White Rose Extension Project
Husky Oil Operations Limited

Canadian Environmental Assessment Act (S.C. 1992, c. 37)
Screening Report

(FINAL)

Prepared by:
Canada-Newfoundland and Labrador Offshore Petroleum Board
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Fisheries and Oceans Canada
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Part A: General Information

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EA Title	Husky Energy White Rose Extension Project
Proponent	Husky Oil Operations Limited St. John's NL A1C 1B6
Contact	Mr. Don Williams HSEQ Lead, Projects
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Location	Jeanne d'Arc Basin & Argentia Peninsula

Part B: Project Information

On May 28, 2012, Husky Oil Operations Limited (Husky), on behalf of the White Rose Extension Project (WREP) proponents, Husky, Suncor Energy Inc. (Suncor) and Nalcor Energy – Oil and Gas Inc. (Nalcor), submitted a project description "*Husky Energy White Rose Extension Project – Project Description*" (Husky May 2012) to the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB), in support of its intention to develop the West White Rose pool using either a wellhead platform (WHP) or a subsea drill centre. Husky and its co-venturers are considering two development options for the WREP: a WHP development option plus up to three subsea drill centres; or a subsea drill centre development option plus up to three additional subsea drill centres. Both development options will be tied back to the existing *SeaRose* floating production, storage and offloading (*FPSO*) vessel where all oil storage and offloading will occur. The "*Husky Energy White Rose Extension Project Environmental Assessment"* (Husky December 2012) (herein referred to as the EA Report) provided an environmental assessment (EA) of the proposed development. The original White Rose field underwent an EA in 2000 pursuant to the *Canadian Environmental Assessment* Act (S.C. 1992, c. 37) as a comprehensive study. In 2007, a further environmental assessment was undertaken on activities associated with construction of up to five additional subsea drill centres and associated flowlines. These previous environmental assessments encompassed the location of the subsea tiebacks, as well as the way in which the construction and operation activities would be performed. Regulatory review comments on the EA Report were provided to Husky on March 15, 2013. Husky provided responses to these review comments in the form of an Addendum, "*Husky Energy White Rose Extension Project Response to Review Comments on the White Rose Extension Project Environmental Assessment*" on April 22, 2013. Additional comments were provided to Husky on May 24, 2013and addressed in Husky's "*Response to Review Comments on the White Rose Extension Project Environmental Assessment Addendum*." (Husky June 2013). Husky provided a complete response in July, 2013 to all review comments, including comments provided by the Newfoundland and Labrador Department of Environment and Conservation (NLDEC) in order to fulfill the requirements of the *Environmental Protection Act*. In completing this Screening Report, information from the EA Report, Addendum and response to Addendum comments was summarized and is included in the following sections.

1.0 Description of Project

The WHP development option includes activities both at the on/nearshore graving dock, and offshore. The subsea development option will be comprised of an excavated subsea drill centre with wells drilled from a mobile offshore drilling unit (MODU). There will be no nearshore components associated with the subsea drill centre development option. On-land and nearshore WREP components are related solely to the WHP development option.

The Concrete Gravity Structure (CGS) will be constructed in a purpose built graving dock at Argentia, NL. The site is approximately 50 km away from the Trans-Canada Highway, via Route NL S100. The overall construction site area will be approximately 20 hectares on a brownfield location that has seen more than 70 years of military and industrial activities. General excavating and grading activities will be required. The road system that currently exists is within 500 m of the graving dock site and will be extended into the site. An existing source of potable, fire and industrial water is located near the construction site. Sewage will be treated on-site prior to ocean disposal. Potential temporary support facilities include a concrete batching plant, offices, a dining hall, a medical clinic, sheds; lay down areas and storage areas. Husky has identified the following key WREP-related activities in the Nearshore Project Area:

- Graving dock excavation. Associated activities may include graving dock side stability/reinforcement (e.g., sheet piles, bund wall, etc.) and site grading and leveling;
- Site dewatering and disposal;
- Use of The Pond for disposal of excavated soil material and dredged material;
- CGS construction at the graving dock;
- shoreline dredging;
- Tow-out channel dredging;

- Tow-out to the deep-water mating site;
- Topsides mating and commissioning at the deep-water mating site;
- Tow-out of the WHP to the White Rose field;
- Operation of support craft associated with the above activities, including but not limited to heavy lift vessels, construction vessels, supply vessels, helicopters, tow vessels and barges; and
- Associated surveys for all above activities, including: remotely-operated vehicle (ROV) surveys, diving programs, geotechnical programs, geophysical programs, geological programs, environmental surveys.

The topsides will be constructed at an existing fabrication facility and is not considered part of the environmental assessment. For the design of the graving dock and its associated construction site, consideration will be given to designing the facility as a permanent graving dock, which could be used for the construction of future CGSs or for other industrial applications. Design of the graving dock for future use could include provision for a gated system allowing the graving dock to be flooded and drained as required. Once construction of the CGS is complete, the structure will be floated out of the graving dock and towed to a deep-water site in Placentia Bay for installation of the topsides. Two potential deep-water sites have been identified, west of Red Island and west of Merasheen Island

The excavation of the graving dock is anticipated to take approximately six to eight months. The CGS will be constructed over a 20 to 24 month period. Dredging of the CGS tow-out route is estimated to take four to six weeks. Two to four days will be required for the CGS transit to the deep-water site from the Argentia Graving Dock. The WHP will be at the deep-water site for approximately six to eight weeks and then transit to the White Rose field from the deep-water site will take up to 15 days.

Husky has identified the following key WREP-related activities in the Offshore Project Area:

- Offshore site and clearance surveys;
- Installation of the WHP/subsea drill centre at its offshore location (may include site preparation activities such as dredging, seafloor leveling, offshore solid ballasting, piles and mooring points;
- Subsea equipment and flowline installation to tieback to the *SeaRose FPSO*;
- Flowline berm protection (i.e., rock piles and/or concrete mats);
- WHP/subsea drill centre commissioning;
- Operation, production, maintenance, modifications, decommissioning and abandonment of the WHP/subsea drill centre;

- Drilling operations (exploration and development drilling), from the WHP of up to 40 wells, or 16 wells from a mobile offshore drilling unit (MODU) through a subsea drill centre, including well testing, well completions and workovers and data logging;
- Supporting activities, including diving programs, and operation of support craft associated with the above activities, including but not limited to dredging vessels, light intervention vessels, construction vessels, MODUs, WHP supply and standby vessels and helicopters;
- Associated surveys for all above activities, including: ROV surveys, diving programs, geotechnical programs, geophysical programs (e.g., vertical seismic profiles (VSPs), geohazard/wellsite surveys), geological programs, environmental surveys (including iceberg surveys); and
- Potential future activities, including excavation of up to two additional subsea drill centres and installation of infrastructure, including any associated surveys (e.g., VSP, geohazard/wellsite).

  For any subsea development component of the WREP, drilling will be conducted from a MODU. Procedures for installation of subsea facilities and subsequent operation are anticipated to be the same as those currently used in the White Rose field.

The WREP development schedule has first oil within the fourth quarter of 2016 under the WHP option. Developing the WREP using a subsea drill centre, subsea construction could begin in 2014, with installation of equipment and first oil potentially in 2015. Additional subsea drill centres could be developed in a similar timeframe or later in the WREP life. In either development option, the WREP is designed to support production by the SeaRose FPSO for the life of the White Rose field.

2.0 Description of Environment

2.1. Physical Environment

Construction of the WHP will occur on the Argentia Peninsula, which is located in Placentia Bay, on the southern Avalon Peninsula, 130 km south west of St. John’s, NL. Socio-economic and terrestrial environmental conditions are considered in the EA for the onshore environment. The EA Report provides a detailed description.

The White Rose field is located in the Jeanne d’Arc Basin, 350 km east of Newfoundland and Labrador in approximately 120 m of water. The EA Report provides a detailed description of the physical environment for the nearshore and offshore. Physical environmental conditions considered in the EA include atmospheric, oceanic, wind, wave and temperature; sea ice and icebergs; and geological setting.

2.1.1. Socio-economic – Onshore

A description is provided in the EA Report of the: Community Physical Infrastructure and Services; Employment and Labour; and Terrestrial Environment.

Benefits will be delivered according to Husky's approach to developing the WREP. WREP-related benefits will be delivered to both the Argentia and St. John's areas. Construction-related employment and business opportunities will have direct economic benefits, while secondary multiplier benefits will also benefit the economy. During operations, the WREP will continue to provide employment and contribute both direct and indirect benefits tot eh St. John's and provincial economies. While the WREP may lead to some increased demand on community services and infrastructure, it is not anticipated that any such increased demand will exceed the capacity of communities to respond.

2.1.2. Wind, Waves and Currents

Nearshore

The most frequent wind direction is southwesterly for Placentia Bay. The maximum average wind speed occurs in January, while the minimum is in July. The most frequent wind direction is southwesterly.

Wave heights in Placentia Bay are lowest in the spring and summer, and largest in the winter. Minimum monthly mean wave height values range from 0.2 m in June and July at the Isle Valen location, to 1.3 m from May through August at the mouth of Placentia Waves are most frequently from the southwest. The largest waves are also generally from the southwest. Thirty percent of waves are greater than 2 m, annually.

Studies of circulation in Placentia Bay describe a general cyclonic circulation during spring and summer, with waters entering by the eastern shore and leaving by the western shore, forming a counter-clockwise open gyre in the bay.

Mean speeds are generally weak and range from 8 to 18 cm/s at the surface (in the top approximately 20 m) and from 3 to 7 cm/s at sub-surface (approximately 45 to 55 m). Bottom currents in the deepest part of the bay and the channel were published only once (April to June 1998), in the western and eastern shore, at 180 and 110 m water depth, respectively.

The largest currents are at the mouth of Placentia Bay: mean currents range from 19 cm/s in June and July to 29 cm/s in November, with 95 percent upper limit speeds ranging from 135 cm/s in February to 178 cm/s in November. The annual 95 percent upper limit current speed at the mouth of Placentia Bay buoy is 59 cm/s.

Offshore

The White Rose field experiences predominately southwest to west flow 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, with maximum wind speeds measured in the MSC50Grid Point 11034 data set at 32.0 m/s in February.

The majority of wave energy comes from the west-southwest to south-southwest, which accounts for 36.0 percent of the waves and that the majority of significant wave heights are 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 on the Grand Banks peak during the winter months with 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 only 1.7 m. The highest significant wave height of 14.8 m occurred on February 15, 1982. The highest combined significant wave heights of 14.6 and 13.8 m in the Terra Nova and Hibernia data sets, respectively, occurred during a storm on February 11, 2003. While the maximum significant wave heights tend to peak during the winter months, a tropical system could pass through the area and produce high wave heights during any month.

In the White Rose area, moored current meter data was collected over short intervals (a few months per site) during the early exploration period between 1984 and 1988 and for the period between 1999 and 2002. At mid-depth and near-bottom, continuous data exists from August 2007 to December 2010. Since January 2008, there has been continuous near-surface current data measured at White Rose. At 20 m (near-surface), the maximum speed that was measured was 89.9 cm/s in September 1999. During the same event, current speeds of 40.8 cm/s were measured at mid-depth. These strong currents were due to the passage of Hurricane Gert. At mid-depth, the maximum current speed of 55.6 cm/s occurred in December 2007 during a winter storm. During the same event the currents near bottom were 36.1 cm/s. The maximum speed near bottom occurred in November 1985 at White Rose J-49 with a speed of 50.6 cm/s. During the same event near-surface speed was 61.7 cm/s.

2.1.3. Air and Sea Temperatures

Nearshore

Monthly air temperature statistics were calculated for nearshore land sites using ICOADS data from 11 Environment Canada weather stations and across Placentia Bay. The mean temperature of the 11 Environment Canada stations ranges from -4.3°C in February to 15.6°C in August. The coldest observed air temperature from land stations surrounding Placentia Bay is -29.5°C over northern sections of the Burin Peninsula, observed in both January and February. The warmest air temperature from these stations was 31.5°C in September. The maximum daily average temperature peaks in August at 19.5°C, while the coldest mean daily minimum of -8.3°C is observed in February.

Over Placentia Bay, air temperature variations are less pronounced due to the effects of the water. The mean temperature ranges from -1.6°C in February to 14.8°C in August. The coldest observed air temperature over Placentia Bay is -18.2°C in February, while the maximum air temperature was 25.2°C in August. The maximum daily average temperature peaks in August at 16.9°C, while the coldest mean daily minimum of -3.9°C is observed in February.

Offshore

The atmosphere is coldest in the month of February with a mean monthly air temperature of -0.4°C, and warmest in August with a mean monthly air temperature of 14.3°C. Similarly, sea surface temperature is warmest in August with a mean monthly temperature of 13.7°C and coldest in February and March with mean monthly temperatures of 0.3°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.

2.1.4. Visibility

Nearshore

Visibility in Placentia Bay can be affected by daylight hours, blowing snow and precipitation, but the most important contributor to reduced visibility is fog and mist. There are several processes that cause fog to develop, but the most common in Placentia Bay is advection fog. Because the water does not warm as quickly as land, fog is less frequent over areas surrounding Placentia Bay, but it is a regular occurrence, especially in the spring and summer as the fog moves onshore from the bay. The most common wind direction causing fog over Placentia Bay is from southeast to southwest, which funnels warmer air over the region.

In Argentia, the highest frequency of good (greater than 10 km) visibility occurs in the fall, when the land/water temperature contrast is least pronounced and snow has yet to begin. Meanwhile, the greatest occurrence of reduced visibilities occurs during the late spring and early summer, when fog often dominates the south coast of Newfoundland with the land/water temperature contrast at its highest. At this time of year, southwesterly winds often bring warm air masses over the region, while the ocean waters have warmed only marginally. This leads to frequent extensive fog banks. Poor visibility conditions (less than 2 km) increase through the spring and peak in July, when it is observed over 30 percent of the time. Conversely, reduced visibility in the winter and early spring can sometimes be attributed to fog and mist, but is typically associated with snow and blowing snow.

Offshore

During the winter months, the main obstruction is snow; however, mist and fog may also reduce visibilities at times. The presence of advection fog increases from April through July. The month of July has the highest percentage of obscuration of 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. 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.

2.1.5. Sea Ice and Icebergs

Nearshore

Most sea ice within the bay is formed off southern Labrador and drifts south to enter the bay around the mid-February timeframe. From mid-February through mid to late-April, the bay experiences first year ice, this can range in thickness from 30 to 120 cm. The bay has been divided into two sections for analysis: the mouth and the bottom. The mouth of the Bay is more susceptible to incursions of the annual pack, while the bottom of the bay only fills with pack when there are sustained periods of onshore winds

The mean circulation in Placentia Bay is driven by westward currents from the inshore branch of the Labrador Current that flows into the bay on the eastern side, continues along the coastline, and flows out of the bay on the western side. As a coastal region, it tends to be less influenced by the cold component of the Labrador Current. The average current velocity in Placentia Bay was about 0.22 m/s between January 2010 and December 2011.

A total of 30 icebergs were recorded in seven of the 30 years between 1974 and 2003.

Offshore

The White Rose field lies close to the extreme southern limit of the regional ice pack. In this area, relatively high water temperatures dissipate the last remnants of ice that have drifted south from original ice growth areas in Baffin Bay, Davis Strait and the Labrador Sea. Median sea ice concentrations for the Grand Banks south of 49°N are usually between 4/10 and 6/10 by early February and persist at this concentration through early April, after which they slowly decrease to 1/10th to 4/10ths coverage and recede to above 49°N.

The number of icebergs off eastern Canada varies considerably both annually and monthly; the number of icebergs on the Grand Banks peaks in mid-April to late-May and their approach to 48°N varies. The number of icebergs reaching the Grand Banks (48 degrees latitude) each year varied from a low of zero in 1966, 2006 and 2011, to a high of 2,202 in 1984. Of these, only a small portion will pass through the White Rose field.

2.1.6. Seafloor Characteristics

Nearshore

Glacial landforms indicating flow direction are observed on the seabed throughout Placentia Bay. Features located on the western side of the Bay indicate a southwesterly ice-flow direction. Flow-parallel landforms, such as drumlins, megaflutes, flutes and crag-and-tail features are found in conjunction with ice-marginal landforms such as De Geer moraines and grounding-line moraines. Drumlins observed on the west side of the bay exhibit average lengths of 795 m, widths of 230 m and heights of 10 m.

Seabed features on the eastern side of Placentia Bay also include landforms indicative of glacially-modified terrain. Drumlins and mega-flutes are common. Elongated spindle-shaped drumlins grade into low, long ridges (mega-flutes) in deeper water. Drumlins have average lengths of 1,040 m, widths of 320 m and heights of 10 m. These seabed features, streamlined bedrock ridges and crag-and-tail features located south of Red Island indicate a southwest direction of ice-flow. Seafloor surficial sediments vary from coarse-grained glacial deposits in the nearshore regions to fine-grained sediments near the centre of Placentia Bay.

Offshore

Surficial sediments at 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. 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. The seafloor in 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 being suggestive of linear and circular patterns that are perhaps the surface expression of large, buried, relict ice scour marks. 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.

2.1.7. Salinity

Nearshore

Placentia Bay shows a marked seasonal cycle with a strong stratification during the summer, with relatively warm and fresh water standing above colder and saltier waters, a more mixed system in fall and an almost completely mixed water column during the winter and spring. The summer period also shows a marked intrusion of deep and salty water entering in the bay and present from June through October.

Based on the density field, three different seasons can be identified: Summer (June to October), three-layer system with warm and fresh water on the upper 30 m (temperature approximately 14°C, salinity approximately 31 practical salinity units (psu)), an intermediate water between 30 to 150 m (temperature approximately 3°C, salinity approximately 32 psu) and a cold and salty water on the bottom final 50 m of the water column (temperature approximately -1°C, salinity approximately 32.5 psu); Fall (November to December), two-layer system with a mixed surface layer of 60 m (temperature approximately 8°C, salinity approximately 31 psu) and a bottom layer of 140 m (temperature approximately 2°C, salinity approximately 32.5 psu); and Winter/Spring (January to May), quasi-uniform water column of constant temperature (approximately 2°C), with a large mixed surface layer 140 m thick (salinity 32 psu) and saltier bottom layer (32.5 psu).

Offshore

The most noticeable feature is the high horizontal gradient in the area over the shelf break that separates the relatively fresh low salinity waters of the Grand Banks from the warmer, higher salinity waters in Flemish Pass. The offshore branch of the Labrador Current flows along the shelf break in the region of the strong density gradients. The majority of the water in the offshore branch of the Labrador Current has been known to have temperatures between 3°C and 4°C and salinities of 34.88 to 34.92 psu. The main salinities ranged between a low of 31.59 psu in August and a high of 32.94 psu in February.

2.2. Biological Environment

2.2.1. Plankton

Nearshore

Areas of persistent high primary production such as where eddies, fronts, or seamounts occur are often areas where faunal biomass is high due to the aggregation of primary consumers and predators. Ramey and Snelgrove (2003) collected water samples at seven locations in Placentia Bay in June and August 1998 and conducted chlorophyll *a* sampling in order to estimate the density of the phytoplankton standing crop. Samples were collected from surface waters (5 m depth) at six sites within inner Placentia Bay, and at one site in the outer bay. Results showed concentrations of chlorophyll *a* were higher in the inner bay than the outer site. Overall, chlorophyll *a* concentration was highest in April. Copepod, krill, amphipod and euphausiid species dominate the zooplankton community, which is most abundant between mid-April and mid-June. Zooplankton also includes meroplankton (the planktonic egg and larval stages of fish and invertebrates). It was found that the distribution of pelagic eggs and early larval stages were consistent with passive drift; but that later stages of larvae frequently concentrated on the western side of Placentia Bay, which suggests larger larvae may be actively swimming 'upstream' of smaller larvae to areas where food is more abundant. They also noted changes in size of recently hatched larvae from pelagic species, with size decreasing throughout the spawning season, likely in relation to seasonal decreases in egg diameter and fecundity. In contrast, larvae from demersally-spawned eggs increased in size over the spawning season (same time period), which may be due to increased retention and growth rates. The highest concentrations of American plaice and Atlantic cod eggs were on the western side of Placentia Bay, and near Bar Haven Island and southern Burin Peninsula. Stage I cod eggs were concentrated in three areas: Perch Rock; Bar Haven; and Oderin Bank. Stage II eggs of both cod and American plaice were also abundant southwest of Merasheen Island. Surveys of spawning and post-spawning season of 1997 and 1998 found that densities of Atlantic cod eggs were highest during early spring, and decreased as the year progressed. Cod was the least abundant of the larval species sampled.

Offshore

The greatest abundance of phytoplankton on the Grand Banks typically occurs in late April to early May within the top 30 to 50 m of the water column. The spring bloom on the Grand Banks is dominated by diatoms. A second peak in phytoplankton abundance occurs on the northern Grand Bank in fall, when dinoflagellates and other microflagellates dominate the plankton community. In years with extensive ice cover, the spring phytoplankton bloom may be delayed until there is enough warming of the surface layer to provide vertical stability and promote phytoplankton growth.

Ichthyoplankton also constitutes a portion of the zooplankton that is collected during surveys on the Grand Banks. Common species observed in the meroplankton during surveys include Atlantic cod, American plaice, sand lance, redfish, capelin, lantern fish (*Nannobrachium achirus*), alligator fish, sculpin, sea snail, white hake (*Urophycis tenuis*), haddock (*Melanogrammus aeglefinus*), wolffish, witch flounder, yellowtail flounder and Greenland halibut (Dalley et al. 2000).

Although warming of sea surface temperatures have been observed in the North Atlantic since the late 1990s, there has not been an observed corresponding change in the seasonal cycle of most phytoplankton and zooplankton species.

2.2.2. Benthos

Nearshore

The benthic communities of the Placentia Bay marine ecosystem include intertidal, shallow sub tidal and sub tidal bottom-dwelling organisms. Dominant fauna in intertidal and shallow sub tidal habitat include blue mussel (*Mytilus edulis*), green sea urchin, common periwinkle, barnacle, frilled anemone, horse mussel (*Modiolus modiolus*), and various amphipods and isopods. In deeper areas of the bay, polychaetes, amphipods, sand dollar, sea urchins, sea stars, scallops, mussels and brittle stars (Class Ophiuroidea) dominate. In recent years, the invasive European green crab (*Carcinus maenas*) has also been observed in Placentia Bay.

Soft-sediment benthic macro fauna studies were carried out in Placentia Bay in 1998 by Ramey and Snelgrove (2003). Benthic macro fauna were sampled at six deep water locations (210 to 230 m) and one other location at 67 m depth. Sampling occurred mainly within the inner bay at six locations: head of Placentia Bay (one site); Western Channel (two sites); Eastern Channel (two sites); and in Central Channel between Merasheen Island and Long Island (one site). The seventh sampling site was further out in the bay near Oderin Bank. Distinct infaunal communities occurred at each site, with the highest macrofaunal densities occurring at the Oderin Bank site. At all sites, densities of macro fauna were greatest in the upper 3 cm of the sediment. Species richness was also highest at Oderin Bank than at other sampling sites. Dominant taxa included polychaete species, a bivalve (*Thyasira* sp.) and various nemertean worms (ribbon worms); amphipods were also abundant at the Oderin Bank station but not at other sites.

Underwater video collected during the fall and winter of 2011/2012 in the Nearshore Study Area using ROV (Stantec 2012b) indicated that sand dollars were very common in sandy habitats, and sea urchins characterized rocky habitat. Rock crabs, hermit crabs, sea stars, barnacles, broken shells, sea gooseberries (planktonic) and frilled anemones were also observed. Most of the macro fauna occurred on sand and fine substrate.

The body burden of blue mussels and rock crab were sampled inside and outside the harbour in 2001 (VBNC 2002). Metal concentrations in mussel tissue were highest in those collected at the head of Argentia Harbour. No differences in concentrations of organic parameters (hydrocarbons) were detected in blue mussel tissue collected from inside and outside the harbour. No clear spatial trend in analyte loading amongst rock crab tissue collected within and outside Argentia Harbour was indicated, although rock crab skeletal muscle did have arsenic levels above MAL, both within and outside Argentia Harbour.

Offshore

The benthic community is very diverse in the Offshore Project Area because of the range of depths and substrate types. This area is known to support a variety of infaunal and epifaunal benthic species including sand dollars, anemones, clams, sea cucumbers, bryozoans, coral, ascidians, urchins, hydroids, polychaete worms, and several crab species. Images of the seabed from the West White Rose area are consistent, showing varying densities of sea stars, brittle stars and bivalves. In terms of mean relative abundance (percent of total), polychaetes were found to be the most abundant benthic invertebrate on the Grand Banks during EEM programs conducted since 2004. Many of these polychaetes are deposit feeders (e.g., Spionidae, 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 metre in areas with suitable habitat (i.e., loosely packed sediment, grain size less than 230 µm and 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.

Soft coral species can occur at shallower depths on the Newfoundland continental shelf, as discovered during DFO RV surveys (Edinger et al. 2007; Gilkinson and Edinger 2009). Identified corals in the vicinity of the Offshore Study Area include Alyconancean (*Anthomastus grandiflorus*; *Capnella flordia*; *Gersemia rubiformis*), Neptheid (unknown species), Pennatulidacea (*Pennatulidae* species) and Gorgonians (*Paragorgia arborea*; *Acanella arbuscula*; *Acanthogorgia armata*; *Keratoisis ornate*; and *Paramuricae* spp., *Radicipes gracilis*) (Gilkinson and Edinger 2009).

2.2.3. Fish and Invertebrates

Nearshore

In the nearshore of Placentia Bay, species such as cod, cunner, winter flounder, lumpfish and herring (*Clupea harengus*) are frequently associated with habitats such as eelgrass, kelp beds or cobble. Soft sediment habitat (e.g., sand or mud) provide refuge for benthic species such as American plaice and winter flounder. Capelin, herring and sand lance form nearshore pelagic schools near the surface, particularly at night and are important forage fish species for higher trophic levels. Several fish species migrate seasonally to Placentia Bay and the coastal area of Cape St. Mary's. In spring, this includes Atlantic herring, capelin and Atlantic cod. In autumn, Atlantic mackerel (*Scomber scombrus*) and possibly herring migrate into the bay. During summer months, Atlantic salmon, brook trout, brown trout (*Salmo trutta*) and American eel (*Anguilla rostrata*) migrate to and from rivers and feed in Placentia Bay. During winter, many of the species that use the shallow areas of Placentia Bay likely migrate to deeper waters, such as lobster (*Homarus americanus*), snow crab and winter flounder. American plaice, Atlantic cod, cunner, winter flounder, lumpfish, capelin, wolffish (*Anarhichas* spp.), herring, mackerel and sand lance all reproduce in Placentia Bay, and many of them rely on coastal habitats for spawning and refugia.

Data collected during the 2009 and 2011 DFO Research Vessel (RV) spring and fall surveys cover the Nearshore Study Area; the 2010 survey did not sample within the Nearshore Study

Area. Although there is considerable annual variability, common species in 2009 and 2011 included Atlantic cod, American plaice, shrimp species, thorny skate (*Amblyraja radiata*) and basket stars. Species that were uncommon during the 2009 and 2011 DFO RV survey of the Nearshore Study Area included Atlantic halibut (*Hippoglossus hippoglossus*), Atlantic herring, capelin, four beard rockling (*Enchelyopus cimbrius*), Greenland halibut (*Reinhardtius hippoglossoides*), sculpin species (Superfamily Cottoidea), eelpout species (Family Zoarcidae), redfish (*Sebastes* spp.), snow crab, squid, witch flounder (*Glyptocephalus cynoglossus*) and yellowtail flounder (*Limanda ferruginea*). Many of these commercial species are uncommon in the nearshore, and pelagic species that may be common (such as capelin and herring) likely have low catchability with the shrimp trawl gear used.

Species that were caught at shallow depth (less than 60 m) included American plaice, Atlantic cod and wolffish species in 2009. The 2011 survey focused on deeper water areas (247 to 267 m), and therefore is more indicative of species at the deep-water mating sites. The primary species caught included alligator fish (*Aspidophoroides monopterygius*), American plaice, Atlantic cod, Arctic cod (*Arctogadus glacialis*), capelin, basket star, Greenland halibut, northern shrimp (*Pandalus borealis*), sea snail (*Liparis atlanticus*), other shrimp species, snow crab, thorny skate, toad crab and wolffish.

During ROV surveys of fish and fish habitat in Argentia, few fish and shellfish were observed; flounder (likely winter flounder), longhorn sculpin, little skate, snow crab, rock crab and one unidentified species of fish occurred in very low numbers (Stantec 2012b).

Offshore

The Offshore Study Area includes most of Northwest Atlantic Fisheries Organization (NAFO) Divisions 3L, 3M and 3N (3LMN), and much smaller portions of Divisions 3O and 3K. The Offshore Project Area is located within UA 3Lt. There are a number of fish species that are commercially harvested. A detailed description of these species was provided in the EA Report and additional information.

Fish and invertebrate species in the Study Area include: snow crab (*Chionoecetes opilio*), northern shrimp (*Pandalus borealis*), Thorny Skate (*Raja radiata*), Arctic cod (*Boreogadus saida*), yellowtail flounder (*Limanda ferruginea*), Greenland halibut (turbot) (*Reinhardtius hippoglossoides*), sand lance (*Ammodytes* spp.), capelin (*Mallotus villosus*).

Snow Crab prefer water temperatures ranging from -0.5^{o}C to 4.5^{o}C. Soft bottom substrates (mud or mud/sand) and water depths between 20 m and 2000 m are primarily habitat for larger snow crabs. Smaller crabs can be found on soft or hard substrates. Mating occurs in early spring with the females carrying the fertilized eggs for one to two years. Hatching occurs in late spring to early summer, with larvae remaining in the water column for up to 15 weeks before settling on the bottom. Snow crab feed on fish clams, polychaete worms, brittle stars, shrimp, and crustaceans, including smaller snow crab.

Northern shrimp occur primarily in areas where the substrate is soft mud and bottom water temperatures range from 0^o to 4^oC typically in waters offshore of Newfoundland and Labrador where depths range between 150 and 350 m. Larvae are released into the water column in April and May, and settle to the bottom from July to September. The reproductive cycles of most northern shrimp stocks are synchronous with the local spring phytoplankton bloom. Spawning occurs in late summer and fall and females retain the fertilized eggs until the following spring, when the eggs are released. The eggs hatch and larvae remain pelagic for a few months before settling to the benthos. Adult shrimp are benthic during the day and feed on detritus, phytoplankton and small invertebrates. At night the shrimp migrate vertically in the water column to feed in surface waters.

Yellowtail flounder can be found along the continental shelf at depths ranging from 10 to 100m. Yellowtail flounder are most densely distributed in the warmer waters of the Tail of the Grand Banks and also along the Laurentian Channel slope, although historically their distribution also included the northern Grand Banks. This species is relatively sedentary and does not undergo migrations. Spawning occurs primarily on the central and southern portion of the Grand Banks, although it can occur in the northern portion, and spawning is thought to occur between April and June. Yellowtail flounder eggs are deposited on the bottom and float to near the surface once fertilized. Newly settled juveniles select mud- and sand-dominated substrate, and the Southeast Shoal of the Grand Banks is known to be an important nursery area for yellowtail flounder.The diet consists of polycheates, amphipods, shrimp, cumaceans, isopods, and small fish.

Greenland halibut (turbot) are large, demersal flatfish that are distributed in Canadian waters from northern Labrador to the Grand Banks and also occur in the Gulf of St. Lawrence. Greenland halibut show a preference for temperatures between -0.5°C and 3°C. They occur within the Offshore Study Area and are known to concentrate along the northeast edge of the Grand Banks and on the northeast Newfoundland Shelf. Greenland halibut also occur less commonly along the southeast and southwest slopes of the Grand Banks and the Laurentian Channel. Greenland halibut are relatively common in the Offshore Project Area during the fall, but are distributed at the edge of the Grand Banks during spring. Eggs and larvae remain pelagic over deep waters until settling. As juveniles (less than 20 cm), Greenland halibut mainly feed on small crustaceans and squid, and as they grow (20 to 69 cm) they mainly feed on capelin. As large (greater than 69 cm) adults, Greenland halibut feed mainly on demersal fish.

Capelin may occur within the Offshore Project Area during spring or fall. Capelin spend most of their time offshore, but the 3KL stock of capelin migrate to the coastal beaches of Newfoundland to spawn in June and July. The NAFO Division 3LK capelin stock is concentrated on the northern Grand Banks and straddles the 3L and 3K Divisions for much of the year, and is concentrated in 3K during fall.

2.2.4. Commercial Fisheries

Nearshore

The composition of the harvest from 3Psc during the period 2005 to 2010, by weight and value, show, cod is by far the most important species harvested in the area, accounting for just over half of the catch by weight, followed by snow crab (16.3 percent) and herring (approximately 10 percent). Although snow crab comprised only 16 percent of the overall quantity of harvest, given its high product value it accounted for over 35 percent of the landed value during 2005 to 2010. In terms of value, cod and snow crab together made up nearly 80 percent of the average annual value. Although the herring fishery is important, especially as bait, it does not have the same economic value as the other key species fisheries. While lobster accounts for only a small percentage by weight of the overall 2005 to 2010 catch (less than 1 percent), given its consistently high value, this species remains very important to many area fishers (just over 5 percent of the total catch value). The fisheries in Placentia Bay are conducted year-round, although in recent years the overall catch has been much less evenly distributed throughout the year compared to a decade ago. Since the 3Psc ground fishery reopened in the mid-1990s, the peak harvesting months in terms of quantity of harvest have been June and July and this is still very much the case in 2012. This pattern is influenced by the cod fishing activities, which generally occur throughout all months except April. However, May and June are the two highest months by value, owing to the large harvest of high-value snow crab in May.

Offshore

The principal fisheries are northern shrimp and snow crab, which together accounted for 76.6 percent of the harvest by quantity and 86.2 percent by value in those years. The remaining fisheries are ground fish (mainly yellowtail flounder and turbot (Greenland halibut)) and a variety of deep water bivalves (clams, scallops), along with smaller quantities of large pelagic species (swordfish, tunas). The majority of the harvesting occurs from May to August and lowest during fall and winter. The snow crab fishery is the only species harvested within the Offshore Project Area in recent years and represents the highest value in the Offshore Study Area, and is the second largest in terms of quantity, accounting for 56.5 percent by value and almost 33 percent by quantity. Snow crab seasons may vary somewhat each year by quota/license category, depending on when quotas are taken, or if other factors intervene, such as the presence of too much soft shell crab. However, it usually occurs within the April to July period.

2.2.5. Marine Mammals and Sea Turtles

There are 21 species of marine mammals that are known to occur in the nearshore or offshore Study Area, including 17 species of cetaceans and four species of seals that are known to occur in the area. Baleen whales most likely to be found in the Study area include the blue (*Balaenoptera musculus*), fin (*B. physalus***)**, sei (*B. borealis*), humpback (*Megaptera novaeangliae*), and minke (*B. acutorostrata*). Toothed whales include the sperm (*Physeter macrocephalus*), northern bottlenose (*Hyperoodon ampullatus*), Sowerby's beaked (*Mesoplodon bidens*), killer (*Orcinus orca*), long-finned pilot (*Globicephala melaena*) whales, the common bottlenose (*Tursiops truncatus*), short-beaked common (*Delphinus delphis*), Atlantic White-sided (*Lagenorhynchus acutus*), white-beaked (*Lagenorhynchus acutus*), Risso's (*Grampus griseus*), striped (*Stenella* coeruleoalba) dolphins, and the harbour porpoise (*Phocoena phocoena*). Seal species that are likely to occur in the area are the harbour seal (*Phoca vitulina),* grey (*Halichoerus grypus*), harp (*Phoca groenlandica*) and hooded (*Cystophora cristata*) seals.

There are three species of sea turtles known to occur in the Project area. These include the Leatherback turtle *(Dermochelys coriacea)*, the loggerhead turtle *(Caretta caretta)*, and the Kemp's Ridley turtle (*Lepidochelys kempii)*. The Leatherback turtle is listed as Endangered under Schedule 1 of the *Species at Risk Act* and the most likely to occur in the Study Area.

Four species may be rare visitors in one or both of the Study Areas: the beluga whale (*Delphinapterus leucas*), North Atlantic right whale (*Eubalaena glacialis*), ringed seal (*Pusa hispida*), and bearded seal (*Erignathus barbatus*).

Nearshore

Few terrestrial mammals are found on the Argentia Peninsula since the area is an exposed brownfield site. Furbearers located onshore near Argentia include small rodents such as rats and mice, meadow vole, snowshoe hare, mink, fox and masked shrew. Numerous species of birds inhabit the Argentia Peninsula. In summer, gannet, alcid and gull nesting and shearwater foraging communities characterize the inshore zone of Placentia Bay; a substantial waterfowl population occurs in the nearshore waters of Placentia Bay in the winter. No known species at risk reside, feed, stage or overwinter on the Argentia Peninsula. There are numerous breeding pairs of Bald Eagle on Merasheen Island.

In addition to the 21 species identified above, the Northern River Otter (*Lontra canadensis*) occurs in high densities in coastal waters from the southern extent of Merasheen Island to the head of Placentia Bay. Dedicated surveys for otter haul out sites in 2006 located 21 sites used by otters in the area of Long Harbour-St. Croix Bay to the Iona Islands (Goudie 2007). River otter signs were evenly distributed among the mainland shoreline of Long Harbour proper and the archipelago complex of the Iona and Brine Islands. In April 2007, 62 otter haul out sites were identified in the head of Placentia Bay, extending from Sound Island to Bordeaux Island; 39 of those sites had signs of recent use (Goudie and Jones 2007).

Surveys of eastern Placentia Bay for marine mammals and sea turtles were undertaken from August 2006 to April 2007 to provide baseline data for the environmental impact assessment of a proposed refinery (Abgrall and Moulton 2007). Three areas in the eastern portion of the bay were each sampled on a monthly basis, usually traversing a total of 291 to 312 km each month. A total of 1,548 km were surveyed in 15 days. Within the Nearshore Study Area, there were a total of 65 not at-risk species sightings (including 13 baleen whale, 23 dolphin, 21 porpoise, and one unidentified whale sightings) and seven seal sightings during the surveys.

Offshore

Primary sources of new information on marine mammal distribution and abundance in and near the Study Area include the results of marine mammal sightings data available from DFO and environmental monitoring programs conducted in the Jeanne d'Arc Basin and north of the Study Area in the Orphan Basin. Results are summarized in the EA Report and additional information. The data indicated that the most common cetaceans in and near the Study Area are the humpback, fin and minke whales. Also, the most common dolphins and porpoises in the Study Area are the Atlantic White-sided and White-beaked dolphins and the harbour porpoise.

2.2.6. Marine Birds

Nearshore

Placentia Bay is one of the richest bays in coastal Newfoundland for marine birds. There are four Important Bird Areas (IBA) at the mouth of Placentia Bay, which are all outside of the Study Area. Cape St. Mary's Ecological Reserve, designated pursuant to the provincial *Wilderness and Ecological Reserves Act* and situated at the southeast corner of Placentia Bay, is one of the most important seabird nesting colonies in Newfoundland and Labrador. It contains the largest Northern Gannet (*Morus bassanus*) nesting colony (14,696 pairs (2011) (CWS unpublished data)), the largest, and most southerly, Thick-billed Murre (*Uria lomvia*) colony on the Island of Newfoundland and third largest Common Murre (*Uria aalge*) colony (14,789 pairs (2009) (CWS unpublished data)) in Newfoundland and Labrador. Two of the three Northern Gannet colonies in the province of Newfoundland and Labrador are on the Avalon Peninsula. The only sustained breeding site for Manx Shearwater in eastern North America is located at the Middle Lawn Islands, Burin Peninsula. Both Corbin Island and Green Island on the Burin Peninsula support more than 100,000 pairs of breeding Leach's Storm-Petrel. Placentia Bay supports large numbers of non-breeding Great Shearwaters (*Puffinus gravis*) during the capelin spawning season. As a result, the southeastern quarter of the bay is designated an IBA. There are over 365 islands in Placentia Bay, many of which support small colonies of terns, gulls and cormorants. In the winter months, several thousand Common Eider (*Somateria mollissima borealis*) and other sea duck species winter along the coast of Placentia Bay. Cape St. Mary's is an important wintering area for the eastern Harlequin Duck (*Histrionicus histrionicus*).

Placentia Bay supports one of the highest densities of Bald Eagles in eastern North America. The species has a year-round presence in Placentia Bay. The Newfoundland and Labrador Wildlife Division has developed a long-term monitoring program for nesting Bald Eagle in Placentia Bay. The survey area includes Merasheen Island, Long Island and part of the western shoreline of Placentia Bay. Extensive surveying has been conducted on at least 13 separate occasions since the late 1980s. The number of nesting pairs fluctuates from year to year, but is consistently between 20 to 30.

Offshore

Approximately 27 marine birds have been identified as occurring in the Study Area. These include species of *Alcidae* (Dovekie (*Alle alle*), Murres – Common (*Uria aalge*) and Thick-billed, Razorbill (*Alca torda*) and Atlantic puffin (*Fratercula arctica*)), *Stercorariidae* (Skuas – Great (*Stercorarius skua*) and South polar (*Stercorarius maccormicki*); Jaegers – Pomarine (*Stercorarius pomarinus*), Parasitic (*Stercorarius parasiticus*), and Long-tailed (*Stercorarius longicaudus*)); *Laridae* (Gulls – Herring (*Larus argentatus*), Iceland (*Larus glaucoides*), Glaucous (*Larus hyperboreus*), lesser (*Larus fuscus*) and Great Black-backed (*Larus marinus*), and Ivory ((*Pagophila eburnean*); Black-legged Kittiwake (*Rissa tridactyla*) and Arctic Tern (*Sterna paradisaea*)), *Sulidae* (Northern Gannet), *Hydrobatidae* (Leach's Storm-Petrels (*Oceanodroma leucorhoa*)); *Oceanitidae* (Wilson's Storm Petrel (*Oceanites oceanicus*)); *Phalaropodinae* (pharlarope – Red (*Phalaropus fulicarius*) and Red-necked (*Phalaropus lobatus*)), and *Procellariidae* (Northern Fulmar (*Fulmarus glacialis*), Greater (*Puffinus gravis*), Sooty (*Puffinus griseus*) and Manx Shearwaters). Information specifics can be found in the EA Report and additional information.

The abundance and distribution of marine birds varies depending on the season. The Northern Fulmar and Black-legged Kittiwake are common throughout the year, whereas the Great Shearwater and Sooty Shearwater is common from June to October, and absent from December to April. Leach's Storm-petrels are common from April to November. Dovekies and Thick-billed Murre are most numerous in Newfoundland waters during the winter and migration periods.

2.2.7. Species at Risk

There are a number of Species at Risk, as defined under Schedule 1 of the *Species at Risk Act* (SARA) that are likely to be in the nearshore and offshore Study Areas. The following table identifies the species likely to be present and their SARA and COSEWIC listing. SARA Schedule 1 – Endangered and Threatened listed species are described below.

Table 1 – Listing of SARA Species in the Nearshore and Offshore Study Areas

Species	**SARA Status**	**COSEWIC Status (Last Examination)**
Blue Whale (*Balaenoptera musculus*) Atlantic population	Schedule 1 - Endangered	Endangered (May 2012)
North Atlantic Right Whale (*Eubalaena glacialis*)	Schedule 1 - Endangered	Endangered (May 2003)
Leatherback sea turtle (*Dermochelys coriacea)*	Schedule 1 - Endangered	Endangered (May 2012)
Ivory Gull (*Pagophila eburnea)*	Schedule 1 – Endangered	Endangered (April 2006)
White Shark (*Carcharodon carcharias*) Atlantic population	Schedule 1 – Endangered	Endangered (April 2006)
Northern Bottlenose Whale (*Hyperoodon ampullatu)* Scotian Shelf population	Schedule 1 – Endangered	Endangered (May 2011)
Piping Plover (*Charadrius melodus melodus) Melodus* subspecies	Schedule 1 – Endangered	Endangered (May 2001)
Red Knot *rufa* subspecies (*Calidris canutus rufa*)	Schedule 1 - Endangered	Endangered (April 2007)
Northern Wolffish (*Anarhichas denticulatus)*	Schedule 1 – Threatened	Endangered (November 2012)
Spotted Wolffish (*Anarhichas minor)*	Schedule 1 - Threatened	Threatened (November 2012)
Atlantic (Striped) Wolffish (*Anarhichas lupus)*	Schedule 1 – Special Concern	Threatened (November 2012)
Fin Whale (*Balaenoptera physalus*) Atlantic population	Schedule 1 – Special Concern	Special Concern (May 2005)
Sowerby's beaked Whale (*Mesoplodon bidens)*	Schedule 1 – Special Concern	Special Concern (November 2006)
Harlequin Duck (*Histrionicus histrionicus)*	Schedule 1 – Special Concern	Special Concern (May 2001)

Blue Whales are uncommon in Eastern Newfoundland waters A Recovery Strategy (Beauchamp et. al 2009) has been published for the Northwest Atlantic population of blue whales. A recovery strategy targets the identification of critical habitat for the blue whale by 2014. There was a single possible blue whale sighting (recorded as a fin or blue whale) during seismic monitoring programs in the Jeanne d'Arc Basin, and only two sightings in the adjacent Orphan Basin (both occurring in August and water depths >2,000 m; Abgrall et al. 2008b). Blue whales are not expected to commonly occur in the Nearshore Study Area. There is little available information on the presence of blue whales in Placentia Bay.

The North Atlantic Right Whale is one of the most critically endangered large whale populations. The population is currently estimated to remain below 350 individuals. The Recovery Strategy (Brown et al. 2009) recommended a schedule of studies to further investigate critical habitat for North Atlantic right whale, including research to determine whether Roseway Basin on the Scotian Shelf constitutes critical habitat. No right whales were seen during boat-based surveys from August 2006-April 2007 in the Nearshore Study Area (Abgrall and Moulton 2007). There are no sightings of right whale in the Offshore Study Area in the DFO cetacean sightings database (DFO 2007c).

Leatherback turtles are often observed off Nova Scotia and Newfoundland from June to October, with peak occurrence in August and September. They are the most likely sea turtle to occur within either the Nearshore or Offshore Study Area. A Recovery Strategy for the Leatherback Turtle has been developed (Atlantic Leatherback Turtle Recovery Team 2006). It identifies several threats to turtles in the marine environment, including entanglement in fishing gear, collisions, marine pollution and acoustic disturbances. Critical habitat for this species has not yet been identified. Leatherback sea turtles will occur occasionally within the Nearshore Study Area during summer and fall, particularly in August and September. Leatherback sea turtles are expected to occur in low densities within the Offshore Study Area during summer and fall, particularly from July to September.

The Ivory Gull is a rare gull species that is associated with polar pack ice at all time of the year. The wintering grounds are poorly known but are generally along the southern edge of pack ice, Davis Strait, Labrador Sea, Strait of Belle Isle, northern Gulf of St. Lawrence and occasionally, Lower North Shore of Quebec and northern Newfoundland. The Canadian breeding population is estimated at 500 to 600 individuals. The goals of the Ivory Gull Management Plan (Stenhouse 2004) are to promote the recovery of the ‘Canadian breeding population to historic levels and to expand the breeding range to historically occupied areas’. Sightings of Ivory Gull are rare in the Nearshore and Offshore Study Areas.

The white shark has been listed as Endangered under Schedule 1 of SARA since 2011. The white shark, Atlantic population, has been rarely sighted in Atlantic Canada (32 records over 132 years) (COSEWIC 2006b). Many of these sightings occur in summer, including in the Bay of Fundy, coastal Nova Scotia, northeastern Newfoundland Shelf, Strait of Belle Isle, St. Pierre Bank and Laurentian Channel, suggesting Newfoundland and the Gulf of St. Lawrence are at the northern limit of its range. The white shark is extremely rare as far north as the Grand Banks and Placentia Bay and has a low likelihood of occurring in the Nearshore or Offshore Study Areas.

The abundance of Northern Bottlenose Whales in the Northwest Atlantic is unknown, but there is an estimate of 163 individuals (Whitehead and Wimmer 2005). The Northern bottlenose whales that occur in the Offshore Study Area would belong to the Davis strait-Baffin Bay-Labrador Sea population. Individuals in the Nearshore Study Area would likely come from the Davis Strait-Baffin Bay-Labrador Sea population. The proposed Recovery Strategy for the Northern Bottlenose Whale is specific for the Scotian Shelf population, with mention of the Davis Strait population. It is remotely possible that northern bottlenose whales may occur in the Nearshore Study Area, but sightings would be considered rare. The available literature and data suggest that northern bottlenose whales likely occur at low densities, possibly year-round, in the deeper waters of the Offshore Study Area.

The Piping Plover melodus subspecies is a migratory shorebird that breeds along the Atlantic coast from Newfoundland to South Carolina. It is listed as Endangered on Schedule 1 of SARA and is designated Endangered under Newfoundland and Labrador's *Endangered Species Act*. A Recovery Strategy has been published for the melodus subspecies of Piping Plover (Environment Canada 2012f). The eastern Canadian population was estimated at 481 adults in 2001. A 2006 census in Newfoundland identified 61 adult Piping Plovers. There are no records of Piping Plover for Placentia Bay; however, a sighting from Bellevue Beach, Trinity Bay indicates the possibility of rare occurrences of Piping Plover in the Nearshore Study Area during migration. The extensive sandy beaches required by Piping Plover for breeding sites do not exist in Placentia Bay.

The Red Knot breeds in the Arctic and winters along coasts from California and Massachusetts south to South America. A substantial decrease in numbers at migration staging and wintering sites in North America have given cause for concern in the North American population. The Red Knot is an uncommon southbound migrant in coastal Newfoundland, as its main migration corridor occurs west of Newfoundland. It is not expected to occur during spring migration. It prefers open sandy beaches, often with rotting kelp piles and extensive mud flats, for feeding. Such habitats occur sparingly in Placentia Bay. During shore-based surveys conducted during August to December 2006 at Arnold's Cove, Come By Chance, North Harbour and Southern Harbour, four and two Red Knot individuals were observed at Come By Chance lagoon and Southern Harbour estuary, respectively. Sightings were made in late August (at Southern Harbour) and late September (Come By Chance) (Goudie et al. 2007). Red Knot may occasionally occur in small numbers at various locations on the coast of Placentia Bay during fall migration in August to October.

Three species of wolffish are listed under Schedule 1 of SARA: spotted; northern; and Atlantic (or striped). All three species may occur in the Offshore Study Area and Nearshore Study Area (though less common in the nearshore).The northern wolffish is a benthic and bathypelagic predator that preys on a variety of prey including gelatinous zooplankton, pelagic and benthic fish. This species commonly occurs at depths from surface to 1,000 m, depending upon time of year and location. Northern wolffish is most abundant in northeastern Newfoundland. The spotted wolffish is a bottom-dwelling predatory fish that occurs in cold temperate shelf waters at depths ranging from 50 to 750 m. Surveys suggest that distribution in the western North Atlantic is concentrated off northeastern Newfoundland, though it occurs occasionally in the Gulf of St. Lawrence. The spotted wolffish is not common enough to support a commercial fishery in Canada, though it does occur as bycatch in other offshore trawl fisheries. Critical wolffish habitat has not been specifically defined, although Atlantic wolffish are known to densely concentrate at the Southeast Shoal and Tail of the Grand Bank Ecologically and Biologically Sensitive Area (EBSA) and spotted wolffish aggregate on the Northeast Shelf and Slope EBSA during spring. These EBSAs occur in the Offshore Study Area. A proposed Recovery Strategy for northern and spotted wolffish, and Management Plan for Atlantic wolffish has been developed to increase the population levels and distribution of the northern, spotted and Atlantic wolffish in eastern Canadian waters such that the long-term viability of these species is achieved (Kulka et al. 2007).

There are likely several different populations of fin whales in the North Atlantic, with western North Atlantic animals distinct from those in Iceland, West Greenland and the eastern North Atlantic. They often occur singly or in small groups of two to seven animals, but have also been observed in feeding aggregations of up to 20 individuals, sometimes with humpback and minke whales. Average fin whale group size off eastern Newfoundland was reported as 2.6 during an aerial survey in August 1980. Fin whales regularly occur in eastern Newfoundland waters, particularly from early summer to late fall. Of the identified baleen whales, fin whales were the second most commonly sighted species (after humpback whales) in the Jeanne d'Arc Basin during seismic monitoring programs from 2004 to 2008, with 110 sightings; there was at least one sighting each year from May to October. There were also several fin whale sightings within the Offshore Study Area west of the Jeanne d'Arc Basin in 2005, and six other sightings in 2008. Fin whales were also frequently observed in deep waters (typically >2,000 m) of the adjacent Orphan Basin during summer, most often in July and August. According to the DFO cetacean sightings database, fin whales were the second most frequently sighted species in the Offshore Study Area; there were 80 sightings of 162 individuals. Fin whales are most common from June to October.

Little is known about beaked whales in general, and most information on Sowerby's beaked whales in Newfoundland is based on stranding records or a few opportunistic sightings. Sowerby's beaked whales are also relatively difficult to detect at sea due to their short surface durations, apparent offshore distribution and barely detectable blows. They have most often been observed in deep waters and continental shelf edges or slopes. Sowerby's beaked whales are expected to occur most frequently in deeper waters, although in relatively low numbers. There were two unidentified beaked whale sightings during seismic monitoring in the Jeanne d'Arc Basin during 2005 to 2008. One of these sightings was deemed a species other than a northern bottlenose whale, and the observer suggested that it was likely a Sowerby's beaked whale (Lang et al. 2006). There was only one confirmed sighting of a Sowerby's beaked whale during four years of monitoring in the adjacent and deeper Orphan Basin; the sighting of four individuals occurred in 2,500 m of water during September. There was one sighting of Sowerby's beaked whale reported in the DFO cetacean sightings database in the Offshore Study Area.

The eastern population of Harlequin Duck breeds on rivers in northern Quebec (rivers draining in to the eastern side of Hudson Bay and Ungava Bay), Labrador (Nachvak Fiord to Hopedale), western coast of Great Northern Peninsula, Newfoundland, Gaspé Peninsula, Quebec and northern New Brunswick (Robertson and Goudie 1999). It winters on the coast, mainly from Newfoundland to Massachusetts, with more than half the population wintering in coastal Maine (Robertson and Goudie 1999). Cape St. Mary's supports the largest and most northerly over-wintering distribution of the eastern Harlequin Duck.. Cape St. Mary's Christmas bird count totals for the period from 1997 to 2006 range from 51 to 200 individuals, with an average of 120 (National Audubon Society 2012). Surveys for Harlequin Duck were completed in the Placentia Bay area in winter-spring 2007 using low-level helicopter searches of marine archipelago and headland areas in western Placentia Bay and southern Burin Peninsula of Newfoundland (Goudie et al. 2007). A number of concentrations of sea ducks and considerable habitat were documented, and many of these areas appeared like suitable habitat for Harlequin Duck.

2.2.8. Sensitive Areas

Nearshore

Placentia Bay is recognized as an ecologically rich and highly productive area. It supports an estimated 26 species of seabirds, 13 species of waterfowl, 10 species of shorebirds, and seven species of raptors. At least 15 bird species breed in Placentia Bay. The marine environment supports at least 14 species of ground fish, seven species of shellfish, 14 marine mammal species, and the leatherback sea turtle.

The sensitive areas within the Nearshore Study Area are discussed in detail in the EA Report. This includes information on the Placentia Bay Extension EBSA, eelgrass beds, salt marshes, capelin beaches and Important Bird Areas (IBAs) such as the Placentia Bay, Lawn Islands Archipelago and Corbin Island IBAs and Cape St. Mary's.

The Placentia Bay Extension Ecologically Biologically Significant Area (EBSA), which includes all of Placentia Bay, is ranked second by DFO (2007b) in priority among the 11 identified EBSAs within the Placentia Bay Grand Banks (PBGB) Large Ocean Management Area (LOMA) as candidate sites for designation as a Marine Protected Area (MPA).

CPAWS have identified three Special Marine Areas within the Nearshore Study Area: Placentia Bay Extension (existing EBSA); Bar Haven; and Ragged Islands.

A bird sanctuary has been established in the town of Arnold's Cove and is an important migratory stopping site for many bird species and used year-round. Species that use the sanctuary include Black Duck, Canada Goose, Pie Ducks, Mallard Duck, Ruddy Turnstone, Plomer, Spoked Sandpiper, Twillick (Greater Yellow Legs), Merganser and variety of gulls. Large concentrations of Black Ducks are known to occur at this site, and Ptarmigan, Bald

Eagles, Osprey and Cormorants also occur occasionally. The site is protected by provincial hunting regulations.

There is a Wetland Stewardship Area in the Come By Chance estuary. It was designated in 1995 to protect waterfowl staging habitat under a Municipal Stewardship Agreement (LGL 2007c). There are 4,046 ha protected, with a management unit area covering 289 ha. The wetlands provide important staging habitat for Black Duck, Canada Goose and Green-winged Teal.

The river otter has adopted a marine lifestyle in Placentia Bay and is resident year-round in relatively large numbers. The inner reaches of the Bay around Merasheen Island and Long Island are recognized to support one of the highest densities of river otter in Newfoundland and Labrador. Twenty-one sites have been identified as otter haul outs in the Long Harbour area.

Offshore

The sensitive areas within the Offshore Study Area are discussed in detail in the EA Report. This includes information on the five of the 11 EBSAs that have been identified within the PBGB LOMA that are located within the Offshore Study Area. They include: Southeast Shoal and Tail of the Banks Ecologically and Biologically Significant Area; Southwest Shelf Edge and Slope Ecologically and Biologically Significant Area; Lily Canyon-Carson Canyon Ecologically and Biologically Significant Area; The Northeast Shelf and Slope Ecologically and Biologically Significant Area; and Virgin Rocks Ecologically and biologically Significant Area. 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 being considered within this section were ranked in the bottom 4 of the 11.

The Northwest Atlantic Fisheries Organization (NAFO) has identified candidate Vulnerable Marine Ecosystems (VMEs). The following VMEs that have been identified by NAFO that occur within the Offshore Study Area are: canyons; seamounts and knolls; and coral-sponge closed areas. The candidate VMEs have been identified 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 (i.e., 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).

The Bonavista Cod Box is an experimental protected area in the Bonavista Corridor and located in the northwest corner of the Offshore Study Area. It was identified as being critical to the life cycle of Atlantic cod, and was designated as an experimental protected area in 2003 following recommendations by the Fisheries Resource Conservation Council. The Fisheries Resource Conservation Council recommended that commercial fishing (excluding snow crab trapping) and other potentially harmful activities such as seismic activities be prohibited.

2.3. Research Surveys and Vessel Traffic

Vessel traffic with respect to fishing vessels is discussed in terms of amount of commercial fishing activity (see Section 2.2.4). DFO conducts annual spring and fall surveys in NAFO Division 3L each year. The DFO Science Advisory Schedule may be accessed on-line (http://www.isdm-gdsi.gc.ca/csas-sccs/applications/events-evenements/index-eng.asp). Prior to the commencement of any, in any given year, Husky will be required to communicate with DFO to avoid any potential conflict with research surveys that may be operating in the area.

Part C: Environmental Assessment Process

3.0 Procedures

On May 28, 2012 Husky submitted a project description "*Husky Energy White Rose Extension Project – Project Description*" (Husky 2012) to the C-NLOPB. This was in support of its intention to develop the WREP to access known resources within the White Rose field, using existing infrastructure.

Initial development of the White Rose field was through excavated subsea drill centres, with flowlines bringing production to a centralized floating production platform, the *SeaRose* floating production, storage and offloading (FPSO) vessel. The White Rose field was originally developed using production from subsea wells in two subsea drill centres; the Central Drill centre (CDC) and the Southern Drill Centre (SDC), and gas injection in a third drill centre, the Northern Drill Centre (NDC). First oil from the White Rose field was produced in November 2005. In May 2010, production commenced from the North Amethyst Drill Centre (NADC), which also was tied back to the *SeaRose* FPSO for production, storage and export to tanker. The current focus of the WREP is on the development of West White Rose.

The original White Rose field underwent a Comprehensive Study level of environmental assessment in 2000 pursuant to the *Canadian Environmental Assessment Act* (the "CEA Act") (S.C. 1992, c. 37). In 2007, a further environmental assessment was undertaken on activities associated with construction of up to five additional subsea drill centres and associated flowlines under *Husky White Rose Development Project: New Drill Centre Construction and Operations Program Environmental Assessment Addendum* (LGL 2007).

The offshore component of the WREP will be contained within the Study Area of the original White Rose field. The proposed offshore infrastructure will be connected to existing infrastructure within the previous Study Area and no portion of the proposed offshore infrastructure will be located outside the boundaries of that area. The WREP was not a project described in *Comprehensive Study List Regulations* and therefore was subject to a screening level environmental assessment.

Husky, on behalf of the WREP proponents, are considering two development options to develop the WREP: a wellhead platform (WHP) development option plus up to three subsea drill centres; or a subsea drill centre development option plus up to three additional subsea drill centres. Both development options will be tied back to the existing *SeaRose FPSO* vessel. The Project will require authorizations pursuant to Section 138 (1) (b) of the *Canada-Newfoundland Atlantic Accord Implementation Act* and Section 134(1) (a) of the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act.*

The C-NLOPB, as Responsible Authority (RA), forwarded the Federal Coordination Regulations Section 5 Notification on June 7, 2012.

Fisheries and Oceans Canada (DFO) responded on 20 June 2012 and indicated that an authorization pursuant to Section 35 (2) of the *Fisheries Act* for the harmful alteration, disruption or destruction (HADD) of fish habitat would be required for some components of the project, including dredging at the Argentia casting site. DFO will ensure implementation of mitigation measures and follow-up monitoring for these project components

Environment Canada (EC) responded on 26 June 2012 that the proposed project would require a permit under Schedule 1, Part 1, Paragraph 3 of Section 127(1) of the *Canadian Environmental Protection Act*, 1999 for disposal of a substance at sea.

Transport Canada (TC) responded on 16 July, 2012 that the proposed project may require approval under Part 1, Section 5 of the *Navigable Waters protection Act* for any man-made structure, device or thing, whether temporary or permanent, that may interfere with navigation within a 12 nautical mile limit of the coastal shoreline.

On July 6, 2012, the *Canadian Environmental Assessment Act* (S.C. 1992, c. 37) was repealed when the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) came into force. The Minister of the Environment designated this project pursuant to subsections 124(2) and 14(2) of CEAA 2012 so the screening for the project continued under the former *Canadian Environmental Assessment Act*.

On October 30, 2012, Husky were informed by the Newfoundland and Labrador Department of Environment and Conservation (NLDEC) that the project activities associated with the Argentia Peninsula and Placentia Bay portion of the project were subject to an Environmental Preview Report. In order to fulfill the requirements of both the *Environmental Protection Act* and the *Canadian Environmental Assessment Act*, an agreement was reached between the C-NLOPB, as the Federal Environmental Assessment Coordinator (FEAC) for the Screening level EA, and the NLDEC that a single harmonized environmental assessment process could accommodate the Province's information and review process requirements.

The scope of the provincial EA is confined to project details regarding the Argentia Peninsula and activities in Placentia Bay and requires Minister of Environment and Conservation approval under Section 54 of the *Environmental Protection Act* and Section 7 of the *Environmental Assessment Regulations*. A provincial EA committee was appointed to prepare the information requirements for the EPR.

The C-NLOPB, DFO, EC and TC are Responsible Authorities and must undertake an environmental assessment of the Project. The C-NLOPB is the FEAC for this Screening.

The Scoping Document issued to Husky on December 18, 2012 provided scoping information for the screening level EA and the EPR.

On December 20, 2012, Husky submitted the "*Husky Energy White Rose Extension Project Environmental Assessment*" Report (herein referred to as the EA Report). The C-NLOPB forwarded the EA Report on 21 December 2012 to DFO, EC, TC, Natural Resources Canada (NRCan), the Department of National Defence (DND) and the provincial Department of Environment and Conservation (NLDEC). A copy of the EA report was also provided to One Ocean and the Fish, Food and Allied Workers (FFAW).

Comments on the EA Report were received from DND, TC, NLDEC, NRCan, DFO, EC and the FFAW. In order to address deficiencies in the EA Report, Husky was required to provide a response to the EA Report comments. Husky responded on April 22, 2013 and the C-NLOPB forwarded the response on 23 April 2013 to DND, TC, NL DEC, NRCan, DFO, EC, and the FFAW. Husky's response to the EA Report review comments did not satisfy all of the information requirements. Husky were asked on May 24, 2013 to address the outstanding comments. Husky provided a response on June 26, 2013.

It is the obligation of the RAs to consider which physical works and undertakings in relation to the proposed project fall within the scope of the Project. If the Project were to proceed, as set out in the application and supporting EA Report and additional information, it would constitute a single project for the purposes of section 15(2) of CEA Act (S.C. 1992). For the purposes of subsection 15(3) of CEA Act (S.C. 1992), the scoping exercise is complete because an assessment was conducted in respect of every construction, operation, modification, decommissioning, abandonment, or other undertaking proposed by Husky that is likely to be carried out in relation to their proposed Project.

3.1. Scope of Project

The operator, Husky and its co-venturers are considering two development options to develop the WREP: a WHP development in the West White Rose pool plus up to three future subsea drill centres; or a subsea drill centre development in the West White Rose pool plus up to three additional future subsea drill centres. Primary infrastructure for both development options will be located within a 1 km radius circle centred on 724 080.00 E 5 187 208.00 N (NAD 83, Zone 22) within the White Rose pool. The water depth in the area is between 115 and 120 m.

The WHP development option will include engineering, procurement, construction, fabrication, installation, commissioning, development drilling, operations and maintenance, and decommissioning activities.

The WHP will consist of a concrete gravity structure (CGS) with a topsides consisting of drilling facilities, wellheads and support services such as accommodations for 120 to 130 persons, utilities, flare boom and a helideck. The topsides will be constructed at an existing fabrication facility (the location of which will be determined during engineering) and is therefore not considered part of this Project Description.

The primary function of the WHP is drilling. There will be no oil storage in the CGS. All well fluids will be transported via subsea flowlines to the *SeaRose FPSO* for processing, storage and offloading. The design of the WHP will account for the risks posed by icebergs, sea ice and the harsh environmental conditions found offshore Newfoundland and Labrador. The productive life of the WHP facility is currently planned to be 25 years.

The WHP development option will entail constructing the CGS in a purpose built graving dock. A review of potential onshore CGS construction sites on the island of Newfoundland was undertaken and Argentia was identified as the most suitable location for the construction of the CGS The CGS will be constructed in the dry, meaning all concrete construction will be completed in a de-watered graving dock. Upon completion of the CGS, the CGS structure will be floated to one of two potential deep-water sites in Placentia Bay, where it will be mated with the topsides structure. The WHP will then be towed to and installed in the western portion of the White Rose field and tied back to the *SeaRose FPSO*. The WHP development option may be developed in conjunction with new subsea drill centres using subsea drill centre technology.

Under the subsea development option for West White Rose pool and any other future resources, it will be comprised of an excavated subsea drill centre into which subsea well infrastructure will be placed. Drilling of the wells will be done from a semisubmersible drilling rig. The subsea drill centre will be tied back to the *SeaRose FPSO*. The connections from new subsea drill centres to existing infrastructure have not been determined. Productive life of the subsea infrastructure will be 20 years, which is similar to the design life of the existing subsea infrastructure in the White Rose field.

At the time of application for subsequent program authorizations or permits in the Study Area, Husky will be required to provide information to the Responsible Authorities that outlines the proposed activities, confirms that the proposed program activities fall within the scope of the previously assessed program, and indicates if with this information, the EA predictions remain valid. In addition, Husky will be required to provide information regarding the adaptive management of requirements of the *Species at Risk Act* (SARA) into program activities (e.g., introduction of new species or critical habitat to Schedule 1; additional mitigations; implementation of recovery strategies and/or monitoring plans). If there are any changes in the scope of project, or information becomes available which may alter the EA conclusions, then a revised EA will be required at the time of authorization renewal. The Canadian Environmental Assessment Registry will be updated as required. In addition, there may be information requirements to satisfy permitting requirements related to project activities.

3.2. Boundaries

The boundaries of the Project, as defined in the EA Report, are as follows.

Boundary	**Description**
Temporal	**WHP Option** – 2013 – 2016 for construction activities; 2017 - 2042 for installation, production, maintenance, After 2042 for decommissioning & abandonment **Subsea Drill Centre Option** – 2014 – 2015 for construction activities;2016 – 2036 for production; After 2036 for decommissioning & abandonment Year-round for all activities associated with both the WHP development option and subsea drill centre option.
Project Area	**Nearshore** (WHP option only): The on-land and marine area within Port of Argentia Harbour and the deep-water topsides mating site. See table below for coordinates. It is defined as the area within which WREP activities will occur. **Offshore**: The Offshore Project Area is defined by the existing White Rose field. Comprised of the following licence areas: PL 1006, PL 1007, PL 1008, PL 1009 and PL 1010. SDL 1018, SDL 1019, SDL 1020, SDL 1023, SDL 1024, SDL 1025, SDL 1026, SDL 1027, SDL 1028, SDL 1029, SDL 1030 and SDL 1045.
Study Area	**Nearshore** (WHP Option only): Defined by modeling WREP-environment interactions, such as accidental events, and considers all WREP-environment interactions. See table below for coordinates.

	Offshore: Defined by modeling WREP environment interactions, such as accidental events and emissions and discharges, and considers all WREP-environment interactions. See table below for coordinates.

		UTM (meters) zone 21		WGS 84 (Decimal Degrees)	
Location	Area	X	Y	X	Y
Near shore Project Area	Centre	711553.08	5252017.1	-54.196931	47.387321
	Top left	701528.95	5265682.7	-54.323369	47.513321
	Top right	733038.34	5246337.1	-53.915636	47.328976
	Bottom right	727991.67	5240319.9	-53.985413	47.276684
	Bottom left	692017.9	5251901.4	-54.455545	47.392317
Near shore Study Area	East shore point	725495.22	5234238.8	-54.021443	47.2229
	West shore point	648349.08	5233114.8	-55.040065	47.234751

		UTM (meters) zone 22		WGS 84 (Decimal Degrees)	
Location	Area	X	Y	X	Y
Off Shore Study Area	Top left	427103.83	5543230.38	-52.02	50.04
	Top right	1189817.31	5583246.57	-41.37	50.00
	Bottom right	1218334.69	4687216.03	-42.33	42.01
	Bottom left	414399.72	4652075.61	-52.03	42.02
	Centre	814249.07	5110684.20	-46.94	46.08

For seismic programs (VSPs, geohazard/well surveys) undertaken, there would also be an area of influence from the sound array. However, depending on the marine species present, this area of influence will vary in size. Hearing thresholds have been determined for a number of species (seals and odontocetes), but the threshold is not known for others (baleen whales). The sound that is actually received by the marine species depends on the energy released from the source and its propagation (and loss) through the water column. Therefore, the hearing ability of the species and background noise will affect the amount of noise from an airgun array detected.

3.3. Scope of Assessment

For the purpose of meeting the requirements of the CEA Act the factors that were considered to be within the scope of an environmental assessment are those set out in subsection 16(1) of the CEAA (S.C. 1992) and those listed in the "*Husky Energy White Rose Extension Project Scoping Document*" (C-NLOPB 2012).

4.0 Consultation

4.1. Consultation carried out by Husky

Husky conducted three open houses in Placentia, Marystown and St. John's in June 2012. The open houses provided an opportunity for Husky to present information on key components of the WREP and for stakeholders to discuss the WREP directly with Husky. The open houses were accessible to any interested member of the public and were advertised in local newspapers and on local radio to encourage maximum participation. Husky also met with local community leaders to discuss their interests and concerns in regard to the WREP. The open houses included one session per community. Attendance was open to all members of the public, with a total of 113 people attending. Information about the WREP was provided on display boards and there was an opportunity for the general public to speak directly with members of Husky's team. Exit surveys were provided to all attendees; 33 completed surveys were submitted to Husky at the Placentia open house, four at Marystown and 28 at St. John's.

Minimizing the effects on the environment, particularly on fish and on Placentia Bay was identified as important by attendees at all open house sessions.

Many open house attendees stated that they believe Husky is taking the necessary steps to minimize negative effects of the WREP. Suggestions for ways that Husky can address public concerns regarding the proposed development of the WREP included:

- Careful research, planning and implementation of the WREP to minimize negative effects
- Providing WREP information online and keeping this information updated

Various Non-Government Organizations were invited to attend a presentation and/or provide comments/queries to Husky on the Project Description.

Nearshore Fisheries Consultations

During preparation of the environmental assessment, Husky consulted with Nearshore Study Area and Nearshore Project Area fisheries representatives, individual fishers, and relevant agency managers. Fishers from various homeports were invited to attend meetings held on June 14, 2012 in Arnold's Cove and Placentia, and in Petit Forte on June 15, 2012. Other fishers on the west side of Placentia Bay, from the communities of Davis Cove and Monkstown, who were not able to attend the Petit Forte meeting, were interviewed by telephone. A meeting with FFAW managers and One Ocean was held in St. John's on May 31, 2012. Additional follow-up telephone calls and emails were used to supplement these meetings. Concerns expressed are described in full detail in the EA Report.

Offshore Fisheries Consultations

The consultation meeting with the FFAW held on 20 September opened with a presentation by Husky on proposed offshore activities. Following this presentation fishers and FFAW representatives raised a number of questions and concerns that fall into three basic categories: safety zone expansion; radio communication; and timing of the WHP tow out. Concerns expressed are described in full detail in the EA Report.

The RAs are satisfied that the consultations carried out by Husky, and reported on in the EA Report, during the preparation of the environmental assessment included all elements of the Project. The RAs are not aware of any public concerns with respect to the environmental effects of the project, and do not require that further consultations be undertaken.

4.2. Consultations with other Federal Authorities and Other Government Departments

Husky provided an overview presentation on the WREP to several government agencies including:

- Environment Canada
- DFO
- Transport Canada
- Newfoundland and Labrador Department of Environment and Conservation
  - Environmental Assessment Division
  - Pollution Prevention Division
  - Water Resources Management Division
- Service NL
- C-NLOPB
- Town of Placentia.

Each of these agencies have had input into the content of the Project Description, environmental assessment and/or Registration documents.

Husky and its consultants have engaged representatives of government agencies to ensure an ongoing exchange of information that has been useful in preparation of the environmental assessment (and Socio-Economic Impact Statement). As well, Husky met with One Ocean, the FFAW and individual local fishers to exchange information that also assisted in the preparation of the environmental assessment.

On December 20, 2012, Husky submitted the "*White Rose Extension Project Environmental Assessment*" Report. The C-NLOPB forwarded the EA Report on 21 December 2012 to DFO, EC, TC, NRCan, DND and the NL DEC. A copy of the EA Report was also provided to One Ocean and the FFAW.

EC responded on 6 March 2013. Environment provided several comments regarding Husky's discussion on: disposal of materials; hydrocarbon spills, including the modelling; wind and wave climatology; ice and icebergs; information on birds; environmental management; and the effects of the environment on the project.

DFO provided comments on 1 March 2013. DFO requested further information on discharges for the offshore and nearshore. They also questioned the modelling, the size of the ecological footprint of the CGS and the accuracy of the existing environment of multiple species.

NRCan responded on 28 February 2013. NRCan requested further information on whether the URS seismic hazard values were mean or median values before they are used in design.

The FFAW responded on 21 February, 2013. The FFAW stated that they had concerns on the future impact of the project on current and future fisheries, accidental events and invasive species. They also raised the issue of compensation and ongoing communication amongst the two industries.

The NL DEC, on behalf of the Government of Newfoundland and Labrador, submitted comments 18 February, 2013. They requested information on all potential discharges, details on the handling water entering the settling pond and its subsequent re-release to sea and information on groundwater flow, quality and treatment. They also identified a number of approvals, regulations and monitoring programs that were required.

TC provided comments on 13 February 2013. They consisted of required approvals, permits and the submission of the final design of the graving dock.

DND provided comments on 7 February 2013 requesting that their original input during the scoping phase be included.

For the other agencies contacted, either no response was received, or they responded that they did not have any environmental assessment requirements for the proposed drilling program.

In order to address deficiencies in the EA Report, Husky was required to provide a response to the EA Report comments. Husky responded on April 22, 2013 and the C-NLOPB forwarded the response on 23 April 2013 to DND, TC, NL DEC, NRCan, DFO, EC, and the FFAW. Husky's response to the EA Report review comments did not satisfy all of the information requirements.

Husky were asked on May 24, 2013 to address the outstanding comments. Husky provided a response on June 26, 2013 and this was forwarded to reviewers for their consideration.

Based on a review of this information the C-NLOPB, DFO, TC and EC have completed their review of the environmental assessment report and have sufficient information to complete the screening report.

The Minister of Environment and Conservation, following review of comments from the public and recommendation from the Assessment Committee, determined on August 21, 2013 that the EA Report and Addendum was considered satisfactory and that the project is released from further environmental assessment, subject to the following conditions:

- A Groundwater Monitoring Plan must be submitted to and approved by the Minister of Environment and Conservation prior to the start of dewatering of the Graving Dock site.

- The 2007 White Rose Expansion Project Framework Agreement must be amended to include benefit requirements for the Wellhead Platform Project as negotiated with the Province. These amendments must be finalized and approved by the Minister of Natural Resources prior to the commencement of any construction activities.

5.0 Environmental Effects Analysis

5.1. Methodology

The RAs (C-NLOPB, EC, DFO and TC) reviewed the environmental effects analysis presented by Husky in the 2013 EA Report and additional information. The environmental assessment methodology and approach used by the Proponent is acceptable to the RAs. The following environmental effects analysis uses the information presented by the Proponent and takes into consideration mitigation proposed by the Proponent and those required by the RAs, to assess the potential for residual environmental effects.

The potential adverse environmental effects, including cumulative effects, were assessed with respect to:

- magnitude of impact
- scale of impact (geographic extent);
- duration and frequency;
- reversibility; and

- ecological, socio-cultural and economic context, and after taking mitigation measures into account,
- significance of residual effect.

The potential effect significance of residual effects, including cumulative effect, for each VEC is rated in this environmental screening report as follows.

0. = No Detectable Adverse Effect
1. = Detectable Effect, Not Significant
2. = Detectable Effect, Significant
3. = Detectable Effect, Unknown

Upon review of the information of the effects assessment presented by Husky in the EA Report and additional information provided, including proposed mitigations, the effects assessment follows.

5.2. Effects of the Environment on the Project

Nearshore

Bathymetry is a primary consideration during tow-out of the CGS and for the mooring systems necessary to maintain the position of the CGS at the deep-water mating site during installation of the topsides. For the nearshore, extreme wind waves and currents can affect towing operations, vessel maneuvering and increase stress on moorings, which can lead to mooring failure. Surface sea temperature in the area can fall below 0°C from January to April so that exposure to water at this temperature may pose a risk to personnel and to exposed surfaces. The combination of low air and sea temperature, strong winds, and high waves can lead to vessel or CGS icing. These issues were considered in the design of the construction site and factored into the scheduling of activities. Husky has an ice management plan for its existing operations in the White Rose field that will be modified to include activities to be conducted in Argentia/Placenta Bay. The existing ice management practices used by Husky provide a safe environment and will minimize operational disruptions caused by ice. Mitigations have been identified and will be employed during the nearshore activity.

Offshore

The variable and sometimes harsh climate on the Grand Banks and the potential for sea ice and icebergs during the winter and spring months can pose significant challenges to drilling operations. Effects of the environment on the Project include those caused by visibility, geohazards, wind, ice and icing, waves, currents and biofouling. Also, devleoping issues such as sea level rise, increased storm intensity and frequency associated with climate change may pose new risks. The physical variables were described in the EA Report and additional information. Effects of the environment will be mitigated by state-of-the-art weather forecasting, ice surveillance and management procedures, operating limits, timing, selection of suitable vessels, properly designed equipment, risk assessment processes and personnel trained to work offshore safely and responsibly. As part of its monitoring program, Husky will have marine weather observers and an active ice management plan that will be amended as required to reflect operational procedures to be implemented in the event of an iceberg threat to the new subsea flowlines. If the WHP option is selected, the design basis for the CGS will incorporate the potential for structural impact from ice. The subsea drill centre option incorporates protection from icebergs in its design.

The marine environment will have an effect on the WREP, however Husky's commitment to apply all the applicable and appropriate standards for design, planning and development as well as mitigation measures to maintain risk as low as reasonably practicable, including but not limited to those noted above, there are no likely significant environmental effects on the WREP.

5.3. Graving Dock & CGS Construction, CGS Tow-out and Topsides Mating

5.3.1. Fish and Fish Habitat 1

Increases in light levels and lighting at night may interrupt the normal circadian rhythm of fish and shellfish, although studies to date have found responses are very species-specific. Increased exposure to light has the potential to result in changes in behaviour, spatial distribution, migration and reproduction. Light is also known to attract or repel species and species distributions may be altered in artificially lighted areas, particularly for pelagic fishes (e.g., herring, sand lance) and squid that are known to be attracted to light. Many planktonic species are phototaxic and float toward the surface during the day but settle in deeper water at night. Consequently, this natural vertical movement may be altered by artificial light over long periods of time.

Potential effects of sedimentation on organisms include direct effects such as smothering (decreased gas exchange), toxicity (exposure to anaerobic sediment layers or contaminated sediment), reduced light intensity, and physical abrasion, as well as indirect effects such as changes in substrate characteristics. Increased levels of suspended sediment can reduce the availability of light in the photic zone and may reduce local primary production, particularly if sediment loading occurs just prior to, or during, a phytoplankton bloom. This could have effects on higher trophic levels including fish and shellfish if the sediment is suspended over large areas for extended duration. Benthic primary production can also be reduced due to decreased light attenuation caused by sediment loading over extended periods. Plankton and sessile invertebrates are unable to actively avoid areas with high sediment loads. Further harm to fish and invertebrates may result from respiratory and feeding problems associated with high sediment levels. The severity of environmental effects of the suspended sediment increases as the volume and duration of exposure increase. Mobile fish and invertebrates may avoid an area completely during the period of construction. Shellfish are typically more likely to experience adverse effects of increased sediment load than fish because they are often sessile and filter feeders, and may reduce or stop feeding until sediment loading decreases to suitable levels.

Dredging in the Nearshore Study Area will occur to allow for removal of the CGS from the graving dock and tow-out to the deep-water mating site. Dredging will occur at three sites in the Nearshore Study Area. There will also be dredging in Placentia Bay at two locations (Corridor 1 and Corridor 2) to allow for tow-out of the CGS to the deep-water mating site. Within dredged areas there will be changes to the quality and quantity of benthic habitat for some taxa. Effects on soft-bottom communities can range from measurable, long-term effects to few or no observable effects. In general, the observed effects include reductions in abundance and diversity of invertebrates relative to reference sites due to disturbance and startle responses. As the dredge material settles, opportunistic invertebrate and fish species will move in from adjacent areas and re-colonize the site. There is often also a temporary loss of benthic productivity within the dredged area. Some species such as polychaetes will re-colonize relatively quickly (within a year), while others species such as scallop may require several years to return to baseline levels. Shifts in dominance patterns may occur and this may also cause shifts in the trophic balance of the affected community. The larval stage of fish and all stages of shellfish are more susceptible to the effects of sedimentation than adult fish because they have no or little ability to leave the area affected. However, the localized effect and high potential for reversibility will limit the magnitude of effects caused by sedimentation. The loss to fish habitat from dredging will be mitigated through compliance with the *Fisheries Act*, including potential requirements for habitat compensation, if required.

Pile driving, either vibratory or impact, may be required during bund wall construction. Sound levels typically recorded during impact pile driving in-water activities do not exceed 180 dB re 1 μPa (rms) beyond several hundred metres from the source.

Underwater noise has the potential to affect fish and fish habitat in a variety of ways depending on source levels, duration of exposure, proximity of sound source, species sensitivities and environmental conditions, among other factors. Fish are generally most sensitive to low frequency sound (10 to 500 Hz), a range that overlaps with the most intense sound produced by vessels. Studies by DFO (2004) concluded that the most likely response is a startle response, a change in swimming pattern, and/or a change in vertical distribution. There is also potential for underwater noise to have effects on communication and environmental sensing (e.g., masking). Recent experimental evidence has shown that sounds can modify mate choice decisions in fish. An acoustic effect on sexual preferences was also inferred for Atlantic cod, in which the male drumming muscle mass was correlated with mating success (Rowe et al. 2008). Hearing may also be used for prey location and predator avoidance. Results of acoustic modeling (JASCO 2012) for two different types of dredgers indicated that sound levels greater or equal to 180 dB re 1 µPa (rms) (un-weighted) occur at $R_{95\%}$ distances of 7 m or less. However, sound levels of 160 dB re 1 µPa (rms) occur within 248 m ($R_{95\%}$) of the dredging site, depending on dredge type and season.

Cumulative environmental effects on Fish and Fish Habitat in the Nearshore Study Area could occur as a result of the WREP activities in combination with anthropogenic activities in the past, present and future including industry and military use, commercial fisheries and marine traffic. These activities can cause disturbance of marine habitat, reduce marine populations, increase noise and contribute to contamination. WREP activities in the nearshore will include operation of support craft associated with construction and installation activities, including but not limited to heavy lift vessels, construction vessels, supply vessels, helicopters, tow vessels and barges. However, in comparison to existing vessel traffic in Placential Bay, WREP vessels will represent a negligible incremental increase in shipping traffic. The cumulative environmental effects of the WREP on fish and fish habitat in the nearshore are predicted to be **not significant**.

Significant adverse residual environmental effects on fish and fish habitat from routine pre-construction and construction activities are **not predicted**. Environmental effects are generally low in magnitude, of limited geographic extent and reversible.

5.3.2. Marine Birds 1

Nearshore WREP activities (construction, tow-out and topsides mating) have the potential to have effects on habitat quantity and habitat quality for marine birds. Habitat quality can be reduced by lights emanating from project activities. Lighting during periods of darkness may attract marine birds, particularly Leach's Storm-Petrels, which may strike vessels or infrastructure leading to injury or stranding. Activities with the greatest potential for disturbance (i.e., change in habitat use) include pile driving, vessel traffic and dredging. Mortality of marine birds is not expected to be an environmental effect of most routine activities in the Nearshore Study Area, except perhaps from night-time collisions with vessels/infrastructure.

Attraction to artificial lighting and attendant grounding appears to be widespread among procellariiform seabird species (i.e., petrels, shearwaters, prions, storm-petrels, and diving-petrels (Pelecanoididae). Light attraction has also been noted in Atlantic Puffin, Crested Auklet and Common Eider. Attraction of migrating land-birds to artificial lighting at sea is found in a large diversity of orders and families, although the majority of species landing on deck are readily able to take off again if uninjured. The attraction of seabirds to artificial lighting occurs at all times of the year, but tends to be more common at the end of the nesting season with the majority of individuals have been newly fledged young, particularly near seabird nesting colonies. The greatest numbers of individual birds attracted to artificial lighting tend to be found when there is a low cloud cover, particularly when accompanied by fog or rain. Light attraction among seabirds also seems to peak when moonlight levels are lowest (i.e., around the time of the new moon). The reason for peaks in activity during overcast or new moon lighting conditions may be a lack of ambient light for navigation. Alternatively, because aerial activity at seabird nesting colonies is lowest around the time of the full moon, a preference among seabirds for dark nights may be a mechanism for avoiding predators. The reason for the attraction of birds to artificial lighting is not clear. To date, the bird strandings in the Newfoundland offshore have been almost entirely Leach's Storm-Petrels. The remaining species were Wilson's Storm-Petrel, Great Shearwater and Sooty Shearwater. Leach's Storm-Petrels breed in large numbers in eastern Newfoundland, with Baccalieu Island at the northeastern tip of Trinity Bay representing the largest breeding colony in the world. Lighting is potentially an issue during WREP activities that provide continuous use of lights during darkness or periods of poor visibility.

Marine oil and gas exploration, commercial fishery activity, marine transportation and existing and future production activity (e.g., White Rose, Hibernia, Terra Nova and Hebron) all have the potential to interact with marine birds. Hunting of marine birds occurs in the Nearshore Study Area. It is unlikely that routine activities associated with other marine exploration, existing production areas, marine transportation and commercial fisheries have substantive environmental effects on marine birds. With the exception of marine bird hunting, cumulative environmental effects in the Nearshore Study Area are expected to be of a lower magnitude than those of the Offshore Study Area, as fewer activities have the potential to interact with the current WREP. The cumulative environmental effects of the WREP on marine birds in the nearshore are predicted to be **not significant**.

Activities with a high potential to affect marine birds are those that create loud nosies, artificial lighting and high vessel traffic. Habitat quantity has the potential to be affected by nearshore dredging. Flaring during offshore operations, as well as collisions with infrastructure, have the greatest potential for mortality of marine birds. Recovered birds will be released in accordance with standard protocols. Additional mitigation measures include the use of directional lighting, avoidance of bird concentrations, setback distances from seabird colonies for helicopter and tow-out activities, and others. Given that WREP activities are mostly localized, of low magnitude, and reversible, there **are not likely to be significant adverse** environmental effects on Marine Birds from pre-construction and installation activities associated with the WREP in the Nearshore Study Area.

5.3.3. Marine Mammals and Sea Turtles 1

In the Nearshore Study Area, underwater noise could result from WREP activities such as possible pile driving, vessel traffic, dredging of the bund wall and sections of the tow-out route to the deepwater site, and geophysical surveys (i.e., side scan sonar and geohazard surveys). These activities could affect the habitat quality for marine mammals and sea turtles.

During graving dock construction, underwater noise could result from WREP activities such as possible pile driving; pile driving would occur on land. Pile driving, vibratory and/or impact, may be required during bund wall construction (placement of sheet piles). The effects of sounds from in-water pile driving could include one or more of the following: tolerance; masking of natural sounds; behavioural disturbance; and at least in theory, temporary or permanent hearing impairment, or non-auditory physical or physiological effects.

Underwater noise will be produced during WREP activities associated with the construction and installation of the CGS. Underwater sounds will be produced by vessels, helicopters, geophysical surveys (i.e., side scan sonar and geohazard surveys) and dredging of the bund wall and possibly sections of the tow-out route to the deepwater site.

In nearshore shallow water regions, dredges can be strong sources of low frequency underwater noise (Richardson et al. 1995). Because low frequency sound attenuates rapidly in shallow water, underwater sound produced by dredging is normally undetectable at ranges beyond 25 km (Richardson et al. 1995). Dredging that occurs consistently over long periods can create a higher potential for disturbance, which could result in changes in habitat use for marine mammals and sea turtles. Limited information is available on the behavioural changes of marine mammals (and none for sea turtles) resulting from dredging operations, but generally, animals have been reported to continue using habitats near dredging operations. No changes in habitat quantity directly affecting marine mammals or sea turtles are expected. However, dredging may change the habitat quantity for marine mammal and sea turtle prey items. Since most marine mammals and sea turtles occurring in the area do not feed off the bottom, change in habitat quantity due to dredging is expected to have negligible effect on these species.

Sounds from vessel traffic associated with the WREP will likely result in a temporary change in habitat quality for marine mammals and sea turtles. The CGS tow-out to the deep-water mating site will employ four tugs and take approximately two to four days. The WHP will be at the deep-water mating site for six to eight weeks. During the topsides mating, there will be an accommodation vessel, a tug and supply vessel. A logistics vessel will transit between the deep-water mating site and the Port of Argentia three to four times per week. Vessel noise is most likely to cause masking or behavioural responses in marine mammals and sea turtles. However, sound levels are not expected to be high enough to cause physical or physiological effects on marine mammals or sea turtles. The greatest and most continuous vessel noise source during construction will result from tugs and barges. Sound levels that would have the potential to induce hearing impairment in marine mammals and sea turtles (180 and 190 dB re 1 μPa (rms)) have been modeled to occur in an area less than 5 m from the tugs used in the WREP (JASCO 2012).

The presence of vessels can also increase the risk of direct mortality via vessel collisions. Evidence suggests that a greater rate of mortality and serious injury is correlated with a greater vessel speed. Activities will avoid spatial and temporal concentrations of marine mammals and sea turtles whenever possible and vessels will maintain a safe speed or deviate from their course to avoid potential fatal collisions.

Some helicopter traffic may occur during WREP activities in the Nearshore Study Area. It can be difficult to determine whether a marine mammal or sea turtle reacts to the noise or the visual stimuli of the aircraft that is causing the noise/disturbance. In general, marine mammals show variable reactions to aircraft; often they startle and dive during low-altitude over flights.

Marine exploration, commercial fishery activity, marine transportation and existing and planned production activity (e.g., White Rose, Hibernia, Terra Nova and Hebron) all have the potential to interact with marine mammals and sea turtles. Hunting of marine mammals and sea turtles does not occur inside the Nearshore or Offshore Study Areas, other than a relatively small harp seal harvest. Cumulative environmental effects in the Nearshore Study Area are expected to be of a lower magnitude than those of the Offshore Study Area, as fewer activities have the potential to interact with the WREP. The overall cumulative environment effects on marine mammals and sea turtles are predicted to be **not significant**.

Given that WREP activities are mostly localized, of low to medium magnitude, and reversible at the population level, there are **not likely to be significant** residual adverse environmental effects on marine mammals and sea turtles.

5.3.4. Commercial Fisheries 1

There should be no loss of access to established fishing grounds because there is currently no fishing in the shoreline area where the graving dock will be constructed. CGS construction will occur inside the graving dock. The graving dock will not require a safety zone. Additional WREP vessel traffic to and from the Argentia site and escaped construction debris could pose an increased risk of gear damage if they stray out of the existing and well-established marine traffic routes to the port of Argentia, such as those used by the interprovincial ferries operated by Marine Atlantic The additional WREP vessel traffic during the construction phase is not expected to be more than a few vessels and therefore unlikely to interfere with fishing vessel transits in or near fishing grounds in Placentia Bay. Fish scaring could occur in the vicinity of the Argentia graving dock site as a result of WREP-related noise (pile driving); however, because there is no fishing in the immediate area now, it should not affect any fishing success. If the noise were to temporarily scare any fish in the area away from the site, it might temporarily increase availability in areas that are fished.

Dredging vessel(s) will have a 500 m safety zone, and all fisheries activities will be excluded from this area for the 6 to 8 weeks needed to complete dredging operations on the route to or at the chosen deep-water mating site. This will allow these operations to take place in a safe and efficient manner.

During the tow from Argentia to the deep-water mating site, there will also be a temporary safety zone around the CGS and the vessels towing it. However, this will be an estimated 2 to 4 days and will be continually moving as the flotilla makes its way across part of the Bay to the chosen mating site.

Once it has been positioned at the deep-water mating site, an estimated 1,500 m radius safety zone will be established around the moored CGS. This safety zone (for both candidate deep-water mating sites) will extend from the centre of the CGS location. During CGS-topsides mating operations (6 to 8 weeks in duration) any harvesters normally fishing there will be temporarily prohibited from setting gear in the safety zone. Fishing and recreational vessels may be permitted to transit nearby, whichever deep-water mating site is used. However, as stipulated in Transport Canada regulations (Rule 43 of the *Collision Regulations* under the *Canada Shipping Act, 2001*), no vessels other than those involved in Project operations will be permitted to operate within 500 m of the operations. While the establishment of a deep-water mating site safety zone will create a temporary loss of access to fishing grounds within these areas, it will serve as a key mitigation to avoid or prevent interaction and to help ensure the safety of workers, fishers and other marine users. The deep-water mating site safety zone will remain in place until the WHP is towed out of the Bay and the anchor/chains are removed. The perimeter of the deep-water mating site safety zone will be clearly marked with buoys, and fishers will be kept informed of its existence throughout the topsides mating operation's period.

Husky will use several mechanisms to keep fishers informed in advance of all relevant marine operations. Before any marine construction activities begin, Husky will establish an area Fisheries Liaison Committee (FLC) to facilitate and formalize its ongoing fisheries consultation and communications process. Husky will establish a Fisheries compensation program to mitigate any actual economic loss as a result of the temporary deep-water mating site safety zone closure. With the described mitigations in place, the effects, including cumulative, of WREP on access to fishing grounds, fishing vessel operations (movements and harvesting), fishing gear and catchability of species (and thereby on inshore net fishing incomes) within the Nearshore Project Area will be **not significant**.

5.3.5. Species at Risk 1

In the Nearshore Study Area, the WREP activities that could affect marine fish SAR include water discharge from The Pond, dewatering of the graving dock, lighting, nearshore surveys (i.e., geotechnical, geophysical), dredging, ballasting of the CGS, towing to the deep-water mating site, topsides mating and the establishment of a no-fishing safety zone. The potential environmental effects from these activities include change in habitat quality, change in habitat quantity and potential mortality. The potential environmental effects of the WREP on marine fish SAR, and associated mitigation measures are the same as those for non-listed marine fish species.

Environmental effects are generally low in magnitude, of limited geographic extent and reversible. **No significant adverse environmental effects** on marine fish SAR from routine WREP activities are predicted with the application of mitigation measures.

Potential interactions between the WREP and non-listed marine birds are similar to those interactions relevant to the at-risk marine bird species. In the nearshore, the WREP could interact with the Harlequin Duck, Red Knot or Ivory Gull. However, interactions with Piping Plover are unlikely, based on this specie's known distribution and the absence of suitable habitat on Placentia Bay. Underwater hearing in birds is poorly understood, however, pile driving and wellsite and VSP surveys may still interact with at-risk marine birds via effects on hearing. Given that WREP activities are mostly localized, of low magnitude, and reversible, there are **not likely to be significant adverse environmental effects** on marine bird species at risk from pre-construction and installation activities associated with the WREP in the Nearshore Study Area.

Marine oil and gas exploration, commercial fishery activity, marine transportation and existing and future production activity all have the potential to interact with marine bird species at risk. Hunting of marine birds occurs in the Nearshore Study Area, but the hunting of at-risk species is prohibited. Cumulative environmental effects in the Nearshore Study Area is predicted to be low in magnitude and therefore **not significant** given that fewer activities have the potential to interact with the current WREP.

WREP activities can interact with at-risk marine mammals and sea turtles by causing changes in habitat quantity, changes in habitat quality, or potential mortality. Given that WREP activities are mostly localized, of low to medium magnitude, and reversible at the population level, there are **not likely to be significant residual adverse environmental effects** on species at-risk marine mammals and sea turtles from the pre-construction and installation activities associated with the WREP in the Nearshore Study Area.

5.3.6. Sensitive Areas 1

In the Nearshore Study Area, eelgrass beds, capelin beaches, wetlands, salt marshes, IBAs, scallop beds and river otter haul outs have been identified as Sensitive Areas. Some of these areas are potentially at risk of disturbance from nearshore WREP activities associated with the construction and tow-out of the CGS. There is potential for dredging activities in the nearshore to adversely affect habitat through sedimentation and disturbance. The potential environmental effects on VECs have been previously discussed. The only additional routine activities that could interact with Sensitive Areas are the graving dock excavation and dredging in addition to the potential environmental effects from an accidental event that is addressed later in the report. The Nearshore Study Area has limited interactions between planned routine WREP activities and Sensitive Areas. Dredging activities in the nearshore may result in the removal of eelgrass in the Nearshore Project Area. As there are multiple eelgrass beds in the Nearshore Study Area, the removal of an eelgrass bed of 1,100 m^2 is considered to be minor.

The WREP activities are mostly localized, of low magnitude and reversible at the population level and therefore are not likely to have significant residual adverse environmental effects, including cumulative, on sensitive areas.

5.4. Wellhead Platform or Subsea Installation/Commissioning

5.4.1. Fish and Fish Habitat 1

The offshore activities that could potentially interact with marine fish and fish habitat during installation and commissioning phases include those associated with installation of the WHP or excavation of a subsea drill centre, installation of flowlines and sub-sea equipment, and operation of the WHP and/or MODU.: The potential environmental effects from activities associated with these phases include change in habitat quality, change in habitat quantity and/or potential mortality due to resulting sedimentation, contamination, increased noise and/or lighting. Habitat quality may be reduced as a result of lighting, discharges, sedimentation and increased noise occurring due to the above activities.

The use of drilling-associated seismic energy, clearance surveys (e.g., sidescan sonar) and operation of vessels will result in increased noise in the Offshore Project Area. The response to seismic sound by fish can range from no observed change in behaviour, to a startle response, to temporary changes in movements for the duration of the sound, to larger changes in movements or behaviour that might displace fish from their normal locations for short or long periods of time. To date, there are no documented cases of fish mortality from 2-D and 3-D seismic noise (under field operating conditions), although it is possible that fish kills have occurred and not been observed (DFO 2004). Under laboratory conditions, mortality or injury to eggs and larvae have only been observed at close range and at high intensity sound. A laboratory experiment by Payne et al. (2009) to determine potential environmental effects of seismic noise on monkfish eggs and larvae found that the difference between eggs and larvae exposed to sound pressure levels at 205 dB peak to peak and that of the control group was not statistically significant 48 to 72 hours after exposure. Payne et al. (2009) concluded that seismic surveys are unlikely to pose any threat to monkfish eggs or larvae that may float in veils at the surface during monkfish spawning. Behavioural effects such as a startle response or change in direction are well-documented in fish exposed to underwater sound. Such responses most commonly occur within the area of a seismic program, but have been observed to occur in fish located tens of kilometres away from the site. Studies suggest that normal behaviour patterns commonly return within 30 minutes of the seismic response, therefore, behavioural effects are expected to be short-term.

For shellfish, there have been no documented cases of invertebrate mortality due to seismic noise, although there have been accounts of mass giant squid strandings on two occasions that corresponded to periods of seismic activity. A review by DFO (2004a) concluded that it is expected that the overall effect of seismic sound on invertebrates is low, unless it can adversely affect reproduction or growth.

Benthic macro invertebrates are less likely to be affected by seismic activity than pelagic or planktonic invertebrates because few benthic invertebrates have gas-filled spaces that would make them sensitive to changes in pressure, and also because benthic species are usually more than 20 m away from the seismic source as they occur on the seafloor.

The installation of the WHP or subsea drill centre and installation of flowlines will create a footprint on the seafloor that may result in loss of benthic habitat or restrict access to fish and shellfish in some areas. However, the presence of rock berm-protected flowlines are expected to create habitat by increasing the amount of habitat available to be colonized, thereby providing a reef effect for fish in an otherwise flat, homogenous soft-sediment environment. Artificial structures in the water column and on the seafloor can increase the amount of available habitat (i.e., settling areas) and increase vertical complexity. Fish and invertebrates associated with rocky habitat and crevices such as Atlantic cod, wolffish species, ocean pout species, flounder, shrimp and sponges may increase in abundance on this artificial habitat, whereas species associated with fine sediment habitat may decrease in abundance as this type of habitat will shrink in the WREP footprint. In addition to providing more complex, rocky habitat, the construction and installation activities may create a reef effect, by drawing higher trophic levels to the Offshore Project Area to feed on lower trophic levels or use habitat provided by settling sponge, coral and other epifauna. It remains unclear whether artificial reefs have increases in fish abundance due to recruitment or attraction (i.e., movement from elsewhere).

Mortality of fish and invertebrates may occur in the offshore due to dredging or due to seismic surveys. Mortality may also decrease in the safety zone where fishing activities are prohibited.

The Offshore WREP activities will occur in accordance with the *Fisheries Act*. A fish habitat compensation agreement (Authorization No. 07-01-002) has been in place with DFO since 2007 to compensate for the excavation of up to five subsea drill centre sites.

Cumulative environmental effects on fish and fish habitat could occur as a result of the WREP in combination with past, present and future oil and gas activities, including the existing White Rose field (including North Amethyst), Terra Nova development, Hibernia oil development, Hibernia Southern Extension project, planned Hebron oil development, exploration seismic activity and exploration drilling activities, which can contribute to physical disturbance, contamination, chronic pollution, smothering effects and increased noise. Commercial fisheries can adversely affect fish and fish habitat. WREP activities will represent a negligible incremental increase to the overall cumulative environmental effects to Fish and Fish Habitat in the Offshore, as the effect on the seafloor will be localized, of short duration and unlikely to overlap in space with other activities. The cumulative environmental effects of the WREP on Fish and Fish Habitat are predicted to be **not significant**.

Mitigation measures to reduce adverse environmental effects include: continuous improvement program; treatment of all waste streams and adherence to OWTG (NED et al. 2010); reinjection of SBM cuttings for the WHP development options, and treatment and proper discharge of SBMs fro the MODU in accordance with OWTG guidelines. Based on knowledge to date of existing operations, it is anticipated the geographic extent and magnitude of dredging and spoils disposal will be low with high reversibility. There is also potential for mortality of fish and shellfish (particularly egg and larval stages) to occur during seismic surveys. The potential effects of mortality resulting from offshore surveys are predicted to be low in magnitude, frequency and duration and considered reversible. Significant residual adverse environmental effects on Fish and Fish Habitat are **not predicted to be significant.**

5.4.2. Marine Birds 0

The WHP or subsea drill centre in the Offshore Project Area would occupy a small area that may reduce the habitat quantity for marine birds. Offshore activities have the potential to result in effects on habitat quality and habitat quantity. Temporary and localized disturbances to marine birds may affect bird habitat quality resulting in behavioural changes. WREP activities creating noise, such as wellsite and VSP surveys, light emissions, vessel traffic and helicopter operations are most likely to potentially result in a change in habitat quality. Wellsite and VSP surveys have the potential to affect habitat quality for marine birds, especially diving species such as the Alcidae, through disturbance from air gun noise. Lighting on vessels and WHPs in the Offshore Study Area at night has the potential to attract nocturnally-active marine birds. Leach's Storm-

Petrels are likely to be attracted, with the potential for stranding onboard the vessels and the WHP or mortality from collisions with infrastructure. Marine birds may be temporarily disturbed by passing vessels, vessels engaged in dredging or helicopters associated with offshore construction/installation activities. No known concentrations of marine birds are likely to occur in the Offshore Study Area that potentially may be affected. Collision with infrastructure resulting from attraction to artificial lighting is a potential source of mortality. However, mortality from collisions is not likely to affect the population of the most commonly attracted species (i.e., Leach's Storm-Petrel).

The effects of illumination on structures and vessels, air emissions, discharges, underwater sound, accidental hydrocarbon spills from exploration vessels, existing production drilling platforms and vessels, other exploratory drilling structures and platforms may have cumulative environmental effects with WREP activities and WREP accidental events. The cumulative effects of the WREP with other on-going projects on the Grand Banks are deemed to be **not significant** given that the predicted environmental effects on marine birds are localized and reversible.

Several activities may lead to temporary disturbance of marine birds in a localized area. Mortality of marine birds is not expected to be an environmental effect of offshore activities. The installation of a subsea drill centre would have similar potential environmental effects on marine birds as the installation of the WHP. Bird attraction to artificial lighting at sea may be mitigated in a variety of ways including releasing stranded birds by experienced environmental observers according to CWS protocols. Additional mitigation measures include the use of directional lighting, avoidance of bird concentrations, setback distances from seabird colonies for helicopter and tow-out activities, and others. Given that WREP activities are mostly localized, of negligible to low magnitude, and reversible, **there are not likely to be significant adverse environmental effects** on Marine Birds associated with the WREP in the Offshore Study Area.

5.4.3. Marine Mammals and Sea Turtles 0

The footprint of the WHP or subsea drill centre in the Offshore Project Area would occupy a very limited area that may be used by pelagic and migratory marine mammal and sea turtle species. Thus, the installation of the WHP or subsea drill centre at the offshore site location will result in minimal habitat loss for marine mammals and sea turtles.

Potential changes in habitat quality of the Offshore Study Area may result from wellsite and VSP and other geophysical surveys, vessel traffic, helicopter over flights, and drilling. These changes may have physical/physiological/ behavioural effects on marine mammals and sea turtles. Drilling may occur from either the WHP or from a MODU, if the subsea drill centre option is selected (and from MODUs at future subsea drill centres). Of note, dynamically-positioned drill ships are typically noisier than semi-submersibles which, in turn, are noisier than jackups. However, no sound level measurements are currently available for a platform. Modeling results by JASCO (2012) showed that sound levels of 160 dB re 1 μPa (rms) or greater occur within 5 m ($R_{95\%}$) of the drilling activity. Thus, there is nearly no risk of TTS or PTS to any marine mammal or sea turtle, and the behavioural disturbance zone around drill operations is very small. Some cetaceans are known to react to drillships and may show slight, but temporary avoidance, whereas seals are very tolerant of drill operations.

Given the predicted minimal environmental effects of other projects/activities, the large size of the Offshore Study Area and the prediction that the residual environmental effects of WREP's routine activities on marine mammals and sea turtles through the difference phases are not significant in the Nearshore and Offshore Study Areas, the cumulative environmental effects on marine mammals and sea turtles are also predicted to be **not significant**.

Given that WREP activities are mostly localized, of low to medium magnitude, and reversible at the population level, there are **not likely to be significant** residual adverse environmental effects on marine mammals and sea turtles from the Offshore WREP.

5.4.4. Commercial Fisheries 1

During installation of WREP-related assets fisher harvesters can expect there will be extra traffic to and from the White Rose field from Newfoundland or mainland ports. This could result in damage to fixed gear caused by construction and supply traffic or operational interference with ships towing mobile fishing gear, and result in a loss of catch because of damage or reduced efficiency. Also, noise from construction related activities (including any VSP or wellsite surveys) could scare fish and thereby reduce catchability, resulting in economic loss.

The offshore construction activities will occur within the existing White Rose field safety zone and the existing oil production installations will occupy a relatively small total area.
With the mitigations outlined in the EA Report, including the Fisheries Liaison Committee and Fisheries Compensation Program, in place the effects, including cumulative effects, of WREP-related activities within the Offshore Project Area will **be not significant**.

5.4.5. Species at Risk 1

The offshore activities that could potentially interact with marine fish SAR include: clearance surveys (e.g., sidescan sonar); operation of vessels and barges; installation of flowlines and pipelines; possible use of rock berms on WHP; lighting; waste (domestic waste, sanitary waste) generation; wellsite surveys and VSPs; dredging and dredge spoils disposal; presence of WHP/subsea drill centre structure; presence of a safety zone; drilling; water based mud (WBM) and synthetic based mud (SBM) cuttings; operation of seawater systems for cooling and firewater; surveys (geotechnical, geophysical, environmental); management of drilling fluids and cuttings (reconditioning, discharge or injection); and oily water treatment. Environmental effects are generally low in magnitude and reversible**. No significant adverse environmental effects** on marine fish SAR from Offshore WREP activities are predicted.

The WHP or subsea drill centre in the Offshore Project Area would occupy a small area that may reduce the habitat quantity for at-risk marine birds (Ivory Gull). However, this reduction in habitat quantity is expected to result in minimal habitat loss. Ivory Gull is rarely seen away from sea ice, so the likelihood of it occurring in the vicinity of the WHP is low. Given that WREP activities are mostly localized, of negligible to low magnitude, and reversible, there are **not likely to be significant** adverse environmental effects on marine bird species at risk associated with the WREP in the Offshore Study Area.

During the installation phase in the Offshore Project Area, underwater noise will result from activities such as dredging, operation of vessels (including tow-out), geophysical surveys and helicopter over flights. Helicopters will be used to transfer personnel to the WHP, drilling units and possibly seismic vessels. These activities could affect habitat quality and habitat use by at-risk marine mammals and sea turtles. In addition, operation of vessels could lead to direct mortality of individuals via collisions. Given that WREP activities are mostly localized, of low to medium magnitude, and reversible at the population level, there are **not likely to be significant** residual adverse environmental effects on at-risk marine mammals and sea turtles from WREP activities.

The effects of illumination on structures and vessels, air emissions, discharges, underwater sound, accidental hydrocarbon spills from exploration vessels, existing production drilling platforms and vessels, other exploratory drilling structures and platforms may have cumulative environmental effects with WREP activities and WREP accidental events. Given that a major spill is unlikely to coincide among various operations on the Grand Banks and that WREP activities are mostly localized, of low to medium magnitude, and reversible at the population level, the cumulative effects on species-at-risk from WREP activities are also predicted to be **not significant**.

5.4.6. Sensitive Areas 0

Sensitive Areas in the Offshore Study Area include EBSAs identified by DFO where there is high productivity and/or aggregations of species, as well as sensitive areas identified by NAFO including VMEs (canyons, seamounts, and knolls), coral-sponge area closures and the Bonavista cod box. The Offshore Project Area is nearest to the Northeast Shelf and Slope EBSA.

Offshore activities associated with the WREP are **not expected to interact** with offshore Sensitive Areas and thus predicted to have **no significant environmental effect**.

5.5. Atmospheric Emissions

Air emissions will occur during all phases of the project, the construction of the WHP in the nearshore environment (if selected) and all offshore activities. The potential emissions include:

- vehicle traffic;
- site clearing and grading equipment;
- excavation equipment;
- potential power generation;
- concrete production;
- bulk material handling;
- back-up power generation;
- shoreline and channel excavation and dredging;
- vessel and helicopter traffic;
- topsides stand-by generator;
- power generation;
- flaring;
- fugitive and venting emissions; and
- maintenance activities.

The change in air quality attributable to the construction, operation and decommissioning of the WREP (Option 1 and Option 2) is expected to be low in magnitude, local in extent, short-term in duration (during construction, but continue for the life of the WREP during operation) and reversible. Components associated with all phases of the WREP for both development options, including power generation, MODU operation, flaring and fugitive releases, as well as accidental releases and cumulative environmental effects, will result in emissions that will not exceed applicable maximum ground level concentration (GLCs).

Construction and operation of the WREP (Option 1 and Option 2) will result in a change in Greenhouse Gas (GHG) emissions. The magnitude of these emissions is ranked low (Option 2) to medium (Option 1) for both the construction (which applies only to Option 1) and operation phases (which applies to both options) of the WREP. Based on the information provided and the CEA Agency guidance (CEA Agency 2003), the WREP development Option 1 would require the preparation of a GHG Management Plan, as it has been found to be a medium emitter.

The estimated GHG emissions resulting from the operation of the WHP are predicted to be much lower than those currently being reported from the other existing offshore developments in the area. Once in operation, the WHP will report annual emissions of CACs and GHG to Environment Canada under the National Pollutant Release Inventory (NPRI) and the National GHG Reporting schemes, as well as meet the reporting requirements pursuant to the Offshore Waste Treatment Guidelines.

5.5.1. Fish and Fish Habitat 0

Emissions of potentially harmful materials will be small and of short duration and will rapidly disperse once released to undetectable levels. There should be no interaction between fish and fish habitat and atmospheric emissions. Effects on fish and fish habitat from atmospheric emissions will be **not significant**.

5.5.2. Marine Birds 0

Emissions of potentially harmful materials will be small and of short duration and will rapidly disperse once released to undetectable levels. The effects of air emissions on marine birds are predicted to be not **significant**.

5.5.3. Marine Mammals and Sea Turtles 0

Emissions of potentially harmful materials will be small and of short duration and will rapidly disperse once released to undetectable levels. There should be no interaction between marine mammals and sea turtles and atmospheric emissions. Effects on marine mammals and sea turtles from atmospheric emissions will be **not significant**.

5.5.4. Commercial Fisheries 0

Emissions of potentially harmful materials will be small and of short duration and will rapidly disperse once released to undetectable levels. There should be no interaction between commercial fisheries and atmospheric emissions. Effects on commercial fisheries from atmospheric emissions will be **not significant**.

5.5.5. Species at Risk 0

There should be no interaction between atmospheric emissions and fish, marine mammals and sea turtles, and marine birds. Any effects on marine fish, marine birds, marine mammals and sea turtles considered at risk will likely be **not significant**.

5.5.6. Sensitive Areas 0

There should be no interaction between sensitive areas and atmospheric emissions and therefore **not significant**.

5.6. Discharge of Drilling Muds and Cuttings

Cuttings from drilling the upper two well sections with WBM will all be released as per the Offshore Waste Treatment Guidelines 2010 (OWTG) close to the seafloor, under either the WHP option with chute release, or under the subsea option with mobile offshore drilling unit (MODU) riserless drilling. Therefore, there is little time for the cuttings to be transported large distances by the ambient currents.

Under the WHP scenario, the drift of cuttings is restricted to a range generally within 2 to 4 km. The maximum extent is approximately 5 km to the southeast and northeast. Cuttings (exclusively WBM) thicknesses are 1 mm or less over these regions.

For drilling of the deeper intermediate and main hole sections SBM will be used. Under the MODU option, SBM will be discharged. Under the WHP option, the base case is to use two cuttings reinjection wells into which treated SBM and cuttings will be re-injected (i.e., no return of materials to the sea).

5.6.1. Fish and Fish Habitat 1

There is potential for operational activities to affect habitat quality through operational discharges (e.g., SBM and WBMs). The principal effects associated with the discharge of muds and cuttings are the smothering of benthos, toxicity (based on chemical constituents of the mud) and bioaccumulation. In modelling exercises conducted by Husky, cuttings thicknesses directly under the WHP are modeled to be 1.8 m. In the immediate vicinity of the WHP, within 100 m, initial cuttings thicknesses are predicted to be 1.4 cm on average, and as high as 8.6 cm. Due to the large volume of material generated by drilling the (initial) 40 wells, a maximum height of 1.8 m (assuming slumping of the cuttings pile, a maximum height is more likely on the order of 0.5 to 1.0 m) is predicted directly at the WHP. These will be almost exclusively the fast-settling pebbles and coarse sand (a very small percentage of the fines will drift for a time and ultimately settle near the WHP), whereas at distances greater than about 50 to 200 m, the deposits will be exclusively fines. From 100 to 200 m out from the WHP, thicknesses are predicted to be 1.9 mm on average and a maximum of 3.4 mm. From 200 to 500 m, thicknesses average 1.8 mm and are a maximum of 4.6 mm.

As part of operations, WBM and SBM cuttings will be discharged. WBM is sometimes considered less harmful to the environment, as it contains mainly water and cannot form surface sheens. SBM can form sheens on the surface, but on the other hand, does not disperse as widely as WBMs. The main component of SBM is synthetic-based oil called Pure Drill IA-35. This fluid has been shown to be non-toxic (acutely or chronically) through both operator testing and government testing (Payne et al. 2000). The main component of WBM is water or seawater. Both WBM and SBM include bentonite (clay) and/or barite. Other chemicals that are used include potassium chloride, caustic soda ash, viscosifiers, filtration-control additives and shale inhibitors, added to control mud properties. If the WHP development option is selected, then SBM cuttings will be re-injected.

Environmental effects are generally low in magnitude, of limited geographic extent and reversible. **No significant adverse environmental effects** on fish and fish habitat from the WREP activities are predicted.

5.6.2. Marine Birds 0

Discharges from the WHP could potentially produce sheens on the water, thereby creating the potential for oiling of marine birds. The drilling program is using WBM and SBM where required. Sheens are not likely associated with the discharge of WBM. SBM mud and cuttings from the WHP will be re-injected, minimizing the possibility of sheens.

Given that WREP activities are mostly localized, of negligible to low magnitude, and reversible, there are **not likely to be significant** adverse environmental effects on Marine Birds from the production/operation and maintenance activities associated with the WREP.

5.6.3. Marine Mammals and Sea Turtles 0

Synthetic-based cuttings will be re-injected into the subsurface if the WHP option is selected and will be treated and discharged overboard if the subsea drill centre option is selected. Drilling activities are unlikely to produce concentrations of heavy metals in muds and cuttings that are harmful to marine mammals. In addition, none of the marine mammals that regularly occur in the Offshore Study Area are known to feed on benthos in the area. The bearded seal, which is considered a benthic feeder, may occasionally occur in the Offshore Study Area, but typically occurs much farther north near ice.

Given that WREP activities are mostly localized, of low to medium magnitude, and reversible at the population level, there are **not likely to be significant** residual adverse environmental effects on marine mammals and sea turtles from WREP operation and maintenance activities.

5.6.4. Commercial Fisheries 0

As indicated above, the effect of fish and fish habitat from drill cuttings deposition is not significant; therefore the effect on commercial fisheries will be **not significant**.

5.6.5. Species at Risk 0

The discharge of drill cuttings is predicted to be not significant for populations of fish, marine mammals, sea turtles, and marine birds. The effect on individual fish, marine mammal, sea turtle, and marine bird species at risk is also considered to be **not significant**.

5.6.6. Sensitive Areas 0

The potential for adverse environmental effects to occur as result of WREP activities is considered unlikely given the low probability for an accidental event occurring and the intervening distance between a spill and most Sensitive Areas. The effect on sensitive areas is also considered to be **not significant**.

5.7. Operational Discharges

Regardless of the development option selected, the produced crude will be transported directly to the *SeaRose FPSO*. All production from the WHP or new drill centres will be processed through the *SeaRose FPSO* currently operating at White Rose. The effects of production (including produced water discharge rates, which will not be exceeded by the WREP) have been previously assessed (Husky Oil 2000; LGL 2007a). Discharges associated with drilling include cement slurry and blowout preventer (BOP) fluid. Blowout preventer fluid contains low toxicity glycol and will be released near the seafloor, Wastes and discharges include: deck drainage, cooling water, sanitary and domestic waste, garbage and other solid waste, ballast water, and bilge water.

5.7.1. Fish and Fish Habitat 0

Results from the ongoing White Rose EEM program have confirmed original assessment predictions of no significant environmental effect on the marine environment as a result of contamination due to operational discharges. The environmental effects of the WREP during the operation phase in the Offshore Study Area and the mitigations to be implemented outlined in the EA Report, will result in **no significant adverse** environmental effects on fish and fish habitat from routine WREP operation and maintenance activities. Environmental effects are low in magnitude, of limited geographic extent and reversible.

5.7.2. Marine Birds 1

Blowout preventer fluid contains low toxicity glycol and will be released near the seafloor, minimizing the possibility of toxic effects on marine birds. Cooling water will be chlorinated and discharged overboard at an approximate temperature of 30°C, with a residual chlorine level <0.5 ppm. This water will therefore be diluted, resulting in small thermal effects. Sewage will be macerated and discharged below the surface. As a result, sewage will be unlikely to attract birds. Operational discharges will be unlikely to have significant residual effects. Given that WREP activities are mostly localized, of negligible to low magnitude, and reversible, there are not likely to be significant adverse environmental effects on Marine Birds.

5.7.3. Marine Mammals and Sea Turtles 0

Cooling water discharges will be chlorinated and monitored as per the OWTG. A low volume of water will be discharged and the area of thermal effects will be small. Operational discharges should have a negligible and not significant effect on marine mammals and sea turtles.

5.7.4. Commercial Fisheries 0

Any effects on fish and fish habitat will be of short duration and low magnitude and therefore not significant.

5.7.5 Species at Risk 0

If mitigations as proposed are followed for operational discharges from drilling activities, then effects on individual fish, marine mammals, sea turtles, and marine birds protected under SARA or listed by COSEWIC will be reduced and considered to be **not significant**.

5.7.6 Sensitive Areas 0

Routine operation activities associated with the WREP are not expected to interact with offshore Sensitive Areas and are therefore considered **not significant**.

5.8. Well Abandonment

Under the WHP development option, the WHP will be decommissioned and abandoned by first abandoning the wells in accordance with standard oil field practices, then decommissioning the topsides, followed by decommissioning and abandonment of the CGS. All infrastructures will be abandoned in accordance with the relevant regulations. The topsides will be removed from the CGS in a manner evaluated to be most effective at the time of decommissioning. The WHP will not be abandoned and disposed of offshore, nor converted to another use on site.

5.8.1. Fish and Fish Habitat 1

The activities involved in decommissioning and abandonment that may have environmental effects on fish and fish habitat include: removal of the WHP; plugging and abandoning of wells; operation of vessels; lighting; the removal of a safety zone; and conducting surveys (geotechnical, geophysical and environmental).

Reduction in habitat quality may result from sedimentation, noise (vessel, seismic) and lighting. A decrease in habitat quantity may arise from decommissioning of the subsea infrastructure, since the removal of these structures will end the reef effect and refuge that this large vertical structure has provided. However, as the structures will be removed, the benthic habitat will once again become available to be colonized.

Significant adverse residual environmental effects on marine fish and fish habitat from routine decommissioning and abandonment activities are **not predicted**. Environmental effects are generally low in magnitude, of limited geographic extent and reversible.

5.8.2. Marine Birds 0

The potential environmental effects of decommissioning activities are expected to be similar (or less than) those of construction or operation; therefore, **no significant** adverse environmental effects are predicted.

5.8.3. Marine Mammals and Sea Turtles 1

Given that WREP activities are mostly localized, of low to medium magnitude, and reversible at the population level, there are **not likely to be significant** residual adverse environmental effects on marine mammals and sea turtles from WREP decommissioning and abandonment activities.

5.8.4. Commercial Fisheries 0

There should be no impact on commercial fisheries associated with well abandonment. As indicated above, impacts on fish and fish habitat are predicted to be not significant, therefore, it can be expected that effects on commercial fisheries would be negligible and **not significant.**

5.8.5. Species at Risk 0

The decommissioning and abandonment activities that could potentially interact with marine fish SAR include: the removal of the WHP; the plugging and abandoning of wells; the operation of vessels; lighting; surveys (geotechnical, geophysical and environmental; and the removal of a safety zone.

Significant adverse residual environmental effects on marine fish SAR from routine decommissioning and abandonment activities are **not predicted**. Environmental effects are generally low in magnitude, of limited geographic extent and reversible.

Given that WREP activities are mostly localized, of low to medium magnitude, and reversible at the population level, there are **not likely** to be significant residual adverse environmental effects on at-risk marine mammals and sea turtles from decommissioning and abandonment.

The potential environmental effects of decommissioning activities are expected to be similar (or less than) those of construction or operation; therefore, **no significant** adverse environmental effects are predicted.

5.8.6. Sensitive Areas 0

There should be no impact on sensitive areas associated with well abandonment, therefore, it can be expected that effects on sensitive areas would be negligible and **not significant.**

5.9. Accidental Events

5.9.1. Fish and Fish Habitat 1

The primary accidental events that could potentially interact with marine fish and fish habitat include a marine vessel incident resulting in a diesel fuel spill, SBM whole mud spill, subsea hydrocarbon blowout, hydrocarbon surface spill, or other spill (e.g., fuel, waste materials) in the Offshore Study Area.

Nearshore

There is the possibility of an accidental event occurring in the Nearshore Study Area during graving dock construction or CGS construction and installation phases. The scenarios with the greatest potential environmental risk are a breach in the graving dock or an accidental release of marine diesel fuel from a vessel as a result of a collision or other incident.

Diesel is known to have an immediate toxic effect on many intertidal organisms, including periwinkle, limpet, gastropods, amphipods and many meiofaunal organisms, with exposed eggs and larvae most at risk since they are not able to actively avoid the fuel. The main effects expected to be observed on phytoplankton following an oil spill include a change in phytoplankton community structure due to adverse effects of contamination, and increases in biomass due to decreased predation by zooplankton. Zooplankton are also sensitive to oil and associated chemicals. Copepods in direct contact with oil have been observed to experience increased mortality, decreased feeding and decreased reproduction. Zooplankton responses to hydrocarbons vary by species, with mortality being more dependent on exposure time than the concentration of oil at the site. Copepods also show some ability to sense and avoid oil spills, which may reduce contact and mortality rates. Recently, the mating behaviour and mating success of copepods was assessed following exposure to three concentrations of the water-soluble fraction of hydrocarbons. Hydrocarbons have been found to be able to persist in marine sediments for several years in the absence of disturbance. Even low levels of hydrocarbons may have sub-lethal effects on invertebrates (including economically important shellfish species). Crustaceans appear to be the most sensitive taxa to hydrocarbons among benthic communities.

In the unlikely event of a worst case accidental event in the nearshore it is not expected to cause an adverse effect on Fish and Fish Habitat resulting in a decrease in abundance or alteration in distribution of the population over more than one generation or so that natural recruitment would not reestablish the population(s) to baseline conditions within several generations. Significant adverse environmental effects on fish and fish habitat from nearshore accidental events are therefore not predicted.

Offshore

Accidental event scenarios during installation or operation phases of the WREP considered in this assessment include: subsea hydrocarbon blowout; surface hydrocarbon blowout; SBM whole mud spill; marine vessel incident (including collision) (i.e., diesel fuel spill); or other spills. An accidental event may result in a decrease in habitat quality and habitat quantity or potential mortality.

Models for both subsea and surface blowouts were produced by SL Ross (2012), based on oil flow rates of 6,435 m^3 per day and 3,963 m^3 per day during winter and summer scenarios. Based on modeling results, the oil spill trajectory for the Offshore Project Area covers an extensive area due to the quick dispersal and the amount of hydrocarbons that could potentially be released in the event of such an accident. After approximately one day of exposure at the water surface, the oil will have lost between 18 and 21 percent of its volume due to evaporation, with the maximum anticipated amount of evaporation over the life of the surface oil is estimated to be 31 to 36 percent (SL Ross 2012). The winter zone of influence is smaller than in summer due to strong, persistent westerly winds in the winter, creating a tighter trajectory. The summer wind direction is more variable and the modeled slick moves over a wider area. Small batch spills could occur from hose ruptures or from platform storage facilities. A vessel collision could result in a larger batch spill of diesel fuel oil. Batch spills are considered instantaneous events.

Modeling was conducted to predict the dispersion footprint and potential effects of an SBM whole mud accidental release (AMEC 2012). Modeling was based on the synthetic drilling fluid Puredrill IA-35LV (65 percent by volume), with a total density of 1,350 kg/m^3. Four spill scenarios were considered: a surface tank discharge; a rise flex joint failure (at two difference fall velocities); and a BOP disconnect. These were modeled over varying fall velocities and release times as well as seasons. The maximum deposition footprint occurred in winter for the riser flex joint scenario, with the lowest fall velocity and longest release period (three hours). The majority of modeled spills had a footprint of 1,800 m^2 or smaller (e.g., 30 m by 60 m). The smallest footprints (30 m b 30 m) were modeled for the BOP disconnect scenario over a relatively short release time (one hour) and at a high fall velocity.

In the unlikely event of an accidental event in the offshore it is predicted to be reversible and is not expected to cause an adverse effect on Fish and Fish Habitat resulting in a decrease in abundance or alteration in distribution of the population over more than one generation or so that natural recruitment would not reestablish the populations(s) to baseline conditions within several generations. Residual environmental effects on fish and fish habitat from offshore accidental events are therefore predicted to be **not significant**.

5.9.2. Marine Birds 2

Nearshore

Spill modeling of the accidental release of marine fuel in Placentia Bay predicts that 100 m^3 and 350 m^3 spills not reaching shore would evaporate from the surface within approximately 52 and 67 hours, respectively (SL Ross 2012). Slick width was estimated to be up to 440 m, with the loss of the slick at distances of up to 53 km. However, under certain wind conditions and currents, a spill in Placentia Bay could reach shore prior to evaporation (SL Ross 2012). When wind conditions were included in the model, a 350 m^3 slick during March-July reached the shore within 2 to 159 hr, but was most likely to do so within 6 to 48 hr (SL Ross 2012). The maximum slick life for a spill that did not reach shore was eight days. Weathering processes (photolysis and biodegradation) would reduce the amount of oil potentially reaching shorelines.

A graving dock breach would increase suspended sediment and sedimentation in the nearshore and potentially affect seabirds through localized effects on their food (e.g., benthic invertebrates and fish) and/or their foraging ability (e.g., reduced visibility).

The presence of hydrocarbons may temporarily affect habitat quality of oiled areas for both oiled and un-oiled birds. Prey availability may be reduced or marine birds may react by avoidance of affected habitat. Sub lethal effects of hydrocarbons ingested by marine birds may affect their reproductive rates or survival rates. Sub lethal effects may persist for a number of years, depending upon generation times of affected species and the persistence of any spilled hydrocarbons.

Exposure to hydrocarbons has effects on thermal regulation and buoyancy that typically lead to mortality of affected marine birds. Although some may survive these immediate effects, long-term physiological changes may eventually result in death. Most seabirds are relatively long-lived. Hydrocarbons may be transferred to eggs or nestlings, causing embryo or nestling mortality.

In the unlikely event of accidental events (hydrocarbon spills due to collisions, graving dock breach), adverse environmental effects in the Nearshore Study Area are predicted to be low to high in magnitude, low to moderate in geographic extent, low to moderate in duration and low in frequency. Although **significant** at the individual level in most cases, these environmental effects are predicted to be reversible at the population level.

Offshore

Spills in the Offshore Study Area could be associated with a subsea hydrocarbon blowout, surface oil spills, or fuel spills from vessels. Oil spill modeling for the WREP in the Offshore Study Area indicates that a diesel fuel spill was estimated to have a slick survival time of 48 hr (SL Ross 2012) and would thus have reduced effects on marine birds compared to a large-scale crude oil spill. A crude oil blowout of 3,963 to 6,435 m^3/day over 120 days would have a slick survival time of more than 30 days; a subsea blowout would have a thinner, but wider slick (up to 2.8 km) than a surface blowout (up to 3.4 mm thick and 160 m wide) (SL Ross 2012). The spill would most likely be dispersed to a southeasterly direction, away from the shore. According to the spill modeling (SL Ross 2012), oil is highly unlikely to reach the shore if a spill occurs in the Offshore Study Area. The probability of a crude oil spill reaching shore was zero for December through February and April through September, and less than 1 percent for March, October and November (SL Ross 2012).

SBM whole mud spills, if they accidentally occur with the WREP, have some potential to form a sheen on the water's surface. However, the most likely scenario would be a release at depths greater than usually used by marine birds. The muds used are selected for their low toxicity to organisms. The density of SBMs would favour sinking to the sea bottom. Most spills modeled for the WREP were predicted to cover 1,800 m^2 or less (AMEC 2012). The SBM will biodegrade within weeks to months depending upon water temperature and other physical factors.

Hydrocarbon spills are not likely to permanently alter marine bird habitat quantity. Spill cleanup, weathering and biodegradation would result in eventual recovery of such habitat. SBM whole mud spills are likely to cover small areas and have small scale, reversible effects on benthos. Any sheen created from an SBM spill would be of short duration and cover a limited area of the sea surface.

Exposure to hydrocarbons frequently leads to hypothermia and deaths of affected marine birds. Although some may survive these immediate effects, long-term physiological changes may eventually result in death. Most marine birds are relatively long-lived. Adult marine birds foraging offshore to provision their young may become oiled and bring hydrocarbons on their plumage back to the nest to contaminate their eggs or nestlings, causing embryo or nestling mortality.

SBM whole mud spills would not be toxic to marine birds and therefore would not have the potential for mortality except under very exceptional circumstances such as a large surface spill, flat calm conditions, presence of birds on the water, and presence of a thick enough sheen to affect insulation.

In the unlikely event of accidental events (i.e., hydrocarbon spills due to collisions, subsea blowouts, batch spills or marine vessel incidents, SBM whole mud spills), adverse environmental effects in the Offshore Study Area are predicted to be low to high in magnitude, low to high in geographic extent, low to moderate in duration and low in frequency. Although hydrocarbon spills could result in some mortality at the individual level, these environmental effects are predicted to be reversible at the population level within one generation. However, these environmental effects could be **significant** if carried over more than one generation according to the definition of significance used in this environmental assessment. Husky has committed to continuing the current seabird observation program for the White Rose field.

5.9.3. Marine Mammals and Sea Turtles 1

Nearshore

The effect of an accidental release of hydrocarbons (i.e., fuel) in the Nearshore Study Area would be attributable to vessel malfunctions. A detailed analysis can be found in SL Ross (2012).

Spill modeling based on the accidental release of fuel in Placentia Bay predicts that a 100 m^3 and 350 m^3 spill that does not reach shore would evaporate from the surface within approximately 52 and 67 hours, respectively (SL Ross 2012). The slick width was estimated to be up to 440 m, with the loss of the slick at distances of up to 53 km. However, a spill in Placentia Bay could reach shore prior to evaporation under certain wind conditions and currents (SL Ross 2012). When wind conditions were included in the model, a 350 m^3 slick during March-July reached the shore within 2 to 159 hr, but was most likely to do so within 6 to 48 hr (SL Ross 2012). The maximum slick life for a spill that did not reach shore was eight days. Weathering processes (photolysis and biodegradation) would reduce the amount of oil potentially reaching shorelines.

No direct changes in habitat quantity are expected during accidental events. However, a change in habitat quality because of a hydrocarbon spill may indirectly reduce the amount of habitat available to a marine mammal, river otter, or sea turtle by rendering it unsuitable for foraging and other activities.

The accidental release of fuel may affect several physical and internal functions of marine mammals and sea turtles. Hydrocarbons can be inhaled or ingested, and may cause behavioural changes, inflammation of mucous membranes, pneumonia and neurological damage. However, most marine mammals, with the exception of fur seals, polar bears and sea otters (none of these species are expected to occur in the Nearshore Study Area), are considered to be not directly susceptible to deleterious effects of oil. However, newborn hair seal pups and weak or stressed animals may also be vulnerable to oils spills. Less information is known about the effects of fuel oil on marine mammals.

A fuel spill in Placentia Bay was estimated to evaporate or disperse within a maximum eight days, limiting the exposure time of the animals to the fuel. Hydrocarbons from a spill could reach the shore, which may result in oiling and degradation of habitat for river otters and hauled out harbour seals. Harbour seals may be particularly at risk because they exhibit site fidelity. However, harbour seals are considered uncommon in the Nearshore Study Area and grey seals are expected to be rare.

It is uncertain how susceptible river otters are to hydrocarbon spills. Coastal river otters in the Placentia Bay feed on intertidal and sub tidal fish and invertebrates and thus have an increased likelihood of exposure to residual hydrocarbons.

For marine mammals and sea turtles, it is probable that only small proportions of populations are at risk at any one time in the Nearshore Study Area. Oil spill prevention measures, along with typical oil spill countermeasures (creating an oil spill response plan, training, preparation, an equipment inventory and conducting emergency response drills) will serve to reduce the number of animals exposed to hydrocarbons. Depending on the time of year, location of animals within the affected area and type of oil spill, the effects of an oil release on the health of cetaceans is predicted to range from negligible to low magnitude over varying geographic extents.

Based on present knowledge of Placentia Bay and the modeling exercises, it can be predicted that a hydrocarbon spill associated with the WREP, although unlikely, will **not result in any significant** residual environmental effects to marine mammals or sea turtles in the Nearshore Study Area.

Offshore
Spills in the Offshore Study Area could be associated with a subsea hydrocarbon blowout, surface oil spills, or fuel spills from vessels. A diesel fuel spill was estimated to have a slick survival time of 48 hours (SL Ross 2012) and would thus have reduced effects on marine mammals and sea turtles compared to a crude oil spill. A detailed analysis can be found in SL Ross (2012).

A crude oil blowout of 3,963 to 6,435 m^3/day would have a slick survival time of more than 30 days; a subsea blowout would have a thinner, but wider slick (up to 2.8 km) than a surface blowout (up to 3.4 mm thick and 160 m wide). The spill would most likely be dispersed to a southeasterly direction, away from the shore. According to the spill modeling (SL Ross 2012), oil is highly unlikely to reach the shore if a spill occurs in the Offshore Study Area. The probability of a crude oil spill reaching shore was zero for December through February and April through September, and less than 1 percent for March, October and November. No direct changes in habitat quantity are expected during accidental events. However, a change in habitat quality because of a hydrocarbon spill may indirectly reduce the amount of habitat available to marine mammals or sea turtles by rendering it unsuitable for foraging and other activities.

The accidental release of hydrocarbons may affect several physical and internal functions of marine mammals and sea turtles. Hydrocarbons can be inhaled or ingested, and may cause behavioural changes, inflammation of mucous membranes, pneumonia and neurological damage. Most marine mammals, with the exception of fur seals, polar bears and sea otters (none of these species are expected to occur in the Offshore Study Area), are considered to be not directly susceptible to deleterious effects of oil. However, weak or stressed animals may also be vulnerable to oils spills.

Oil is not expected to reach the shore if a spill occurs in the Offshore Study Area. Thus, hauled out seals are not expected to be effected. Therefore, the effects are considered less for seals in the Offshore Study Area compared with the Nearshore Study Area.

Marine mammals and sea turtles are not considered to be at high risk from the effects of oil exposure, but some evidence implicates oil spills with seal mortality, particularly young seals. Sea turtle carcasses are also often found after a spill. However, harbour seals are considered rare in the Offshore Study Area, and grey seals as well as sea turtles are expected to be uncommon. Baleen whales appear to be less susceptible to spills than delphinids, as dolphins are often found stranded after an oil spill. Thus, delphinids that occur in the Offshore Study Area at the time of the spill are most susceptible to fouling.

Animals exposed to heavy doses of hydrocarbon for prolonged periods could experience mortality. Chronic exposure to hydrocarbons, either through surface contact or ingestion, may occur in cetaceans, seals and sea turtles. Hydrocarbon toxicity could result in physiological damage, such as lesions and effects on blood and enzyme chemistry.

For marine mammals and sea turtles, it is probable that only small proportions of populations are at risk at any one time in the Offshore Study Area. Oil spill prevention measures, along with typical oil spill countermeasures (creating an oil spill response plan, training, preparation, an equipment inventory, and conducting emergency response drills) will serve to reduce the number of animals exposed to oil.

Depending on the time of year, location of animals within the affected area, and type of oil spill or blow-out, the effects of an offshore oil release on the health of cetaceans is predicted to range from negligible to low magnitude over varying geographic extents. Based on present knowledge of Jeanne d'Arc Basin, the modeling exercises, and on past monitoring experience with large spills (*e.g.*, *Exxon Valdez*, *Arrow* and others), although unlikely, it can be predicted that an oil spill associated with the WREP will **not result in any significant** residual environmental effects to marine mammals or sea turtles in the Offshore Study Area.

5.9.4. Commercial Fisheries 1

Accidental events that might affect fisheries and fisheries research in both the Nearshore and Offshore Study Areas are mostly related to the unplanned release of hydrocarbons, whether refined or crude product. Others are the accidental release of construction debris, which might damage fishing gear beyond the safety zones, and a breach in the graving dock, which could release debris and a sediment plume which could foul gear and affect catch quantity and/or quality. It is concluded that biophysical effects on fish from an unlikely spill or blowout will be **not significant**.

However, economic impacts might still occur if a spill prevented or impeded a harvester's ability to access fishing grounds (because of areas temporarily excluded during the spill or spill clean-up), caused damage to fishing gear (through oiling) or resulted in a negative effect on the marketability of fish products (because of market perception resulting in lower prices). While there is little fish harvesting in the Offshore Project Area, in the case of an uncontrolled release from the platform, a slick could reach an active fishing area (e.g., to the north or east of the drill centres or WHP in summer). In that case, it is likely that fishing would be halted, owing to the possibility of fouling gear. If the release site is some distance from snow crab fishing grounds, there would be time to notify fishers of the occurrence and prevent the setting or hauling of gear and thus prevent or minimize gear damage. Exclusion from the spill area would be expected to be short-term, as typical sea and wind conditions in the Offshore Project Area would promote fairly rapid evaporation and weathering of the slick, and fishing vessels would likely be able to return within several days. Nevertheless, if fishers were required to cease fishing, harvesting might be disrupted (though, depending on the extent of the slick, alternative fishing grounds might be available in a nearby area). An interruption could result in reduced catches, or extra costs associated with having to relocate crab harvesting effort.

Effects due to market perceptions of poor product quality (no buyers or reduced prices, etc.) are more difficult to predict, since the actual (physical) effects of the spill might have little to do with these perceptions. It would only be possible to quantify these effects by monitoring the situation if a spill were to occur and if it were to reach snow crab harvesting areas. In some circumstances, a shortage of raw materials supply because of a spill has been observed to drive up prices paid for fish because of supply shortages. Financial compensation would be provided for any actual loss in fishing income resulting from a spill, and Husky's fishing gear and vessel compensation program will include spill related damage (such as fouling) to mitigate for gear damage that may result from an accidental WREP event.

Economic effects from accidental events, including hydrocarbon spills (caused by loss of access, gear damage or changes in market value) **could be considered significant** to the commercial fisheries. However, the application of appropriate mitigative measures (e.g., economic compensation) would reduce the potential effect to **not significant**.

5.9.5. Species at Risk 1

Nearshore

The offshore activities that could potentially interact with marine fish SAR include those discussed in **Section 5.8.1**. A hydrocarbon spill could result in effects with high magnitude and have a relatively large geographic extent and have effects for up to one year. In the unlikely case of a marine diesel fuel spill, the potential adverse effects are predicted to result in the killing or harming of a fish species that is listed as extirpated, endangered or threatened, even with mitigations in place. However, as none of the Schedule 1 marine fish SAR are a population that is vulnerable to extinction, environmental effects are considered **not significant**.

Offshore

There is potential for accidental events to occur in the Offshore Study Area during installation or operation phases of the project, including: a subsea hydrocarbon blowout, SBM whole mud spill, marine diesel fuel spill, other spills (e.g., fuel, waste materials), or a hydrocarbon surface spill. There is potential for such an accidental event to affect marine fish SAR through change in habitat quality or potential mortality. **The effects are described above in Section 5.8.1.** Environmental effects from an SBM whole mud spill or other type of spill (e.g., waste materials) are predicted to be not significant as the environmental effects are generally low in magnitude, of limited geographic extent and reversible.

Environmental effects on marine fish SAR from the release of marine diesel or hydrocarbons (subsea blowout or surface spill) are predicted to be high in magnitude and to cover a large geographic extent and result in change in habitat quality and potential mortality of marine fish SAR. In the unlikely case of a marine diesel fuel spill, subsea hydrocarbon blowout or surface spill, potential adverse environmental effects are predicted to result in the killing or harming of a fish species that is listed as extirpated, endangered or threatened, even with mitigations in place. However, as none of the Schedule 1 marine fish SAR are a population that is vulnerable to extinction, environmental effects are considered **not significant**.

5.9.6. Sensitive Areas 1

Nearshore

The assessment of the environmental effects of an accidental event on the Nearshore Study Area includes the potential effects on Sensitive Areas that could result from the accidental release of diesel fuel (as a result of a collision) in the Nearshore Study Area. Oil spill trajectory modeling suggests that hydrocarbons from a spill at the Nearshore Project Area will likely remain near the site of the spill and will reach shorelines within 24 to 48 hours, without any spill mitigation or spill response. As this EBSA covers the entire Placentia Bay, any spill has the potential to have an interaction with this Sensitive Area.

Seagrasses, including the local species of eelgrass (*Zostera marina*), are sensitive to exposure to hydrocarbons. Possible interactions could include uptake of hydrocarbons or the oiling of leaves, which may cause the plants to lose their leaves. Direct oiling is more likely to occur in very shallow water where the eelgrass sits at the surface and is exposed to the hydrocarbon slick; however, direct oiling is uncommon .The greater concern is the uptake of hydrocarbons by the plant from the water column .The presence of hydrocarbons in the water column may cause non-lethal physiological effects or the mortality of individual plants if there are moderate to high concentrations in the water column for a few hours, or low concentrations of hydrocarbons that persist over a few days; however, no effect may also be observed. The potential effects from oiling on eelgrass may be greater in sheltered areas that have little mixing and flushing action since oil will tend to persist for longer. Seasonal variation can also affect the duration and extent of a hydrocarbon spill, as well as potential effects on the eelgrass life cycle.

Pebble beaches are used by spawning capelin in Newfoundland and Labrador. Pebble beaches are permeable with an unstable surface layer, and typically have low diversity and abundance of marine life. Oil on pebble beaches is less likely to stay at lower levels of the beach and more likely to concentrate on the upper beach due to wave action, or to become buried in sediment.
A diesel fuel spill as a result of an accidental event or collision occurring in May, June, or July may interact with capelin spawning, eggs and larvae. Natural mortality levels of capelin eggs and larvae are very high; therefore although the effect of a diesel spill on spawning success may be

considerable locally if capelin spawning and the diesel fuel spill overlap spatially and temporally, it would likely be undetectable at the population level.

Short-term responses of plants to oil exposure include reductions and transpiration and carbon fixation to mortality of plants. Chronic oil pollution severely reduces marsh grasses and can alter marsh extent. Oil can affect root systems if it penetrates the sediment, and can also affect bacteria populations and the cycling of oxygen. Vegetation (i.e., leaves) that becomes coated in oil can reduce oxygen diffusion and cause root die-off. Oil adheres to most salt marsh plants and low tidal flow cannot readily wash it off. Plant recovery is dependent on surviving roots. The worst-case scenario would occur if seedlings and annual plant species were exposed to oil during the spring and summer growth season and there was a large-scale die-off of marsh plants. Temperate salt marsh plants may be capable of recovering from spill events over months to a few years; however, in other cases, oiled plants have been documented to fail to re-sprout or to recruit seedlings 17 months after oiling. There is also potential for persistence of oil in sediments, as has been reported in cases where the spill involved thick, untreated oil that was stranded on the high marsh during a spring tide in a highly sheltered area. It has been reported that oil continued to affect a marsh ecosystem for six years after an oil spill and that after 20 years, residual effects were “extremely small”, provided the oil remained undisturbed in sediments. Salt marshes have been identified near Swift Current in northwestern Placentia Bay, with estuarine influence reaching Sound Island, Woody Island and Bar Haven Island. The nearshore oil spill trajectory modeling (SL Ross 2012) indicated that there is a 1 to 5 percent probability that oil could reach the outer edges of Sound Island (closest to Swift Current), but would not reach the inner reaches of Swift Current, likely due to the strong freshwater influxes from Piper’s Hole and other nearby rivers.

The Placentia Bay and Cape St. Mary’s IBAs have been designated as globally important sites for seabirds, shorebirds and migratory birds. In the case of an accidental event there is potential for diesel fuel to contaminate the marine environment and reduce water quality, and potentially affect birds using the IBAs. An accidental release of marine diesel fuel has been modeled for the areas where project activities will occur (S.L. Ross 2012) and it is not anticipated to reach the Cape St. Mary’s IBA and has a predicted one to five percent chance of reaching the Placentia Bay IBA.

River otters are common in Placentia Bay and exhibit a marine lifestyle. They use several sites as haul out areas and for feeding. In the case of an accidental event, oiling of otters due to the accidental release of diesel fuel in the nearshore is a potential threat, as the fuel can be toxic if ingested and can reduce or remove the insulating ability of fur. A recent study of sea otters (*Enhydra lutris*) in Prince William Sound, Alaska, suggests that hydrocarbons from the 1988 *Exxon Valdez* oil spill have persisted in intertidal sediments, and that otters foraging in the intertidal zone are exposed to the oil (Bodkin et al. 2012).

The likelihood of an oil spill in the Nearshore Study Area from an accidental event or collision occurring is low. In the unlikely event of a diesel spill in the Nearshore Study Area, procedures and plans will be implemented to reduce the severity and duration of interactions between hydrocarbons and Sensitive Areas. Adverse residual environmental effects are predicted to be not significant for identified Sensitive Areas in the Nearshore Study Area. The likelihood of such an event occurring is considered low.

Offshore

In the highly unlikely event of a spill offshore, spill modeling predicts that the dispersed oil will have a low to moderate chance of interacting with Sensitive Areas. It is also predicted that the Sensitive Areas would not be affected on a permanent basis, nor is it predicted that the resident species would be affected in such a way that natural recruitment is unable to return the population or community to its former level. Spill prevention and contingency plans will reduce the likelihood of an accidental event. The residual adverse environmental effects on Sensitive Areas are rated as not significant.

5.10. Follow-up Monitoring Required Yes☒ No☐

The C-NLOPB, EC, DFO and TC will require Husky to undertake follow-up monitoring, as defined in the CEA Act.

DFO will require monitoring of the stability/movement of dredge spoil piles using seabed surveys in order to determine whether the disposal of material from the proposed activities remains contained within the area where HADD will be authorized. DFO will also require Husky to carry out compensation and monitoring measures as outlined in any Fish Habitat Compensation Agreement related to the project.

The C-NLOPB will require Husky to undertake environmental effects monitoring of its development drilling and production activities associated with the new drilling activities. The environmental effects monitoring is to confirm or validate environmental assessment predictions and to ascertain environmental effects from offshore petroleum production activities. Therefore, Husky will be required to modify its existing EEM program to incorporate drilling and production activities of the Project.

Husky has committed to continuing the current seabird observation program for the White Rose field.

6.0 Other Considerations

Mitigations presented by Husky in its environmental assessment for the WREP are sufficient to prevent or reduce environmental impacts. Specific details of the monitoring program will be discussed with Husky at the time of application for the well abandonment program. Depending on the timing of the well abandonment program, additional mitigations or monitoring protocols may be required.

The RAs are satisfied with the environmental information provided by Husky regarding the potential adverse environmental effects, which may result from the proposed activities and are satisfied with the Operator's proposed monitoring and mitigative measures.

The RAs are of the view that the environmental effects from the Project, in combination with other projects or activities that have been or will be carried out, are not likely to cause significant adverse cumulative environmental effects.

The RAs are of the view that if the proposed environmental mitigative measures outlined in the 2012 EA Report and 2013 response to review comments, and those listed below are implemented, the Project is not likely to cause significant adverse environmental effects.

6.1. Recommended Conditions and/or Mitigations

For authorizations issued by the C-NLOPB, it is recommended that the following conditions be appended, if the Project is approved.

For any authorizations issued by the C-NLOPB

- *Husky Energy shall implement, or cause to be implemented, all the policies, practices, recommendations and procedures for the protection of the environment included in or referred to in the "Husky Energy White Rose Extension Project Environmental Assessment" (Husky December 2012), and supporting documents, and the "Husky Energy White Rose Extension Project Response to Review Comments on the White Rose Extension Project Environmental Assessment" (Husky 2013).*

For Drilling and Production Operations

- *Husky Energy will be required to submit to the Chief Conservation Officer, no later than 12 months prior to the scheduled commencement of offshore drilling activities associated with the Project, an amended EEM design that incorporates drilling and production activities associated with the proposed activities, and tie-back to the SeaRose. The amended EEM Plan* *should be consistent with the strategy in the Husky EEM Design Report, discuss any changes that may be required to existing sampling stations, and consider the necessity for collection of baseline data at any or all of the new drill centre and CGS locations. Drilling operations associated with the Project will not be authorized until an acceptably amended EEM Plan is in place. Drill cutting dispersion model predictions will be validated in situ by monitoring the thickness of cutting piles on the seafloor once the White Rose EEM program is revised to accommodate operation of the WREP.*

- *Husky Energy will be required, prior to commencement of offshore construction activities, to collect any field data required to inform the design of its EEM program.*

- *Husky Energy will design a drill cuttings particle size sampling plan to be executed at the next opportunity. The samples will be analyzed for particle size and those data will be compared to the data used for input into the WREP environmental assessment cutting dispersion model (AMEC 2012). If the particle size data sets are not comparable, the cutting dispersion model(s) will be re-run and the results used to re-assess and adjust the associated environmental assessment predictions, as necessary.*

For VSP and/or Wellsite Surveys

- *The Operator, or its contractors, shall shut down the seismic air gun array if a marine mammal or sea turtle listed as Endangered or Threatened (as per Schedule 1 of SARA) is observed in the safety zone during ramp- up procedures and when the array is active. The safety zone shall have a radius of at least 500 m, as measured from the centre of the air source array(s).*

For authorizations issued by Fisheries and Oceans Canada, it is recommended that the following conditions be appended, if the Project is approved.

- *Husky Energy (the Operator) shall implement, or cause to be implemented, all the policies, practices, recommendations and procedures for the protection of the environment included in or referred to in the "Husky Energy White Rose Extension Project Environmental Assessment" (Husky December 2012), and supporting documents, and the "Husky Energy White Rose Extension Project Response to Review Comments on the White Rose Extension Project Environmental Assessment" (Husky 2013).*

For Near Shore Activities (Graving Dock)

- *To compensate for the loss of productive fish habitat associated with the excavation and dredging of the seabed adjacent to the graving dock, Husky Energy will agree to conditions* *related to mitigations, fish habitat compensation measures and monitoring as presented in its subsection 35(2) Fisheries Act Authorization.*

For VSP and/or Wellsite Surveys

- *The Operator, or its contractors, shall adhere to the "Statement of Canadian Practice with respect to Mitigation of Seismic Sound in the Marine Environment", which specifies the mitigation requirements that must be met during the planning and conduct of marine seismic surveys, in order to minimize impacts on life in the oceans.*

For permits issued by Environment Canada, it is recommended that the following conditions be appended, if the Project is approved.

- *Any effluents discharged to the marine environment at Argentia during CGS construction must meet the requirements of the general provisions of the Fisheries Act Section 36(3).*

Part D: Screening Decision

7.0 Decision/Decision Date

The Canada-Newfoundland and Labrador Offshore Petroleum Board, Environment Canada, Fisheries and Oceans Canada, and Transport Canada are of the opinion that, taking into account the implementation of proposed mitigation measures set out in the conditions above and those committed to by Husky Energy, the Project **is not likely to cause significant adverse environmental effects.** This represents a decision pursuant to Section 20(1) (a) of the CEA Act (S.C. 1992).

Responsible Officer *Original signed by Elizabeth Young* Date: *September 18, 2013*
Elizabeth A. Young
Environmental Assessment Officer
C-NLOPB

Responsible Officer *Original signed by Jeffrey Corkum* Date: *September 11, 2013*
Regional Director
Environmental Protection Operations Division
Environment Canada

Responsible Officer *Original signed by Tilman Bieger* Date: *September 10, 2013*
Regional Manager
Fisheries Protection Program
Fisheries and Oceans Canada

Responsible Officer *Original signed by Kevin LeBlanc* Date: *September 11, 2013*
Regional Manager
Environmental Affairs & Aboriginal Consultation
Transport Canada

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