The provinces of Nova Scotia, New Brunswick, PEI, and the Gaspé Peninsula in Quebec are founded on land historically occupied by the ancestors of the Mi'kmaq. The earliest evidence of Indigenous peoples in the Maritimes Region indicates that the ancestors of the Mi'kmaq have existed on the land for more than 11,000 years (Nova Scotia Office of Aboriginal Affairs (OAA) website 2017). The Mi'kmaq generally lived in semi-permanent and permanent settlements at resource-rich locations (Mi'kma'ki All Points Services 2013). The lives of Indigenous peoples in what are today referred to as the Maritime Provinces considered the seasonal cycles of the local vegetation, animals, and fish, living a traditional life as fishers, hunters, and gatherers throughout their territory (MGS 2016). In the summer, areas around the coastal camps provided fish, shellfish, fowl, and eggs, while during the colder months, the Mi'kmaq did most of their game hunting moving inland from their summer camps (Speck 1922 in MGS 2016; Denys 1993 in MGS 2016). When resources such as fish, game and plants became scarce near an encampment, the Mi'kmaq moved it to a new location (Robertson 1969 in MGS 2016; Speck 1922 in MGS 2016).

4.3.2.3.1 Mi'kmaq of Nova Scotia

There are 13 Mi'kmaq communities in NS:

- Acadia First Nation
- Annapolis Valley First Nation
- Bear River First Nation
- Eskasoni First Nation

- Glooscap First Nation
- Membertou First Nation
- Paq'tnkek Mi'kmaw Nation
- Pictou Landing First Nation
- Potlotek First Nation
- Wagmatcook First Nation
- We'koqma'q First Nation
- Sipekne'katik First Nation
- Millbrook First Nation

The Mi'kmaq of Nova Scotia have established an Aboriginal right to hunt, trap and fish on ancestral land (including the right to fish for food, social and ceremonial (FSC) purposes); as well as a Treaty right to hunt, fish and gather for a moderate livelihood, which flows from the Peace and Friendship Treaties. The Project does not overlap with the claimed traditional territory of the Mi'kmaq of Nova Scotia, however, Glooscap, Membertou, Millbrook, Paq'tnkek, Pictou Landing, Sipekne'katik, Wagmatcook, and Waycobah First Nations have commercial communal licences to harvest swordfish and/or tuna in NAFO Unit Areas which overlap with the Project Area.

The Mi'kmaq, Nova Scotia and federal governments signed an Umbrella Agreement in 2002 to establish a "Made-in-Nova Scotia" negotiation process to resolve outstanding issues related to Mi'kmaq Treaty and Aboriginal rights following the Marshall decision in 1999. On February 23, 2007, a Framework Agreement was signed between the three parties to set out the process to promote efficient, effective, orderly, and timely negotiations towards a resolution of issues respecting Mi'kmaq rights and title (NS Office of Aboriginal Affairs website 2017). After a three-year pilot period, on August 31, 2010, the thirteen Mi'kmaq communities through the Assembly of Nova Scotia Mi'kmaq Chiefs signed an historic agreement with the Governments of Canada and Nova Scotia. The Mi'kmaq-Nova Scotia-Canada Consultation Terms of Reference lays out a consultation process for the parties to follow when governments are making decisions that have the potential to adversely impact asserted Mi'kmaq Aboriginal and treaty rights, with the Terms of Reference developed under the 2002 Umbrella Agreement.

Of the 13 Nova Scotia Mi'kmaq First Nation communities, 11 are currently represented by the Assembly of Nova Scotia Mi'kmaq Chiefs (ANSMC). The Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO) is the administrative office of the Assembly that coordinates treaty negotiations and consultation on decisions/actions that may impact Mi'kmaq Aboriginal or treaty rights. In 2013 and 2016, respectively, Sipekne'katik and Millbrook First Nations chose to withdraw from the ANSMC and represent themselves in consultation. The Sipekne'katik First Nation and Millbrook First Nation assert the same rights as the other Mi'kmaq communities.

The 13 Mi'kmaq communities located in Nova Scotia are discussed in further detail in Table 4.48.

Table 4.48 Mi'kmaq of Nova Scotia Community Profiles

Community Indicator	Description
Acadia First Nation	
Location and Proximity to Project Area	Acadia First Nation, in southwestern Nova Scotia, is comprised of five reserves, in five counties from Yarmouth to Halifax. Acadia First Nation communities are approximately 962 km from the Project Area.
General Overview	Acadia First Nation encompasses five reserves: Yarmouth 33 (3.2 km east of Yarmouth with an area of 27.7 ha), Ponhook Lake 10 (115.2 km southwest of Halifax with an area of 101.8 ha), Medway River 11 (l108.8 km southwest of Halifax with an area of 4.7 ha), Wildcat 12 (11 km southwest of Halifax with an area of 465.4 ha) and Gold River 21 (60.8 km west of Halifax with an area of 270.2 ha) (INAC undated). Acadia First Nation also has separate land holdings in Gardner's Mill and Hammonds Plains. Acadia First Nation is represented by the ANSMC. According to 2016 census data, the on-reserve population for Yarmouth was 157, Ponhook Lake was 15, Wildcat was 29 and Gold River was 95 (Statistics Canada undated). Population data were not available for Medway River.
Health and Socio-economic Conditions	The availability of infrastructure within each community varies, however Acadia First Nation has experienced infrastructure growth over the past decade, including the development of housing and roads (Acadia First Nation undated). An after-school program exists within Yarmouth, for children ages 5 – 12, attending elementary school. Health centers are in Yarmouth and Gold River. The Yarmouth Health Centre includes a dentist, Victorian Order of Nurses (VON), clinic nursing, foot care clinics and wellness and health promotion clinics (Acadia First Nation undated). The Gold River Health Centre provides a VON, clinic nursing, wellness and health-promotion clinics, afterschool program and parent and tot groups (Acadia First Nation undated). In Wildcat, a VON is available once a month (Acadia First Nation undated). Recent economic developments for the Nation include administrative buildings, gaming facilities, and offices in Halifax and Milton to serve the off-reserve population. As described in more detail below, Acadia First Nation hold several commercial communal licenses for a variety of fish and marine species. The First Nation has an established fisheries company, Kespuwick Resources, established in 2001. Kespuwick Resources' main onshore facilities are in Yarmouth (Acadia First Nation undated).
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	The Acadia First Nation were once based in what is today's Queen's County with artifacts found along the Mersey River (KMKNO undated). The Project does not overlap with the traditional territory of the Mi'kmaq of Nova Scotia, therefore there are no known physical and cultural heritage sites in or near the Project Area.

Community Indicator	Description
Current Use of Lands for Traditional Purposes	The Mi'kmaq of Nova Scotia harvest Atlantic salmon as part of their Aboriginal right to fish for FSC purposes (UINR 2018). Salmon harvesting occurs throughout the year; however, efforts are concentrated during, or just prior to, salmon runs. Atlantic salmon is an integral component to Mi'kmaq culture. The practice of salmon fishing, using traditional harvesting methods, creates opportunities for traditional knowledge sharing, transmission, and adaptation, expressing Mi'kmaw values of sharing catches with the community, and other uses specific to salmon that cannot be replaced by harvesting other species (UINR 2018). The Mi'kmaq of Nova Scotia also harvest American eel within Aboriginal rights-based, treaty rights-based and commercial fisheries. In addition to a rich food source, the American eel is also used for medicinal purposes.
Commercial Communal Fishing	Acadia First Nation hold several commercial communal licenses for groundfish, lobster, scallops, snow crab, jonah crab, herring, mackerel, quahaug and tuna. Lobster is licensed for LFA 33 and 34.
Food, Social, Ceremonial Fishing	Acadia First Nation hold several FSC fishing licenses for blue shark, blueback herring, brook trout, gaspereau, herring, mussel, periwinkle, seal, smallmouth bass, soft-shell clams, squid, striped bass, tomcod, quahaug, rainbow trout and razor clams. The First Nation also hold an FSC license to fish for groundfish, lobster, and crab (other than snow crab). Lobster is licensed in LFA 33, 34, and 35. There are no location restrictions on gaspereau, eel, mackerel, shad, smelt, green crab, jonah crab or bait (mackerel and herring) fishing (Newbould, DFO, pers. comm. 2017; Statoil 2017). Acadia First Nation also has an Aboriginal right to fish for Atlantic salmon for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Mi'kmaq of Nova Scotia have established Aboriginal and Treaty rights. This includes a right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties, and an Aboriginal right to fish for FSC purposes.
Annapolis Valley First Nation	
Location and Proximity to Project Area	Annapolis Valley First Nation is comprised of two reserves within Kings County in southwestern Nova Scotia. Annapolis Valley First Nation is located approximately 927 km from the Project Area.
General Overview	Annapolis Valley First Nation encompasses two reserve lands: Annapolis Valley (Cambridge) (88 km northwest of Halifax with an area of 59 ha) and St. Croix 34 (46.6 km northwest of Halifax with an area of 126.2 ha) (INAC undated). Annapolis Valley First Nation is represented by the ANSMC. According to 2016 census data, the on-reserve population was 140 (Statistics Canada undated).
Health and Socio-economic Conditions	Established in 1998, the Three Wishes Learning Centre provides a nursery school program, after school program, and culture programs (Annapolis Valley First Nation undated). The Annapolis Valley First Nation Health Centre has a registered community health nurse, access to prevention and weight control programs, foot care clinics, prenatal programs, massage therapy, physical activity programs, drug and alcohol abuse prevention, suicide prevention, injury / illness prevention and health and wellness promotion (Annapolis Valley First Nation undated). A dental hygienist is available twice a month at the health center. Annapolis Valley First Nation's economic initiatives include Annapolis Valley First Nation Gaming, Annapolis Valley First Nation Smoke Shop, and Annapolis Valley First Nation Gas Bar (Annapolis Valley First Nation undated).

Community Indicator	Description
	As described in more detail below, the Annapolis Valley First Nation hold several commercial communal licenses for a variety of fish and marine species. The Nation also operates the Annapolis Valley Commercial Fisheries. The Annapolis Valley Commercial Fisheries operates one lobster fishing boat (BP 2017).
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	There is a long history of Mi'kmaq presence in Annapolis Royal and the surrounding areas; archeologists have identified several settlement patterns (Statoil 2017). The Mi'kmaq lived in Annapolis Valley when the Europeans arrived in the area, with lifestyles heavily influenced by the land and ecosystems and a strong tradition of innovation connected to the homelands. The Project does not overlap with the traditional territory of the Mi'kmaq of Nova Scotia, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	The Mi'kmaq of Nova Scotia harvest Atlantic salmon as part of their Aboriginal rights for FSC purposes (UINR 2018). Salmon harvesting occurs throughout the year; however, efforts are concentrated during, or just prior to, salmon runs. Atlantic salmon is an integral component to Mi'kmaq culture. The practice of salmon fishing, using traditional harvesting methods, creates opportunities for traditional knowledge sharing, transmission, and adaptation, expressing Mi'kmaw values of sharing catches with the community, and other uses specific to salmon that cannot be replaced by harvesting other species (UINR 2018). The Mi'kmaq of NS also harvest American eel within Aboriginal rights-based, treaty rights-based and commercial fisheries. In addition to a rich food source, the American eel is also used for medicinal purposes.
Commercial Communal Fishing	Annapolis Valley First Nation holds several commercial communal licenses for groundfish, lobster, scallops, herring and sea urchins. Lobster is licensed for LFA 33 and 34.
Food, Social, Ceremonial Fishing	Annapolis Valley First Nation holds several FSC licenses for trout, mussels, clams, mackerel, herring, groundfish, eel, flounder, halibut, pollock, gaspereau, shad, smelt, lobster and scallops. Annapolis Valley First Nation also has an Aboriginal right to fish for Atlantic salmon for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Mi'kmaq of Nova Scotia have established Aboriginal and Treaty rights. This includes a right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties, and an Aboriginal right to fish for FSC purposes.
Bear River First Nation	
Location and Proximity to Project Area	Bear River First Nation is comprised of three reserves, within the Annapolis Valley between the towns of Annapolis Royal and Digby (KMKNO undated). Bear River First Nation is approximately 1,055 km from the Project Area.
General Overview	Bear River First Nation encompasses three reserve lands: Bear River 6 (17.7 km southeast of Digby with an area of 633.8 ha), Bear River 6A (9.6 km southeast of Annapolis Valley with an area of 31.2 ha), and Bear River 6B (6.4 km southeast of Annapolis Valley with an area of 24.3 ha) (INAC undated). Bear River First Nation is represented by the ANSMC. According to 2016 census data, the on-reserve population in Bear River 6 was 138, Bear River 6A was 0, and Bear River 6B was 16 (Statistics Canada undated).

Community Indicator	Description
Health and Socio-economic Conditions	The majority of community members live on the Bear River 6, also known as L'sitkuk Mainland (Mainland Mi'kmaq Development Inc. 2016). In Bear River, a learning center provides space for educational activities. There is a health center in Bear River, offering healing services and workshops (Bear River First Nation 2016). A doctor visits the health center monthly (Bear River First Nation 2016). Recently, an RCMP satellite office opened in the community. Bear River First Nation enterprises include a Treaty Gas bar, L'sitkuk Gas Bar Limited, and a seasonal Heritage and Cultural Centre. As described in more detail below, Bear River First Nation hold commercial communal licenses for lobster and tuna.
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	There is a long history of Bear River Mi'kmaq presence in Digby and Annapolis Counties (Mainland Mi'kmaq Development Inc. 2016). As early as 1612, the Mi'kmaq have been recorded as harvesting resources in the Annapolis River and French Bay (Bay of Fundy) (Mainland Mi'kmaq Development Inc. 2016). Traditionally, during the fall and winter, families would travel to hunt big game such as moose, deer, caribou and bear, and smaller game such as beaver, bird species, and rabbit. In the spring, families typically settled along the coast and in the summer, they harvested shellfish such as clam, mussels, and scallops as well as several fish species including cod, salmon, trout, eel, herring, and bass (Mainland Mi'kmaq Development Inc. 2016). Seals, walrus, porpoises and berries and plants were also harvested. Bear River First Nation was traditionally, and continues to be, well known for their artwork, specializing in embroidering porcupine quills on birchbark, leatherwork, and basketry (Mainland Mi'kmaq Development Inc. 2016). The Project does not overlap with the traditional territory of the Mi'kmaq of Nova Scotia, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	The Mi'kmaq of Nova Scotia harvest Atlantic salmon as part of their Aboriginal rights for FSC purposes (UINR 2018). Salmon harvesting occurs throughout the year; however, efforts are concentrated during, or just prior to, salmon runs. Atlantic salmon is an integral component to Mi'kmaq culture. The practice of salmon fishing, using traditional harvesting methods, creates opportunities for traditional knowledge sharing, transmission, and adaptation, expressing Mi'kmaw values of sharing catches with the community, and other uses specific to salmon that cannot be replaced by harvesting other species (UINR 2018). The Mi'kmaq of NS also harvest American eel within Aboriginal rights-based, treaty rights-based and commercial fisheries. In addition to a rich food source, the American eel is also used for medicinal purposes.
Commercial Communal Fishing	Bear River First Nation holds commercial communal licenses for lobster and tuna. Lobster fishing is licensed in LFA 34 and 35.
Food, Social, Ceremonial Fishing	Bear River First Nation holds several FSC licenses for bar clam, groundfish, gaspereau, herring, landlocked salmon, mackerel, mussel, quahaug, razor clam, smallmouth bass, soft-shelled clam, striped bass and trout, lobster, and crab (other than snow crab) and scallop. Seal may also be harvested. There are no restrictions on the fishing of eel, shad or smelt. Bear River First Nation also has an Aboriginal right to fish for Atlantic salmon for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Mi'kmaq of Nova Scotia have established Aboriginal and Treaty rights. This includes a right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties, and an Aboriginal right to fish for FSC purposes.

Community Indicator	Description
Eskasoni First Nation	
Location and Proximity to Project Area	Eskasoni First Nation is comprised of three reserves, along the shore of the Bras d'Or Lakes. Eskasoni First Nation is approximately 633 km from the Project Area.
General Overview	Eskasoni First Nation encompasses three reserves: Eskasoni 3 (40 km southwest of Sydney with an area of 3,504.6 ha), Eskasoni 3A (40 km southwest of Sydney with an area of 28.5 ha), and Malagawatch 4 (62 km southwest of Sydney with an area of 661.3 ha) (INAC undated). Eskasoni First Nation is the largest Indigenous community in Atlantic Canada (KMKNO undated). Eskasoni First Nation is represented by the ANSMC. According to 2016 census data, the on-reserve population was 3,422 (Statistics Canada undated).
Health and Socio-economic Conditions	Eskasoni First Nation has community-owned infrastructure such as a community-operated school, accommodating students from kindergarten to grade 12, a supermarket, a community rink and a cultural center. The Eskasoni Community Health Centre provides a wide range of primary care services as well as several health programs and services such as blood collection, community health nursing, maternal child health, medical transportation, and diabetic services (Eskasoni Community Health Centre 2004). The Eskasoni Pharmacy is in the Health Centre. The pharmacy provides information to the community on drug use, Native Alcohol and Drug Addiction Counseling Association, and Mi'kmaq Family and Children's Services. The Health Centre is staffed with a nurse, medical transcriptionist, and several physicians (Eskasoni Community Health Centre 2004). Community Health Representatives are also on-site and act as a liaison between health care providers and community members, assisting with translation and administration of health care services and programs (Eskasoni Community Health Centre 2004). Within the community there is also a fire department, with four career firefighters and 20 volunteer firefighters (Eskasoni First Nation undated). As described in more detail below, Eskasoni First Nation hold several commercial communal licenses for a variety of fish and marine species. The community operates Crane Cove Seafoods. Crane Cove Seafoods owns 13 vessels ranging from 30 – 65 feet and employs over 100 community members, with an additional 35 community members employed at the associated processing plant (Eskasoni First Nation undated). Fish harvesting takes place throughout Nova Scotia from Ingonish to Yarmouth.
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	Chartered in 1832, Eskasoni First Nation became an official reserve in 1834. From 1845 to 1851, much of Cape Breton suffered from famine (MGS 2012). During this time, the Mi'kmaq transitioned into a more stationary lifestyle and found opportunities to provide labour, typically traveling to Sydney to work and sell wares (MGS 2012). The population of Eskasoni grew in the 1940s as the Department of Indian Affairs implemented a new policy to centralize Indigenous peoples (Eskasoni First Nation undated). In the 1950s, Eskasoni First Nation began controlling their own affairs and a Band Council was established in 1958 (Eskasoni First Nation undated). The Project does not overlap with the traditional territory of the Mi'kmaq of Nova Scotia, therefore there are no known physical and cultural heritage sites in or near the Project Area.

Community Indicator	Description
Current Use of Lands for Traditional Purposes	The Mi'kmaq of Nova Scotia harvest Atlantic salmon as part of their Aboriginal rights for FSC purposes (UINR 2018). Salmon harvesting occurs throughout the year; however, efforts are concentrated during, or just prior to, salmon runs. Atlantic salmon is an integral component to Mi'kmaq culture. The practice of salmon fishing, using traditional harvesting methods, creates opportunities for traditional knowledge sharing, transmission, and adaptation, expressing Mi'kmaw values of sharing catches with the community, and other uses specific to salmon that cannot be replaced by harvesting other species (UINR 2018). The Mi'kmaq of NS also harvest American eel within Aboriginal rights-based, treaty rights-based and commercial fisheries. In addition to a rich food source, the American eel is also used for medicinal purposes.
Commercial Communal Fishing	Eskasoni First Nation hold several commercial communal licenses for groundfish, lobster, snow crab, herring, mackerel, and shrimp. There are no location restrictions on gaspereau, eel, mackerel, and bait (O'Neil, DFO, pers. comm. 2017; Statoil 2017). Lobster fishing is licensed in LFA 28.
Food, Social, Ceremonial Fishing	Eskasoni First Nation hold several FSC licenses for clam, cod, flounder, haddock, mussels, quahaug, scallops, shad, smelt, trout, eel, and lobster. Eskasoni First Nation also has an Aboriginal right to fish for Atlantic salmon for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Mi'kmaq of Nova Scotia have established Aboriginal and Treaty rights. This includes a right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties, and an Aboriginal right to fish for FSC purposes.
Glooscap First Nation	
Location and Proximity to Project Area	Glooscap First Nation is comprised of one reserve (Glooscap 35), northwest of Halifax. Glooscap First Nation is approximately 932 km from the Project Area.
General Overview	Glooscap 35 is 68.8 km northwest of Halifax with an area of 171.1 ha (INAC undated). Glooscap First Nation is represented by the ANSMC. According to 2016 census data, the on-reserve population was 81 (Statistics Canada undated).
Health and Socio-economic Conditions	Glooscap First Nation does not have any schools within the community; however, the Nation has an appointed education director who oversees primary and secondary education for on-reserve members (Glooscap First Nation 2018). There is a Health Centre in the community, offering health and healing services that focus on six components: education, health promotion, culture and language, nutrition, social support, and parent / family involvement (Glooscap First Nation 2018). Established in 2014, Glooscap Ventures was created as the economic department for the community and is owned and operated by Glooscap First Nation. Glooscap Ventures manages on-reserve businesses including the variety store / gas bar, gaming facility, and commercial fisheries. Currently, Glooscap Ventures is developing a 27-acre parcel of land, Glooscap Landing, along Highway 101 for retail purposes (Glooscap First Nation 2018). Other initiatives include the expansion of the commercial fisheries and pursuing opportunities in renewable energy (Glooscap First Nation 2018). As described in more detail below, Glooscap First Nation holds several commercial communal licenses for a variety of fish and marine species.

Community Indicator	Description
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	Established in 1984, Glooscap First Nation became the thirteenth Mi'kmaq band in NS (KMKNO undated). Originally, Glooscap First Nation was created following the separation of two communities, Annapolis Valley and Glooscap, that were 30 km apart (KMKNO undated). Glooscap First Nation was originally known as Horton but was renamed in 2001 (KMKNO undated). The Project does not overlap with the traditional territory of the Mi'kmaq of Nova Scotia, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	Glooscap First Nation's traditional activity is focused on harvesting of migratory marine species, particularly for FSC and commercial communal purposes. The Mi'kmaq of Nova Scotia harvest Atlantic salmon as part of their Aboriginal rights for FSC purposes (UINR 2018). Salmon harvesting occurs throughout the year; however, efforts are concentrated during, or just prior to, salmon runs. Atlantic salmon is an integral component to Mi'kmaq culture. The practice of salmon fishing, using traditional harvesting methods, creates opportunities for traditional knowledge sharing, transmission, and adaptation, expressing Mi'kmaw values of sharing catches with the community, and other uses specific to salmon that cannot be replaced by harvesting other species (UINR 2018). The Mi'kmaq of NS also harvest American eel within Aboriginal rights-based, treaty rights-based and commercial fisheries. In addition to a rich food source, the American eel is also used for medicinal purposes.
Commercial Communal Fishing	Glooscap First Nation holds several commercial communal licenses for gapereau, groundfish, herring, lobster, mackerel, swordfish, and tuna. Lobster fishing is licensed in LFA 34.
Food, Social, Ceremonial Fishing	Glooscap First Nation holds several FSC licenses for groundfish, cod, flounder, haddock, halibut, pollock, soft-shelled clams, striped bass, lobster, eel, shad, smelt and scallops. There are no location restrictions on gaspereau, eel, mackerel, and bait (O'Neil, 2017 pers comm; Statoil 2017). In addition, the Agency identified Glooscap First Nation as having an Aboriginal right to fish for Atlantic salmon for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Mi'kmaq of Nova Scotia have established Aboriginal and Treaty rights. This includes a right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties, and an Aboriginal right to fish for FSC purposes.
Membertou First Nation	
Location and Proximity to Project Area	Membertou First Nation is comprised of four reserves, in northeastern and southwestern Sydney. Membertou First Nation is 596 km from the Project Area.
General Overview	Membertou First Nation encompasses four reserves: Membertou 28B (1.6 km south of Sydney with an area of 100.1 ha), Sydney 28A (1.6 km northeast of Sydney with an area of 5.1 ha), Caribou Marsh 29 (8 km southwest of Sydney with an area of 219 ha) and Malagawatch 4 (62 km southwest of Sydney with an area of 661.3 ha) (INAC undated). Membertou First Nation is represented by the ANSMC. According to 2016 census data, the on-reserve population was 1,015 (Statistics Canada undated).

Community Indicator	Description
Health and Socio-economic Conditions	Membertou First Nation has one school, Maupeltuewey Kina'matno'kuom, accommodating students from kindergarten to grade 6 (Membertou First Nation undated). A local Cape Breton Regional Police detachment is in Membertou. The Membertou Wellness Centre delivers programs to the community that address prominent health issues such as smoking cessation, crisis prevention / intervention, addictions services, and home and community care (Membertou First Nation undated). The Membertou Wellness Centre also provides a family practice medical clinic with a doctor available Monday through Friday (Membertou First Nation undated). Membertou First Nation has made considerable investments in infrastructure and providing services to community members over the last decade such as a gas station, church, community center, band office and boxing gym. Membertou First Nation also recently built the Membertou Sports and Wellness Centre, with two ice surfaces, an indoor walking track, a YMCA gym and multi-purpose meeting and event rooms (Membertou Sports and Wellness Centre undated). Within Membertou, there is a business park including the Membertou Trade and Convention Centre, Membertou Heritage Park and Petroglyphs Gift Shop, a hotel, Kiju's Restaurant, Membertou Entertainment Centre, and private businesses. In 2002, Membertou First Nation became the first Indigenous government in the world to be ISO-certified (CANDO 2018). As described in more detail below, Membertou First Nation holds several commercial communal licenses for a variety of fish and marine species. The Nation owns and operates a seafood company, First Fishermen Seafoods. The company has six fleet vessels and harvests a variety of groundfish, shellfish, tuna, and swordfish (Membertou First Nation undated).
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	Once known as Kings Road, Membertou was situated along the banks of Sydney Harbour. In 1926, Membertou was officially moved to its present location (Membertou First Nation undated). As an urban Indigenous community, few members relied solely on traditional hunting, fishing, and gathering to earn their living; instead, both men and women worked in various industries (Membertou First Nation undated). The Project does not overlap with the traditional territory of the Mi'kmaq of Nova Scotia, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	The Mi'kmaq of Nova Scotia harvest Atlantic salmon as part of their Aboriginal rights for FSC purposes (UINR 2018). Salmon harvesting occurs throughout the year; however, efforts are concentrated during, or just prior to, salmon runs. Atlantic salmon is an integral component to Mi'kmaq culture. The practice of salmon fishing, using traditional harvesting methods, creates opportunities for traditional knowledge sharing, transmission, and adaptation, expressing Mi'kmaw values of sharing catches with the community, and other uses specific to salmon that cannot be replaced by harvesting other species (UINR 2018). The Mi'kmaq of Nova Scotia also harvest American eel within Aboriginal rights-based, treaty rights-based and commercial fisheries. In addition to a rich food source, the American eel is also used for medicinal purposes.
Commercial Communal Fishing	Membertou First Nation holds several commercial communal licenses for eel, gapereau, snow and rock crab, eel, groundfish, herring, lobster, mackerel, sea scallops, sea urchins, shrimp and bluefin tuna. Lobster fishing is licensed in LFA 27.

Community Indicator	Description
Food, Social, Ceremonial Fishing	Membertou First Nation holds several FSC licenses for clams, cod, crab, eel, flounder, haddock, halibut, mussel, oyster, pollock, quahaug, smelt, striped bass, mackerel, lobster and scallop. There are no location restrictions on gaspereau, eel, mackerel, and bait (O'Neil, 2017 pers comm; Statoil 2017). Membertou First Nation also has an Aboriginal right to fish for Atlantic salmon for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Mi'kmaq of Nova Scotia have established Aboriginal and Treaty rights. This includes a right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties, and an Aboriginal right to fish for FSC purposes.
Paq'tnkek Mi'kmaw Nation	
Location and Proximity to Project Area	Paq'tnkek Mi'kmaw Nation is comprised of three reserves, southeast of Amherst and east of Antigonish. Paq'tnkek Mi'kmaw Nation is approximately 729 km from the Project Area.
General Overview	Paq'tnkek Mi'kmaw Nation encompasses three reserves: Franklin Manor 22 (32 km southeast of Amherst with an area of 212.5 ha), Paq'tnkek-Niktuek 23 (24 km east of Antigonish with an area of 218.1 ha), and Welnek 38 (18 km east of Antigonish with an area of 43.4 ha) (INAC undated). Paq'tnkek is represented by the ANSMC. According to 2016 census data, the on-reserve population was 353 (Statistics Canada undated).
Health and Socio-economic Conditions	Since 1980, the Paq'tnkek Pre-School has been in operation in Afton, NS. The nearest RCMP detachment is in Antigonish. The Paq'tnkek Health Centre provides a variety of programs and services to community members, including community health promotion, education, and prevention programming (Paq'tnkek Mi'kmaw Nation 2018). Paq'tnkek Mi'kmaw Nation has an Economic Development Department which manages all development projects within the community, including recent infrastructure development projects related to highway development and commercial opportunities. The First Nation also operates the Paq'tnkek Entertainment Centre, Gas Bar, and Smoke Shop (Paq'tnkek Mi'kmaw Nation 2018). As described in more detail below, Paq'tnkek holds several commercial communal licenses for a variety of fish and marine species. The First Nation owns and operates the Paq'tnkek Fisheries Enterprise, employing 20 community members. The enterprise has a fleet of five communal vessels and harvests lobster, snow crab, and herring (Paq'tnkek Mi'kmaw Nation 2018).
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	Established in 1820, Paq'tnkek, meaning "by the bay", has been a traditional stopping point for Mi'kmaq travelling to and from Unama'ki, and a central meeting point for Chiefs across the province. Cultural and traditional practices such as spearing eels and salmon and snaring rabbits are still practiced within the community (Paq'tnkek Mi'kmaw Nation 2018). The Project does not overlap with the traditional territory of the Mi'kmaq of Nova Scotia, therefore there are no known physical and cultural heritage sites in or near the Project Area.

Community Indicator	Description
Current Use of Lands for Traditional Purposes	The Mi'kmaq of Nova Scotia harvest Atlantic salmon as part of their Aboriginal rights for FSC purposes (UINR 2018). Salmon harvesting occurs throughout the year; however, efforts are concentrated during, or just prior to, salmon runs. Atlantic salmon is an integral component to Mi'kmaq culture. The practice of salmon fishing, using traditional harvesting methods, creates opportunities for traditional knowledge sharing, transmission, and adaptation, expressing Mi'kmaw values of sharing catches with the community, and other uses specific to salmon that cannot be replaced by harvesting other species (UINR 2018). The Mi'kmaq of Nova Scotia also harvest American eel within Aboriginal rights-based, treaty rights-based and commercial fisheries. In addition to a rich food source, the American eel is also used for medicinal purposes.
Commercial Communal Fishing	Paq'tnkek Mi'kmaw Nation holds 37 commercial communal licenses for rock crab, eel, groundfish, herring, lobster mackerel, marine plants, oysters, scallops, smelts, snow crab and squid. Paq'tnkek First Nation also holds commercial communal licenses for swordfish in NAFO divisions that overlap with the exploration licenses included in the Project Area. Lobster fishing is licensed in LFA 26.
Food, Social, Ceremonial Fishing	Paq'tnkek Mi'kmaw Nation holds FSC licenses for salmon, striped bass, and eel. Paq'tnkek Mi'kmaw Nation also has an Aboriginal right to fish for Atlantic salmon (outer Bay of Fundy population) for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Mi'kmaq of Nova Scotia have established Aboriginal and Treaty rights. This includes a right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties, and an Aboriginal right to fish for FSC purposes.
Pictou Landing First Nation	
Location and Proximity to Project Area	Pictou Landing First Nation is comprised of five reserves on the south shore of the Northumberland Strait in Pictou County. Pictou Landing First Nation is approximately 792 km from the Project Area.
General Overview	Pictou Landing First Nation encompasses five reserves: Franklin Manor 22 (32 km southeast of Amherst with an area of 212.5 ha), Fisher's Grant (10 km north of New Glasgow with an area of 142.7 ha), Boat Harbour West 37 (8 km north of New Glasgow with an area of 98.2 ha), Fisher's Grant 24G (3.2 km southeast of Pictou Landing with an area of 60.0 ha) and Merigomish Harbour 31 (12.8 km east of New Glasgow with an area of 14.2 ha) (INAC undated). Pictou Landing First Nation is represented by the ANSMC. According to 2016 census data, Fisher's Grant (the main community) had a population of 485 and a small population lived in Merigomish Harbour (INAC 2017). No population data were available for the other communities.
Health and Socio-economic Conditions	Pictou Landing First Nation School, accommodates students from primary to grade 6. There are no police detachments or fire halls within the community. The Nation has a church, gas bar, and health center (KMKNO undated). As described in more detail below Pictou Landing First Nation holds several commercial communal licenses for a variety of fish and marine species. The Pictou Landing First Nation fishery is the Nation's main industry, with a fleet of 12 vessels and employing approximately 100 people (full and part time) a year (KMKNO undated).

Community Indicator	Description
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	Pictou Landing First Nation have lived on a seasonal basis in and around a small tidal estuary connected by a narrow channel to the Northumberland Strait (Statoil 2017). The area provided an abundance of resources such as fish, eels, crustaceans, and shellfish as well as hunting and trapping near shore (Statoil 2017). The Project does not overlap with the traditional territory of the Mi'kmaq of Nova Scotia, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	The Mi'kmaq of Nova Scotia harvest Atlantic salmon as part of their Aboriginal rights for FSC purposes (UINR 2018). Salmon harvesting occurs throughout the year; however, efforts are concentrated during, or just prior to, salmon runs. Atlantic salmon is an integral component to Mi'kmaq culture. The practice of salmon fishing, using traditional harvesting methods, creates opportunities for traditional knowledge sharing, transmission, and adaptation, expressing Mi'kmaw values of sharing catches with the community, and other uses specific to salmon that cannot be replaced by harvesting other species (UINR 2018). The Mi'kmaq of Nova Scotia also harvest American eel within Aboriginal rights-based, treaty rights-based and commercial fisheries. In addition to a rich food source, the American eel is also used for medicinal purposes.
Commercial Communal Fishing	Pictou Landing First Nation hold 146 commercial communal licenses for alewives / gaspereau, clams, rock and spider / toad crab, eel, groundfish, herring, lobster, mackerel, marine plants, oysters, scallops, smelts, snow crab, squid, seal and bluefin tuna. Pictou Landing First Nation also holds commercial communal licenses for swordfish in NAFO divisions that overlap with the exploration licenses included in the Project Area. Lobster fishing is licensed in LFA 26.
Food, Social, Ceremonial Fishing	Pictou Landing First Nation holds FSC licenses for lobster, salmon, striped bass and trout. Pictou Landing First Nation also has an Aboriginal right to fish for Atlantic salmon for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Mi'kmaq of Nova Scotia have established Aboriginal and Treaty rights. This includes a right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties, and an Aboriginal right to fish for FSC purposes.
Potlotek First Nation	
Location and Proximity to Project Area	Potlotek First Nation is comprised of two reserves, southwest of Sydney. Potlotek First Nation is approximately 654 km from the Project Area.
General Overview	Potlotek First Nation encompasses two reserves: Chapel Island 5 (69 km southwest of Sydney with an area of 595.5 ha) and Malagawatch 4 (62 km southwest of Sydney with an area of 661.3 ha (INAC undated). Potlotek First Nation is represented by the ANSMC. According to 2016 census data, the on-reserve population was 506 (Statistics Canada undated).

Community Indicator	Description
Health and Socio-economic Conditions	Within the community, there is a day care and elementary school, the Mi'kmawey School. Established in 1998, it accommodates students from primary to grade 6 (Potlotek First Nation 2016). An RCMP building and fire hall exist within the community. The Potlotek Volunteer Fire Department has 14 active members (KMKNO undated). A Health Centre is in the community, providing a variety of services and programs such as addiction services, maternal care, home care, advanced and diabetic foot care, healing programs and wellness programs (Potlotek First Nation 2016). A doctor visits the Health Centre on a weekly basis (Potlotek First Nation 2016). Additional infrastructure within the community includes the Chapel Island Community Hall / Kateri Chapel and a Youth Centre. Recently, economic developments such as the construction of a store-gas bar which includes Robins Donuts, a Rite Stop, Esso and video lottery terminals have provided employment opportunities for community members (KMKNO undated). As described in more detail below, Potlotek First Nation holds several commercial communal licenses for a variety of fish and marine species. The fisheries industry plays a dominant role in the First Nation's economy, particularly in oyster cultivation. Formed in 1995, the Apaqtukewaq Fisheries Co-op includes four members and employs seven people during peak season (May to September) (Potlotek First Nation 2016). An oyster plant operates within the community and the Co-op operates two fishing vessels used for harvesting of lobster and snow crab (Potlotek First Nation 2016).
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	Established in 1834, Potlotek First Nation, also known as Chapel Island, is the home of the Saint Anne's Mission where each year Mi'kmaq people gather to celebrate the Feast of Saint Anne (Potlotek First Nation 2016). Chapel Island is considered a sacred ground to the Mi'kmaq (Potlotek First Nation 2016). The Project does not overlap with the traditional territory of the Mi'kmaq of Nova Scotia, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	The Mi'kmaq of Nova Scotia harvest Atlantic salmon as part of their Aboriginal rights for FSC purposes (UINR 2018). Salmon harvesting occurs throughout the year; however, efforts are concentrated during, or just prior to, salmon runs. Atlantic salmon is an integral component to Mi'kmaq culture. The practice of salmon fishing, using traditional harvesting methods, creates opportunities for traditional knowledge sharing, transmission, and adaptation, expressing Mi'kmaw values of sharing catches with the community, and other uses specific to salmon that cannot be replaced by harvesting other species (UINR 2018). The Mi'kmaq of Nova Scotia also harvest American eel within Aboriginal rights-based, treaty rights-based and commercial fisheries. In addition to a rich food source, the American eel is also used for medicinal purposes.
Commercial Communal Fishing	Potlotek First Nation and Apaqtukewag Fishermen's Co-op hold several commercial communal licenses for snow crab, groundfish, herring, lobster, sea urchin, mackerel, squid, gaspereau, eel, bait, and shrimp.
Food, Social, Ceremonial Fishing	Potlotek First Nation holds several FSC licenses for capelin, cod, flounder, haddock, mackerel, mussel, pollock, shad, trout, quahaug, smelt, soft-shelled clams, striped bass, eel, salmon, lobster, scallop and bluefin tuna. Potlotek First Nation also has an Aboriginal right to fish for Atlantic salmon for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Mi'kmaq of Nova Scotia have established Aboriginal and Treaty rights. This includes a right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties, and an Aboriginal right to fish for FSC purposes.

Community Indicator	Description
Wagmatcook First Nation	
Location and Proximity to Project Area	Wagmatcook First Nation is comprised of three reserves, within the Bras d'Or Lakes region of Cape Breton. Wagmatcook First Nation is approximately 651 km from the Project Area.
General Overview	Wagmatcook encompasses three reserves: Malagawatch 4 (62 km southwest of Sydney with an area of 661.3 ha), Margaree 25 (68.8 km northwest of Sydney with an area of 0.8 ha), and Wagmatcook 1 (51 km west of Sydney with an area of 385.0 ha) (INAC undated). Wagmatcook First Nation is represented by the ANSMC. According to 2016 census data, the on-reserve population at Wagmatcook 1 was 537 (Statistics Canada undated). No population data were available for Malagawatch 4 and Margaree 25.
Health and Socio-economic Conditions	In 1986, Wagmatcook First Nation initiated the first Indigenous secondary school in the Atlantic Region and established the first Nova Scotia Mi'kmaq Day Care Centre (Statoil 2017). A new elementary-secondary education school, Wamgatcookewey School, is the first kindergarten to grade 12 Mi'kmaq First Nation school in Nova Scotia (Wagmatcook First Nation 2016). There is no police detachment within the community, but there is a fire hall. The cultural center, the Wagmatcook Enterprise and Cultural Centre, provides a variety of services to community members including an Alternate School for Youth, cultural demonstration projects, and a Fitness Centre (Wagmatcook First Nation 2016). The cultural center also houses the TD Canada Trust Agency bank, a Canada Post office, and the Clean Wave Restaurant (Wagmatcook First Nation 2016). The band also operates a gas bar, grocery store, wharf, and warehouse. As described in more detail below, Wagmatcook First Nation holds several commercial communal licenses for a variety of fish and marine species. The Wagmatcook commercial fishery has been in operation since 1990 and is communally owned by registered members of Wagmatcook First Nation (Wagmatcook First Nation 2016). The Wagmatcook Commercial Fishery employs 35 fishers and one shore-based manager (Wagmatcook First Nation 2016). It utilizes a total of eleven fishing vessels and primarily harvests groundfish, palegics, shellfish and is a producer / wholesaler of shell ice products (Wagmatcook First Nation 2016). The fishery has six Cape Islander-style lobster vessels, one groundfish vessel, two storage facilities and an ice processing facility (Wagmatcook First Nation 2016). The fishery generates the highest projected returns to the community (Wagmatcook First Nation 2016).
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	The Project does not overlap with the traditional territory of the Mi'kmaq of Nova Scotia, therefore there are no known physical and cultural heritage sites in or near the Project Area.

Community Indicator	Description
Current Use of Lands for Traditional Purposes	The Mi'kmaq of Nova Scotia harvest Atlantic salmon as part of their Aboriginal rights for FSC purposes (UINR 2018). Salmon harvesting occurs throughout the year; however, efforts are concentrated during, or just prior to, salmon runs. Atlantic salmon is an integral component to Mi'kmaq culture. The practice of salmon fishing, using traditional harvesting methods, creates opportunities for traditional knowledge sharing, transmission, and adaptation, expressing Mi'kmaw values of sharing catches with the community, and other uses specific to salmon that cannot be replaced by harvesting other species (UINR 2018). The Mi'kmaq of Nova Scotia also harvest American eel within Aboriginal rights-based, treaty rights-based and commercial fisheries. In addition to a rich food source, the American eel is also used for medicinal purposes.
Commercial Communal Fishing	Wagmatcook First Nation hold several commercial communal licensesfor rock crab, spider / toad crab, groundfish, lobster, mackerel, smelts, snow crab, squid and bluefin tuna. Wagmatcook First Nation also holds commercial communal licenses for swordfish in NAFO divisions that overlap with the exploration licenses included in the Project Area. Lobster fishing is licensed in LFA 26.
Food, Social, Ceremonial Fishing	Wagmatcook First Nation holds several FSC licenses for cod, eel, flounder, haddock, herring, mackerel, mussel, pollock, scallop, shad, smelt, trout, lobster and salmon. In addition, the Agency identified Wagmatcook First Nation as having an Aboriginal right to fish for Atlantic salmon for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Mi'kmaq of Nova Scotia have established Aboriginal and Treaty rights. This includes a right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties, and an Aboriginal right to fish for FSC purposes.
We'koqma'q First Nation	
Location and Proximity to Project Area	We'ko'kmaq (Waycobah) First Nation is comprised of two reserves within the village of Whycocomagh in Cape Breton. Waycobah First Nation is approximately 671 km from the Project Area.
General Overview	Waycobah First Nation encompasses two reserves: Malagawatch 4 (62 km southwest of Sydney with an area of 661.3 ha) and Whycocomagh 2 (70 km west of Sydney with an area of 908 ha) (INAC undated). Waycobah First Nation is represented by the ANSMC. According to 2016 census data, the on-reserve population was 831 (Statistics Canada undated).
Health and Socio-economic Conditions	In 2008, a new elementary-secondary school was opened within the community (Waycobah First Nation undated). A daycare facility also exists within the community as well as a RCMP station and volunteer fire department. In 2010, the Theresa Cremo Memorial Health Centre was opened, offering a variety of programs and services such as a full time Nurse Practitioner, full time clinical therapist, prenatal classes, lab collection, Reiki treatments, an Alcohol and Drug counselor, midwifery clinics, well women and men clinics, a dietician, teen health clinic and a variety of activities for members of the community of all ages (Waycobah First Nation undated). A doctor is available at the Health Centre twice a week. The Nation also owns and operates a convenience store and gas bar and a gaming center (Waycobah First Nation undated).

Community Indicator	Description
	As described in more detail below, Waycobah First Nation holds several commercial communal licenses for a variety of fish and marine species. The First Nation has two lobster licenses, shrimp trap and trawl licenses, groundfish quotas and an active elver fishery (Waycobah First Nation undated). The Waycobah Fisheries employs approximately 35 community members (Waycobah First Nation undated). In 2011, a trout fish farm was re-established within the community. Although owned by Cold Water Fisheries, employees are largely Waycobah community members (Waycobah First Nation undated).
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	Established in the early 1800s, Waycobah First Nation was originally known as We'ko'kmaq. In the 1940s, the community experienced a decline in population because of the federal government's centralization policy, where many individuals were relocated to the community of Eskasoni (Waycobah First Nation undated). The Project does not overlap with the traditional territory of the Mi'kmaq of Nova Scotia, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	The Mi'kmaq of Nova Scotia harvest Atlantic salmon as part of their Aboriginal rights for FSC purposes (UINR 2018). Salmon harvesting occurs throughout the year; however, efforts are concentrated during, or just prior to, salmon runs. Atlantic salmon is an integral component to Mi'kmaq culture. The practice of salmon fishing, using traditional harvesting methods, creates opportunities for traditional knowledge sharing, transmission, and adaptation, expressing Mi'kmaw values of sharing catches with the community, and other uses specific to salmon that cannot be replaced by harvesting other species (UINR 2018). The Mi'kmaq of Nova Scotia also harvest American eel within Aboriginal rights-based, treaty rights-based and commercial fisheries. In addition to a rich food source, the American eel is also used for medicinal purposes.
Commercial Communal Fishing	Waycobah First Nation holds several commercial communal licenses for groundfish, lobster, snow crab, herring, mackerel, sea urchin, shrimp, and swordfish. Lobster fishing is licensed in LFA 27 and 29.
Food, Social, Ceremonial Fishing	Waycobah First Nation hold several FSC licenses for 16 species within the tidal waters of Cape Breton. The Nation also holds licenses to harvest lobster throughout Cape Breton. In addition, the Agency identified Waycobah First Nation as having an Aboriginal right to fish for Atlantic salmon for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Mi'kmaq of Nova Scotia have established Aboriginal and Treaty rights. This includes a right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties, and an Aboriginal right to fish for FSC purposes.
Sipekne'katik First Nation	
Location and Proximity to Project Area	Sipekne'katik First Nation (also known as Indian Brook or Shubenacadie) is comprised of five reserves in Hants County, near the town of Shubenacadie. Sipekne'katik First Nation is approximately 892 km from the Project Area.

Community Indicator	Description
General Overview	Sipekne'katik First Nation encompasses five reserves: Indian Brook 14 (29 km southwest of Truro with an area of 1,234.2 ha), Wallace Hills 14A (with an area of 54.8 ha), Shubenacadie 13 (32 km north of Halifax with an area of 412.0 ha), Pennal 19 (67.2 km northwest of Halifax with an area of 43.5 ha) and New Ross 20 (64 km northwest of Halifax with an area of 408.3 ha) (INAC undated). Sipekne'katik First Nation is currently not represented by the ANSMC. Sipekne'katik First Nation asserts the same rights as other Mi'kmaq communities in Nova Scotia. According to 2016 census data, the on-reserve population at Wallace Hills was 10, Pennal was 27, and Indian Brook was 1,089 (Statistics Canada undated). No population data were available for Shubenacadie or New Ross.
Health and Socio-economic Conditions	In 2008, the L'nu Sipuk Kina'muokum (LSK) school opened in the community, accommodating students from primary to grade 12. The school specializes in Mi'kmaq studies and Mi'kmaq language courses (Sipekne'katik First Nation 2016). Little Eagles Daycare Centre provides care to children ages 1 – 4 years old (Sipekne'katik First Nation 2016). The community also has the Sipekne'katik Multipurpose Centre, used for community meetings, events, and social gatherings. Local businesses within the community include a community gas-bar, tobacco shop, gaming room and convenience store. As described in more detail below, Sipekne'katik First Nation holds several commercial communal licenses for a variety of fish and marine species. The Sipekne'katik First Nation Fisheries Department is an economic enterprise, managing 33 fishing licenses for various species including lobster, crab, and groundfish (BP 2017).
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	Established in 1820, Sipekne'katik was originally named "Indian Brook". The area was traditionally used as a sacred site to prepare for ceremonies and hunting and fishing trips (Sipekn'katik First Nation undated). In 1752, one of the most significant Peace and Friendship Treaties was signed at Shubenacadie District (Sipekn'katik First Nation 2016). This treaty dealt with lands, hunting, fishing, trapping, gathering, and trading. In 2002, a memorial was erected in honor of Chief Jean Baptiste Cope and the Treaty of 1752 (Sipekn'katik First Nation 2016). The Project does not overlap with the traditional territory of the Mi'kmaq of Nova Scotia, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	The Mi'kmaq of Nova Scotia harvest Atlantic salmon as part of their Aboriginal rights for FSC purposes (UINR 2018). Salmon harvesting occurs throughout the year; however, efforts are concentrated during, or just prior to, salmon runs. Atlantic salmon is an integral component to Mi'kmaq culture. The practice of salmon fishing, using traditional harvesting methods, creates opportunities for traditional knowledge sharing, transmission, and adaptation, expressing Mi'kmaw values of sharing catches with the community, and other uses specific to salmon that cannot be replaced by harvesting other species (UINR 2018). The Mi'kmaq of Nova Scotia also harvest American eel within Aboriginal rights-based, treaty rights-based and commercial fisheries. In addition to a rich food source, the American eel is also used for medicinal purposes.
Commercial Communal Fishing	Sipekne'katik First Nation holds several commercial communal licensesfor groundfish, lobster, scallops, snow crab, sea urchins and tuna. Sipekne'katik First Nation also holds commercial communal licenses for swordfish in NAFO divisions that overlap with the exploration licenses included in the Project Area. Lobster fishing is licensed in LFA 33, 34, and 35.

Community Indicator	Description
Food, Social, Ceremonial Fishing	Sipekne'katik First Nation holds several FSC licenses to harvest 20 species within the inland and tidal waters of NS. The First Nation also holds licenses to fish for several other species in defined NAFO units in and around Nova Scotia, such as crab, lobster, scallops and groundfish. Sipekne'katik First Nation also has an Aboriginal right to fish for Atlantic salmon for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Mi'kmaq of Nova Scotia have established Aboriginal and Treaty rights. This includes a right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties, and an Aboriginal right to fish for FSC purposes.
Millbrook First Nation	
Location and Proximity to Project Area	Millbrook First Nation is comprised of seven reserves, near the community of Truro and Halifax. Millbrook First Nation is approximately 853 km from the Project Area.
General Overview	Millbrook First Nation encompasses seven reserves. Four reserve lands: Truro 27A, Truro 27B, Truro 27C and Millbrook 27, are near the town of Truro with a total area of 344.9 ha (INAC undated). The remaining three are: Beaver Lake 17 (78.4 km southeast of Halifax with an area of 49.4 ha), Sheet Harbour 36 (91.2 km northeast of Halifax with an area of 32.7 ha), and Cole Harbour 30 (9.6 km east of Halifax with an area of 18.6 ha (INAC undated). Millbrook First Nation is currently not represented by the ANSMC. Millbrook First Nation asserts the same rights as other Mi'kmaq communities in Nova Scotia. According to 2016 census data, the population at Millbrook was 860 and the Sheet Harbour was 25 (Statistics Canada undated). No population data were available for Cole Harbour and Beaver Lake.
Health and Socio-economic Conditions	Infrastructure and services available in the community of Millbrook are the Millbrook Band Office, Millbrook Community Hall, Millbrook Ballfield, Millbrook Gym, Millbrook Early Education Centre, Millbrook Senior's Centre, and Sacred Heart Mission Church (Millbrook First Nation 2018). The Millbrook Health Centre is also in the community, providing a variety of programs and services such as home and community care and assisted living programs, youth support, addiction services, wellness programs and community support and family enrichment programs. Millbrook First Nation owns, develops, and manages the retail park, Millbrook Power Centre, in Truro, NS. This park encompasses 68 acres of commercial land on the most traveled stretch of highway in Nova Scotia, outside of Halifax (Millbrook First Nation 2018). Since opening in 2001, the Millbrook Power Centre has approximately a dozen tenants including a multiplex theatre, several restaurants, two hotels, a recreational vehicle retailer, a service station, an aquaculture facility, a furniture store, and the Glooscap Heritage Centre (Millbrook First Nation 2018). There have also been recent developments in the Cole Harbour community, including apartment buildings, General Dynamics Building, and a gaming center. As described in more detail below, Millbrook First Nation hold several commercial communal licenses for a variety of fish and marine species. Millbrook Fisheries is an important part of the local economy, controlling eight vessels and employing over 40 staff members throughout the year.
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	From the late 1700s to the early 1800s, the Mi'kmaq near Truro were settled along the banks of the Salmon River. The Mi'kmaq then relocated to their current community at Millbrook (Millbrook First Nation 2018). The Project does not overlap with the traditional territory of the Mi'kmaq of Nova Scotia, therefore there are no known physical and cultural heritage sites in or near the Project Area.

Community Indicator	Description
Current Use of Lands for Traditional Purposes	The Mi'kmaq of Nova Scotia harvest Atlantic salmon as part of their Aboriginal rights for FSC purposes (UINR 2018). Salmon harvesting occurs throughout the year; however, efforts are concentrated during, or just prior to, salmon runs. Atlantic salmon is an integral component to Mi'kmaq culture. The practice of salmon fishing, using traditional harvesting methods, creates opportunities for traditional knowledge sharing, transmission, and adaptation, expressing Mi'kmaw values of sharing catches with the community, and other uses specific to salmon that cannot be replaced by harvesting other species (UINR 2018). The Mi'kmaq of Nova Scotia also harvest American eel within Aboriginal rights-based, treaty rights-based and commercial fisheries. In addition to a rich food source, the American eel is also used for medicinal purposes.
Commercial Communal Fishing	Millbrook First Nation holds several commercial communal licenses for alewives / gaspereau, rock crab, eel, groundfish, herring, lobster, mackerel, oysters, scallop, smelts, and squid. Millbrook First Nation also holds commercial communal licenses for swordfish and tuna in NAFO divisions that overlap with the exploration licenses included in the Project Area. Lobster fishing is licensed in LFA 26.
Food, Social, Ceremonial Fishing	Millbrook First Nation hold several FSC licenses to harvest 17 species within the inland and tidal waters of NS including the tidal water of the Bay of Fundy. The Nation also holds licenses to fish for several other species in defined NAFO units in and around Nova Scotia, including herring, lobster, mackerel, ocean quahaug, oysters and scallops. Millbrook First Nation also has an Aboriginal right to fish for Atlantic salmon for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Mi'kmaq of Nova Scotia have established Aboriginal and Treaty rights. This includes a right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties, and an Aboriginal right to fish for FSC purposes.

4.3.2.3.2 Mi'kmaq of Prince Edward Island

Abegweit and Lennox Island First Nations, the two Mi'kmaq communities on PEI, are represented in consultation and engagement by the Mi'kmaq Confederacy of Prince Edward Island (MCPEI). Established in 2002, MCPEI started as a service delivery organization and has expanded to include economic development, integrated resource management, government advisory services, and consultation on behalf of these two Mi'kmaq communities (MCPEI undated).

In 2009, PEI's Aboriginal Affairs Secretariat was created to manage government's response to Aboriginal matters within the province (MCPEI undated). On August 13, 2012, the Government of Canada and the Province, and the Mi'kmaq of PEI signed a tripartite consultation agreement, Mi'kmaq – Prince Edward Island – Canada Consultation Agreement (Abegweit First Nation 2015). The Agreement outlines a means for Canada and PEI to consult with the Mi'kmaq on proposed actions or decisions that may adversely impact asserted or established Aboriginal treaty rights (Abegweit First Nation 2015).

The Project does not overlap with known traditional territory of the Mi'kmaq of PEI, however Abeqweit and Lennox Island First Nations both have commercial communal fishing licences to harvest swordfish in NAFO divisions that overlap with the Project Area.

The Mi'kmaq communities located in PEI are discussed in further detail in Table 4.49.

Table 4.49 Mi'kmaq of Prince Edward Island Community Profiles

Community Indicator	Description
Abegweit First Nation	
Location and Proximity to Project Area	Abegweit First Nation is comprised of three reserves, extending along the eastern portion of PEI. The community is approximately 790 km from the Project Area.
General Overview	Abegweit First Nation encompasses three reserves: Morell Rear Reserve 2 (approximately 40 km northeast of Charlottetown with an area of 83 hectares (ha)), Rocky Point Reserve 3 (south of Charlottetown with an area of 4.8 ha), and Scotchfort Reserve 4 (24 km northeast of Charlottetown with an area of 113.1 ha) (BP 2017). Abegweit First Nation is represented by MCPEI. As of October 2017, Abegweit First Nation had a registered population of 379 (INAC 2017).
Health and Socio-economic Conditions	Abegweit First Nation has no schools within the community. As of 2015, Abegweit First Nation students were enrolled in approximately 15 different schools throughout the province (Abegweit First Nation 2015). The Abegweit First Nation's Education Program does however play a significant role, providing a variety of programs and services such as access to upgrading and GED programs, after-school tutoring programs, homework clubs, post-secondary education programs and early childhood learning (Abegweit First Nation 2015). The Abegweit First Nation Mi'kmaq Wellness Centre delivers health care services to the community, while respecting safety, cultural values, traditions, and beliefs of the community. The Wellness Centre has an interdisciplinary team including a doctor, registered nurse, licensed practical nurse, registered dietician, native alcohol and drug addiction counselor and a community health representative (Abegweit First Nation 2015). The Abegweit First Nation Community Economic Development Program serves the community, its members, and businesses in many ways including proposal development, land and resource development, and economic planning (Abegweit First Nation 2015). Abegweit First Nation owns and operates the Epekwit Gas Bar and the Redstone Truck and Marine facility (Abegweit First Nation 2015). Other economic initiatives include the Epekwit Gardens and Preserves, Abegweit Biodiversity and Enhancement Hatchery, stream enhancement and forestry (Abegweit First Nation 2015; BP 2017). As described in more detail below, Abegweit First Nation holds several commercial communal licenses for a variety of fish and marine species. The First Nation has an established commercial fishery for lobster, snow crab, rock crab, mackerel, tuna and silverside (Abegweit First Nation 2015; BP 2017).
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	Abegweit First Nation was established in 1972 due to separation from the Lennox Island First Nation (Abegweit First Nation 2015). The first election for the band occurred in May of 1972. The Project does not overlap with traditional Mi'kmaq territory, therefore there are no known physical and cultural heritage sites in or near the Project Area.

Community Indicator	Description
Current Use of Lands for Traditional Purposes	The Mi'kmaq of PEI are known to occupy and use the land and waters around PEI, including use for travel corridors, land hunting and harvesting, and fishing for traditional purposes. The Mi'kmaq Confederacy of PEI database which is a partial inventory of existing knowledge does not indicate use of lands in the Study Area for traditional purposes, although it could be that evidence of use, if it exists, has not yet been collected. Refer below for details on FSC fishing practices.
Commercial Communal Fishing	Abegweit First Nation holds 200 commercial communal licenses for clams, rock crab, toad / spider crab, eel, groundfish, herring, lobster, mackerel mussels, oysters, quahaugs, scallops, seal, silverside, smelts, snow crab, squid, bluefin tuna and whelks. Abegweit First Nation also holds commercial communal licenses for swordfish in NAFO divisions that overlap with the exploration licenses included in the Project Area. Lobster is licensed for LFA 24.
Food, Social, Ceremonial Fishing	Abegweit Fish Nation holds several FSC licenses for clams, eel, gaspereau, herring, lobster, mackerel, mussels, oysters, quahaug, rock crab, scallops, seals, silversides, smelts, striped bass, toad crab and trout. Abegweit First Nation also has an Aboriginal right to fish for Atlantic salmon (outer Bay of Fundy population) for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Mi'kmaq of PEI assert an Aboriginal right to fish for FSC purposes, and hold commercial communal licences issue by DFO as a result of the Marshall decision (1999). The rights to fish under the Marshall decision flow from the Peace and Friendship Treaties.
Lennox Island First Nation	
Location and Proximity to Project Area	Lennox Island First Nation is comprised of one reserve, extending along the northwestern portion of PEI, facing the Gulf of St. Lawrence. Lennox Island is approximately 856 km from the Project Area.
General Overview	Lennox Island is 24 km north of Summerside with an area of 535.1 ha (BP 2017). Lennox Island First Nation is represented by MCPEI. As of October 2017, Lennox Island First Nation had a registered population of 967 (INAC 2017).
Health and Socio-economic Conditions	In 1972-73, a bridge was built to Lennox Island, allowing for year-round accessibility. Established in 1981, the Mi'kmaq school, John J. Sark Memorial, accommodates approximately 50 students from kindergarten to grade 6 (Lennox Island 2013). The Lennox Island Health Centre provides the community with a variety of programs and services including basic health care services, delivery of home support services, substance abuse counselling, access to fitness and maternal health coordination. There is also a fire department in the community. The Lennox Island Development Corporation was developed by the First Nation to further economic prosperity within the community (Lennox Island 2013).

Community Indicator	Description
	As described in more detail below, Lennox Island First Nation hold several commercial communal licenses for a variety of fish and marine species. The fisheries industry is the band's largest employer. Fisherman's Pride Inc., owned and operated by Lennox Island First Nation, is a primary resource harvester and seller of inshore seafood, operating on Lennox Island. In 2012, the fishery operated 32 boats and employed three shore-based personnel and 24 sea-going personnel (Lennox Island First Nation 2013). Fisherman's Pride Inc. also invests in mentoring programs for its members. Established in 2010, Minigoo Fisheries, is also owned and operated by the Lennox Island First Nation. Minigoo Fisheries processes wild Atlantic lobster, fished by Indigenous and non-Indigenous fishermen for international markets (Lennox Island First Nation 2013). The plant is located on Indigenous lands in PEI and operates under a Government of Canada processing license (Lennox Island First Nation 2013).
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	The Project does not overlap with traditional Mi'kmaq territory, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	The Mi'kmaq of PEI are known to occupy and use the land and waters around PEI, including use for travel corridors, land hunting and harvesting and fishing for traditional purposes. The Mi'kmaq Confederacy of PEI database which is a partial inventory of existing knowledge does not indicate use of lands in the Study Area for traditional purposes, although it could be that evidence of use, if it exists, has not yet been collected. Refer below for details on FSC fishing practices.
Commercial Communal Fishing	Lennox Island First Nation holds 352 commercial communal licenses for clams, rock crab, eel, groundfish, herring, lobster, mackerel, mussels, quahaug, oysters, scallops, seal, shark, porbeagle / mackerel, silverside, smelts, snow crab, squid, bluefin tuna and whelks. Lennox Island First Nation also holds commercial communal licenses for swordfish in NAFO divisions that overlap with the exploration licenses included in the Project Area. Lobster is licensed for LFA 24 and 25.
Food, Social, Ceremonial Fishing	Lennox Island First Nation holds several FSC licenses for mussels, clams (bar, soft-shell, and razor), oysters, eel, gaspereau, groundfish, herring, lobster, rock crab, salmon, seals, smelt and trout. Lennox Island First Nation also has an Aboriginal right to fish for Atlantic salmon (outer Bay of Fundy population) for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Mi'kmaq of PEI assert an Aboriginal right to fish for FSC purposes, and hold commercial communal licences issue by DFO as a result of the Marshall decision (1999). The rights to fish under the Marshall decision flow from the Peace and Friendship Treaties.

4.3.2.3.3 Mi'gmaq of New Brunswick

There are nine Mi'gmaq First Nations in New Brunswick:

- Elsipogtog First Nation
- Fort Folly First Nation
- Eel Ground First Nation
- Pabineau First Nation
- Esgenoôpetitj First Nation
- Indian Island First Nation
- Eel River First Nation
- Metepenagiag Mi'gmaq Nation
- Buctouche First Nation

Eight of the nine Mi'gmaq communities in New Brunswick are represented by the Mi'gmawe' Tplu'taqn Incorporated (MTI) (the exception is Elsipogtog First Nation). MTI, formed in late 2015, is a not-for-profit organization established to manage consultation and, promote and support the recognition, affirmation, and implementation of the inherent Aboriginal and Treaty Rights of its members. Elsipogtog First Nation conducts its own consultation and engagement, and in 2016 launched an Aboriginal title claim to the southeastern third of the province.

Traditional territory for the Mi'gmaq in New Brunswick includes lands and waters draining into the Gulf of St. Lawrence and a portion of the lands and waters draining into the Bay of Fundy (MGS and UINR 2016). The Project does not overlap with the traditional territory of the Mi'gmaq of New Brunswick. However, Fort Folly First Nation holds commercial communal fishing licences for swordfish and tuna in the Study Area including within NAFO Unit Areas which overlap with the Project Area.

All nine Mi'gmaq communities located in New Brunswick are discussed in further detail in Table 4.50.

Table 4.50 Mi'gmaq of New Brunswick Community Profiles

Community Indicator	Description
Fort Folly First Nation	
Location and Proximity to Project Area	Fort Folly First Nation is comprised of one reserve, located near Dorchester in Westmorland County. Fort Folly is approximately 922 km from the Project Area
General Overview	Fort Folly 1 is 2 km southeast of Dorchester with an area of 56.0 ha (INAC undated). Fort Folly First Nation is a Mi'gmaq Nation affiliated with the North Shore Micmac District Council and represented by MTI. According to 2016 census data, the on-reserve population was 40 (Statistics Canada undated).

Community Indicator	Description
Health and Socio-economic Conditions	The Fort Folly First Nation Pre-School is located within the community, accommodating students in kindergarten. There is no police detachment or fire hall within the community. As described in more detail below, Fort Folly First Nation holds several commercial communal licenses for a variety of fish and marine species. Fort Folly's fishing, particularly for lobster and scallops, plays an important part of the local economy (Fort Folly First Nation undated). The First Nation owns two lobster boats (Fort Folly First Nation undated).
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	In 1918, Fort Folly First Nation community members were relocated to Robinson, outside of Richibucto (Fort Folly First Nation undated). The Project does not overlap with the traditional territory of the Mi'gmaq of New Brunswick, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	The Mi'gmaq of New Brunswick are known to occupy and use the land and waters around New Brunswick primarily for travel corridors, hunting, harvesting and fishing for traditional purposes. Although not necessarily reflective of all Mi'gmaq use of lands and resources, Indigenous knowledge studies conducted in 2016 and 2017 involving 112 MTI community members demonstrate a diversity of traditional harvesting, fishing and gathering activities occurring primarily in the province of New Brunswick, Bay of Fundy, Northumberland Strait and Gulf of St. Lawrence (SVS 2017). Fort Folly First Nation was also included in a Traditional Use Study conducted for the Scotian Basin Exploration Drilling Project, which focused on the First Nation's commercial communal and FSC fishing offshore Nova Scotia (MGS and UINR 2016). .
Commercial Communal Fishing	Fort Folly First Nation holds several commercial communal licences for groundfish herring, lobster, and scallops. They also hold commercial communal licences to fish for swordfish, and tuna in NAFO Unit Areas which overlap the Project Area.
Food, Social, Ceremonial Fishing	Fort Folly First Nation holds FSC licenses to harvest lobster in the Bay of Fundy. Fort Folly First Nation also has an Aboriginal right to fish for Atlantic salmon (outer Bay of Fundy population) for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Mi'gmaq of New Brunswick have a right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties, and an Aboriginal right to fish for FSC purposes.
Eel Ground First Nation	
Location and Proximity to Project Area	Eel Ground First Nation is comprised of three reserves, along the Miramichi River near Newcastle. Eel Ground First Nation is approximately 983 km from the Project Area.
General Overview	Eel Ground First Nation encompasses three reserves: Big Hole Tract 8 (21 km west of Newcastle with an area of 1,740.2 ha), Eel Ground 2 (5 km west of Newcastle with an area of 1,072.8 ha), and Renous 12 (27 km west of Newcastle with an area of 10.0 ha) (INAC undated). Eel Ground First Nation is a Mi'kmaq Nation affiliated with the North Shore Micmac District Council and represented by MTI. According to 2016 census data, the on-reserve population for Eel Ground 2 was 532 (Statistics Canada undated). No population data exist for Big Hole Tract or Renous.

Community Indicator	Description
Health and Socio-economic Conditions	In 2015, a new school was built in Eel Ground First Nation, Natoaganeg School, accommodating students from kindergarten to grade 8 (Eel Ground School undated). There is a health center in the community, the Eel Ground Health and Wellness Centre, offering a variety of programs and services such as women's wellness clinics, blood collection, well baby clinics and home and community care and support services (Eel Ground First Nation undated). A doctor visits the Eel Ground Health and Wellness Centre once a week (Eel Ground First Nation undated). There is no police detachment or fire hall in the community. Eel Ground First Nation is active in the forestry industry with the company Straight Arrow Specialized Lumber Products. As described in more detail below, Eel Ground First Nation holds several commercial communal licenses for a variety of fish and marine species.
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	The Project does not overlap with the traditional territory of the Mi'gmaq of New Brunswick, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	The Mi'gmaq of New Brunswick are known to occupy and use the land and waters around New Brunswick primarily for travel corridors, hunting, harvesting and fishing for traditional purposes. Although not necessarily reflective of all Mi'gmaq use of lands and resources, Indigenous knowledge studies conducted in 2016 and 2017 involving 112 MTI community members demonstrate a diversity of traditional harvesting, fishing and gathering activities occurring primarily in the province of New Brunswick, Bay of Fundy, Northumberland Strait and Gulf of St. Lawrence (SVS 2017). Refer below for information on FSC fishing.
Commercial Communal Fishing	Eel Ground First Nation hold 24 commercial communal licenses for alewives / gaspereau, groundfish, herring, lobster, mackerel, marine plants, oysters, sea urchins, snow crabs and soft-shell clams. Lobster fishing is licensed for LFA 25.
Food, Social, Ceremonial Fishing	Eel Ground First Nation hold several FSC licenses for clams, mussels, eels, gaspereau, herring, mackerel, oysters, quahaug, salmon, shad, smelts, striped bass, and brook trout. Clams, mussels, oysters and quahaug can be harvested in the tidal waters of Northumberland County and herring and mackerel in the Northumberland Strait (Nexen Energy ULC 2018). Eel, gaspereau, salmon, smelt, stiped bass and brook trout are licensed to be harvested in the tidal / or inland portions of the Miramichi River System (P. Belanger, DFO, pers. comm. 2017; Statoil 2017). Eel Ground First Nation also has an Aboriginal right to fish for Atlantic salmon (outer Bay of Fundy population) for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Mi'gmaq of New Brunswick have a right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties, and an Aboriginal right to fish for FSC purposes.
Pabineau First Nation	
Location and Proximity to Project Area	Pabineau First Nation is comprised of one reserve, located south of Bathurst. Pabineau First Nation is approximately 977 km from the Project Area.
General Overview	Pabineau 11 is 8 km south of Bathurst with an area of 429.0 ha (INAC undated). Pabineau First Nation is a Mi'gmaq Nation affiliated with the North Shore Micmac District Council and represented by MTI. According to 2016 census data, the on-reserve population was 134 (Statistics Canada undated).

Community Indicator	Description
Health and Socio-economic Conditions	A daycare program is offered to members of the community, accommodating children 2 – 5 years of age (Pabineau First Nation undated). The Pabineau First Nation Health Care Centre was opened in 2011, providing a variety of programs and services to community members including a Community Health Nurse, addictions counselling, diabetes prevention, a visiting Nurse Practitioner and foot care service (Pabineau First Nation undated). There is a police detachment within the community, but no fire hall or school. Community-owned and operated businesses include the Pabineau Seafood Takeout, Pabineau Smoke Shop, and Pabineau Gas Bar (Pabineau First Nation undated). As described in more detail below, Pabineau First Nation holds several commercial communal licenses for a variety of fish and marine species. Pabineau First Nation is involved in collaborative efforts to support the enhancement of healthy salmon populations within the Nepisiguit and Pabineau Rivers (Pabineau First Nation undated). Since 1981, Pabineau First Nation has been involved in the operation and management of a salmon counting and brood stock collection fence (Pabineau First Nation undated). The Pabineau Salmon Enhancement Centre employs approximately 10 community members each summer and fall (Pabineau First Nation undated).
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	The Project does not overlap with the traditional territory of the Mi'gmaq of New Brunswick, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	The Mi'gmaq of New Brunswick are known to occupy and use the land and waters around New Brunswick primarily for travel corridors, hunting, harvesting and fishing for traditional purposes. Although not necessarily reflective of all Mi'gmaq use of lands and resources, Indigenous knowledge studies conducted in 2016 and 2017 involving 112 MTI community members demonstrate a diversity of traditional harvesting, fishing and gathering activities occurring primarily in the province of New Brunswick, Bay of Fundy, Northumberland Strait and Gulf of St. Lawrence (SVS 2017). Limited publicly-availble information exists on current use of lands and resources for traditional purposes for Pabineau First Nation. Pabineau First Nation has a long history of fishing Atlantic salmon in the Little River system (Nexen Energy ULC 2018). Refer below for more information on FSC fishing.
Commercial Communal Fishing	Pabineau First Nation holds 24 commercial communal licenses for rock crab, groundfish, herring, lobster, mackerel, oysters, scallops, snow crab and bluefin tuna. Lobster fishing is licensed for LFA 23.
Food, Social, Ceremonial Fishing	Pabineau First Nation hold several FSC licenses including for soft-shell, bar, and razor clams, quahaugs, herring, mackerel, mussels, oysters, salmon, and trout. Pabineau First Nation also has an Aboriginal right to fish for Atlantic salmon (outer Bay of Fundy population) for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Mi'gmaq of New Brunswick have a right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties, and an Aboriginal right to fish for FSC purposes.

Community Indicator	Description
Esgenoôpetitj First Nation	
Location and Proximity to Project Area	Esgenoôpetitj First Nation is comprised of three reserves, located southwest of the village of Neguac in Kent County. Esgenoôpetitj is approximately 941 km from the Project Area.
General Overview	Esgenoôpetitj First Nation encompasses three reserves: Esgenoôpetitj Indian Reserve 14 (32 km northeast of Chatham with an area of 985. 4 ha); Pokemouche 13 (64 km east of Bathurst with an area of 151.4 ha); and Tabusintac 9 (40 km northeast of Chatham with an area of 3,268.7 ha) (INAC undated). Esgenoôpetitj First Nation is a Mi'kmaq Nation affiliated with MAWIW Council and represented by MTI. According to 2016 census data, the on-reserve population of Esgenoôpetitj Indian Reserve 14 was 1,179 and Tabusintac was 10 (Statistics Canada undated). No population data exist for Pokemouche.
Health and Socio-economic Conditions	The Esgenoôpetitj School accommodates students from kindergarten to grade 8. There is no police detachment but there is a fire hall. Publicly-available information on economic development for the Esgenoôpetitj First Nation could not be found. As described in more detail below, Esgenoôpetitj First Nation hold several commercial communal licenses for a variety of fish and marine species.
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	The Project does not overlap with the traditional territory of the Mi'gmaq of New Brunswick, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	The Mi'gmaq of New Brunswick are known to occupy and use the land and waters around New Brunswick primarily for travel corridors, hunting, harvesting and fishing for traditional purposes. Although not necessarily reflective of all Mi'gmaq use of lands and resources, Indigenous knowledge studies conducted in 2016 and 2017 involving 112 MTI community members demonstrate a diversity of traditional harvesting, fishing and gathering activities occurring primarily in the province of New Brunswick, Bay of Fundy, Northumberland Strait and Gulf of St. Lawrence (SVS 2017). Refer below for information on FSC fishing.
Commercial Communal Fishing	Esgenoôpetitj First Nation holds 163 commercial communal licenses for bar clams, rock and spider / toad crab, eel, groundfish, herring, lobster, mackerel, marine plants, mussels, oysters, quahaugs, scallops, smelts, snow crab, soft shell clams and bluefin tuna. Lobster is licensed for LFA 23.
Food, Social, Ceremonial Fishing	Esgenoôpetitj First Nation holds several FSC licenses for soft-shell and bar clams, quahaug, eel, herring, lobster, mackerel, mussels, oysters, salmon, smelts, striped bass and trout. Esgenoôpetitj First Nation also has an Aboriginal right to fish for Atlantic salmon (outer Bay of Fundy population) for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Mi'gmaq of New Brunswick have a right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties, and an Aboriginal right to fish for FSC purposes.
Buctouche First Nation	
Location and Proximity to Project Area	Buctouche First Nation is comprised of one reserve, located near the town of Buctouche. Buctouche Fist Nation is approximately 927 km from the Project Area.

Community Indicator	Description
General Overview	Buctouche 16 is 3 km southwest of Buctouche with an area of 62.3 ha (INAC undated). Buctouche First Nation is a Mi'kmaq Nation affiliated with the North Shore Micmac District Council and represented by MTI. According to 2016 census data, the on-reserve population was 96 (Statistics Canada undated).
Health and Socio-economic Conditions	A kindergarten, Buctouche First Nation Pre-school, is in the community. There is no police detachment but there is a fire hall. The Buctouche First Nation Health Centre is also in the community. Buctouche First Nation has an economic development program that focuses on band-owned business opportunities (Buctouche First Nation undated). The program provides community members with employment and training opportunities (Buctouche First Nation undated). The Buctouche Micmac Band Forestry Department administers the distribution of royalties received through the Band's annual allocation by the Province of New Brunswick (Buctouche First Nation undated). The band also owns and operates the River of Little Fire Incorporated Gas Bar (Buctouche First Nation undated). As described in more detail below, Buctouche First Nation hold several commercial communal licenses for a variety of fish and marine species.
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	Established in 1810, Buctouche First Nation was abandoned in 1924 then re-established in 1958. Historically, it is thought that the Band's traditional fishing, trapping, and hunting territories expanded to the western portion of PEI, through the coast of New Brunswick from the Miramichi Bay along the Northumberland Strait, southeast between Nova Scotia on the Bay of Fundy to the border of Maine. Throughout the winter, traditional territory also encompassed inland areas around Fredericton, Grand Lake, Moncton and Miramichi (Buctouche First Nation undated). The Project does not overlap with the traditional territory of the Mi'gmaq of New Brunswick, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	The Mi'gmaq of New Brusnwick are known to occupy and use the land and waters around New Brunswick primarily for travel corridors, hunting, harvesting and fishing for traditional purposes. Although not necessarily reflective of all Mi'gmaq use of lands and resources, Indigenous knowledge studies conducted in 2016 and 2017 involving 112 MTI community members demonstrate a diversity of traditional harvesting, fishing and gathering activities occurring primarily in the province of New Brunswick, Bay of Fundy, Northumberland Strait and Gulf of St. Lawrence (SVS 2017). Refer below for information on FSC fishing.
Commercial Communal Fishing	Buctouche First Nation holds 31 commercial communal licenses for alewives / gaspereau, bar clams, rock and spider / toad crab, ground fish, herring, lobster, mackerel, oysters, scallops, seal, porbeagle / mackerel shark, smelts, snow crab and bluefin tuna. Lobster is licensed for LFA 25.
Food, Social, Ceremonial Fishing	Buctouche First Nation holds several FSC licenses for striped bass, clams, oysters, trout, mackerel, salmon, and eels. Buctouche First Nation also has an Aboriginal right to fish for Atlantic salmon (outer Bay of Fundy population) for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Mi'gmaq of New Brunswick have a right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties, and an Aboriginal right to fish for FSC purposes.

Community Indicator	Description
Indian Island First Nation	
Location and Proximity to Project Area	Indian Island First Nation is comprised of one reserve, located near Miramichi Bay on the eastern coast of NB. Indian Island First Nation is approximately 925 km from the Project Area.
General Overview	Indian Island 28 is 8 km northeast of Rexton with an area of 38.4 ha (INAC undated). Indian Island First Nation is a Mi'kmaq Nation affiliated with the North Shore Micmac District Council and represented by MTI. According to 2016 census data, the on-reserve population is 138 (Statistics Canada undated).
Health and Socio-economic Conditions	Within the community, there is no police detachment, fire hall or school. As described in more detail below, Indian Island First Nation holds several commercial communal licenses for a variety of fish and marine species. Since 2007, the Indian Island Aquaculture Development Corporation has been growing oysters (Indian Island First Nation 2015). As of 2015, there have been approximately 2.6 million oysters on-site (Indian Island First Nation 2015). The Corporation has four leases, three are used as grow-out leases and one as an overwintering lease (Indian Island First Nation 2015). Indian Island Aquaculture Development Corporation employs five seasonal fulltime employees and up to two summer students (Indian Island First Nation 2015). The Corporation has over $600,000 in assets (Indian Island First Nation 2016).
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	The Project does not overlap with the traditional territory of the Mi'gmaq of New Brunswick, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	The Mi'gmaq of New Brunswick are known to occupy and use the land and waters around New Brunswick primarily for travel corridors, hunting, harvesting and fishing for traditional purposes. Although not necessarily reflective of all Mi'gmaq use of lands and resources, Indigenous knowledge studies conducted in 2016 and 2017 involving 112 MTI community members demonstrate a diversity of traditional harvesting, fishing and gathering activities occurring primarily in the province of New Brunswick, Bay of Fundy, Northumberland Strait and Gulf of St. Lawrence (SVS 2017). Refer below for information on FSC fishing.
Commercial Communal Fishing	Indian Island First Nations hold 44 commercial communal licenses for alewives / gaspereau, rock crab, eel, groundfish, herring, lobster, mackerel, oysters, scallops, smelts, snow crab, soft shell crabs and bluefin tuna. Lobster is licensed for LFA 25.
Food, Social, Ceremonial Fishing	Indian Island First Nation holds several FSC licenses for soft shell, razor, and bar clams, mussels, eel, gaspereau, herring, lobster, mackerel, oysters, quahaug, rock crab, salmon, smelts, striped bass and trout. Indian Island First Nation also has an Aboriginal right to fish for Atlantic salmon (outer Bay of Fundy population) for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Mi'gmaq of New Brunswick have a right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties, and an Aboriginal right to fish for FSC purposes.
Eel River Bar First Nation	
Location and Proximity to Project Area	Eel River Bar First Nation is comprised of three reserves, located near Dalhousie. Eel River Bar First Nation is approximately 1,032 km from the Project Area.

Community Indicator	Description
General Overview	Eel River Bar First Nation encompasses three reserves: Eel River 3 (3 km south of Dalhousie with an area of 122.0 ha), Indian Ranch (2 km south of Dalhousie with an area of 45.7 ha), and Moose Meadows (32 km south of Dalhousie with an area of 404.7 ha) (INAC undated). Eel River Bar First Nation is a Mi'kmaq Nation affiliated with the North Shore Micmac District Council and represented by MTI. According to 2016 census data, the on-reserve population of Eel River 3 was 329 and Indian Ranch was 89 (Statistics Canada undated). No population data exist for Moose Meadows.
Health and Socio-economic Conditions	The Eel River Bar Pre-School is within the community. There is no police detachment or fire hall. The Uqpi'ganjig Health Centre provides a variety of programs and services such as substance abuse prevention programs, maternal child health, home and community care, chronic disease prevention, children's oral health initiative, aboriginal diabetes initiative and injury prevention programs (Eel River Bar First Nation 2018). Eel River Bar First Nation has a forestry department that oversees and provides support for woodlot management (Eel River Bar First Nation 2018). The First Nation owns and operates the Osprey Truck Stop which consists of a convenience store, restaurant, commercial road transportation services and video lottery terminals (Eel River Bar First Nation 2018). As described in more detail below, Eel River Bar First Nation holds several commercial communal licenses for a variety of fish and marine species.
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	Traditionally, members of the Eel River Bar community would annually migrate from the sheltered in-land areas of the territory after winter to a summer encampment in the area around Benjamin and Eel Rivers (Eel River Bar First Nation 2018). The area provided access to Heron Island, where traditional burials would take place. Historically, the Eel River Bar community would harvest resources of the land, oceans, and lakes and rivers which provided a variety of fish, seals, shellfish, moose, deer, bear, small animals, and birds. The community would fish in the waters of the Bay of Chaleur and dig for clams on the shores of Eel River Bar. In 1963, flooding, due to the construction of a dam, resulted in the loss of fishing and harvesting of clam along Eel River (Eel River Bar First Nation 2018). The Project does not overlap with the traditional territory of the Mi'gmaq of New Brunswick, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	The Mi'gmaq of New Brunswick are known to occupy and use the land and waters around New Brunswick primarily for travel corridors, hunting, harvesting and fishing for traditional purposes. Although not necessarily reflective of all Mi'gmaq use of lands and resources, Indigenous knowledge studies conducted in 2016 and 2017 involving 112 MTI community members demonstrate a diversity of traditional harvesting, fishing and gathering activities occurring primarily in the province of New Brunswick, Bay of Fundy, Northumberland Strait and Gulf of St. Lawrence (SVS 2017). Refer below for information on FSC fishing.
Commercial Communal Fishing	Eel River Bar First Nation holds 50 commercial communal licenses for rock crab, groundfish, herring, lobster, mackerel, mussels, oysters, scallops, sea urchins, shrimp, smelts, snow crab and bluefin tuna. Lobster is licensed for LFA 23.
Food, Social, Ceremonial Fishing	Eel River Bar First Nation holds several FSC licenses for soft shell clams, herring, salmon, striped bass, lobster, and rock crab. Eel River Bar First Nation also has an Aboriginal right to fish for Atlantic salmon (outer Bay of Fundy population) for FSC purposes.

Community Indicator	Description
Asserted or Established Aboriginal and / or Treaty Rights	The Mi'gmaq of New Brunswick have a right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties, and an Aboriginal right to fish for FSC purposes.
Metepngiag Mi'kmaq First Nation	
Location and Proximity to Project Area	Metepngiag Mi'kmaq First Nation is comprised of three reserves, on the Miramichi River near Newcastle. Metepngiag First Nation is approximately 1,000 km from the Project Area.
General Overview	Metepngiag First Nation encompasses three reserves: Indian Point 1 (19 km west of Newcastle with an area of 41.2 ha), Red Bank 4 (23 km west of Newcastle with an area of 1,457.0 ha), and Red Bank 7 (24 km west of Newcastle with an area of 1,011.7 ha) (INAC undated). Metepngiag First Nation is a Mi'kmaq Nation affiliated with the North Shore Micmac District Council and represented by MTI. According to 2016 census data, the on-reserve population for Red Bank 4 was 309 (Statistics Canada undated). No population data exist for Red Bank 7 or Indian Point 1.
Health and Socio-economic Conditions	The Metepngiag School accommodates students from kindergarten to grade 6 within the community. There is no police detachment or fire hall. Publicly-available information on economic development for the Metepnagiag First Nation could not be found. As described in more detail below, Metepngiag First Nation hold several commercial communal licenses for a variety of fish and marine species.
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	Traditionally, the Miramichi River served as a travel route and meeting place for the Mi'kmaq people in NB (MMFN undated). Metepngiag First Nation developed a heritage park containing two of the most important Indigenous heritage archaeological sites in eastern Canada: the Augustine Mound National Historic Site and the Oxbow National Historic Site (Metepngiag First Nation 2017). Archeological sites at these two locations demonstrate that the area has been inhabited by Mi'gmaq people for over 3,000 years (Metepngiag First Nation 2017). The Project does not overlap with the traditional territory of the Mi'gmaq of New Brunswick, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	The Mi'gmaq of New Brunswick are known to occupy and use the land and waters around New Brunswick primarily for travel corridors, hunting, harvesting and fishing for traditional purposes. Although not necessarily reflective of all Mi'gmaq use of lands and resources, Indigenous knowledge studies conducted in 2016 and 2017 involving 112 MTI community members demonstrate a diversity of traditional harvesting, fishing and gathering activities occurring primarily in the province of New Brunswick, Bay of Fundy, Northumberland Strait and Gulf of St. Lawrence (SVS 2017). Refer below for information on FSC fishing.
Commercial Communal Fishing	Metepngiag First Nation holds 18 commercial communal licenses for alewives / gaspereau, rock crab, herring, lobster, mackerel, oysters, scallops, shrimp, and snow crabs. Lobster is licensed for LFA 25.
Food, Social, Ceremonial Fishing	Metepngiag First Nation holds several FSC licenses for eel, salmon, shad, striped bass, and brook trout. Metepngiag First Nation also has an Aboriginal right to fish for Atlantic salmon (outer Bay of Fundy population) for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Mi'gmaq of New Brunswick have a right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties, and an Aboriginal right to fish for FSC purposes.

Community Indicator	Description
Elsipogtog First Nation	
Location and Proximity to Project Area	Elsipogtog First Nation is comprised of two reserves, located near Rexton and Moncton. Elsipogtog First Nation is approximately 942 km from the Project Area.
General Overview	Elsipogtog First Nation encompasses two reserves: Richibucto Reserve (8 km southwest of Rexton with an area of 1,742.0 ha), and Soegao Reserve (5 km west of Moncton with an area of 105.0 ha). Elsipogtog First Nation is a Mi'gmaq Nation affiliated with the MAWIW Council Inc. According to 2016 census data, the on-reserve population for Richibucto First Nation was 1,937 (Statistics Canada undated). No population data exist for Soegao Reserve.
Health and Socio-economic Conditions	The Elsipogtog School accommodates students from kindergarten to grade 8 within the community (Elsipogtog First Nation undated). There is no police detachment or fire hall. The two primary economic developments within the community are the River of Fire Market and Elsipogtog Pharmasave (Elsipogtog First Nation undated). As described in more detail below, Elsipogtog First Nation holds several commercial communal licenses for a variety of fish and marine species.
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	The Project does not overlap with the traditional territory of the Mi'gmaq of New Brunswick, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	The Mi'gmaq of New Brunswick are known to occupy and use the land and waters around New Brunswick primarily for travel corridors, hunting, harvesting and fishing for traditional purposes. Refer below for information on FSC fishing.
Commercial Communal Fishing	Elispogtog First Nation holds 320 commercial communal licenses for alewives / gaspereau, bar clams, rock crab, eel, groundfish, herring, lobster, mackerel, marine plants, mussels, oysters, quahaugs, scallops, seals, smelts, snow crab, soft shell clams and bluefin tuna. Lobster is licensed for LFA 25.
Food, Social, Ceremonial Fishing	Elispogtog First Nation holds several FSC licenses for clams, eel, gaspereau, herring, lobster, mackerel, mussels, oysters, quahaug, rock crab, salmon, scallops, seals, shad, smelts, striped bass, and trout. Elispogtog First Nation also has an Aboriginal right to fish for Atlantic salmon (outer Bay of Fundy population) for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Mi'gmaq of New Brunswick have a right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties, and an Aboriginal right to fish for FSC purposes.

4.3.2.4 Wolastoqiyik of New Brunswick (Maliseet)

The Wolastoqiyik Nation of New Brunswick are a group of Indigenous communities that reside along the Saint John River (Wolastoq), predominately in the west and northwest areas of the province. The Wolastoqiyik traditional territory is bordered by the Mi'kmaq traditional territory to the east and Passamaquoddy traditional territory along the Bay of Fundy and the Gulf of Maine coast and Penobscot traditional territory to the west (MGS and UINR 2016). The Project does not

overlap with the claimed traditional territory of the Wolastoqiyik of New Brunswick. However, St. Mary's First Nation and Woodstock First Nation hold commercial communal fishing licences for swordfish and tuna (Woodstock only) within NAFO Unit Areas that overlap the Project Area. Further, the Outer Bay of Fundy Designatable unit of Atlantic salmon was an important dietary staple of all the Wolastoqiyik. While the community of Madawaska still fishes salmon from the St. Lawrence, all other communities use of this culturally important fish has been restricted for the purposes of conservation (WNNB, pers. comm. 2018).

The Wolastoqiyik were traditionally primarily an agricultural and forestry-based community, supplementing their diet with hunting, fishing, and gathering fruits, berries, and nuts (Madawaska Maliseet First Nation website, undated).

The Peace and Friendship Treaties were established between 1725 and 1779 between the Mi'kmaq, the Wolastoqiyik, the Peskotomuhkati, and British settlers, the terms of which were intended to assist in establishing peace and trade relations (AANDC 2013). These treaties guarantee rights to hunt and fish throughout the region and to maintain a moderate livelihood.

There are six Wolastoqiyik Nation communities in New Brunswick:

- Kingsclear First Nation
- Madawaska Maliseet Nation
- Oromocto First Nation
- Tobique First Nation
- St. Mary's First Nation
- Woodstock First Nation

The Wolastoqiyik Nation of New Brunswick (WNNB) was established in 2016 and represents five of the six Wolastoqiyik Nations in consultation and engagement. The exception is Woodstock First Nation, which handles its own consultation and engagement, although WNNB and Woodstock often share much of their technical expertise on open files (WNNB, pers. comm. 2018).

The six Wolastoqiyik Nation communities located in New Brunswick are discussed in further detail in Table 4.51.

Table 4.51 Wolastoqiyik of New Brunswick (Maliseet) Community Profiles

Community Indicator	Description
Kingsclear First Nation	
Location and Proximity to Project Area	Kingsclear First Nation is comprised of two reserves, in York County along the Saint John River. Kingsclear First Nation is approximately 1,096 km from the Project Area.

Community Indicator	Description
General Overview	Kingsclear First Nation encompasses two reserves: Kingsclear 6 (14 km west of Fredericton with an area of 374.7 ha), and The Brothers 18 (on two small islands in Kennebecasis Bay 3 km north of Saint John with an area of 4.0 ha) (INAC undated). The Brothers 18 is also affiliated with Woodstock First Nation, Tobique First Nation, and Madawaska First Nation. Kingsclear First Nation is a Wolastoqiyik Nation and represented by WNNB. According to Kingsclear's registry administrator there is currently 737 people living on-reserve, with an additional 310 living off band lands (WNNB, pers. comm. 2018). No population data exist for The Brothers 18.
Health and Socio-economic Conditions	The Kingsclear First Nation Education Program accommodates students from kindergarten to grade 12, and includes a band operated school, Wulastukw Elementary, accommodating students from kindergarten to grade 5 (Kingsclear First Nation 2014). A health center provides a variety of services and programs to community members such as prenatal / postnatal programs, well baby clinics, chronic disease screening and education, home care nursing, prevention (additions) and mental wellness and children's oral health programs (Kingsclear First Nation 2014). A physician visits the health center once a week to provide primary care for members of the community (Kingsclear First Nation 2014). Kingsclear First Nation is active in the forestry industry, cutting their allocation under the Allowable Annual Cut arrangement with the provincial government, generally cut by contractors under agreement with the Band (Kingsclear First Nation 2014). This activity results in significant return and capital for community members (Kingsclear First Nation 2014). Kingsclear First Nation also owns and operates the Wulastukw Convenience store and a video lottery terminal lounge. As described in more detail below, Kingsclear First Nation hold several commercial communal licences for a variety of fish and marine species. The Nation is exploring opportunities to expand their fisheries operations, particularly in aquaculture for eel and sea urchin production (Kingsclear First Nation 2014). The Band is also considering developing whale watching and guided tours along the Saint John River (Kingsclear First Nation 2014).
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	The Maliseet were traditionally known to be hunters, trappers, and gatheres, who travelled along the St. John River valley depending on the season to find sustenance and shelter, as well as to trade with Europeans. The community of Kingsclear was established in 1795. Prior to settling at its current location, the Maliseet people lived in a village known as Ekwpahak located a few miles downriver of Kingsclear (Kingsclear First Nation 2014). During late spring and summer, wigwams were set up on the adjacent island known as Ekwpahak Island. This area was used by the Maliseet for spearing salmon, bass, and sturgeon, planting corn, and gathering foods and medicines such as fiddleheads, berries, butternut, grapes, and wild potatoes (Kingsclear First Nation 2014). The Project does not overlap with the traditional territory of the Wolastoqiyik of New Brunswick, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	Wolastoqey (Maliseet) First Nations continue to harvest, hunt, and consume traditional foods including moose, deer, fish, fiddleheads and berries, and use resources from the local landscape for medicinal and ceremonial purposes. Refer below for information on FSC fishing.
Commercial Communal Fishing	Kingsclear First Nation holds 18 commercial communal licences for crab, groundfish, herring, lobster, scallops, and sea urchins for the Bay of Fundy.

Community Indicator	Description
Food, Social, Ceremonial Fishing	Kingsclear First Nation holds several FSC licences for striped bass and lobster. In addition, the Agency identified Kingsclear First Nation as having an Aboriginal right to fish for Atlantic salmon (outer Bay of Fundy population) for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Wolastoqiyik have Aboriginal rights under Section 35 of the Constitution Act, 1982, and Peace and Friendship Treaty rights, which include the right to fish for a "moderate livelihood".
Madawaska Maliseet First Nation	
Location and Proximity to Project Area	Madawaska First Nation is comprised of two reserves along the Saint John River. Madawaska First Nation is located approximately 1,172 km from the Project Area.
General Overview	Madawaska First Nation encompasses two reserves: St. Basile 10 (2 km east of Edmundson with an area of 340.3 ha), and The Brothers 18 (on two small islands in the Kennebecasis Bay, 3 km north of Saint John with an area of 4.0 ha) (INAC undated). The Brothers 18 is affiliated with Kingsclear First Nation, Tobique First Nation, and Woodstock First Nation. Madawaska First Nation is affiliated with Wolastoqey Tribal Council and represented by WNNB. According to 2016 census data, the on-reserve population of St. Basile was 214 (Statistics Canada undated) although the membership clerk declares only 168 on-reserve (WNNB, pers. comm. 2018). No population data exist for The Brothers 18.
Health and Socio-economic Conditions	Madawaska Maliseet First Nation has no school, police detachment, or fire hall. A health center exists within the community, staffed by a doctor and a nurse (Madawaska Maliseet First Nation undated). The Madawaska Maliseet Economic Development Corporation focuses on business development, attracting new businesses and visitors, and investing with regional partners (Madawaska Maliseet First Nation undated). Businesses within the community include gas stations, restaurants, car dealerships and the Grey Rock Casino (Madawaska Maliseet First Nation undated). The Grey Rock Power Centre also exists within the community, along the Trans-Canada Highway (Madawaska Maliseet First Nation undated). As described in more detail below, Madawaska First Nation hold several commercial communal licences for a variety of fish and marine species.
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	The Maliseet were known to be traditional hunters, trappers, and gatheres, who travelled along the St. John River valley depending on the season to find sustenance and shelter, as well as to trade with Europeans. The Project does not overlap with the traditional territory of the Wolastoqiyik of New Brunswick, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	Wolastoqey (Maliseet) First Nations continue to harvest, hunt, and consume traditional foods including moose, deer, fish, fiddleheads and berries, and use resources from the local landscape for medicinal, arts, crafts, instruments and other ceremonial purposes. Refer below for information on FSC fishing.
Commercial Communal Fishing	Madawaska First Nation holds 14 commercial communal licences for rock crab, groundfish, herring, lobster, mackerel and scallops. Lobster is licenced for LFA 23.

Community Indicator	Description
Food, Social, Ceremonial Fishing	Madawaska First Nation holds several FSC licences for lobster, salmon, and trout. In addition, the Agency identified Madawaska First Nation as having an Aboriginal right to fish for Atlantic salmon (outer Bay of Fundy population) for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Wolastoqiyik have Aboriginal rights under Section 35 of the Constitution Act, 1982, and Peace and Friendship Treaty rights, which include the right to fish for a "moderate livelihood".
Oromocto First Nation	
Location and Proximity to Project Area	Oromocto First Nation is comprised of one reserve, located in Sunbury County near the town of Oromocto. Oromocto First Nation is approximately 1290 km from the Project Area.
General Overview	Oromocto 26 is adjacent to Gagetown with an area of 32.0 ha (INAC undated). Oromocto First Nation is a Wolastoqiyik Nation affiliated with the Wolastoqey Tribal Council Inc. (WTCI) and represented by WNNB. According to 2016 census data, the on-reserve population was 282 (Statistics Canada undated) but has since grown.
Health and Socio-economic Conditions	The Oromocto First Nation Health Centre is staffed by an early childhood wellness coordinator, a community health representative, a community health nurse and an alcohol and drug worker (Oromocto First Nation 2018). There is no school, police detachment, or fire hall within the community. Oromocto First Nation economic initiatives include forestry, fisheries, and a gas station (Oromocto First Nation 2018). Further information on these initiatives could not be found. In addition, a local operation has built handcrafted canoes within the community since 1897 (Oromocto First Nation 2018). As described in more detail below, Oromocto First Nation hold several commercial communal for a variety of fish and marine species.
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	The Maliseet were known to be traditional hunters, trappers, and gatheres, who travelled along the St. John River valley depending on the season to find sustenance and shelter, as well as to trade with Europeans. The Project does not overlap with the traditional territory of the Wolastoqiyik of New Brunswick, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	Wolastoqey (Maliseet) First Nations continue to harvest, hunt, and consume traditional foods including moose, deer, fish, fiddleheads and berries, and use resources from the local landscape for medicinal and ceremonial purposes. Refer below for information on FSC fishing.
Commercial Communal Fishing	Oromocto First Nation holds 10 commercial communal licences for lobster, sea scallops, sea urchins, herring, groundfish, gaspereau, herring, mackerel, shad, and smelts.
Food, Social, Ceremonial Fishing	Oromocto First Nation holds several FSC licences for groundfish, eel, lamprey, trout, gaspereau, shad, striped bass, sturgeon, and lobster. In addition, the Agency identified Oromocto First Nation as having an Aboriginal right to fish for Atlantic salmon (outer Bay of Fundy population) for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Wolastoqiyik have Aboriginal rights under Section 35 of the Constitution Act, 1982, and Peace and Friendship Treaty rights, which include the right to fish for a "moderate livelihood".

Community Indicator	Description
St. Mary's First Nation	
Location and Proximity to Project Area	St. Mary's First Nation is comprised of two reserves in the Saint John River Valley near Fredericton. St. Mary's First Nation is approximately 1290 km from the Project Area.
General Overview	St. Mary's First Nation encompasses two reserves: St. Mary's 24 (6 km east of Fredericton with an area of 1.0 ha), and Devon 30 (6 km east of Fredericton with an area of 125.9 ha) (INAC undated). St. Mary's First Nation is a Wolastoqiyik Nation affiliated with the WTCI and represented by the WNNB. According to 2016 census data, the on-reserve population was 1,038 (Statistics Canada undated).
Health and Socio-economic Conditions	Within the community, an elementary school, Chief Harold Sappier Memorial Elementary, accommodates students from kindergarten to grade five. There is no police detachment health centre, and a fire hall. St. Mary's First Nation businesses include the St. Mary's Entertainment Centre, the St. Mary's Retail Sales (which includes a gas bar, smoke shop, supermarket, coffee shop, a fish and chip shop and a fine dining restaurant), and there are a number of band member privately owned businesses (WNNB, pers. comm. 2018). The St. Mary's Entertainment Centre is in Fredericton and includes one of the largest bingo facilities in Atlantic Canada (St. Mary's First Nation undated). St. Mary's First Nation is also engaged in the forestry industry. Initiated in 1998, the St. Mary's Logging Program was established to create employment for band members with an interest in working in the forestry industry (St. Mary's First Nation undated). As described in more detail below, St. Mary's First Nation hold several commercial communal licences for a variety of fish and marine species. St. Mary's First Nation owns six active commercial fishing vessels. The Nation is currently not equipped to fish tuna, swordfish or shrimp and these licences are typically leased to others for a percentage of the catch (Nexen Energy ULC 2018).
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	The Wolastoqiyik (Maliseet) were known to be traditional hunters, trappers, and gatherers, who travelled along the St. John River valley depending on the season to find sustenance and shelter, as well as to trade with Europeans. Although the St. Mary's First Nation community was not recognized until 1867, it was documented as an encampment site as early as 1818. The Maliseet people would travel the Saint John River, and it is believed that Maliseet from Kingsclear, Madawaska, Tobique, Woodstock and Meductic would assemble in the area to sell furs and trade handmade goods. The St. Mary's Maliseet maintained migratory practices by hunting, fishing, and trapping downriver each summer. Once the Oromocto First Nation was established in 1895, some Maliseet from St. Mary's relocated, but most remained within the community (St. Mary's First Nation undated). The Project does not overlap with the traditional territory of the Wolastoqiyik of New Brunswick, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	Wolastoqey (Maliseet) First Nations continue to harvest, hunt, and consume traditional foods including moose, deer, fish, fiddleheads and berries, and use resources from the local landscape for medicinal and ceremonial purposes. Refer below for information on FSC fishing.
Commercial Communal Fishing	St. Mary's First Nation holds 17 commercial communal licences for herring, lobster, scallops, sea urchins, shrimp, swordfish, gaspereau, shad and bluefin tuna.

Community Indicator	Description
Food, Social, Ceremonial Fishing	St. Mary's First Nation holds several FSC licences for eel, smallmouth bass, trout, gaspereau, shad, striped bass, groundfish, lobster and scallops. In addition, the Agency identified St. Mary's First Nation as having an Aboriginal right to fish for Atlantic salmon (outer Bay of Fundy population) for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Wolastoqiyik have Aboriginal rights under Section 35 of the Constitution Act, 1982, and Peace and Friendship Treaty rights, which include the right to fish for a "moderate livelihood".
Tobique First Nation	
Location and Proximity to Project Area	Tobique First Nation is comprised of two reserves in Victoria County on the northside of the Tobique River. Tobique First Nation is approximately 1,140 km from the Project Area.
General Overview	Tobique First Nation encompasses two reserves: Tobique 20 (27 km south of Grand Falls with an area of 2,724.0 ha), and The Brothers 18 (on two small islands in Kennebecasis Bay, 3 km north of Saint John with an area of 4.0 ha) (INAC undated). The Brothers 18 is affiliated with Kingsclear First Nation, Madawaska First Nation, and Woodstock First Nation. Tobique First Nation is a Wolastoqiyik Nation affiliated with MAWIW and represented by WNNB. According to 2016 census data, the on-reserve population for Tobique 20 was 968 (Statistics Canada undated). No population data exist for The Brothers 18.
Health and Socio-economic Conditions	Within the community, the Mah-Sos School accommodates students from kindergarten to grade 8. There is a police detachment and a fire hall. The Neqotkuk Health Centre promotes, educates, and provides primary health care services to community members (Tobique First Nation 2015). Community-owned enterprises include the Tobique Gaming Centre, Tobique Bingo, Two Rivers Restaurant, Tobique Youth Centre and Tobique Convenience and Gas Bar (Tobique First Nation 2015). Other businesses within the community include tobacco shops, take-out restaurants, and convenience stores (Tobique First Nation 2015). As described in more detail below, Tobique First Nation holds one commercial communal licence.
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	The Maliseet were known to be traditional hunters, trappers, and gatheres, who travelled along the St. John River valley depending on the season to find sustenance and shelter, as well as to trade with Europeans. The Project does not overlap with the traditional territory of the Wolastoqiyik of New Brunswick, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	Wolastoqey (Maliseet) First Nations continue to harvest, hunt, and consume traditional foods including moose, deer, fish, fiddleheads and berries, and use resources from the local landscape for medicinal and ceremonial purposes. Refer below for information on FSC fishing.
Commercial Communal Fishing	Tobique First Nation holds one commercial communal licence for bluefin tuna.
Food, Social, Ceremonial Fishing	Tobique First Nation holds several FSC licences for smallmouth bass and trout. In addition, the Agency identified Tobique First Nation as having an Aboriginal right to fish for Atlantic salmon (outer Bay of Fundy population) for FSC purposes.

Community Indicator	Description
Asserted or Established Aboriginal and / or Treaty Rights	The Wolastoqiyik have Aboriginal rights under Section 35 of the Constitution Act, 1982, and Peace and Friendship Treaty rights, which include the right to fish for a "moderate livelihood".
Woodstock First Nation	
Location and Proximity to Project Area	Woodstock First Nation is comprised of two reserves, located on the Saint John River near Woodstock. Woodstock First Nation is approximately 1,148 km from the Project Area.
General Overview	Woodstock First Nation encompasses two reserves: Woodstock 23 (5 km south of Woodstock with an area of 159.8 ha), and The Brothers 18 (on two small islands in Kennebecasis Bay, 3 km north of Saint John with an area of 4.0 ha) (INAC undated). The Brothers 18 is affiliated with Kingsclear First Nation, Tobique First Nation, and Madawaska First Nation. Woodstock First Nation is a Wolastoqiyik Nation affiliated with the WTCI. According to 2016 census data, the on-reserve population for Woodstock 23 was 327 (Statistics Canada undated). No population data exist for The Brothers 18.
Health and Socio-economic Conditions	The Woodstock First Nation Pre-School exists within the community. There is no police detachment or fire hall. The Woodstock First Nation Health Centre provides a variety of programs and services such as family support program, footcare, children's oral health initiative, a community health nurse and home and community care. A Nurse Practitioner is also available to community members who do not have a primary health care provider (Woodstock First Nation undated). Woodstock First Nation economic enterprises include three gas stations / convenience stores and the Eagle's Nest Gaming Place. Woodstock First Nation is engaged in the forestry industry, owning Woodstock First Nation Logging (Woodstock First Nation undated). As described in more detail below, Woodstock First Nation hold several commercial communal licenses for a variety of fish and marine species. The Woodstock First Nation began commercial fishing operations in 1996, and they have become a significant source of employment and revenue for the First Nation. The First Nation has expanded operations and now includes the harvesting of scallop, lobster, sea urchins, swordfish, and tuna with four commercial fishing vessels (Woodstock First Nation undated).
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	The Maliseet were known to be traditional hunters, trappers, and gatheres, who travelled along the St. John River valley depending on the season to find sustenance and shelter, as well as to trade with Europeans. The Project does not overlap with the traditional territory of the Wolastoqiyik of New Brunswick, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	Wolastoqey (Maliseet) First Nations continue to harvest, hunt, and consume traditional foods including moose, deer, fish, fiddleheads and berries, and use resources from the local landscape for medicinal and ceremonial purposes. Refer below for information on FSC fishing.
Commercial Communal Fishing	Woodstock First Nation holds 14 commercial communal licences for lobster, scallops, sea urchins, tuna, herring, mackerel, swordfish and groundfish.
Food, Social, Ceremonial Fishing	Woodstock First Nation holds several FSC licences for smallmouth bass, smelt, gaspereau, striped bass, trout, lobster, and scallops. In addition, the Agency identified Woodstock First Nation as having an Aboriginal right to fish for Atlantic salmon (outer Bay of Fundy population) for FSC purposes.

Community Indicator	Description
Asserted or Established Aboriginal and / or Treaty Rights	The Wolastoqiyik have Aboriginal rights under Section 35 of the Constitution Act, 1982, and Peace and Friendship Treaty rights, which include the right to fish for a "moderate livelihood".

4.3.2.5 Peskotomuhkati Nation (Passamaquoddy)

The Peskotomuhkati Nation (Passamaquoddy) is a third Indigenous group in New Brunswick. The traditional territory of the Passamaquoddy included all lands and waters of the St. Croix River watershed, Machia River watershed and the Magaguadavic River watershed, draining into the Bay of Fundy and Gulf of Matine (Bassett 2014, in MGS and UINR 2016). The territory was bordered on the northeast by the Wolastoqiyik traditional territory of all lands and waters draining the St. John River watershed, and bordered on the west by the Penobscot traditional territory of the Penobscot River watershed and Union River watershed in Maine, USA (MGS and UINR 2016).

The community is in St. Andrews where they assert title to territories along the Maine and New Brunswick border, with most of the members currently living on the US side of the border (Table 4.52). The Passamaquoddy are specifically named in the Marshall decision based on the Peace and Friendship Treaties which provides them the Treaty right to fish. The Passamaquoddy have submitted a claim to the federal government which has currently been accepted for review.

Table 4.52 Peskotomuhkati Nation (Passamaquoddy) Community Profile

Peskotomuhkati Nation in New Brunswick	
Location and Proximity to Project Area	Peskotomuhkati Nation is in St. Andrews. Peskotomuhkati Nation is approximately 1,135 km from the Project Area.
General Overview	The homeland of the Peskotomuhkati people is centered around the Passamaquoddy Bay, the drainage area of the Schoodic (St. Croix) River, and the Fundy Islands (in Canada and the United States) (Nexen Energy ULC 2018). In 2013, it was estimated that the Schoodic Band numbered 300 residing in NB, primarily in the southwestern portion of the province along the Maine and NB border. A larger group of Peskotomuhkati live in the State of Maine. No census information is available specifically for Peskotomuhkati Nation in New Brunswick.
Health and Socio-economic Conditions	Limited information is available on the health and socio-economic conditions of the Peskotomuhkati as a group because they do not live on a reserve or in a separate community.

Peskotomuhkati Nation in New Brunswick	
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	Limited information is available on the physical and cultural heritage of the Peskotomuhkati. However, evidence suggests that their ancestors inhabited their traditional territory from Machias, Maine to Point Lepreau, NB for the last 13,000 years. More than 70 known pre-contact archaeological sites, on the Canadian side of the Peskotomuhkati's traditional territory, hold artifacts demonstrating continuous occupancy. Many more sites are believed to be underwater. Seasonal journeys within their traditional territory, which extended inland north along the Schoodic River to the Chipputnecook Lakes, involved harvesting natural resources throughout the year (Nexen Energy ULC 2018). In the spring, Peskotomuhkati people occupied a field at Salmon Falls on the Schoodic River to take advantage of the runs up-river by salmon, eels, and alewives. Passamaquoddy Bay was also an important fishing area for its abundance of pollock. Gran Manan was also considered an important fishing and hunting location. At least three Peskotomuhkati communities were established in Charlotte County, NB in the 19th and early 20th centuries. Established in 1785, the Schoodic Reserve, located in Milltown, NB, was an important fishing place and tribal burial ground. The Canoose Reserve, at the confluence of the Canoose and Schoodic Rivers, was created in 1851. The St. Croix Reserve was created in 1881 on the St. Croix River. At least two other tracts of land in St. Andrews and Gran Manan Island were known to be gathering places and were the subject of various petitions for reserve status but were never formalized. The Project does not overlap with the traditional territory of the Peskotomuhkati, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	Peskotomuhkati communities were traditionally located along the coast and its people were mainly a seafaring nation of fishermen and harvesters migrating to and from the coast within rivers and valleys (Bassett 2014, in MGS and UINR 2016).
Commercial Communal Fishing	Peskotomuhkati Nation has no commercial communal licenses.
Food, Social, Ceremonial Fishing	Peskotomuhkati Nation has no FSC licenses, however the Agency identified them as having an Aboriginal right to fish for Atlantic salmon for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	No information is available for established Aboriginal and / or treaty rights for the Peskotomuhkati Nation.

4.3.2.6 Mi'kmaq and Innu of Québec

4.3.2.6.1 Mi'gmaq of Québec

Three Mi'gmaq First Nation groups were identified in the EIS Guidelines for engagement and inclusion in the EIS:

- Micmacs of Gesgapegiag
- La Nation Micmac de Gespeg
- Listuguj Mi'gmaq Government

These Indigenous communities are represented by Mi'gmawei Mawiomi Secretariat (MMS) to represent the Mi'gma'gi of Gespe'gewa'gi in Aboriginal title, Mi'kmq rights and Treaty rights with the Governments of Canada and Québec. The MMS formally submitted a statement of claim to the federal and provincial governments in 2007. The Mi'kmaq, Québec and Canada formally agreed to pursue land claims negotiations in 2008 and signed a framework agreement and a consultation agreement in 2012. The three parties are currently negotiating an agreement-in-principle (AIP) that should eventually lead to a final agreement (AANDC 2014, 2016; MMS 2017).

The Project does not overlap with the traditional territory of the Mi'gmaq of Quebec (the Gespe'gewa'gi), which includes virtually all of the Gaspé Peninsula and a large part of New Brunswick, and adjacent waters.

The three Mi'gmaq communities located in Quebec are discussed in further detail in Table 4.53.

Table 4.53 Mi'gmaq of Quebec Community Profiles

Micmacs of Gesgapegiag	
Location and Proximity to Project Area	Micmacs of Gesgapegiag is comprised of one reserve, located on the south shore of the Gaspe Peninsula, at the intersection of the Gesgapegiag River estuary and the Baie des Chaleurs. Micmacs of Gesgapegiag is approximately 997 km from the Project Area.
General Overview	Gesgapegiag is 45 km west of Bonaventure, on the north shore of Cascapedia Bay with an area of 222 ha (INAC 2015). According to 2016 census data, the on-reserve population of the Micmacs of Gesgapegiag was 653 (Statistics Canada 2018). The population of the Gesgapegiag community decreased from 2011 to 2016, which may be attributed to the result of a lower birth rate or possible out-migration, as approximately half of the registered population of Gesgapegiag live off-reserve (Nexen Energy ULC 2018).
Health and Socio-economic Conditions	The Micmacs de Gesgapegiag Band Council provides education, health care, social services, fire and police services, public works, economic development, and employment through community employment projects. The Wejgwapniag School exists within the community, providing primary and secondary education. Established in 1996, the Gesgapegiag Health and Community Services (GHCS) provides a variety of programs and services through a medical center, healing lodge, and youth center (MOG 2018). In addition, the Mawiomi Treatment Centre in Gesgapegiag specializes in the treatment of substance, drug, and alcohol abuse (Statoil 2017). Also located within the community is the Walgwan Treatment Centre, which is one of a network of nine First Nation treatment centers in Canada to provide culturally-based treatment services for dependence on solvents and other substances as well as addictive behavior to First Nations and Inuit youth (Statoil 2017). The Micmacs of Gesgapegiag are engaged in the forestry industry, through a Forest Management Agreement with the provincial government to harvest 15,000 cubic meters of softwood to be sold to a local sawmill (MOG 2018). The Band's forestry industry employs 25 – 30 individuals on a seasonal basis. Other economic activities include construction, tourism, handicraft production and outfitting services for sport fishing and hunting (CDPDJ 2009). In 2011, the largest employer within the community was Public Administration, employing approximately 42% of the workforce.

Micmacs of Gesgapegiag	
	As described in more detail below, Micmacs of Gesgapegiag has an agreement with the provincial government for communal fishing, which occurs primarily in the Cascapedia River mouth as well as in the Petite riviere Cascapedia and its mouth (MMAFMA 2017). Established in 2012, the Mi'gmaq Maliseet Aboriginal Fisheries Management Association (MMAFMA), in partnership with the Quebec School of Fisheries and Aquaculture, assists the Micmac of Gesgapegiag in commercial fishing initiatives. The MMAFMA has a commercial fishing vessel and administers training programs for fishing mackerel, herring and bluefin tuna, pelagic species for which it holds commercial communal licenses. The boat is also used for training programs in groundfish (Atlantic halibut, Greenland halibut, redfish) fisheries through a program with Quebec School of Fisheries and Aquaculture. The Micmac of Gesgapegiag are also engaged in a joint aquaculture initiative to grow and process kelp products and the Micmacs de Gesgapegiag co-manage sport salmon fishing in the Cascapedia River through Société Cascapedia inc. (MOG 2018; Samon Quebec 2017). The Gesgapegiag Fisheries Department (GFD) manages the Band's participation in commercial seafood harvesting. The GFD employs 48 registered First Nations members and nine non-Indigenous people in the fishing industry, seasonally. Fishers harvest lobster, shrimp, and crab off the coast of the Gaspe Peninsula.
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	Traditionally, the Mi'kmaq lived by hunting, fishing, and gathering throughout their territory, which covered the southeastern portion of the Gaspe Peninsula, NS, PEI, most of NB, southern Newfoundland and Labrador. Mi'kmaq hunters and fishers were also known to travel to Anticosti Island and the shore of the North Coast and the Magdalen Islands (CDPDJ 2009). Traditional camps of the Quebec Mi'kmaq were located along the shores of the St. Lawrence River. The Project does not overlap with the traditional territory of the Micmacs of Gesgapegiag, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	Various fish species have traditionally been fished by the Mi'gmaq in the Gulf of St. Lawrence through the seasons, including winter flounder as the ice begins to melt, then spawning runs of anadromous and catadromous fish including smelt in March, alewife in April, sturgeon and salmon in May, July and August, eel in September and Atlantic tomcod as late as December (Morrison 2018). During spring and summer, the Mi'gmaq also harvest marine invertebrates including oysters, scallops, quahog or hard clam, soft clam, American lobster, and northern crab (Morrison 2018). Traditionally, the people of the Micmacs of Gesgapegiag used Atlantic salmon for barter, spiritual, and ceremonial practices Fishing occurred from late May to early November. From 1984-2008, the Micmac of Gesgapegiag annually harvested salmon in the Cascapedia River for subsistence purposes. The Gesgapegiag have not taken salmon in the Cascapedia River since 2009 pursuant to an agreement with the provincial government to cease fishing salmon in return for monetary compensation (Nexen Energy ULC 2018). Eel harvesting is a traditional Mi'kmaq activity, beginning in May and ending when the ice forms. According to members of the Micmac of Gesgapegiag, eel is largely harvested in the mouth and estuary of the Cascapedia River. Harvesting sites extend along the coast from Carleton to Bonaventure including the Nouvelle area (Nexen Energy ULC 2018). Cod fishing has been an important aspect to the economic and cultural landscape of the Gaspe Peninsula but is now restricted due to low stocks. Members of Gesgapegiag have reported catching cod in the Cascapedia River estuary in recent years. Members have

Micmacs of Gesgapegiag	
	also reported that striped bass is captured mostly as by-catch in the Cascapedia River estuary, along the shoreline near Carleton and New Richmond. The marine area of the Banc des Americans has been identified as being of economic, ecological, and cultural importance for the Mi'kmaq communities. The area is used to harvest crab, lobster, mackerel, herring, cod, and waterfowl (MMAFMA 2017).
Commercial Communal Fishing	Gesgapegiag holds commercial fishing licences for cod and turbot, halibut, and winter flounder (Morrison 2018). Commercial communal licences are held for mackerel and shrimp (Morrison 2018).
Food, Social, Ceremonial Fishing	The Micmac of Gesgapegiag participate in fishing for FSC purposes. The First Nation has an agreement with the provincial government for communal fishing, which occurs principally in the Cascapedia River mouth as well as the Petite riviere Cascapedia and its mouth (MMAFMA 2017).
Asserted or Established Aboriginal and / or Treaty Rights	The MMS signed a Framework Agreement for a comprehensive claim with Canada (2012) that includes the Gaspe Peninsula and westward down the St. Lawrence River as well as Anticosti Island. Mi'gmaq First Nations have a right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties and an Aboriginal right to fish for FSC purposes.
La Nation Micmac de Gespeg	
Location and Proximity to Project Area	La Nation Micmac de Gespeg has no land base; members live throughout the Gaspe Peninsula and in other areas. La Nation Micmac de Gespeg is approximately 892 km from the Project Area.
General Overview	La Nation Micmac de Gespeg is represented by the MMS. In 2016, la Nation Micmac de Gespeg had 820 registered members living throughout the Gaspe Peninsula and in other areas (INAC 2015). No census information is available specifically for La Nation Micmac de Gespeg.
Health and Socio-economic Conditions	Publicly-available information of the health and socio-economic conditions of the Micmac de Gespeg could not be found. La Nation Micmac de Gespeg is actively engaged in the fishing industry, through the MMAFMA who hold several commercial communal licenses for a variety of fish and marine species. The MMAFMA has a commercial fishing vessel and administers training programs for fishing mackerel, herring and bluefin tuna, pelagic species for which it holds commercial communal licenses. The vessel is also used for training programs in groundfish (Atlantic halibut, Greenland halibut, redfish) fisheries through a program with Quebec School of Fisheries and Aquaculture. La Nation Micmac de Gespeg is also engaged in a joint aquaculture initiative to grow and process kelp products.
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	Traditionally, the Mi'kmaq lived by hunting, fishing, and gathering throughout their territory, which covered the southeastern portion of the Gaspe Peninsula, NS, PEI, most of NB, southern Newfoundland and Labrador. Mi'kmaq hunters and fishers were also known to travel to Anticosti Island and the shore of the North Coast and the Magdalen Islands (CDPDJ 2009). Traditional camps of the Quebec Mi'kmaq were located along the shores of the St. Lawrence River. No specific information is available of the physical and cultural heritage of la Nation Micmac de Gespeg. The Project does not overlap with the traditional territory of la Nation Micmac de Gespeg, therefore there are no known physical and cultural heritage sites in or near the Project Area.

Micmacs of Gesgapegiag	
Current Use of Lands for Traditional Purposes	Various fish species have traditionally been fished by the Mi'gmaq in the Gulf of St. Lawrence with different species being targeted in certain seasons, including winter flounder as the ice begins to melt, followed by spawning runs of anadromous and catadromous fish including smelt in March, alewife in April, sturgeon and salmon in May, July and August, eel in September and Atlantic tomcod as late as December (Morrison 2018). During spring and summer, the Mi'gmaq also harvest marine invertebrates including oysters, scallops, quahog or hard clam, soft clam, American lobster, and northern crab (Morrison 2018). Traditionally, the people of la Nation Micmac de Gespeg used Atlantic salmon for barter, spiritual, and ceremonial practices. Fishing occurred from late May to early November. Members of Gespeg took salmon in the Saint-Jean, Dartmouth, York, and Malbaie Rivers and in the mouth of the Dartmouth River (MMAFMA 2017). According to some members, cod is also harvested in the Gaspe Bay, particularly in the southern and northern portions. Striped bass is also harvested at locations between Gaspe and the Malbaie River, generally from May to October. Eel harvesting is a traditional Mi'kmaq activity, beginning in May and ending when the ice forms.
Commercial Communal Fishing	The MMAFMA hold several commercial communal licenses for mackerel, herring, and bluefin tuna (Nexen Energy ULC 2018). Commercial harvesting of groundfish (e.g., Atlantic halibut, Greenland halibut, redfish) is planned.
Food, Social, Ceremonial Fishing	La Nation Micmac de Gespeg participate in fishing for FSC purposes. The First Nation has an agreement with the provincial government for harvesting salmon on the Saint-Jean, Dartmouth, and York Rivers. Most of the salmon harvested is distributed to elders. Eel harvesting sites reported by the Gespeg First Nation include the shoreline between Gaspe and Perce.
Asserted or Established Aboriginal and / or Treaty Rights	The MMS signed a Framework Agreement for a comprehensive claim with Canada (2012) that includes the Gaspe Peninsula and westward down the St. Lawrence River as well as Anticosti Island. Mi'gmaq First Nations have a right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties and an Aboriginal right to fish for FSC purposes.
Listuguj	
Location and Proximity to Project Area	Listuguj is comprised of one reserve, located at the mouth of the Restigouche River in the southwestern area of the Gaspe Peninsula. Listuguj is approximately 1,059 km from the Project Area.
General Overview	Listuguj is 118 km southwest of Bonaventure, on the north shore of the Restigouche River with an area of 4,344 ha (INAC 2015). Listuguj is represented by the Mi'gmawei Mawiomi Secretariat (INAC 2015). According to 2016 census data, the on-reserve population of the Listuguj was 1,241 (Statistics Canada 2018). The population of Listuguj decreased from 2011 to 2016, which may be attributed to the result of a lower birth rate or possible out-migration, because approximately half of the registered population of Listuguj live off-reserve (Nexen Energy ULC 2018).

Micmacs of Gesgapegiag	
Health and Socio-economic Conditions	Listuguj Mi'gmaq Government (LMG) provides facilities and programs to the community in housing, education, community and social services, health, community health, fire safety, policing, restorative justice, drinking water, wastewater management, solid waste management, roads, and natural resource management. Established in 1997, the Alaqsite'w Gitpu School exists within the community, accommodating 250 students from nursery to grade 8 (LMG 2017). The Band Council provides additional educational support through the Post-Secondary Student Support Program and Mi'kmaq language and culture programs (LMG 2017). The community also has a variety of community health services, provided by the Listuguj Community Health Services, including the Listuguj Health Centre, women's shelter, a long-term care facility for the elderly and a youth group home (LMG 2016). The LMG is actively engaged in the forestry industry and Listuguj members are employed in the LMG silvicultural and forestry operations and as independent loggers (LMG 2016). In 2011, the largest employer in the Listuguj community was Public Administration, employing approximately 31 percent of the workforce. As described in more detail below, the Band Council holds several commercial communal licenses for a variety of fish and marine species. The fisheries sector is an important element for Listuguj First Nation. Listuguj Fisheries directly employs community members and owns 13 fishing vessels (Listuguj Fisheries 2014). Listuguj Fisheries is also involved in fisheries training, employment, and policy development (Listuguj Fisheries 2014).
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	The Mi'kmaq traditionally lived by hunting, fishing, and gathering throughout their territory, which covered the southeastern portion of the Gaspe Peninsula, NS, PEI, most of NB, southern Newfoundland and Labrador. Mi'kmaq hunters and fishers were also known to travel to Anticosti Island and the shore of the North Coast and the Magdalen Islands (CDPDJ 2009). Traditional camps of the Quebec Mi'kmaq were located along the shores of the St. Lawrence River. The Project does not overlap with the traditional territory of the Listuguj, therefore there are no known physical and cultural heritage sites in or near the Project Area.
Current Use of Lands for Traditional Purposes	Various fish species have traditionally been fished by the Mi'gmaq in the Gulf of St. Lawrence with different species being targeted in certain seasons, including winter flounder as the ice begins to melt, followed by spawning runs of anadromous and catadromous fish including smelt in March, alewife in April, sturgeon and salmon in May, July and August, eel in September and Atlantic tomcod as late as December (Morrison 2018). During spring and summer, the Mi'gmaq also harvest marine invertebrates including oysters, scallops, quahog or hard clam, soft clam, American lobster, and northern crab (Morrison 2018). The Mi'kmaq have traditionally relied upon marine resources. Since 1984, Listuguj have taken approximately 1,000 salmon annually in the Restigouche River (Nexen Energy ULC 2018). Eel harvesting is a traditional Mi'kmaq activity, beginning in May and ending when the ice forms.
Commercial Communal Fishing	Listuguj holds commercial fishing licences for cod, turbot and halibut and commercial communal licenses for snow crab (Morrison 2018).
Food, Social, Ceremonial Fishing	Listuguj participates in communal fishing for FSC purposes with licenses to harvest salmon and lobster (Statoil 2017).

Micmacs of Gesgapegiag	
Asserted or Established Aboriginal and / or Treaty Rights	The MMS signed a Framework Agreement for a comprehensive claim with Canada (2012) that includes the Gaspe Peninsula and westward down the St. Lawrence River as well as Anticosti Island. Mi'gmaq First Nations have a right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties and an Aboriginal right to fish for FSC purposes.

4.3.2.6.2 Innu of Québec

The Innu people of Quebec were traditionally nomadic and depended on the products of hunting, fishing, and gathering activities for their subsistence. Their ancestral territory covers the entire region between Québec City and Labrador and extends north of Schefferville, with permanent establishment of Innu communities in the south of their territory at the end of the 19th century from the participation in the fur trade and expansion of the forestry and mining industries. The Project does not overlap with the traditional territory of the Innu of Quebec.

In 1979, Québec Innu land claim negotiations were initiated by the Atikamekw and Montagnais Council, which was created in 1975 to represent nine Québec Innu Nations and three Atikamekw Nations; however, due to differences of opinion, mainly with respect to recognition of Aboriginal rights and certainty, the Atikamekw and Montagnais Council was dissolved. The Mamuitun mak Nutashkuan Tribal Council completed negotiations in 2004 and a general Agreement-in-Principal (AIP) was signed by the Chiefs of the Essipit First Nation, Mashteuiatsh First Nation, Nutashkuan First Nation and Pessamit First Nation and the governments of Québec and Canada (Tremblay 2011). The land claims AIP is significant in that the Innu First Nations would not surrender title over their traditional territory and would no longer be subject to the *Indian Act*; instead, a form of self-government would be determined (NP 2016). Negotiations towards a Final Agreement are still underway (INAC 2016). The Pessamit First Nation no longer participates in the negotiations and the Regroupement Petapan now represents the other three First Nations (RP 2017).

The Regroupement Mamit Innuat Tribal Council (MICT) was formed in 1982 as an advisory body to create a common development structure for the four "Montagnais" Innu First Nations of the Lower North Shore (i.e., Ekuanitshit, Nutashkuan, Unamen Shipu and Pakua Shipu). The MICT represents the interests of the First Nations in public, provincial, national, and international initiatives (MICT 2011).

Two Innu communities were identified in the EIS Guidelines for engagement and inclusion in the EIS:

- Les Innus de Ekuanitshit
- Innu First Nation of Nutashkuan

They are discussed in further detail in Table 4.54.

Table 4.54 Innu of Quebec Community Profiles

Les Innus de Ekuanitshit	
Location and Proximity to Project Area	The Innu of Ekuanitshit is comprised of one reserve, at the confluence of the Mingan River and the Gulf of St. Lawrence. The Innu of Ekuanitshit community is approximately 594 km from the Project Area.
General Overview	Mingan is 28 km west of Havre-Saint-Pierre with an area of 3,838 ha (INAC 2015). The Innu of Ekuanitshit is represented by Regroupement Mamit Innuat Tribal Council (INAC 2015). The total registered population of the Conseil des Innu of Ekuanitshit is 645, of whom 94 percent live on-reserve (Nexen Energy ULC 2018).
Health and Socio-economic Conditions	Within the community, Ecole Teueikan accommodates students from pre-kindergarten to grade 4. A health center provides emergency and preventive care and community health services. Five nurses are available on-reserve, and a nutritionist, psychologist and dentist visit regularly. The Council of the Ekuanitshit First Nation is responsible for the provision of health services to community members, after this responsibility was transferred by Health Canada. The Innu Mukutan Economic Development Corporation is responsible for economic development for Innu communities under its jurisdiction, including the Innu of Ekuanitshit. The main economic activities in the community are the public sector, outfitting, commercial fishing and handicrafts (Englobe 2018). In 2011, the largest employer for community members was Public Administration, employing approximately 31 percent of the workforce. The community has commercial fishing enterprises, but limited information is publicly available. Ekuanitshit co-manages Pêcheries Shipek with the Pakua Shipi Innu First Nation. Pêcheries Shipek commercially harvests scallops, crab, halibut, sea cucumber and whelk, and sells its products to three fish stores. Ekuanitshit operates six boats and its commercial fishing activities employ some 40 persons on a full- or part-time basis (Nexen Energy ULC 2018). The Innu communities of Nutashkuan, Ekuanitshit, Pakua Shipi and Unamen Shipu are planning to develop a fish processing plant (Nexen Energy ULC 2018).
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	Innu culture and heritage are based on their relationship with game and fish and the seasonal migrations and locations of various species, particularly caribou and salmon. The spring hunt for migratory birds, seal hunting, and fishing for Atlantic salmon has been practiced by the Innu of Ekuanitshit for several thousand years (Englobe 2018). There are numerous coastal sites dating from approximately a thousand years ago showing intensive spring harvesting of migratory bird species, including the Canada Goose and common eider (Englobe 2018). Innu people travelled across a vast territory that encompassed the entire St. Lawrence catchment area between the Saguenay-Lac-Saint-Jean and Labrador (Nexen Energy ULC 2018). Of the approximately 8,000 archaeological sites discovered in Quebec, over 1,600 are in traditional Innu territory. Two important Innu sites have been discovered. The first is approximately 60 km from the coast, on the northern shore of Lake Jourdain, and was used as a staging area for lengthy portages. The second site, on the shore of the Jean-Pierre River, demonstrates Innu relationships with groups to the West, North-West and North (MRCN 2010). These archaeological sites are located along the shores of lakes and rivers that were used as encampment areas and travel routes for the Innu. None of these locations are located within or near the Project Area. The Project does not overlap with the traditional territory of the Innu of Quebec, therefore there are no known physical and cultural heritage sites in or near the Project Area.

Les Innus de Ekuanitshit	
Current Use of Lands for Traditional Purposes	Traditional hunting, fishing and gathering activities continue to support the domestic economcy as well as local traditions for Les Innus de Ekuanitshit (Englobe 2018). The Innu continue to use resources of the St. Lawrence for food and communal purposes. Activities include fishing for Atlantic salmon, herring, and brook trout; collecting goose eggs in the peat bogs between the River and its tributaries; collecting other bird eggs; hunting waterfowl; gathering edible plants; fishing for lobster and scallops; collecting other shellfish along the coast; and harp seal hunting (Piétacho 2018; CIE 2014). Fishing, particularly for Atlantic salmon, has played an important role and continues to have a prominent place in contempory Innu culture on the North Shore of the St. Lawrence River and estuary. Salmon harvesting continues to be a family and community activity, and the respect and sharing of salmon remain strong community values. The Innu demonstrate their respect for the salmon in several ways: fishers only take what they need; they respect the quotas they set for catching fish for their own food purposes rather than commercial fishing; and they do not waste the salmon. Sharing the salmon with all community members is also part of pow-wow and St. Anne (Fête de la Sainte-Anne) festivities (Ekuanitshit Innu Council, pers. comm. 2018). The run of salmon in rivers in June traditionally coincided with the arrival of the Innu on the shore, with salmon fishing marking the transition from living on land during winter in small family groups, to the summer on the coast where the entire community gathered (Piétacho 2018). The Innu of Ekuanitshit have identified 35 harvesting areas and 21 camps for salmon fishing along the Romaine River and its main tributary, the Puyjalon River. They also take salmon in the Jupitagon, Magpie, Saint-Jean, Mingan and Manitou Rivers (HQP 2007). Salmon fishing (subsistence and sport) in the Romaine River is now closed because of scarcity (MFFP 2017). On the Romaine River, immediately downstream of Grande Chute, hunting is practiced by the Innu of Ekuanitshit using motorized canoe and snowmobiles. Trapping activities are focused on beaver, otter, and muskrat. Various species of ducks are also hunted, particularly in the Grande Hermine Bay (HQP 2007). Migration patterns of some of these species, namely salmon, marine mammals and birds pass through or are in close proximity to the Project Area.
Commercial Communal Fishing	Les Innus de Ekuanitshit have commercial communal licences in its own name, as a member of the Agence Mamu Innu Kaikusseht, and through the Pecheries Shipek fishing company. These three entities have commercial communal fishing licences for several species of fish and shellfish and are important economic levers for their community (Ekuanitshit Innu Council, pers. comm. 2018).
Food, Social, Ceremonial Fishing	Les Innu de Ekuanitshit has no FSC licenses. However, Atlantic salmon, herring, brook trout, lobster, scallop and other shellfish are known to be important species for FSC purposes.
Asserted or Established Aboriginal and / or Treaty Rights	The Innus of Ekuanitshit assert Aboriginal rights, including the right to hunt, fish, and gather throughout its traditional territory. The Innus of Ekuanitshit claim a territory that extends over parts of Labrador and Quebec, including Anticosti Island in the Gulf of St. Lawrence.

Les Innus de Ekuanitshit	
Innu First Nation of Nutashkuan	
Location and Proximity to Project Area	The Innu First Nation of Nutashkuan is comprised of one reserve, at the mouth of the Natashquan River in the Gulf of St. Lawrence. Nutashkuan is approximately 733 km from the Project Area.
General Overview	Nutashkuan is 336 km east of Sept-Îles with an area of 118.9 ha (INAC 2015). Nutashkuan is represented by Regroupement Mamit Innuat Tribal Council (INAC 2015). In October 2017, the total registered population of Nutashkuan was 1,144, of whom 91 percent live on-reserve (Nexen Energy ULC 2018). The Project does not overlap with any Innu First Nation of Nutashkuan reserve lands. Nitassinan, its traditional territory, covers 51,950 km^2.
Health and Socio-economic Conditions	Within the community, Ecole Uauitshitun accommodates students from kindergarten to secondary V (grade 11). The Band Council provides medical care and fire protection. Policing services are provided by the Surete du Quebec. A health center provides front-line, emergency, and preventive health services as well as community health services. Patients requiring hospitalization are transferred to regional centers. Five nurses are available on-reserve, and a nutritionist, psychologist and dentist visit regularly. Innu First Nation of Nutashkuan manages health services, after this responsibility has been transferred by Health Canada. The Innu First Nation of Nutashkuan has recently established its own Economic Development Office. Economic initiatives within Nutashkuan include handicraft production, trapping, tourism, construction, transportation, and outfitting. In 2011, the largest employer for community members was Public Administration, employing approximately 31 percent of the workforce. The community has commercial fishing enterprises, which have several fishing licences. The Council of the Innu First Nation of Nutashkuan owns two boats: Lady Rachel and C.N.M. Nutashkuan (Ekuanitshit Innu Council, pers. comm. 2018). The Innu First Nation of Nutashkuan commercially fish crab, clams, lobster and groundfish and owns two fishing vessels (Nexen Energy ULC 2018). Pêcheries Commerciales Nutashkuan, which was established by the Band Council in 1994, employs between six and 25 individuals (FNQLEDC 2010). The Innu First Nation of Nutashquan is planning to develop a fish processing plant in cooperation with Ekuanitshit, Pakua Shipi and Unamen Shipu (Nexen Energy ULC 2018).
Physical and Cultural Heritage (including archaeological, paleontological, historical or architectural sites)	Innu culture and heritage are based on their relationship with game and fish and the seasonal migrations and locations of various species, particularly caribou and salmon. Innu people travelled across a vast territory that encompassed the entire St. Lawrence catchment area between the Saguenay-Lac-Saint-Jean and Labrador (Nexen Energy ULC 2018). Of the approximately 8,000 archaeological sites discovered in Quebec, over 1,600 are in traditional Innu territory. Two important Innu sites were discovered along the shores of lakes and rivers that were used as encampment areas and travel routes for the Innu. None of these sites are located within or near the Project Area. The Project does not overlap with the traditional territory of the Quebec Innu, therefore there are no known physical and cultural heritage sites in or near the Project Area.

Les Innus de Ekuanitshit	
Current Use of Lands for Traditional Purposes	The Innu continue to use the resources of the St. Lawrence for food and communal purposes. Activities include fishing for Atlantic salmon, herring, and brook trout; collecting goose eggs in the peat bogs between the River and its tributaries; collecting other bird eggs; hunting waterfowl; gathering edible plants; fishing for lobster and scallops; collecting other shellfish along the coast; and harp seal hunting (CIE 2014). Fishing, particularly for Atlantic salmon, played and continues to play an important role in Innu life on the North Shore of the St. Lawrence River, estuary, and Gulf. The waterways contemporarily used by the Innu First Nation of Nutashkuan include the Nutashquan Romaine, De la Corneille, Piashit, Quetachou, Nabisipi and Aguanish Rivers. The southern portion of the land use area extends from the coast to Wakeham, Forgues, Pauline and Metivier Lakes. Trapping and small game hunting in that portion is facilitated by transportation routes. Along the shore, west of Baie-Johan-Beetz, harvesting activities occur up to the Havre-Saint-Pierre region. Lobster and scallops are taken from Nickerson Bay. Canada geese and eider are also hunted from the shoreline or by motorized boat, and waterfowl are hunted along the shore. Many hunting areas and encampments are located at the Grande Hermine and Nickerson Bays, as well as on the coastal plain of the Romaine River, particularly on either side of Route 138. Beaver trapping and gathering of small fruit occur on the Romaine coastal plain. Porcupine is often hunted near the shore along Route 138 and other roads leading north. The Innu First Nation of Nutashkuan have continued to be mobile and still cover a large territory but travels are not as expansive as they have been historically.
Communal Fishing	The Innu First Nation of Nutashkuan has communal licenses. The fisheries cover several areas and species including cod, Atlantic halibut, Greenland halibut, fluke, mackerel, herring, groundfish, whelk, lobster, Arctic surf clam crab and scallop (Innu First Nation of Nutashkuan, pers. comm. 2018).
Food, Social, Ceremonial Fishing	The Innu First Nation of Nutashkuan has no FSC licenses. However, Atlantic salmon, herring, brook trout, lobster, scallops, and other shellfish are understood to be important FSC species for the Innu.
Asserted or Established Aboriginal and / or Treaty Rights	The Innu First Nation of Nutashkuan asserts Aboriginal rights, including the right to hunt, fish, and gather throughout its traditional territory. The Innu First Nation of Nutashkuan claim a territory that extends over parts of Labrador and Quebec, including part of Anticosti Island and Jacques Cartier Strait in the Gulf of St. Lawrence.

4.3.2.7 Harvested Species

Project interactions with species of cultural or commercial importance that have the potential to occur or migrate through the Study Area are reviewed in this section.

4.3.2.7.1 Commercial Communal Fisheries

Within the waters of offshore Newfoundland and Labrador, including waters within the Project Area and the Study Area, commercial fishing activity for several different species occurs, including species that Indigenous groups may hold commercial communal licenses to harvest. Commercial communal fishing activity and licenses for Indigenous groups is described in Sections 4.3.2.2 to

4.3.2.6. Table 4.55 summarizes the Indigenous groups within Newfoundland and Labrador which hold commercial communal licences within the Study Area. Species permitted for harvest for commercial communal purposes within the Study Area include capelin, groundfish, herring, mackerel, seal, shrimp, snow crab, tuna, and whelk. Commercial fisheries are discussed in Section 4.3.1, and indicates that commercial fishing activities, including those that are carried out under a commercial communal license by Indigenous groups, are occurring within the Project Area or Study Area.

Commercial fishing activity is permitted to occur throughout the Study Area, with shrimp, snow crab, and groundfish being the key species eligible for harvesting in and near the Project Area. Species such as capelin, herring, and mackerel are generally harvested in coastal areas. Commercial fishing gear used in offshore Newfoundland and Labrador are unique to the species that is being harvested, except for groundfish which typically uses a combination of stern otter trawls, mobile or fixed gillnets, or longlines (e.g., baited hooks). Crab pots are used in the snow crab fishery and shrimp trawls for northern shrimp. Most harvesting occurs between the months of April and August, with some activity occurring year around (refer to Section 4.3.1).

Harp, grey, hooded, and ringed seals are harvested by Indigenous groups in Newfoundland and Labrador, but generally not within the Study Area. Sealing generally occurs between late March and mid-May, however can vary by species, and considers environmental and biological conditions (DFO 2011a). The ringed seal is the primary seal species harvested by the Inuit (DFO 2011a). The harp seal is commonly harvested in Greenland, with the harvest in Greenland surpassing the Canadian commercial harvest in recent years because Inuit harvesters tend to harvest older animals than are available in the Canadian commercial harvest (DFO 2011a). Hooded seals are also an important to subsistence harvesters in Greenland, particualry to the Inuit along the east coast (DFO 2011a). Grey seals are generally harvested around the Gulf of St. Lawrence and coastal areas of Nova Scotia. In addition to the commercial communal fishery, Indigenous groups can harvest seals throughout the year for FSC purposes.

In addition to species commercially fished by the Newfoundland and Labrador Indigenous groups, Indigenous groups within the Maritime provinces hold commercial communal licences which are located within the Study Area. This includes commercial communal licences for swordfish and tuna. Table 4.56 proviceds a summary of Indigenous groups in the Maritime provinces that hold commercial communal licences in the Study Area. Details for each of these species is provided below.

Table 4.55 Commercial Communal Fishing Licences Issued to Newfoundland and Labrador Indigenous Groups for Fishing in the Study Area

Indigenous Group	Commercial Communal Fishing Licence								
	Capelin	**Groundfish**	**Herring**	**Mackerel**	**Seal**	**Shrimp**	**Snow Crab**	**Tuna**	**Whelk**
	Capelin Fishing Area	NAFO Unit	Herring Fishing Area	Mackerel Fishing Area	Sealing Area	Shrimp Management Area	Crab Fishing Area	NAFO Unit	NAFO Unit
Innu Nation	2, 3, 4, 5, 6, **7, 8**	2J, **3**K**L**	-	3, 4, 5, 6, **7, 8**	-	**6, 7**	-	-	-
Nunatsiavut Government	-	2J, **3**K**L**		-	4, 5, **6, 7**	-	2	-	-
NunatuKavut Community Council	2	2J, **3**K**L**	-	-	4, 5, **6, 7**	**6**	2	-	2J
Miawpukek First Nation (MFN)	2, 3, 4, 5, 6, **7, 8**	2J, **3**K**L**N	-	3, 4, 5, 6, **7, 8**	4, 5, **6, 7**			**3L**NO	-
Qalipu Mi'kmaq First Nation Band (QMFNB)	2, 3, 4, 5, 6, **7, 8**	2J, **3**K**L**N	3, 4, 5, 6, **7, 8**	3, 4, 5, 6, **7, 8**		**6**	4	-	-
Mi'kmaq Alsumk Mowimsikik Koqoey Association[1]	-	2J, **3**K**L**N	-	-	-	-	-	-	-

NOTES:
[1] formed by MFN and QMFNB under DFO's Aboriginal and Aquatic Resources Management Program
Bolded text indicates areas within the Project Area.
Data provided by DFO (2018)

Table 4.56 Commercial Communal Fishing Licences Issued to Maritime Indigenous Groups for Fishing in the Study Area

Indigenous Group	Swordfish	Tuna
	NAFO Unit	NAFO Unit
Glooscap First Nation	**3L**MNO	**3L**MNO
Membertou Band Council	-	**3L**MNO
Millbrook First Nation	**3L**MNO	**3L**MNO
Mime'j Seafoods Ltd (NCNS)	**3L**MNO	**3L**MNO
Paqtnkek First Nation	**3L**MNO	-
Pictou Landing First Nation	**3L**MNO	-
Sipekne'katik First Nation	**3L**MNO	**3L**MNO
Wagmatcook First Nation	**3L**MNO	-
Waycobah First Nation	**3L**MNO	-
Abegweit Band	**3L**MNO	-
Lennox Island First Nation	**3L**MNO	-
Native Council of PEI	**3L**MNO	-
Bouctouche Micmac Band	-	-
Eel River Bar First Nation	-	-
Elsipogtog First Nation	-	-
Esgenoopetitj First Nation	-	-
Fort Folly First Nation	**3L**MNO	**3L**MNO
Indian Island First Nation	-	-
Pabineau First Nation	-	-
St. Mary's First Nation	**3L**MNO	-
Tobique First Nation	-	-
Woodstock First Nation	**3L**MNO	**3L**MNO

NOTES:
Bolded text indicates areas within the Project Area.
Data provided by DFO (2018)

4.3.2.7.1.1 Swordfish

Swordfish are a migratory species that are distributed widely throughout the Atlantic Ocean and can occur in waters of offshore NL. As shown in Table 4.56, there are several Indigenous groups that hold commercial communal fishing licenses for swordfish in NAFO Areas that overlap with the Project Area and the Study Area including NAFO subdivisions 3LMNO). However, commercial landing locations for swordfish, including those landings fished under a commercial communal license, between 2011 and 2015, have been located primarily within NAFO subdivisions 3O and 3N, outside of the Project Area. While commercial landings for swordfish are an indication of swordfish distribution, the species has a wide range and can be found along the edge of the continental shelf. According to recent DFO research surveys, swordfish was found in the Project Area between July and October and the potential for occurrence within the Project Area was

considered low. In general, there is potential for swordfish to move throughout the Project Area during certain times of the year.

4.3.2.7.1.2 Tuna

In addition to swordfish, Indigenous groups within Atlantic Canada also hold commercial communal licenses to harvest species of tuna. Most commercial landings for tuna species within offshore waters of Newfoundland and Labrador, have generally been concentrated within NAFO area 3O, which is outside of the Project Area, and within the southwest portion of the Study Area. As tuna are a highly migratory species, and they have been found in the offshore waters of Newfoundland and Labrador, there is potential that the species could migrate through the Project Area in search of prey species. The most recent DFO research vessel survey results showed that bluefin, albacore, and bigeye tuna were observed in the Project Area. Albacore tuna were found in the Project Area between September and December, while bluefin tuna were observed in the Project Area between July and September. For the three species, DFO noted that the potential for occurrence within the Project Area was low (Section 4.3.1).

4.3.2.7.2 Food, Social, Ceremonial Fisheries

As noted in Sections 4.3.2.2 to 4.3.2.6, there are various species harvested by Indigenous groups for FSC purposes, including, but not limited to gaspereau, trout, Atlantic salmon, bass, mackerel, eel, shad, groundfish (e.g., flounder, halibut, pollock), Arctic char, smelt, blue shark, herring, mussel, clams, periwinkle, soft-shell clams, squid, tomcod, quahaug, razor clams, lobster, crab and scallops. Many of FSC species are harvested in the inshore and/or freshwater systems and would not be expected to interact with Project activities. However, some species are anadromous and can potentially migrate through the Study Area and/or Project Area. Two migratory fish species have been highlighted during Indigenous engagement as being of concern due to potential interaction with Project activities: American eel and Atlantic salmon. These species, including their significance to Indigenous peoples and their potential for occurrence in the Study Area, as described below.

4.3.2.7.2.1 American Eel

The American eel (*Anguilla rostrata*) (*Katew)* is a catadromous (i.e., migrating down rivers to the sea to spawn) fish that lives primarily within freshwater and estuarine environments and has a broad distribution throughout the northwest Atlantic Ocean, stretching from Venezuela to Greenland and Iceland (COSEWIC 2012). The most recent DFO research vessel surveys for 2016 / 2017 found that American eel could occur within the Project Area between March and November, but the potential for occurrence was considered low. There is little information available on specific migration patterns of American eel, and if American eel were to occur within the Project Area, it is likely that they would be carried by currents on their way either Greenland, Iceland, or to Newfoundland and Labrador.

The American eel (*Katew*) an important traditional food source with medicinal properties and has spiritual significance to the Mi'kmaq, Wolastoqiyik and Passamaquoddy (Parks Canada 2017; UINR 2015a; Prosper and Paulette 2002). Various types of tools are used when fishing *Katew*, including stone eel weirs and different types of spears depending on the season (Prosper and Paulette 2002). The Mi'kmaq practiced "take what is needed" ethics, not wasting or over-exploiting the eel (Denny 2014). Traditionally all parts of the eel were used, with skin used as boot/moccasin soles, ties, and bindings and used to wrap sprains and provide relief from cramps, rheumatism, headaches, and lameness (Parks Canada 2017; UINR 2015a; Prosper and Paulette 2002). Eel skin was also used to create decorative ornaments (Parks Canada 2017). Tails are used as bait and oils from larger eels were used to treat ear infections and loosen ear wax (UINR 2015a). The eel is available year around and is a dependable important source of food and were often the main source of food during winter, consumed three times a day for days to weeks (Denny 2014).

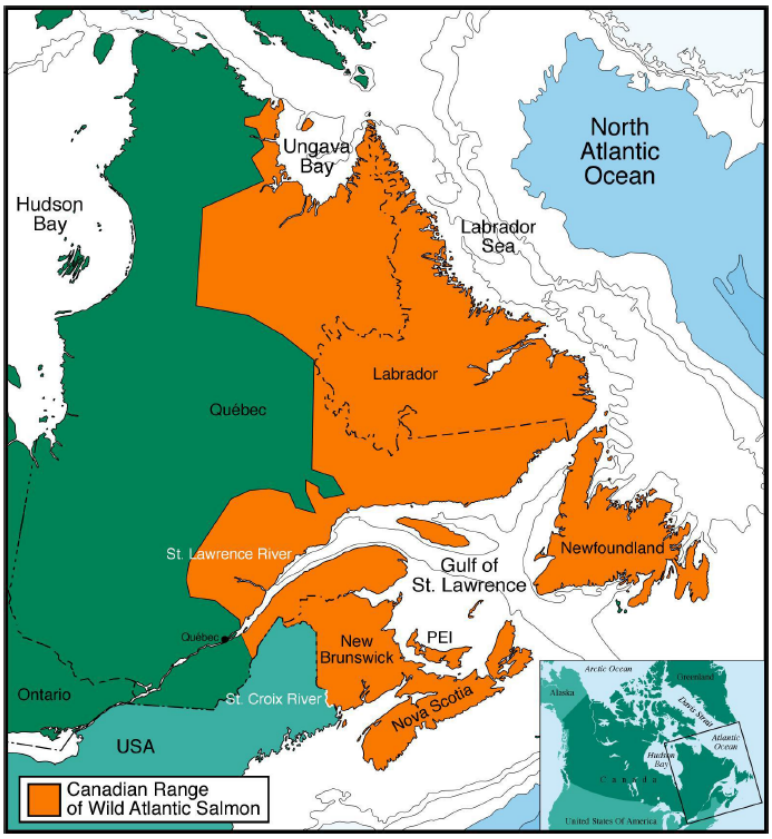
The American eel is assessed by COSEWIC as *threatened* because of dramatic declines over a significant portion of its distribution (COSEWIC 2012). Various factors have been identified as threats to the American eel including habitat loss, dams, overfishing, disease, and possibly global warming (UNIR 2015a; Parks Canada 2017; COSEWIC 2012). A relatively new threat is an exotic swim bladder nematode parasite which may also be adversely affect the eel (COSEWIC 2012; Parks Canada 2017). Mi'kmaq eel fishers have observed declines in traditional fishing areas as having to fish longer to get the same amounts to feed their families and provide for cultural events (Denny et al. 2012 and Wagner et al. 2004, in Denny and Kavanagh 2018).

4.3.2.7.2.2 Salmon

North American Atlantic salmon (*Salmo salar*) breed and spend the early part of their life cycle in freshwater systems throughout Atlantic Canada, eastern Québec, and the northeastern seaboard of the United States. Salmon (or *Plamu* as it is known to the Mi'kmaq) are an important food source for the Mi'kmaq. Salmon spend most of their lives in brooks and rivers, with a rocky bottom of gravel and cobble being ideal habitat (UINR 2015b). They are generally caught using rods, spear, snare, seines, or weirs. *Plamu* were historically a staple, dependable and predicable food source (Denny and Fanning 2016). Rivers where salmon were fished were shared among families, and sometimes other tribes, and fished on a rotational basis (Ladner 2005, Marshall 2014 in Denny and Fanning 2016). Due to the decline in salmon, they are now generally reserved for special occasions such as feasts, powwows, and other celebrations where the serving of a large fish like salmon is preferred (UINR 2015b; Denny and Fanning 2016). The experience of the salmon harvest is important to the Mi'kmaq, it is part of their culture as many Mi'kmaq grew up harvesting *Plamu* with family, learning the harvesting practices and about sustainability (UINR 2015b). Mi'kmaq use all parts of the salmon, with little to no waste and any unusable parts would be buried so that the spirit and body of the salmon would be recycled (UINR 2015b; Denny and Fanning 2016). Netukulimk (traditional Mi'kmaq concept of conservation) was and continues to be the guiding principle to harvesting salmon, with fishers governing themselves in accordance with their interactions and relationships with their environment (Giles et al. 2016 in Denny and Fanning 2016).

COSEWIC-assessed Endangered Atlantic Salmon Populations

Atlantic salmon in North America, breed and live the early part of their life in freshwater systems throughout Atlantic Canada, eastern Québec, and the northeastern seaboard of the United States (Figure 4-66). As salmon tend to return to their natal rivers to breed, there can be considerable variation in the genetic structure and life history traits among river populations. This variation among salmon rivers tends to increase with geographic distance. As a result, Fisheries and Oceans Canada manages groups of salmon rivers as metapopulations, called Designatable Units (DUs), based on geography and unique genetic and life history traits (Committee on the Status of Endangered Wildlife in Canada (COSEWIC) 2010b).



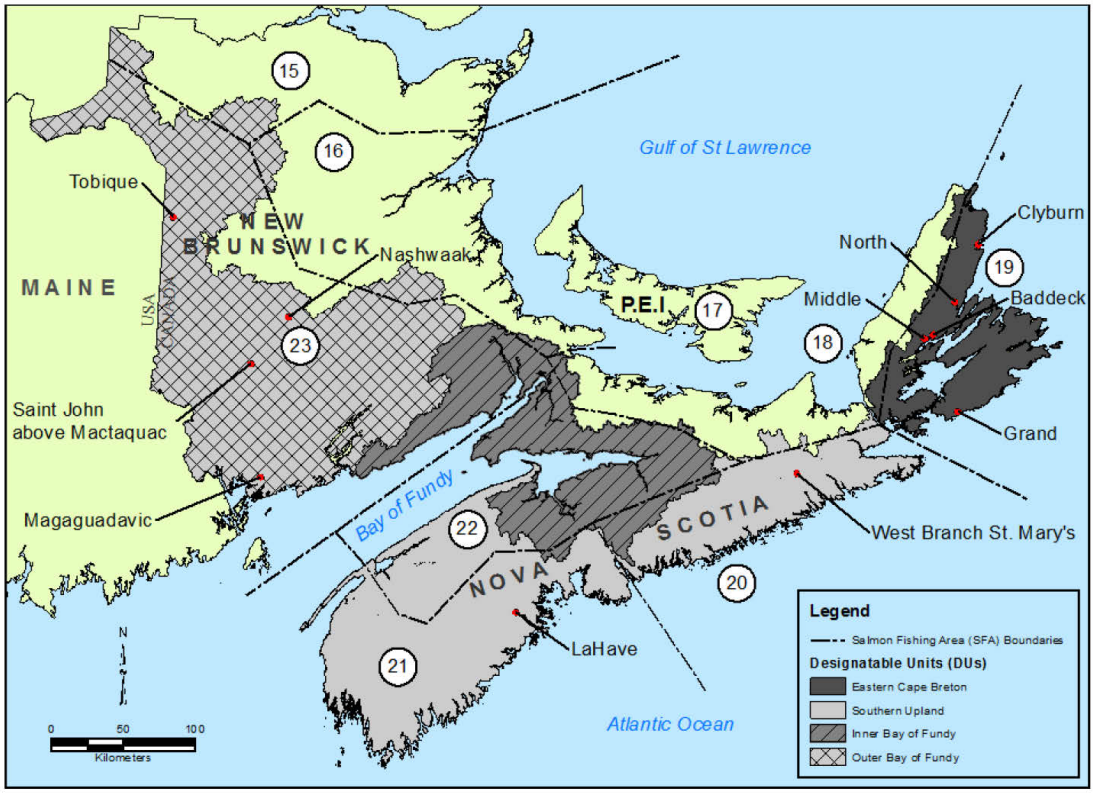
Source: DFO 2010c

Figure 4-66 Inland Range of Atlantic Salmon in Canada

DFO manages Atlantic salmon populations under 15 DUs (Table 4.57). Among these DUs, COSEWIC has identified five as Endangered, including the Outer Bay of Fundy, Inner Bay of Fundy, Southern Uplands, Eastern Cape Breton (Figure 4-67), and Anticosti Island (Figure 4-68) metapopulations.

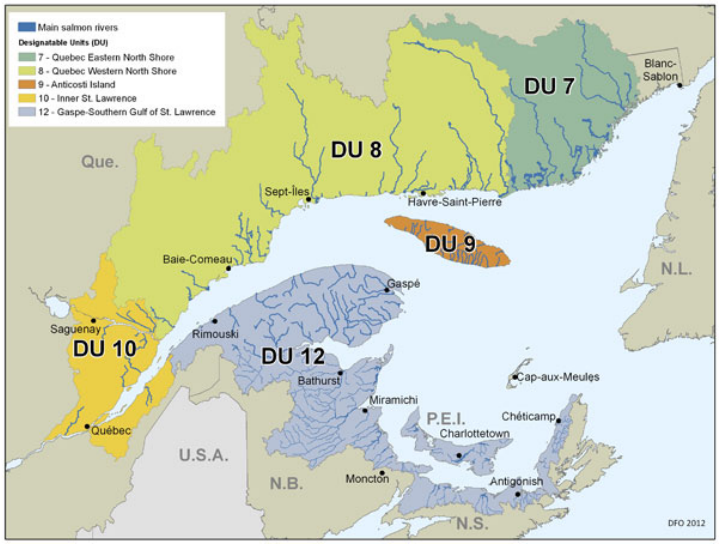
Table 4.57 Federal Conservation Status of Canada's Atlantic Salmon Designatable Units

Population	Range	COSEWIC Status	SARA Status
Inner Bay of Fundy	New Brunswick, Nova Scotia, Atlantic Ocean	Endangered	Schedule 1; Endangered
Outer Bay of Fundy	New Brunswick, Nova Scotia, Atlantic Ocean	Endangered	No Status
Southern Uplands	Nova Scotia, Atlantic Ocean	Endangered	No Status
Eastern Cape Breton	Nova Scotia, Atlantic Ocean	Endangered	No Status
Anticosti Island	Quebec, Atlantic Ocean	Endangered	No Status
Gaspé-Southern St. Lawrence	Quebec, New Brunswick, Prince Edward Island, Nova Scotia, Atlantic Ocean	Special Concern	No Status
Inner St. Lawrence	Quebec, Atlantic Ocean	Special Concern	No Status
Quebec Western North Shore	Quebec, Atlantic Ocean	Special Concern	No Status
Quebec Eastern North Shore	Quebec, Atlantic Ocean	Special Concern	No Status
South Coast Newfoundland	Newfoundland and Labrador, Atlantic Ocean	Threatened	No Status
Southwest Newfoundland	Newfoundland and Labrador, Atlantic Ocean	Not at Risk	No Status
Northeast Newfoundland	Newfoundland and Labrador, Atlantic Ocean	Not at Risk	No Status
Labrador	Quebec, Newfoundland and Labrador, Atlantic Ocean	Not at Risk	No Status
Nunavik	Quebec, Newfoundland and Labrador, Atlantic Ocean	Data Deficient	No Status
Lake Ontario	Ontario, Atlantic Ocean	Extinct	No Status
Source: DFO 2010c			



Source: DFO 2016j

Figure 4-67 Inland Range of Outer Bay of Fundy, Inner Bay of Fundy, Southern Uplands, and Eastern Cape Breton Designatable Units



Source: DFO 2012d

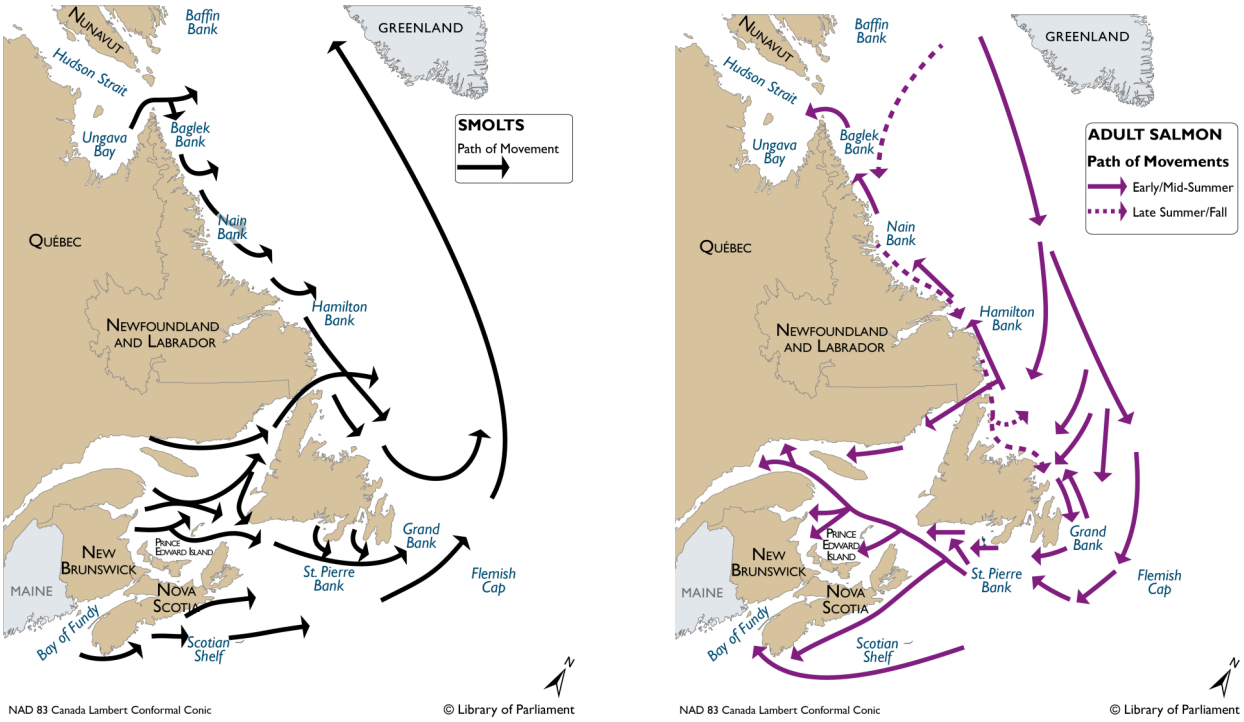
Figure 4-68 Inland Range of the Antocosti Island Atlantic Salmon Designatable Unit (DU9)

The Inner Bay of Fundy metapopulation is the only Atlantic salmon DU with legal protection as a listed species (Endangered) on Schedule 1 of the SARA. Consultation documents were distributed for inclusion of the Outer Bay of Fundy (DFO 2014c), Southern Uplands (DFO 2013b), and Eastern Cape Breton (DFO 2014d) DUs in Schedule 1 of SARA. DFO is in the process of developing SARA listing recommendations to include Outer Bay of Fundy, Southern Uplands, and Eastern Cape Breton DUs (DFO 2016j). Consultation documents were distributed for inclusion of the Anticosti Island DU in Schedule 1 of SARA (DFO 2012d).

General Ocean Distribution and Migration

Atlantic salmon leave their natal rivers of Atlantic Canada and eastern Quebec in the spring and migrate to summer/fall feeding areas in the Labrador Sea gyre, the western coast of Greenland, and the eastern Grand Banks via the Strait of Belle Isle and waters off the eastern Newfoundland Coast (Reddin 2006; Figure 4-69). Migration routes are generally thought to follow the dominant surface currents (DFO 2014e). Overwintering distribution is not well defined but is generally believed to encompass an area from the southern Labrador Sea, to the eastern edge of the Scotian shelf (COSEWIC 2010b). Available literature suggests that the Labrador Sea is the primary over wintering area. Reddin (2006) reports zero to low catch rates near the Grand Bank during winter months of 1985 when salmon populations were much heathier and that "These results suggest, since salmon were found in the Labrador Sea in the fall and then in the following spring, that adult salmon of North American origin probably overwinter there." DFO 2013c states "All age groups of salmon at sea are represented in the Labrador Sea, where they also probably spend the winter".

Migration back to freshwater, in the summer and fall, generally follows ocean currents back toward coastal environments and onward to natal rivers. The distribution and migration patterns of Atlantic salmon are influenced by the age structure of the population. With respect to the ocean phase of the life cycle, salmon of various ages may be found, and those ages influence migratory patterns such that, at any given time, there are individuals in a population inhabiting ocean environments (COSEWIC 2010b). Post-smolts (salmon that have not yet spent a winter at sea) exit rivers in May/June to feed in the summer/fall and overwinter. Following their first winter, those salmon are termed one sea-winter (1SW) salmon. One sea-winter salmon may migrate back to their natal rivers to spawn the following summer or they may migrate to ocean foraging grounds and overwinter for another season. Those that remain are known as two sea-winter (2SW) salmon and these individuals return to spawn the following summer. Fish that are successful at spawning typically overwinter in freshwater and return to the ocean the following spring. Thus, at any given time there are multiple age classes of salmon expected to be using ocean environments.



Source: The Standing Committee on Fisheries and Oceans 2017
Note: Left figure indicates seaward migration routes; right figure illustrates return migration routes

Figure 4-69 General Ocean Distribution and Migratory Patterns of Canadian Atlantic Salmon

The marine distribution and habitat requirements of salmon at sea have generally been inferred from commercial catch data, research vessel surveys, and telemetry studies (Reddin 2006; COSEWIC 2010b; Lacroix 2013; DFO 2015a). During spring, summer, and fall migration and foraging activities, salmon spend the majority of time in the warmer surface waters, although they have been shown to enter deeper waters as well. Salmon are opportunistic foragers that will consume a variety of prey species. It is thought that abundances of energy-rich small fish species, such as capelin (*Mallotus villosus*) and sand lance (*Ammodytes hexapterus*), are important components of the diet. The physiological temperature range of Atlantic salmon is quite broad (approximately 0°C to -20°C); however, the catch data suggest individuals are more common in waters ranging from 4°C to 12°C. It is likely that these temperature-related observations are the result of biological rhythms associated with prey life cycle and abundance trends. Little is known regarding the overwintering habitats of Atlantic salmon. However, due to metabolic constraints, it is likely that this is a period of reduced foraging activity where individuals are inhabiting deeper, warmer waters.

While there is a general understanding of the spatial and temporal distribution of salmon at sea, the resolution of this information is low (Reddin and Frieland 1993; Reddin 2006; COSEWIC 2010b). This is further complicated by evidence of climate-induced salmon prey population changes that may be actively changing salmon distribution patterns within the North Atlantic Ocean over time

(Mills et al 2013; Renkawitz et al. 2015). Although it is an active area of current research, the potential variation in ocean distribution within and among salmon DUs is not well described. It is generally thought that the open ocean distribution of many DUs overlap (Reddin 2006). While salmon populations all seem to migrate north to feeding areas, the relative incidence of individual salmon from more southerly populations is expected to decrease with increasing longitude (Reddin 2006; COSEWIC 2010b). Most individuals from a population are expected to migrate to the feeding grounds by the most direct, or energy efficient, path. Therefore, for example, DUs from the Bay of Fundy and the eastern coast of Nova Scotia are expected to have little presence in the Gulf of St. Lawrence (Bradbury et al. 2016a) and be more concentrated in the eastern Grand Banks and Labrador Sea in the spring (Reddin 2006).

With respect to the Project, research vessel surveys have caught salmon within the Study Area in the spring (Reddin and Frieland 1993; Reddin 2006). There is no specific information for the Project Area with respect to salmon abundance or the relative DU composition of individuals that may inhabit the area. Likewise, there is no information with regards to salmon overwintering in relation to the Project Area.

Ocean distribution and migration information for COSEWIC – Endangered salmon DUs are provided below. The information available for specific DUs is limited. Where data do exist, it is based on tagging studies of salmon from a limited sample of river systems (Hedger et al. 2009; Jacobs et al. 2011; Lefévre et al. 2012; Lacroix 2013; Strom et al. 2017) or it is inferred from the genetic composition of commercial fisheries catch data (Bradbury et al. 2015; Bradbury et al. 2016a, Bradbury et al. 2016b). As a result, the general information provided below infers from the general understanding of salmon distribution when DU-specific information is not available. This information is subject to change as future studies are completed.

Inner Bay of Fundy Salmon DU

As the only Atlantic salmon DU (encompasses part of Salmon Fishing Area (SFA) 22 and inner portion of SFA 23) afforded legal protection under SARA, the spatial and temporal distribution of Inner Bay of Fundy salmon are perhaps the best understood. Existing data suggest that the distribution Inner Bay of Fundy salmon at sea is unique relative to other DUs. Studies tracking the movement of post-smolts, salmon that have not yet spent a full winter at sea, suggest that most of the population stays within the Northern Gulf of Maine in their first summer (Marshall 2014). It is unclear where the minority of post-smolts that do leave the Northern Gulf of Maine go and their overwintering distribution is not known. However, Inner Bay of Fundy kelts (salmon that have returned to the ocean following spawning) seem to follow migratory patterns similar to that of post-smolts. Kelt overwintering data suggest that the majority remain in the Northern Gulf of Maine through the colder winter months, with some venturing into the warmer Scotian Shelf waters (Lacroix 2013). The existing information suggests that Inner Bay of Fundy salmon are not known to inhabit North Atlantic Ocean waters near the Flemish Pass or the Grand Banks. Thus, with respect to the Project Area (see Figure 2-1), the presence of Inner Bay of Fundy salmon are not expected at any life history stage or season.

Outer Bay of Fundy, Southern Uplands and Eastern Cape Breton DUs

Limited work has been conducted on the ocean distribution of salmon from the Outer Bay of Fundy, Southern Uplands, and Eastern Cape Breton DUs. The interpretation presented below for all three DUs is largely based on Lacroix (2013), who worked on salmon from a single tributary of the Saint John River system (n=15; Hammond River; Outer Bay of Fundy DU).

Outer Bay of Fundy (encompasses outer portion of SFA 23) metapopulation breeds in rivers along the New Brunswick side of the Bay of Fundy, from the U.S. border to the Saint John River (DFO 2011b), with 17 rivers identified as containing (or historically containing) Atlantic salmon (Gibson et al. 2016). There have been no recreational fisheries or food, social, and ceremonial (FSC) allocations in this SFA since 1998. All rivers remained closed to salmon fishing in 2015 (DFO 2016j).

The Southern Uplands metapopulation (encompasses SFAs 20, 21 and part of 22) breeds in rivers from northeastern mainland Nova Scotia, along the Atlantic coast and into the Bay of Fundy as far as Cape Split (DFO 2011c), with 72 rivers identified as containing (or historically containing) Atlantic salmon (Gibson and Bowlby 2012). All rivers within SFA 20 and 21 have been closed to recreational fishing and FSC allocations since 2010 (DFO 2016j).

The Eastern Cape Breton (encompasses SFA 19) metapopulation breeds in rivers on Cape Breton Island that drain into the Bras d'Or Lakes and Atlantic Ocean (DFO 2011d) with 46 rivers identified as containing (or historically containing) Atlantic salmon (DFO 2104c). With the exception of Middle River, Baddeck River, and North River, all rivers in this DU were closed to salmon fishing in 2015. In 2015, FSC allocations were available from these three rivers; however, no FSC harvests were recorded from these three rivers in 2015 (DFO 2016j).

Based on their geographies, most salmon from these three DUs likely migrate directly across the Cabot Strait toward the eastern Grand Banks and Labrador Sea (Bradbury et al. 2016a; Lacroix 2013). The low proportion of salmon from these DUs identified in the Labrabor subsistence and west Greenland fisheries (Bradbury et al. 2015; Bradbury et al. 2016b) suggests most do not migrate to these more northerly feeding grounds. Therefore, salmon from these DUs may be more prevalent in Labrador Sea and eastern Grand Banks feeding areas during the summer/fall feeding season (Reddin and Frieland 1993; Lacroix 2013; DFO 2014e). Migration routes back to these DUs are thought to be similar to the routes out to sea. Available information does not allow the resolution to determine if salmon from these DUs would be commonly found. It is expected that large numbers of salmon would only occur if high concentrations of prey items circulated through the Project Area during the spring/summer feeding season. However, given the large expanse of known salmon feeding grounds, it is not expected that many individuals would be in the immediate Project Area.

Anticosti Island DU

Members of this metapopulation originate from the 25 known salmon rivers on Anticosti Island (DFO 2011e). This metapopulation is currently considered productive (DFO 2013b). However, due

to its small size, the overall contribution of this DU to the West Greenland commercial salmon fishery is low (Gauthier-Ouellet et al. 2009, in DFO 2013b).

Given Anticosti Island's location relative to Québec's north shore and the Gaspé Peninsula, it is likely that most salmon from this DU migrate toward the Labrador Sea through the Strait of Belle Isle (Hedger et al. 2009; Jacobs et al. 2011; Lefévre et al. 2012; DFO 2013b; Strom et al. 2017). The majority likely feed in the Labrador Sea gyre and the western coast of Greenland, moving into the southern Labrador Sea (DFO to overwinter (2013b). Migration routes back to Anticosti Island are thought to be similar to the routes out to sea. There is little detailed information on the migration routes and ocean distribution of salmon of the Anticosti Island DU. They do, however, appear to overlap in the North Atlantic. All age groups of salmon at sea are represented in the Labrador Sea, where they also probably spend the winter. It is not expected that many individuals of this metapopulation would be in the immediate Project Area.

Gaspe-Southern Gulf of St. Lawrence DU

The Gaspe-southern Gulf of St. Lawrence population is within DU 12 and is currently considered Special Concern by COSEWIC (2010) but has No Status under SARA (Species at Risk Public Registry 2017). The DU extends from the Ouelle River (excluded) in the western Gaspe to the northern tip of Cape Breton. Genetic data are not available for Atlantic salmon on Prince Edward Island; however, it is thought that salmon in small streams probably reflect the province's original populations, those in larger Prince Edward Island streams are heavily influenced by stocking from eastern New Brunswick (COSEWIC 2010). Prince Edward Island has also provided salmon eggs for other rivers in the Maritimes and received substantial numbers of eggs and juveniles from mainland rivers; for most of this DU, stocking events have been common for at least the past 100 years (COSEWIC 2010). For these reasons, Prince Edward Island salmon are placed within DU 12.

Once they leave their native rivers, post-smolt are distributed according to prevailing surface currents and that strong currents act as transportation vectors that facilitate migration to marine feeding areas (Jonsson et al. 1993) to reduce energy needs. This process appears to influence the migratory pathway for post-smolt within the Gulf of St. Lawrence region. For example, post-smolt from the north shore of the Gulf of St. Lawrence, as well as the Miramichi, Restigouche, and Cascapedia rivers, follow the coast eastward and use the Strait of Belle Isle as their major pathway during emigration to the North Atlantic (Lefevre et al. 2012). Post-smolt from other rivers farther south on the Gaspe Peninsula have been recaptured near both the Strait of Belle Isle and Cabot Strait.

Caron (1983) and Dutil and Coutu (1988) concluded that some Gulf of St. Lawrence stocks delayed migration from the Gulf and that at least some post-smolt remained there until late autumn. Post-smolt have been captured as bycatch in herring gear in the northern Gulf of St. Lawrence in late summer (COSEWIC 2010; Canadian Science Advisory Secretariat 2012) and the winter destination of these late migrations remains unknown. Post-smolt within the Gulf of St. Lawrence were also recorded as spending more time in near-shore coastal habitat than smolt from other regions, which spend very little time in or near estuary habitat (COSEWIC 2010). Once

moving to open sea, post-smolt from the Gulf tend to head in a general northward direction (COSEWIC 2010). This information suggests that post-smolt from the Gulf of St. Lawrence travel to the Labrador Sea primarily in a northerly route through the Strait of Belle Isle and eastward around the Island of Newfoundland. They may also delay migration away from estuary habitat and the Gulf in general until late fall and may overwinter in the Gulf area for their first winter.

Canadian Science Advisory Secretariat (2012) indicates that the west Greenland fishery has captured salmon from Gulf of St. Lawrence rivers with an estimated harvest of 3 to 10 percent of total sea winter salmon being from the region (2006-2011). River age data suggest that salmon along the eastern edge of the Grand Bank would at least be partially of Gulf of St. Lawrence origin (particularly the southern portion of the Gulf of St. Lawrence).

Atlantic salmon of Gulf of St. Lawrence origin would likely feed and overwinter in the Labrador Sea and a portion of them may congregate off the eastern edge of the Grand Bank in spring prior to completing their spring spawning migration back to natal rivers. Post-smolt from this region would also be similar to those of insular Newfoundland in that they would not overwinter in the Flemish Pass area (Reddin and Friedland 1993). In terms of initial post-smolt migration from their natal river to feeding areas in the Labrador Sea, it would also be likely that they follow a more coastal route along the coast of Newfoundland (Reddin and Friedland 1993; Canadian Science Advisory Secretariat 2013). Returning adults to the Gulf of St. Lawrence in the spring would also tend to move into Newfoundland coastal waters and then move coastwise in a southerly and then westerly direction along the Newfoundland coast (Reddin and Friedland 1993).

Given the available data, spring migration of adults within and near the Grand Banks and Flemish Pass is possible and therefore interaction between these populations and the Project Area would be considered possible but low.

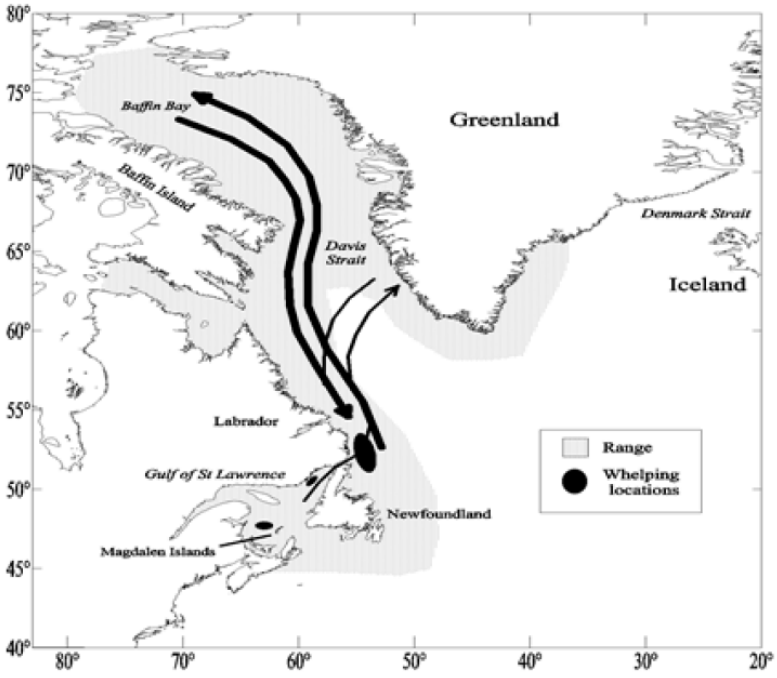
4.3.2.7.3 Hunting and Gathering

Hunting and gathering on land is also a key component of Indigenous groups harvest and includes such activities as hunting for birds, seals, rabbits, caribou and moose, and trapping (Nalcor 2011). Country food has value which cannot be replaced or substituted and cannot only be measured by market criteria, because the cultural, social, and nutritional qualities of country food are an integral part of the Indigenous lifestyle. Given the offshore location of the Project, this section focuses on species that have potential to migrate through the Project Area.

In addition to the commercial communal fishery, Indigenous groups can harvest seals throughout the year for FSC purposes. The Jeanne d'Arc Basin and adjacent areas overlap with regions where harp seals have been observed during January and February (Lacoste and Stenson 2000, in Husky Energy 2012a). During years when pack ice extends to the Northern Grand Banks, harp seals may use the region for spring pupping, mating, and moulting.

The Northwest Atlantic population of harp seal summers in the eastern Canadian Arctic and Greenland and undergo an annual southward migration the fall to Atlantic Canadian waters to birthing (whelping) locations in the Gulf of St. Lawrence or off northern Newfoundland, where they

give birth on pack ice during late February or March (Figure 4-70) (DFO 2016k). Dedicated at-sea surveys and data from satellite-tagged animals indicate that harp seals spend most of their time in offshore areas of southern Labrador and eastern Newfoundland during the winter (Stenson and Sjare 1997, in Husky Energy 2012a; Lacoste and Stenson 2000, in Husky Energy 2012a). Older seals also aggregate to moult off northeastern Newfoundland and in the northern Gulf of St. Lawrence in April and May before migrating northward (DFO 2000, in Husky Energy 2012a).



Source: DFO 2016k

Figure 4-70 Range, Migratory Pathways and Whelping Locations of Harp Seals in the Northwest Atlantic

This population of harp seals are hunted for commercial (in their whelping locations) and subsistence purposes by Inuit in Labrador, Arctic Canada, and Greenland. The majority of the approximately 80,000 subsistence animals are harvested in Greenland. A five-year (2014 to 2018) management plan regulates the commercial harvest, which removes less than 100,000 seals per year since 2009, using 12,000 licences (DFO 2016k). The estimated Northwest Atlantic harp seal population is 7.4 million (DFO 2016k).

Migratory bird species hunted onshore have potential to migrate through the Project Area. Migratory birds represent an important component of the overall subsistenence harvest (Natcher et al. 2010). Several migratory bird species (including species of waterfowl and murres) are hunted in marine and inland areas and have long been an important source of food in traditional diets (Amec 2014). Bird hunting is permitted in Canada under the *Migratory Birds Hunting Regulations*.

The migratory bird harvest is important for subsistence purposes (Natcher et al. 2010). Species commonly harvested by Indigenous groups include goose, ducks, loons, and seagulls, which are hunted year around when available (Nalcor 2011). Other migratory birds that are traditionally harvested include murres (also referred to as turrs), mergansers, and scoters (Sikumiut 2008). Within the Study Area, murres have the potential to migrate through the area, most likely a thick-billed murre which is harvested off the coast of Labrador, north of Groswater Bay. A murre harvested off the coast of Labrador, north of Groswater Bay, is most likely a Thick-billed Murre breeding in the Arctic and migrating either to or from its breeding ground along the coast of Labrador (S. Wilhelm, CWS, pers. comm., 2016). It is during this migration that it has the potential to be harvested. The Canadian Arctic is estimated to host 1,080,000 breeding Thick-billed Murres, of which 178,399 (16.5%) may over-winter on the Grand Banks (Frederiksen et al. 2016).

For murres harvested south of Groswater Bay, in addition to the Arctic Thick-billed Murre breeders, may originate from Common and/or Thick-billed Murre colonies in Groswater Bay and the Gannet Islands. While tracking data for birds breeding in Groswater Bay are not available (S. Wilhelm, CWS, pers. comm. 2016), tracking data of Thick-billed and Common murres from the Gannet Islands show that they primarily over-winter on the Grand Banks (McFarlane Tranquilla et al. 2014, 2015).

Therefore, during routine operations of an exploration drilling program within the Project Area, there would be little chance of an interaction with murres from the Labrador colonies. However, in the unlikely case of a blowout where murres were oiled, there is a risk to 16.5% of murres traditionally harvested north of Groswater Bay, and although not quantified, a likely higher risk to murres from the Gannet Islands. CWS is currently studying the species composition of the migratory bird harvest along the Labrador coast, but results are not expected to be available for three to five years (R. Wells, CWS, pers. comm., 2016).

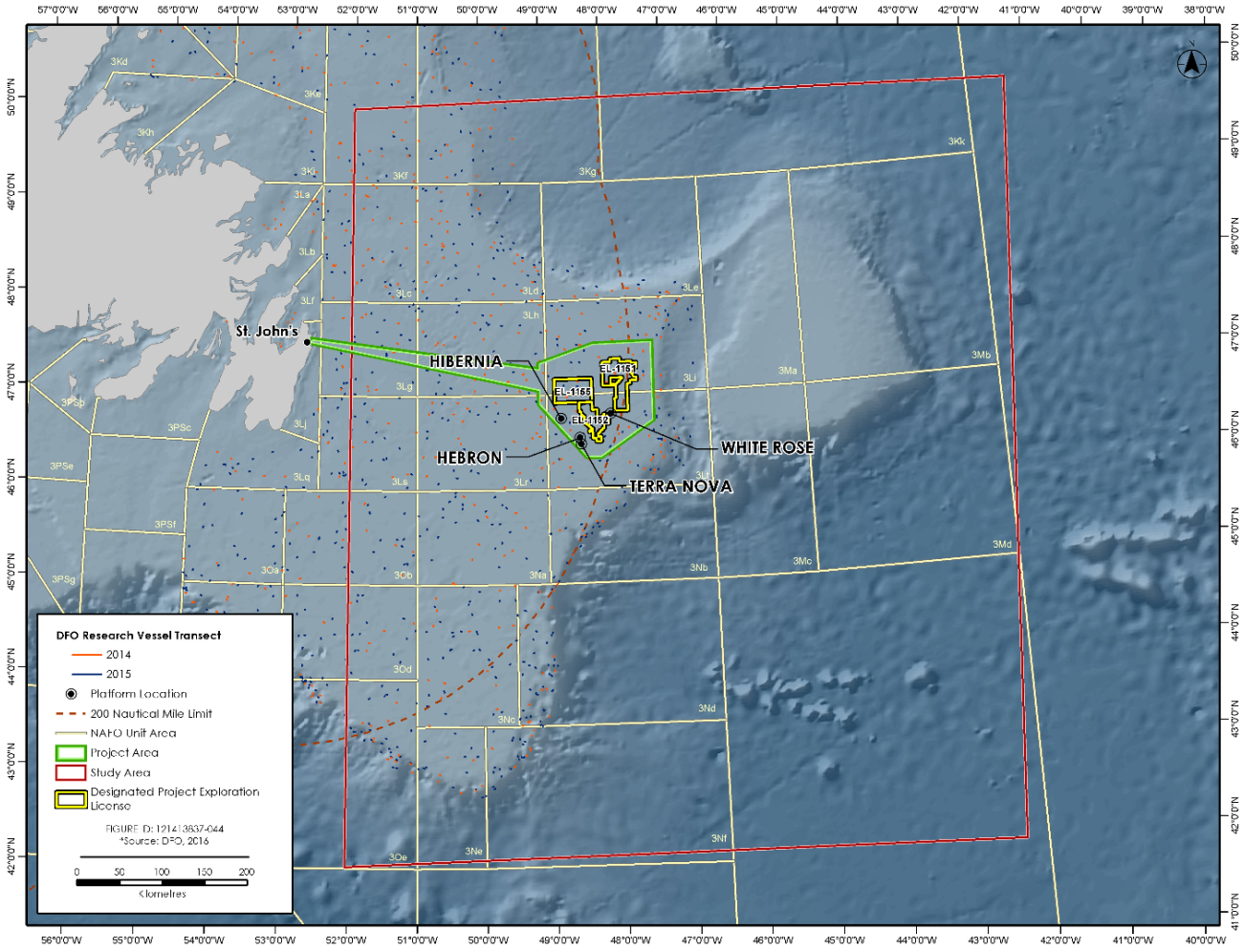
Following the *Labrador Inuit Land Claims Agreement Act* which came into effect in 2005, the Nunatsivut Government undertook an initative to determine the Inuit domestic harvest level, which included in a survey of mirgratory bird species commonly harvested by the Inuit. Between 2006 and 2007, the Nunatsiavut migratory bird harvest reported 5,468 birds, with common eiders represting 30%, followed by Canada geese (20%) and black ducks (19%) (Natcher et al. 2010). Approximately 75% of the migratory bird harvest occurs in the fall. In 2007, a survey was undertaken to understand the harest of migratory bird eggs (Natcher et al. 2012). A total of 9,346 eggs were reported as being harvested, common eider eggs represting 36% of the eggs harvested, followed by gulls (32%), terns (20%), and common guillemot (12%) (Natcher et al 2012).

Berry picking is common throughout Labrador along access routes and river valleys in the mid- to late-summer and generally included blueberries, partridge berries and bakeapples (Nalcor 2011). Medicinal plants are also harvested, with some of the harvested components including the inner and outer bark of trees, herbs, flowers, berries, mosses, and lichens (Nalcor 2011).

4.3.3 Marine Research

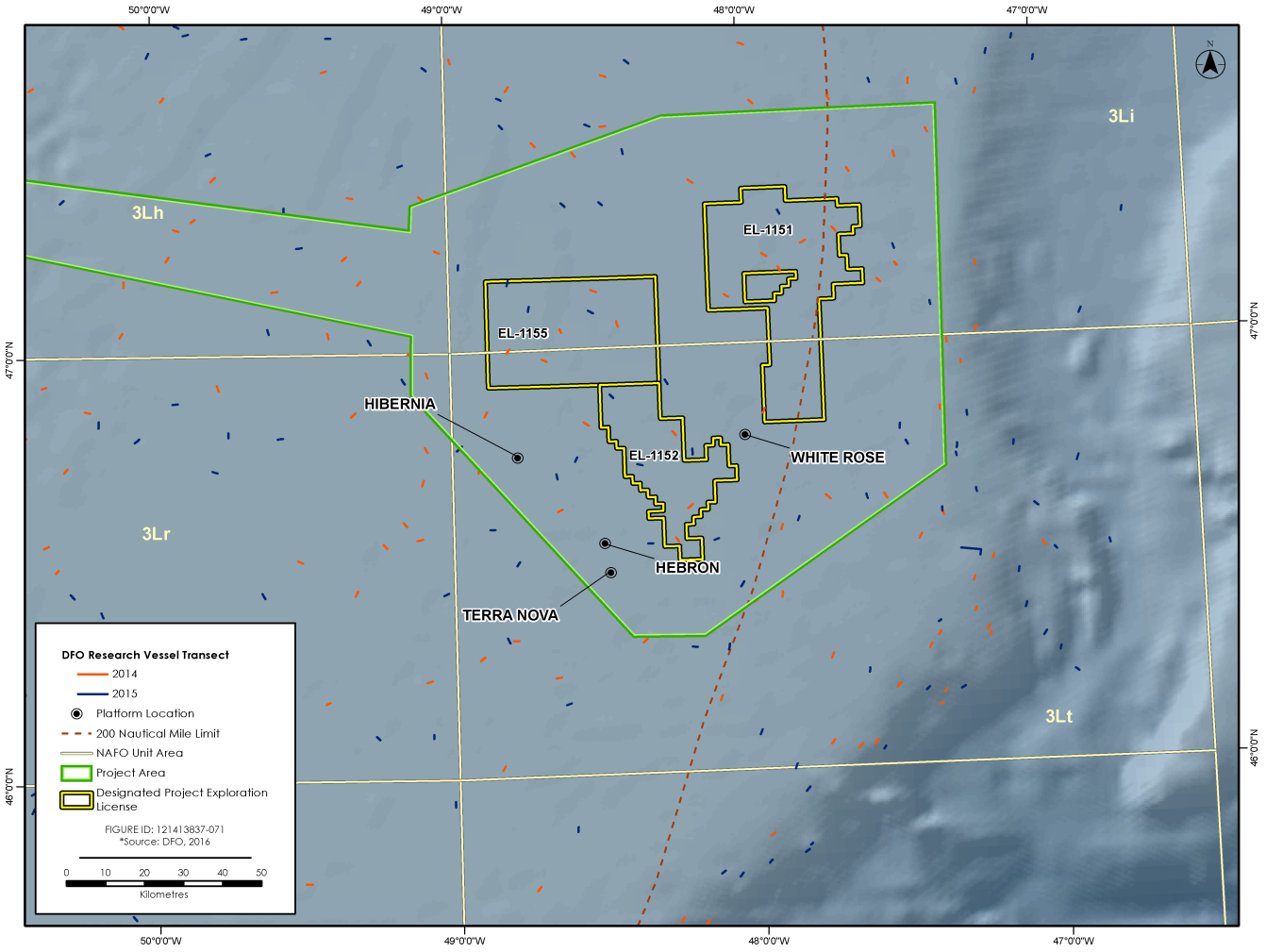
DFO conducts annual research studies, such as the Atlantic Zone Monitoring Program and the RAPID Climate Change Program Study throughout NAFO divisions within Canada's 200 nm EEZ. Research activities include bottom trawl surveys to collect information for managing and monitoring marine resources in the offshore Newfoundland and Labrador region. Parts of the Study Area and Project Area overlap with DFO research surveys in 3K, 3L, 3N, and/or 3O (Figures 4-71 and 4-71, respectively). The results of these surveys have been incorporated into the appropriate sections of this EIA.

The 3LNO spring survey is typically conducted in May to June, while the fall survey is typically conducted from early October to mid-December (Husky 2012a). Through the review of annual EA updates, Husky typically consults with DFO regarding their scheduled survey operations, to reduce the potential for interactions between marine research vessels and Project activities. Table 4.58 shows the 2017 scheduled surveys for both DFO offshore research vessels.



Source: DFO 2017a

Figure 4-71 Locations of DFO Research Vessel Transects in the Study Area, 2014 and 2015



Source: DFO 2017

Figure 4-72 Locations of DFO Research Vessel Transects in the Project Area, 2014 and 2015

Table 4.58 Tentative Timing of DFO Research Vessel Surveys, 2017

Vessel	Activity	NAFO Division(s)	Tentative Start Date	Tentative End Date
CCGS Needler	NL Spring Survey	3P	March 31	April 11
		3P	April 12	April 25
		3PO	April 26	May 9
		3ON	May 9	May 23
		3LN	May 24	June 10
	Shellfish Survey	2J4R	August 31	September 12
	NL Fall Survey	3O	September 13	September 26
		3ON	September 26	October 10
		3NL	October 11	October 24
		3L	October 24	November 7
		3KL	November 8	November 21
CCGS Teleost	NL Spring AZMP	3L	April 4	April 25
	Capelin Survey	3KL	May 2	May 23
	NL Summer AZMP		July 8	July 29
	NL Fall Survey	2H	October 5	October 10
		2HJ	Oct 11	Oct 24
		2J3K	October 24	November 7
		3K	November 8	November 21
		3K+3L Deep	November 21	December 5
Source: DFO 2017				

Along with DFO scheduled research surveys, FFAW-Unifor conducts annual industry-DFO collaborative post-season trap surveys for snow crab in NAFO Divisions 2J3KLOPs4R after the commercial snow crab fishery has closed. Each year approximately 1,500 stations are sampled in all CMAs (see Figure 4-73). The survey covers a broad range of the Grand Banks, including areas near offshore installations and established vessel traffic lanes. OSVs deviate from routine course while stations along routine routes are being sampled (DFO 2017). Ongoing meetings through One-Ocean and consultations with FFAW-Unifor provide the opportunity to mitigate interactions.

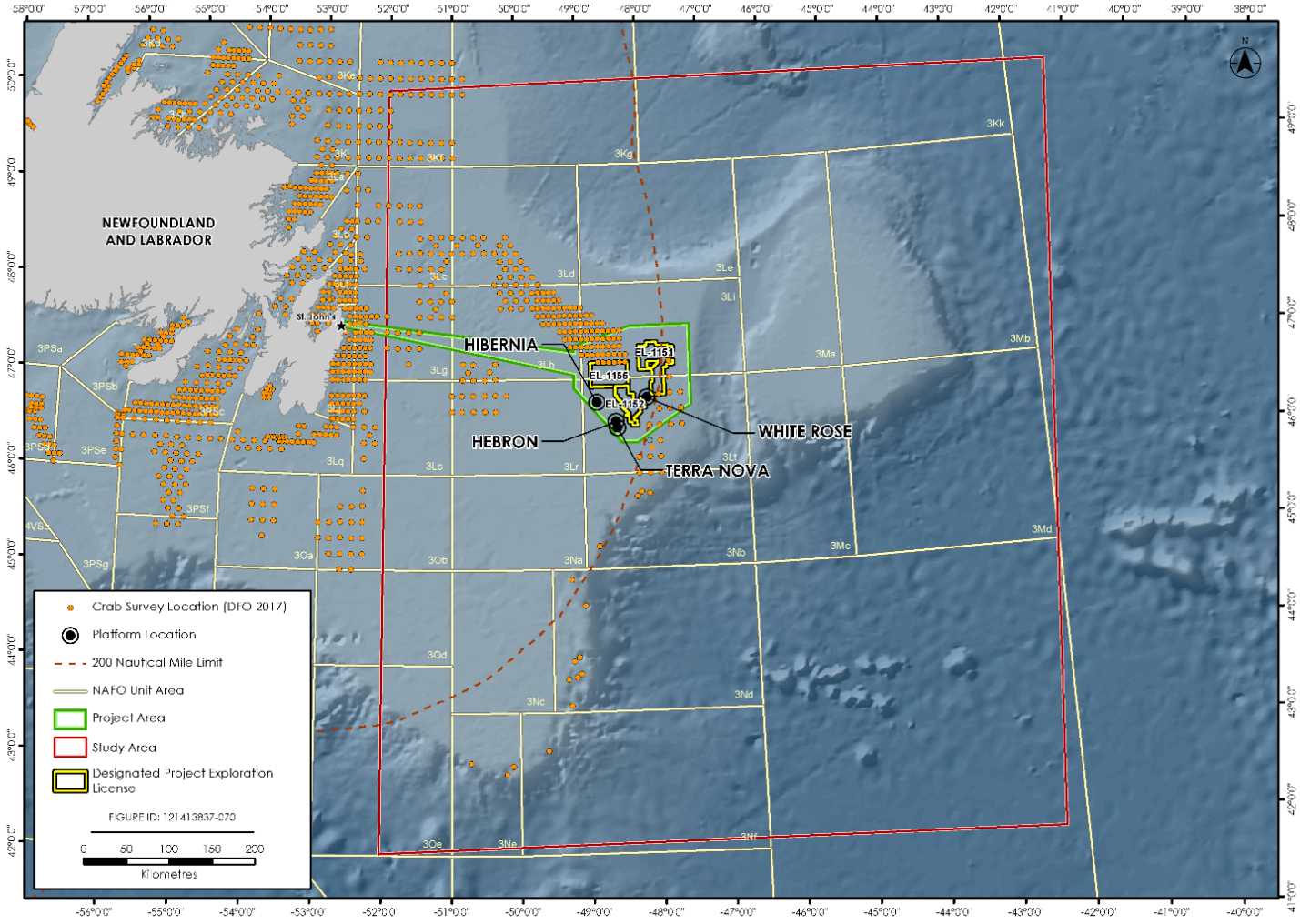


Figure 4-73 CMA Snow Crab Core Survey Stations, 2016

4.3.4 Marine Shipping

The eastern region of Newfoundland has approximately 17 ports that are used for both domestic and international shipping activities. Nine of these ports accommodate both domestic and international shipping; four ports are used exclusively for international shipping; and four are used for domestic shipping (Amec 2014). In 2011, the eastern region of Newfoundland included approximately 698 international shipping movements, handling 16,654 t of total tonnage. In the same year, domestic shipping included 3,044 movements, handling 27,248 t of total tonnage (Statistics Canada No Date a; Statistics Canada No Date b). Harbours are regulated under federal authority of the federal *Fishing and Recreational Harbours Act*. DFO, through the Canadian Coast Guard (CCG), provides communications and traffic management services in certain Canadian ports. International routes commonly used by vessels to transit through the Study Area and corners of the Project Area. The highest density traffic routes are illustrated in Figure 4-74.

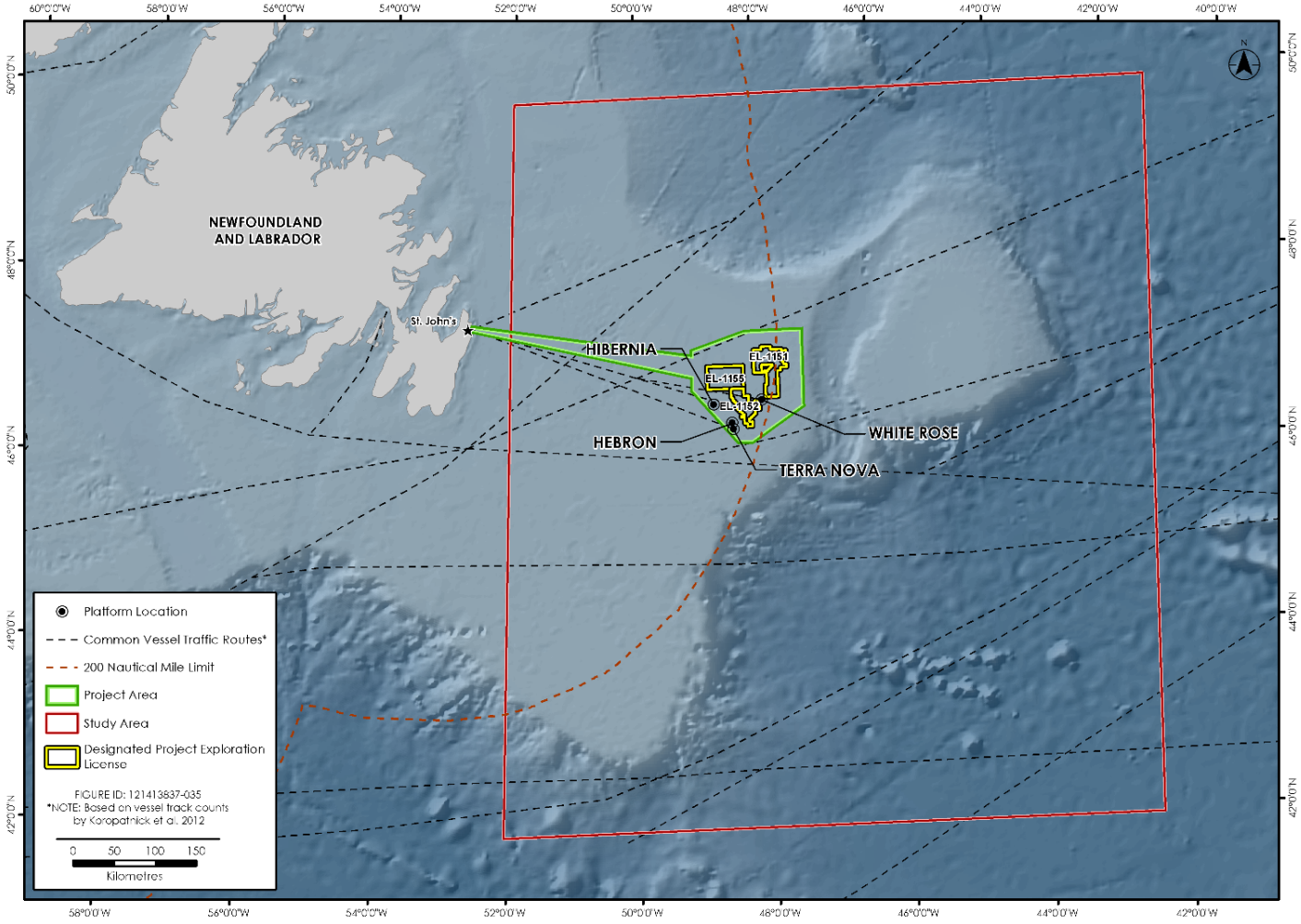
4.3.5 Other Offshore Oil and Gas Activity

Offshore oil and gas production activities have been occurring off the coast of Newfoundland and Labrador for more than 20 years; exploration has occurred for decades. There are currently four producing fields within the Jeanne d'Arc Basin: Hibernia (Hibernia Management and Development Company Limited), Terra Nova (Suncor Energy Inc.), White Rose (Husky Energy Inc.), and Hebron (ExxonMobil Canada Properties). Hebron is Newfoundland and Labrador's newest production field, which began production in 2017.

In addition to production operations, oil and gas exploration is active in the Newfoundland offshore. The C-NLOPB moved into a scheduled land tenure system in 2013, dividing offshore Newfoundland and Labrador into eight regions. As of August 2018, there were 28 ELs, 56 SDLs, and 12 PLs in the offshore area (C-NLOPB 2018). As of August 1, 2018, a total of 466 wells have been drilled in the entire Newfoundland and Labrador offshore area. This includes 171 exploration wells, 57 delineation wells, and 238 development wells (C-NLOPB 2018b). Within the Study Area, Husky holds three ELs (1151, 1152, and 1155) in the Jeanne d'Arc Basin. These licences are bordered by other ELs, SDLs, and PLs owned by other operators (Figure 4-75).

4.3.6 Department of National Defence Operations

DND is responsible for overseeing national security, including the defence and protection of Canada's marine jurisdiction. To meet this mandate, the Royal Canadian Navy and Air Force conduct routine surveillance operations throughout Atlantic Canadian waters which may include aircraft or marine patrols within the Study Area. Military vessels sometimes support DFO with research operations or conducting fishery patrols (Amec 2014).



Source: Koropatnick et al. 2012, data files provided by S. Coffen-Smout, DFO, Dartmouth, NS.

Figure 4-74 Common Vessel Traffic Routes in the Study Area

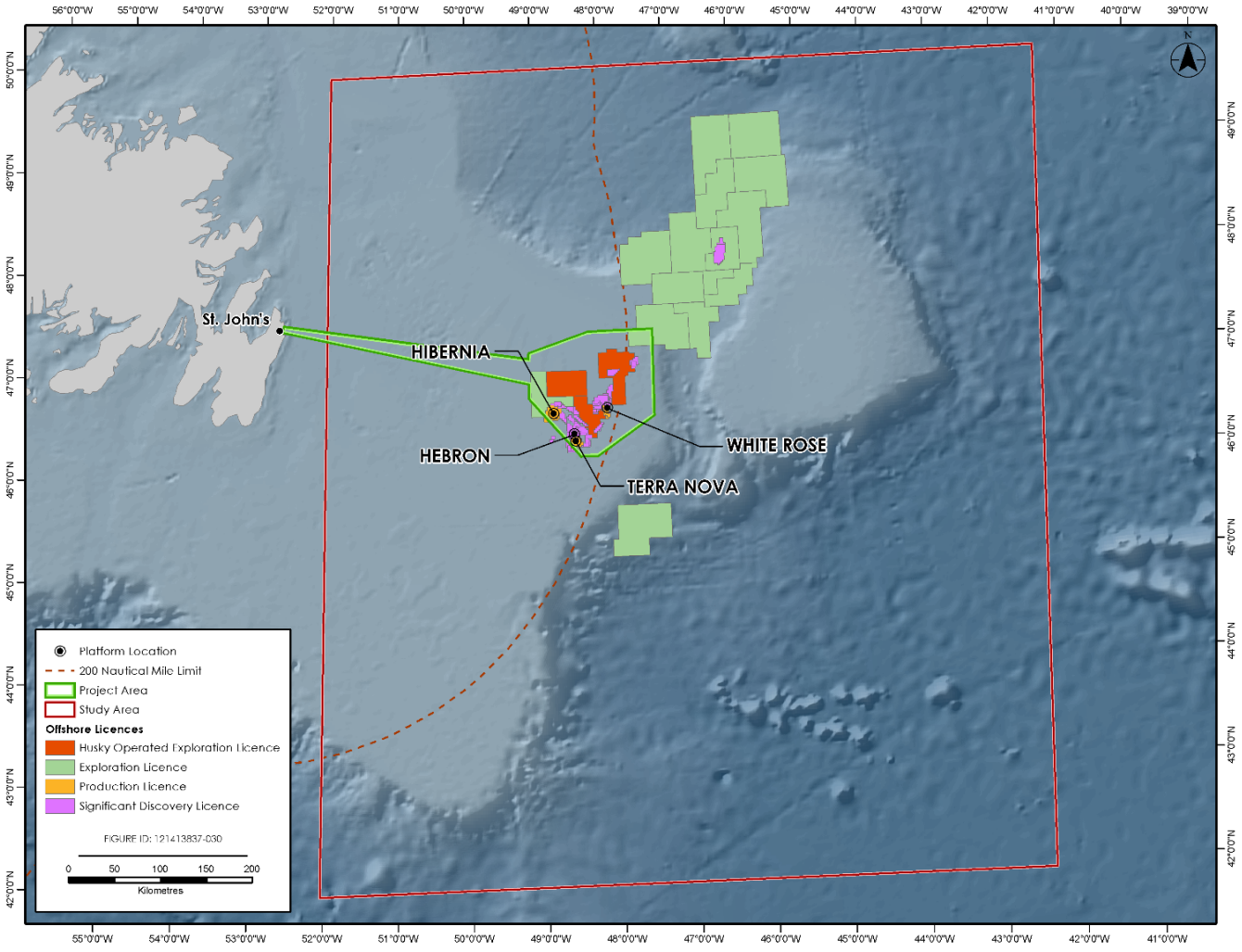
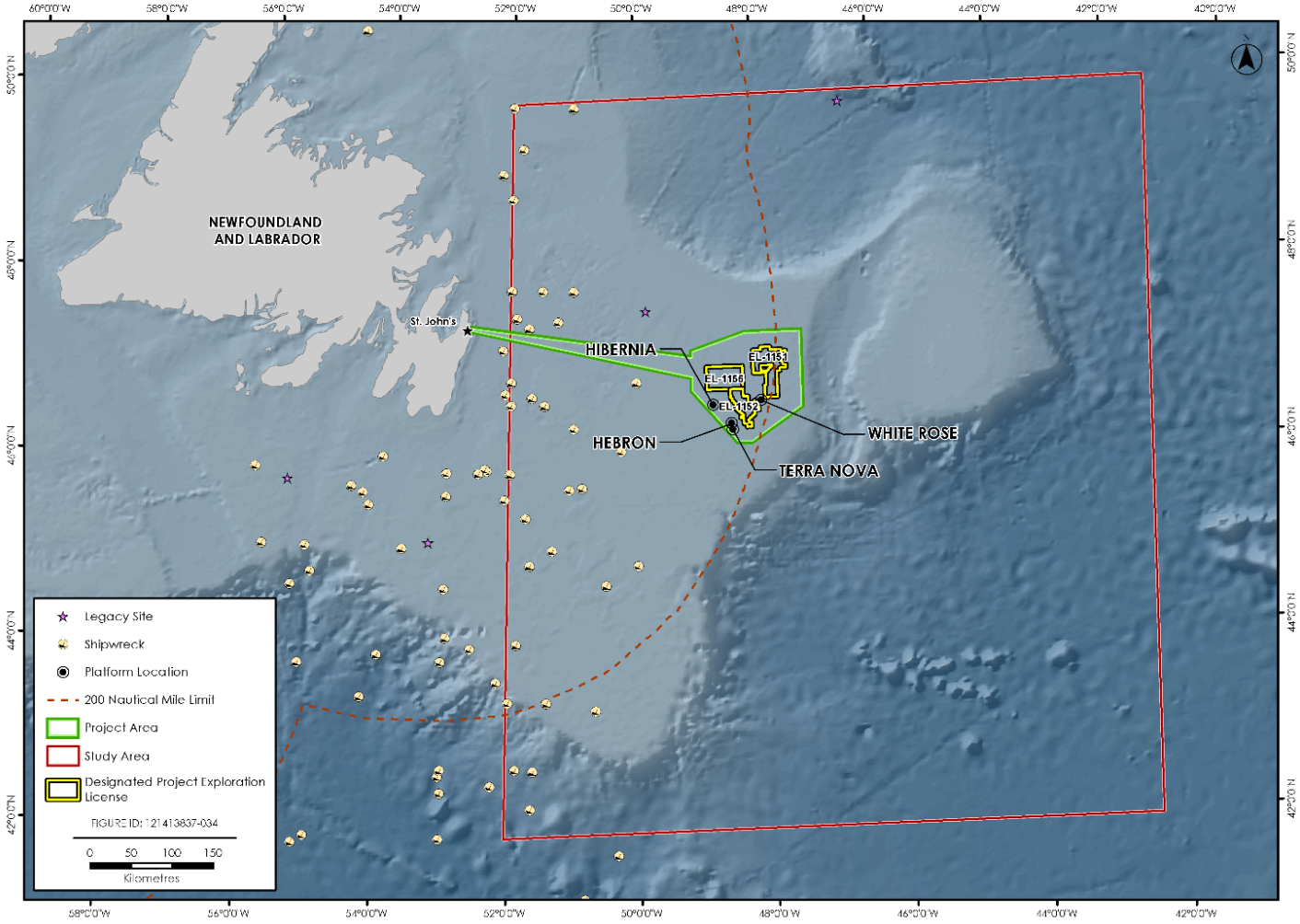


Figure 4-75 Grand Banks and Flemish Pass Licences

In the past, many sites across Canada have been used for military training and weapons testing by DND. Legacy sites exist across Canada's coastline where unexploded ordnance (UXO) may remain, and there are 1,100 known UXO sites that exist off Canada's east coast (Amec 2014). There are 32 shipwrecks and two legacy sites within the Study Area; there are none within the Project Area (Figure 4-76).

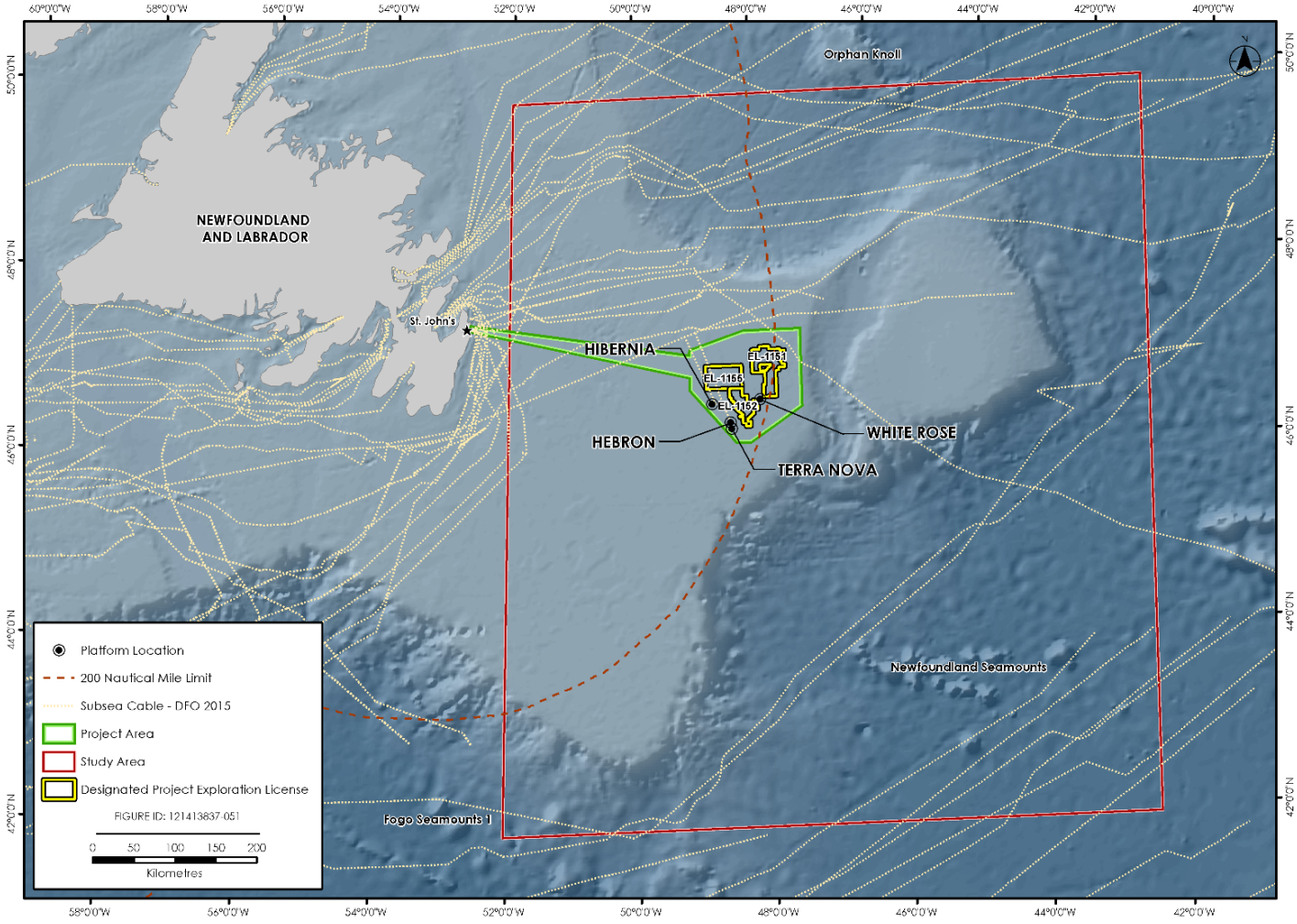
4.3.7 Additional Ocean Infrastructure

Both active and inactive marine subsea cables are known to occur within the Study Area. These cables are laid across the seabed between two land-based substations to carry telecommunications between geographic regions (Amec 2014). Most these cables span the Atlantic Ocean, connecting North America to the United Kingdom and Europe. There is the potential for more marine cables to be constructed within the Study Area over the life of the Project. Figure 4-77 shows the locations of active and inactive marine cables within the Study Area. The only submarine cable that overlaps with an EL is an abandoned telegraph cable from the 19th century (DFO 2015f).



Source: Defence Construction Canada 2015

Figure 4-76 Legacy and Shipwreck Sites in Offshore Newfoundland



Source: DFO 2015g

Figure 4-77 Subsea Cable Location in Offshore Newfoundland and Labrador