CANADA-NEWFOUNDLAND and LABRADOR OFFSHORE PETROLEUM BOARD
ENVIRONMENTAL ASSESSMENT

PART A: GENERAL INFORMATION

Screening Date	**August 14, 2013**
EA Title	Environmental Assessment of GXT's LabradorSPAN 2-D Seismic, Gravity and Magnetic Survey, 2013-2015
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Law List Triggers	Paragraph 138(1) (b) *Canada-Newfoundland Atlantic Accord Implementation Act* (Accord Act)

Part B: PROJECT INFORMATION

On January 29, 2013, GX Technology Canada Ltd. (GXT) submitted a project description entitled, *GXT 2013-2015 LabradorSPAN Marine 2-D Seismic, Gravity and Magnetic Survey* (GXT, 2013) to the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB), describing its plans to conduct 2-Dimensional (2D) seismic, gravity, and magnetic surveys in the offshore region of the Labrador Shelf and Slope. GXT may conduct these surveys in one or more years within the 2013-2015 timeframe. GXT submitted the *Environmental Assessment of GXT's LabradorSPAN 2-D Seismic, Gravity and Magnetic Survey, 2013-2015* (LGL, 2013a) on April 2, 2013. On June 25, 2013, the C-NLOPB requested additional information from GXT to respond to review comments on the April 1 submission. On July 1, 2013, GXT responded to the review comments, via the *GX Technology Canada Ltd. 2-D Seismic, Gravity and Magnetic Survey for the Labrador Shelf Area, 201 to 2015 Environmental Assessment Responses to Environmental Assessment Review Comments* (LGL 2013b).

1 Description of Project

The proposed Project is a ship-based program to conduct a 2-D single streamer marine geophysical survey that will collect seismic, gravity and magnetic data. A seismic survey is proposed between 1 June to 30 November in any given year between 2013 and 2015. A maximum acquisition of 8,500 line km will

be acquired each year. During 2013, up to 8,500 line km will be acquired. Additional seismic surveys may be conducted within the Project Area in 2014 and 2015 also with a maximum annual proposed acquisition of 8,500 km. The proposed 2-D program will use a conventional seismic ship which will tow the sound source (airgun array) and a single seismic hydrophone streamer up to 12 km long. The seismic vessel will also collect (passively) gravity and magnetic data at the same time, and it will have an echosounder for depth soundings

2 Description of Environment

The following sections provide a summary of the environmental factors described in the EA Report. A complete description of the biological and physical environment can be found in that report (March 2013) and the subsequent addendum (June 2013).

2.1 Physical Environment

The bathymetry in the Study Area is relatively complex with depths ranging from ~100 m to depths over 3,000 m, including continental shelves, slopes, and the abyssal plain. The Study Area is bounded on the northwest by Saglek Bank and the entrance to Hudson Strait, and in the south by the continental shelf waters of Newfoundland. Other major bathymetric features include Nain Bank, Makkovik Bank, Hamilton Bank, Harrison Bank, Hopedale Saddle, Cartwright Saddle, and the Labrador Marginal Trough.

Data from the National Climate Data and Information Archive, Climate Normals and Averages for four land based weather stations near the Study Area—Hopedale, Cartwright, Battle Harbour (Loran; 1961-1990), and Nain (1971-2000) were used to calculate average air temperatures from June to November. Air temperature means ranged from -5.1 to 12.3° C (Environment Canada 2013), with coldest temperatures in Nain in November.

Within the Study Area, the lowest mean monthly wind speeds are experienced in July. MSC50 hindcast data from the Meteorological Service of Canada, taken from Section 3 of the Labrador Shelf Offshore Area SEA (Sikumiut 2008) are used here to describe wind speeds in the GXT Study Area. A series of nine grid point locations distributed north to south throughout the Study Area were used. Mean monthly wind speeds for the period of June to November range from 4.97-9.54 m/s in the north and 5.96-10.53 in the south. July had the lowest mean wind speed at all nine locations, with wind speeds increasing through the fall and into the winter. Maximum monthly wind speeds of 28.69 m/s were recorded in November at grid point location 58° N, 59° W. The maximum wind speeds for July were 19.65 m/s at grid point location 53° N, 51° W.

Within the Study Area, annual visibility statistics for the South Labrador coast, Offshore Weather Station Bravo (OWS), and Northwest Labrador Sea, indicate more variable visibility during summer months (June-August), with higher percent occurrence of reduced visibility, and increased visibility through the fall to November.

The Labrador Current runs south along the Labrador coast originating in the Davis Strait with contributions from the warmer more saline waters of the West Greenland Current, and the cold, low salinity waters of the Baffin Island Current and Hudson Bay. In the middle of the Study Area, near Hamilton Bank, the Labrador Current branches into a smaller inshore and larger offshore stream. The minimum mean velocity, occurring in March/April is 3.1 cm s^{-1} and the maximum mean velocity, typically in October, is 35.1 cm s^{-1}. The steepest portion of the continental slope generally experiences stronger currents than over the continental shelf or areas farther offshore.

Wind conditions in the Study Area are relatively low during the summer and fall; usual wave conditions are also relatively minimal. Using 50 years of hindcast data from the same nine MSC50 grid locations as

for the wind conditions, the lowest monthly mean significant wave heights are experienced in July increasing through the fall, peaking in December and January. At the most northern grid point (60° N, 61° W) the range of mean significant wave heights between June and November is 1.20-2.63 m and at the most southerly point (52° N, 51° W), 1.53-3.41 m. Maximum monthly significant wave heights recorded in the Study Area were up to 12.59 m in November (grid point 54° N, 53° W) and in July, maximum significant wave height reached 6.00 m at the most southerly station (grid point 52° N, 51° W).

The average start of the ice season in the Study Area is mid-November in the more northern areas and throughout December in the southern extent. Ice growth continues until early spring when ice retreat and break-up occurs. First signs of break-up occur around Notre Dame Bay in mid-March. The southern ice edge retreats to the Strait of Belle Isle by late-May and northward again to 55° N by late-June. More northern coastal regions see the end of ice season in late-July/early-August. The majority of the Study Area will be free of sea ice from late-June to November.

Data from the International Ice Patrol (IPP) Iceberg Sightings Database for the period of June to November, 2001-2011, show a total of 10,758 icebergs observed offshore Labrador. These observed sightings may not include all icebergs passing through offshore Labrador but indicate where they are most likely to occur in the area and relative abundance by month and year. Of the 10,758 icebergs observed during the June to November periods, most were sighted in June (45.0%) and July (23.3%). There is a great deal of interannual variation in the numbers of observed icebergs. For example, in 2005, during June to November, there were 36 icebergs whereas for that same time period in 2011, there were 3133 icebergs. About 45% of the 10,758 icebergs recorded during June to November, 2001-2011 were classified as medium, large or very large size.

2.2 Biological Environment

2.2.1 Species at Risk

There are a number of Species at Risk, as defined under Schedule 1 of the *Species at Risk A*ct (SARA) that are likely to be within the Study Area. The following table identifies species likely to be present and their SARA listing and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status. A brief description of species listed as endangered, threatened or of special concern on Schedule 1 is included below.

SPECIES	SARA Status	COSEWIC Status
Blue Whale (*Balenoptera musculus*)	Schedule 1 – Endangered (May 2012)	Endangered (May 2012)
Northern bottlenose whale (*Hyperoodon ampullatus*) Scotian Shelf population	Schedule 1 – Endangered (May 2011)	Endangered (May 2011)
White shark (*Carcharodon carcharias*) Atlantic population	Schedule 1 – Endangered (April 2006)	Endangered (April 2006)
Leatherback Sea Turtle (*Dermochelys coriacea*)	Schedule 1 – Endangered (May 2012)	Endangered (May 2012)
Ivory Gull (*Pagophilia eburnea*)	Schedule 1 – Endangered (April 2006)	Endangered (April 2006)
Northern Wolffish (*Anarhichas denticulatis*)	Schedule 1 – Threatened (November 2012)	Threatened (November 2012)
Spotted Wolffish (*Anarhichas minor*)	Schedule 1 – Threatened (November 2012)	Threatened (November 2012)

Atlantic Wolffish (*Anarhichas lupus*)	Schedule 1 – Special Concern (November 2012)	Special Concern (November 2012)

The blue whale tends to be more frequently observed in deep water than in coastal environments. Blue whales likely number in the low hundreds in the NW Atlantic (COSEWIC 2002); the recovery strategy for blue whales in the NW Atlantic notes a long-term recovery goal of 1,000 mature individuals through the achievement of three 5-year objectives (Beauchamp et al. 2009). No Critical Habitat was identified. Blue whales have been sighted only sporadically off the Labrador coast (COSEWIC 2002). There have been rare sightings of blue whales off Labrador, although this may at least partially be attributable to poor observer coverage in the Project Area. In the DFO cetacean sightings database, there were only two records of blue whales in the southwestern portion of the Study Area. Blue whales are likely to occur on the Labrador Shelf in late winter and spring, but have been sighted in the region year-round.

The total abundance of northern bottlenose whales in the N Atlantic is unknown. However, Whitehead and Wimmer (2005) estimated that ~163 individuals comprise the Scotian Shelf population; the most recent estimate is ~164 individuals (COSEWIC 2011). The size of the Baffin Bay-Davis Strait-Labrador Sea population is uncertain (COSEWIC 2011; Whitehead and Hooker 2012). The recovery goal for the Scotian Shelf population is to "achieve a stable or increasing population and to maintain, at a minimum, current distribution. The Davis Strait population has no status under *SARA* but is considered *special concern* by COSEWIC (2011). The Labrador population is considered to occur in the area year-round, with mating and births occurring from April to June, with a peak in April. Northern bottlenose whales are likely to occur at low densities, but year-round, throughout the deep, offshore waters of the Labrador Sea. Based on the DFO cetacean sightings database, 116 groups of northern bottlenose whales have been sighted in the deeper waters and near the shelf break of the Study Area from April to December.

The white shark has been recorded from the NE Newfoundland Shelf, the Strait of Belle Isle, the St. Pierre Bank, Sable Island Bank, the Forchu Misaine Bank, in St. Margaret's Bay, off Cape La Have, in Passamaquoddy Bay, in the Bay of Fundy, in the Northumberland Strait, and in the Laurentian Channel as far inland as the Portneuf River Estuary. The species is highly mobile, and individuals in Atlantic Canada are likely seasonal migrants belonging to a widespread NW Atlantic population. It occurs in both inshore and offshore waters, ranging in depth from just below the surface to just above the bottom, down to a depth of at least 1,280 m.

There are an estimated 34,000 to 94,000 leatherback adults in the North Atlantic (TEWG 2007), but there is no current estimate of the number of leatherbacks using eastern Canada waters (COSEWIC 2012). Nonetheless, James et al. (2006) suggested that Canadian waters support high densities of leatherbacks during the summer and fall, and that the Canadian waters should be considered critical foraging habitat for this species. Three primary habitats, likely used as foraging areas by leatherback turtles in Atlantic Canada, were identified using satellite tracking data: (1) the area near Georges Bank, (2) southeastern Gulf of St. Lawrence and waters east of Cape Breton, and (3) waters south and east of Burin Peninsula, Newfoundland (DFO 2011c). Leatherback sea turtles forage on jellyfish in Atlantic Canadian waters. In the recovery strategy for leatherback sea turtle in the Canadian Atlantic Ocean, the recovery goal is to "achieve the long-term viability of the leatherback turtle populations frequenting Atlantic Canadian waters" via six supporting objectives (ALTRT 2006). No critical habitat was designated. Adult leatherbacks are considered regular summer visitors to eastern Newfoundland, with observations occurring from ~July to October, with a peak in August and September (Goff and Lien 1988). Most sea turtles migrate southward by mid-October (James et al. 2007; Sherrill-Mix et al. 2008). DFO

Newfoundland Region has maintained a database of leatherback turtle sightings and entanglements in Newfoundland and Labrador but records for Labrador are rare; there is only one record in the DFO database of a leatherback turtle sighting in the Study Area off Labrador, at latitude of 53ºN.

The current status of the global Ivory Gull population is poorly known. It is rare on a global scale with fewer than 14,000 pairs (COSEWIC 2006). The Canadian Arctic supports a significant but declining population of Ivory Gull. The Canadian breeding population was estimated at 2,400 individuals in the early 1980s. Currently, the Canadian breeding population is estimated at approximately 500 to 600 individuals, based on surveys conducted between 2002 and 2005. The winter range of the Ivory Gull in the Northwest Atlantic is among sea ice from the Davis Strait south to about 50º to the Labrador Sea. In some years, this includes the Strait of Belle Isle, and northern Gulf of St. Lawrence, the east coast of Newfoundland particularly the Northern Peninsula of Newfoundland, and the Lower North Shore of Québec (COSEWIC 2006). The population that winters off the Labrador and northern Newfoundland coasts include Ivory Gulls breeding in the eastern Canadian Arctic, Greenland and Franz Josef Land, based upon banding recoveries and satellite transmitters. A recent marine bird survey conducted within the pack ice off the coast of Newfoundland and Labrador in March 2004 observed few Ivory Gulls, Stenhouse and Wells, unpubl. data *in* COSEWIC 2006. Ivory Gull is probably present in the Study Area when pack ice is present or near the Study Area from December to April or May.

The Northern Wolffish and the Spotted Wolffish are primarily distributed on Newfoundland's Grand Banks and areas to the north, while Atlantic Wolffish has a wider distribution in the Gulf of St. Lawrence, Scotian Shelf, Bay of Fundy and Georges Bank, where the other two species are rare. The Northern and Spotted Wolffish are estimated to be one million and 2.7 million individuals, respectively. Atlantic wolffish is primarily demersal and inhabits shallower areas than the northern and spotted Wolffishes. During DFO RV surveys conducted in the Study Area during 2007-2011, 3,379 Atlantic wolffish were caught, 89% of which were taken during the fall surveyA large decline in wolffish numbers was observed between 1980 and 2001 in the Labrador Shelf SEA Area, particularly in the mid-1990s (Kulka *et al*. 2008). While all three species have undergone substantial declines during the 1980s and 1990s, the causes of their decline remain uncertain (Kulka *et al*. 2008). The importance of effects mitigation during offshore exploration activities has also been underlined in the recovery and management strategies for these three species. All three species are likely to be found within the Study Area, though all three are expected to be found at varying depths. A Recovery Strategy for the northern wolffish and spotted wolffish, and a Management Plan for Atlantic wolffish in Canada was published in 2008 (Kulka *et. al*., 2008).

2.2.2 Fish and Fish Habitat

A detailed description of the plankton and benthos communities can be found in the EA Report (LGL 2013a) and EA Addendum (LGL 2013b). There are three main types of marine fish present in the Study Area: pelagic fish, those that live and feed close to the surface; demersal or groundfish, those that live and feed close to the bottom; and shellfish, which include crustaceans and bivalves. The species that have typically made up more than 99% of the Study Area harvest in recent years are described below. Other species that have been harvested as incidental by-catch within the Study Area during recent years are described in the EA Report.

Distributions of Northern or pink shrimp (*Pandalus borealis*) in the Northwest Atlantic range from the Davis Strait to the Gulf of Maine. They occupy soft muddy substrates up to depths of 600 m in temperatures of 1°C to 6°C. As with most crustaceans, northern shrimp grow by moulting their shells. During this period, the new shell is soft, causing them to be highly vulnerable to predators such as Greenland halibut (turbot), cod, Atlantic halibut, skates, wolfish, and harp seals (*Phoca groventandica*). Northern shrimp are vulnerable to these predators regardless of whether they have a soft shell.

Snow crab (*Chionoecetes opilio*) occurs over broad depths in the Northwest Atlantic, from Greenland to the Gulf of Maine. Distribution is widespread on the Newfoundland and Labrador shelves. There are indications that snow crabs move from gravel bottom to mud bottom, usually in deeper waters, as they reach maturity. Snow crabs grow by moulting their shells in the spring. There is little or no information on the offshore snow crab migrations. Offshore mating is known to occur during the late winter or spring; however the actual area is unknown.

Greenland halibut (*Reinhardtius hippoglossoides*), commonly known as turbot, is a deepwater flatfish, is distributed throughout cold, deep waters of the Labrador Shelf, inhabiting the continental shelf and slope at depths of 200 to 600 m or more. High abundances of the species occur in the Hopedale, Cartwright, and Hawke Channels of mid- to southern Labrador. High abundances in shelf channels have been attributed to high concentrations of available prey, namely northern shrimp. Greenland halibut feed on a variety of species, including shrimp, small pelagic crustaceans, small fish (e.g., Arctic cod, capelin), larger fish (e.g., redfish, grenadier), and squid (DFO 2008).

Other species that have been harvested as incidental by-catch within the Study Area during recent years include striped shrimp (*Pandalus montagui*), wolffishes redfish (*Sebaste*s spp.), roughhead grenadier (*Macrourus berglax*), American plaice (*Hippoglossoides platessoides*), Atlantic cod (*Gadus morhua*), roundnose grenadier, Atlantic salmon (*Salmo salar*), Cusk, American eel, Arctic cod (*Boreogadus saida*), Sand lance (*Ammodytes* spp.), and Arctic char (*Salvelinus alpinus*).

2.2.3 Commercial Fisheries

The Study Area supports a variety of commercial fisheries based on latest available DFO catch landings data. Some of the most important fisheries in and adjacent to the Study Area include those for northern shrimp, snow crab, and Greenland halibut. All major fish groups, including groundfish, pelagic and shellfish fished in the Study Area occur in NAFO divisions 2G, 2H, 2J, 3K, 0B and 1F. Two macroinvertebrate species, northern shrimp and snow crab, and one fish species, Greenland halibut, were targeted commercial fisheries within the Study Area during 2005-2010. The domestic harvest within the Study Area is very largely northern shrimp, with much lesser quantities of snow crab and Greenland halibut. Together, these three species have typically made up more than 98% of the Study Area harvest in recent years. May, June, July, August and September were the most productive months for harvesting, accounting for more than 60% of the annual catch. Snow crab is fished using fixed gear (crab pots), Northern shrimp by mobile gear (trawling), and Greenland halibut by fixed gear gillnets.

2.2.4 Marine Mammals and Sea Turtles

A total of 21 marine mammals, including 14 cetacean and 6 seal species, and the polar bear occur in the Study Area. Most marine mammals use the Study Area seasonally, and the region likely represents important foraging areas for many. Sea turtles are uncommon in the Study Area, but they may be present in summer and fall, with two species potentially occurring within the Study Area. The EA Report provides a description of the marine mammals and sea turtles known or expected to occur in the Study Area. It also provides a summary of sightings from data sources including commercial whaling, fisheries observers, Marine Mammal Observers (MMOs) on board seismic vessels, and the general public.

Five species of baleen whales occur in the Study Area. Blue whales are considered rare and are described above in Section 2.2.1. The four more common baleen whales are the Fin Whale (*Balaenoptera physaalus*), Humpback whale (*Megaptera novaeangliae*), Sei whale (*B.borealis*), and Minke whale (*B. acutorostrata*). Although some individual baleen whales may be present in offshore waters of Newfoundland and Labrador year-round, most baleen whale species presumably migrate to lower latitudes during winter months.

Fin whales continue to regularly occur in Newfoundland and Labrador waters, particularly during summer months (Sikumiut 2008). Fin whales within the Labrador Shelf area mainly occur nearshore (COSEWIC 2005). Based on the DFO cetacean sightings database, fin whales have been sighted throughout the Study Area from May to December; however, the greatest number of observations occurred in the southwestern portion of the Study Area within the 500-m isopleth during July to September. There was also a single fin whale sighting offshore of Labrador during a summer 2007 aerial survey (Lawson and Gosselin 2009). They feed on small schooling fish and krill and tend to be found in areas where these prey concentrate, such as in areas of upwelling, shelf breaks, and banks. Fin whales may stay on the Labrador shelf year-round or migrate to warmer mid-latitude waters, but little information on winter habitat is currently available. There are an estimated 11,570 humpback whales in the North Atlantic. Primary feeding areas in the N Atlantic have been described using genetic and individual identification data as the Gulf of Maine, eastern Canada, west Greenland, and the NE Atlantic. Humpback whales are common over the banks and nearshore areas of Newfoundland and Labrador from June through September. The Labrador Shelf SEA (Sikumiut 2008) suggests that primary feeding areas for humpbacks are likely found along the shoreline from Hudson Strait to the southern coast of Newfoundland; this is supported by extensive sightings (n = 1004) over the continental shelf in the Study Area, especially off southern Labrador from July through November, based on the DFO cetacean sightings database. Sei whale distribution is poorly known, but it occurs in all oceans and it appears to prefer mid-latitude temperate waters. There is no current population estimate for the N Atlantic, but 1,400 to 2,250 individuals were estimated to use the NW Atlantic based on catch data collected during commercial whaling. Sei whales appear to prefer offshore, pelagic, deep areas that are often associated with the shelf edge, and feed primarily on copepods. There are numerous observations in the region according to the Labrador Shelf SEA, and there were 66 sightings of sei whales in the Study Area based on the DFO cetacean sightings database. Most sightings were made during August through October within the 500-m isopleth off southern Labrador, but some sightings were made in deeper water farther offshore. The Labrador Sea appears to be an important feeding area for sei whales from the NE Atlantic. There are four populations of minke whales recognized in the N Atlantic, including the Canadian east coast, west Greenland, central N Atlantic, and NE Atlantic stocks. There are an estimated 8,987 individuals in the Canadian east coast stock, which ranges from the Gulf of Mexico to the western half of Davis Strait. Minke whales are common over the banks and coastal regions of Newfoundland and Labrador from early spring to fall, arriving as early as April and typically remaining as late as October and November; however, some may stay through the winter. Minke whale sightings are common in the Study Area; according to the DFO cetacean sightings database, there were 189 sightings from April to December and two sightings during January. During August–September surveys of sub-Arctic North Atlantic waters, minke whales were sighted in the Strait of Belle Isle and off the east coast of Newfoundland. Minke whales tend to forage in continental shelf waters on small schooling fish like capelin and sand lance, making relatively short duration dives.

Nine species of toothed whales, Odontocetes, are known or expected to occur in the Study Area. Many of these species seem to be present in the Study Area only seasonally, but there is generally little information on the distribution and abundance of these species. The nine species include the: Northern bottlenose whale (described above), Sperm Whale (*Physter macrocephalus*), Sowerby's beaked whale (*Mesoplodon bidens*); Beluga whale; Killer whale (*Orcinus orca*); Long-finned pilot whale (*Globicephala melas*), Atlantic white-sided dolphin (*Lagenorhynchus acutus*), White-beaked dolphin (*Lagenorhynchus albirostris*), and short-beaked common dolphin (*Delphinus delphis*).

Sperm whales appear to prefer deep waters off the continental shelf, particularly areas with high secondary productivity, steep slopes, and canyons that may concentrate their prey of large-bodied squid. Sperm whales are deep divers, regularly diving to hundreds of metres, sometimes to depths over 1,000 m and remaining submerged up to an hour. Sperm whales are most likely to occur in deep water and high relief areas offshore of Labrador, most likely during summer months. They were the most frequently sighted toothed whale in the Study Area, based on the DFO cetacean sightings database; there were 172 sperm whale sightings, most occurring from July to October. There are an unknown number of Sowerby's beaked whales in the N Atlantic, but they are only rarely encountered offshore of eastern Newfoundland and Labrador. They are most often observed in deep water, along the shelf edge and slope. One sighting of four individuals was made during a seismic survey in Orphan Basin in 2005. There were no sightings within the Study Area of Sowerby's beaked whale from the DFO cetacean sightings database. It is unclear if Sowerby's beaked whales are uncommon or poorly surveyed because of their deep-diving behaviour, small size, and offshore habitat. Observations most frequently occur during the summer, but observer effort is considerably increased during this season in offshore areas northeast of Newfoundland and Labrador. Despite the scarcity of confirmed sightings, Sowerby's beaked whales may occur in low densities in deep areas offshore of Labrador. Belugas occurring in offshore Labrador waters are likely members of either the Ungava Bay or eastern Hudson Bay populations. Both populations are small; the Ungava Bay population is too small to estimate and might have been *extirpated* while the eastern Hudson Bay population includes ~2000 individuals. Belugas are now considered scarce and are reported occasionally each summer (COSEWIC 2004). However, two satellite-tagged individuals from the eastern Hudson Bay population were tracked to positions near Nain, Labrador in January suggests that eastern Hudson Bay animals overwinter along the Labrador coast. There were four beluga whale sightings (of 89 individuals) during a summer 2007 aerial survey offshore of Labrador (Lawson and Gosselin 2009). The DFO cetacean sightings database has two records of beluga within the southwestern portion of the Study Area, one in July and one in September. Killer whales offshore of Labrador and eastern Newfoundland are likely members of the NW Atlantic/ eastern Arctic population. The number of killer whales in the NW Atlantic/eastern Arctic population is unknown, but at least 63 individuals have been identified in Newfoundland and Labrador. Observed group sizes range from 1 to 60 individuals, averaging 5.1 whales (Lawson et al. 2007). Although they occur at relatively low densities, killer whales are considered year-round residents of Newfoundland and Labrador. Based on the DFO cetacean sightings database, there have been 63 killer whale sightings in the Study Area from March to December, with most sightings occurring during July–September. An estimated 12,619 individuals of long-finned pilot whales occur in the NW Atlantic. In the DFO cetacean sightings database, long-finned pilot whales were one of the most commonly identified toothed whales within the Study Area, occurring year-round, but with most sightings occurring during July and August. Pilot whale distribution is linked with areas of high relief, the shelf break, or slope, and they often exhibit inshore-offshore movements coinciding with movements of their prey. Short-finned squid are a primary prey item in Newfoundland, but they also consume other cephalopods and fish. Atlantic white-sided dolphins occur regularly from spring to fall in offshore areas of Newfoundland and Labrador, but less is known of their winter distribution. Sightings in the N Atlantic seem to coincide with the 100-m depth contour and areas of high relief. Based on bycatch data from 1965–2001, white-sided dolphins were the most frequently caught species in the Labrador Sea during July–October; spring bycatch rates were much lower. There were 48 sightings in the DFO cetacean sightings database in the Study Area from June through December. There was a single August sighting during a summer 2007 aerial survey offshore of Labrador. Prey items range from cephalopods to pelagic or benthopelagic fishes like capelin, herring, hake, sand lance, and cod White-beaked dolphins have a more northerly distribution than most dolphin species, occurring in cold temperate and sub-Arctic waters

of the N Atlantic. It is unknown how many occur off Labrador and northeastern Newfoundland, but based on ship-board surveys undertaken in the summer of 1982, Alling and Whitehead (1987) provided an abundance estimate of 3486 white-beaked dolphins for Labrador. In the DFO cetacean sightings database, 119 sightings were made in the Study Area from July through November, but especially during August, although none were seen during a summer 2007 aerial survey offshore of Labrador (Lawson and Gosselin 2009). White-beaked dolphins typically occur in groups of less than 30 animals, but group sizes up to the low hundreds have also been reported. White-beaked dolphins have a range of prey items, including squid, crustaceans, and a number of small mesopelagic and schooling fishes like herring, haddock, hake, and cod. An estimated 120,743 individuals of the short-beaked common dolphin reside in the NW Atlantic, but an unknown number are found in eastern Canada. They form groups ranging in size from several dozens to over 10,000, often moving rapidly and displaying much aerial behaviour such as porpoising and bowriding. They are found in a variety of habitats, ranging from 100 to 2,000 m deep, but appear to prefer areas with high seafloor relief (Selzer and Payne 1988) and are often associated with features of the Gulf Stream. The abundance and distribution of short-beaked common dolphins also coincides with peaks in abundance of mackerel, butterfish and squid (Selzer and Payne 1988). They can be abundant off the coast of Nova Scotia and Newfoundland for a few months during the summer. There were 37 sightings of common dolphins reported in the DFO cetacean sightings database in the Study Area, mainly during July to September.

Six species of seals occur in the Study Area, including: ringed (*Phoce hispida*); harp (*Phoca groenlandicus*); hooded (*Cystophara cristata*); bearded (*Erignathus barbatus*); harbour (*Phoca vitulina*); and grey (*Halichoerus grypus*). Ringed seals are the most abundant seal species in northern Labrador. Ringed seals prefer annual landfast ice with extensive snow cover, but also occur in offshore pack ice; pupping occurs in late winter to early spring. Moulting occurs on the ice following the spring breeding season until ice breakup, and intensive feeding occurs from late July through October in pelagic areas or among pack ice. Harp seals are considered the most abundant seal in the NW Atlantic. Based on survey data, the population size for eastern Canada was estimated at 8.3 million harp seals for 2008. Harp seals are common during spring off northeast Newfoundland and southern Labrador where they congregate to breed and pup on the pack ice; the majority of the NW Atlantic population uses this region while the small remainder uses the Gulf of St. Lawrence. Harp seals migrate to Arctic and Greenland waters during summer, while offshore areas of southern Labrador and eastern Newfoundland appear to be major wintering areas. Hooded seals are found in the N Atlantic, ranging from Nova Scotia to the high Arctic in Canada. There are an estimated 593,500 individuals in the Canadian Atlantic, the majority of which (~535,800 animals) whelp and breed in the pack ice off northeast Newfoundland/southern Labrador in late winter-early spring. Four primary pupping and mating areas occur in the N Atlantic and include northeast Newfoundland/southern Labrador, the Gulf of St. Lawrence, Davis Strait, and northeast Greenland (Jefferson et al. 2008). Hooded seals aggregate in eastern Greenland to moult during early summer before dispersing to Davis Strait or the Greenland Sea for late summer and fall. Hooded seals consume benthic invertebrates like shrimp, Greenland halibut, redfish, Arctic cod, and squid. The bearded seal is an ice-affiliated seal occurring throughout Arctic regions, mainly over the continental shelf and areas with moving ice or ice leads (Jefferson et al. 2008). An estimated 190,000 bearded seals may exist within the Canadian Arctic, but no estimates are available for Labrador waters. There is little information on the distribution or movements of bearded seals in Labrador, but they appear to be found at low densities along the entire coast and more common in northern portions. Bearded seals are benthic feeders, consuming a variety of crustaceans, mollusks, and some benthic fishes like sculpins, flatfish, and cod. Grey seals inhabit cold temperate to sub-Arctic regions of the N Atlantic, ranging in Canada from Nova Scotia to Labrador (Jefferson et al. 2008). An estimated ~300,000 grey seals occur in the NW Atlantic, with the majority breeding and moulting on Sable Island, south of Nova Scotia, over the winter and spring, respectively. An unknown number range into eastern Newfoundland and Labrador. Although

generally coastal, grey seals forage over the continental shelf and consume primarily herring, Atlantic cod, and sand lance. Grey seals presumably move northward, ranging occasionally into Labrador waters, from July to September.

Polar bear (*Ursus maritimus*) distribution and range is primarily limited to terrestrial environments. The proposed seismic program is greater than 40 km from shore; therefore, they are not likely to be encountered since they are most likely to be around coastal areas foraging for food.

Three species of sea turtles could potentially occur in the Study Area. They are the leatherback, loggerhead (*Caretta caretta*) and Kemp's Ridley (*Lepidochelys kempii*) sea turtles. The leatherback sea turtle, the most probable to occur in the Study area, is listed as endangered under SARA and is discussed in Section 2.2.1. There are no current population estimates for loggerhead turtles in Atlantic Canada. However, it is the most common sea turtle in North American waters, but rarely ventures as far north as Labrador, as it prefers water between 20–25°C. The Kemp's Ridley sea turtle is restricted in its distribution, primarily occurring only in the Gulf of Mexico, but some juveniles sometimes feed along the U.S. east coast and rarely range into eastern Canada waters. Movements outside of the Gulf of Mexico likely occur during summer and in coastal areas. Juveniles have been sighted along the southern Newfoundland coast, in St. Mary's Bay, and off of Nova Scotia, but there are no known reports off Labrador.

2.2.5 Marine Birds

The Labrador Sea is rich in breeding and migratory seabirds. There are 32 species of marine birds occurring regularly on the Labrador coast and the north coast of Newfoundland. The more common ones include: Northern Fulmar (*Fulmarus glacialis*);Great Shearwater (*Puffinus gravis*); Sooty Shearwater (*Puffinus griseus*); Manx Shearwater (*Puffinus puffinus*); Leach's Storm-Petrel (*Oceanodroma leucorhoa*); Northern Gannet (*Morus bassanus*); Red-necked Phalarope (*Phalaropus lobatus*); Red Phalarope (*Phalaropus fulicarius*); Ring-billed Gull (*Larus delawarensis*); Herring Gull *(Larus argentatus*); Iceland Gull (*Larus glaucoides*); Glaucous Gull (*Larus hyperboreus*); Great Black-backed Gull (*Larus marinus*); Black-legged Kittiwake *(Rissa tridactyla*); Ivory Gull (*Pagophila eburnean*); Common Tern *(Sterna hirundo*); Arctic Tern *(Sterna paradisaea*); Great Skua (*Stercorarius skua*); Pomarine Jaeger (*Stercorarius pomarinus*); Parasitic Jaeger *(Stercorarius parasiticus*); Long-tailed Jaeger (*Stercorarius longicaudus*); Dovekie (*Alle alle*); Common Murre (*Uria aalge*); Thick-billed Murre (*Uria lomvia*); Razorbill (*Alca torda*); Black Guillemot (*Cepphus grille*); and Atlantic Puffin (*Fratercula arctica*).

The Labrador and northern Newfoundland coasts are important areas for sea ducks (tribe Mergini). The largest nesting colonies of Common Eider in Newfoundland and Labrador occur in the area of Table Bay to Groswater Bay with a secondary concentration in Nain Bight, reflecting a level of productivity also noted for breeding seabirds. Surf, Black and White-winged Scoters breed in interior Labrador and by mid-summer relatively large aggregations moult in Hamilton Inlet and Nain Bight. Common Goldeneye, Barrow's Goldeneye and Red-breasted Merganser moult in coastal areas of Labrador in smaller aggregations (generally hundreds). Four species from the Procellariidae family occur regularly in the Study Area: Northern Fulmar, Great Shearwater, Sooty Shearwater and Manx Shearwater. Northern Fulmar has a circumpolar distribution with the centre of breeding abundance in the North Atlantic, including the Canadian Arctic, Greenland, Iceland and northeast Europe and Scandinavia. Very few nest on the coast of Newfoundland and Labrador. Great Shearwater breeds in the South Atlantic, mainly on the Tristan da Cunha Island and Gough Island. The adults are present at the breeding sites from October to April. They spend the non-breeding season (April to October) in the N Atlantic. A significant percentage of the total world population migrates to eastern Newfoundland and Labrador for the annual moult from

June through August. Sooty Shearwater has a similar distribution to Great Shearwater in that it nests in the Southern Hemisphere and some of the population flies to the Northern Hemisphere during the summer. The small population of Manx Shearwater present in Atlantic Canada during the summer months is probably a combination of Newfoundland breeders from Middle Lawn Island (Burin Peninsula) and non-breeding sub-adults and migrants from European breeding colonies. Leach's Storm-Petrel is the only species of the family Hydrobatidae occurring regularly off the Labrador coast. Leach's Storm-Petrel is a widespread and abundant species occurring in both the Atlantic and Pacific oceans. It is a scarce breeder in Labrador with less than 30 pairs known to breed along the mid-Labrador coast. Northern Gannet breeds in the North Atlantic in Quebec, Newfoundland, Iceland, Faeroe Islands and British Isles. It occurs regularly in small numbers on Hamilton Bank in April to October. The Red-necked and Red Phalaropes occur in the marine environment of the Labrador coast during migration. In migration phalaropes are known to congregate in areas of upwelling and oceanographic fronts in the Labrador Sea, particularly along the continental shelf slope. . Herring and Great Black-backed Gull are common and widespread breeders along the entire coast. They are absent from areas of dense pack ice during winter. Ring-billed Gull nests locally in small colonies on the coastlines north to Voisey's Bay. Glaucous Gull is a northern species breeding south along the Labrador coast to 55°30'N. It winters at sea, particularly among pack ice and near the ice edge south to the Carolinas. Iceland Gull breeds north of Labrador, with Baffin Island being the centre of abundance. The species winters commonly south to Newfoundland and the Gulf of St. Lawrence. Black-legged Kittiwake is a true sea gull, spending all its life at sea except when it has to nest on coastal islands. It is a common resident in Newfoundland and Labrador waters, remaining outside of the main pack ice in winter. In Newfoundland and Labrador, it breeds in large colonies, mainly on the Avalon Peninsula. Black-legged Kittiwake breeds in surprisingly small numbers on the Labrador coast. Arctic and Common Terns are the only species of tern occurring in offshore Labrador and offshore northern Newfoundland. Both species are locally common at breeding sites along the coasts of Labrador and northern Newfoundland. Common Tern reaches its northern limit of breeding at about 56°40'N. Common Tern migrates near shore whereas Arctic Tern migrates both inshore and offshore. Great Skua breeds in the Northeast Atlantic in Iceland, Faeroe Islands, Scotland and Norway, and winters farther south, but remains north of the equator. In Atlantic Canada, it is a summer visitor and spring and fall migrant. The three species of jaeger, Pomarine, Parasitic and Long-tailed, have circumpolar distributions, breeding in the low and high Arctic. In general jaegers are in offshore waters of Labrador and northern Newfoundland from mid-May to October. Common Murre breeds in the North Pacific and North Atlantic Oceans. In the Atlantic it breeds in northern Europe, including Iceland and Greenland, and in the Northwest Atlantic from Labrador to Nova Scotia. Murres are most numerous offshore in the Study Area after the flightless fledglings and breeding adults abandon nesting colonies in late summer until the adults return inshore to the colonies in spring. On the Labrador and northern Newfoundland coast Thick-billed Murre is outnumbered by Common Murre during the breeding season. It is estimated that up to four million Thick-billed Murres winter in Newfoundland and Labrador waters. Thick-billed Murre is present year round off the Labrador coast. In winter this species may be common along the eastern edge of the pack ice. About 43% (18,526 pairs) of the North American breeding population of Razorbill nests on the mid-section of Labrador coast. Most of these (14,329 pairs) are on The Gannet Islands. Razorbill numbers in eastern Newfoundland waters peak from mid-October to mid-November. Razorbills are present in Labrador shelf waters from April to November. The more than 82,000 pairs breeding of Atlantic Puffin on the mid-Labrador coasts represent about 20% of the North American breeding population. In North America Atlantic Puffins winter mainly off southern Newfoundland and Nova Scotia. Atlantic Puffin is present off the Labrador and northern Newfoundland coasts from May to November. Black Guillemot breeds on both sides of the Atlantic, north into Arctic waters. It nests in numerous small colonies on

coastal headlands and many small rocky islands. Unlike the other members of the Alcidae, it feeds near shore and is rarely found more than a few kilometres from shore or pack ice. Black Guillemot is a year round resident on the coast of Labrador. Many of the ten million pairs of Dovekie breeding in Greenland winter in Newfoundland and Labrador. The abundant Dovekie is common near ice and in open offshore waters of the Labrador coast from September to May.

2.2.6 Sensitive and Special Areas

Potential sensitive areas include: important bird areas (IBA); Marine Protected Areas (MPAs); National Marine Conservation Areas (NMCAs); and National Parks and Reserves.

Sensitive areas that occur at least partially within the Study and/or Project Areas include the following:

- Hawke Channel Fishery Closure Area;
- Funk Island Deep Fishery Closure Area;
- Coral Protection Zone; Nain Bight Candidate National Marine Conservation Area (NMCA);
- Hamilton Inlet Candidate National Marine Conservation Area (NMCA); and
- The Zone.

Sensitive areas that occur proximate to the Study Area include the following:

- Cabot Island Funk Island Fishery Closure Area;
- Gilbert Bay Marine Protected Area (MPA);
- Battle Harbour National Historic Site (NHS);
- Gannett Islands Ecological Reserve;
- Fourteen (14) Important Bird Areas (IBAs);
- Torngat Mountains National Park;
- Mealy Mountains National Park (proposed); and
- Eagle River Waterway Provincial Park (proposed).

A description of the above is presented in the EA Report. There are also important areas within the Study Area, though not specifically designated, that may be important areas for corals, spawning, nursing, rearing, and/or migratory areas, and areas of traditional harvesting activities.

2.2.7 Research Surveys and Vessel Traffic

Fisheries research surveys conducted by DFO, and sometimes by the fishing industry, are important to the commercial fisheries to determine stock status, as well as for scientific investigation. . In any year, there may be overlap between the Study Area and DFO research surveys in NAFO Divisions 2HJ3K, depending on the timing in a particular year. According to DFO, research surveys are likely to occur in the Study area for most of October, a portion of November, and perhaps in early December. The snow crab DFO-industry collaborative post-season trap survey is conducted every year. It starts on September 1 and may continue until November before it is completed. The set locations are determined by DFO and do not change from year to year. Many of the northern stations fall within GXT's Study Area and are identified in the EA Report.

Labrador waters are used extensively by local aboriginal peoples for traditional hunting and fishing. The area is used extensively for fishing of crab, rock cod (= Greenland cod), Atlantic cod, Arctic char, sculpin, mussels, clams, wrinkles, and sea urchin. Ducks and geese are also hunted in the area and other traditional activities are well dispersed throughout the Labrador Shelf Area. Though not specified by the

Labrador Shelf SEA (Sikumiut 2008), it is likely that most of these activities occur in inshore waters landward of the Project and Study Areas. Inuit have the right to harvest fish, wildlife, and plants throughout the Labrador Inuit Settlement Area at all times of the year up to their full level of needs for food, social and ceremonial (FSC) purposes. Inuit are able to take as many fish as they need for their FSC purposes unless a total allowable harvest is established by the federal Minister of Fisheries for conservation purposes.

Arctic char and Atlantic salmon are important non-commercial species targeted by recreational fisheries in. Recreational fisheries directed at brook trout (*Salvelinus fontinalis*) also occur in Labrador waters. These are typically harvested in freshwater or coastal marine waters, outside of the Study Area. Subsistence fisheries also occur for Atlantic salmon and Arctic char in Labrador waters. Small recreational fisheries for Atlantic cod occur in Labrador Shelf waters with the majority of catches occurring within NAFO Division 2J.

National Defence (DND) is likely to be operating in the area in a non-interference manner. GXT will maintain contact with DND throughout each work season.

Part C: ENVIRONMENTAL ASSESSMENT PROCESS

3. Review Process

On January 29, 2013, GX Technology Canada Ltd. (GXT) submitted a project description entitled, *GXT 2013-2015 LabradorSPAN Marine 2-D Seismic, Gravity and Magnetic Survey* (GXT, 2013) to the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB), describing its plans to conduct a 2D seismic, gravity, and magnetic survey offshore Newfoundland in the offshore region of the Labrador Shelf and Slope. The Project requires an authorization 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 requested comments on the project description and identification of expertise on January 30, 2013 to: Fisheries and Oceans Canada (DFO); Environment Canada (EC); Department of National Defence (DND); Transport Canada (TC); Natural Resources Canada (NRCan); Health Canada; Nunatsiavut Government (NG); and the Newfoundland and Labrador Departments of Environment and Conservation, Fisheries and Aquaculture, and Natural Resources.

On March 26, 2013, the C-NLOPB notified GXT that an environmental assessment was required and the Scoping Document was provided.

GXT submitted the *Environmental Assessment of GXT's LabradorSPAN 2-D Seismic, Gravity and Magnetic Survey, 2013-2015* (LGL, 2013a) on April 2, 2013. The C-NLOPB forwarded the EA Report on April 2, 2013 to DFO, EC, DND, NG, and the provincial Departments of Environment and Conservation, Fisheries and Aquaculture, and Natural Resources (DNR). The Fish, Food, and Allied Workers Union (FFAW) and One Ocean were also provided a copy of the EA Report for review.

Comments on the EA Report were received from DFO, EC, DND, NL DNR, NG and the FFAW. In order to address deficiencies in the EA Report, GXT was required to provide a response to the EA Report comments. On July 1, 2013, GXT responded to the review comments, via the *GX Technology Canada Ltd. 2-D Seismic, Gravity and Magnetic Survey for the Labrador Shelf Area, 201 to 2015 Environmental Assessment Responses to Environmental Assessment Review Comments* (LGL 2013b) and this was forwarded to reviewers for their consideration. Additional comments were provided from reviewers and these were forwarded to GXT on July 22, 2013.

Additionally, on July 29, 2013, GXT provided information for an increase in the length of streamer proposed for the surveys from 9 km to up to 12 km and an assessment of the environmental implications of the potential change in streamer length. This was forwarded to EA Report reviewers for their consideration.

3.1 Scope of Project

The Study Area includes the Project Area plus a 20 km buffer area around the Project Area to account for the propagation of seismic survey sound that could potentially affect marine biota. The proposed Project is a ship-based seismic program commencing in 2013 with a 2-D seismic, gravity and magnetic survey acquiring approximately 8,500 line km of data. Additional seismic surveys may be conducted within the Project Area in 2014 and 2015 also with a maximum annual proposed acquisition of 8,500 km. The proposed 2-D program will use a conventional seismic ship which will tow the sound source (airgun array) and a single streamer containing receiving hydrophones. The seismic vessel will also collect (passively) gravity and magnetic data at the same time, and it will have an echosounder for depth soundings. The seismic ship will be accompanied by a support vessel.

The seismic energy source will be an airgun array comprising individual airguns ranging in size from 100 to 250 in^3 each. The array will consist of four sub-arrays, with a total of 36 active airguns, totalling a discharge volume of 6300 in^3. The airguns in the array are strategically arranged to direct most of the energy vertically downward. The nominal firing pressure of the array will be 2000 pounds per square inch (psi). The shot interval will be one shot every 19 to 22 s. The source level of the array will be ~264.3 dB re 1 μPa (peak-peak broadband) or 242.3 dB re 1 μPa_{rms} (over 90% pulse duration). The array will be towed at a depth of 8–11 m. The survey speed will be around 4.5 knots (8.3 km/h).

The seismic ship will also tow a single seismic hydrophone cable (streamer) up to 12 km long, deployed near the ocean surface, at a depth of approximately 9–15 m. This is a passive listening device, which will receive the sound waves reflected from structures underneath the ocean floor and transfer the data to an on-board recording and processing system. The cable will be a solid-core DigiSTREAMER Integrated Data Acquisition System manufactured by GXT parent company ION Geophysical. It will have DigiBird units (also manufactured by ION) attached at least every 300 m to maintain correct streamer depth and positioning.

The streamer will be made up of up to 90 Solid Active Streamer Sections, each 100 m in length. Streamer sections will contain a non-liquid fill to reduce self-noise properties and provide consistent buoyancy. The DigiSTREAMER technology performs better in cold weather where sentinel solid streamers may become stiff, leading to additional handling challenges. A stress-member chassis of non-magnetic Vectran® will provide high-tensile strength and predictable elongation for long tow configurations, such as that used for this survey.

Gravity and magnetic data will be collected (passively) using an UltraSys™ marine gravity metre system consisted of a LaCoste and Romberg Marine Gravity metre, which has been modified by ZLS Corporation to upgrade the optical beam position sensor to a capacitive inductance sensor. The metre has also been sealed with a dry nitrogen atmosphere to negate pressure differential and moisture effects.

The seismic vessel is equipped with a Skipper GDS-101 echosounder. The downward-facing Skipper GDS-101 operates at a frequency of 38 kHz or 200 kHz and will be used to collect water depth information. For this Project, sound velocity profiles will also be acquired in the water column at various

locations within the survey area. Sound velocity profiles allow for more accurate interpretation of the acoustic data (i.e., seismic pulses) recorded by the seismic streamer. These data are acquired with a small, passive device that will be deployed by the support vessel. The device measures pressure, temperature, and salinity, from which the speed of sound can be calculated.

It is anticipated that annual seismic surveys will occur sometime within the period 1 June to 30 November from 2013 to 2015. The timing of the acquisition of specific lines within the Project Area in any year will depend on several factors, including commercial fish harvesting, the local weather, sea state, and ice conditions in specific locations.

3.2 Boundaries

The boundaries of the Project are defined in the EA Report as follows and are acceptable to the C-NLOPB.

Boundary	**Description**
Temporal	From 1 June to 30 November, 2013 to 2015.
Project Area	The Labrador Shelf and Slope within the following Project Area Coordinates (WGS84): NE – Latitude 61.00000; Longitude -57.38344 SE – Latitude 50.33333; Longitude - -48.08269 SW – Latitude 50.33333; Longitude - -54.58333 NW – Latitude 61.00000; Longitude - -64.25286 The Project Area includes the ships' turning radii.
Study/Affected Area	The Study Area includes the Project Area plus a 20 km buffer area for potential effects around the Project Area.
Regional Area	The area extending beyond the "Affected Area" boundary within the Labrador Shelf and Slope.

There may 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 CEAA, the factors that were considered to be within the scope of the environmental assessment are those set out in the GX *Technology Canada Ltd. 2D Seismic, Gravity and Magnetic Survey (2013-2015) Newfoundland and Labrador Offshore Area Scoping Document* (C-NLOPB 2013).

4. Consultation

4.1 Consultation carried out by GXT

Consultation sessions were undertaken by GXT in March and May 2013, assisted by Sikumiut Environmental Management Ltd., LGL Ltd. and/or Canning & Pitt Associates Inc.

The most consistent issue raised during the consultations was the commercial fisheries – specifically ensuring that the survey does not interfere with or otherwise impact harvesting success. Fisheries-related

consultations and contacts (in person, by telephone and/or by email) were conducted with representatives of the following groups / agencies:

- Nunatsiavut Government, Department of Lands and Natural Resources – in person
- Torngat Joint Fisheries Board of the Torngat Wildlife, Plants and Fisheries Secretariat (for Nunatsiavut) – in person (GXT was invited to the Secretariat quarterly meeting where all members and staff were present) / email
- Torngat Fish Producers Co-operative Society – in person
- FFAW and fleet representatives – in person / email / telephone
- Labrador Fisherman's Union Shrimp Company – telephone / emails
- Association of Seafood Producers (ASP) –emails
- Canadian Association of Prawn Producers (CAPP) - emails
- Groundfish Enterprise Allocation Council - emails
- Fisheries and Oceans Canada (DFO) - emails
- Ocean Choice International (OCI) - emails
- Groundfish Enterprise Allocation Council (GEAC) Ottawa - emails
- Clearwater Seafoods - emails
- Icewater Fisheries - emails
- Newfound Resources Ltd. (NRL) - emails
- One Ocean - in person / emails

All of these groups (except One Ocean) represent fishers or harvesting companies, or manage harvesting operations in the Project Area. Fisheries information was also presented and comments invited at public meetings in Labrador. At the FFAW's request, local fishing interests in communities where fishers are represented by the union (the adjacent communities on the Island of Newfoundland and Southern Labrador, primarily) were to be consulted by them and information/comments passed on to GXT.

Other groups consulted about the proposed Project included:

- Sivunivut Inuit Community Corporation, North West River – in person
- Nature Newfoundland and Labrador (NNL) (and various member organizations) – telephone / email
- Environment Canada (EC) – emails
- Town of Happy Valley - Goose Bay (Deputy Mayor) – email / in person
- Community meeting in Happy Valley-Goose Bay – in person
- Community Meeting in North West River – in person
- Community Meeting in Nain – in person.

There were also questions raised about economic opportunities (benefits) that the Project might provide. The following presents the main issues raised.

- Physical interference with fishing activities caused by the ships and towed seismic gear (especially with fixed gear fisheries for snow crab and Greenland halibut/turbot)
- Effects on fish behaviour from Project sound, especially the array (scaring fish away from fishing gear, reducing catch success – all commercial species)
- Damage to fixed fishing gear (crab pots, Greenland halibut/turbot nets, caused by the Project ships or streamer)

- Physical effects on key commercial fisheries species from the sound of the array (especially snow crab, shrimp and groundfish)
- Representation of interests (Aboriginal and commercial harvesting) at sea during the Project
- Ensuring adequate on-going communications and information exchange during the survey
- Physical and behavioural effects on marine mammals and sea turtles
- Effects on seabirds, especially related to vessel stranding
- Pollution (water quality, air emissions and spill prevention and response)
- Species at Risk (*SARA* and COSEWIC)
- Other potential marine hazards/vessel traffic.

The C-NLOPB is satisfied that the consultations carried out by GXT, and reported on in the EA Report, included all elements of the Project, and that GXT has addressed substantive concerns about the proposed Project.

4.2 Review of the March 2013 EA Report

The C-NLOPB forwarded the EA Report on April 2, 2013 to DFO, EC, DND, NG and the provincial Departments of Environment and Conservation, Fisheries and Aquaculture, and Natural Resources. The FFAW and One Ocean also were provided a copy of the EA Report to review.

EC provided comments on the EA Report on 16 May 2013. The key issues were: a request that GXT collect seabird data and provided the protocol for proper bird-handling; and a reminder of federal regulations that the proponent must adhere. EC provided a response on the EA Addendum on 10 July 2013 that they were satisfied with the response.

DFO provided comments on the EA Report on 21 May 2013. Their comments focused on adherence to the Standard of Canadian Practice, changes to Species at Risk during the multi-year program, submission of sightings data of marine mammals and sea turtles, accuracy of fish data, importance of corals and avoidance of DFO Post Season Trap Surveys. DFO provided comments on the EA Addendum on 17 July 2013 and were satisfied.

DND provided comments on the EA Report on 24 May, 2013 which reflected the fact that comments provided by DND and previously forwarded to GXT were absent in the EA Report. On July 4, 2013 DND replied that GXT's response in the EA Addendum to this comment was satisfactory.

The NG provided comments on the EA Report on 27 May 2013. Their comments included: impacts of seismic programs on catch rates for fisheries in the area; timing of the program to prevent overlap with fisheries in the area; the hiring of Inuit observers; and annual report submitted by January 31 or the following year on the benefits and impacts of the program; and continued communication and consultation. The NG provided comments on the EA Report on 19 July 2013. Their comments included: effects of seismic on marine life; opportunities for employment; and requested cited literature from GXT.

The FFAW provided comments on the EA Report on 21 June 2013. The key issues were: inconsistencies in the document; more complete graphical representations of commercial fisheries and activities; and avoidance of active fisheries and the DFO Post Season Trap Survey for Snow Crab. The FFAW provided comments on the EA Addendum 18 July, 2013. Comments included: consistency issues; overlay of multi-resource activities; and avoidance of the post-season trap survey for snow crab.

The consolidated review comments were provided to GXT on June 25, 2013. GXT responded on July1, 2013 in the form of an EA Addendum. GXT's July 1, 2013 response was forwarded to reviewers on July 3, 2013 for consideration. Additional comments were forwarded to GXT on July 22, 2013.

The C-NLOPB believes that all substantive comments within the scope of the EA have been satisfactorily addressed.

5. Environmental Effects Analysis

5.1 Methodology

The C-NLOPB reviewed the environmental effects analysis presented by GXT in its EA Report. A Valued Ecosystem Component (VEC) based assessment, based on the interaction of project activities with VECs, was used in assessing environmental effects, including cumulative effects and effects due to accidental events. The environmental assessment methodology and approach used by the Proponent is acceptable to the C-NLOPB.

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

- magnitude of impact;
- geographic extent;
- duration, likelihood, and frequency;
- reversibility;
- ecological, socio-cultural and economic context; and
- significance of residual effects following implementation of mitigation measures.

The potential effect significance of residual effects, including cumulative effects, for each VEC was 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

These ratings, along with the likelihood of the effect, were considered in determining overall significance of residual effects.

In the EA Report, GXT presented information regarding the potential effects of the seismic survey program activities on fish and fish habitat, commercial fisheries, seabirds, marine mammals and sea turtles, species at risk, and sensitive areas. A summary of the effects assessment follows.

5.2 Valued Ecosystem Components/ Potential Environmental Effects

5.2.1 Fish and Fish Habitat 1

The seismic, gravity and magnetic survey program will not result in any direct physical disturbance of the bottom substrate. During seismic surveys, survey equipment is not expected to come in contact with the seafloor and deep-water corals and sponges. Therefore the negligible residual effects on fish habitat (i.e., water and sediment quality, phytoplankton, zooplankton, and benthos) are predicted to be **not significant**.

The potential effects of exposure to sound on fish and marine invertebrates can be either physical (pathological and physiological) or behavioural. In the natural environment, fish have shown avoidance responses and swim away as an airgun array ramps up or as the survey slowly approaches. The airgun will be ramped-up, thereby allowing fish in the area to move away. Studies referenced in the EA Report (March 2013) and Addendum (June 2013) indicated that fish mortality did not result from exposure to

seismic sound sources. Physical injury may include failure to reach the next development stage, hearing injury and death to: fish eggs and larvae; juvenile and adult finfish; and invertebrates. Any mortality is minimal and not greater than any natural level of mortality. Stress responses (physiological effects) to seismic exposure occur in fish but are temporary and reversible. Behavioural responses to seismic have been documented in a number of studies and are discussed in the EA Report (March 2013) and Addendum (June 2013). In general, fish show a startle response and change in direction and speed of swimming. In some studies, looking at the effects on commercial catch rates, the change in swimming direction accounted for a decrease in catch rate. Some studies show that this effect was temporary, whereas other studies report that fish behaviour was altered for several days. The EA Report (March 2013) and Addendum (June 2013) states that the temporary nature of these responses varies depending on the fish species and the sound source. Studies to determine effects on the auditory thresholds of fish have shown that Temporary Threshold Shift (TTS) can occur in fish exposed to seismic noise, under certain conditions. To date, there have been no documented cases of acute mortality of juvenile or adult fish exposed to seismic sound characteristic of typical 2D and 3D seismic surveys. Limited data regarding physiological effects on fish indicate that they are both short-term and most obvious after exposure at close range.

Mitigations consistent with those outlined in the *Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (C-NLOPB 2012), will be implemented. Spatial and temporal avoidance of critical life history times (e.g., spawning aggregations) should mitigate the behavioural effects of exposure to airgun sound. The effects assessment concluded that physical effects on fish due to project activities will be negligible to low in magnitude, for a duration of less than 1 month to 1 to 12 months over an area of less than 1 to 11-100 km^2. The likelihood of effects (behavioural and physical) is low and therefore **not significant**.

There is less knowledge of the effects of seismic sound on marine invertebrates, although some studies have been conducted on the sensitivity of certain invertebrate species to underwater sound. Crustaceans appear to be most sensitive to low frequency sounds, less than 1,000 Hz. Invertebrates may be capable of detecting vibrations but they do not appear to be capable of detecting pressure fluctuations. The studies done to date on the effects on marine invertebrates have not demonstrated any serious pathological or physiological effects. Benthic invertebrates are less likely to be affected by seismic activity because few invertebrates have gas-filled spaces and benthic species are usually more than 20 m away from the seismic source.Studies referenced in the EA Report (March 2013) and Addendum (June 2013) indicated that available experimental data suggest that there may be physical impacts on the fertilized eggs of snow crab and on the eggs of cod at very close range, less than a metre. The results indicated that effects are short-term and most obvious after exposure at close range. Spatial and temporal avoidance of critical life history times (e.g. spawning aggregations) should mitigate the behavioural effects of exposure to airgun sound. Snow crab, sensitive to the particle displacement component of sound only, will be far enough away from the airguns and will not likely be affected by any particle displacement resulting from airgun discharge. Any potential physical or behavioural impact to invertebrate species is considered to be negligible to low in magnitude, for a duration of less than 1 month to 1 to 12 months over an area of less than 1 to 11-100 km^2. The likelihood of effects (behavioural and physical) is low and therefore **not significant**.

5.2.2 Commercial and Traditional Fisheries and DFO Research Surveys 1

Potential interactions with this VEC include the potential for a decrease in catch rates, interference with fishing gear and potential impact on DFO research survey trawls. As indicated above, seismic activity can result in a dispersion of fish species, and subsequently reduced catch rates for a relatively short duration. The seismic survey vessel and project-related support vessel traffic will be present within 2G, 2H, 2J, 3K, 0B, and 1F.

Fisheries data presented in the EA Report (March 2013) and Addendum (June 2013) shows the average annual Canadian-landed harvest by species, 2005 to 2010, from within the Study Area, during June to November, based on the geo-referenced DFO datasets. As the data show, the domestic harvest in the Study Area has been singly dominated by shrimp throughout this period, in terms of quantity.

The principal fisheries (by quantity of harvest) within the Study Area are for northern shrimp (86.1%), 87,976 mT, snow crab (8.3%) 8,455 mT, and Greenland halibut (turbot) (3.7%), 3,820 mT. These same three species accounted for more than 98% combined average annual catch value during the same period. The total annual commercial fisheries catch weights of all species during June to November, 2005-2010 combined The Study Area overlaps with parts of Shrimp Fishing Area (SFA) 4, 5, and most of 6 and is managed by Canada's DFO.

Snow crab is the second most important commercial species in the Study Area by both quantity and value. May and June were the two months during which most of the snow crab was caught.
The fishery poses a potential for seismic / fishing gear conflicts in those areas where the two marine activities might overlap because the fishery uses fixed gear (crab pots). The Study Area overlaps with portions of crab fishing areas in 2H, 2J, and 3K.

Greenland halibut (often called turbot) represents about 3.7% of the Study Area catch by quantity and value, an average of just over 20 t between July and December over the five year period. Most (about 99%) of this harvest in the Study Area is taken using fixed gear gillnets.

Analysis of the average annual domestic harvest for all species (from 2005 to 2010) indicates, June, July and August were the most productive months during this period, accounting for more than 50% of the annual catch.

While adult fish could be injured by seismic arrays if they are within a few metres of an air source, this is not likely to happen as most fish disperse when the array ramps up and becomes active, or when the vessel approaches. Thus, the most likely type of impacts will be on fish behaviour. Seismic surveys can result in reduced trawl and longline catches immediately following a survey as the fish temporarily move from the area. Although studies referenced in the EA Report (March 2013) and Addendum (June 2013) indicated some impacts on fish behaviour, they reached different conclusions about the duration of the change in behaviour and/or the degree of the effect on catch.

It is important to the Nunatsiavut Government that the aboriginal fisheries, both offshore and nearshore are not disturbed or adversely affected by the proposed seismic program in 2013 to 2015.

GXT has indicated that a number of mitigations, consistent with those outlined in the *Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (C-NLOPB 2012), will be implemented. These include: the spatial and temporal avoidance of heavily fished areas and ongoing communication; use of a Fisheries Liaison Officer (FLO) on the seismic vessel to be a communication link between the two industries and to help ensure effective communication between petroleum operators and fishers at sea; communication with fishers (via a Notice to Mariners and a Notice to Fishers) and scheduling of surveys to reduce interference with DFO research vessels; the use of a single point of contact (SPOC); and a fishing gear damage compensation plan. A picket vessel will accompany the seismic survey vessel to provide advance warning of fishing activities in the area and for communications with other vessels. This vessel will meet similar criteria as the survey vessel. GXT will also coordinate with the FFAW to avoid any potential conflicts with survey vessels. The potential for impacts on fish harvesting will depend on the location of the surveying activities in relation to fishing areas in any given season. If the survey work is situated away from fishing areas, the likelihood of any effects on commercial harvesting will be greatly reduced.

To avoid potential conflict with DFO Research surveys, GXT will maintain communications with DFO personnel to keep up-to-date on the timing of planned research surveys. In addition, a temporal and spatial buffer zone will be implemented, in consultation with DFO, to reduce any potential interference with fish behavioural patterns. The impact of both noise and the seismic streamer on DFO research surveys will be negligible and **not significant**.

Given the application of mitigation measures, including the avoidance of fishery activity, it is predicted that the effects of seismic activity, including vessel movement, will be negligible to low in magnitude, over duration of one to twelve months and over an area of less than 1 to 100 km^2. Therefore, effects to the commercial fishery are not likely and **not significant**.

5.2.3 Marine Mammals and Turtles 1

A potential effect of the proposed operation upon marine mammals and sea turtles, which may be present in the area, may be from the sound pulses from the survey equipment. Marine mammals and sea turtles could likely exhibit certain behavioural reactions, including displacement from an area around an airgun array. The size of the displacement area varies amongst species, during different times of the year, and even amongst individuals within a given species. There is also a risk that marine mammals and sea turtles that are very close to the seismic array may incur hearing impairment. The EA Report (March 2013) and Addendum (June 2013) describes in more detail the numbers and the species of cetaceans which have been observed in, or which are considered likely to frequent, the Study Area. A review of the potential effects of the proposed seismic survey on marine mammals and sea turtles in the Study Area is provided in the EA Report (March 2013) and Addendum (June 2013). The review includes: the hearing abilities of marine mammals and sea turtles; the potential for masking by seismic surveys; disturbance effects of seismic surveys; the possibility of hearing impairment by seismic surveys; and the possibility of physical and non-auditory physiological effects.

Overall, odontocete reactions to large arrays of airguns are variable and, at least for delphinids and some porpoises, seem to be confined to a smaller radius than has been observed for some mysticetes. However, other data suggest that some odontocetes species, including belugas and harbour porpoises, may be more responsive than might be expected given their poor low-frequency hearing. Visual monitoring from seismic vessels has shown only slight (if any) avoidance of airguns by pinnipeds, and only slight (if any) changes in behaviour. These studies show that many pinnipeds do not avoid the area within a few hundred metres of an operating airgun array. Baleen whales generally avoid an operating air gun, but the avoidance radii appear to be quite variable. Baleen whales, like the listed fin and blue whales, may deviate from a migratory route, suspend feeding or avoid the area. The biological significance of such a change in behaviour is considered slight since there are no uniquely significant habitats (feeding, nursery, mating) identified within the Study Area and there are alternate feeding areas. Fin whales are expected to avoid the area of 160 dB and higher. They may tolerate higher decibel levels if they are feeding, rather than migrating, as bowheads apparently do.

The limited available data indicate that sea turtles will hear airgun sounds. Based on available data, it is likely that sea turtles will exhibit behavioural changes and/or avoidance within an area of unknown size near a seismic vessel. There are no specific data that demonstrate the consequences to sea turtles if seismic operations do occur in important areas at important times of year. Sea turtles are likely to show avoidance behaviour during seismic surveys. The discontinuous nature of sonar pulses makes significant masking effects unlikely, however, the extent of avoidance is unknown. Sea turtles might experience temporary hearing loss if the turtles are close to the airguns.

There is some risk for collision between marine mammals and sea turtles and the seismic vessel. However, given the slow surveying speed of the vessel, the risk is minimal with avoidance.

In summary, marine mammals and sea turtles will likely exhibit certain behavioural reactions, including displacement from an area around a seismic acoustic sources and as stated above, the size of this displacement area will likely vary amongst species, during different times of the year, and amongst individuals within a given species. There are a number of mitigations (e.g. ramping up of airguns, use of observers, shut-down procedures) which, when applied, can reduce impacts to marine mammals and sea turtles in the vicinity of a seismic survey. The EA Report (March 2013) and Addendum (June 2013) lists a number of mitigations that will be implemented during the seismic program, consistent with the mitigations recommended in Appendix 2 of *The Geophysical, Geological, Environmental and Geotechnical Program Guidelines* (C-NLOPB 2012).

The effects on marine mammals are predicted to be negligible to low in magnitude, within an area less than 1 km to 10 km^2, and over a duration of one month to twelve months. With the application of mitigation measures, the likelihood of effects occurring is low, and effects will be **not significant**.

The effects on sea turtles are predicted to be low in magnitude, within an area less than 1 km to 10 km^2, and over duration of 1 to 12 months. With the application of mitigation measures, the overall likelihood of effects occurring is low, and effects will be **not significant.**

5.2.4 Marine Birds 1

Most species of seabirds that are expected to occur in the Study Area feed at the surface or at less than one metre below the surface of the ocean. Northern Gannet plunge dives to a depth of 10 m. They are under the surface for a few seconds during each dive so would have minimal exposure to underwater sound. Great Shearwater, Sooty Shearwater, and Manx Shearwater feed mainly at the surface but also chase prey briefly beneath the surface down to a depth of two to ten metres. The Alcidae are one group of birds that spends considerable time under water at various depths to hunt for food and require a significant length of time to secure food. This group includes Dovekie, Common Murre, Thick-billed Murre, Razorbill and Atlantic Puffin. From a resting position on the water, they dive under the surface in search of small fish and invertebrates. Alcids use their wings to propel their bodies rapidly through the water. All are capable of reaching considerable depths and spending considerable time under water. An average duration of dive times for the five species of *Alcidae* is 25 to 40 seconds reaching an average depth of 20 to 60 m, but murres are capable of diving to 120 m and have been recorded underwater for up to 202 seconds. The sound created by airguns is focused downward below the surface of the water. Above the water, the sound is greatly reduced and should have little or no effect on birds that have their heads above water or are in flight. It is possible birds on the water at close range would be startled by the sound, however, the presence of the ship and associated gear dragging in the water should have already warned the bird of unnatural visual and auditory stimuli. The effects of underwater sounds on Alcidae are unknown. Sounds are probably not important to Alcidae in securing food. However, all six species are quite vocal at breeding sites indicating auditory capabilities are important in that part of their life cycle. The 'laughing call' of the Thick-billed Murre is shown to cover a frequency range of 1.0 to 4.0 kHz. While supporting data on actual effects are few, it is predicted that there will be **no significant effects** on seabirds from the sound because the magnitude of the effect (if it occurs) will be negligible to low, the geographic extent will be small (probably < 1 km^2 to 1-10 km^2), and duration will be 1-12 months.

A seabird data collection program shall be undertaken aboard the seismic vessel by experienced biologists. An Environmental Observer will be onboard to record marine bird (and marine mammals) sightings during the program. The protocol will follow CWS's Standardized Protocols for Pelagic Seabirds Surveys from Moving and Stationary Platforms for the Hydrocarbon Industry: Interim Protocol

– June 2006. GXT will ensure that CWS is provided field data collection, including in raw data format, with respect to marine birds. Marine bird data reports will be provided following this survey and any other subsequent seismic surveys.

Lighting is required at night for safety purposes, however mitigation will include routine checks for stranded birds and implementation of appropriate procedures for release that will minimize the effects of vessel lighting on birds in the Project Area. Deck lighting will be minimized (if safe and practical to do so) to reduce the likelihood of stranding. GXT's procedure for handling stranded birds is based on those outlined in the Leach's Storm Petrel Mitigation Program developed by Williams and Chardine in 1999. The effect of vessel lighting on marine birds is predicted to be of low magnitude, within an area 1-10 km, and over duration of less than one month. Therefore, the effect of vessel lighting on marine birds is deemed **not significant**.

5.2.5 Species at Risk 1

The physical effects of the Project on the various life stages of wolffishes and the white shark will range from negligible to low over a duration of 1-12 months, within an area of <1 km^2. Behavioural effects may extend out to a larger area but are still predicted to be **not significant**. The mitigation measure of ramping up the airgun array (over a 30 min period) is expected to minimize the potential for impacts on wolffishes and the white shark.

The predicted effect of the Project on the Ivory Gull, Harlequin Duck, and Barrow's Goldeneye is **not significant.** These species are unlikely to occur in the Study Area, particularly during the summer when seismic surveys are likely to be conducted. In addition, the foraging behaviour (and location of foraging areas) would not likely expose them to underwater sound from the Project. Furthermore, these bird species are not known to be prone to stranding on vessels. The mitigation measure of monitoring the seismic vessel and releasing stranded birds and ramping up the airgun array will minimize the potential for impacts on these species.

Based on available information, the blue whale and leatherback sea turtle are not expected to occur regularly in the Study Area. Northern bottlenose whales, (Scotian Shelf population), are expected to occur regularly in the Study Area during summer months and perhaps also at other times of the year. The polar bear also occurs in the Study Area primarily during the winter and spring. There are finalized recovery strategies for leatherback sea turtles (ALTRT 2006), blue whales in Atlantic Canada (Beauchamp et al. 2009), and the Scotian Shelf population of northern bottlenose whales (DFO 2010). Mitigation and monitoring designed to minimize potential effects of airgun array noise on *SARA*-listed marine mammals and sea turtles will be implemented. The effects are predicted to be negligible to low in magnitude, within an area less than 1 km to 10 km^2, and over a duration of one month to twelve months. With the application of mitigation measures, the likelihood of effects occurring is low, and effects will be **not significant**.

5.2.6 Sensitive Areas 0

Potential sensitive areas include: important bird areas (IBA); Marine Protected Areas (MPAs); National Marine Conservation Areas (NMCAs); and National Parks and Reserves.

Sensitive areas that occur at least partially within the Study and/or Project Areas include the following:

- Hawke Channel Fishery Closure Area;
- Funk Island Deep Fishery Closure Area;

- Coral Protection Zone;
- Nain Bight Candidate National Marine Conservation Area (NMCA);
- Hamilton Inlet Candidate National Marine Conservation Area (NMCA); and
- The Nunatsiavut Zone.

Sensitive areas that occur proximate to the Study Area include the following:

- Cabot Island Funk Island Fishery Closure Area;
- Gilbert Bay Marine Protected Area (MPA);
- Battle Harbour National Historic Site (NHS);
- Gannett Islands Ecological Reserve;
- Fourteen (14) Important Bird Areas (IBAs);
- Torngat Mountains National Park;
- Mealy Mountains National Park (proposed); and
- Eagle River Waterway Provincial Park (proposed).

Specifically considering the Sensitive Areas listed above, the first two are considered sensitive from a fisheries perspective. Within the Hawke Channel, no seismic lines will occur in any program year. For the Funk Island Deep, few seismic lines will occur within these areas given the widely spaced nature of GXT's line layouts; in addition, since there are no gillnet or trawl fisheries presently operating in the area there is no interaction with the Project and thus no direct effect on these types of fisheries operations. While crab fishing does occur there, given the mitigations of communications, information exchange and avoidance of any active snow crab fishing, interactions with fisheries will not occur. For the most part, any potential effects on these areas would involve effects on the fish and fish habitat VEC. Any effects on the Hawke Channel and Funk Island sensitive areas are therefore predicted to be **not significant**.

The Project involves no physical disturbance of the seabed and thus will have no interaction with corals and hence no effect on them. Thus, effects on the Coral Protection Zone are predicted to be **not significant.**

The Nain Bight and Hamilton Inlet Candidate NMCAs were proposed primarily for reasons of high biological productivity and a diverse and abundant avifauna. The Project will have negligible effect on primary and secondary productivity (e.g., plankton). The seismic vessel will not enter the nearshore zone with gear deployed and thus any effects on waterfowl and their habitats can be considered negligible in these areas and thus not significant. Any effects on these candidate NMCAs are therefore predicted to be **not significant.**

The Nunatsiavut Zone falls slightly within the western nearshore boundary of the Study Area. However, no part of the Project Area extends into the Zone; furthermore, the seismic vessel will not enter any part of the Zone with seismic gear deployed and lines heading towards the Zone (i.e. those tending from East to West) will be ended at least 6 km before the Zone boundary so that line turns can be completed without entering the Zone. Thus the program will produce **no significant effects** in this area.

In summary, based on an analysis of the six sensitive areas and their associated VECs identified for the Study Area, it is predicted that the Project will have **no significant effects** on the sensitive areas VEC.

5.2.7 Water Quality/Discharges 0

Routine discharges, which are likely to occur during operation, are similar to those associated with many typical vessel operations. The vessels proposed for the survey will meet all Canadian regulations and standards to work in Canadian waters. Ship operations will adhere to Annex I of the *International Convention for the Prevention of Pollution from Ships* (MARPOL 73/78). Hydrocarbon concentrations associated with ship discharges are not generally associated with formation of a surface slick. They are therefore not likely to have a measurable effect on the marine environment. The waste generated by the survey vessels will be limited because of the length of the survey program. A licensed waste contractor will be used for any waste returned to shore. The effect of the seismic program operations on marine water quality should be undetectable and **not significant**.

5.3 Cumulative Environmental Effects 1

Potential cumulative environmental effects external to the project include seismic program(s) by other operators, commercial and traditional fishing, marine transportation and tourism/recreation. The potential exists that other seismic survey(s) could occur concurrently, resulting in a temporal overlap with the Project. There would be no spatial overlap as there must be enough distance between streamers as to avoid interfering with data acquisition by individual vessels. Good coordination between programs to minimize potential acoustic interference will also be needed. GXT has committed to ongoing communication with other marine users in the Study Area. Therefore, there is some potential for cumulative environmental effects with the seismic program in this context but vessels not associated with the seismic program are restricted from being close to the seismic vessel during the seismic survey. The residual cumulative environmental effect with noise and traffic external to the seismic program will be negligible. Compared to existing vessel traffic in the area, the incremental amount of vessel traffic, because of this seismic program, will be negligible. Cumulative environmental effects resulting from any of the seismic program activities will not be additive or cumulative because the seismic program activities are transitory. With the implementation of mitigative measures, the limited temporal scope, and overlap with other projects and activities, the cumulative environmental effect of the seismic program in conjunction with other projects and activities is predicted to be **not significant**.

5.4 Accidents and Malfunctions

Accidental discharge of oil into the marine environment may result from improper operational procedures (e.g., improper draining of streamer reel trunks), loss of streamer fluid due to breakage, or, as a worst case, as a result of total vessel loss.

The vessel is required to carry a "Shipboard Oil Pollution Emergency Plan" pursuant to MARPOL 73/78. The Plan contains a description of procedures and checklists which govern operations involving hydrocarbons, adherence to which should prevent unintended releases. The vessel will also carry a copy of GXT AS's "Spill Response Plan". Inspections of seismic equipment will be conducted regularly and where feasible, solid streamers will be used. Solid streamers will be deployed in the 2013 program.

Effects due to accidental spills associated with the proposed operation, therefore, are considered, overall, to be detectable if they occur, but neither significant nor likely.

5.5 Follow-up Program Required Yes☐ No☒

The C-NLOPB does not require follow-up monitoring, as defined in the CEA Act, to be undertaken for this Project.

6. Other Considerations

The C-NLOPB is satisfied with the environmental information provided by GXT regarding the potential adverse environmental effects which may result from the proposed project, and are satisfied with the operator's proposed monitoring and mitigative measures.

The C-NLOPB is 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.

7. Recommended Conditions and /or Mitigations

The C-NLOPB recommends that the following conditions be included in the authorization if the seismic survey program is approved:

- *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 Application and in the Environmental Assessment of GXT's LabradorSPAN 2-D Seismic, Gravity and Magnetic Survey, 2013-2015* (LGL, 2013a), *GX Technology Canada Ltd. 2-D Seismic, Gravity and Magnetic Survey for the Labrador Shelf Area, 2013 to 2015 Environmental Assessment Responses to Environmental Assessment Review Comments (GXT, LGL, & Sikumiut 30 June 2013), GX Technology Canada Ltd. 2-D Seismic, Gravity and Magnetic Survey for the Labrador Shelf Area, 2013 to 2015 Environmental Assessment Responses to Environmental Assessment Review Comments (GXT & LGL 26 July, 2013) &* Assessment of the Environmental Implications of using a 12- km Streamer for GX Technology's 2013 LabradorSPAN 2D Marine Survey (GXT 29 July 2013).

- *The Operator, or its contractors, shall shut down the seismic airgun 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).*

- *No later than January 31, 2014, the Operator shall submit a report to the C-NLOPB describing the progress and potential environmental effects of its 2013 2D seismic program. It shall include, but not be limited to, copies of the Fisheries Liaison Officer (FLO) reports and the marine mammal observer (MMO) reports that were produced during the program.*

Part D: Screening Decision

8.1 C-NLOPB Decision

The C-NLOPB is of the opinion that, taking into account the implementation of the proposed mitigation measures set out in the conditions above and those committed to by GX Technology Canada Ltd., the Project ***is not likely to cause significant adverse environmental effects***.

Responsible Officer _____ D*ate:* _____

Elizabeth Young
Environmental Assessment Officer
*Canada-Newfoundland and Labrador Offshore Pet*roleum Board

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