Refinery Footprint

The predominant vegetation types in the greenfield site are blanket bog (25.6 per cent) and Scrub Spruce Forests (41.2 per cent; Figure 3.65), and several predominating peatland communities of the *Kalmia-Cladonia* alliance and the *Scirpus-Sphagnum* alliance were identified (Figure 3.65; Table 3.20). The blanket bogs of this region are primarily oligotrophic, obtaining most nutrients from precipitation, and are therefore nutrient-poor. The southernmost head has a narrow coastal band of hyper-oceanic barrens dominated by dwarf, ericaceous shrubs and White Spruce.

Most of the coastline is rocky, often precipitous, but there are small, scattered cobble beaches where some maritime plant species exist. Maritime plant species are rather limited in this area due to the lack of suitable beach habitat, but occur in pocket beach areas such as at Hollett's Cove, e.g., cinquefoil (*Potentilla ededii*), sea lungwort (*Martensia maritima*) and beach pea (*Lathyrus japonicus*). The rocky shoreline contains primarily seaside plantain (*Plantago maritima*). Among and along the back of the few scattered cobblestone beaches, a few typical maritime species do grow.



Figure 3.65 Overlay of Vegetation Types Classified in the Greenfield Site for the Proposed Oil Refinery at Southern Head. Red Highlights the Herb-rich Balsam Fir Forests, and Green Highlights the Floristically-rich Fen Habitats

| Table 3.20 | Blanket Bog Vegetation | Types Documented at Southern He | ad |
|------------|------------------------|---------------------------------|----|
|------------|------------------------|---------------------------------|----|

| Blanket Bog Species Associations | | | | | | |
|----------------------------------|----------------------|--|--|--|--|--|
| Kalmia-Cladonia Alliance | | | | | | |
| Associations | Differential Species | | | | | |
| Kalmia-Sphagnum fuscum | Sphagnum fuscum | | | | | |
| | Sphagnum imbraticum | | | | | |
| | Sphagnum rubellum | | | | | |
| | Dicranum scoparium | | | | | |
| Scirpus-Sphagnum Alliance | | | | | | |
| Associations | Differential Species | | | | | |
| Scirpus-Sphagnum magellanicum | Carex oligosperma | | | | | |
| | Carex exilis | | | | | |

| Blanket Bog Species Associations | | | | | |
|----------------------------------|-----------------------|--|--|--|--|
| | Sphagnum magellanicum | | | | |
| | Sphagnum flavicomans | | | | |
| | Sphagnum Papillosum | | | | |
| Scirpus-Sphagnum tenellum | Utricularia cornuta | | | | |
| | Eriophorum spissum | | | | |
| | Sphagnum tenellum | | | | |
| | Sphagnum cuspidatum | | | | |
| | Sphagnum magellanicum | | | | |
| | Sphagnum lindbergii | | | | |

Source: Wells and Hirvonen (1988) and Meades (1990).

Access Roads

The vegetation found along the part of the proposed access roads (72.2 ha) that are included in the 1207 ha area that was assessed included considerable scrub spruce forest, mainly the scrub black spruce with *Kalmia angustifolia* and *Cladonia* spp. type (15.1 per cent) and Scrub Black Spruce with *Empetrum nigrum* and *Kalmia angustifolia* type (8.5 per cent)(Figure 3.66). Balsam fir forest makes up 14 per cent of this area, including 2.7 ha (3.7 per cent) of herb rich balsam fir forest. Fen habitat is found along the proposed road leading to the proposed quarry and makes up 0.5 per cent of this area.

The proposed access roads dissect extensive bogs and closed mature black spruce and balsam fir stands. Clearings that show evidence of past cutting are rare and more frequent on the western side. Ground cover in these forests consists mainly of feather moss (*Pleurozium schreberi*), with *Hylocomnium splendens*, *Polytrichum* and *Hypnum* mosses occurring sporadically and *Sphagnum* dominating in wetter areas. Common herbs include *Gaultheria hispid*ula, *Cornus canadensis*, *Clintonia borealis*, *Rubus pubescens*, *Mainthemum canadensis*, *Carex* spp, *Orthilia secunda*, *Trientalis* borealis, *Platanthera obtusata* and *Drypoteris* spp. There is considerable potential for balsam fir regeneration in the open areas left by timber harvest and/or blow down due to past insect infestation, though moose browsing is limiting sapling growth. Patches of alder (*Alnus crispa*) and raspberry (*Rubus idaeus*) are common in the moist parts of these clearings.





Rare Plants and Vegetation

A plant species is considered rare if it has a small population within the province (Collins 1986). On Southern Head, Placentia Bay, the observation of the round-leaf orchid, *Platanthera orbiculata* and the dwarf plumboy (*Rubus arcticus* ssp. *acaulis*), extended the known range of these species in the province. Of particular note are the discoveries of three woodland orchids, the blunt-leaf orchid (*P. obtusata*), the round-leaf orchid (*P. orbiculata*) and early coral-root (*Coralorhiza trifida*). Throughout central and western Newfoundland, early coralroot, blunt-leaf orchid and round-leaf orchids are regularly encountered in their preferred habitat. However, the former two orchids are, overall, quite rare on the Avalon Peninsula. The round-leaf orchid is uncommon in eastern Newfoundland and extremely rare on the Avalon, and until this survey, was known only from the Brigus Junction area (John Maunder, Provincial Museum of

Newfoundland and Labrador, pers. comm.). Its appearance on Come By Chance Head was unexpected and may warrant further investigation along the coastal headlands of this area. A survey earlier in the season might also confirm the presence of heart-leaf twayblade (*Listera cordata*), another orchid often found in association with the aforementioned three species. The blunt leaf orchid was also observed on the proposed access road up from the Come By Chance gut on June 18, 2007; it was seen in mid-June just prior to coming into flower, which suggests the possibility that the round-leaf orchid and heart-leaf twayblade may be present in this area as well. These species would be more evident later in the season as they blossom.

Another notable discovery was a population of dwarf plumboy (*Rubus arcticus* ssp. *acaulis*). Its presence at Come By Chance Head constitutes the first record for this species in eastern Newfoundland. The dwarf plumboy is only known from western, northern and central Newfoundland with the most common occurrence along the western shores of the Great Northern Peninsula (Meades et al. 2000).

Vegetation in the general area of Southern Head is surprisingly lush in localized areas. LGL biologists noted herb-rich forests (classified as a Balsam Fir – Herb Rich type) often present along the upper slopes consisting of balsam fir (*Abies balsamea*) with a lush carpet of *Cornus Canadensis, Aralia nudicolis, Linnaea borealis, Mainthemum canadensis* and *Trientalis* borealis. There is greater diversity of herbaceous plants among the coastal forests, and those present appear more prolific and dense than the interior forests that are more typical of those described by Meades and Moores (1989). Additional herbaceous species seen here include one-flowered wintergreen (*Moneses uniflora*), one-sided pyrola (*Orthilia secunda*), lesser pyrola (*Pyrola minor*), sweet-scented bedstraw (*Galium triflorum*) and dwarf enchanter's nightshade (*Circaea alpina*).

In some areas near the coast, white spruce (*Picea glauca*) has invaded former cleared areas and is associated with interspersed areas of heath (*Empetrum nigrum*) and fens (*Sanguisorba-Rununculus*). Forested areas contain showy mountain ash (*Sorbus decora*) and white birch (*Betula papyrifera*). An unusually tall pussy willow (*Salix discolour*) was recorded amidst the balsam fir forest on the eastern stretch of the proposed access road above the Come by Chance gut. Though fallen over, the tree was over 10 meters in height and was vigorously resprouting. While this species is common on the Avalon Peninsula, it usually grows in a shrubby form, and it is uncommon for it to surpass a height of 5 m. There are localized small sections of saltmarsh cordgrass (*Spartina alterniflora*) usually associated with cobble beaches. However, this species is not at Hollett's Cove where the backshore meadow is dominated by Scotch lovage and Iris versicolor, and the immediate backshore supports cinquefoil (*Potentilla ededii*), sea lungwort (*Martensia maritima*) and beach pea (*Lathyrus japonicus*).

Some ponds, and especially the larger lakes on the plateau, support extensive marsh vegetation, and there is a notable presence of *Potamogeton natans*, *Menyanthes trifoliata*, *Sparganium angustifolium*, *Glyceria canadensis*, *Utricularia cornuta*, *Nuphar variegatum* and

substantial emergent cover of *Juncus militarus*. The large lake system of Watson's Brook in the northern portion of the study area supports substantial alluvial deposits, alder shrub cover and fluvial marshlands associated with the delta.

Fens were infrequent in the Southern Head area. Small sites with examples of the Birch-*Cladonia* alliance and *Scirpus* alliance were identified (Table 3.20). Fens with Iris versicolor, *Sanguisorba canadensis, Myrica* gale, *Betula pumila* and *Thalictrum polygonum* are associated along the meandering brook emptying into Hollett's Cove. The transition zone between blanket bogs and coastal forest often have scattered, small pockets of more minerotropic fens. These peatlands are more floristically-rich, and while Sphagnum and sedges are still predominant, there is a much greater diversity of herbaceous plants than in the blanket bogs. Of the 29.3 ha of fens in the 1207 ha that was classified (Figure 3.64), 12.9 ha occur within the greenfield site (Figure 3.65) and 0.3 ha occur within the proposed access road section (Figure 3.66).

Forest Lichens (Distribution and Abundance)

Several specimens of the rare boreal felt lichen (*Erioderma pedicellatum*) were found in the area of the proposed access road along the western side of the peninsula (see Section 3.6.7 for details). In the forested habitats of the eastern side of Southern Head, overall, there were relatively few cyanolichens present. This area contains balsam fir forests that appear suitable for the rare boreal lichen although a high proportion of the forest was collapsed from a previous insect infestation. There was little or no forest regeneration, likely attributable to the high density of moose in the area. Of some 5000 trees searched on the eastern side of Southern Head, only two phorophytes supporting the related cyanolichen *Coccocarpia parmicola* were located. In the Project Area, there are numerous coastal areas with old growth forests of white spruce; on the eastern side of the headland and at Hollett's Cove, these supported very lush growths of the lung lichen (*Lobaria pulmonaria*), and lesser amounts of the textured lungwort (*L. scrobiculata*), smooth lungwort (*L. quercizans*) and *Degelia plumbea*. Very little *Lobaria* spp. was located on the western side of the peninsula despite extensive coastal stands of white spruce.

Surveys of forested habitats on the western side of Southern Head indicated a more diverse presence of cyanolichens. Of some 4000 trees searched for lichens, *Coccocarpia parmicola* was located on 28 phorophytes. Also, the less common cyanolichens, *Lichinodium sirosiphoideum* (12 phorophytes) and *Fuscopannaria ahlneri* (2 phorophytes) co-occurred in these stands. A considerable presence was noted of the bryophyte (a liverwort) Frullania tamarisci that is thought to host the contact of the fungal hyphae of *Erioderma pedicellatum* with the blue-green bacteria *Scytonema* sp. (Maass and Yetman 2002). The lung lichen (Lobaria pulmonaria) and the related *L. scrobiculata* with *L. quercizans* were also located on a large mountain ash (*Sorbus decora*). Similar to the eastern portion of the headland and at Hollett's Cove, there were mature white spruce regenerating on previously open meadow areas along a coastal band near Emberley Cove. Only *L. scrobiculata* was observed in the area of the western side of the headland, on white spruce near South Point. The balsam fir-black spruce

forest stands on the western side of the headland were relatively intact, and there was little evidence of collapse from insect infestation compared to the eastern portion of the headland. The presence of the green beard lichen *Usnea longissima*, an old growth forest indicator species (Cameron 2002), was confirmed, and it was abundant in some of the more productive forest types on the western side of the headland.

Forest surveys along the eastern section of the proposed access road did not detect the boreal felt lichen or *Coccocarpia parmicola*. The liverwort *Frullania tamarisci* plays an important role facilitating the reproduction of boreal felt lichen, and this species was found on approximately half of the 1000 trees surveyed in this area. Most of the forested area surveyed was mature balsam fir, thickly covered with *Usnea* spp. though there were patches of white spruce and of white and black spruce krummholz, the latter common by the bogs at the southern end of the proposed access road.

Forest Lichens (as Bio-indicators)

Monitoring of epiphytic lichens is an important component of environmental impact assessment when there is potential for effects on air quality. Baseline information on lichens is especially relevant to the assessment and monitoring of potential impacts of air emissions, because lichens can absorb and retain pollutants that come in contact with their thalli. [Lichens convert inorganic sulphur from their surrounding environment to organic sulphur.] Cyanolichens occur in this general area and are relevant as indicators of air quality, being highly sensitive to sulphur dioxide. Some species of arboreal lichens, notably *Alectoria sarmentosa*, are differentially sensitive to air pollution and have been recognized as indicators of atmospheric quality, and *Lobaria* spp. are considered pollution intolerant (Baddeley et al. 1973; Cameron et al. 2007). Previous studies in the Come By Chance area have demonstrated elevated concentrations of sulphur of anthropogenic origin in this species (Wadleigh and Blake 1999; Wiseman and Wadleigh 2002; Wadleigh 2003).

Results of the lichen analyses demonstrated that sampled lichens are influenced by an anthropogenic pollution input, as indicated by the strong relationship among δ^{34} S, sulphur concentration and nitrogen concentration together in the samples of *A. sarmentosa* and *Lobaria* sp. The source is most likely the existing oil refinery, as lichens sampled at sites close to the refinery exhibited decreased levels of δ^{34} S coupled with increased sulphur and nitrogen content, and elevated concentrations of trace elements. These findings appear logical, as prevailing westerly and southwesterly winds would tend to disperse past emissions more to the north and east.

Those lichens sampled farther away, especially in Goobies area and the headland to the west of Come By Chance, showed less evidence of anthropogenic influence, but reflected marine sources of sulphur input such as sea spray, and values of nickel and vanadium higher than background. The latter elements are considered indicators of refinery emissions and pollution input.

3.6.3 Wetlands

Wetlands are lands that are saturated with water long enough to promote aquatic processes as indicated by poorly drained soils, hydrophytic vegetation and various kinds of biological activities that are adapted to a wet environment (National Wetlands Working Group 1997). The Guidelines for this EIS issued by the Government of Newfoundland and Labrador requested the classification of wetland resources including location, size and class of any wetland within a predicted zone of influence from Project activities. As such, a wetland evaluation of the Project Area was undertaken and is summarized below.

Marshes, bogs and fens occur in the Project Area. Marshes are minerotrophic and usually eutrophic wetlands. Nutrients are derived from the substrate through periodic aeration and generally support high productivity of vascular plants and rates of decomposition of plant material. Organic wetlands refer to peatlands, and these contain > 40 cm of accumulated peat on which organic soils develop. Zonations of vegetation communities are usually concentrically arranged in wetlands and are attributed to water duration and depth, with a transition from open water to emergent deep marsh to shallow marsh. Surface water origin determines whether the wetlands are considered terrigenous (connected to local ground water systems) or littogenous (connected to tidal or riparian/lacustrine water) (National Wetlands Working Group 1997).

The Canadian Wetland Classification System and its three hierarchial levels (class, form and type) were used for wetland evaluation in the area of the proposed oil refinery site (including the access roads) at Southern Head in Placentia Bay. Wetlands were initially classified using stereo-pairs of 1:12,500 scale colour aerial photographs. Classifications were verified during field investigations for the refinery assessment. Basin marshes and basin water comprised the most frequently encountered wetland types. A large expanse of fluvial delta marsh and lentic marsh was delineated at Half Moon Pond on Watson's Brook, and domed bogs and basin bogs were common (Figure 3.67). Fens were previously delineated in the immediate footprint of the development and a few additional stream fens were detected. The north-eastern extension of Half Moon Pond supports very extensive riparian delta marsh, and riparian floodplain marsh that are unusually productive for this ecoregion. It is noteworthy that Black Ducks and Ring-necked Ducks were confirmed to be nesting in the Project Area in low densities typical of this area of Newfoundland. No unusually high densities of breeding waterfowl were evident in the Southern Head area.

The Canadian Wetland Classification System contains three hierarchial levels: namely class, form and type, and surveyed wetlands were classified to type (Figure 3.68). Virtually all those present were terrigenous, meaning that they were connected to the local ground water system. A small area of littogenous wetlands are associated with the fluvial delta at Half Moon Pond on

Watson's Brook where a large expanse of lentic-riparian marshes occur (25.0 ha). Eighty wetlands totalling 146.6 ha were classified and the majority of these were basin marsh (31.3 ha), basin water (15.0 ha), basin bog (22.3 ha) and blanket bog (24.3 ha) (Table 3.21). Emergent rushes and sedges were present as was an abundance of floating and aquatic vegetation. On water associated with peatlands tussocks were frequently encountered.



Figure 3.67 General Classes of Wetlands Delineated in the Area of the Proposed Oil Refinery at Southern Head, Placentia Bay.



Figure 3.68 Wetland classes, form and types that occur in the Area of the Proposed Oil Refinery at Southern Head, Placentia Bay.

| CLASS NAME | No. | AREA (HA) |
|-------------------------|-----|-----------|
| Alluvial Meadow | 3 | 4.3 |
| Basin Bog | 29 | 22.3 |
| Basin Marsh | 14 | 31.3 |
| Basin Water | 20 | 15.0 |
| Blanket Bog | 2 | 24.3 |
| Bog | 1 | 0.8 |
| Domed Bog | 1 | 3.1 |
| Fen | 4 | 2.7 |
| Flat Bog | 1 | 0.9 |
| Intertidal Flat | 1 | 6.4 |
| Lentic Marsh | 1 | 18.6 |
| Riparian Delta Marsh | 1 | 6.7 |
| Salt Marsh | 2 | 10.5 |
| TOTAL | 80 | 146.7 |

Table 3.21Wetland class and coverage (ha) delineated in the area of the proposed oil refinery
at Southern Head, Placentia Bay.

Wetland Protection

The wetlands within the municipality of Come By Chance are encompassed under a Wetland Stewardship Agreement under the Eastern Habitat Joint Venture (see EHJV 1995) of the North American Waterfowl Management Plan (see Goudie et al. 2007 for more details). The focus of that program is on the protection of the coastal-estuarine habitats. Enhancement and protective measures recommended that wetlands should be protected from any drainage, burning or filling. It identified the paucity of high-quality brood-rearing habitat for waterfowl within the existing town boundaries and recommended an extension to include wetlands on the Southern Head (proposed oil refinery site), more specifically, the are of Half Moon Pond and Watson's Pond at the headwaters of Watson's Brook and other smaller ponds, many of which have emergent marsh cover, especially the military rush (Juncus militaris). These wetlands offer productive brood-rearing habitat that is limited in occurrence inside the existing municipal boundary, and was the basis for EHJV (1995) recommending that Come By Chance council request an expansion of its boundaries to include these wetland habitats. LGL biologists identified broods of Ring-necked Ducks and Black Ducks in some of these wetlands in early September 2007. This confirmed that some of these wetlands are utilized by breeding waterfowl (Goudie et al. 2007).

As part of its commitment to wetlands conservation, the Government of Canada (1991) adopted The Federal Policy on Wetland Conservation (FPWC—see Goudie et al. 2007) with its objective to:

"promote the conservation of Canada's wetlands to sustain their ecological and socioeconomic functions, now and in the future."

NLRC will look for opportunities to enhance wetland habitat in the general area of Southern Head-Come By Chance.

3.6.4 Wildlife

The terrain in Southern Head, Placentia Bay Project Area provides habitat for numerous species of terrestrial and semi-aquatic mammals (Table 3.22). LGL biologists have recorded moose, caribou, black bear, otter, mink, beaver, red fox, red squirrel and snowshoe hare in the Study Area. It is expected that meadow voles, mice, shrews and bats also occur there, and possibly lynx, coyote and ermine. The forest, heath, bog and scrub provide a diversity of terrestrial habitats for mammal species. Some species, such as beaver, are sedentary and have relatively confined home ranges in contrast to river otters that are wide-ranging and Black Bears that occur seasonally. The lakes, rivers and wetlands provide habitat for semi-aquatic mammals like mink, beaver, muskrat and otter and can also be used seasonally by moose.

Some of these wildlife species are abundant on or near the Southern Head Project Area. Incidental to fieldwork on vegetation in and around the proposed refinery site at Southern Head, LGL biologists recorded extensive evidence of use of the area by otters as there were frequent coastal haul-outs (rubs) and well-worn trails linking some of these sites to the interior lakes and brooks. In some cases burrows were evident (river otters are discussed further in Section 4.9). Moose densities appeared especially high on the eastern side of the Southern Head peninsula. There was considerable sign of black bear in the area, and incidental areas along or proximate to the unnamed brook and adjacent peatlands extending inland through the proposed oil refinery site. Caribou were observed on Sall the Maid Island, in the proposed project footprint, and small numbers (ten to twelve) have been reported in the Southern Head area for the past decade or so.

The following provides a description of mammals that occur in and near the Project Area.

| Species | Scientific Name | Abundance | Habitat | | |
|------------------------------------|-------------------------|-------------------------------|--|--|--|
| Small Mammals | | | | | |
| Common shrew | Sorex cinereus | Common | Damp forest | | |
| Little brown bat | Myotis lucifugus | Common | Roosts in trees, caves | | |
| Deer mouse | Peromyscus maniculatus | Common | Forests, grasslands | | |
| Meadow vole | Microtus pennsylvanicus | Common | Forests associated with meadow, open grassland near freshwater | | |
| Terrestrial Furbearers | | | | | |
| Snowshoe hare | Lepus americanus | Common | Boreal forest | | |
| Red squirrel | Tamiasciurus hudsonicus | Common | Coniferous forest | | |
| Red fox | Red fox Vulpes vulpes | | Semi-open areas, along edges of bogs and headlands | | |
| Coyote Canis latrans | | Uncommon | Open and edge habitats along juxtaposed forests, bogs and heathlands | | |
| Ermine | Mustela erminea | Common | Riparian forest, marsh, open areas near forests | | |
| Lynx | Lynx canadensis | Uncommon | Old growth boreal forest | | |
| Semi-aquatic Furbearers | | | | | |
| River otter | Lutra canadensis | Common | Rivers, lakes, coastal areas | | |
| American mink | Mustela vison | Common | Rivers, lakes | | |
| Beaver | Castor canadensis | Common | Rivers, streams, marshes, lakes, ponds | | |
| Muskrat | Ondatra zibethicus | Uncommon | Marshes, pond and lake edges, streams | | |
| Big Game | | | | | |
| Moose | Alces alces | Common | Coniferous forests, near wetlands and lakes | | |
| Woodland caribou Rangifer tarandus | | Uncommon, small numbers | Peatland, heath | | |
| Black bear | Ursus americanus | Uncommon | Coastal coves and edge habitat along peatlands and heath. | | |

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Small Mammals

Several species of small mammals are known or expected in the Project Area, namely the common (or masked) shrew, little brown bat, deer mouse, and meadow vole. House mouse (*Mus musculus*) and Norway rat (*Rattus norvegicus*) are also possible, but the habitat is marginal to support these species.

The common shrew is the most widely distributed shrew in North America and it was introduced to Newfoundland in the late 1950s to control larch sawfly (*Pristiphora erichsonii*). It is found in damp forest habitats. Its diet primarily consists of worms, insects and snails. Shrews have a high metabolic rate, and can eat the equivalent of their own body weight in a day (Banfield 1975).

The little brown bat is ubiquitous in Newfoundland, and commonly roosts in trees, buildings or caves. Little brown bats feed on insects such as moths, beetles, mosquitoes and dipteran flies. During the summer months, the bats consume about half their weight in insects each night. In late summer-fall, they accrue body fat needed to survive months of hibernation. Bats hibernate in winter in frost-free locations such as caves, mineshafts, cellars, tunnels or buildings (Banfield 1975).

The deer mouse occurs in forests and grasslands throughout Newfoundland. It is the most widely distributed small native rodent in North America and only established (believed to have been introduced) on insular Newfoundland in recent decades. Its diet consists of seeds, fruits, fungi, spiders, and eggs and larvae of insects.

Meadow voles inhabit forest habitats on insular Newfoundland associated with wet meadows, open grassland near streams, lakes, ponds and swamps. This species eats mainly herbaceous vegetation, such as grasses, sedges, fruits, seeds, and grain, and may also consume some snails and insects. On insular Newfoundland this is the only indigenous small mammal.

Furbearers

Terrestrial Furbearers

Several species of terrestrial furbearers are known or likely to occur in and around the Southern Head Project Area. These include the snowshoe hare, red squirrel, red fox, coyote, ermine and lynx.

Snowshoe hares were introduced to Newfoundland around 1870. They are found throughout most of the boreal forest in coniferous, deciduous or mixed habitat, and occur in essentially all terrestrial habitats in the Project Area, particularly where there is cover and adequate food available. Hares are a major prey item for carnivores and are considered by many to be a keystone species in the ecosystem; that is, they are crucial to the functioning of the boreal ecosystem (Krebs et al. 2001). Some predators that depend heavily on hare abundance include lynx, red fox, ermine, great horned owl and northern goshawk. Hares exhibit a 9-to10-year population cycle. In spring and summer, hares feed on grasses and herbaceous plants primarily at the forest edge near escape cover. In winter, hares feed on twigs and may strip bark from young trees.

The red squirrel is the most widely distributed squirrel in North America, and was introduced to Newfoundland (Goudie 1978). It is generally associated with coniferous forest, but also uses mixed-wood and deciduous. It is a prey for many species like hawks, owls, foxes, coyotes and weasels. Squirrels are omnivorous and have a varied diet including seeds, nuts, berries, fungi, insects, bird eggs, juvenile animals (e.g., birds, rodents and hares), carrion and tree bark (Banfield 1975). Squirrels or their signs were regularly observed in the Project Area in 2006 and 2007.

The red fox is indigenous to insular Newfoundland and is found across the island, mostly in semi-open habitats. Tracks have been observed in the Project Area and fox were observed at Come By Chance at the 'Gut', that is, the outlet of the bar lagoon on June 27, 2007 and another at the public wharf near the existing refinery on June 28, 2007. Its generalist diet consists of small mammals (such as voles, squirrels, hares and mice), nesting waterfowl, berries, plants, young birds, eggs and trout. Signs of this species are often encountered along the edges of bogs and headlands.

Coyotes were first confirmed on the island in 1987, and are now widely dispersed across Newfoundland (Parker 1995). The coyote is extremely adaptable, and its continued population growth in Newfoundland has been a controversial topic (Blake 2006). Despite several eradication attempts throughout North America, coyotes have actually expanded their range (the litter size of a coyote increases with lower densities). In Newfoundland, as elsewhere, populations will likely be controlled by the amount of available habitat more than by management programs. It is probable that the coyote population in and around the Southern Head, Placentia Bay area is very low (Mike McGrath, Newfoundland Wildlife Division, pers. comm.). The increasing numbers of coyote may result in reductions in red fox densities as has been reported elsewhere; however, it remains unclear how these two species will interact in Newfoundland. Coyotes are generalists in their diet (Banfield 1975), feeding on small mammals, hare, caribou calves (and sometimes adults) (Thomas and Gray 2002), moose calves, birds and eggs, insects, amphibians and berries.

Ermine are primarily nocturnal hunters feeding on small mammals, hares, birds, insects, fish, frogs, carrion and berries. Ermine prefer riparian forest, marsh, shrubby second-growth and open areas adjacent to forests. Tracks of ermine were observed during winter-spring surveys of the Southern Head area.

Lynx prefer old growth boreal forest, usually with thick cover, and they are often found in areas where the snowshoe hare population has increased. The lynx's population cycle closely coincides with that of the snowshoe hare, and during winter, most of the lynx's diet consists of snowshoe hare. When prey is scarce in the forested areas, lynx will venture into more open habitats in search of food. When snowshoe hare numbers are low, lynx supplement their diet with various rodents and birds (Banfield 1975). Moose and caribou (usually calves) may account for some of the lynx's diet (Thomas and Gray 2002), but they rarely attack large prey. It is

probable that the population of lynx in and around the Project Area is very low, as no evidence of lynx was noted during winter-spring surveys on Southern Head.

Semi-aquatic Furbearers

Four species of semi-aquatic mammals are known or expected to occur in or around the Project Area, namely the river otter, American mink, beaver and muskrat.

The river otter is a large member of the weasel family Mustelidae. This species is found throughout North America, inhabiting rivers, lakes and coasts. In Newfoundland, the inner reaches of Placentia Bay, particularly around Merasheen Island and Long Island, support one of the highest densities of river otter in the province. The marine area offshore of, and adjacent to, Southern Head also supports a large population of otters. In this area, there are coastal haulouts (rubs) and well-worn trails linking some of these sites to the interior lakes and brooks. Otters occupy relatively large home ranges up to 100 km of linear shoreline (e.g., Coté et al. *in* prep.). Otters feed on fish, insects, molluscs, crustaceans, small mammals and waterfowl. However, in Placentia Bay, otters exhibit a primarily marine existence where they forage on fish such as cunners, gunnels, pouts, sculpins, flounders and sticklebacks (Coté et al. in prep), as well as lobster and other shellfish. In freshwater ecosystems of Newfoundland, otters prey on brook trout, eel and Atlantic salmon.

The American mink occurs throughout insular Newfoundland and established from escapees from early mink farms (Northcott 1972). It is a carnivore and has a component of fish in its diet but takes a greater proportion of terrestrial prey, such as small mammals and birds. It is more characteristic of inland habitats than coastal areas. Fresh mink tracks were noted at Southern Head in the winter-spring of 2007.

Beaver occupy rivers, streams, marshes, lakes and ponds and exist in and around the Project Area on Watson's Brook watershed and other scattered lakes and ponds on the peninsula. The activity of beavers in freshwater environments can have considerable localized impacts on the physical and biological components of riparian ecosystems. Beavers often increase habitat diversity by damming small streams, resulting in inundation, wetland enrichment and increased biodiversity. In the boreal forest, beavers are considered important to wetland enrichment for breeding waterfowl (Longcore et al. 2000). The lodges they build typically support six individuals. This large rodent feeds mainly on bark and twigs but also eats leaves, grasses, herbs, berries and aquatic plants.

The muskrat is also in the rodent family and inhabits marshes, pond and lake edges, and streams throughout Newfoundland. It feeds primarily on the roots and stems of aquatic vegetation and sometimes on clams, frogs and fish. Evidence of muskrat was not detected in the survey area of the Southern Head.

<u>Big Game</u>

Moose were introduced to Newfoundland in 1878 and 1904, with the second introduction considered the successful establishment. The species rapidly expanded to all parts of the Island. Moose prefer coniferous forest, especially near wetlands and lakes with regenerating coniferous trees. Moose selectively use forest cover to travel and are less likely to venture onto exposed habitats. In winter, excessive snow (exceeding knee deep or chest height) impedes movements by moose and animals may group to keep snow compacted while accessing shrubs and regenerating balsam fir (Renecker and Schwartz 2005). The summer diet consists mainly of aquatic vegetation, deciduous trees, shrubs and grasses. During winter, moose browse primarily on balsam fir on insular Newfoundland, and to some extent white birch, pin cherry and willow if they occur. Extensive browsing in blow-down areas has limited any successful regeneration of forests by balsam fir and/or birch in many areas. The Southern Head area is especially noted by local hunters for its high population of moose, particularly the eastern side of the Peninsula. During surveys in 2006-2007, there was considerable evidence that moose were using the Project Area, including fresh tracks, droppings, bedding areas and browsed vegetation, and numerous sightings. During late-winter surveys in 2007, a wintering area was identified at the east slopes of Southern Head near Goat Point. This site reflected use over several years. Bedding areas and shed antlers were located in the forested area, and browsing evidence of balsam fir was severe.

Woodland caribou are native to Newfoundland and move about according to the time of year. Insular Newfoundland supports large and relatively healthy herds of woodland caribou estimated at over 100,000 and increasing, and they are considered not at risk by COSEWIC (Thomas and Gray 2002). More than 50 per cent of the forest-dwelling caribou in Canada occur in Newfoundland where there are currently fifteen natural population and twelve introduced (for example, to some offshore islands such as Merasheen Island in Placentia Bay) (Mahoney and Shaefer 1996). The Middle Ridge herd is the closest caribou range to the Southern Head survey area near Come By Chance, and caribou have had an established presence in the Southern Head area for the last two decades (D. Slade, retired Wildlife Officer, pers. comm.). On June 28, 2007, seven caribou, consisting of 1 stag, 4 does and 2 calves were observed in the area of the proposed footprint of the oil refinery. It appears likely that this small herd is also calving in this general area.

Caribou use a mixture of boreal and taiga coniferous forest with some shrubland, peatlands and barrens (Thomas and Gray 2002). Therefore, the peatland and heath habitats of the Southern Head area are very suitable for this species, and small numbers of caribou are known to occur there. Caribou diet varies throughout the year, consisting of: evergreen and deciduous shrubs and sedges in spring; deciduous shrubs, lichens (*Cladonia* spp.) and fungi in summer; *Cladonia* spp. in autumn; and arboreal lichens and evergreen shrubs in winter (Bergerud 1972).

The black bear (*Ursus americanus hamiltoni*) of insular Newfoundland is recognized as a subspecies of the mainland black bear. Black bears tend to occur in low densities and have large territories. The population of insular Newfoundland was estimated at 6000-10,000 animals and was considered stable in the mid-nineties (Pelton et al. 1994). Black bears have rarely been reported on the Avalon Peninsula and currently do not have an established population there. There was considerable sign of black bear in the area of Hollett's Cove and near the proposed oil refinery site. On June 28, 2007, an adult black bear was observed on the western side of Southern Head adjacent to Sall The Maid Island. Black bears may use the Southern Head area due to its remoteness and availability of berries, insects and other foods suitable to their generalist diet. In some areas of Newfoundland, black bear can be an important predator on moose and caribou calves (Thomas and Gray 2002).

Wildlife Resource Use

The Project Area is in Moose Management Area 28 (Black River). This area had a 56.9 per cent hunter success rate in 2005-6, slightly lower than the provincial average of 65.6 per cent. In 2006-7, 400 licenses were issued for the area, somewhat lower than the provincial average of 525 per management area. Local residents and moose hunters reported that there were a lot of moose in the area of Southern Head. There is no designated hunting season or management unit for caribou in the Come By Chance-North Harbour area (Government of Newfoundland and Labrador 2007).

Several species of furbearers may be trapped in and around the Project Area, including coyote, beaver, lynx, mink, otter, and fox, and snaring of snowshoe hare may occur infrequently. LGL biologists did not observe evidence of trapping or snaring in the Project Area during field studies conducted in 2006-2007.

The Project Area has an abundance of snowshoe hare, and is known to have game birds including Willow Ptarmigan, Ruffed Grouse, waterfowl, and snipe. All hunting activities require an appropriate license. Snowshoe hare may be hunted or snared from October 13, 2007 to February 24, 2008 with a possession limit of 40 animals. Ptarmigan in the survey area are managed under the Avalon/Swift Current Management Area with hunting seasons covering September 22 to November 4, 2007 and daily and possession bag limits of 6 and 12, respectively. The Ruffed Grouse hunting season extends from September 15 to December 29, 2007 and snaring from October 13, 2007 to February 24, 2008 with daily and possession bag limits of 20 and 40, respectively.

Migratory game birds such as waterfowl are managed by the federal government under the Migratory Birds Convention Act, and require a migratory game bird hunting permit. Waterfowl in the Project Area fall under the Avalon-Burin Inland Zone and Avalon Burin Coastal Zone with seasons extending from the September 15 to December 29, 2007 for waterfowl other than sea ducks and for sea ducks (namely, Common Eiders, Long-tailed Ducks, Scoters) from November

24, 2006 to February 28, 2008. Daily bag and possession limits for 'inland ducks' are 6 and 12, respectively for ducks other than mergansers and sea ducks, 6 and 12 for mergansers, respectively and 5 and 10 for geese, respectively. For sea ducks, daily bag and possession limits are 6 and 12, respectively. These birds are likely hunted by locals in the area, and some of the ATV trails linking Come By Chance estuary to the wetlands at Half Moon Pond on Watson's Creek are probably attributable to hunting activity for waterfowl. Sea ducks are infrequent in this general inner area of Placentia Bay during the winter months. Some aggregations may occur in spring associated with the northward migration and occurrence of Arctic pack ice.

A number of remote cabins have been constructed by local residents within the peninsula. These cabins are well constructed and well-used.

Recreational fishing probably occurs for brook trout, including ice fishing and Watson's Brook has anadromous Atlantic Salmon that receive some angling pressure (D. Slade, retired Wildlife Officer, pers. comm.).

3.6.5 Birds

Landbirds or birds that typically associate with a terrestrial habitat occur within the Project Area in all months of the year. At least 47 species of landbirds likely occur in the proposed oil refinery footprint at Southern Head and many of these species breed there (Table 3.23). Some additional species that occur inland also occur in coastal habitat and are considered in Section 3.7.3, with the exception of breeding waterfowl which are described below. The species of landbirds known or expected to occur in the proposed area for the oil refinery and its access roads are typical of those that occur in much of eastern Newfoundland, as much of the habitat is similar (Goudie et al. 2007). Species considered at risk provincially and/or federally are discussed in Sections 3.6.7 and 3.7.5.

Songbirds

A songbird survey² was conducted in the proposed oil refinery footprint on 28 June 2007 as part of a Component Study (Goudie et al. 2007) in support of this document. The objective of the survey was to document species that breed in the refinery footprint area. [Prior to this survey, there were no systematic data collected for songbirds in the Project Area.] A biologist surveyed a route and focused on several areas representative of the three main habitats (black spruce forest and scrub, bog and fen, and balsam fir) in the refinery footprint by listening, observing and attempting to attract breeding birds to an alarm note. All birds were recorded and listed as

² The protocols used by the Ontario Breeding Bird Atlas for determining the breeding status of birds were adapted for the survey in the refinery footprint area (<u>http://www.birdsontario.org/atlas/atlasmain.html</u>).

being in one of the three general habitats of black spruce and scrub/forest, balsam fir and bog, and fen.

Based on survey results, a total of 20 species showed signs of breeding in the refinery footprint (Goudie et al. 2007). The four most numerous species observed on the refinery footprint area were Swamp Sparrow, White-throated Sparrow, Blackpoll Warbler and Savannah Sparrow with 16-40 pairs of each recorded. Yellow-bellied Flycatcher, Gray Jay, Yellow-rumped Warbler and Dark-eyed Junco were moderately common with 6-15 pairs recorded. One to five pairs of Wilson's Snipe, Common Tern, Downy Woodpecker, Black-capped Chickadee, Boreal Chickadee, Ruby-crowned Kinglet, Hermit Thrush, American Robin, Black-and-white Warbler, Northern Waterthrush, Wilson's Warbler and Fox Sparrow were also recorded. Most species were sighted in black spruce scrub and forest habitat and in the balsam fir habitat. Only four species were confirmed breeding or probably breeding in the other primary habitat type, bog and fen. However, three of these species (Wilson's Snipe, Common Tern, and Savannah Sparrow) were found exclusively in this habitat. Swamp Sparrow was the only species ubiquitous across all habitats in the refinery footprint area.

Breeding Waterfowl

Waterfowl breed in low densities throughout interior Newfoundland and these vary by ecoregion (Goudie 1987) with relatively low numbers expected in the Study Area. The Project Area is part of the Maritime Barrens Ecoregion and wetlands are typically acidic and dominated by peatland formations. There is little information on breeding waterfowl associated with wetlands on Southern Head. Species such as the Ring-necked Duck (*Aythya collaris*) and to a lesser extent the Black Duck (*Anas rubripes*) that exploit these oligotrophic habitats are expected to occur in the Project Area. Aerial helicopter surveys were conducted in early September 2006 and late June 2007 as part of reconnaissance for vegetation and wetlands, and biologists participating in these surveys recorded the presence of waterfowl broods and indicated pairs (see Goudie et al. 2007 for detailed survey procedures).

Aerial surveys of the Southern Head area in early September 2006 confirmed the presence of broods of Ring-necked Ducks on wetlands in and immediately north of the footprint of the proposed oil refinery. A single Black Duck was observed at this time and believed to be a hatchyear bird (that is, hatched in 2006 and possibly local). In late June 2007³, male and lone female Ring-necked Duck were observed on four wetlands, and a pair and single female Black Duck were observed on two wetlands in the Project Area. These sightings are likely indicative of breeding as all individuals were flight capable, and no evidence of moulting waterfowl was

³ Standard Operating Procedures as applied for Black Duck Joint Venture surveys under the North American Waterfowl Management Plan were employed.

documented in the Study Area. In addition to ducks, there were Greater Yellowlegs present on some wetlands and presumed to be breeding.

| Species | Scientific Name | Status ¹ | Abundance ² | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | ОСТ | NOV | DEC |
|------------------------------|------------------------|---------------------|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ruffed Grouse | Bonasa umbellus | В | Uncommon | | | | | | | | | | | | |
| Northern Harrier | Circus cyaneus | М | Scarce | | | | | | | | | | | | |
| Sharp-shinned Hawk | Accipiter striatus | М | Scarce | | | | | | | | | | | | |
| Northern Goshawk | Accipiter gentilis | B?, W | Scarce | | | | | | | | | | | | |
| Rough-legged Hawk | Buteo lagopus | М | Scarce | | | | | | | | | | | | |
| Merlin | Falco columbarius | В, М | Scarce | | | | | | | | | | | | |
| Great Horned Owl | Bubo virginianus | B?, M | Scarce | | | | | | | | | | | | |
| Boreal Owl | Aegolius funereus | B? | Scarce | | | | | | | | | | | | |
| Downy Woodpecker | Picoides pubescens | В | Scarce | | | | | | | | | | | | |
| Hairy Woodpecker | Picoides villosus | В | Scarce | | | | | | | | | | | | |
| Black-backed Woodpecker | Picoides arcticus | B? | Scarce | | | | | | | | | | | | |
| Northern Flicker | Colaptes auratus | B?, M | Scarce | | | | | | | | | | | | |
| Yellow-bellied Flycatcher | Empidonax flaviventris | В | Common | | | | | | | | | | | | |
| Northern Shrike | Lanius excubitor | W | Scarce | | | | | | | | | | | | |
| Gray Jay | Perisoreus canadensis | В | Uncommon | | | | | | | | | | | | |
| Blue Jay | Cyanocitta cristata | М | Scarce | | | | | | | | | | | | |
| Horned Lark | Eremophila alpestris | М | Scarce | | | | | | | | | | | | |
| Tree Swallow | Tachycineta bicolor | B?, M | Scarce | | | | | | | | | | | | |
| Bank Swallow | Riparia riparia | М | Scarce | | | | | | | | | | | | |
| Black-capped Chickadee | Poecile atricapillus | В | Uncommon | | | | | | | | | | | | |
| Boreal Chickadee | Poecile hudsonica | В | Uncommon | | | | | | | | | | | | |
| Red-breasted Nuthatch | Sitta canadensis | В | Scarce | | | | | | | | | | | | |
| Golden-crowned Kinglet | Regulus satrapa | В | Uncommon | | | | | | | | | | | | |
| Ruby-crowned Kinglet | Regulus calendula | В | Common | | | | | | | | | | | | |
| Gray-cheeked Thrush | Catharus minimus | B?, M | Scarce | | | | | | | | | | | | |

Table 3.23 Seasonal occurrence and abundance of landbirds predicted to occur regularly on the refinery footprint area.

| Species | Scientific Name | Status ¹ | Abundance ² | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | ОСТ | NOV | DEC |
|-------------------------|-------------------------------|---------------------|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Hermit Thrush | Catharus guttatus | В | Uncommon | | | | | | | | | | | | |
| American Robin | Turdus migratorius | В | Uncommon | | | | | | | | | | | | |
| American Pipit | Anthus rubescens | М | Scarce | | | | | | | | | | | | |
| Yellow Warbler | Dendroica petechia | М | Scarce | | | | | | | | | | | | |
| Yellow-rumped Warbler | Dendroica coronata | В | Common | | | | | | | | | | | | |
| Blackpoll Warbler | Dendroica striata | В | Common | | | | | | | | | | | | |
| Black-and-white Warbler | Mniotilta varia | В | Uncommon | | | | | | | | | | | | |
| Northern Waterthrush | Seiurus noveboracensis | В | Uncommon | | | | | | | | | | | | |
| Common Yellowthroat | Geothlypis trichas | B?, M | Scarce | | | | | | | | | | | | |
| Wilson's Warbler | Wilsonia pusilla | В | Uncommon | | | | | | | | | | | | |
| Savannah Sparrow | Passerculus sandwichensis | В | Common | | | | | | | | | | | | |
| Fox Sparrow | Passerella iliaca | В | Common | | | | | | | | | | | | |
| Swamp Sparrow | Melospiza georgiana | В | Common | | | | | | | | | | | | |
| Dark-eyed Junco | Junco hyemalis | В | Uncommon | | | | | | | | | | | | |
| Snow Bunting | Plectrophenax nivalis | W | Scarce | | | | | | | | | | | | |
| Pine Grosbeak | Pinicola enucleator | B? W | Scarce | | | | | | | | | | | | |
| Purple Finch | Carpodacus purpureus | B? M | Scarce | | | | | | | | | | | | |
| Red Crossbill | Loxia curvirostra | B?, M | Scarce | | | | | | | | | | | | |
| White-winged Crossbill | Loxia leucoptera | Β, Μ | Scarce | | | | | | | | | | | | |
| Common Redpoll | Carduelis flammea | M, W | Scarce | | | | | | | | | | | | |
| Pine Siskin | Carduelis pinus | B?, M | Scarce | | | | | | | | | | | | |
| American Goldfinch | Carduelis tristis | М | Scarce | | | | | | | | | | | | |
| Evening Grosbeak | Coccothraustes vespertinus | М | Scarce | | | | | | | | | | | | |

¹ Status in refinery footprint area, B = Breeding, W = Wintering, M = Migrant

²Common = likely present daily in moderate to high numbers; Uncommon = likely present daily in small numbers; Scarce = likely present regularly in very small numbers may be absent. Dark highlighted fields indicate presence of species in the area during that month.

3.6.6 Freshwater Fish and Fish Habitat

The existing freshwater fish and fish habitat conditions of the Southern Head Project area have been described in the Freshwater Fish and Fish Habitat Component Study. Relevant portions have been provided in the following sections where appropriate to provide the reader a summary of conditions.

Species Present

Fish species recorded during Southern Head studies in the proposed Project Area include brook trout (*Salvelinus fontinalis*), Atlantic salmon (*Salmo salar*) and American eel (*Anguilla rostrata*). Several DFO documents summarize the general biology of each species for use in habitat quantification (see Bradbury et al. 1999 and Grant and Lee 2004). Each is listed below with a brief life history description from these documents.

Brook Trout

Brook trout are widely distributed throughout Newfoundland and Labrador and are thought to exist in all Newfoundland freshwater ecosystems, where they have been reported to make extensive use of lake habitats. They can be either landlocked or anadromous, spending one or two months feeding at sea in relatively shallow water, close to their natal stream. There is also evidence to suggest that two forms of brook trout may coexist in some Newfoundland lakes; a primarily benthic feeding population that is relatively slow growing and short-lived, and a larger-bodied, piscivorous population that is faster growing and longer-lived. Optimal riverine habitat is characterized as clear, cold spring-fed water with silt-free rocky substrate in riffle-run areas; well vegetated stream banks; an approximate 1:1 pool-riffle ratio with areas of slow, deep water; abundant instream cover; and relatively stable water flow, temperature regimes and stream banks.

Spawning normally occurs between late September and early November in Newfoundland in shallow, gravel-bottomed streams and occasionally in lakes. In lakes, spawning typically occurs at depths less than two metres. Although growth rates are variable in Newfoundland, brook trout usually mature at two to four years of age. Although they seldom live longer than five or six years of age, brook trout have been reported from several Newfoundland lakes up to eight years of age.

Brook trout often seek refuge among rocks, aquatic vegetation, woody debris, overhanging logs and undercut banks.

Atlantic salmon (Salmo salar)

Atlantic salmon are distributed throughout the northern portion of the Atlantic Ocean from Portugal to Norway in the east, throughout southern Iceland and Greenland, and from Hudson Bay to the Connecticut River in the west. In Canada, the anadromous form is distributed throughout eastern Quebec, the Maritimes and Newfoundland and Labrador. Atlantic salmon are found throughout Newfoundland and southern Labrador and have been reported in coastal rivers as far north as the Fraser River. Throughout Newfoundland and Labrador, Atlantic salmon occur in both anadromous and landlocked populations. Anadromous salmon have been captured at sea up to the northern tip of Labrador.

Atlantic salmon typically remain at sea for 1-3 years before returning to their natal river to spawn for the first time. They generally ascend rivers in the fall; however the timing of upstream migration may occur from May to September in Newfoundland and July to August in Labrador. In Newfoundland, spawning typically occurs between mid-October and mid-November. Nesting sites are chosen by the female and are usually within a clean area which is well-aerated with gravel bottom where a riffle exists above a pool. Spawning has also been reported at the tail of pools and on the upstream edge of riffles. Egg incubation period is normally four to five months, with hatching occurring between mid-April and early May in Newfoundland.

After emergence, young-of-year may remain within the vicinity of the redd until they reach a length of approximately 65mm. Most will then disperse downstream and establish territories, usually occupying an area of slow-flowing water initially and moving into faster-flowing water, such as riffles and rapids, as they increase in size.

<u>American Eel</u>

The American eel is distributed from the southern tip of Greenland, southward along the Atlantic coast and the Gulf of Mexico to the northern portion of the east coast of South America. They have been reported throughout Newfoundland and the south-eastern coast of Labrador as far north as Hamilton Inlet. The American eel is catadromous spending most of its life in freshwater and estuaries but migrating to sea to spawn. Eels typically begin their spawning migration in late summer and fall throughout much of eastern Canada, although migration from lakes that are far inland may begin earlier. Peak migratory activity often occurs in September-October during the last quarter of the moon and is enhanced by dark, stormy nights and rising water levels.

Eels spawn in the Sargasso Sea, with peak spawning occurring in mid-winter between January and March, but may extend as late as May or June. Although the depth at which spawning occurs is not known, evidence suggests that eels spawn in the upper few hundred metres of the water column. Adult eels presumably die after spawning.

During the freshwater phase of their life history, eels move into streams, rivers and muddy or silt-bottomed lakes, generally following the bank of the river in very shallow water. Eels can be very mobile and may gain access to ponds and lakes, which appear unavailable to them, by using very small watercourses or by moving overland through wet grass. Being nocturnal, they usually spend the day hiding under rocks and logs or buried in the mud. Investigations on diet

composition of juvenile eels suggest that American eels rely heavily on benthic organisms and demersal fishes as food sources. There are indications that a proportion of eels remain in brackish estuaries and do not enter freshwater at all. In Newfoundland, eels migrate to sea after spending twelve to thirteen years in freshwater.

Recent concern regarding population decreases in the Great Lakes has prompted COSEWIC to list the American eel as a Species of Concern in 2006 (COSEWIC 2006). This designation is defined as a wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats. The reason for the designation has been indicators of the total Canadian component of this species status are not available. Indices of abundance in the Upper St. Lawrence River and Lake Ontario have declined by approximately 99 per cent since the 1970s. The only other data series of comparable length (no long-term indices are available for Scotia/Fundy, Newfoundland and Labrador) are from the lower St. Lawrence River and Gulf of St. Lawrence, where four out of five time series declined. Because the eel is panmictic (i.e., all spawners form a single breeding unit), recruitment of eels to Canadian waters would be affected by the status of the species in the United States as well as Canada. Prior to their declines, eels reared in Canada comprised a substantial portion of the breeding population of the species. The collapse of the Lake Ontario-Upper St. Lawrence component may have significantly affected total reproductive output, but time series of elver abundance, although relatively short, do not show evidence of an ongoing decline. Recent data suggest that declines may have ceased in some areas; however, numbers in Lake Ontario and the Upper St. Lawrence remain drastically lower than former levels, and the positive trends in some indicators for the Gulf of St. Lawrence are too short to provide strong evidence that this component is increasing. Possible causes of the observed decline, including habitat alteration, dams, fishery harvest, oscillations in ocean conditions, acid rain and contaminants, may continue to impede recovery. The designation as a Species of Concern does not enact any additional conservation measures outside those within the Fisheries Act.

Fish Habitat Present

There are a total of five drainage basins within the Southern Head area with all five being directly within or near the footprint of the proposed refinery. Provided below is a general description of the existing environment within each of the potential basins within the Project footprint. It should be noted that all other streams and ponds within the project footprint not identified below are not considered fish habitat as they did not contain fish or were small flooded, overland flows with no suitable habitat.

Holletts Brook (Tributary T1)

Holletts Brook (T1) and its tributary stream (T1-1) are located on the southwest side of Southern Head. It is a small drainage area directly within the footprint of the proposed refinery which flows south and drains into Holletts Cove, Placentia Bay (Figure 3.69). It extends approximately

2km inland from its outflow at the southern tip of Southern Head and drains approximately 1.5k km² (40 per cent of the Project footprint area). Sample streams T1 and T1-1, when combined, measure a total of 2,412 m in length (all within the project footprint).

Holletts Brook and its small tributary flows primarily through sections of open bog. Both streams have riparian vegetation consisting of predominantly gramminoids with some conifers. The substrate composition of stream T1 is mostly bedrock and gravel. The substrate composition of tributary T1-1 was predominantly detritus and rubble. Both follow the surficial contours of the bog and for the most part have gradients of less than 10 per cent.



Figure 3.69 Surveyed Ponds and Streams Within the General Project Area.

Habitat units defined within Holletts Brook were classified as 3.83 units of Steady, 12.78 units of Riffle, 4.04 units of Run, 0.61 units of Rapid and 0.67 units of Pool. The small tributary was classified as containing 0.84 units of Riffle and 0.20 units of Steady. The remainder consisted

of flow over grass (i.e. overland flow) that would be dry during low flow periods and hence is not considered fish habitat.

Both brook trout and American eel were captured in Holletts Brook during electrofishing surveys and it has been calculated that approximately 16.55 and 17.44 Habitat Equivalent Units (HEU's) exist for brook trout and American eel respectively in T1 with tributary T1-1 containing 0.95 HEU's for American eel. The small tributary had an HEU of 0.00 for brook trout (not suitable).

Pond P2

Pond P2 is located at the headwater of Holletts Brook (Figure 3.70). The surface area comprised 2.6 ha, of which 2.2 ha is littoral and 0.4 ha of non-littoral. The average depth of the pond was 3.1 m, while the deepest location in the pond was 5.6 m. The shoreline is generally comprised of cobble, gravel and rubble.

A combination of fyke nets and baited minnow traps were all fished for 3 nights, yielding a total catch of 66 brook trout. Habitat equivalent units (HEU) for brook trout were calculated at 2.17 ha.



Figure 3.70 Pond P2

Watson's Brook (T2, T2-1 and T2-2)

Sample streams T2, T2-1 and T2-2 are part of the Watson's Brook drainage basin. The drainage area within the footprint is small (1.24 km²) which drains the northeastern portion of the footprint (Figure 3.71). The area within the footprint comprises 4.2 per cent of the Watson's Brook drainage basin (total drainage of 29.86 km²). All reaches within the project footprint flow through sections of bog with shoreline vegetation consisting mostly of gramminoids and conifers. Substrate throughout is predominantly rubble and boulder.

T2 itself drains from a small bog pond (Pond P7) on the eastern edge of the footprint to a larger pond (Pond P1) on the northern edge. It has a total length of 409 m (all within the project footprint), has an average gradient of less than 3 per cent and contains a considerable quantity of overland flow. The habitat within T2 was classified as 0.72 units of Riffle, 0.70 units of Run and 1.52 units of Pool. There were also 1.29 units of overland flow.

Tributary T2-1 originates outside the eastern edge of the project footprint. It is a small tributary that empties into the eastern side of Pond P7. The stream itself measures approximately 343 m in length. The substrate composition of the steam is predominantly gravel and cobble. The shoreline vegetation is made up entirely of gramminoids and conifers. The stream for the most part was well defined and, with the exception of reach 4, has an average gradient of less than 5 per cent. The habitat within the entire tributary was classified as 1.21 units of Riffle and 0.56 units of Cascade.

Stream T2-2 drains a pond toward the northern edge of the footprint (Pond P8) into Pond P1. It has a total length of 363 m (all within the project footprint) and has a gentle gradient (less than 1 per cent). The habitat was classified as 1.61 units of Riffle and 1.39 units of Pool.

Brook trout, Atlantic salmon and threespine stickleback are all known to occur within the Watson Brook watershed. Therefore, HEU's for all three species are presented below (Table 3.24), even though threespine stickleback and brook trout were the only two fish species captured during the electrofishing surveys.

| Tributory | HEU by Species | | | | | | | |
|-----------|----------------|-----------------|------------------------|--|--|--|--|--|
| mbutary | Brook Trout | Atlantic Salmon | Threespine Stickleback | | | | | |
| T2 | 1.28 | 1.27 | 0.51 | | | | | |
| T2-1 | 1.27 | 1.22 | 0.86 | | | | | |
| T2-2 | 2.70 | 1.87 | 2.05 | | | | | |

| Table 3.24 Su | ummary of Habitat Eq | uivalent Units, Watsor | n's Brook tributaries |
|---------------|----------------------|------------------------|-----------------------|
|---------------|----------------------|------------------------|-----------------------|

Pond P1

The section of pond P1 that is located within the footprint of the Project was sampled (Figure 3.69). The section within the footprint has a total area 7.4ha; all littoral with an average depth of 1.0 m, being 1.2 m at its deepest. Littoral substrate was comprised of mainly muck, detritus and rubble. The shoreline was generally comprised of detritus and to a lesser extent rubble.

A total of 56 brook trout, 40 threespine stickleback and 3 juvenile Atlantic salmon were captured within Pond P1. HEU values for each species are 5.00 ha, 7.42 ha and 0.53 ha for brook trout, threespine stickleback and Atlantic salmon respectively.



Figure 3.71 Pond P1

Pond P7

Pond P7 is located along the southeast end of the Project footprint within Tributary T2. The total surface area is 1.25 ha with the deepest location being 0.65 m deep (Figure 3.72). The substrate was comprised of mostly aquatic vegetation, detritus, gravel and cobble.

A total of 38 Threespine sticklebacks and one Atlantic salmon were captured within Pond P7. Brook trout were not captured but are common throughout the Watson Brook drainage basin,

therefore, HEU values for each species are 1.24 ha (stickleback), 0.29 ha (Atlantic salmon) and 0.92 ha (brook trout).



Figure 3.72 Pond P7

Pond P8

Pond P8 is a very shallow pond located in T2 in the northern portion of the Project footprint (Figure 3.73). The total surface area of Pond P8 is 5.78 ha and averaged a depth of 0.63 m, the deepest location measured 0.90 m deep. The substrate was comprised of gravel, cobble, detritus and sand. The larger substrate extended approximately half a meter into the pond which then changed to aquatic vegetation and detritus.

A total of 53 brook trout, 81 threespine stickleback and 1 Atlantic salmon juvenile were captured within Pond P8. HEU values for each species are 3.91 ha, 5.75 ha and 0.10 ha for brook trout, threespine stickleback and Atlantic salmon respectively.

Stream T3

Sample Stream T3 is a small stream that flows from sample Pond P3 and drains into North Harbour, a length of 863 m. Substrate composition is primarily gravel, cobble and detritus. The

first 213 m of the stream was well defined, after which it becomes less distinct with sparse intermittent channels and overland flow to Pond P3. The new Classification System classified a total of 2.55 units of Riffle.

Brook trout were identified within the drainage basin rendering a total of 1.67 Habitat Equivalent Units (HEU).



Figure 3.73 Pond P8

Pond P3

Pond P3 is a shallow pond located along the western edge of the Project footprint (Figure 3.74) and is mostly surrounded by bog. The total surface area of Pond P3 is 1.47 ha; all littoral habitat. The average depth was 0.7 m, and the deepest location measured 0.9 m. The pond substrate consisted of mostly cobble, gravel and rubble.

A total of 24 brook trout were captured in Pond P3 with a HEU value of 1.08 ha.

Stream T5

Stream T5 is located to the south of Stream T3. While the stream was not intermittent or overland flow, it is not considered fish habitat. Electrofishing and fyke net results throughout this drainage basin did not capture any fish.



Figure 3.74 Pond P3

3.6.7 Species at Risk

Species at Risk are designated by three different sources, and their lists differ slightly. A species can be designated by the provincial government through the *Endangered Species Act* (*ESA*), by the federal government through the *Species at Risk Act* (*SARA*), and by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), that operates independent of government, but whose list is given legal status under *SARA* (Table 3.25).

| Species | Scientific Name | Provincial ESA (designation date) | COSEWIC (last assessment date) | SARA (Schedule) |
|---|------------------------------|-----------------------------------|--------------------------------|------------------------------------|
| Peregrine Falcon (<i>anatum</i>) | Falco peregrinus anatum | Threatened (2002) | Threatened (2007) | Threatened (Schedule 1) |
| Peregrine Falcon (<i>tundrius</i>) | Falco peregrinus tundrius | Threatened (2002) | Special Concern (2007) | Special Concern (Schedule 3) |
| Eskimo Curlew | Numenius borealis | Endangered (2002) | Endangered (2000) | Endangered (Schedule 1) |
| Short-eared Owl | Asio flammeus | Vulnerable (2002) | Special Concern (2004) | Special Concern (Schedule 3) |
| Gray-cheeked Thrush | Catharus minimus | Vulnerable (2006) | - | - |
| Rusty Blackbird | Euphagus carolinus | - | Special Concern (2006) | No status or schedule ¹ |
| Red Crossbill | Loxia curvirostra percna | Endangered ² | Endangered (2004) | Endangered (Schedule 1) |

Table 3.25Terrestrial bird species considered at risk under the Newfoundland Labrador ESA,
SARA, and by COSEWIC.

Note: Vulnerable is a Newfoundland and Labrador designation equivalent to Special Concern for COSEWIC and SARA.

Sources: http://www.sararegistry.gc.ca/; http://www.env.gov.nl.ca/env/wildlife/wildlife_at_risk.htm (accessed 20 June 2007)

¹ Under consideration for addition to Schedule 1

² Year not listed on government website.

Birds

In the Project Area, there is potential habitat for several terrestrial species of birds considered at risk. The species listed as at risk (Table 3.25) for the island of Newfoundland are Peregrine Falcon, Eskimo Curlew, Red Crossbill, Gray-cheeked Thrush, Short-eared Owl, and Rusty Blackbird.

Peregrine Falcon

The Peregrine Falcon is practically cosmopolitan, breeding on all continents but Antarctica. It breeds throughout North America in low densities. In Canada the two main subspecies are *anatum*, which breeds in southern Canada, and *tundrius*, which breeds in the Arctic and sub Arctic. The *anatum* subspecies is designated as Threatened by COSEWIC. The *tundrius* is considered Threatened by the Newfoundland and Labrador Special Status Advisory Committee (SSCA) and a species of Special Concern by COSEWIC. At the time of the writing of this EIS, COSEWIC status reports, Recovery Strategies, and Management Plans are not available for these subspecies.

The *anatum* subspecies, on average, has darker plumage with a stronger malar stripe than the *tundrius* subspecies. In Newfoundland and Labrador, the division in the breeding ranges of the

two subspecies is approximately at the tree line in northern Labrador. Many individuals breeding in Labrador are difficult to assign to subspecies. Approximately 60-70 nest sites of Peregrine Falcon are known from Labrador.(www.env.gov.nl.ca/env/wildlife/wildatrisk/Perigrine_Falcon.pdf). The peregrine falcon does not nest, On the island of Newfoundland, but is mainly a fall migrant. It is more scarce during spring migration. A few birds overwinter on the southern Avalon Peninsula.

In the Study Area, Peregrine Falcon would occur mainly as an uncommon fall migrant with a few individuals possible occurring during spring migration. One or two Peregrine Falcons overwinter in the Cape St. Mary's area every year. Both subspecies have been identified in Placentia Bay, but the ratio of the occurrence of *anatum* to *tundrius* subspecies is not known. No Peregrine Falcons were observed during field studies conducted in support of this EIS. However, Peregrine Falcons probably occasionally occur in and near the Project Area during fall migration.

Eskimo Curlew

The Eskimo Curlew is listed as Endangered by the province, *SARA* (Schedule 1), and COSEWIC, although this species is likely extinct. A proposed Recovery Strategy is in place but it concludes that "...recovery of the Eskimo Curlew is not feasible at this time and suggests that no recovery actions be undertaken" (Environment Canada 2007). Recovery was not deemed feasible given that nests have not been located in over 140 years and there are few if any individuals remaining. This species declined rapidly in the 1870s to 1890s and overhunting is thought to be the main reason for this decline (Environment Canada). There are only two documented breeding sites in Canada, both occurred in the Northwest Territories and these sites were noted before the 1870s. Eskimo Curlews were known to migrate eastwards in the fall to Newfoundland and Labrador and then to South America. Although Eskimo Curlews may have occurred in the Study Area in the past, no Eskimo Curlews are expected to occur there now given their extremely endangered (likely extinct) status.

Short-eared Owl

Short-eared Owl was designated as a Vulnerable species in Newfoundland and Labrador under the *ESA* in 2002. It is listed as a species of Special Concern by COSEWIC and is currently listed as such under Schedule 3 of *SARA*. A COSEWIC status report and Management Plan are not available for this species.

This species breeds in North America, South America and Eurasia. It is widespread in Canada, breeding from the sub-Arctic southward. Its distribution is patchy and numbers have declined in the United States and most of Canada. In Newfoundland and Labrador, Short-eared Owls have been reported in tundra, coastal barrens, sand dunes, field and bog habitats (Schmelzer 2005). In Newfoundland, Short-eared Owls feed on small rodents, mainly meadow voles, and occasionally small birds that are surprised in the low vegetation (grasses) of coastal locations.
In the early 1990s, a pair of Short-eared Owls summered at the Argentia airbase and they were suspected of breeding (B. Mactavish, pers. obs.). Short-eared Owls also occur regularly during the breeding season (April-September) at Cape St. Mary's. In Placentia Bay, Short-eared Owls are expected to occur locally in small numbers during April to November. There is a small amount of suitable habitat for the Short-eared Owl in the Project Area but there are no records of its presence there. Migrating Short-eared Owls may occur at any coastal site including the Project Area from April-May and September to November.

Gray-cheeked Thrush

The Gray-cheeked Thrush is listed as Vulnerable in Newfoundland and Labrador by SSAC but is not listed by COSEWIC and *SARA*. The analysis of data from 21 Breeding Bird Surveys routes on insular Newfoundland indicates a significant decline between 1980 and 2003 (Dalley et al. 2005).

The breeding range of Gray-cheeked Thrush is northern boreal forests near the tree line from Alaska to Newfoundland and Labrador (Godfrey 1986). This species winters from southern Mexico south to Brazil (Godfrey 1986). It occurs in Newfoundland from late May to September. In Newfoundland and Labrador, the preferred breeding habitat includes dense low coniferous woods, open canopy old growth forest having dense growth of small conifers in the understory, and dense stunted spruce and fir on windblown sites on the coast or at higher elevations. The Gray-cheeked Thrush is an uncommon breeder on the west side of Placentia Bay preferring the steep slopes of the coastal enclaves including the Placentia area (B. Mactavish, pers. obs). There is suitable breeding habitat for the Gray-cheeked Thrush in the Project Area, and the species has been reported to occur in the Southern Avalon region. However, no Gray-cheeked Thrush were observed during field studies conducted in support of this EIS.

Rusty Blackbird

The Rusty Blackbird is listed by COSEWIC as a species of Special Concern but it is not listed under the provincial *ESA*. Evidence of a continent wide decline within the breeding range and wintering areas has resulted in COSEWIC designating the Rusty Blackbird as a species of Special Concern. The Canadian population is estimated at between 110,400 and 1.4 million individuals and it includes approximately 70 per cent of the global population (COSEWIC 2006). The Rusty Blackbird breeds throughout the boreal forest of North America from Alaska to Newfoundland and Labrador, and winters from southern Canada to Mexico (Godfrey 1986). In Newfoundland and Labrador, the Rusty Blackbird is a widespread breeder on lakes, waterways and bogs during late April to October. The species has experienced a severe decline primarily due to habitat conversion on the winter range and blackbird control programs in the United States (COSEWIC 2006). This decline has likely occurred during the past century as historical records from 1900 list the Rusty Blackbird as "fairly common". Habitat suitable for the Rusty Blackbird as "fairly common". Habitat suitable for the Rusty Blackbird exists in fresh water wetlands around Placentia Bay. Rusty Blackbirds are probably a

scarce bird in the Study Area during late April to October. In addition, there is suitable nesting habitat for Rusty Blackbirds in the Project Area, but none were observed during field studies conducted in support of this EIS (Goudie et al. 2007).

Red Crossbill

The Red Crossbill is widespread in coniferous forests of North America extending south to mountains in Nicaragua (Godfrey 1986). The *percna* subspecies is believed to only nest in insular Newfoundland and it is estimated that 500-1500 individuals currently occur in Newfoundland (Environment Canada 2006). The Newfoundland subspecies of Red Crossbill percna is currently listed as Endangered under Schedule 1 of *SARA* and the Newfoundland and Labrador *ESA*. A Recovery Strategy is in place for this subspecies (Environment Canada 2006).

A sharp decline in Red Crossbills recorded during Christmas Bird Counts from 1968 to 2002 reveals a 75 per cent decrease in numbers per decade (COSEWIC 2004). The reasons for this decline are uncertain, but the decline of the white pine (*Pinus strobus*) caused by the accidental introduction of white pine blister rust (*Cronartium ribicola*), widespread logging reducing available habitat and the introduction of the red squirrel (*Tamiascriurus hudsonicus*) competing for the same food may be contributing factors (Environment Canada 2006). The Avalon Peninsula is presently one of the strongholds for the Red Crossbill in Newfoundland. In 2005 and 2006, there were reports of Red Crossbills from several individuals who regularly attend and watch bird feeders in the Trinity Bay and Bay Verde Peninsula area (B. Mactavish, pers. comm.). Nesting in the Whitbourne area was confirmed when adult Red Crossbills that had been using a feeder on a daily basis brought juveniles to the feeder in June and fed them (B. Mactavish, pers. comm.). Habitat associations are poorly understood for the Red Crossbill in Newfoundland, but it is unlikely that the Project Area possesses any critical habitat characteristics for this species, as the habitat types present are common around most of the island. No Red Crossbills were observed during field studies conducted in support of this EIS.

Lichens

The boreal felt lichen (*Erioderma pedicellatum*) is listed as a Special Concern by COSEWIC and is listed as such on Schedule 1 of *SARA* and Vulnerable by the Newfoundland and Labrador ESA. Newfoundland currently supports the largest remaining known populations in the world, and they are localized in areas of the boreal forest of the Avalon Peninsula (Maass and Yates 2002). Recently the species has been located in the area of Long Harbour, Placentia Bay (Goudie and Conway 2006), and it was located in the 1980's in the area of Goobies within about 20 km of the Project Area (Wolfgang Maass, Research Associate, Dalhousie University, Nova Scotia, pers. comm.). This species is especially sensitive to sulphur dioxide (Maass and Yates 2002; Richardson and Cameron 2004).

Boreal felt lichen was located in the Project Area parting the general area of the proposed access road along the western side of the peninsula (Figure 3.75) during a search of 2000 trees and about 2 km of coverage. Twelve thalli of the boreal felt lichen were located on four phorophytes (3 dead, 1 mature). *Coccocarpia parmicola* and the *less common cyanolichens, Lichinodium sirosiphoideum* (12 phorophytes) *and Fuscopannaria ahlneri* (two phorophytes) co-occurred in these stands. The phorophytes supporting the boreal felt lichen were 300 to 500 m east of the proposed right-of-way (Figure 3.75). Forested habitats in this area are dominated by balsam fir, although the coastal band often contains white spruce. Black spruce dominates along bog edges and is interspersed with balsam fir on low ridges in forested areas of the more open headland. Other phorophytes of *Erioderma pedicellatum* are likely present in this road access area and likely within the footprint of the development given that the associate cyanolichen species have been located there (see Goudie and Munier 2007).



Figure 3.75 Sites where *Erioderma pedicellatum* was located by LGL Limited Proximate to the Western Part of the Proposed Access Road on 28 June 2007

3.7 Marine Biological Environment

3.7.1 Introduction

The physical characteristics of Placentia Bay allow its waters to support a wide variety of planktonic, benthic, and pelagic communities. Characteristics of the Bay, such as its ice-free conditions, sufficient mixing of ocean waters and excellent sources of nutrients, allow a diverse range of species to flourish.

The marine VECs identified for this project include fish and fish habitat, marine mammals and sea turtles, seabirds, and special areas. The plankton and benthos of Placentia Bay support, direct or indirectly, several of these marine VECs.

Numerous birds and mammals inhabit inner portions of the Bay and surrounding areas. During summer months, communities of gannets, cormorants, alcids, gulls, and terns nest along rocky cliffs and islands. Several species of migratory birds, such as shearwaters, also over-winter and forage in these waters during summer months. Thirteen species of marine mammals, including baleen and toothed whales, are also considered seasonal visitors to Placentia Bay.

The following sections provide greater detail on the marine biological setting present in Placentia Bay. Descriptions of fish and fish habitat, seabirds, and marine mammal species currently found within Placentia Bay are given, as well as a section discussing species found in Placentia Bay that are protected under Federal or Provincial Species at Risk legislation.

3.7.2 Marine Fish and Fish Habitat

The existing marine fish and fish habitat conditions of the Southern Head Project area have been described in detail within the Marine Fish and Fish Habitat Component Study. Furthermore, commercial wild fish resources have been identified in the NL Refinery Fisheries Baseline Document (Canning and Pitt Associates 2007). Related portions have been provided in the following sections where appropriate to provide the reader with a summary of conditions.

Species Present

This section provides an overview and description of marine species in Placentia Bay. Commercially valuable fish and shellfish within the NAFO Unit Area (UA) 3PSc and species identified during surveys at the project site are listed in Table 3.26 (Canning and Pit 2007; AMEC 2007).

| Marine Species | Scientific Name |
|---------------------|-----------------------------------|
| Atlantic Cod | Gadus morhua |
| Redfish | Sebastes spp. |
| Atlantic Halibut | Hippoglossus hippoglossus |
| American Plaice | Hippoglossoides platessoides |
| Yellowtail Flounder | Limanda ferruginea |
| Winter Flounder | Psuedopleuronectus americanus |
| Pollock | Pollachius virens |
| White Hake | Urophycis tenuis |
| Monkfish | Lophius americanus |
| Atlantic Herring | Clupea harengus harengus |
| Mackerel | Scomber scombrus |
| Capelin | Mallotus villosus |
| Sea Scallop | Placopecten magellanicus |
| Squid | Illex illecebrosus |
| Whelks | Buccinum undatum |
| Sea Cucumber | Cucumaria frondosa |
| Green Sea Urchins | Strongylocentrotus droebachiensis |
| American Lobster | Homarus americanus |
| Snow Crab | Chionecetes opilio |
| Lumpfish | Cyclopterus lumpus |
| Sand Dollar | Echinarachnius parma |
| Periwinkle | Littorina littorea |

| Table 3.26 | Marine Species of Placentia Bay |
|------------|---------------------------------|
|------------|---------------------------------|

Atlantic Cod

Cod is still the most commercially harvested species in the area. Cod are opportunistic feeders. Their diet consists of a variety of marine species depending on the available prey community. Juvenile cod tend to feed primarily on large zooplankton, shrimp and other small crustaceans, polychaetes and capelin (Hanson and Chouinard 2002). Mature cod select large prey such as fish and invertebrates. These may include capelin, herring, redfish, and crustaceans such as snow crab. Cod will also prey on juvenile cod if available (Waiwood and Majkowski 1984).

Redfish (Ocean Perch)

Redfish are a benthic species that inhabit a wide range of depths, generally from 75 to 750 meters. They exhibit diurnal movements and migrate to shallow depths at night to feed and return to deeper waters during the day. Redfish diet is made up of over 90 per cent pelagic

organisms including copepods, amphipods, euphausiids, other zooplankton species, shrimp and fish (DFO 1984)

Atlantic Halibut

Atlantic Halibut is found in deep waters around Newfoundland with the main concentration located off Newfoundland's south coast and southern Grand Banks (Scott and Scott 1988). Atlantic Halibut are not considered to be a highly migratory species, but are strong and vigorous fish that can move great distances. They migrate from deeper water where they over-winter to shallower waters during the summer. Halibut are voracious feeders and consume a variety of prey including annelid worms, crabs, shrimp, euphausiids and other fish (www.dfo-mpo.gc.ca/zone/underwater_sous-marin/ahalibut/ahalibut-fletan_e.htm)

American Plaice

American Plaice are most abundant in water depths ranging between 70-150 m, and tend to inhabit waters with cold temperatures (1oC to 4oC) and soft bottom sediment (Swain 1997). They consume both benthic and epi-bentic organisms. Juvenile plaice feed primarily on krill, amphipods and echinoderms; larger plaice consume mainly echinoderms, molluscs and small fish. Feeding occurs primarily during summer and is considered a critical life stage as they cease feeding during the winter and early spring (Maddock and Burton 1999).

Yellowtail Flounder

The Yellowtail Flounder is usually found on mud bottoms at depths of 27 to 365 m. Its seasonal migration consists mainly of movement into shallower water in spring and back to deeper water in the fall and early winter. The Yellowtails diet is restricted due to the size of its mouth and consists mainly of polychaete worms and amphipods, along with small vertebrates such as sand lance and capelin, crustaceans that live on the ocean floor such as such as shrimp, cumaceans, and isopods (DFO 1983).

Winter Flounder

This shallow water flatfish, also known as black-back flounder, is found in all marine waters throughout Newfoundland and Labrador. Winter Flounder are sedentary and only move short distances seasonally between the inshore and offshore waters. In summer Winter Flounder may be found in coastal waters <24 m and in winter<30 m of water. Winter Flounder prey on eggs from other fish and consume a wide range of benthic and epibenthic organisms, including polychaetes, amphipods, isopods, tunicates and clams. (Klein-Macphee 1978).

<u>Pollock</u>

Pollock are found off southern Newfoundland. They are voracious eaters, and since they often congregate in large numbers, they can have a severe impact on schools of herring, juvenile cod,

haddock and hake. Although generally referred to as groundfish, Pollock are really benthopelagic, as they are found throughout the water column feeding on smaller fish and crustaceans near the bottom and squid, shrimp and euphausiids at the surface (DFO 1993)

White Hake

In Newfoundland the White Hake are more common on the south coast. Their habitat is comprised of soft substrate and can be founds in temperatures ranging from 5oC to 11oC. It exhibits a bimodal distribution with respect to depth, ranging from <100 m to >200 m. The adult Hake's diet is primarily comprised of fish such as herring, cod, haddock, mackerel, sand lance and other hake. Juvenile hake feed primarily on shrimp, polychaetes and small crustaceans. Intermediate sized hake eat large quantities of decapods, euphausiids and some fish (Morin and Hurlbut 1994).

<u>Monkfish</u>

Monkfish are a large, bottom-dwelling cartilaginous, lethargic fish. The species prefers warm slope regions with a variety of sediment types and can be found at depths of 0 to 650 m and prefers temperatures between 6°C to 10°C. Seasonal distribution of monkfish suggests they migrate to shallow water during the summer and move to deeper waters during winter.

Atlantic Herring

Atlantic Herring are a pelagic schooling fish. They can be found in shallow inshore waters, as well as offshore waters ranging up to depths of 200 m. They are highly mobile, migrating to spawning grounds, over-wintering areas and feeding grounds throughout the year. Herring are planktivorous, feeding by selective capture of individual particles or by non-selective filter-feeding depending on the size and concentration of prey. The Herring diet consists of plankton such as euphausiids, copepods, fish eggs, mollusc larvae and larval fish (DFO1999).

<u>Mackerel</u>

Mackerel are a pelagic, schooling species that migrate annually in response to seasonal temperature changes. They are normally seasonal migrants into Newfoundland's southern and east coast waters, arriving in mid-summer and leaving by late fall. Mackerel engage in both "selective" and "filter" feeding. They consume a large variety of planktonic organisms including amphipods, shrimp, crab larvae, small squid, fish eggs, capelin and herring (DFO 1985).

<u>Capelin</u>

Capelin inhabit marine waters throughout Newfoundland and southern Labrador. They primarily remain within the top 20 m of the water column during the day and form discrete schools in deeper water at night. Capelin feed mainly on invertebrate zooplankton. Feeding patterns vary seasonally. Capelin fast during the early winter months and resume feeding in late winter and

early spring. During the spawning period, feeding ceases all together. Capelin is relied upon as a staple food source for a variety of fish species, marine mammals and seabirds (DFO 1999).

<u>Sea Scallop</u>

The Sea Scallop is found throughout the coastal region of insular Newfoundland. Its habitat needs vary with the life-cycle stages. The larvae need uncontaminated seawater at an appropriate temperature and containing an adequate food supply. Juvenile and adult scallops are found on various substrates but appear to prefer firm gravel and cobble. All scallop stages feed on plankton and non-living organic material that originates from the death and breakdown of organic matter. These filter feeders strain out the food from seawater which passes through their gills (DFO 1999).

<u>Squid</u>

Short finned squid are found throughout the entire south coast of the province. Squid are a migratory species. Abundance and distribution vary greatly both seasonally and annually. They generally travel is schools, largely consisting of one sex, and spend most of day near the ocean floor. At night they relocate to shallower depths. The diet of the squid is varied and adults are considered voracious eaters, consuming a variety of crustaceans as juveniles and concentrating more toward fish and other squid as they mature (DFO 1989).

<u>Whelks</u>

The whelk is commonly referred to as a sea snail and is found in inshore waters around Newfoundland and Labrador. It is a cold-water species that inhabits a wide range of bottom types. The species can grow to maximum length of 15 cm, a shell height of 7 cm and a weight of 50-100 g. The whelk is known to migrate shoreward and spawn at any time between late summer and early autumn.

Sea Cucumber

The Sea Cucumber is a bottom dwelling organism found worldwide. The species has a tubeshaped elongated body with rows of tube feet used for locomotion. The species prefers rocky or sandy substrates with strong currents and depths from 30 to approximately 300 m (DFO 1989).

Green Sea Urchins

The Green Sea Urchin is commonly found along the coastal areas of Newfoundland. It has been known to appear and disappear unpredictably with changing environmental conditions, and can be found in the lower intertidal zone and the subtidal zone. It inhabits almost any type of substrate from sandy to cobble bottoms. In Newfoundland the Sea Urchin is most abundant in shallow water up to 30 m and can usually be found on rocky, gravel, or shelly bottoms. It is an

omnivorous feeder whose diet consists of seaweeds, sedentary invertebrates and dead animals of any kind (DFO 1999).

American Lobster

The American Lobster is a vitally important shellfish to the inshore fishery, and can be found along the entire coast of insular Newfoundland. Though its habitat is typically in shallow coast waters, the habitat requirements vary throughout its life cycle. Juveniles prefer inshore habitat consisting of gravel/cobble substrate with kelp cover. Mature Lobster prefers an environment containing large rocks and boulders with a fine substrate for burrowing, and the presence of kelp. Their diets consist mainly of benthic invertebrates such as crab, sea urchins, mussels and starfish, and scavenge food under certain conditions (DFO 1999).

Snow Crab

Snow Crab is found in all waters surrounding Newfoundland and southern Labrador. They are commonly found on muddy or sandy bottoms at depths ranging from two to 580 m. Snow Crab are dominant in areas frequented by brittlestars, which are their main food item, and most feeding activity is generally at night (DFO 1993). The crab's diet is varied and can include shellfish, worms, sea urchins and detritus. (Squires and Dawe 2003).

<u>Lumpfish</u>

Lumpfish are primarily bottom dwelling fish, but frequently are semipelagic, hiding under floating seaweed. The pelvic fins are modified to form an adhesive disc by which the fish attaches itself to the bottom or suitable object. Lumpfish prefer course, rocky, boulder/bedrock substrate for ease of attachment. It feeds primarily on euphausiid shrimp, pelagic amphipods, copepods, jellyfish, worms and some small fishes such as herring and sand lance (DFO 1999).

Sand Dollars

Sand Dollars can grow as wide as 7.5 cm. They are brownish-red to purple in colour, and paler underneath. These flat, round, star-patterned animals burrow themselves just under the surface of the mud using numerous small spines that cover the top of their external skeleton. Sand Dollars thrive in sandy areas. As the Sand Dollar burrows into the sand, tiny food particles get trapped between the spines. Food is channels to the mouth through "grooves" that radiate outwards from the mouth. Its diet consists mainly of plankton and small organic particles that have fallen to the sea bottom. Sand Dollars live in the coastal zones of all the Atlantic Canadian provinces in the appropriate habitat. They can be found from just below the low tide mark to depths of 200 m.

<u>Periwinkle</u>

Periwinkle is the common name applied to certain gastropod mollusks found on seashores around the world and is one species in a group of marine snails. The common species found in Newfoundland and Labrador is classified as *Littorina littorea*. Periwinkles are found in large numbers along rocky shores in the intertidal and low sub-tidal zones where they reach about 2.5 cms in length. Although it must spend part of its time underwater, it prefers to be partially exposed to air. In most periwinkle species, eggs are laid in a gelatinous mass within the tide zone. The egg mass disintegrates within a few hours into several thousand individual eggs which float away and soon hatch into tiny larvae. Although not commercially exploited in the province, periwinkle is widely distributed around the coast. Its diet consists of algae (DFA 2002).

Marine Fish Habitat

A qualitative and quantitative characterization of the marine habitat was conducted within the footprint of the proposed marine facilities associated with the construction and operation of the refinery project. The marine habitat characterization required the collection of baseline data for the following:

- substrate distribution;
- depth profiles;
- macrofauna distribution;
- macroflora distribution;
- sediment chemistry (see Section 3.5.10); and
- water chemistry (see Section 3.5.9).

For the purposes of marine habitat quantification, the survey area was divided into four distinct zones (Figure 3.76):

- Zone 1 Marine Terminal/Tug Berth;
- Zone 2 Marine Jetty;
- Zone 3 Marine Water Intake; and
- Zone 4 Marine Outfall.

Habitat characterization consisted of field observations and a quantitative review of videos captured along transects (Figure 3.77). Nine transects were conducted in a grid pattern within the proposed marine terminal/tug berth area (Zone 1). Transects were run perpendicular from the shoreline and spaced at 100 m increments encompassing the entire marine terminal/tug berth footprint. One transect was parallel to the shoreline and ran north to south along the outside margin of the marine terminal/tug berth footprint. Another transect ran north to south along the shoreline within the marine terminal/tug berth footprint.

Three video transects were conducted along the linear footprint of the proposed marine jetty (Zone 2), one transect conducted from the shoreline in a southerly direction along the linear footprint of the proposed marine water intake pipe (Zone 3), and one transect conducted from the shoreline in a southerly direction along the linear footprint of the proposed marine outfall pipe (Zone 4).









Zone 1 – Marine Terminal and Tug Berth

Substrate distribution within the entire zone consists of cobble and small boulder. The southern portion of Zone 1 transitions into a region of course gravels interspersed with occasional bedrock outcrops, followed by a region predominated by sand and fine gravel. The northern portion transitions from the nearshore cobble and small boulder to a region typified by sand and fine gravels.

Crustose algae is consistently encountered on hard substrates in densities ranging from <25 to 50 per cent. Sour weed was also ubiquitous on all substrates except fine sand, although the highest densities are usually observed on small boulder substrate. Edible kelp (*Alaria sp.*) is common on large substrates with the highest densities generally associated with the shoreline and intertidal areas. Low densities of sea colander are found in deeper water at distances greater than 100 m from the shoreline. Shoreline algal species are dominated by rockweed and knotted wrack, interspersed with lesser amounts of green filamentous, black whip weed, sea lettuce, coral weed, red tubed weed and dulse.

Moderate-to-low numbers of sea urchins and starfish inhabit both hard/coarse and soft/fine substrates from the shoreline to the outer limits of Zone 1. Slightly higher numbers of urchins are associated with areas consisting primarily of large boulder and bedrock. Blue mussels and horse mussels are found sporadically on large substrate and bedrock outcrops. Horse mussels are generally encountered in deeper water >10 m, although blue mussels also inhabit the tops of large boulders at these depths. Periwinkles are found primarily on large substrates within 50 m of the shoreline in water depths < 10 m, but also inhabit large shallow substrates at greater distances.

Species found more sporadically on large substrates (independent of depth) include frilled anemone in low-to-high numbers and low numbers of tube worms. Sand dollars and winter flounder inhabit areas with fine gravel and sand substrates. Deep-sea scallop and American plaice are present primarily on soft substrates at deeper depths.

<u>Zone 2 – Marine Jetty</u>

Substrates are uniform throughout the entire zone consisting primarily of sand with small amounts of gravel and isolated small boulders.

Crustose algae are located sporadically in association with intermittent cobble and boulder substrate. Sour weed and edible kelp inhabit the isolated hard substrates on the shoreward portion. Storm tossed sour weed, sea colander, kelp (*Laminaria sp.*), and rockweed may be found intermittently throughout the entire area.

Relatively low numbers of sea urchins, starfish and deep-sea scallop occupy areas of sand and gravel substrates throughout the entire zone. Species observed infrequently included American plaice, Atlantic cod, skate, frilled anemone and tube worms.

<u> Zone 3 – Marine Water Intake</u>

Nearshore substrates are predominantly cobble with lesser amounts of sand and gravel and isolated small boulders and bedrock. The northern half of Zone 3 consists primarily of gravel and sand, with lesser amounts of cobble and isolated boulder. The southern half transitions to compositions consisting of large bedrock outcrops interspersed with small boulders, and gulches dominated by cobble.

Crustose algae inhabit most hard substrates in Zone 3. Sour weed are fairly abundant on all substrates in the northern half of the zone. The predominant shoreline and intertidal species include edible kelp, kelp (*Laminaria sp.*), black whip weed, hollow green weed, smooth chord weed, coral weed, green filamentous, red tubed weed and rockweed. Sea colander is found just outside the zones boundaries. Intermittent species include red fern and banded weed.

Sea urchins and starfish are found throughout the entire zone. Horse mussels, blue mussels and frilled anemone are found infrequently on large boulder and bedrock substrates. Uncommon species in the zone include hermit crabs, eel pout, deep-sea scallop and polychaetes.

<u> Zone 4 – Marine Outfall</u>

Substrates in the nearshore area (shoreline -40 m) are predominantly small boulder with lesser amounts of cobble and gravel. Further south sediment composition changes to consist primarily of bedrock and large boulder interspersed with cobble and gravel. Sand and gravels with occasional cobble patches dominate the southern portion of the zone.

Crustose algae are found on hard substrates and sour weed on all substrates throughout the entire zone. Edible kelp is located in the shoreline/intertidal area and in a narrow band about 100 m from the shoreline. Less dominant shoreline/intertidal species include rockweed, knotted wrack, coral weed, red fern, sea lettuce, black whip weed and green filamentous.

Sea urchins, starfish and deep-sea scallops can be found throughout Zone 4. Sand dollars inhabit areas of fine substrate. Periwinkles are commonly found on large substrate within the shoreline/intertidal zone. Blue and horse mussels, frilled anemone, and barnacles are found sporadically on large substrates. Other species found in low numbers include hermit crabs, winter flounder, and skate.

Commercially Valuable Marine Species Within the Project Area

Although lobsters were not observed in significant numbers during surveys, the nearshore areas are known to contain lobster habitat. This is evidenced by the large numbers of lobster pots observed during the surveys and the long timeline of the traditional lobster fishery in the area. Due to the primarily nocturnal nature of lobster movements, it is common for them not to be observed during daylight video surveys.

Based on conversations with local fishers it has been ascertained that lumpfish, capelin and scallop are not present in commercial quantities within the boundaries of the proposed marine facilities. There is currently no commercial fishery being prosecuted for either of these species within the marine boundaries of the project.

3.7.3 Marine Associated Birds

Marine-associated birds for the purposes of this EIS are those species that spend time associated with the coastal and/or pelagic environment. The species known to occur in the Study Area, including their status as breeding, wintering or migrant, and their relative monthly abundance are provided in Table 3.27. Most species have either a coastal or pelagic distribution but some species, such as large gulls, spend time in both habitats. Seabirds largely depend on the marine environment for their life cycle, and include: 1) species that come to land only to nest, and spend the rest of their lives at sea, often beyond sight of land, 2) species like gulls and terns, which can occur inland but also utilize coastal habitats and spend considerable time at sea, 3) species of waterfowl, notably sea ducks, some dabbling ducks and diving ducks or Common Loons that occur inland during breeding but often winter on the marine coast, and 4) species of shorebirds that breed in interior Arctic and sub-Arctic biomes and occur in coastal habitats during the summer-fall migration, or winter in coastal areas. The following text, sub-divided by coastal and pelagic bird groups, provides background information on various species, including results of studies undertaken in support of the proposed Project.

Pelagic Birds

Pelagic birds or seabirds for the purposes of this EIS are considered birds that spend most of their lives at sea. Seabirds include: 1) species that come to land only to nest and spend the rest of their lives at sea, often beyond sight of land, and 2) species like gulls and terns, which can live inland but also live at coastal habitats and spend considerable time at sea.

| Table 3.27 | List of marine-associated species known to occur in the Study Area, including the areas where they occur and their |
|------------|--|
| | relative monthly abundance. |

| Species | Scientific Name | Status ¹ | Occur ² | Abundance ³ | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | ост | NOV | DEC |
|---------------------|---------------------------|---------------------|--------------------|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Canada Goose | Branta canadensis | В | С | Uncommon | | | | | | | | | | | | |
| Gadwall | Anas strepera | U | С | Rare | | | | | | | | | | | | |
| American Wigeon | Anas americana | U | С | Scarce | | | | | | | | | | | | |
| American Black Duck | Anas rubripes | BW | С | Common | | | | | | | | | | | | |
| Mallard | Anas platyrhynchos | BW | С | Scarce | | | | | | | | | | | | |
| Blue-winged Teal | Anas discors | М | С | Scarce | | | | | | | | | | | | |
| Northern Pintail | Anas acuta | В | С | Uncommon | | | | | | | | | | | | |
| Green-winged Teal | Anas crecca | В | С | Uncommon | | | | | | | | | | | | |
| Ring-necked Duck | Aythya collaris | В | С | Uncommon | | | | | | | | | | | | |
| Greater Scaup | Aythya marila | W | С | Uncommon | | | | | | | | | | | | |
| Lesser Scaup | Aythya affinis | М | С | Scarce | | | | | | | | | | | | |
| King Eider | Somateria spectabilis | М | C, P | Scarce | | | | | | | | | | | | |
| Common Eider | Somateria mollissima | W | C, P | Common | | | | | | | | | | | | |
| Harlequin Duck | Histrionicus histrionicus | W | С | Scarce | | | | | | | | | | | | |
| Surf Scoter | Melanitta perspicillata | W | C, P | Uncommon | | | | | | | | | | | | |
| White-winged Scoter | Melanitta fusca | W | C, P | Uncommon | | | | | | | | | | | | |
| Black Scoter | Melanitta nigra | W | C, P | Uncommon | | | | | | | | | | | | |
| Long-tailed Duck | Clangula hyemalis | W | C, P | Common | | | | | | | | | | | | |
| Bufflehead | Bucephala albeola | М | С | Scarce | | | | | | | | | | | | |
| Common Goldeneye | Bucephala clangula | BW | С | Uncommon | | | | | | | | | | | | |
| Barrow's Goldeneye | Bucephala islandica | W | С | Rare | | | | | | | | | | | | |
| Hooded Merganser | Lophodytes cucullatus | W | С | Rare | | | | | | | | | | | | |
| Common Merganser | Mergus merganser | В | С | Uncommon | | | | | | | | | | | | |

| Species | Scientific Name | Status ¹ | Occur ² | Abundance ³ | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | ОСТ | NOV | DEC |
|-----------------------------|-----------------------------|---------------------|--------------------|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Red-breasted Merganser | Mergus serrator | BW | C, P | Common | | | | | | | | | | | | |
| Red-throated Loon | Gavia stellata | М | С | Uncommon | | | | | | | | | | | | |
| Common Loon | Gavia immer | BW | С | Common | | | | | | | | | | | | |
| Horned Grebe | Podiceps auritus | М | С | Scarce | | | | | | | | | | | | |
| Red-necked Grebe | Podiceps grisegena | W | С | Uncommon | | | | | | | | | | | | |
| Northern Fulmar | Fulmarus glacialis | М | Р | Common | | | | | | | | | | | | |
| Greater Shearwater | Puffinus gravis | М | Р | Common | | | | | | | | | | | | |
| Sooty Shearwater | Puffinus griseus | М | Р | Common | | | | | | | | | | | | |
| Manx Shearwater | Puffinus puffinus | М | Р | Uncommon | | | | | | | | | | | | |
| Wilson's Storm-Petrel | Oceanites oceanicus | М | Р | Scarce | | | | | | | | | | | | |
| Leach's Storm-Petrel | Oceanodroma leucorhoa | В | Р | Common | | | | | | | | | | | | |
| Northern Gannet | Morus bassanus | В | Р | Common | | | | | | | | | | | | |
| Double-crested Cormorant | Phalacrocorax auritus | В | C, P | Common | | | | | | | | | | | | |
| Great Cormorant | Phalacrocorax carbo | В | C, P | Common | | | | | | | | | | | | |
| American Bittern | Botaurus lentiginosus | В | С | Uncommon | | | | | | | | | | | | |
| Great Blue Heron | Ardea herodias | М | С | Rare | | | | | | | | | | | | |
| Osprey | Pandion haliaetus | В | С | Common | | | | | | | | | | | | |
| Bald Eagle | Haliaeetus leucocephalus | BW | С | Common | | | | | | | | | | | | |
| Black-bellied Plover | Pluvialis squatarola | М | С | Common | | | | | | | | | | | | |
| American Golden-Plover | Pluvialis dominica | М | С | Common | | | | | | | | | | | | |
| Semipalmated Plover | Charadrius semipalmatus | М | С | Common | | | | | | | | | | | | |
| Spotted Sandpiper | Actitis macularius | BM | С | Common | | | | | | | | | | | | |
| Solitary Sandpiper | Tringa solitaria | М | С | Scarce | | | | | | | | | | | | |

| Species | Scientific Name | Status ¹ | Occur ² | Abundance ³ | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | ОСТ | NOV | DEC |
|------------------------|----------------------|---------------------|--------------------|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Greater Yellowlegs | Tringa melanoleuca | BM | С | Common | | | | | | | | | | | | |
| Lesser Yellowlegs | Tringa flavipes | М | С | Scarce | | | | | | | | | | | | |
| Whimbrel | Numenius phaeopus | М | С | Common | | | | | | | | | | | | |
| Hudsonian Godwit | Limosa haemastica | М | С | Scarce | | | | | | | | | | | | |
| Ruddy Turnstone | Arenaria interpres | М | С | Common | | | | | | | | | | | | |
| Red Knot | Calidris canutus | М | С | Scarce | | | | | | | | | | | | |
| Sanderling | Calidris alba | М | С | Uncommon | | | | | | | | | | | | |
| Semipalmated Sandpiper | Calidris pusilla | М | С | Common | | | | | | | | | | | | |
| Least Sandpiper | Calidris minutilla | М | С | Common | | | | | | | | | | | | |
| White-rumped Sandpiper | Calidris fuscicollis | М | С | Common | | | | | | | | | | | | |
| Baird's Sandpiper | Calidris bairdii | М | С | Rare | | | | | | | | | | | | |
| Pectoral Sandpiper | Calidris melanotos | М | С | Uncommon | | | | | | | | | | | | |
| Purple Sandpiper | Calidris maritima | М | С | Common | | | | | | | | | | | | |

Notes: Shaded areas represent the months when species may be expected

¹ B = Breeding, W = Wintering, M = Migratory, U = Uncertain

² C = Coastal, P = Pelagic

³ Common = likely present daily in moderate to high numbers; Uncommon = likely present daily in small numbers; Scarce = likely present regularly in very small numbers; Rare = usually absent, individuals occasionally present. Dark highlighted fields indicate presence of species in the area during that month.

Source: Brown (1986); Lock et al. (1994); B. Mactavish, LGL, pers. obs.

Placentia Bay is one of the richest bays in Newfoundland for seabirds. There are five Important Bird Areas (IBA) in and near the Study Area (Figure 3.78; Table 3.28): four seabird colonies (Cape St. Mary's, Middle Lawn Island, Corbin Island and Green Island) and a 1675 km² area on the east side of Placentia Pay (www.ibacanada.com). Cape St. Mary's supports the largest Northern Gannet colony in Newfoundland and nearly 20 per cent of the Atlantic Canada breeding population. Middle Lawn Island, Burin Peninsula, supports the only known sustainable breeding colony of Manx Shearwaters in North America. Large numbers of Greater and Sooty Shearwaters that breed in the Southern Hemisphere during the NW Atlantic winter spend part of the Newfoundland summer in Placentia Bay, feeding on capelin and other fish while moulting flight feathers. Concentrations of summering shearwaters in eastern Placentia serve as the basis for designating that area as an IBA. Large numbers of Common Murres (> 10,000 pairs) breed at Cape St. Mary's and feed in Placentia Bay during the summer months. In winter both Common Murres, from Newfoundland breeding colonies, and Thick-billed Murres, from Arctic breeding colonies, use Placentia Bay. In the winter, aggregations of sea ducks such as Common Eider, Black Scoter, Long-tailed Duck and the eastern Harlequin Duck are found in parts of Placentia Bay (see Section 3.7.3). There are over 365 islands in Placentia Bay, many of which support small colonies of Common and Arctic Terns, Herring, Great Black-backed and Ring-billed Gulls and Black Guillemots.

Information Sources

Published and unpublished information on seabirds in Placentia Bay includes:

- Seabirds census work at the major seabird breeding colonies including Cape St. Mary's, Corbin Island, Middle Lawn Island and Green Island;
- Aerial surveys by the Canadian Wildlife Service (CWS) in 2005 of tern and gull colonies of Placentia Bay; and
- Shipboard surveys under the PIROP (Programme Intégré de Recherches sur les Oiseaux Pélagiques) system devised by the CWS for Atlantic Canada, including the outer portion of Placentia Bay.

Some of this information is relatively old and incomplete, notably the pelagic bird data (PIROP). In an attempt to address data gaps and update information on distribution and abundance of seabirds at sea in Placentia Bay, three boat-based survey routes were designed and surveyed. Fifteen surveys were conducted by LGL Limited biologists in the period of August 2006 to April 2007. Survey protocols were based upon those outlined in Moulton and Mactavish (2004) and involved conducting 10-minute counts using the Tasker Method. These surveys are on-going and are expected to continue during the summer of 2007. The survey routes are shown in Figure 3.79. Preliminary analyses of the data acquired from these surveys have been included in this section of the EIS. A complete and final report of the survey results is in preparation (LGL in prep.).



Figure 3.78 Important Bird Areas in and near the Study Area

| Species | Cape St. Mary's | Middle Lawn Island | Corbin Island | Green Island |
|-------------------------|----------------------|-----------------------|----------------------|---------------------|
| Northern Fulmar | 12 ^a | - | - | - |
| Manx Shearwater | - | 100 ^b | - | - |
| Leach's Storm-Petrel | - | 26,313 ^b | 100,000 ^b | 72,000 ^b |
| Northern Gannet | 12,156 ^c | - | | - |
| Herring Gull | Present ^b | 20 ^b | 5,000 ^b | - |
| Great Black-backed Gull | Present ^b | 6 ^b | 25 ^b | - |
| Black-legged Kittiwake | 10,000 ^b | - | 50 ^b | - |
| Common Murre | 10,000 ^b | - | - | - |
| Thick-billed Murre | 1,000 ^b | - | - | - |
| Razorbill | 100 ^b | - | - | - |
| Black Guillemot | Present ^b | - | - | - |
| TOTALS | 33,256 | 26,413 | 105,075 | 72,000 |

 Table 3.28
 Seabird colonies designated as Important Bird Areas in and near the Study Area

Source: ^a Stenhouse and Montevecchi (1999), ^b Cairns et al. (1989), ^c Chardine (2000)

Northern Fulmar

The Northern Fulmar has a circumpolar distribution, breeding in the north Pacific, Arctic and the north Atlantic Ocean. The center of breeding abundance in the north Atlantic is the Canadian Arctic, Greenland, Iceland and northeast Europe and Scandinavia. It is a common year-round resident in eastern Newfoundland waters south of the pack ice. Only about 100 pairs breed in eastern Newfoundland (Lock et al. 1994; Stenhouse and Montevecchi 1999). Twelve pairs held nest sites at Cape St. Mary's in 1999 (Stenhouse and Montevecchi 1999). The summer populations off eastern Newfoundland are thought to be composed of sub-adults from northern breeding colonies. Banding records show that Northern Fulmars from breeding colonies in the Canadian Arctic, Greenland and the British Isles regularly occur in Newfoundland waters (Brown 1986; Lock et al. 1994). The Northern Fulmar is probably scarce to common in the outer reaches of Placentia Bay throughout the year. Winter storms are known to shift hundreds of individuals temporarily into Placentia Bay. Counts of 1619 and 330 Northern Fulmar were observed flying south past Cross Point, St. Brides, the morning after southeast gales during Christmas bird counts in December 1999 and 2006. annual respectively (http://www.audubon.org/bird/cbc/hr/). During the monthly pelagic bird survey program in Placentia Bay from August 2006 to April 2007, only four Northern Fulmars were observed, including three in September and one in December (LGL in prep.). All sightings occurred along the southern portions of survey routes A and B. A Northern Fulmar was also recorded by LGL biologists at Southern Harbour during coastal surveys following an intense southerly storm (Goudie et al. 2007).



Figure 3.79 Seabird survey routes in Placentia Bay, August 2006 to April 2007

Shearwaters

Greater Shearwaters nest in Tristan de Cunha in the South Atlantic from November to March. Most of the world population of 5-10 million shearwaters summer in the North Atlantic (Lock et al. 1994). The Grand Banks off Newfoundland are thought to be the main summering area for a significant portion of the population (Lock et al. 1994). During the monthly pelagic bird survey program in Placentia Bay from August 2006 to April 2007, the only Greater Shearwaters recorded were of single birds seen in August and October (LGL in prep.). The Sooty Shearwater also breeds in the Southern Hemisphere from November to March. A large percentage of the population migrates to the Northern Hemisphere and is present from May through October (Table 3.26). It is a common bird during the summer months off Atlantic Canada north to Labrador, but it usually outnumbered by the Greater Shearwater with which it often associates. During the monthly pelagic bird survey program in Placentia Bay from August 2006 to April 2007, only three Sooty Shearwaters were recorded and these birds were seen in August (LGL in prep.). Concentrations of 100,000 shearwaters, mostly Greater with some Sooty Shearwaters, have been observed on the east side of Placentia Bay in June. Such observations serve as the basis for the IBA in eastern Placentia Bay (www.ibacanada.com). Shearwaters undergo their feather moult (including their flight feathers) in June and July; during this period they spend considerable time in flocks resting on the water. The diet of Greater and Sooty Shearwaters includes small fish and crustaceans. Large numbers of shearwaters are attracted to the southern Avalon Peninsula during the early summer season from mid June to late July when capelin spawn. The numbers of Greater and Sooty Shearwaters using Placentia Bay during the summer is not accurately known but is probably in the hundreds of thousands.

The Manx Shearwater is the smallest regularly-occurring shearwater species in Newfoundland. Most of the world population of Manx Shearwater breeds on islands in northwest Europe (Iceland, Scotland, Ireland, England and France) and The Azores and Canary Islands. It winters in the southwest Atlantic off eastern South America (Lee and Haney 1996). It is an uncommon species in Atlantic Canada from May through October, with most of the birds thought to be sub-adults from European breeding colonies. The only known established breeding colony in the northwest Atlantic is at Middle Lawn Island, Burin Peninsula, Newfoundland, where breeding was first confirmed in 1977. The breeding population has been estimated as high as 100 pairs based on the number of burrows and adults present. However, it was later determined that most of the birds appeared to be prospecting nesting sites without actually laying eggs. In 1981, 13 burrows contained eggs with an estimated 360 birds attending the colony (Storey and Lien 1985). The low rate of breeding indicates the colony was in the early stages of development. In 2000, a thorough survey of nesting burrows revealed only two burrows with an egg; nine other burrows were deemed active (Robertson 2002). In 2001, an estimated 100 Manx Shearwaters were present at Middle Lawn Island (Robertson 2002). The consistent low rate of breeding relative to the number of birds in attendance from 1981 to 2001. the decline in numbers of eggs in burrows from 1981 to 2000, and fewer birds attending the colony indicates the breeding colony is struggling to maintain an existence. During the monthly pelagic bird survey program in Placentia Bay, a single Manx Shearwater was observed on transect B in August (LGL in prep.).

Storm-Petrels

Wilson's Storm-Petrel breeds on islands from December to March in the south Atlantic Ocean, including the Antarctic and sub-Antarctic. In the non-breeding season, the population that breeds in the south Atlantic migrates to the Northern Hemisphere. The southern limit of its range is Nova Scotia, and the northern limit is Newfoundland (Brown 1986; Godfrey 1986). This species is generally considered scarce in Newfoundland waters. Small numbers probably occur annually in the outer reaches of Placentia Bay. None were observed during the monthly pelagic bird survey program in Placentia Bay from August 2006 to April 2007 (LGL in prep.).

Leach's Storm-Petrel is a widespread and abundant species occurring in both the Atlantic and Pacific oceans. In the Atlantic, it breeds in northwest Europe (Iceland, Scotland and Norway) and in North America, from southeast Labrador to Massachusetts (Huntington et al. 1996). In the Pacific Ocean, it breeds mainly south of the equator. The center of breeding abundance in the North Atlantic is Newfoundland. There are several large colonies on the east coast of Newfoundland including the largest colony in the world at Baccalieu Island at the western mouth of Conception Bay (3.3 million pairs). Three significant breeding colonies of Leach's Storm-Petrels are located on the southern Burin Peninsula, namely: Middle Lawn Island with 26,313 pairs, Corbin Island with 100,000 pairs and Green Island with 72,000 pairs (Cairns et al. 1989). Leach's Storm-Petrels are common and widespread at sea. They probably occur regularly in moderate numbers in the outer parts of Placentia Bay from April through at least the end of October. Leach's Storm-Petrels visit nesting colonies under the cover of darkness to avoid predators, mainly gulls, and do not normally occur within sight of land during daylight hours, except during fog and onshore winds. During the monthly pelagic bird survey program in Placentia Bay from August 2006 to April 2007, a single Leach's Storm-Petrel was observed on transect at the southern end of survey route B on 20 October 2006 (LGL in prep.).

Northern Gannet

Northern Gannets breed in the north Atlantic in eastern Canada, Iceland, Faeroe Islands and British Isles. This species winters along the coast from New Jersey to Florida and from the British Isles to the Azores. Three of the five major Northern Gannet colonies in North America are located in Newfoundland at Cape St. Mary's, Baccalieu Island and Funk Island. In 1999, there were 12,156 pairs of adult Northern Gannets at Cape St. Mary's (Chardine 2000). This represents 51.3 per cent of the Newfoundland breeding population, 19.9 per cent of the Canadian breeding population (Chardine 2000), and 3.1 per cent of the world population.

Gannets feed by plunge diving from the air. Their food is mainly small to medium size fish and squid over shelf waters; they usually avoid deep water beyond the continental slope. Northern Gannets feeding extensively in Placentia Bay often follow spawning herring and capelin schools right to the head of the bay at Arnold's Cove and to the entrance to Long Harbour. They are common in Placentia Bay from late March to mid November with a few individuals remaining until early December (Table 3.26). During the monthly pelagic bird survey program in Placentia Bay, Northern Gannets were observed in low-to-moderate numbers in August, September and October, with a few late individuals observed on 4 December along survey route A (Table 3.29). Densities on survey routes A and B ranged from 0.18 to 1.50 individuals per km2 during August to October (Table 3.29). Returning spring migrants were observed along route A on 13 April with 0.14 individuals per km² (Table 3.29). The fewest numbers of Northern Gannets were recorded on survey route C in upper Placentia Bay with densities of 0.02 and 0.04 individuals per km2 on 4 August and 26 September, respectively.

Phalaropes

Many species of shorebird migrate through Newfoundland between Arctic breeding grounds and wintering areas south of the province. Of the shorebird group only phalaropes are considered pelagic because they spend most of the non-breeding season at sea. In the northwest Atlantic, only the Red-necked Phalarope and Red Phalarope regularly occur. Both these phalarope species have been recorded in the Study Area, but there are little data on their abundance. During fall migration, Red-necked Phalaropes generally migrate earlier than Red Phalaropes with peak fall migration occurring in August and September while the Red Phalarope migration extends into October with stragglers into November and even December. The only phalaropes observed during the monthly pelagic bird survey program in Placentia Bay were two Red Phalaropes sighted along survey route C on 26 September 2006 and two unidentified phalaropes sighted along survey route A on 18 October 2006 (LGL in prep.). On 4 December 2006, three Red Phalaropes were observed from boat by LGL biologists while in transit to Southern Head from Northern Harbour (Goudie et al. 2007).

<u>Gulls</u>

At least eleven species of gulls are likely to occur annually in Placentia Bay (Table 3.26). The Black-legged Kittiwake is the only truly pelagic gull species in Newfoundland. Approximately 10,000 pairs of Black-legged Kittiwakes nest at Cape St. Mary's, but these estimates are about two decades old (Cairns et al. 1989). This is about 12 per cent of the total documented breeding population in Newfoundland. An isolated breeding colony at Goose Island, two km southeast of Arnold's Cove, contained 788 nest in 2005 (G. Robertson, CWS, unpubl. data). On 21 April 2007 while conducting an aerial survey for Harleguin Ducks, a relatively large concentration of Black-legged Kittiwakes (estimated at 800 and presumed to be breeding) was observed by LGL biologists at on the Columbier Islands southwest of Lawn on the Burin Peninsula (Goudie and Jones 2007). Black-legged Kittiwakes from other Newfoundland and sub-Arctic breeding colonies winter at sea off Newfoundland, including Placentia Bay. A small percentage of the Newfoundland population of Great Black-backed Gulls and Herring Gulls winters at sea. Herring Gulls and Great Black-backed Gulls were the most numerous gulls recorded during the monthly pelagic bird survey program in Placentia Bay from August 2006 to April 2007; they were recorded on all 15 surveys (Table 3.29). The Herring Gull was slightly less numerous on the survey C route through Merasheen Island and Long Island than on survey routes A and B in more open waters of Placentia Bay (Table 3.29). Herring Gull numbers peaked in October for all three survey routes with averages of 1.02, 1.11 and 0.77 individuals per km² for routes A, B and C, respectively (Table 3.29). Numbers were generally lower in winter. Great Black-backed Gull densities were about one third that of Herring Gull densities with a similar trend in monthly abundance. The Black-legged Kittiwake was not observed on three of the 15 pelagic boat surveys from August 2006 to April 2007. It was generally less numerous than Herring and Great Black-backed Gull, but sometimes occurred in small flocks. In winter, some Glaucous Gulls and Iceland Gulls from breeding areas in the low Arctic also

winter at sea in Newfoundland and are expected in low densities in Placentia Bay; however, only the Iceland Gull was recorded during the 2006/2007 pelagic boat-based seabird surveys (Table 3.29). During aerial surveys focused on Harlequin Ducks in western Placentia Bay extending to the southern Burin Peninsula, LGL biologists recorded a few Glaucous Gulls on 27 February 2007 and especially 13 March 2007 whereas Iceland Gulls were relatively common along the southern Burin Peninsula on 13 March, 2007. Some Black-legged Kittiwakes were observed in pelagic areas while in transit to coastal areas in winter (Goudie and Jones 2007).

Ring-billed Gulls stay near shore but breed on islands in Placentia Bay. Large breeding colonies are known from Crawley Island in Long Harbour and Goose Island two km southeast of Arnold's Cove. The Crawley Island colony contained 992 active nests in 2005 whereas Goose Island contained 304 active nests in 2005 (G. Robertson, CWS, unpubl. data). Other colonies are known from the Burin Peninsula, including 518 pairs at Woody Island (47°13' N, 55°.02'W) and 800 pairs at Spanish Room Point (47°13'N, 55°.05'W) (Cairns et al. 1989). Ring-billed Gulls were common in this area and only observed on the 21 April 2007 survey (Goudie and Jones 2007). Ring-billed Gulls are present near shore in Placentia Bay from April through October (Table 3.26). The only Ring-billed Gulls recorded during the monthly boat-based pelagic bird survey program in Placentia Bay from August 2006 to April 2007 were singles observed on 4 August 2006 and 13 April 2007 (LGL in prep.).

Mew Gulls and Lesser Black-backed Gulls (along with Black-headed Gulls) are European species that regularly migrate in small numbers to Atlantic Canada in the non-breeding season.

| | | Survey | Route / | 4 | | Sur | vey Rou | ite B | | | | Survey | Route 0 |) | |
|-----------------------------|-----------|-----------|----------|-----------|----------|-----------|-----------|-----------|----------|----------|-----------|-----------|-----------|----------|-----------|
| Species | 22 Sep | 18 Oct | 4 Dec | 13 Apr | 3 Aug | 28 Sep | 20 Oct | 20 Dec | 1 Mar | 4 Aug | 26 Sep | 23 Oct | 19 Dec | 2 Mar | 29 Mar |
| American Black duck | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.02 | Х | 0 | 0 |
| King Eider | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.02 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Common Eider | 0 | Х | Х | Х | 0 | 0 | 0 | 0.02 | 4.58 | 0 | 0 | 0.04 | 1.64 | 0 | 0 |
| Long-tailed Duck | 0 | 0 | 0.04 | 0.04 | 0 | 0 | 0 | 1.44 | 0.63 | 0 | 0 | 0 | 0.33 | 2.13 | 0.04 |
| Red-breasted Merganser | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | х | 0 |
| Common Loon | Х | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Х | 0 | 0 |
| Red-necked Grebe | 0 | 0 | 0 | 0.02 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Х | 0 | 0 | 0 |
| Northern Fulmar | Х | 0 | 0.02 | 0 | 0 | Х | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Greater Shearwater | 0 | 0 | 0 | 0 | Х | 0 | Х | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sooty Shearwater | 0 | 0 | 0 | 0 | 0.04 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Manx Shearwater | 0 | 0 | 0 | 0 | 0.02 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Leach's Storm-Petrel | Х | 0 | 0 | 0 | 0 | 0 | 0.02 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Northern Gannet | Х | 0.46 | 0.08 | 0.14 | 0.18 | 1.50 | 0.38 | 0 | 0 | 0.02 | 0.04 | 0 | 0 | 0 | 0 |
| Double-crested Cormorant | х | 0 | 0 | 0 | 0.09 | х | 0 | 0 | 0 | 0 | х | 0 | 0 | 0 | 0 |
| Great Cormorant | 0 | Х | Х | 0.02 | 0 | 0 | 0.91 | 0.30 | Х | Х | 0 | 0.04 | 0.02 | 0.02 | Х |
| unidentified cormorant | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | х | х | 0 | х |
| Bald Eagle | 0 | Х | Х | Х | 0 | Х | 0 | 0 | Х | Х | Х | Х | 0.13 | 0.02 | Х |
| Sanderling | 0 | 0 | 0 | 0 | 0 | 0 | 0.04 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Purple Sandpiper | 0 | 0 | 0 | 0 | 0 | 0 | 0.02 | 0 | 0.32 | 0 | 0 | 0 | 0 | 0.06 | 0 |
| Red Phalarope | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.02 | 0 | 0 | 0 | 0 |
| unidentified phalarope | 0 | 0.02 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| Table 3.29 | Average density of marine-associated birds (pe | er km²) | ²) per 10-minute survey in Placentia Bay, August 2006 | 6 to April 2007 |
|-------------|--|---------|---|-----------------|
| 1 able 5.29 | Average density of marine-associated birds (pe | er km j |) per 10-minute survey in Placentia Bay, August 2006 | to April . |

| | | Survey | Route | 4 | | Surv | vey Rou | ite B | | | : | Survey | Route 0 | 2 | |
|----------------------------|-----------|-----------|----------|-----------|----------|-----------|-----------|-----------|----------|----------|-----------|-----------|-----------|----------|-----------|
| Species | 22 Sep | 18 Oct | 4 Dec | 13 Apr | 3 Aug | 28 Sep | 20 Oct | 20 Dec | 1 Mar | 4 Aug | 26 Sep | 23 Oct | 19 Dec | 2 Mar | 29 Mar |
| Ring-billed Gull | 0 | 0 | 0 | 0.02 | 0 | 0 | 0 | 0 | 0 | 0.05 | 0 | 0 | 0 | 0 | 0 |
| Herring Gull | Х | 1.02 | 0.39 | 0.26 | 0.83 | 1.07 | 1.11 | 0.08 | 0.04 | 0.18 | 0.43 | 0.77 | 0.61 | Х | 0.26 |
| Iceland Gull | 0 | 0 | 0.04 | 0 | 0 | 0 | 0 | 0.06 | 0.02 | 0 | 0 | 0 | 0.20 | 0 | 0 |
| Great Black-backed Gull | х | 0.16 | 0.10 | 0.02 | 0.11 | 0.10 | 0.24 | х | 0.12 | 0.02 | х | 0.15 | 0.11 | 0.02 | х |
| Black-legged Kittiwake | 0 | 0.02 | 0.15 | 0.02 | 0.9 | 0 | 0.06 | 0.02 | 0.55 | 0.08 | 0 | 0.46 | х | 0.32 | 0.17 |
| Common Tern | 0 | 0 | 0 | 0 | 0.14 | 0 | 0 | 0 | 0 | 0.10 | 0 | 0 | 0 | 0 | 0 |
| Arctic Tern | 0 | 0 | 0 | 0 | 0.16 | 0 | 0 | 0 | 0 | 0.02 | 0 | 0 | 0 | 0 | 0 |
| Pomarine Jaeger | 0 | 0 | 0 | 0 | Х | 0 | 0 | 0 | 0 | 0 | Х | 0.04 | 0 | 0 | 0 |
| Parasitic Jaeger | 0 | 0 | 0 | 0 | Х | 0 | 0 | 0 | 0 | 0 | 0 | 0.02 | 0 | 0 | 0 |
| Dovekie | 0 | 0.16 | 0.54 | 0 | 0 | 0 | 0.04 | 0.41 | 0.12 | 0 | 0 | 0 | Х | 0.02 | 0.02 |
| Common Murre | 0 | Х | 0 | 0.38 | 0.07 | 0 | 0 | 0.06 | 0.14 | 0.02 | 0 | 0 | 0 | 0.11 | 0.11 |
| Thick-billed Murre | 0 | 0 | 0.48 | 0.57 | Х | 0 | 0 | 0.22 | 0.99 | 0 | 0 | 0 | 0.04 | 0.30 | 0.38 |
| Unidentified Murre | 0 | 0.02 | 0 | 0.10 | 0 | 0 | Х | Х | 0.04 | 0 | 0.02 | 0 | 0 | 0 | 0.15 |
| Razorbill | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Х | 0 | 0 | Х | 0 | 0 | 0 |
| Black Guillemot | 0 | 0.12 | 0 | 0.18 | Х | 0 | 0 | Х | 0.04 | 0.13 | 0.02 | 0 | Х | 0.09 | 0.02 |
| Atlantic Puffin | 0 | 0 | 0.12 | 0 | 0.25 | 0.02 | 0.12 | 0.47 | 0.10 | Х | 0 | 0 | 0.02 | 0 | 0 |
| All Species Combined | х | 1.95 | 1.97 | 1.78 | 2.84 | 2.71 | 2.96 | 3.1 | 7.7 | 0.6 | 0.53 | 1.54 | 3.1 | 3.15 | 1.15 |

Notes: X = recorded off transect only.

<u>Terns</u>

Common and Arctic Terns are the species of tern occurring regularly in Placentia Bay. Common Terns breed throughout Atlantic Canada north to mid Labrador. It breeds inland as well as in coastal areas and it winters in the southern United States and southward. The Arctic Tern is more of a coastal species that breeds north to the high Arctic. The Arctic Tern winters at sea south to the Antarctic. Both species are present in Newfoundland waters from late May to early September. They often nest in mixed colonies. Aerial surveys of colonial nesting birds in Placentia Bay by CWS in 2005 located 22 tern colonies ranging in size from 10 to 350 individuals, with six colonies consisting of >100 individuals (P. Thomas, CWS, unpubl. data). A few individual Arctic Terns and Common Terns were recorded in August during the monthly pelagic bird survey program in Placentia Bay (Table 3.29). A pair of Common Terns were observed on a nest with three eggs in late June 2007 on a lake in the upper watershed of Watson's Brook (Goudie et al. 2007). A Caspian Tern was observed at Arnold's Cove and Southern Harbour and this uncommon species, formerly listed as Special Concern but recently re-assessed as Not at Risk by COSEWIC, occurs in the Study Area.

<u>Skuas</u>

The Great Skua and South Polar Skua are very uncommon seabirds in eastern Canadian waters. The Great Skua breeds in the northeast Atlantic Ocean in the Faeroes and Iceland, and winters farther south, but remains north of the equator. In Atlantic Canada, it is a summer visitor, and spring and fall migrant. The South Polar Skua breeds in the Southern Hemisphere on Antarctic islands from December to March. Part of the population migrates to the north Atlantic during May to October. Both species of skua have been recorded in Placentia Bay in the summer. They are likely regular visitors in small numbers in the outer reaches of Placentia Bay from May through October (Table 3.29).

Jaegers

The Pomarine Jaeger, Parasitic Jaeger and Long-tailed Jaeger have a circumpolar distribution, breeding in the low Arctic and Arctic. They winter at sea in the mid-to-southern Atlantic Ocean. Adults of the three species of jaeger migrate through Newfoundland waters during spring and fall. Sub-adult birds spend the summer south of the breeding range including Newfoundland pelagic waters. Jaegers are kleptoparasites meaning that they are predatory in feeding actions by forcing, through persistent pursuit, other seabirds to release their food or disgorge the contents of their stomach. As with most seabird predators, their numbers are relatively low compared to the seabirds that are their targets (e.g., Black-legged Kittiwakes and terns). In the Study Area, jaegers are expected to be scarce to uncommon in the middle and outer portions of the bay between May and October (Table 3.29). During the monthly pelagic bird survey program in Placentia Bay, only three Parasitic and five Pomarine Jaegers were observed in August, September and October. These species were also recorded by LGL biologists during

coastal surveys on 25 October 2007 at Southern Harbour, Placentia Bay following a strong coastal storm (Goudie et al. 2007).

<u>Dovekie</u>

The Dovekie breeds in the North Atlantic mainly in Greenland and east Novaya Zemlya, Jan Mayen and Franz Josef Land in northern Russia; it winters at sea south to 35°N. The Dovekie is a very abundant bird with a world population estimated at 30 million individuals (Brown 1986). A large percentage of the Dovekies that breed in Greenland winter in the western Atlantic, mainly off Newfoundland (Brown 1986). Dovekies can be common in the Study Area from October through April (Table 3.29). Dovekies were recorded in low numbers in October, December and March during the monthly pelagic bird survey program in Placentia Bay from August 2006 to April 2007 (Table 3.29). Peak numbers occurred in December with average densities of 0.54 individuals per km2 along survey route A and 0.41 individuals per km² along survey route B (Table 3.29).

Common Murre

The Common Murre breeds in the North Pacific and North Atlantic. In the Atlantic, it breeds in northern Europe including Iceland and Greenland and in the western Atlantic from Labrador to Nova Scotia. It is an abundant breeder in eastern Newfoundland with nearly half a million pairs, with 80 per cent of those on Funk Island. Cape St. Mary's holds 10,000 pairs of breeding Common Murres or about 2 per cent of the Newfoundland breeding populations (Cairns et al. 1989). Common Murres include capelin as part of their diet and will follow spawning schools far into Placentia Bay during the summer but typically feed offshore. In the spring and summer (March to July), the Common Murre can be common in Placentia Bay depending in part on food availability. In fall and winter, it is expected to be scarce in Placentia Bay. The Common Murre was recorded in low numbers during the monthly pelagic bird survey program in Placentia Bay from August 2006 to April 2007 (Table 3.29). Peak numbers were recorded in late winter (March) and early spring (April) and these birds were possibly spring migrants returning to the Cape St. Mary's breeding colony. Common Murres were not observed during August and September surveys (Table 3.29). On 15 May 2007, flocks of up to 25 Common Murres were observed from boat while LGL biologists were in transit from Bordeaux Island (near Arnolds Cove) to North Harbour (Goudie et al. 2007).

Thick-billed Murre

The Thick-billed Murre breeds in the sub-Arctic to Arctic in North America and Eurasia. In Atlantic Canada it breeds as far south as Newfoundland. It winters in open water within its breeding range and in the western Atlantic south to New Jersey. The Thick-billed Murre is the "winter murre" in eastern Newfoundland. Many of the more than two million Arctic Canada and Greenland breeders winter in Newfoundland and Labrador waters. The Grand Banks has been identified as an important wintering area for Thick-billed Murres (Brown 1986; Lock et al. 1994).

Relatively small numbers (~2000) breed in eastern Newfoundland, and about half of these breed at Cape St. Mary's (Cairns et al. 1989). The Thick-billed Murre is the main species taken during the traditional winter murre hunt in Newfoundland. The Thick-billed Murre is expected to be scarce to common in Placentia Bay throughout the year, but most numerous in winter. During the monthly pelagic bird survey program in Placentia Bay from August 2006 to April 2007 it was found in low numbers in October, December, March and April; densities were greatest on survey routes A and B (Table 3.29). Average densities on route A were 0.48 and 0.57 individuals per km² on 4 December 2006 and 13 April 2007, respectively; and 0.22 and 0.99 individuals per km2 on 20 December 2006 and 13 April 2007 on route B, respectively (Table 3.29). Densities of Thick-billed Murres were highest during the March and April 2007 surveys for all three survey routes (Table 3.29).

<u>Razorbill</u>

The Razorbill breeds in the North Atlantic Ocean from Maine, eastern Canada, Greenland and Iceland to Great Britain. It winters south to North Carolina and France. Razorbills are relatively scarce compared to Common and Thick-billed murres. Most of the 20,000 pairs breeding in Atlantic Canada are in southeast Labrador (Brown 1986). About 710 pairs breed in eastern Newfoundland adjacent to the Study Area. About 100 pairs breed at Cape St. Mary's (Cairns et al. 1989). The Razorbill is expected to be scarce in Placentia Bay throughout the year, but least numerous in winter. During the monthly pelagic bird survey program in Placentia Bay from August 2006 to April 2007, the Razorbill was observed only once during October and March (Table 3.29).

Black Guillemot

The Black Guillemot is ubiquitous along open coastlines of Newfoundland. Newfoundland breeders are augmented by migrants from the Arctic in fall and winter. Guillemots usually feed within two km of shore. Breeding numbers are difficult to determine because their breeding sites in crevices and under rocks are difficult to detect. Black Guillemot is expected to be fairly common year-round near shore around the entire coastline of Placentia Bay, including the islands. This species was observed along all three pelagic bird survey routes but was most numerous at the head of Placentia Bay, particularly in August and March (Table 3.29).

Atlantic Puffin

Atlantic Puffins breed in the north Atlantic in Maine, Nova Scotia, Newfoundland and Labrador, Greenland, Iceland and northwest Europe. Atlantic Puffins are abundant in the North Atlantic with about 12 million pairs (Brown 1986). About 320,000 pairs nest in Atlantic Canada, most of which nest in southeast Newfoundland (Brown 1986). In North America, they are thought to winter from southern Newfoundland to southern Nova Scotia. Grand Colombier in St. Pierre et Miquelon with 400 breeding pairs of puffins is the only breeding colony near Placentia Bay. Atlantic Puffins occur in Placentia Bay during migration and in small numbers in summer and

winter. During the monthly pelagic bird survey program in Placentia Bay from August 2006 to April 2007, Atlantic Puffins were observed in low numbers in all months surveyed, supporting that the species over-winters in Placentia Bay. Atlantic Puffins were more regularly observed on route B than route A or C (Table 3.29). Overall, the peak Atlantic Puffin numbers for each of the three routes occurred in December (Table 3.29).

Coastal Birds

Coastal birds for the purposes of this EIS include waterfowl, loons, grebes, cormorants, shorebirds, and birds of prey that feed in nearshore waters or in the intertidal zone. Also included in this group is the Black-headed Gull that is considered a coastal vs. pelagic species.

Sources of Information

Despite the biological richness of Placentia Bay, there is a paucity of systematically collected data on coastal bird distribution and abundance. There have been some ongoing surveys in the area of Long Harbour and eastern Placentia Bay related to the proposed nickel processing plant for Long Harbour (Goudie and Mactavish, in prep.; Jones and Goudie, in prep.). Some of that work repeats the study initiated by Memorial University (MUN) and the CWS in the mid 1970's and early 1980's (see Goudie 1981; Threlfall and Goudie 1986). The Proponent has supported shore-based surveys of coastal areas in and near the Project Area in an attempt to address data gaps about coastal bird distribution and abundance. More specifically, weekly or bi-weekly observations were conducted from August 2006 to April 2007 at sites located in Southern Harbour (four sites), Arnold's Cove (three sites), Come By Chance Bay (three sites), and North Harbour (four sites). Each site was visited for 20-30 minutes and all birds and other wildlife were recorded. The results of surveys conducted to date are presented in Goudie et al. (2007) and are summarized below. In addition, observations on breeding waterfowl were collected in September 2006 and June 2007 in the Project Area (see Section 3.6.5).

Waterfowl

The **Canada Goose** breeds on open bogs and wetlands in much of Newfoundland (Goudie 1987). In migration they often stage in shallow tidal areas and estuaries. Small concentrations of geese occur during migration in coastal areas of Placentia Bay. In spring, up to 400 Canada Geese staged at Come By Chance lagoon during migration in late March and early April 2007 (Goudie et al. 2007). There are no other known areas where large (e.g., >100 individuals) numbers of Canada Geese concentrate in the Study Area.

The **American Black Duck** is the most common dabbling duck in Newfoundland. The species is a freshwater species but also regularly feeds in the intertidal zone and estuaries (Goudie 1987). During the non-breeding season, small numbers of Black Ducks are widespread in Placentia Bay where there are sheltered or even semi-sheltered coves. Concentrations of more than 50 are known to occur on Harbour Island at the entrance to Long Harbour during fall

migration (A. Murphy, pers. comm.). The largest concentration of Black Ducks occurs at the bar lagoons in Arnold's Cove and Come By Chance. Since protection from hunting was enforced in these areas in the late 1980s, Black Duck concentrations have peaked at 300+ individuals in fall and winter. During shore-based surveys, Black Ducks staged and wintered (100 to 200 individuals) in and around the bar lagoons in Arnold's Cove and Come By Chance (Goudie et al. 2007). These observations support that the northern portion of the Study Area provides important habitat for large winter aggregations of Black Ducks in Newfoundland.

Dabbling ducks (those that tip into the water to feed as opposed to those that dive) that occur in Placentia Bay are similar to the species found throughout Newfoundland. Small numbers of **Mallard**, **Northern Pintail** and **Green-winged Teal** (and perhaps **Blue-winged Teal**) are found in tidal flats around Placentia Bay. Mallards and Green-winged Teals were observed in low numbers at Arnold's Cove and Come By Chance Bay during shore-based surveys conducted from August 2006-April 2007, whereas **Gadwall** and **American Wigeon** were observed incidentally during shore-based surveys of inner Placentia Bay. The latter species are considered rare and scarce, respectively, in the Study Area (Table 3.26; Goudie et al. 2007).

Diving ducks include the **Ring-necked Duck** that is a common species breeding in Newfoundland with a preference for fresh water. It exploits relatively acidic wetlands and has been extending its range northeastward over the past few decades (Goudie 1987). Small numbers breed on ponds and peatlands near the coast in Placentia Bay and rarely in shallow protected coves during spring and fall migration. Two broods of Ring-necked Ducks were recorded by LGL biologists on small ponds in the footprint of the proposed oil refinery during an aerial survey of Southern Head on September 6, 2007. **Greater Scaup** is an uncommon duck species breeding in Newfoundland, but occurs more commonly as a migrant and wintering bird (Goudie 1987). Greater Scaup regularly use both salt water and freshwater habitats. Traditional wintering flocks in Newfoundland tend to be localized, and small numbers of Greater Scaup are expected to be encountered during migration and winter in Placentia Bay. At present, no large wintering flocks are known to occur in Placentia Bay, but the potential for these flocks is fairly high. Ten to fourteen individuals were recorded by LGL biologists in February and March 2007 at Arnolds Cove (Goudie et al. 2007). **Lesser Scaup** are considered scarce in the Study Area.

The **Common Eider** is the most abundant species of sea duck wintering in Placentia Bay. There are two subspecies of Common Eider occurring in Atlantic Canada. The northern subspecies *Somateria mollissima borealis* breeds in the eastern Arctic south to the mid-Labrador coast, and winters south to Newfoundland and the Gulf of St. Lawrence. The southern subspecies *S. m. dresseri* breeds from the mid-Labrador coast south to Massachusetts wintering in Newfoundland, Gulf of St. Lawrence south to Massachusetts (Goudie et al. 2000). The Common Eider occurring in Placentia Bay is mostly of the northern subspecies and mainly as a wintering species from September to May (Table 3.26) with peak numbers in November to April. Large numbers winter at Cape St. Mary's. A winter study of sea ducks at Cape St. Mary's in 1978-79 showed a peak mean of 4593 during the 4-24 January period (Goudie 1981).

Christmas Bird Count totals for the period 1997-2006 ranged from 1999 to 3198 with an average of 2613 Common Eiders (http://www.audubon.org/bird/cbc/hr/).

On occasion, ten thousand have been observed at Cape St. Mary's in early spring (Goudie 1981), and in years of heavy Arctic pack ice some low tens of thousands may aggregate in St. Mary's Bay and Placentia Bay before the northward migration to the breeding range (Goudie et al. 2000). One to two thousand Common Eiders winter in Placentia Bay 1 km offshore at the Virgin Rocks and along the 10 km stretch of east coast of Placentia Bay from Great Barasway to Overall, the population of Common Eiders wintering in coastal Gooseberry Cove. Newfoundland has diminished from historical numbers (Goudie et al. 2000). During the 2006/2007 pelagic seabird surveys scattered groups of Common Eiders were observed over offshore shoals south of Red Island in December 2006 and March 2007 (Goudie et al. 2007; LGL in prep.). Several thousand (3,990 on 20 April 2007) eiders were observed during aerial surveys in "The "Breadbox", adjacent to Morgan's Island (St. Lawrence to Point May area) during the winter of 2007. The only King Eider identified during recent boat-based surveys was an adult male that was sighted south of Red Island on 20 December 2006. This species is considered scarce in the Study Area (Table 3.29).

All **White-winged Scoter**, **Surf Scoter** and **Black Scoter** migrate through Placentia Bay and winter there in small numbers. Cape St. Mary's supports the largest known wintering flock of Black Scoters in Placentia Bay and Newfoundland. This is the most northerly distribution documented for this species in winter in eastern North America (Bordage and Savard 1995). Based on Christmas Bird Counts at Cape St. Mary's in 1997-2006, the number of Black Scoters ranged from 25 to 112 individuals with an average of 61, whereas in earlier decades more than 500 regularly wintered there (http://www.audubon.org/bird/cbc/hr/). This is the only species of scoter confirmed to breed on insular Newfoundland (Goudie 1987). Populations of Black Scoters are thought to be in long-term decline (Bordage and Savard 1995) and are the focus of international conservation concern (Goudie et al. 1994).

The Long-tailed Duck is a ubiquitous sea duck over-wintering in ice-free coastal waters of Newfoundland. The Cape St. Mary's Christmas Bird Count totals in the ten-year period from 1997-2006 ranged from 116 to 365 individuals with an average of 227 (http://www.audubon.org/bird/cbc/hr/). The Long-tailed Duck over-winters throughout coastal Placentia Bay, typically in flocks of 5-to-50 or more birds. During the 2006/2007 pelagic seabird surveys, Long-tailed Ducks were encountered almost exclusively near shore or over shoals; scattered groups were observed over offshore shoals south of Red Island in December 2006 and March 2007 (LGL in prep.).

Cape St. Mary's supports the largest and most northerly over-wintering distribution of the eastern **Harlequin Duck**, currently listed as species of concern (see Section 3.7.5). A designated aerial survey for this species detected a small wintering group in the area of Lawn

on the Burin Peninsula and incidental numbers along the Cape Shore of Placentia Bay (Goudie and Jones 2007).

The **Common Goldeneye** is a widespread locally-common resident duck in Newfoundland. It nests in tree cavities along lakes and rivers (Goudie 1987). In Newfoundland, it winters mainly in tidal estuaries and shallow bays. Common Goldeneyes are known to winter in the brackish water at Swift Current and likely regularly winter where other larger rivers empty into the ocean. **Barrow's Goldeneye** is listed as *Special Concern* under the *SARA*; this species is described in Section 3.6.7. The **Bufflehead** is a scarce migrant and wintering bird in Newfoundland. It often associates with the Common Goldeneye in the non-breeding season. It probably occurs in very small numbers with wintering Common Goldeneye in Placentia Bay.

The **Common Merganser** is a year-round resident in Newfoundland. It nests in tree cavities along lakes and rivers, and over-winters where fast-moving fresh water does not freeze, and in brackish water estuaries where larger rivers enter the ocean (Goudie 1987). Common Merganser is probably regular in small numbers in Placentia Bay and it likely breeds in the Study Area. The **Red-breasted Merganser** breeds on large lakes, rivers, tidal estuaries and coastal islands in Newfoundland. It winters on saltwater close to shore usually in broad shallow coves and tidal estuaries including the outer coastal headlands. Based on Christmas Bird Counts at Cape St. Mary's in 1997-2006, the number of Red-breasted Mergansers ranged from 27 to 67 individuals with an average of 49 (http://www.audubon.org/bird/cbc/hr/). The Redbreasted Merganser is fairly common during the winter in suitable habitat in Placentia Bay. It was observed at all four coastal sites surveyed in winter and spring with highest average counts observed at North Harbour followed by Arnold's Cove, Come By Chance and Southern Harbour. Forty-five Red-breasted Mergansers were recorded at North Harbour during winter (Goudie et al. 2007). The Hooded Merganser is considered a rare visitor in the Study Area (during October to December; Table 3.29); it was observed incidentally during shore-based surveys in inner Placentia Bay (Goudie et al. 2007).

<u>Loons</u>

The **Common Loon** is the regular occurring species of loon in Newfoundland waters. The Common Loon is a widespread breeder in Newfoundland and is regularly occurs in ice-free coastal waters throughout the year. Sub-adults remain in saltwater throughout the year. Adult Common Loons breeding on insular Newfoundland and north of Newfoundland occur in coastal areas of Newfoundland during spring, fall migration, and winter. In summer, Common Loons that breed on lakes within commuting distance of the coast may use coastal areas for feeding. During Christmas bird counts conducted at Cape St. Mary's during 1996-2005, Common Loons were recorded each year with an average of 16.3 loons per year and a maximum of 42 in 2002. The Common Loon is expected to be relatively common in coastal Placentia Bay throughout the year. During the 2006/2007 pelagic seabird surveys, there was one incidental sighting of a Common Loon; no Red-throated Loons were observed (LGL in prep.). Common Loons were
recorded in small numbers at shore-based sampling locations during August 2006-April 2007 surveys; however, they were more common at Arnold's Cove and Come By Chance vs. North Harbour and Southern Habour (Goudie et al. 2007). A maximum of four Common Loons were observed at Come By Chance during summer surveys. Common Loons were also observed incidentally during aerial surveys in February, March and April 2007 in the Study Area (Goudie et al. 2007).

The **Red-throated Loon** is an uncommon spring and fall migrant and is considered a scarce wintering bird in coastal waters of Newfoundland. It was historically reported to breed on insular Newfoundland (Montevecchi and Tuck 1987). Small numbers can be expected in Placentia Bay mainly during fall migration (September to November). Small numbers over-winter locally on the south coast of Newfoundland. During Christmas bird counts conducted at Cape St. Mary's during 1996-2005, Red-throated Loons were recorded during four years, with a maximum count of three loons recorded in 1997. During the 2006/2007 pelagic seabird surveys and other surveys conducted in support of the EIS, Red-throated Loons were not identified (Goudie et al. 2007).

<u>Grebes</u>

Grebes are less abundant than loons in Newfoundland. In Canada, the **Horned Grebe** and **Red-necked Grebe** breed in a variety of wetland habitats from British Columbia east to Ontario. Both species winter largely on saltwater. The Horned Grebe is rare in Newfoundland with at least one record from Placentia Bay at Cape St. Mary's recorded in December 1998. The Red-necked Grebe occurs in Newfoundland in small numbers during the non-breeding season (October to April) in ice-free coastal bays and inlets (Table 3.29). During Christmas Bird Counts conducted at Cape St. Mary's during 1996 to 2005, the Red-necked Grebe count ranged from 1 to 11 individuals per year, with an average of 2.3 individuals. There were two sightings (of single) Red-necked Grebes during the pelagic seabird surveys; one near Merasheen Island recorded on October 23, 2006 and the other offshore recorded on April 13, 2007 (Goudie et al. 2007).

Cormorants

The **Great Cormorant** is a year-round resident in the Study Area (Table 3.29). The Great Cormorant breeds in Newfoundland, including Placentia Bay, but its population is poorly known. The number of Great Cormorant breeding pairs in Newfoundland, based on surveys prior to 1989, was 160 pairs (Cairns et al. 1989). Only 19 pairs were known to nest in Placentia Bay; these pairs nested in the Cape St. Mary's Ecological Reserve. However, it is thought that breeding numbers of Great Cormorants have increased on the eastern side of Placentia Bay. Great Cormorants winter in Placentia Bay, and were observed during coastal surveys and aerial surveys. Some were observed at Southern Head (Goudie et al. 2007).

The **Double-crested Cormorant** is present in the Study Area from late April to October. At least 261 pairs of Double-crested Cormorants breed in Newfoundland based on an incomplete tally of breeding colonies (Cairns et al. 1989). A colony north of Great Barasway, on the Cape Shore of Placentia Bay contained 29 pairs of Double-crested Cormorants in 1988 (Cairns et al. 1989). Populations have probably increased in eastern Newfoundland in recent years. An aerial survey for colonial nesting birds (mainly terns and gulls) conducted in Placentia Bay on June 25 and 27, 2005 by CWS located seven Double-crested Cormorant colonies; five colonies ranged in size from 11 to 100 individuals, and two colonies ranged in size from 101 to 500 individuals (P. Thomas, CWS, unpubl. data).

Cormorants were recorded on all fifteen surveys during the 2006/2007 pelagic seabird study (LGL in prep.). Most were observed off transect and near shore at the beginnings of the survey routes or on small rocky islets around Merasheen Island and Long Island. A significant roost of Great Cormorants was present on King Island in the Iona Island group, i.e., 50 on 23 October 2006 and 97 on 2 March 2007. Great Cormorants were not identified during August and September surveys but were present during surveys from October to April; the highest density (0.91 birds/km²) was observed in October along survey route B (Goudie et al. 2007). Double-crested Cormorants were less numerous than Great Cormorants and were observed during August and September pelagic surveys and only in small groups on isolated rocks around Long Island (Goudie et al. 2007).

American Bittern and Great Blue Heron

The **American Bittern** and the **Great Blue Heron** are considered uncommon and rare in the Study Area, respectively (Table 3.26). The bittern is a cryptic wading bird that breeds on wetlands in interior Newfoundland (Montevecchi 1990), and would be expected to occur on some of the enriched interior wetlands of the Study Area. On April 21, 2007 a Great Blue Heron was observed in the area of the Iona Islands near Long Harbour, Placentia Bay while LGL biologists were in transit to conduct aerial surveys for Harlequin Ducks (Goudie and Jones 2007). This species has not been confirmed to breed in Newfoundland.

Birds of Prey

Bald Eagles are year round residents in Placentia Bay. One of the densest breeding concentrations of the Bald Eagle in eastern North America occurs in Placentia Bay (Dominguez 1998). The Wildlife Division of the NL Department of Environment and Conservation has conducted Bald Eagle surveys in Placentia Bay most years since 1983. Since the early 1990s, permanent survey plots were established in the area of high-density nesting Bald Eagles on Long Island, Merasheen Island, Ragged Island and a section of coastline along the adjacent western Placentia Bay. A population estimate for Placentia Bay of 125 individuals, including immatures, and 30 nests was provided by the provincial Wildlife Division (J. Brazil, Department of Environment and Conservation, pers. comm.). LGL biologists detected up to twenty Bald

Eagles on 4 December 2006 during coastal surveys suggesting that a large proportion of the Placentia Bay population over-winters in this area. Adult Bald Eagles were observed at all four shore-based survey sites and immature Bald Eagles were sighted at all sites except North Harbour (Goudie et al. 2007). Bald Eagles were also observed regularly during other field studies for the proposed oil refinery including the documentation of five active nests between Bordeaux Island and Garden Cove during boat-based surveys for otters in May 2007. A nest site is located on the east side of the headland near Goat Point and reproduction was successful there in 2007 (Goudie et al. 2007). Bald Eagles forage extensively by scavenging thereby increasing potential contact with contaminated wildlife prey, notably oiled seabirds (Dominguez et al. 2002; Wiese and Ryan 2003).

Osprey are less numerous than the Bald Eagle in Placentia Bay but breed locally, and occur regularly from late April to September. Concentrations of up to four Osprey were recorded by LGL biologists at Come By Chance lagoon in August 2006, and low numbers were recorded at Arnold's Cove and North Harbour during shore-based surveys (Goudie et al. 2007)

Incidental observations of raptors included **Goshawk**, **Sharp-shinned Hawk**, **Northern Harrier** and **Merlin** (Goudie et al. 2007). These species are more typical of interior habitats. A Northern Harrier was observed in an open heath and peatland area of the proposed refinery footprint.

Shorebirds

Many species of shorebird occur in Newfoundland including Placentia Bay. Most of these are Arctic or sub-Arctic breeders that migrate through Placentia Bay in the late summer and fall. Spring migration routes typically occur west of Newfoundland. Shallow tidal flats, estuaries and kelp build-up on beaches offer the best feeding opportunities for shorebirds. Species breeding in Newfoundland include Spotted Sandpipers, Greater Yellowlegs and Least Sandpipers that occur commonly during spring and fall migration, but only the Spotted Sandpiper breeds in coastal terrain, e.g., grassy areas above highest tide line. The most numerous species of migrant shorebirds in Placentia Bay include Black-bellied Plover, Semipalmated Plover, Greater Yellowlegs, Ruddy Turnstone, Sanderling, Semipalmated Sandpiper, Least Sandpiper, Whiterumped Sandpiper, Pectoral Sandpiper and Short-billed Dowitcher (Goudie et al. 2007). Modest concentrations of migrant shorebirds occur in Placentia Bay. Arnold's Cove contains tidal flats that attract up to 100 individuals present during peak days in August and September with Greater Yellowlegs, Semipalmated Plovers, Semipalmated Sandpipers and White-rumped Sandpipers being the dominant species. Seventeen species of shorebirds were recorded in late summer and fall 2006 during field studies for the proposed oil refinery, with notable aggregations of Greater Yellowlegs (with some Lesser Yellowlegs), Semipalmated Sandpipers, Semipalmated Plovers, and Ruddy Turnstones. Some shorebird species recorded during these recent surveys were considered uncommon or rare for the province, notably Red Knot and Baird's Sandpiper, respectively. Red Phalaropes are considered pelagic in the non-breeding

season and three were sighted near the Project Area on December 4, 2006 which is considered relatively late for this species (Goudie et al. 2007).

Purple Sandpiper is the only shorebird species to over-winter in Placentia Bay. This species breeds in the Arctic, and lives along rocky shorelines of exposed to high wave energy in outer coastal areas such as points, islands and rocky islets. Numbers wintering in Placentia Bay are unknown. Purple Sandpiper was recorded in nine of ten Cape St. Mary's Christmas Bird Counts in the ten-year period from 1996-2005. Numbers ranged from 2 to 61 with an average of 27.3 per year. While conducting aerial surveys for Harlequin Ducks in western Placentia Bay south to the tip of the Burin Peninsula, LGL biologists recorded hundreds of Purple Sandpipers (Goudie and Jones 2007). This species was also observed along pelagic survey routes B and C, with highest densities observed in March (0.32 birds/km²). Numerous Purple Sandpipers (515) were observed in April during aerial surveys (Goudie et al. 2007). There is concern for this species as populations appear to be in decline, and a status review may proceed in the near future (P. Thomas, CWS, pers. comm.)

Black-headed Gull

The **Black-headed Gull** is a European species that regularly migrates in small numbers to Atlantic Canada in the non-breeding season. Over recent decades it has been confirmed breeding on the Ladle Cove Island (northeast coast) and the Stephenville Crossing area of western coastal Newfoundland. Groups of up to 50 Black-headed Gulls occur on the tidal flats at Arnolds Cove in fall, winter and spring. There was a strong presence of Black-headed Gulls at Arnold's Cove and Come By Chance during August 2006-April 2007 surveys (Goudie et al. 2007), and this species is localized in occurrence in the province.

Summary

Placentia Bay is an important ecosystem for marine birds throughout the year. Cape St. Mary's supports the largest colony of the Northern Gannet in Newfoundland and nearly 20 per cent of the Atlantic Canada breeding population. Middle Lawn Island, Burin Peninsula, supports the only known viable breeding colony of the Manx Shearwater in North America. Large numbers of Common Murre, Black-legged Kittiwake and Leach's Storm-Petrel breed on islands in the outer reaches of Placentia Bay. Placentia Bay supports large numbers of non-breeding species as well. Concentrations of tens of thousands of Greater Shearwaters from the Southern Hemisphere are known to concentrate in Placentia Bay to feed on capelin during the spawning season (June and July). In the winter, concentrations of sea ducks, especially the Common Eider spend the season feeding over rich inshore shoals. Cape St. Mary's supports the largest and most northerly distribution for some species of over-wintering sea ducks eastern Harlequin Duck, currently listed as species of concern. The rich avifauna of Placentia Bay is reliant on the existing healthy ecosystem. Any disruption to the marine life systems could affect many marine birds.

3.7.4 Marine Mammals

Marine mammals are common visitors to the waters of Newfoundland and Labrador. Observed year-round, they are most common during highly productive summer months as the waters off Newfoundland and Labrador, including those of the Study Area, represent a primary feeding ground for a number of species. Eleven species of marine mammals are expected to occur in Placentia Bay, including eight species of cetaceans (Table 3.30) and three species of seals (Table 3.31). Several additional species have been sighted in the Study Area or likely occur there, but because of their rarity in the area are not considered in this document. However, two mysticete species, the blue whale (*Balaenoptera musculus*) and North Atlantic right whale (*Eubalaena glacialis*), whose occurrence in the Study Area would be considered rare are reviewed in Section 3.7.5 as they are listed as Endangered under Schedule 1 of *SARA*.

Despite its biological richness, there is a paucity of systematically-collected data on marine mammal distribution and abundance in Placentia Bay. This data gap was identified by the Proponent and marine mammal surveys of Placentia Bay were conducted to provide baseline data on abundance and distribution. Boat-based surveys were designed to sample three areas of Placentia Bay and provide data for a complete year. An interim report describing results for surveys conducted from August-December 2006 is available (Abgrall and Moulton 2007) and surveys will continue during summer 2007, after which a final field report will be prepared. In total, 1544 km have been surveyed to date (August 2006-April 2007; Abgrall and Moulton in prep.). The survey routes and all marine mammal sightings are shown in Figure 3.80. Another source of information is a cetacean database maintained by DFO, St. John's, NL. This database contains records (incidental sightings, survey results, entanglements, and stranding data) collected by or reported to DFO since the 1970s. The DFO database only provides information on occurrence within a particular area, and caution should be made when interpreting relative abundance (temporal and spatial) given that observational effort is biased and limited in geographic scope (J. Lawson, DFO, pers. comm.).

Mysticetes (Baleen Whales)

Three species of baleen whales or mysticetes occur regularly in Placentia Bay including humpback (*Megaptera novaeangliae*), fin (*Balaenoptera physalus*), and minke whales (*B. acutorostrata*) (e.g., Hay 1982; Marques 1996; Abgrall and Moulton 2007). Of these species, only the fin whale is considered at risk by COSEWIC (2007); it is listed as Special Concern on Schedule 1 of *SARA*; this species is described in Section 3.7.5. There have only been three sightings of sei whales (*B. borealis*), two sightings of blue whales and one sighting of a right whale in Placentia Bay in the Study Area (DFO, unpubl. data; Figure 3.81). Each summer, most baleen whales arrive in Placentia Bay in late spring or early summer and the more abundant species remain until September or October. They feed primarily on capelin, but also feed on krill, squid, herring, and sand lance. The whales follow the migration of capelin and are common around inshore Newfoundland during the summer. The arrival of capelin to the head of

Placentia Bay generally occurs in June and July and it is likely that baleen whales would be most abundant during these months. Most whales have moved offshore and have begun to migrate south by late October (Lien 1985). The density⁴ of baleen whales (minke, fin, humpback and unidentified baleen whales combined) based upon recent boat-based surveys in the Study Area during August 2006-April 2007 was 0.008 baleen whales per km² (Abgrall and Moulton in prep.).

⁴ This estimate was derived using the DISTANCE program from 17 sightings of baleen whales; it is corrected for detection and availability biases (Forney and Barlow 1998).

| Species | | | | | COSEWIC Status | | |
|-----------------------------------|-------------------------------|------------|---|-------------------------------------|--|---|--|
| Common Name | Scientific Name | Occurrence | Season | Habitat | (date of most recent status report) | SARA Status [®] | |
| Baleen Whales | Mysticeti | | | | | | |
| Humpback whale | Megaptera novaeangliae | Common | Spring to fall | Primarily nearshore and banks | Not At Risk (May 2003) | No status | |
| Minke whale | Balaenoptera acutorostrata | Common | Year-round but primarily spring to fall | Continental shelf and coastal | Not At Risk (April 2006) | No status | |
| Fin whale | Balaenoptera physalus | Common | Spring to fall | Continental slope and pelagic | Special Concern (May 2005) | Schedule 1: Special Concern | |
| Toothed Whales | Odontoceti | | | | | | |
| Long-finned pilot whale | Globicephala melas | Uncommon? | Year-round | Mostly pelagic | Not assessed | No status | |
| Short-beaked common dolphin | Delphinus delphis | Uncommon | Summer | Continental shelf and pelagic | Not assessed | No status | |
| Atlantic white- sided dolphin | Lagenorhynchus acutus | Common | Year-round but primarily spring and fall | Continental shelf and slope | Not assessed | No status | |
| White-beaked dolphin | Lagenorhynchus albirostris | Common | Year-round? | Continental shelf | Not assessed | No status | |
| Harbour porpoise | Phocoena phocoena | Common | Year-round? | Continental shelf | Special Concern (April 2006) | No schedule or status; referred back to COSEWIC | |

 Table 3.30
 Cetaceans with expected occurrence within the Study Area.

Notes: ? indicate uncertainty; ^a Species designation under the Species at Risk Act (COSEWIC 2007).

| Species | | Occurrence | Season | Habitat | SARA/COSEWIC Status | |
|-----------------------------|-------------------------|------------|--------------------------|---------|----------------------|--|
| Common Name Scientific Name | | Occurrence | Season | | OANA/OOOLIIIO Olalus | |
| True Seals | Phocidae | | | | | |
| Grey seal | Halichoerus grypus | Common | Primarily summer | Coastal | Not assessed | |
| Harbour seal | Phoca vitulina | Common | Year-round | Coastal | Not assessed | |
| Harp seal | Pagophilus groenlandica | Uncommon | Late winter/early spring | Ice | Not assessed | |

 Table 3.31
 Seals with expected occurrence within the Study Area.



Figure 3.80 MM-1. Sightings of marine mammals made during boat-based surveys in August 2006-April 2007 (Abgrall and Moulton in prep.).



Figure 3.81 Sightings of marine mammals in the Study Area obtained from the DFO marine mammal sightings database.

Humpback Whale

Humpback whales regularly occur along the south coast of Newfoundland, including Placentia Bay, and these whales belong to the western north Atlantic population. It is estimated that 11,570 individuals comprise the entire North Atlantic population (Stevick et al. 2001) but this is likely an underestimate. In eastern Canada, based on data from 1992-1993, it is estimated that >2500 humpback whales occur there; this is most likely an underestimate (Anonymous 2001 *in* Baird 2003). The stock structure of this population is not clear, but it has been suggested that a separate feeding stock exists for Newfoundland and Labrador (Baird 2003). There is no reliable population estimate for humpback whales in Newfoundland. COSEWIC (2007) lists the species as 'Not at Risk'.

Like most baleen whales, humpbacks whales exhibit seasonal migrations from high-latitude feeding areas in summer and low-latitude breeding and calving areas in winter. Humpbacks typically arrive in Newfoundland waters around June and have mostly left by September. Some individuals visit the Study Area earlier; a humpback whale was observed in mid-April 2007 near Long Harbour (Abgrall and Moulton in prep.). Based on sightings from the DFO database where month was recorded, June and July (80.7 per cent of 326 sightings) appears to be the period of peak occurrence in the Study Area. Humpback whales have typically been considered (and described) as a coastal species but recent acoustic evidence (along with data from offshore seismic monitoring programs) shows that some whales do use offshore areas during non-migration periods (Baird 2003; Moulton and Miller 2004; Moulton et al. 2005, 2006a,b). A humpback whale density of 0.004 individuals per km² was observed during an aerial survey conducted in Placentia Bay on 6 August 1980 (Hay 1982). Based upon the DFO cetacean database, humpback whales occur throughout Placentia Bay, including areas near the Project Area (Figure 3.81), and it is the most abundant baleen whale recorded in the Study Area (326 sightings; DFO, unpubl. data). During recent boat-based surveys of Placentia Bay, four sightings of humpbacks (five individuals) occurred in August 2006; no humpbacks were identified in September or October (Table 3.32; Abgrall and Moulton 2007). All humpback sightings occurred east and southeast of Placentia within ~10 km of the coast (Figure 3.81).

In the northwest Atlantic, humpback whales feed during spring, summer and fall over a wide range (Katona and Beard 1990). They have a generalist diet consisting of euphausiids and different species of small schooling fish like herring, sand lance, capelin, and mackerel (Clapham 2002). In Newfoundland, their summer distributions are principally controlled by those of their prey (e.g., capelin). Large groups of humpbacks can concentrate in an area where prey are abundant. Humpbacks give birth from December through April and breeding also occurs at this time; gestation lasts 11-12 months.

Minke Whale

Current population estimates for minke whales in Newfoundland are not available. Boat-based surveys conducted in the southeastern area of Placentia Bay (near Cape St. Marys) in 1993 and 1994 found relative abundances of 0.26 and 0.66 minke whales per hour, respectively (Marques 1996). The best population estimate available is for the area extending from George's Bank to the mouth of the Gulf of St. Lawrence and in the Gulf of St. Lawrence: the estimate is 3,618 (CV = 0.18) (Waring et al. 2006). This species is not listed under *SARA* and COSEWIC recently (April 2006) listed it as not at risk.

Like other baleen whales, minkes undergo seasonal migrations from high-latitude feeding grounds in the summer to low-latitude breeding grounds in the winter. Some minke whales, however, are seen at high latitudes in the winter, including off Newfoundland (Lynch 1987). Minke whales are common off Newfoundland from May to August, where they feed principally on capelin (Sergeant 1963). Minke whales have been recorded in Placentia Bay from April to November and were most commonly recorded in July (47.7 per cent of 111 minke whale sightings), followed by June (34.2 per cent of sightings; DFO, unpubl. data). This species has recently been observed in late winter (2006) and early spring (2007) in Long Harbour (B. Mactavish and J. Christian, LGL, pers. comm.), perhaps in pursuit of herring. Based upon recent boat-based surveys of the Study Area, minke whales were the most numerous baleen whale observed (Table 3.32), with two sightings in each of August, September, October and March. Sightings occurred east of Long Island and southeast of Red Island (Figure 3.82). An incidental sighting of a minke whale ~100 m from the proposed oil refinery site was made during a songbird survey at Southern Head on 28 June 2007 (Goudie et al. 2007). During the summers of 1993 and 1994, minke whales were less abundant than humpback and fin whales in southeastern Placentia Bay (Margues 1996).

Minke whales are relatively solitary, usually seen individually or in groups of two or three, but they can occur in large aggregations of up to 100 animals at high latitudes where food resources are concentrated (Perrin and Brownell 2002). Females give birth every year and calving typically occurs between November and March (Sergeant 1963). Capelin and cod are considered dominant prey in Newfoundland (Perrin and Brownell 2002).

Table 3.32Summary of monthly marine mammal sightings made during the Placentia Bay
surveys (August, September, October, December 2006; March, April 2007).

| Group (Species) | Number of Sightings (Number of individuals) | | | | | | | |
|------------------------------|---|-----------|---------|----------|-------|-------|----------|--|
| Group (Species) | August | September | October | December | March | April | Total | |
| Dolphins | | | | | | | | |
| Atlantic white-sided dolphin | 7 (75) | 5 (83) | 2 (30) | 1 (1) | 1 (6) | - | 16 (195) | |

| Crown (Species) | Number of Sightings (Number of individuals) | | | | | | | |
|-------------------------|---|-----------|---------|----------|---------|-------|----------|--|
| Group (Species) | August | September | October | December | March | April | Total | |
| White-beaked dolphin | 2 (20) | - | - | - | 1 (8) | - | 3 (28) | |
| Unidentified | 6 (17) | 1 (10) | 1 (3) | - | - | - | 8 (30) | |
| Baleen Whales | | | | | | | | |
| Minke Whale | 2 (2) | 2 (2) | 2 (2) | - | 2 (2) | - | 8 (8) | |
| Fin Whale | 1 (1) | - | - | - | - | - | 1 (1) | |
| Humpback whale | 4 (5) | - | - | - | - | 1 (1) | 5 (6) | |
| Unidentified | 3 (3) | - | - | - | - | - | 3 (3) | |
| Toothed Whales | | | | | | | | |
| Sperm whale | - | - | 1 (1) | - | - | - | 1 (1) | |
| Others | | | | | | | | |
| Harbour porpoise | 1 (1) | - | - | 2 (7) | 16 (35) | 2 (6) | 21 (49) | |
| Grey seal | - | - | - | 1 (1) | - | - | 1 (1) | |
| Harp seal | | | | | 2 (4) | 1 (1) | 3 (5) | |
| Unidentified seal | 1 (1) | - | - | - | 3 (4) | - | 4 (5) | |
| Unidentified whale | 1 (1) | - | - | - | - | - | 1 (1) | |
| GRAND TOTAL | 27 (116) | 8 (95) | 6 (36) | 4 (9) | 25 (59) | 4 (8) | 75 (333) | |

Notes: Survey effort varied by month (Aug= 225.0 km, Sep=279.6 km, Oct=314.8 km, Dec=310.9 km, Mar=304.0 km, April=110.3 km)

Odontocetes (Toothed Whales)

Four species of odontocetes or toothed whales have been regularly sighted in the Study Area, including Atlantic white-sided dolphin (*Lagenorhynchus acutus*), white beaked dolphin (*Lagenorhynchus albirostris*), harbour porpoise (*Phocoena phocoena*) and long-finned pilot whale (*Globicephala melaena*). There have been relatively few sightings of common dolphins (*Delphinus delphis*), killer whales (*Orcinus orca*) and sperm whales (*Physeter macrocephalus*). The harbour porpoise is considered of Special Concern by COSEWIC and has no schedule or status under *SARA* given the recent (April 2006) re-assessment by COSEWIC; this species is discussed in Section 3.7.5.

Most odontocetes occur seasonally in Placentia Bay and little is known regarding their distribution and population size. Some species may remain in waters of southern Newfoundland throughout the autumn and winter, but the seasonal movement patterns of most species are unknown. Most toothed whales that occur in Placentia Bay are known or thought to eat squid, fish (capelin, cod, sand lance, herring, mackerel), and/or amphipods. It is likely that the distribution patterns of most odontocetes are related to the occurrence of their prey.



Figure 3.82 Sightings of baleen whales made during boat-based surveys in August 2006-April 2007 (Abgrall and Moulton in prep.).

Atlantic White-sided Dolphin

This species is found in temperate and sub-polar waters of the North Atlantic Ocean. In the Northwest Atlantic, three stocks of Atlantic white-sided dolphins may exist: Gulf of Maine, Gulf of St. Lawrence and Labrador Sea, and the combined Northwest Atlantic population is thought to number 27,000 individuals (Palka et al. 1997). However, Waring et al. (2006) estimates that the Gulf of Maine stock is ~51,600 individuals. It is uncertain which stock of dolphins occurs in the Study Area. COSEWIC lists this species as 'Not at Risk' (COSEWIC 2007).

White-sided dolphins range from about Cape Cod to Davis Strait and Greenland (Katona et al. 1993). This species is regularly sighted along the south coast of Newfoundland, at least during summer and early fall. There is one recorded sighting in April (DFO database, unpubl. data). This species was the most frequently sighted dolphin during the 2006-2007 boat-based surveys. It was sighted in all months surveys were conducted (August, September, October, December, March) with the exception of April when only one route was surveyed (Table 3.32; Abgrall and Moulton in prep.). The density⁵ of Atlantic white-sided dolphins based upon recent boat-based surveys in the Study Area during August 2006-April 2007 was 0.285 dolphins per km² (Abgrall and Moulton in prep.).

It has been reported that white-sided dolphins prefer waters > 50 m deep (Katona et al. 1993) and that they are found primarily on continental shelf waters to the 100 m depth contour (Waring et al. 2006). They are also regularly sighted in slope areas and deeper oceanic waters (Cipriano 2002). Based on the DFO sighting database, this species appears to have a scattered distribution along the south coast of Newfoundland. Nine sightings of white-sided dolphins have been recorded in the Study Area, four in August, three in July and one in each of June and October (DFO, unpubl. data). This species was observed along all three survey routes in the Study Area with a cluster of sightings east of Long Island and two sightings in the middle of Placentia Bay during September (Figure 3.83).

In the western Atlantic, calving season peaks in mid-summer after an 11-month gestation period; lactation occurs for ~18 months (Weinrich et al. 2001; Cipriano 2002). Katona et al. (1993) report that females give birth every 2.5 years but some individuals may breed annually (Cipriano 2002). In the inshore waters of Newfoundland, group sizes of 50-60 are typical. White-sided dolphin prey includes herring, mackerel, gadoids (e.g., cod), smelt, hake, sand lance and squid (Cipriano 2002). This species does not appear to be a deep diver, the maximum time recorded for a tagged individual being four minutes (Mate et al. 1994).

⁵ This estimate was derived using the DISTANCE program from 16 sightings of Atlantic white-sided dolphins; it is corrected for detection and availability biases (Forney and Barlow 1998).





White-beaked Dolphin

The white-beaked dolphin tends to be a coastal, cool-water species (Reeves et al. 1999). This species seems to remain at relatively high latitudes throughout the fall and winter (Lien et al. 1997), but the nature of their seasonal movements is uncertain.

There are indications (based on morphometric data) that there are at least two different stocks of white-beaked dolphins, the eastern and western North Atlantic stocks (Mikkelsen and Lund 1994 *in* Waring et al. 2006). There are no total abundance estimates for white-beaked dolphins that occur in Canadian waters. The total North Atlantic population may range from high tens of thousands to low hundreds of thousands (Reeves et al. 1999). COSEWIC lists this species as 'Not at Risk' (COSEWIC 2007). High densities of this species have been observed in Placentia Bay (0.29 individuals per km2) and Fortune (0.24 individuals per km²) Bay in August 1980 (Hay 1982).

In the northwest Atlantic, the largest concentrations of this species occur off Labrador and southwest Greenland (Kinze 2002). White-beaked dolphins have been observed along the south coast of Newfoundland, and most of these sightings have occurred in nearshore waters of the Study Area (DFO, unpubl. data; Figure 3.81), however, this may be related to observation effort. Sightings of white-beaked dolphins have been recorded in the Study Area from April to September, with the majority of sightings in August (62.5 per cent of 40 sightings; DFO, unpubl. data). Ice entrapments of this species along the Newfoundland northeast, south and west coasts (Hai et al. 1996), suggest that like blue whales, some white-beaked dolphins remain associated with the ice edge through winter (J. Lawson, DFO, pers. comm.). As many as 150 white-beaked dolphins were entrapped by pack ice near Point Verde, Placentia Bay in March 1983 (Hai et al. 1996).

During recent boat-based surveys in the Study Area, white-beaked dolphins were observed in August (two sightings of 20 dolphins) and March (one sighting of eight individuals; Table 3.32; Abgrall and Moulton in prep.). Sightings occurred north of Long Island and north of Red Island (Figure 3.83).

The diet consists mainly of mesopelagic fish species, especially cod, whiting and other gadids, as well as squid, octopus and sometimes benthic crustaceans (reviewed in Lien et al. 2001; Kinze 2002). Groups of a few or several dolphins may occur in the Study Area, but large groups of up to 1500 animals have been observed off Newfoundland (Katona et al. 1993). Little is known about this species' reproductive parameters. Births occur during summer and gestation lasts 10-11 months (Kinze 2002).

Long-finned Pilot Whale

Long-finned pilot whales are abundant throughout the North Atlantic Ocean as far north as 70°N (Bernard and Reilly 1999), with some evidence of segregation between the western and eastern North Atlantic (Bloch and Lastein 1993).

The northwest Atlantic population probably numbers between 4,000 and 12,000 individuals (Nelson and Lien 1996). In August 1980, a fixed-wing aerial survey of whales in the coastal and offshore (ca. 100 nautical miles offshore) waters of eastern Newfoundland and southeastern Labrador yielded a minimum abundance estimate based on line-transect analysis of 13,167 (\pm 3,155) pilot whales (Hay 1982). No recent population estimates exist. COSEWIC (2007) lists the long-finned pilot whale as 'Not at Risk'. There are no available estimates for numbers of pilot whales that occur in the Study Area.

The long-finned pilot whale is considered the most common toothed cetacean in the Grand Banks and is also one of the few year-round residents. This species is considered abundant in the Grand Banks area from July through December. There have been 38 sightings of long-finned pilot whales in the Study Area recorded in DFO's database (from 1979-2006). Eighty-two per cent of these sightings occurred during June to August, with pilot whales most frequently recorded in July (DFO, unpubl. data). However, no pilot whales were sighted in Placentia Bay during an aerial survey on 6 August 1980 (Hay 1982). Also, no pilot whales were sighted during boat-based surveys conducted in 2006-2007 (Abgrall and Moulton in prep.). Available information suggests that this species is not common in the Study Area; however, there are not enough systematic survey data to definitively state this.

Pilot whales are very social and are usually found in large groups. Pilot whales pods are known to strand frequently en masse. It is a common belief that long-finned pilot whales in the northwest Atlantic prey mainly on short-finned squid in summer. However, this statement is based largely on evidence from inshore waters of Newfoundland (Sergeant 1962), and other evidence suggests that they also prey on a variety of fish species, as well as additional species of cephalopods (especially long-finned squid, *Loligo pealei*) at other times and in other areas (Waring et al. 1990; Overholtz and Waring 1991; Desportes and Mouritsen 1993; Nelson and Lien 1996; Gannon et al. 1997). Mating typically occurs in spring or early summer and gestation is 12 months (or perhaps 16 months; see Katona et al. 1993). Lactation lasts for at least three years (Olson and Reilly 2002).

Common Dolphin

Common dolphins are widely distributed in tropical and temperate oceans around the world. The northernmost limit of their range is typically about 50°N in the Atlantic (Evans 1994). In the northwest Atlantic, they have been sighted in August as far north as 47°N off Newfoundland (Gaskin 1992). Common dolphin distribution has been shown to be associated with steep underwater topography (Evans 1994).

There are no available population estimates for Atlantic Canada or Newfoundland. Waring et al. (2006) provided an abundance estimate of 90,547 (CV = 0.24) for common dolphins from Maryland to Bay of Fundy. COSEWIC (2007) lists the common dolphin as 'Not at Risk'.

There are eight common dolphin sightings in the Study Area recorded in the DFO marine mammal database; 50 per cent of these were made in June (DFO, unpubl. data). No common dolphins were identified during recent boat-based surveys in Placentia Bay (Abgrall and Moulton in prep.). Migration of common dolphins onto the continental shelf off Newfoundland occurs during summer and autumn when water temperatures exceed 11°C (Sergeant et al. 1970). Common dolphins are likely uncommon in the Study Area.

Common dolphins often travel in fairly large groups; schools of hundreds or even thousands are commonly seen, although their basic social units likely number less than 30 individuals (Evans 1994). Common dolphins feed on a variety of prey including small mesopelagic fish and squid, small scombroids and clupeoids. Foraging dives have been recorded to 200 m (Perrin 2002). The biology of common dolphins in the northwest Atlantic has not been studied in detail. Based on other regions, gestation lasts 10-11 months and lactation lasts 5-6 months (Perrin 2002).

Phocids (Seals)

Three species of seals are known to occur in and near Placentia Bay including harbour (*Phoca vitulina*), grey (*Halichoerus grypus*) and harp seals (*Phoca groenlandica*). Little is known about their distribution and abundance within Placentia Bay.

<u>Harbour Seal</u>

Harbour seals have one of the largest distributions of any pinniped. They can be found in most coastal waters of the North Atlantic and North Pacific to as far north as about 80°N off Spitzbergen (Bigg 1981).

Harbour seals that occur in Newfoundland waters belong to the western Atlantic population and the size of this population is not known with any degree of certainty. From 30,000-40,000 were thought to be present in Canadian waters in 1993 (Burns 2002). The harbour seal population size in Atlantic Canada was estimated to be 31,900 in 1996 (this estimate was based on data provided in Boulva and McLaren (1979)) and, at that time, it was increasing at a rate of 5.6 per cent per year (Hammill and Stenson 2000). Harbour seals are year-round residents along the south coast of Newfoundland. In 1973, approximately 930 harbour seals were estimated to be present in coastal areas in St. Mary's and Placentia Bay (Boulva and McLaren 1979). There are no recent population estimates available for this species in Newfoundland or the Study Area. The harbour seal's COSEWIC status is data deficient. A draft COSEWIC status report is in preparation.

In recent years (2001-2003), DFO has conducted boat- and shore-based surveys at known harbour seal haulout sites along the south coast of Newfoundland (Sjare et al. 2005). Although the surveys do not provide population estimates they do provide the best available (and most recent) information for local abundance of harbour seals. Small numbers of harbour seals were counted in Placentia Bay (13-27). Harbour seals, including female and pup pairs, were observed in the Marystown estuary in May and June (2002 and 2003; Table 3.33). Seals were also observed at King Island (adjacent to Merasheen Island), including a female and pup. However, relatively little is known about breeding activity of harbour seals at these and other sites within the Study Area.

Harbour seals breed on the Grand Barachois of Miquelon, which is ~16 km south of the Study Area. From 1981-1990, the population estimate for seals on Grand Barachois ranged from 400-908 seals. In recent years, numbers of seals have declined and in 2003 and 2006, ~200 harbour seals were counted (B. Sjare, DFO, St. John's, NL, pers. comm.). In St. Mary's Bay, 269 harbour seals were counted during a DFO survey in August 2003 (Table 3.33). It is possible that some of the seals at Miquelon and St. Mary's Bay travel to Placentia Bay to forage. No harbour seals were identified during recent boat-based surveys in the Study Area.

Harbour seal pups are born in late spring or summer, and mating occurs in the water around the time that the pups are weaned, at about four weeks of age (Burns 2002). Moulting occurs during mid-summer to early fall, during which time harbour seals haul out more frequently than at most other times of the year. In general, harbour seals have a varied diet, including pelagic and demersal fish as well as cephalopods and crustaceans (see, for example, Boulva and McLaren 1979; Bowen and Harrison 1996). In Newfoundland and Labrador, Arctic cod and capelin as well as shorthorned sculpin are important prey items. Based on preliminary analyses, Sjare et al. (2005) note that diet of harbour seals in Newfoundland varied by region, with seals on the south coast (Placentia and St. Mary's bays) consuming more Atlantic cod (27 per cent of stomach wet mass) and those on the northeast coast consuming more shorthorned sculpin (28 per cent) and winter flounder (26 per cent).

Table 3.33Summary of DFO survey results which provide local abundance estimates for harbour seals in and near the Study Area
based on shore-based and boat-based surveys from 2001-2003 (adapted from Sjare et al. 2005).

| Survey | | | No. of | Comments on Age | Main Concentration | |
|-----------|-------------|-------------------------|------------------|---------------------------|--------------------------|--|
| Date | Method | Location | harbour Seals | Structure | Area(s) | |
| 5-Jun-01 | Boat | Merasheen/King Is. | 14 | Female/young pup | Southern King Is. | |
| 29-May-03 | Boat | Merasheen/King Is. | 7 | | Southern King Is. | |
| 5-May-02 | Shore-based | Marystown | 6 | 1 female-pup pair | Southwest Arm | |
| 4-Jun-02 | Shore-based | Marystown | 13 | 3 female-pup pairs | Southwest Arm | |
| 6-Jun-02 | Shore-based | Marystown | 9 | 2 female-pup pairs | Southwest Arm | |
| 7-Jun-02 | Shore-based | Marystown | 7 | 3 female-pup pairs | Southwest Arm | |
| 27-May-03 | Shore-based | Marystown | 9 | 3 pregnant females; 1 pup | Southwest Arm | |
| 31-May-03 | Shore-based | Marystown | 10 | | Southwest Arm | |
| 1-Jun-03 | Shore-based | Marystown | 11 | 1 female-pup pair | Southwest Arm | |
| 5-Jun-03 | Shore-based | Marystown | 11 | 1 female-pup pair | Southwest Arm | |
| 13-Aug-03 | Boat | W. coast St. Mary's Bay | 269 | | Bull Is. Pt. To Red Head | |
| 5-Jun-02 | Shore-based | Pt. May | 46 | 5 female-pup pairs | Pt. May Pond & slipway | |
| 8-Jun-02 | Shore-based | Pt. May | 30 | | Pt. May Pond | |
| 28-May-03 | Shore-based | Pt. May | 43 | 1 female-pup pair | Pt. May Pond | |
| 1-Jun-03 | Shore-based | Pt. May | 20 | 8 pregnant females | Pt. May Pond | |
| 5-Jun-03 | Shore-based | Pt. May | 24 | | Pt. May Pond | |
| 18-Jun-03 | Shore-based | Pt. May | 17 | 1 female-pup pair | Pt. May Pond | |

Note: these results are not intended to represent population estimates.

<u>Grey Seal</u>

Grey seals that may occur in the Placentia Bay area are migrants from the Sable Island and Gulf of St. Lawrence breeding populations. The number of grey seals that migrates into the Study Area is unknown, but is believed low. In the summer, more than a 100 grey seals haul out within the Grand Barachois of Miquelon (J. Lawson, DFO, pers. comm.). This species may occur in Placentia Bay area year-round, but are thought to be most common in July and August (Stenson 1994). There was one sighting of a grey seal in the southeast portion of the Study Area during recent boat-based surveys (Table 3.32; Abgrall and Moulton in prep.). The food of grey seals in the western North Atlantic includes at least 40 species, some of which are commercially important (for example, Atlantic cod, herring and capelin) (Benoit and Bowen 1990; Hammill et al. 1995). Grey seals breed in early winter (peak period in mid-January) and moult from mid-May to mid-June. Grey seals are not considered at risk by COSEWIC.

Harp Seal

Harp seals in Placentia Bay are migrants from the Gulf of St. Lawrence and the "Front" breeding populations. Breeding occurs in March and the moult follows shortly thereafter. The number of harp seals that migrates into the Placentia Bay area is unknown, but numbers may be increasing as the range of this species appears to be expanding southward (e.g., McAlpine et al. 1999). Harp seals would likely be most common in autumn and winter as individuals summer in the Arctic. Indeed, harp seals (likely juveniles) were identified in March and April in the Study Area during recent boat-based surveys (Table 3.32; Abgrall and Moulton in prep.). Harp seals eat a variety of prey; on the Grand Banks, capelin predominate, followed by sand lance, Greenland halibut and other pleuronectids (Wallace and Lawson 1997; Lawson et al. 1998). The harp seal population is currently estimated at 5.9 million (CV=0.13; ICES 2005). Harp seals are not considered at risk by COSEWIC.

River Otter

The river otter occurs throughout Canada, along rivers, lakes and ocean coasts. In various areas of its range, this species lives a largely marine existence or may alternate between coastal and interior habitats (Larsen 1984; Stenson et al. 1984). It is adapted to an aquatic existence, having webbed feet, a streamlined shape, and a powerful tail. Although population estimates are unavailable, one of the highest river otter densities in Newfoundland occurs in coastal waters from the southern extent of Merasheen Island to the head of Placentia Bay. There, some river otters have adopted a primarily marine lifestyle. The complexity of the shoreline may be an important habitat component favouring the extensive use of the bay by otters (Goudie and Jones 2007).

It is likely that the population of otters using Placentia Bay is relatively contiguous given the large home range of this species (Goudie and Jones 2007). In the 1970s, one juvenile otter

captured and tagged in the Kings Island area of Merasheen archipelago was later caught by a trapper in Come-by-Chance area, representing a 40-50 km range (D. Slade, pers. comm.). In Bonavista Bay, the home range of otters was shown to be >100 km (Coté et al. in prep.) It is possible that otters from Placentia Bay may interchange regularly with the Trinity Bay population (Goudie and Jones 2007).

Despite its historic presence, exploratory research commencing in the 1970's, local knowledge and traditional trapping activity, there remains very limited and only fragmented information of this mammal in the Study Area. The Proponent recognized this data gap and contracted biologists to gather preliminary information and baseline data on the presence of otters at the head of Placentia Bay. Shoreline surveys for river otter haul-out sites (or rubs) were conducted during three days in April 2007 in an area extending from Bordeaux Island in the east to Sound Island in the west (see Figure 3.84). The shoreline was accessed via a boat operated by D. Slade (a retired wildlife officer experienced in river otter biology) and sites known to be used by otters as rubs as well as additional sites detected while in the field were visited (by D. Slade and a biologist) and classified according to use (time since last use, degree of use). Select sites were revisited during two days in May 2007 to assess the "long-term" use by otters. The results of the otter surveys are described in detail in Goudie and Jones (2007) and are summarized below.

In April 2007, 62 otter haul-out sites were identified in the head of Placentia Bay, extending from Sound Island to Bordeaux Island; 39 of those sites had signs of recent use (Figure 3.84; Goudie and Jones 2007). Goudie and Jones (2007) noted low estimates of river otter use in the vicinity of Whiffen Head. It appears that river otters may use the eastern side of Placentia Bay from Bordeaux Island north less than the areas to the west; this could be due to increased industrial activity, infrastructure, and associated shipping traffic in that area (Goudie and Jones 2007). Nonetheless, instances of frequent use by otters were located on select promontories located less than 1.5 km from the Come By Chance loading/unloading jetty (Goudie and Jones 2007). Slade and Pitcher (1971) also noted a high incidence of otter activity near Come By Chance and North Harbour. Sixteen otter rubs were located within the boundaries of the Project Area and several others were located nearby (Figure 3.84). Most of these haul-out sites were actively being used during the initial survey in April 2007 and there was evidence of re-use about a month after the initial survey (Goudie and Jones 2007). The coast of the Project Area is an area of active use by otters but the overall biological importance of rubs in the Project Area is unknown.

Incidental to aerial surveys for nesting bald eagles conducted in June 2006, 35 sites were identified as otter haul-outs (rubs) in the inner and eastern portion of Placentia Bay, extending from Arnold's Cove south to Northern Head, Cape St. Mary's (Goudie and Mactavish 2006). Dedicated surveys for otter haul-out sites in 2006 located 21 sites utilized by otters in the area of Long Harbour-St. Croix Bay to the Iona Islands (Goudie 2007). River otter signs were evenly

distributed among the mainland shoreline of Long Harbour proper and the archipelago complex of the Iona and Brine Islands (Goudie 2007).

The diet of river otters is mainly comprised of fish but invertebrates, amphibians, birds and small mammals are also taken depending on availability (Banfield 1974). In Placentia Bay, otters prey on cunners, gunnels/pouts, sculpins, flounders and sticklebacks; lobsters are also taken (Ian Goudie, LGL, pers. obs.). River otters mate in late winter/early spring and have a delayed implantation of up to 290-380 days with a gestation period of 60-62 days (Banfield 1974). Two to three young are typically born in March to April; however, they do not leave the den with the female until 10-12 weeks of age. During that time, females are localized to den/rearing sites, and little is known regarding their periodic movement rates or distance traveled away from the young. A denning and brood rearing site, first identified in the 1970s (D. Slade, retired Wildlife Officer, pers. comm.) on the western shoreline of the channel separating Sound Island and the mainland (see haul-out site R41 in Figure 3.84), still appears to be an important area for otters as evidenced by signs of frequent use (Goudie and Jones 2007).

The population of river otters is considered stable in Newfoundland, and harvesting is permitted. The furbearer trapping season for this species generally occurs from mid-October to mid-March. In the head of Placentia Bay, trapping is presently conducted by residents of Arnold's Cove, North Harbour, Garden Cove and Swift Current.



Figure 3.84 Locations of river otter haul-out sites (rubs) relative to the Project Area identified during shore-based surveys from Bordeaux to Sound Island.

3.7.5 Species at Risk

Table 3.34 provids a list of narine-associated bird species considered at risk under the Newfoundland Labrador ESA, SARA, and by COSEWIC.

| Table 3.34 | Marine-associated bird species considered at risk under the Newfoundland |
|------------|--|
| | Labrador ESA, SARA, and by COSEWIC. |

| Species | Scientific Name | Provincial ESA (designation date) | COSEWIC (last assessment date) | SARA (Schedule) |
|--|------------------------|-----------------------------------|-----------------------------------|---------------------------------|
| Barrow's Goldeneye (eastern population) | Bucephala islandica | Vulnerable (2002) | Special Concern (2000) | Special Concern (Schedule 1) |
| Harlequin Duck | Histrionicus | Vulnerable (2002) | Special Concern | Special Concern |

| Species | Scientific Name | Provincial ESA (designation date) | COSEWIC (last assessment date) | SARA (Schedule) |
|-------------------------|-------------------------------|-----------------------------------|-----------------------------------|------------------------------------|
| (eastern population) | histrionicus | | (2001) | (Schedule 1) |
| Piping Plover | Charadrius melodus melodus | Endangered (2002) | Endangered (2001) | Endangered (Schedule 1) |
| Ivory Gull | Pagophila eburnea | Vulnerable (2002) | Endangered (2006) | No schedule or status ¹ |
| Red Knot | Calidris canuuts | | Endangered (2007) | No schedule or stauts |

Note: Vulnerable is a Newfoundland and Labrador designation equivalent to Special Concern for COSEWIC and SARA.

Sources: http://www.sararegistry.gc.ca/; <u>http://www.env.gov.nl.ca/env/wildlife/wildlife_at_risk.htm</u> (accessed 20 June 2007)

¹ Under consideration for addition to Schedule 1

Marine Mammals

Blue Whale

Blue whale abundance in the North Atlantic is currently thought to range from 600 to 1500 individuals, although more reliable and wide-ranging surveys are required for better estimates (Sears and Calambokis 2002). The blue whale is considered Endangered by COSEWIC (COSEWIC 2002) and is listed as such on Schedule 1 of the *SARA*. Accordingly, a Recovery Strategy is being developed under *SARA* and is likely due for release in the near future (J. Lawson, DFO, pers. comm.). Little is known about the distribution and abundance of blue whales in the northwest Atlantic—especially the waters off eastern Newfoundland. One area of blue whale concentration is the Gulf of St. Lawrence where 350 individuals have been catalogued photographically (Sears 2002).

Blue whales have a coastal and pelagic distribution and they are known to frequent areas of the Gulf of St. Lawrence, the lower Estuary part of the St. Lawrence, and to a lesser extent the west and southwest coasts of Newfoundland. Most sighting effort and sightings of blue whales have been made along the Quebec North Shore from the Mingan and Anticosti islands region, off the Gaspé Peninsula, and west into the St. Lawrence Estuary to the Saguenay River (Sears and Calambokidis 2002). Little survey effort has been expended in other regions of the Gulf or elsewhere in the northwest Atlantic, especially outside of the summer period. Information on the distribution of blue whales in winter is lacking. Some blue whales become entrapped by ice (during heavy ice years) near the southwest coast of Newfoundland (Stenson et al. 2003). Records of entrapped blue whales date back to 1868 and 41 individual blue whales (23 entrapment events) have been recorded since then. Based upon the DFO sighting database, most sightings of blue whales in Newfoundland have occurred near the coast, which may, in part, be related to the lack of dedicated marine mammal surveys in offshore waters. Blue whales were regularly sighted in offshore waters (~100-3000 m deep) of the Laurentian Sub-

basin area during a seismic monitoring program in June to September 2005. In fact, blue whales were the most frequently sighted baleen whale species. Sighting rates of blue whales was highest in water depths ranging from 2000-2500 m (Moulton et al. 2006a). Blue whales were not observed during boat-based surveys conducted in Placentia Bay in 2006 and 2007 (Abgrall and Moulton 2007). There have been two sighting of blue whales in Placentia Bay (Figure 3.81) recorded in DFO's cetacean database:

- Five individuals were sighted southeast of the Project Area on 20 August 1979; and
- Four individuals (two females with calves) were sighted east of Point May in July 2002.

Based on available information, blue whales may occur in the Study Area, but their occurrence is likely rare.

Blue whales feed almost exclusively on euphausiids (krill) such as *Thysanoessa raschii* and *Meganyctiphanes norvegica* (Yochem and Leatherwood 1985). Blue whales also feed on copepods (e.g., *Temora longicornis*) and some fish species (Kawamura 1980; Reeves et al. 1998). During feeding and traveling, blue whales swim at speeds of 2-8 km/h but can reach speeds of 32-36 km/h (Sears and Calambokidis 2002). Blue whales generally dive for 5-15 minutes.

North Atlantic Right Whale

The North Atlantic right whale is the most endangered large whale in the world. In spite of being the first whale to receive total protection from hunting over 60 years ago, its population size remains low. The western North Atlantic population is estimated to be on the order of 300 individuals (IWC 2001a; Kraus et al. 2001) and appears to be declining (Caswell et al. 1999). Human-caused mortalities resulting from ship strikes (see Knowlton and Brown 2007 for a review) and entanglements in commercial fishing gear are thought to be major contributors to the population's failure to recover in the post-whaling era, and the survival of this population appears unlikely unless human-caused mortality is reduced (Kraus 1990, Caswell et al. 1999, IWC 2001). The North Atlantic right whale is presently listed under Schedule 1 of *SARA* as Endangered.

Within the western North Atlantic, right whales are known to aggregate in five seasonal habitat areas (IWC 2001b). From December to March, adult female right whales and their newborn calves, as well as some juvenile animals, can be found in coastal waters of the southeastern United States, with the peak of the calving season occurring in January. In January, right whales begin arriving in Cape Cod Bay, and their abundance peaks there from March to May. Right whales are present in the Great South Channel, off Cape Cod, from April through July, with a peak in May and June. Right whales can be found in the Bay of Fundy from June to November, with a peak of abundance in August to early October. Finally, right whales can be found in Roseway Basin, south of Nova Scotia, from July to November, with a peak in

abundance in August and September, but their use of this area seems to be declining in recent years (IWC 2001b). Although there has been a great deal of effort put into identifying their distribution, on average, only about 25 per cent of the known right whale population can be accounted for in any month except August (IWC 2001b).

Right whales are generally found in waters with surface temperatures ranging from 8°C to 15°C in areas that are 100 to 200 m deep (Winn et al. 1986). In the lower Bay of Fundy, right whales are generally distributed in an area where the bottom topography is relatively flat and the water column is stratified (Woodley and Gaskin 1996). Right whales tagged with satellite-monitored radiotags in the Bay of Fundy were found to range widely (Mate et al. 1997) and were most often located along bank edges, in basins, or along the continental shelf in water <182 m deep. Tagged whales were also noted to spend extended periods of time at the edge of a warm core ring and in upwellings.

Historically, whalers took right whales off the coast of Newfoundland, but recent sightings in these waters have been rare despite systematic surveys. Scattered sightings of right whales off Newfoundland and in the Gulf of St. Lawrence have been made in recent years, but these are not important summering areas for these whales (Gaskin 1991). There has been one sighting of a right whale in Placentia Bay (Figure 3.81). During a Provincial Airlines (PAL) flight in August 2005, a right whale was sighted and photographs were taken by the crew; the whale in the photos was later confirmed as a right whale by DFO (J. Lawson, DFO, pers. comm.). There have been rare sightings of this whale species in the Laurentian Sub-basin (Sergeant 1966) and speculation of some movement of these whales to and from the Gulf of St. Lawrence and western Newfoundland waters. No right whales were seen during boat-based surveys from August 2006-April 2007 in the Study Area (Abgrall and Moulton in prep.). Hence, while it is possible that right whales could occur in the Study Area between late spring and early fall, their presence is likely extremely rare.

The primary prey item of the North Atlantic right whale is the copepod *Calanus finmarchicus*, and shifts in the distribution and abundance of this species can dramatically affect right whale distribution (Kenney 2001). Zakardjian et al. (2003) suggested that North Atlantic right whales might occasionally feed on the large concentrations of copepods known to occur in the Laurentian Channel. In the Great South Channel, the average right whale dive depth was found to be only 7.3 metres, and few dives were deeper than 30 metres (Winn et al. 1994).

Certain characteristic behaviours of right whales, during which they may be less aware of their surroundings, make this species especially vulnerable to ship collisions. These behaviours include: surface active group (SAG) activity (individuals interacting at the surface with frequent physical contact); skim feeding (swimming slowly at the surface with mouth open); and logging (resting motionlessly at the surface), an activity frequently observed in nursing mothers (Knowlton 1997). Controlled exposure experiments in the right whale summer feeding area in the Bay of Fundy showed that right whales did not respond to the playback of the sound made