PHASE 2
DRAFT ENVIRONMENTAL IMPACT STATEMENT

Table of Contents

Table of Contents i

List of Figures iii

List of Tables iii

List of Appendices iv

Glossary and Abbreviations v

11. Marine Wildlife 11-1

11.1 Incorporation of Traditional Knowledge 11-1

11.1.1 Incorporation of Traditional Knowledge for Existing Environment and Baseline Information 11-1

11.1.2 Incorporation of Traditional Knowledge for Marine Wildlife VEC Selection 11-1

11.1.3 Incorporation of Traditional Knowledge for Spatial and Temporal Boundaries 11-1

11.1.4 Incorporation of Traditional Knowledge for Project Effects Assessment 11-1

11.1.5 Incorporation of Traditional Knowledge for Mitigation and Adaptive Management 11-2

11.2 Existing Environment and Baseline Information 11-2

11.2.1 Regional Overview 11-2

11.2.2 Proximity to Designated Environmental Areas 11-3

11.2.2.1 Marine Mammals 11-3

11.2.2.2 Seabirds and Seaducks 11-4

11.2.3 Regulatory Framework 11-17

11.2.3.1 Canada *Fisheries Act* 11-17

11.2.3.2 *Migratory Birds Convention Act* 11-17

11.2.3.3 Nunavut *Wildlife Act* 11-17

11.2.3.4 Canada *Species at Risk Act* 11-17

11.2.4 Data Sources 11-18

11.2.5 Methods 11-18

11.2.6 Characterization of Baseline Conditions for Marine Mammals 11-19

11.2.6.1 Ringed Seal 11-19

11.2.6.2 Baseline Data for Marine Mammals 11-23

11.2.6.3 Doris Project 11-24

11.2.7 Characterization of Baseline Conditions for Marine Birds 11-29

11.2.7.1 Marine Birds 11-32

11.2.7.2 Baseline Information on Seabirds and Seaducks 11-34
11.2.7.3 Doris Project 11-48
11.3 Valued Components 11-49
11.3.1 Potential Valued Components and Scoping 11-49
11.3.1.1 The Scoping Process and Identification of Marine Wildlife VECs 11-49
11.3.1.2 NIRB Scoping Sessions 11-50
11.3.1.3 TMAC Consultation and Engagement Informing VEC Selection 11-50
11.3.2 Valued Components Included in the Assessment 11-50
11.3.3 Valued Components Excluded from the Assessment 11-51
11.4 Spatial and Temporal Boundaries 11-52
11.4.1 Project Overview 11-52
11.4.1.1 The Approved Project 11-52
11.4.1.2 The Phase 2 Project 11-56
11.4.2 Spatial Boundaries 11-57
11.4.2.1 Project Development Area 11-57
11.4.2.2 Local Study Area 11-57
11.4.2.3 Regional Study Area 11-58
11.4.3 Temporal Boundaries 11-58
11.5 Project-Related Effects Assessment 11-58
11.5.1 Methodology Overview 11-58
11.5.2 Identification of Potential Effects 11-60
11.5.2.1 Ringed Seal 11-62
11.5.2.2 Marine Birds 11-64
11.5.3 Mitigation for Marine Wildlife VECs 11-65
11.5.4 Characterization of Potential Effects 11-69
11.5.4.1 Ringed Seals 11-69
11.5.4.2 Marine Birds 11-72
11.5.5 Characterization of Residual Effects 11-76
11.5.5.1 Characterization of Residual Effect for Ringed Seal 11-76
11.5.5.2 Characterization of Residual Effect for Marine Birds 11-76
11.6 Cumulative Effects Assessment 11-76
11.7 Impact Statement 11-76
11.7.1 Marine Mammals 11-76
11.7.2 Marine Birds 11-77
11.8 References 11-79

List of Figures

Figure 11.2-1. Migratory Routes and Main Summering Areas of Whales along the Commercial Shipping Route 11-5

Figure 11.2-2. Main Summering Areas of Seals, Walrus, and Polar Bears along the Commercial Shipping Route 11-7

Figure 11.2-3. Important Breeding and Staging Habitat for Seabirds and Seaducks along the Commercial Shipping Route – Southern, Arctic Mainland 11-9

Figure 11.2-4. Important Breeding and Staging Habitat for Seabirds and Seaducks along the Commercial Shipping Route – Northern, Arctic Islands 11-11

Figure 11.2-5. Distribution of Seals and Breathing Holes Observed during Spring Seal Aerial Surveys, June 2010.....11-25

Figure 11.2-6. Marine Mammal Observations Recorded during the Barge Survey, September 2010 ..11-27

Figure 11.2-7. Seabird Species Abundance during Pair and Brood Waterbird Surveys, 2006 to 2015.11-37

Figure 11.2-8. Annual and Seasonal Variation in Seabird Abundance and Species Richness, 2006 to 2015.....11-38

Figure 11.2-9. Flocks of Seabirds and Seaducks Observed in the Marine Wildlife Regional Study Area, 2006 to 2015 11-43

Figure 11.2-10. Seabird Observations Recorded during the Barge Survey, September 2010.....11-45

Figure 11.2-11. Islands with Nests of Seabirds Observed during Nest Search Surveys, 2006, 2009, and 2010 11-47

Figure 11.4-1. Project Development Area and Local Study Area and Regional Study Area for Marine Wildlife VECs 11-53

List of Tables

Table 11.2-1. Spatial and Temporal Distribution of Marine Mammals along the Commercial Shipping Route 11-13

Table 11.2-2. Breeding Areas for Seabirds and Seaducks along the Commercial Shipping Route in the Southern and Northern Arctic 11-15

Table 11.2-3. Marine Mammal Species Potentially Occurring in the Regional Study Area and their Regularity and Timing of Occurrence and Conservation Status 11-20

Table 11.2-4. Comparative Ringed Seal Densities on Ice from Other Studies in the Alaskan and Canadian Arctic 11-21

Table 11.2-5. Results of the Spring Seal Survey, 2010.....11-23

Table 11.2-6. Seabird Species Potentially Occurring in Marine Wildlife RSA and their Conservation Status 11-30

Table 11.2-7. Survey Timing of Pair and Brood Surveys, 2006 to 2015 11-35

Table 11.2-8. Transect Characteristics of Dedicated Seabird Surveys in 2009 and 2010 11-36

Table 11.2-9. Marine Bird Abundance and Species Richness during Seabird Bird Surveys, 2009 to 2010.....11-41

Table 11.3-1. Wildlife Valued Ecosystem Components Included in the Marine Wildlife Assessment .11-51

Table 11.3-2. Wildlife Valued Ecosystem Components Excluded from the Marine Wildlife Assessment 11-51

Table 11.4-1. Temporal Boundaries for the Effects Assessment for Marine Wildlife.....11-59

Table 11.5-1. NIRB Guidelines for Marine Wildlife and Identified Potential Effects for the Assessment.....11-61

Table 11.5-2. Potential Project-related Effects to Ringed Seal.....11-63

Table 11.5-3. Potential Project-related Effects to Marine Birds.....11-64

List of Appendices

Appendix V5-11A. Hope Bay Belt Project: Marine Wildlife Baseline Report, 2011

Glossary and Abbreviations

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

CESCC	Canadian Endangered Species Conservation Council
DOE	Department of Environment
EAA	Existing and approved authorizations
EBSA	Ecologically and biologically significant areas
EIS	Environmental Impact Statement
IBA	Important bird area
KIA	Kitikmeot Inuit Association
KMHS	Key Marine Habitat Site
KTHS	Key Terrestrial Habitat Site
LSA	Local study area
MLSA	Marine wildlife local study area
MRSA	Marine wildlife regional study area
NIRB	Nunavut Impact Review Board
NTKP	Naonaiyaotit Traditional Knowledge Project
RSA	Regional study area
SARA	*Species at Risk Act*
TK	Traditional knowledge
VEC	Valued ecosystem component
VSEC	Valued socio-economic component
WMMP	Wildlife Mitigation and Monitoring Plan

11. Marine Wildlife

This section presents the existing conditions of the marine wildlife surrounding the proposed Project and identifies and evaluates the potential Project-related effects and cumulative effects on marine wildlife and their habitat within a local and regional context.

11.1 INCORPORATION OF TRADITIONAL KNOWLEDGE

11.1.1 Incorporation of Traditional Knowledge for Existing Environment and Baseline Information

Baseline studies were designed to characterize marine wildlife identified as culturally important to Inuit and to characterize important marine wildlife habitat. The baseline programs conducted between 2010 and 2013 included the collection and analysis of data on the relative seasonal and annual trends in abundance and distribution of marine wildlife identified as important to Inuit. Marine wildlife habitat use within the marine wildlife local study area (MLSA) and marine wildlife regional study area (MRSA), including the identification of important habitat features such as breeding and staging areas for seabirds, and pupping and moulting areas for ringed seals was also documented. These studies were guided by Traditional Knowledge (TK) and included local assistance with surveys in areas deemed as important habitat for marine wildlife. This information was also used as baseline information around which the human and environmental risk assessments (Volume 6, Section 5) were developed.

11.1.2 Incorporation of Traditional Knowledge for Marine Wildlife VEC Selection

The results of the Inuit TK for TMAC Resources Inc. Proposed Hope Bay Project, Naonaiyaotit Traditional Knowledge Project (NTKP) draft report (Banci and Spicker 2016) were used for scoping and refining the potential VEC/VSEC list. The TK report presents maps of the locations where valued animal species are more abundant and hunted, environmental components, and traditional land use activities. This information was used to determine if these values potentially interacted with the Phase 2 Project, and if so, they were included in the initial VEC/VSEC list.

11.1.3 Incorporation of Traditional Knowledge for Spatial and Temporal Boundaries

The NTKP report (Banci and Spicker 2016) was used to guide the selection of the MLSA and MRSA. Baseline marine wildlife field studies were completed in those study areas to encompass potential Project effects on marine wildlife resulting from construction, operation and closure of the Phase 2 Project.

Current Inuit use of the water for hunting and travel overlaps the marine study areas (Volume 6, Section 4; Land Use), and was also considered in the delineation of these boundaries (Banci and Spicker 2012; Banci and Spicker 2016). The MRSA encompasses an area large enough to characterize potential effects to species which may come into contact with the Phase 2 Project or Project-related activities during their lifetime. In particular, the MRSA includes the northern portion of Bathurst Inlet, which TK identified as an important area for collecting marine bird eggs and marine birds, and for hunting marine mammals.

11.1.4 Incorporation of Traditional Knowledge for Project Effects Assessment

The list of potential effects to be considered in the effects assessment was based in part on Inuit input. TK information related to the distribution and habitat use was included in the assessment of potential effects on marine wildlife by determining the potential overlap of wildlife species with the spatial

boundaries of the Phase 2 project. TK helped to determine the location of potential marine wildlife receptors and the spatial and temporal overlap with the Phase 2 Project in these areas such as timing and location of sea bird staging and ringed seal congregations. In particular, the traditional use of the northern portion of Bathurst Inlet was considered in the assessment.

11.1.5 Incorporation of Traditional Knowledge for Mitigation and Adaptive Management

As summarized within the Socio-economic (Volume 6, Section 3) and Land Use Section (Volume 6 Section 4), focus group sessions revealed Inuit concerns about the potential for marine wildlife, forage, or habitat quality to be affected by the Phase 2 Project. Mitigation measures are designed primarily to reduce the potential for adverse effects on marine wildlife and wildlife habitat. Mitigation and management strategies in place for the Doris Project will also be used for the Phase 2 Project. These strategies are in place for a number of Valued Ecosystem Components (VECs) including the marine physical environment, marine fish, and wildlife and Valued Socio-economic Components (VSECs) which will serve to minimize the potential effects of the Phase 2 Project on marine wildlife and wildlife habitat. In particular, only open-water season shipping (no ice-breaking) will occur so as to avoid potential negative effects on wildlife dependent on ice, and the design of the permanent in-water infrastructure minimizes habitat loss for marine wildlife.

Direct and indirect mitigation and adaptive management strategies for marine wildlife and the ways in which TK was incorporated into the development of these strategies, are detailed in other sections of the EIS including:

- Air Quality (Volume 4, Section 2);
- Marine Physical Processes (Volume 5, Section 7);
- Marine Water Quality (Volume 5, Section 8);
- Marine Sediment Quality (Volume 5, Section 9);
- Marine Fish (Volume 5, Section 10);
- Terrestrial Wildlife and Wildlife Habitat (Volume 4, Section 9); and
- Land Use (Volume 6, Section 4).

11.2 EXISTING ENVIRONMENT AND BASELINE INFORMATION

11.2.1 Regional Overview

The Hope Bay Development is comprised of existing and approved projects and the Phase 2 Project. The Phase 2 Project is located approximately 125 km southwest of Cambridge Bay, Nunavut, on the southern shore of Melville Sound in the West Kitikmeot region of Nunavut. Infrastructure associated with the Hope Bay Development is present along the southern shoreline of Roberts Bay (68° 12' N, 106° 38' W), a small inlet that empties into Melville Sound and is bordered by Hope Bay (west) and Ida Bay (east).

Shipping access to the Phase 2 Project is via the Arctic Ocean terminating at the port site in Roberts Bay. Shipping occurs along existing shipping route through the Northwest Passage and includes shipping outside of the MRSA. The common Northwest Passage shipping route starts in Nunavut at Lancaster Sound, and passes through Barrow Strait, Peel Sound, Victoria Strait, and the Queen Maud Gulf. Ships would then travel south into northern Bathurst Inlet, and enter from the west into Melville Sound terminating in Roberts Bay.

Roberts Bay and the surrounding waters in the MRSA are typically ice covered from late October to June, most of that time with land-fast ice that is about 1.5 m thick. The marine wildlife community of Roberts Bay and the greater regional area of Melville Sound are representative of an Arctic marine ecosystem, and include the seasonal use of marine habitat by a variety of marine wildlife species including several species of marine mammals and seabirds.

This section provides a summary of the methods and results of studies for marine wildlife conducted in the MRSA as baseline studies for the Phase 2 Project and as ongoing monitoring of the Doris Project.

11.2.2 Proximity to Designated Environmental Areas

There are no existing or proposed parks or conservation areas near the proposed Project. The nearest conservation area is the Queen Maud Gulf Migratory Bird Sanctuary approximately 50 km east of Roberts Bay by air and over 300 km by water (as Melville Sound is isolated from the Queen Maud Gulf by the Kent Peninsula). The Draft Nunavut Land Use Plan (Nunavut Planning Commission 2016) has designated northern Bathurst Inlet, Melville Sound, and Elu Inlet as a key bird habitat site, and thus the Phase 2 Project marine LSA and MRSA are contained within this area. The proposed Hiukitak River Cultural Area is on the eastern shore of northern Bathurst Inlet and is outside of the MRSA, approximately 120 km northeast of Roberts Bay (by water).

Outside of the MRSA but along the current shipping routes used for the approved Project, several additional ecologically and biologically significant areas (EBSAs) and Key Marine or Terrestrial Habitat Sites (KMHS and KMTS) and Important Bird Areas (IBAa) occur. EBSAs are identified as a management tool to provide information about important species, habitat and ecosystem components, and ultimately provide the primary inputs for the design of Marine Protected Areas. Key habitat sites are identified as marine or terrestrial areas supporting at least 1% of the Canadian population of at least one species of migratory birds (or in some cases subspecies). IBAs identify habitats that are important to species of conservation concern, to large congregations of migratory birds, and to species that are limited by range or habitat (IBA 2012a).

The following sections summarize the regional setting for marine mammals and seabirds and present the spatial and temporal distributions of these species as well as important habitat areas for marine wildlife species along the commercial shipping routes.

11.2.2.1 Marine Mammals

Several species of marine mammals likely occur along the shipping routes, including: walrus (*Odobenus rosmarus*), narwhal (*Monodon monoceros*), beluga whale (*Delphinapterus leucas*), bowhead whale (*Balaena mysticetus*), polar bear (*Ursus arctos*) and ringed seals. In addition, several other species may occur on a small proportion of the commercial shipping routes including, bearded seal (*Erignathus barbatus*), harp seal (*Phoca groenlandica*), hooded seal (*Crystophora cristata*), and killer whales (*Orcinus orca*). TK indicates that these species are not commonly observed in the MRSA (Banci and Spicker 2016). Spatial and temporal distributions of these species along the commercial shipping routes are presented in Figures 11.2-1 and 11.2-2 and Table 11.2-1.

Most of the marine mammals along the commercial shipping routes likely would not come into close contact with vessels, regardless of the number of vessels, because of their distribution or preferred habitats. The commercial shipping route is located well offshore or in mid-channel, whereas many of the marine mammals are coastal and some are found only in low numbers along the commercial shipping routes.

The relatively few times and locations when marine mammals could occur near the commercial shipping route during the shipping season are as follows:

- A population of bowhead whales occur in the Peel Sound/Franklin Strait area and in Barrow Strait during August and September. The Eastern Arctic bowhead population is present in Lancaster Sound and Prince Regent Inlet from late June through September as ice conditions allow.
- Beluga whales occur in deep-water areas offshore in Peel Sound called the Franklin Trench from mid-August to early/mid-September. The Western Beaufort Sea beluga population is in the western Mackenzie River estuary and delta from June to late August.
- Narwhals occur in small numbers in Barrow Strait and Peel Sound during August and September. During fall migration back to Baffin Bay via Lancaster Sound, narwhal are dispersed in open-water and remain there as long as open-water permits.
- Very few walrus use the offshore waters and south shores of Barrow Strait, the west shores of Prince Regent Inlet and the Gulf of Boothia, or Peel Sound.

11.2.2.2 Seabirds and Seaducks

Several areas along the mainland coast host large numbers of breeding waterfowl, such as the Queen Maud Gulf Migratory Bird Sanctuary and the Kent Peninsula (Mallory and Fontaine 2004; Zinifex 2007; Dickson 2012b). The islands of the Arctic Archipelago also contain breeding and staging habitat for a large number of seabirds and seaducks. In particular, the coastal areas and islands within the vicinity of Barrow Strait/Lancaster Sound contain several well-known breeding colonies. The Barrow Strait/Lancaster Sound area supports large percentages of the Canadian Arctic population of thick-billed murre (27%), northern fulmar (57%), and black-legged kittiwake (35%; Mallory and Fontaine 2004).

Breeding areas for seabirds and seaducks that are adjacent to or near the commercial shipping route are mapped in Figures 11.2-3 and 11.2-4. Most of these areas are identified as Key Marine and Terrestrial Habitat Sites (KMHS and KMTS), or IBAs. Additional areas outside of the wildlife MRSA, such as northern Baffin Island and Devon Island, and their associated marine areas (e.g., Lancaster Sound) are identified as important nesting and foraging areas for a variety of seabirds including murres, gulls, and eiders (Mallory and Fontaine 2004). TK also identified a number of seabird and seaduck habitats within the MRSA (Banci and Spicker 2016).

Polynyas are habitats of particular importance for marine birds; polynyas are year-round ice-free areas. Many species that breed in the Arctic rely on polynyas to stopover and feed before moving to breeding grounds (Mallory and Fontaine 2004). Several polynyas occur in the Arctic, including the Lambert Channel Polynya in the Coronation Gulf which is a Key Marine Habitat Site (Environment Canada 2014), the Franklin Strait Polynya, the Bellot Strait Polynya in Peel Sound, and the Lancaster Sound Polynya between Baffin and Devon Islands which has also been identified as a Key Marine Habitat Site (Mallory and Fontaine 2004; Hannah, Dupont, and Dunphy 2009; Environment Canada 2014). The Lambert Channel polynya is a regular stopover point for a subspecies of common eider (Pacific common eider; *Somateria mollissima v-nigra*) that breed in the Bathurst Inlet and Elu Inlet Key Marine Habitat Site area (Dickson 2012b).

Figure 11.2-1
Migratory Routes and Main Summering Areas of Whales along the Commercial Shipping Route

Figure 11.2-2
Main Summering Areas of Seals, Walrus, and Polar Bears along the Commercial Shipping Route

Figure 11.2-3
Important Breeding and Staging Habitat for Seabirds and Seaducks along the Commercial Shipping Route – Southern, Arctic Mainland

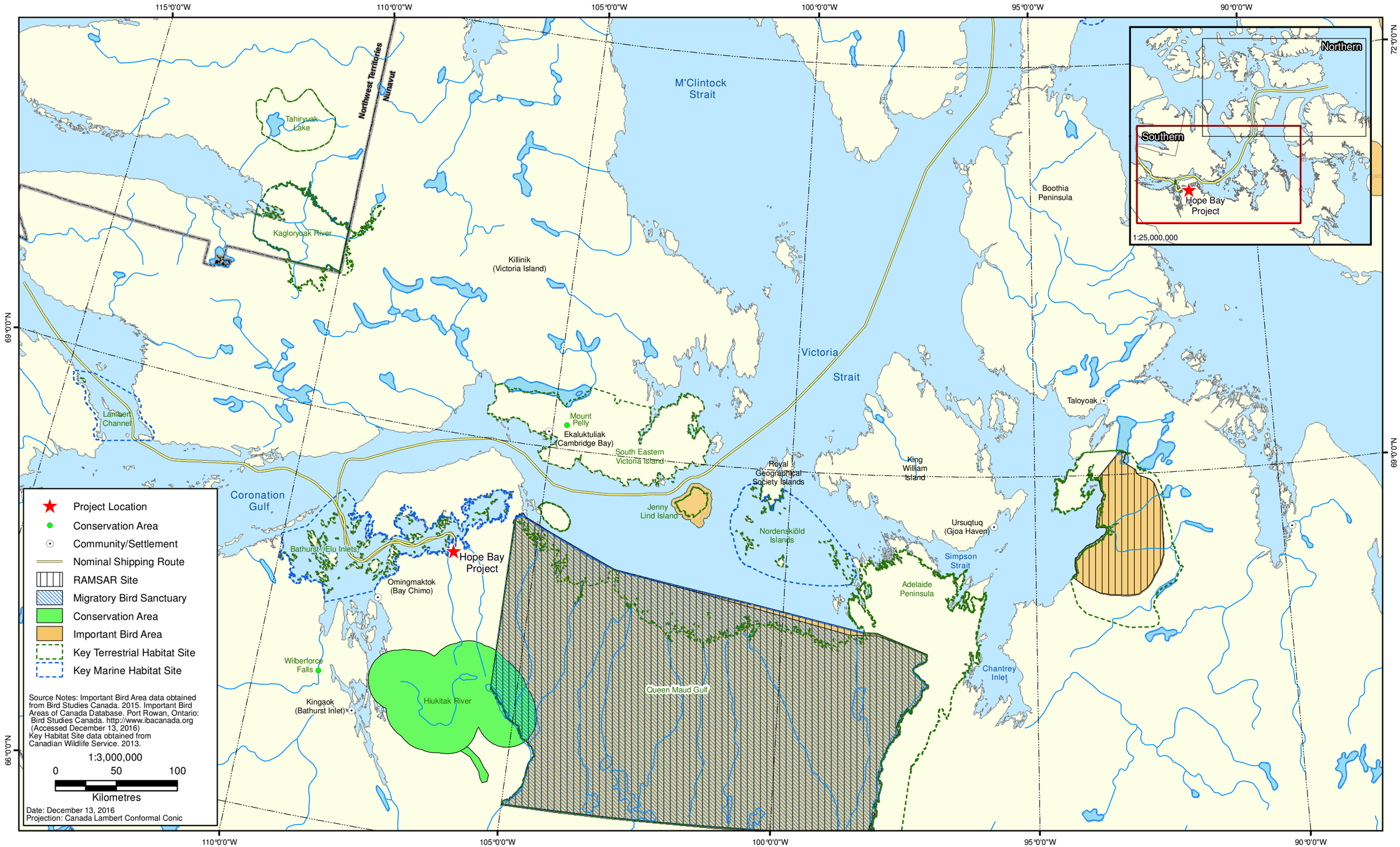


Figure 11.2-4
Important Breeding and Staging Habitat for Seabirds and Seaducks along the Commercial Shipping Route – Northern, Arctic Islands

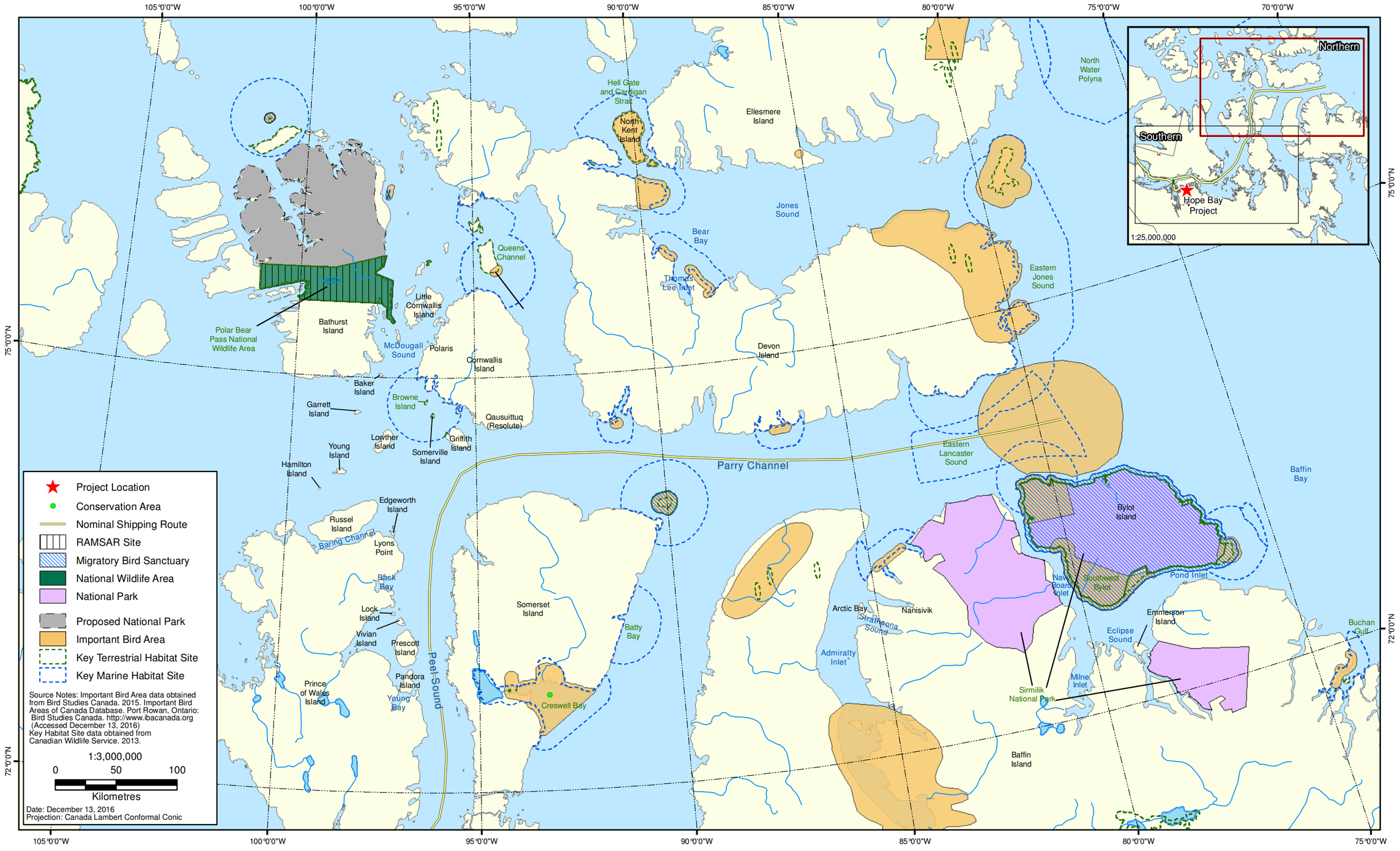


Table 11.2-1. Spatial and Temporal Distribution of Marine Mammals along the Commercial Shipping Route

Species	Overlap with Proposed Shipping Route in Nunavut	Typical Spatial Distribution[1]	Temporal Distribution	References
Main Species Occurring on the Proposed Shipping Route				
Ringed Seal	West and East	Arctic Archipelago	year-round	(McLaren 1958; Heide-Jørgensen, Stewart, and Leatherwood 1992; Harris et al. 1997; Harris et al. 1998; Kapel et al. 1998; Lawson and Moulton 1999; Teilmann, Born, and Acquarone 1999; Moulton and Lawson 2001; Moulton et al. 2002; Kelly et al. 2010)
Walrus	East	Lancaster Sound and Barrow Strait	Spring Migration: June – early-August	(Davis, Koski, and Finley 1978; Koski and Davis 1979; Koski 1980a, 1980b; Stewart 2008)
			Summer: August and September	(Johnson et al. 1976; Koski and Davis 1979)
			Fall Migration: end-September - October	(Koski 1980a)
		Baffin Bay	Wintering: late-October - June	(Riewe 1976; Davis, Koski, and Finley 1978; Kiliaan and Stirling 1978; Sjare and Stirling 1996) (Stewart 2008)
Narwhal	East	Lancaster Sound	Spring Migration: April – July	(Finley et al. 1990)
			Fall Migration: mid-September – early October	(Heide-Jørgensen, Dietz, et al. 2003)
		North of Baffin Island, Prince Regent Inlet, Somerset Island, Gulf of Boothia, Barrow Strait, and Peel Sound	Summer: August and September	(Finley and Johnston 1977; Fallis, Klenner, and Kemper 1983; Smith et al. 1985; Koski and Davis 1994; Richard et al. 1994; Heide-Jørgensen, Dietz, et al. 2003; Heide-Jørgensen, Richard, et al. 2003; Marcoux, Auger-Méthé, and Humphries 2009)
		Davis Strait and Baffin Bay	Winter: October - June	(McLaren and Davis 1982)
Beluga (Eastern High Arctic-Baffin Bay stock)	East	Lancaster Sound (April – July)	Spring Migration: late-April/early May – July	(Davis and Finley 1979; Finley and Renaud 1980; Koski, Davis, and Finley 2002)
			Fall Migration: early-September- November	(Richard et al. 2001; Heide-Jørgensen, Richard, et al. 2003)
		Barrow Strait, Peel Sound, Franklin Strait, Prince Regent Inlet, Somerset Island	Summer: mid-July – mid-August	(Finley 1976; Smith et al. 1985; Richard et al. 2001; Koski, Davis, and Finley 2002)
		Baffin Bay	Wintering: late-September – early-May	(Davis and Finley 1979; Finley and Renaud 1980; McLaren and Davis 1983; Heide-Jørgensen, Richard, et al. 2003)

Species	Overlap with Proposed Shipping Route in Nunavut	Typical Spatial Distribution[1]	Temporal Distribution	References
Beluga (Eastern Beaufort Sea Stock)	West	Beaufort Sea (western Chukchi Sea may be important fall migration destination)	Spring Migration: April - July	(COSEWIC 2004)
		Mackenzie Delta, Amundsen Gulf, Viscount Melville Sound	Summer: July and August	(Richard, Martin, and Orr 2001; COSEWIC 2004)
		Bering Sea	Winter: November - April	(Tynan, Ainley, and Stirling 2009)
Bowhead Whale (Davis Strait-Baffin Bay stock)	East	Lancaster Sound, Gulf of Boothia, Prince Regent Inlet	Spring Migration: early/mid-May – early-August Fall Migration: late-August - October	(Davis and Koski 1980; Reeves et al. 1983; Moore and Reeves 1993) (Koski and Davis 1980)
		Milne Inlet, and Admiralty Inlet (summer)	Summer: August and September	(Davis and Koski 1980; Koski and Davis 1980; Finley 1990, 2001)
		Hudson Strait, Baffin Bay	Wintering: October – May/June	(Koski, Heide-Jørgensen, and Laidre 2006)
Polar Bear	East	Northern Arctic Archipelago	Summer: August – September	(Amstrup et al. 2000)
		Ice-Covered Waters across Arctic Archipelago as far south as Larsen Sound	Winter: October – June/July	(LGL Limited 2005)
Other Species that May Occur on the Proposed Shipping Route				
Bearded Seal	West and East	Northern circumpolar	Year-round, moves with ice as ice retreats and reforms	(Fedoseev 1965; Johnson et al. 1966; Burns and Frost 1979; Burns 1981; Kelly 1988)
Harp Seal	East	Lancaster sound, Peel Sound	Spring Migration: July – late-August Fall Migration: late-September-early October	(Finley 1976; Koski and Davis 1980)
		Davis Strait, Baffin Bay, Lancaster Sound, Prince Regent Inlet, Barrow Strait, Peel Sound	Summer: late-August – late-September	(Johnson et al. 1976; Koski and Davis 1979; Fallis, Klenner, and Kemper 1983; Lavigne and Kovacs 1988)
		Labrador coast	Winter: October – mid-June/July	(Koski and Davis 1980)
Hooded Seal	East	Lancaster Sound, Baffin Bay, Davis Strait	Summer: August and September	(Sergeant 1976)
		Newfoundland/Labrador/ Davis Strait	Winter/Spring: late-September – late-July	(Sergeant 1976)
Killer Whale	East	Lancaster Sound, Prince Regent and Admiralty Inlets	Summer: mid-August – early-October, but rare	(Koski and Davis 1979; Baird 2001; Reeves et al. 2002)
		North Atlantic (open-water)	Winter: early-October through August	(Davis, Finley, and Richardson 1980)

[1] *Spatial Distribution only includes distribution of populations and areas with potential for overlap with the proposed shipping route.*

KMTS surrounding terrestrial breeding sites were delineated using a 15 or 30 km buffer from land, the buffered areas relating to the species occupying the terrestrial site and primary area in which that species forage while nesting and raising young (roughly from June through early August). For example, marine habitats extending 30 km from nesting sites were used for long ranging species such as thick-billed murre and black-legged kittiwakes, while 15 km buffers were used for species known to forage closer to nesting colonies, such as black guillemots and common eider (Mallory and Fontaine 2004). Some KMHSs were identified as important staging or moulting areas used on a regular basis during migration. These are sites which are integral to sustaining bird populations either during the pre-breeding spring migration (May and June) or post-breeding fall migration (August through October). For example, the Bathurst and Elu Inlet KMHS is important for moulting and staging purposes; male and female Pacific common eider use marine habitat in this area from July through early October. In addition, areas of national importance to migratory birds are designated as Migratory Bird Sanctuaries (MBS). MBS, and other areas with territorial or federal protection that are important to seabirds and seaducks, are shown on Figures 11.2-3 and 11.2-4. The approximate numbers of seabirds and seaducks using these KTHSs or IBAs and other known nesting areas during the breeding season are shown in Table 11.2-2.

Table 11.2-2. Breeding Areas for Seabirds and Seaducks along the Commercial Shipping Route in the Southern and Northern Arctic

Name	Designation[1]	Principle Nesters	Estimated Number of Birds[2]	Date of Estimate
Southern Arctic/Mainland				
Lambert Channel	KMHS, KTHS	Pacific Common Eider	Not available	
South Eastern Victoria Island	KTHS	Canada goose, King eider, Long-tailed duck	Not available	
Melbourne Island	KMHS, KTHS	Greater white-fronted goose, Snow Goose, Canada Goose	Not available	
Queen Maud Gulf	MBS, IBA, KTHS	Snow Goose, Ross's Goose, Cackling Goose, Brant, Greater White-fronted Goose, Tundra Swan, Common Eider, King Eider, Long-tailed duck, Northern Pintail, Sandhilll Crane	1,463,650	1990, 1998
Jenny Lind Island	IBA, KTHS	Snow Goose, Ross's Goose, Cackling Goose	20,500	1990, 1998
Nordenskiöld Islands[3]	KMHS, KTHS	Pacific Common Eider	11,500	1995
Northern Arctic/Arctic Islands				
Seymour Island	IBA, KMHS, KTHS	Ivory Gull*	110	2005
Cheyne Islands	IBA, KTHS	Ross's Gull*, Northern Common Eider, Arctic Tern	1,230	2002, 2006
Washington Point, Baillie-Hamilton Island	IBA, KTHS	Black-legged Kittiwake, Black Guillemot, Glaucous Gull	3,000	1975
Cornwallis Island	none	Ivory Gull*	3	2005
Browne Island	KTHS, KMHS	Black-legged Kittiwake	1,692	2003
Prince Leopold Island	MBS, IBA, KMHS, KTHS	Thick-billed Murre, Northern Fulmar, Black Guillemot, Black-legged Kittiwake, Brant, Common Eider, Parasitic Jaeger, Glaucous Gull	362,400	1977
Batty Bay	KTHS, KMHS	Black-legged Kittiwake	350	1974
Sydkap Ice Field	IBA, KMHS	Ivory Gull*	0**	2003

Name	Designation[1]	Principle Nesters	Estimated Number of Birds[2]	Date of Estimate
Northwestern Brodeur Peninsula	IBA,KTHS	Ivory Gull*	0**	2005
Cape Hay	MBS, IBA, KMHS	Thick-billed Murre, Black-legged Kittiwake	160,000	2000
Southwest Bylot Island	MBS, IBA, KTHS	Snow Goose, Long-tailed Duck, King Eider	156,000	1993
Cape Liddon	IBA, KMHS	Northern Fulmar, Black Guillemot	20,200	1977
Hobnose Inlet	IBA, KMHS	Northern Fulmar, Glaucous Gull, Thayer's Gull, Black Guillemot	50,000	1977
Berlinguet Inlet	IBA, KTHS	Snow Goose	14,700	1983
Baillarge Bay	IBA, KMHS, KTHS	Northern Fulmar	23,000	2002
Cambridge Point, Coburg Island	IBA, KTHS, National Wildlife Area	Black-legged Kittiwake, Thick-billed Murre, Northern Fulmar, Black Guillemot, Glaucous Gull, Common Eider, Atlantic Puffin	381,130	2000, 2004
Eastern Devon Island Nunataks	IBA, KTHS	Ivory Gull*	3	2005
Inglefield Mountains	IBA, KTHS	Ivory Gull*	200	2005
Cape Graham Moore	MBS, IBA, KMHS	Thick-billed Murre, Black-legged Kittiwake	33,000	2000

Notes:
[1] KMHS = Key Marine Habitat Site, KTHS = Key Terrestrial Habitat Site, IBA = Important Bird Area, MBS = Migratory Bird Sanctuary.
[2] Rounded to nearest 10.
[3] Some habitat sites polygons provided by CWS encompassed both terrestrial and marine habitat, where terrestrial habitats were generally clusters of small islands. In these cases, terrestrial habitat sites were mapped with ArcGIS around the outer edge of all islands within the boundaries of the polygon as per direction from the CWS.
** Species listed under Schedule 1 of SARA (2002).*
*** No ivory gulls were counted at the Sydkap Ice Field in 2003, but up to 300 individuals had been recorded in the area in the late 1980s. Similarly, no ivory gulls were counted on the Brodeur Peninsula in 2005; however, 54 individuals counted in 2004 (COSEWIC 2006).*
Sources: Mallory and Fontaine (2004), IBA (2012b), Latour et al. (2008), COSEWIC (2006), Raven and Dickson (2009), Environment Canada (unpublished data).

Several species of seabirds and seaducks in addition to those discussed in Section 11.2.7 occur along the commercial shipping route, including black-legged kittiwake (*Rissa tridactyla*), black guillemot (*Cepphus grille*), northern fulmar (*Fulmarus glacialis*), Ross's goose (*Chen rossii*), and thick-billed murre (*Uria lomvia*). Other species may also occur, though their presence would be infrequent. Some species may only use marine areas during one part of the open-water season (e.g., staging), and others occur in low numbers or have restricted breeding ranges in the Arctic. These species include Atlantic puffin (*Fratercula arctica*), dovekie (*Alle alle*), ivory gull (*Pagophila eburnean*), Ross's gull (*Rhodostethia rosea*), Sabine's gull (*Xema sabini*), and Thayer's gull (*Larus glaucoides*). Ivory and Ross's gulls have reached critically low population numbers in the Canadian Arctic. The *Species at Risk Act* (SARA) lists these two species on Schedule 1 as Endangered (ivory gull) and Threatened (Ross's gull; Government of Canada 2012).

There are several areas along the commercial shipping route where it is likely that vessels will pass in close proximity to breeding or staging areas used by a number of seabirds and seaducks. In part, the route itself will lessen the frequency of interactions, as ships pass well offshore or in mid-channel except

in Bathurst Inlet and Melville Sound, whereas many of the breeding or staging areas are located in marine habitats within 30 km from the shores of the mainland and Arctic Islands (Figures 11.2-3 and 11.2-4).

11.2.3 Regulatory Framework

Several federal regulations guide development where it pertains to marine wildlife and habitat protection. These include the:

- Canada *Fisheries Act* (1985);
- *Canada Migratory Birds Convention Act* (1994);
- *Nunavut Wildlife Act* (2003); and
- Canada *Species at Risk Act* (2002).

The following sections describe these acts, regulations, and guidelines and how they apply to the protection of marine wildlife and marine wildlife habitat.

11.2.3.1 Canada Fisheries Act

Marine mammals fall under the jurisdiction of the Department of Fisheries and Oceans Canada (DFO), and are protected under the federal *Fisheries Act* (1985). Although cetaceans and pinnipeds are mammals, their inclusion in this Act reflects the fact that they were once managed and harvested as "fish" stocks. Section 32 and 35(1) of the federal *Fisheries Act* protect marine mammals and their habitat from alteration, disruption, or destruction. Section 7 of the Marine Mammal Regulations protects marine mammals from being disturbed.

11.2.3.2 Migratory Birds Convention Act

Seabirds and seaducks, and their nests are protected by the federal Migratory Birds Convention Act (1994), which prohibits killing migratory birds and their eggs, taking their nests, and also prohibits the deposition of harmful substances in areas frequented by migratory birds (which include seabirds and seaducks).

11.2.3.3 Nunavut Wildlife Act

Wildlife in Nunavut, including marine wildlife are protected under the *Nunavut Wildlife Act* (2003). The Nunavut Wildlife Act identifies and defines wildlife management strategies for Nunavut, including strategies for conservation, protection and recovery of species at risk, managing nuisance wildlife, and possession of wildlife. The Act provides interpretation of approved and restricted hunting and related activities, including the possession of wildlife and enforcement that will follow should any of the Act's issued sections and corresponding regulations be contravened. The *Nunavut Wildlife Act* prohibits destruction of bird nests when these are being used for breeding by birds, as well as disturbance to a 'substantial number' of birds.

11.2.3.4 Canada Species at Risk Act

The federal *Species at Risk Act* (SARA; 2002) is designed to prevent Canadian indigenous species, subspecies, and distinct populations from becoming extirpated or extinct. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses and identifies species at risk. COSEWIC is designated under SARA to assess species according to their level of conservation concern: *extinct*, *extirpated*, *endangered*, *threatened*, *special concern*, *not at risk* or *data deficient*. Only those wildlife species listed in SARA Schedules qualify for legal protection and recovery under SARA. The Act prohibits the killing, harming, harassing, capturing or taking of an individual of a wildlife species that is listed in

Schedule 1 as *extirpated*, *endangered* or *threatened* by SARA (section 32(1)). SARA also protects the residence of species listed as *extirpated*, *endangered* or *threatened* from being damaged and destroyed as specified in Section 33.

11.2.4 Data Sources

Specific sources of baseline information on marine wildlife used in this Section include the following Hope Bay Development Project reports:

- *Hope Bay Belt Project: Marine Wildlife Report 2011* (Appendix V5-11A);
- *Inuit Traditional Knowledge for TMAC Resources Inc. Proposed Hope Bay Project, Naonaiyaotit Traditional Knowledge Project (NTKP)* (Banci and Spicker 2016);
- *Doris North Project: 2015 Wildlife Mitigation and Monitoring Plan Compliance Monitoring Report* (ERM 2016);
- *Doris North Project: 2014 Wildlife Mitigation and Monitoring Plan Compliance Monitoring Report* (ERM 2015a);
- *Doris North Project: 2013 Wildlife Compliance Monitoring Report (ERM Rescan 2014);*
- *Doris North Project: 2012 Wildlife Mitigation and Monitoring Program Report* (Rescan 2013b);
- *Doris North Project: 2011 Wildlife Mitigation and Monitoring Program Report* (Rescan 2011b);
- *Hope Bay Belt Project: Marine Wildlife Baseline Report 2011* (Rescan 2011d);
- *Doris North Gold Mine Project: 2010 Wildlife Mitigation and Monitoring Report* (Rescan 2011a);
- *Doris North Gold Mine Project: 2009 Wildlife Mitigation and Monitoring Report* (Rescan 2010);
- *Doris North Project: Wildlife Mitigation and Monitoring Program – 2008 Final Report* (Golder 2009);
- *Doris North Project: Wildlife Mitigation and Monitoring Program – 2007 Final Report* (Golder 2009); and
- *Doris North Project: Wildlife Mitigation and Monitoring Program – 2006 Final Report* (Golder 2007).

In addition to the baseline studies, publically available data from other nearby studies (e.g. Back River Project; Rescan 2013a; Sabina 2015a, 2015b) and that reported in the literature (e.g. Dickson 2012b; Environment Canada 2014) was used for comparison to data collected as part of the Hope Bay baseline and monitoring programs.

11.2.5 Methods

Baseline surveys were conducted in the MRSA to document the presence and distribution of marine species, including marine mammal and seabirds in relation to the Phase 2 Project and proposed Project activities (e.g., shipping) as well as to document spring migration crossing routes for Dolphin and Union caribou (discussed in Volume 4, Section 9.2). The collection of baseline data was limited to the MRSA. Shipping activities for the Phase 2 Project will occur outside of the MRSA, along the commercial shipping route. A discussion on the presence, distribution, and timing of marine wildlife (including marine mammals and seabirds), and important habitat areas along the commercial shipping route, is discussed in Section 11.2.2.1 and 11.2.2.2.

Within the MRSA, two survey methods were implemented for the documentation of marine mammals: An aerial survey was flown in the early spring of 2010 to document the presence and distribution of seals on the pack ice; and a vessel-based survey was conducted in late summer of 2010 to document the presence of larger marine mammals, such as belugas and seabirds.

Aerial surveys were also conducted between 2006 and 2015 during the early and late breeding period to document the presence and distribution of seabirds within marine areas surrounding the port site at Roberts Bay. Additional seabird-specific surveys were conducted in July and August of 2009 and 2010 to include greater coverage of the marine areas and islands surrounding the Roberts Bay port site. In addition of aerial and vessel-based surveys for seabirds in July of 2006, 2009, and 2010, ground-based seabird nest searches were conducted on small islands (less than 20 ha) to document the presence of common eider nest sites in the marine areas adjacent to and surrounding the Roberts Bay port site. Details on survey methods for marine wildlife species are discussed in the baseline data sections for each marine wildlife VEC.

11.2.6 Characterization of Baseline Conditions for Marine Mammals

Marine mammals that have the potential to occur in the MRSA include ringed seal (*Pusa hispida*), bearded seal (*Erignathus barbatus*), beluga whale (*Delphinapterus leucas*), narwhal (*Monodon monoceros*), bowhead whale, walrus and polar bear (Table 11.2-3). Polar bear and bowhead whale are listed on Schedule 1 of SARA. Ringed seals are designated as Not at Risk by COSEWIC (COSEWIC 2012). Ringed seals and bearded seals (at a lower abundance) occur regularly (Rescan 2011d). Beluga whales are infrequent summer visitors to Bathurst Inlet based on historical evidence (Stewart and Burt 1994; Priest and Usher 2004; NPC 2008), but were recently detected in 2011 (>100 individuals) in Melville Sound (Banci and Spicker 2016). Narwhal are observed infrequently in western Queen Maud Gulf as far east as Cambridge Bay (NPC 2008), but have recently been observed (in 2011) in Cambridge Bay when summer ice conditions were uncharacteristically open (Alex Buchan, pers. Comm. 2011) and on the northeast side of the Kent Peninsula near the Mac Alpine Islands in 2013 (Banci and Spicker 2016). Historically, narwhal have been hunted in Bathurst Inlet by Inuit (Banci and Spicker 2016). Traditional knowledge also indicates that bowhead whales were historically abundant in the MRSA, especially in the mouth of Bathurst Inlet and in 2011, a bowhead whale was observed off Cockburn Islands at the mouth of Melville Sound (Banci and Spicker 2016). Walrus (in the islands west of Umingmaktok) and polar bear (in the mouth of Bathurst Inlet) were also reported to be historically rare in the MRSA (Banci and Spicker 2016).

For the purpose of the environmental assessment, ringed seal is considered the representative species for marine mammals as it is more abundant relative to the bearded seal in the assessment area. Ringed seals were also identified as the most important marine mammal species to the local Inuit as they are hunted for food and their fur used for boot soles, kayaks and tents (Banci and Spicker 2016). Therefore, further details are provided for ringed seals.

11.2.6.1 Ringed Seal

Population Trends and Conservation

Ringed seals are the most abundant marine mammal in the Canadian Arctic. Population estimates are typically based on surveys of visible seals hauled-out on the ice in spring. Published estimates include:

- at least 40,000 ringed seals in the Canadian Beaufort Sea (Stirling, Kingsley, and Calvert 1981);
- 50,000 in northern Amundsen Gulf (Kingsley 1990), northwest of the Phase 2 Project;
- 49,000 in Prince Albert Sound, the south west inlet on Victoria Island in the Amundson Gulf (Kingsley 1990); and
- 90,000 in the Canadian High Arctic (Kingsley, Stirling, and Calvert 1985; Kingsley 1990).

Table 11.2-3. Marine Mammal Species Potentially Occurring in the Regional Study Area and their Regularity and Timing of Occurrence and Conservation Status

Common Name	Scientific Name	Regularity of Occurrence	Detected during Baseline Studies*	Timing of Occurrence	Conservation Status				
					NU Rank	COSEWIC	SARA	Global Rank	IUCN Red List
Ringed Seal	*Pusa hispida*	Regular	Y	Breeding	NA	NAR		G5	Least Concern
Bearded Seal	*Erignathus barbatus*	Regular	Y	Breeding	NA			G4G5	Least Concern
Beluga Whale (Eastern Beaufort Sea population)	*Delphinapterus leucas*	Rare	N	Summer Migrant	NA	NAR		G4TNR	Near Threatened
Narwhal	*Monodon monoceros*	Rare	N	Summer Migrant	NA	SC		G4	Near Threatened
Bowhead Whale (Bering-Chukchi-Beaufort population)	*Balaena mysticetus*	Historically Regular	N	Summer Migrant	NA	SC	Schedule 1	G3T3	Least Concern
Walrus	*Odobenus rosmarus*	Historically Rare	N	Migrant?	NA	SC		G4	Data Deficient
Polar Bear	*Ursus maritimus*	Historically Rare	N	Migrant	Sensitive	SC	Schedule 1	G3	Vulnerable

Large natural fluctuations in ringed seal numbers have been documented over short periods of time (Stirling, Archibald, and DeMaster 1977). For example, in 1974 to 1975, there was a marked decrease (50%) in the abundance and productivity of seals in the Canadian Beaufort Sea and Amundsen Gulf to the northwest of the Phase 2 Project (Stirling, Archibald, and DeMaster 1977; Smith and Stirling 1978). Stirling et al (1982) noted a doubling of the same population between 1974 and 1979. Another decrease in this same population was reported between 1982 and 1985 (Harwood and Stirling 1992). Unusual thick ice conditions were identified as a possible cause of the decrease in the seal population, while large-scale immigration was a factor attributed to the increase (Stirling, Kingsley, and Calvert 1982).

There are few population estimates in the literature based on open-water surveys, likely because ringed seals are only visible during aerial surveys over open-water in ideal conditions (e.g., low sea state, no forward glare). Densities estimated under such conditions are lower than those in spring, and highly variable. Estimated densities of ringed seals in the Beaufort Sea during the open-water season (late summer) were 0.42/km^2 in 1982, 0.15/km^2 in 1984, 0.08/km^2 in 1985, and 0.19/km^2 in 1986 (Harwood and Stirling 1992).

Baseline surveys to estimate ringed seal densities were conducted in Bathurst Inlet. Surveys conducted in late June of 2004 and 2007 during the moulting season (when seals were basking in the sun on the ice) provided an ringed seal density of 0.69/ km^2 in Coronation Gulf (LGL Limited 2005) and 0.3/km^2 in Bathurst Inlet (LGL Limited 2007). In 2012, and 2013, additional surveys were conducted in Bathurst Inlet during the moulting season in June and found a ring seal density of 0.5/km^2 (2.05/km^2 after correcting for observer bias) in 2012 and 1.2/km^2 in 2013 (Rescan 2013a; Sabina 2015a). These survey estimates are within the range of densities for ringed seals seen on the ice during studies in other areas in the Canadian and US Arctic (Table 11.2-4).

Table 11.2-4. Comparative Ringed Seal Densities on Ice from Other Studies in the Alaskan and Canadian Arctic

Year	Country	Location	*Number/km^2	Citation
1975	Canada	Central Arctic (early June)	1.32	Finley (1976)
1975	Canada	Central Arctic (late June)	0.67	Finley (1976)
1978	Canada	Baffin Island Fiords	1.72	Finley et al. (1983)
1979	Canada	Northwest Baffin Island	1.31	Finley et al. (1983)
1980, 1981	Canada	Central Arctic	0.27, 0.41	Kingsley et al. (1985)
1981 to 1983	Canada	Beaufort, Amundsen, Prince Albert Sound	0.06 to 0.41	Kingsley (1984)
1985 to 1999	US	North Slope, Alaska	0.58 to 1.67	Frost et al. (2002)
1997	Canada	Barrow Strait Fiords (Freemans Cove)	3.26 to 4.86	Finley (1979)
1997	Canada	Barrow Strait Fiords (Aston Bay)	0.98 to 10.44	Finley (1979)
1997 to 2002	US	Prudhoe Bay Area	0.39 to 0.83	Moulton et al. (2005)
2004	Canada	Coronation Gulf	0.69	LGL Ltd., (2005)
2007	Canada	Bathurst Inlet	0.30	LGL Ltd., (2007)
2012	Canada	Bathurst Inlet	0.5	Rescan (2013a)
2013	Canada	Bathurst Inlet	1.2	Sabina (2015a)

**Density not corrected for observer bias.*

Migration Patterns and Distribution

Ringed seals are year-round residents of the Arctic and are highly adapted for living in the winter fast-ice environment. Unlike other northern seals such as harp and hooded seals, the ringed seal is adapted to ice-covered waters and does not migrate to open-water areas in the winter (Siegstad et al. 1998). Ice conditions influence ringed seal distribution and abundance (Smith and Stirling 1975, 1978; Moulton et al. 2002). During winter and late spring (roughly November to mid-June), when virtually the entire Canadian Arctic Archipelago is ice-covered, only ringed seals and bearded seals could occur in Melville Sound, Bathurst Inlet, and the Coronation Gulf in fast-ice conditions. Ringed seals use the ice as a platform for building lairs to birth and raise pups, and during the spring to bask in the sun during the moulting period. Ringed seal movement during this time is usually relatively small (Kelly et al. 2010). Ice begins to break up in June (late spring), and the open-water period in Melville Sound, Bathurst Inlet, and Coronation Gulf usually lasts throughout July, August, and September or October. Ringed seals disperse during the open-water period and occur in lower abundance in the MRSA in Melville Sound, Bathurst Inlet and the Coronation Gulf relative to when these areas are covered in sea ice. TK indicates that ringed seals are common in the mouth of Bathurst Inlet, Melville Sound, and Elu Inlet during the spring and near coastal areas and islands during the winter (Banci and Spicker 2016).

Although not considered a migratory species, ringed seals are capable of moving distances of 1,000 km or more from their wintering grounds to summer habitat (Heide-Jørgensen, Stewart, and Leatherwood 1992; Kapel et al. 1998; Teilmann, Born, and Acquarone 1999). Summer movements of up to 1,800 km from winter to spring ranges have been recorded (Kelly et al. 2010). Site fidelity has also been documented in this species, with tagged seals returning to the same 1 to 2 km^2 areas during the winter months over multiple years (Teilmann, Born, and Acquarone 1999; Kelly et al. 2010).

During summer, ringed seals are distributed throughout open-water areas (Banci and Spicker 2016). Some disperse to offshore areas after the ice breaks up in summer (Heide-Jørgensen, Stewart, and Leatherwood 1992), while some move into coastal waters. Ringed seals encountered in the Alaskan Beaufort Sea during open-water seismic exploration were broadly dispersed as individuals or small groups (Harris et al. 1997; Harris et al. 1998; Lawson and Moulton 1999; Moulton and Lawson 2001; Moulton et al. 2002). It is unclear how far ringed seals disperse from their winter habitat in Melville Sound and Bathurst Inlet. Seals are hunted by boat in Bathurst Inlet during the summer months (Banci and Spicker 2016).

Information obtained from a recent satellite tagging study of ringed seals suggests winter habitat partitioning between adults and subadults in Alaska (Crawford et al. 2012). Crawford et al. (2012) reported that subadults traveled south to the ice edge during the late-fall and winter, returning north as ice receded in the spring; adult movements were more limited and farther from the ice edge. These data suggest that subadults, unhampered by breeding requirements for territory maintenance or pup rearing, may move to areas that afford better feeding opportunities, require less energetic costs, and limit predation exposure.

Habitat Use

Ringed seals use stable ice platforms for pupping and nursing (McLaren 1958, 1962; Smith and Stirling 1975; Finley et al. 1983; Kelly 1988). Ringed seals prefer to breed on ice that has frozen to coast lines (landfast ice) and extends from land into the sea (McLaren 1958; Kelly 1988), but they also breed on the pack ice (Finley et al. 1983; Kelly 1988). Lairs are constructed as early as mid-March (Smith, Hammill, and Taugbol 1991) below the snow on the ice often where snow accumulates, such as near pressure ridges (Chapskii 1940; McLaren 1958; Smith and Stirling 1975). Lairs are usually excavated above breathing holes to allow access to the sea while providing a stable platform with which the species may give birth, raise young, and rest, while being sheltered from winter and early spring

climate conditions, and predators. Ringed seal lairs have been observed in the MRSA, including the northern portion of Bathurst Inlet among the islands southwest of Umingmaktok and in areas north of Umingmaktok (Sabina 2015a).

Ringed seals also use the sea ice during the moulting period from approximately mid-May through mid-July, depending on the region and annual conditions, to haul-out on and rest (Vibe 1950; McLaren 1958; Smith 1973; Smith and Hammill 1981; Smith 1987; Kunnasranta et al. 2002). Ringed seals can spend more than 60% of their time on the ice in June when they are actively moulting (Kelly et al. 2010). Time spent on ice decreases (to approximately 30% in the Alaskan Beaufort Sea) into late June and July (Kelly et al. 2010) as the condition of ice deteriorates.

11.2.6.2 Baseline Data for Marine Mammals

Two of the four possible marine mammal species, ringed seal and bearded seal, were detected during the aerial and barge surveys conducted in 2010. Results of baseline surveys indicate that habitat within the wildlife marine LSA and RSA constitutes primarily spring moulting habitat for ringed seals. No lairs were observed during the spring seal aerial surveys and the density of all marine mammals was low during the open water season when the summer barge survey was conducted. Some foraging habitat is also available within the LSA and RSA during the open water season, as seals have been documented in these areas, albeit in low densities during that time.

Spring Seal Aerial Survey

A spring seal survey was conducted concurrently with the Dolphin and Union caribou ice crossing survey in June 2010 in the MRSA (Volume 4, Section 9, Section 9.2.5.2) (Figure 11.2-5). Surveys occurred on June 3, 4, and 5, 2010, and recorded 777 seals, including 87 bearded seals, 386 ringed seals, and 322 unknown seals (Rescan 2011d), and 129 open breathing holes (Figure 11.2-5). Of the seals that were observed, a total of 48 bearded, 210 ringed, and 41 unknown seals were observed on transect (Figure 11.2-5; Table 11.2-5). Of the breathing holes that were observed, 79 were observed on transect (Table 11.2-5). The remaining observations were recorded incidentally.

Table 11.2-5. Results of the Spring Seal Survey, 2010

Survey Area	Total Length of Transects Surveyed	Species									Breathing Hole	
		Bearded Seal			Ringed Seal			Unknown Seal				
		#	# / km^2 On	Inc.[1]	#	#/ km^2 On	Inc.[1]	#	#/ km^2 On	Inc.[1]	#	Inc.[1]
Melville Sound	423.3	28	0.07	11	93	0.22	21	10	0.02	56	54	3
Coronation Gulf	270	20	0.07	6	117	0.43	15	13	0.05	113	25	2
Transit to/ from Doris Site	-	0		22	0		122	0		112	0	45
Survey Total		**48**	**0.07**	**39**	**210**	**0.30**	**158**	**41**		**281**	**79**	**50**

[1] *Inc. = incidental observation (more than 500 m from the helicopter or during ferry flights) and not included in calculations.*

The density of seals in the survey area was 0.43/km^2; 0.30/km^2 for ringed seal and 0.07/km^2 for bearded seal. Ringed seal densities observed during this study were similar to that reported in a study in Bathurst inlet conducted in 2007 (LGL Limited 2007) and in 2012 and 2013 (Rescan 2013a) as well as

to those reported during other studies in the Central Arctic and Beaufort Sea (see Table 11.2-4). However, ringed seal densities were lower than those reported in studies conducted in Bathurst Inlet 2013 (Table 12.2-6; Sabina 2015a). Ringed seal density was greater in the Coronation Gulf relative to Melville Sound (Table 11.2-5).

Seals and breathing holes were more frequently observed in upper Bathurst Inlet and in the Coronation Gulf in comparison to areas within Melville Sound (Figure 11.2-5). The highest number of bearded seals per km was recorded on Transect CG3 in the Coronation Gulf (Figure 11.2-5). The highest number of ringed seals per km was also recorded in the Coronation Gulf along Transect CG1 (Figure 11.2-5). The relatively large number of seals of unknown species recorded during the spring seal survey results from seals frequently diving before positive species identification could be made. In addition, many seals were too far from the helicopter to enable positive species identification.

Spring seal surveys indicated that the majority of habitat within the marine wildlife RSA was suitable as moulting habitat for ringed and bearded seals. Only one unidentified seal was observed within the marine LSA; however, no transect lines overlapped with the marine wildlife LSA in Roberts Bay and all observations within the LSA were incidental. In addition, no lairs were documented within the marine wildlife RSA. However, lairs are difficult to detect during aerial surveys as they typically occur near pressure ridges (Chapskii 1940; McLaren 1958; Smith and Stirling 1975).

Summer Marine Mammal Barge Survey

A marine mammal survey was conducted aboard the “Sea Commander” barge on September 10 and 12, 2010, following a transect through the MRSA (Figure 11.2-6) from the Doris North Jetty in Roberts Bay to Cambridge Bay and back. Survey methodology was based on Kenyon (2009) with modifications in regards to survey distance based on Hyrenbach et al. (2007). For each marine mammal observation, the time, GPS location, distance and bearing, group size, species, certainty of identification, and activity (e.g., flying, feeding, resting) were recorded. Weather conditions such as precipitation, visibility, and sea state were recorded.

Few marine wildlife species were recorded during the barge surveys (Figure 12.2-10; Rescan 2011d); two ringed seals, one bearded seal, and one unknown seal (Figure 11.2-6). One ringed seal was recorded at the entrance of Roberts Bay while the other was recorded midway through Melville Sound (Figure 11.2-6). The bearded seal and the unknown seal were both observed at the entrance of Melville Sound (Figure 11.2-6).

Results of the marine barge survey indicate that ringed seals continue to use the marine LSA and RSA during the open water period, likely for foraging. Inuit TK has indicated observations of ringed seals in Bathurst Inlet and Melville Sound during the summer months and even observations of seals following fish up major river systems (Banci and Spicker 2016). Bearded seals are primarily benthic feeders and feed on a variety of small prey found along the ocean floor, including clams, squid and fish. Adults tend to feed in shallow coastal areas no more than 200 m deep (Burns and Frost 1983; Finley and Evans 1983), thus bearded seals are most abundant in areas where they can reach the bottom to feed.

11.2.6.3 Doris Project

Between 1996 and 2004, exploration occurred in the Hope Bay Belt. In 2005, the FEIS for the Doris Project was submitted and a certificate for a two year underground mine was issued in 2006 (Miramar 2005)(Miramar 2005). Construction of the Doris Project began in 2009, but was put into care and maintenance following changes in market conditions in 2010, and was re-opened for additional construction and resource exploration in 2015. To date, the Roberts Bay laydown has disturbed an area of marine beach of approximately 100 m in length, through the use of the area as a barge and boat landing.

Figure 11.2-5
Distribution of Seals and Breathing Holes Observed during Spring Seal Aerial Surveys, June 2010

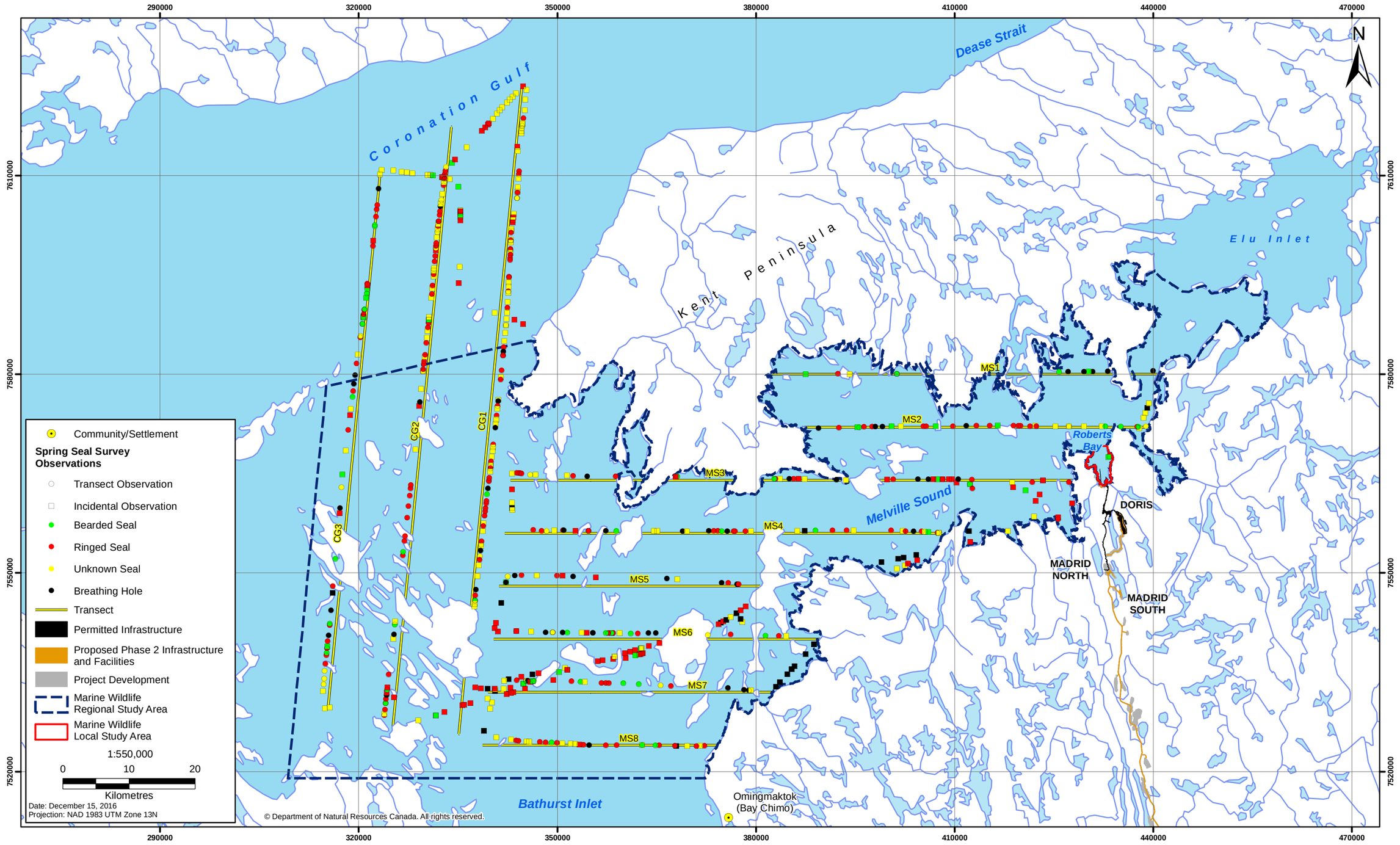
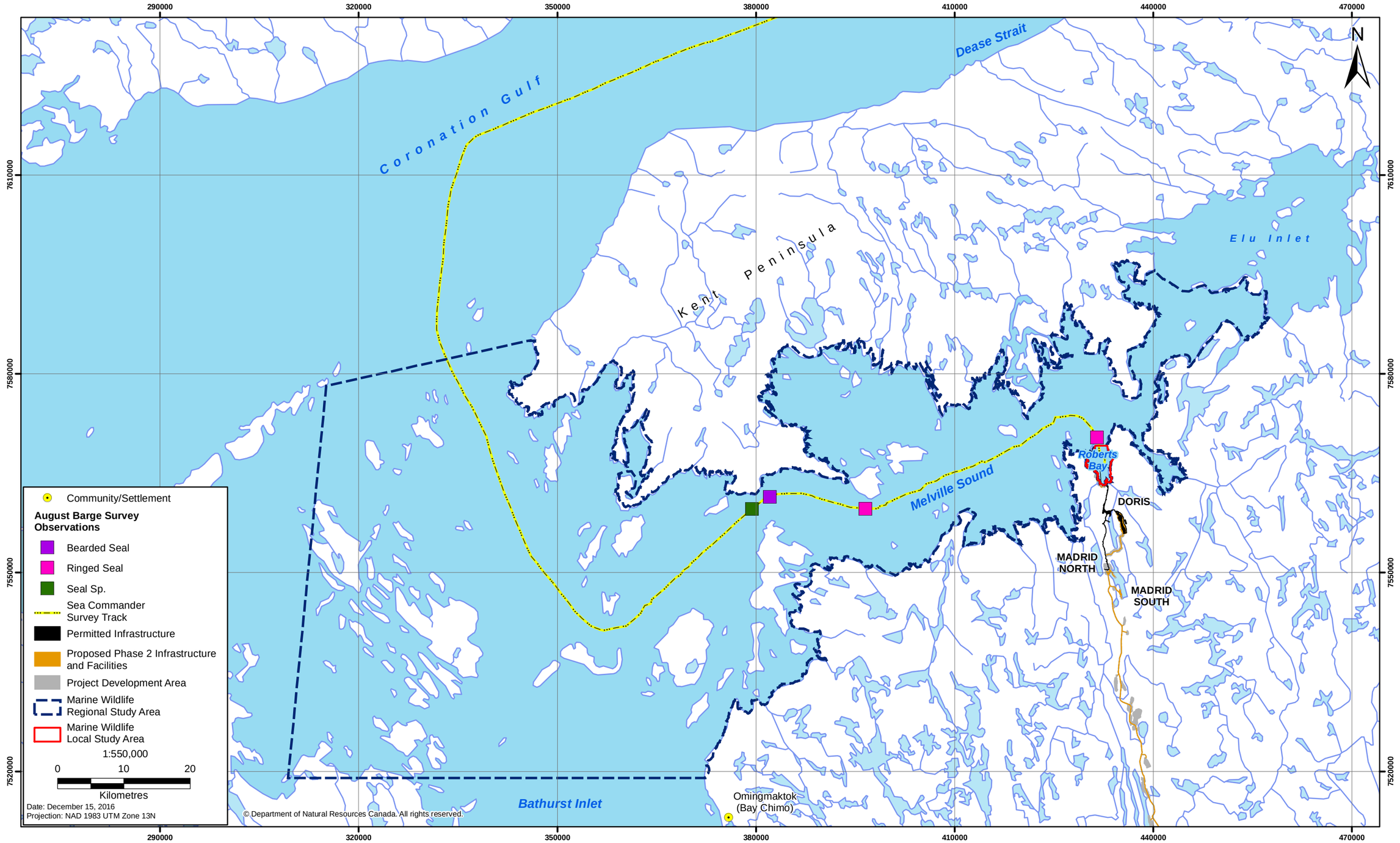


Figure 11.2-6
Marine Mammal Observations Recorded during the Barge Survey, September 2010



The Wildlife Mitigation and Monitoring Plan (WMMP) for the Doris Project included monitoring of marine mammals for potential incidents and mortality through incidental reporting. All project personnel are required to report any wildlife mortality and wildlife incidents to the Doris Project Environment and Social Responsibility (ESR) lead. During the nine years of WMMP program monitoring (2007 to 2016), there have been no reported mortalities of marine mammals due to the Doris Project.

There have been several wildlife incidents involving marine mammals, but none of these incidents resulted in injury or mortality to the animal. On July 22, 2010 a seal was found in a trap net deployed in Roberts Bay during marine fisheries surveys. The seal was able to move freely and breathe from the surface; when discovered, the trap net was cut open to release the seal. On three occasions during May 5 to 7, 2011, a hauled-out seal was moved from the Roberts Bay to Doris camp road and to open water. Land users on site speculated that the seal was using the road surface as a movement corridor to inland lakes or was curious about the Doris Project.

11.2.7 Characterization of Baseline Conditions for Marine Birds

For the purposes of this assessment, “marine birds” or “seabirds and seaducks” is used as a collective term to describe all migratory bird species that may use marine areas during any time of the year. As such, seabirds and seaducks encompass a very diverse group of avian species, from eider ducks and scoters that have a strong association with marine habitats through the breeding, staging, and migration periods, to geese, dabbling ducks, and other diving ducks that may only use marine habitats during the staging and migration periods. Several of the species in the latter category are also considered to be migratory waterbirds (Volume 4, Section 9), as they breed in terrestrial habitats rather than marine. The seabirds and seaducks assessment only considers potential effects of the Phase 2 Project to species using marine habitats for breeding and staging surrounding the Phase 2 Project.

Seabirds and seaducks, and their nests are protected by the federal *Migratory Birds Convention Act* (1994), which prohibits killing migratory birds and their eggs, taking their nests, and also prohibits the deposition of harmful substances in areas frequented by migratory birds (which include seabirds and seaducks). In addition, seabirds and seaducks in Nunavut are protected under the *Nunavut Wildlife Act* (2003), which prohibits destruction of bird nests when these are being used for breeding by birds, as well as disturbance to a ‘substantial number’ of birds, such as to flocks of birds that amass during the spring and fall staging periods.

A total of 26 species which use marine habitats have the potential to occur within the marine RSA (Table 11.2-6) including 5 species of geese and swans, 11 species of ducks and seaducks, 3 species of loons, and 7 species of gulls. Two species potentially occurring in the wildlife RSA are listed on Schedule 1 (Table 11.2-6) under the federal Species at Risk Act (SARA): Ross’s gull (*Mouette rosee*), listed as “Threatened” and Ivory gull (*Pagophila eburnean*), listed as “Endangered”. However, based on species ranges, both of these species are considered to have a rare occurrence in the RSA and are considered migrants.

Four Ross’s gull nesting locations of have been documented in Canada; three are in Nunavut (Cheyne Islands, and Penny Strait, both located north of the marine RSA, and Prince Charles Island in Foxe Basin, east of the marine RSA), and one located near Churchill, Manitoba (COSEWIC 2007). Ivory gull colonies are concentrated around Jones and Lancaster sounds on southeastern end of Ellesmere Island, eastern Devon Island, and the Brodeur Peninsula of northern Baffin Island (COSEWIC 2007), all located north of the marine RSA. However, some of these areas are located on the Northwest Passage shipping route that is currently used for the Hope Bay Project.

Table 11.2-6. Seabird Species Potentially Occurring in Marine Wildlife RSA and their Conservation Status

Common Name	Scientific Name	Regularity of Occurrence	Detected during Marine Baseline Studies*	Timing of Occurrence	Conservation Status				
					NU Rank	COSEWIC	SARA	Global Rank	IUCN Red List*
Geese and Swans									
Tundra Swan	*Cygnus columbianus*	Regular	Y	Breeding	Secure			G5	LC
Canada Goose	*Branta canadensis*	Regular	Y	Breeding	Secure			G5	LC
Greater White-fronted Goose	*Anser albifrons*	Regular	Y	Breeding	Secure			G5	LC
Brant	*Branta bernicla*	Regular	N	Migrant	Secure			G5	LC
Snow Goose	*Chen caerulescens*	Regular	N	Migrant	Secure			G5	LC
Loons									
Red-throated Loon	*Gavia stellata*	Regular	Y	Breeding	Secure			G5	LC
Pacific Loon	*Gavia pacifica*	Regular	Y	Breeding	Secure			G5	LC
Yellow-billed Loon	*Gavia adamsii*	Regular	Y	Breeding	Secure	NAR		G4	LC
Seaducks									
King Eider	*Somateria spectabilis*	Regular	Y	Breeding	Sensitive			G5	LC
Common Eider	*Somateria mollissima*	Regular	Y	Breeding	Sensitive			G5	NT
Surf Scoter	*Melanitta perspicillata*	Rare	Y	Migrant	Undetermined			G5	LC
White-winged Scoter	*Melanitta fusca*	Rare	Y	Migrant	Undetermined			G5	LC
Black (American) Scoter	*Melanitta nigra*	Rare	N	Migrant	Undetermined			G5	LC
Long-tailed Duck	*Clangula hyemalis*	Regular	Y	Breeding	Sensitive			G5	LC
Greater Scaup	*Aythya marila*	Regular	Y	Breeding	Secure			G5	LC
Northern Pintail	*Anas acuta*	Regular	Y	Breeding	Secure			G5	LC
Red-breasted Merganser	*Mergus serrator*	Regular	Y	Breeding	Secure			G5	LC
Thick-billed Murre	*Uria lomvia*	Rare	N	Migrant	May be at risk			G5	LC
Common Murre	*Uria aalge*	Rare	Y	Migrant	No Rank			G5	LC

Common Name	Scientific Name	Regularity of Occurrence	Detected during Marine Baseline Studies*	Timing of Occurrence	Conservation Status				
					NU Rank	COSEWIC	SARA	Global Rank	IUCN Red List*
Gulls and Terns									
Herring Gull	*Larus argentatus*	Regular	Y	Breeding	Secure			G5	LC
Glaucous Gull	*Larus hyperboreus*	Regular	Y	Breeding	Sensitive			G5	LC
Sabine's Gull	*Xema sabini*	Rare	N	Breeding	Secure			G5	LC
Thayer's Gull	*Larus thayeri*	Rare	N	Breeding	Sensitive			G5	LC
Arctic Tern	*Sterna paradisaea*	Regular	N	Breeding	Sensitive			G5	LC
Ross's Gull[1]	*Rhodostethia rosea*	Rare	N	Migrant	At Risk	Threatened	Schedule 1	G3G4	LC
Ivory Gull[1]	*Pagophila eburnean*	Rare	N	Migrant	At Risk	Endangered	Schedule 1	G5	NT

**LC = Least Concern; NT = Near Threatened.*

[1] The only known nesting colonies of Ross's and ivory gull are located over 800 km to the north of the Project in the Barrow Strait and Lancaster Sound area (Mallory and Fontaine 2004; COSEWIC 2006, 2007).

In addition to species listed under SARA, the following seabird and seaduck species are listed under the Canadian Endangered Species Conservation Council (CESCC) for Nunavut: Ross's gull and Ivory gull listed as "At Risk", thick-billed murre listed as "May be At Risk", and king eider, common eider, glaucous gull, Thayer's gull, and long-tailed duck listed as "Sensitive" (CESCC 2010). Species designated as "Sensitive" by CESCC rankings are species that may require special attention to prevent population declines (CESCC 2010). Of the species listed under the CESCC designations for Nunavut, the thick billed murre, king eider, common eider, glaucous gull and Thayer's gull breed in marine habitat. However, similar to Ross's gull and Ivory gull, based on the species range, the thick billed murre are considered to have a rare occurrence in the RSA and is considered a migrant in the area. Common eider (the Pacific common eider subspecies), glaucous gull and Thayer's gull have the potential to breed in the marine RSA. King eider, primarily breeds north west of the Phase 2 Project near Victoria and Banks Island (Dickson 2012a). The long-tailed duck is frequently observed in the marine habitat during staging periods, but commonly breeds in the terrestrial freshwater environment.

11.2.7.1 Marine Birds

Population Trends and Conservation

Regulatory organizations that track and assign conservation status based on population trends and other criteria for seabirds and seaducks include the North American Waterbird Conservation Plan (Kushlan et al. 2002), the North American Waterfowl Management Plan (North American Waterfowl Management Plan (NAWMP) 2004), and the Sea Duck Joint Venture Strategic Plan (Sea Duck Joint Venture Management Board 2008). This section focuses on the population trends and conservation of species of concern listed as sensitive in Nunavut that regularly occur within the RSA and nest in marine habitats (common eider, Thayer's gull, and glaucous gull).

Common eiders nesting in the western and central Arctic declined by more than 50% from 1976 to 1996, based on spring migration counts in Alaska (Goudie, Robertson, and Reed 2000; Suydam et al. 2000). More recent spring migration counts (2002 and 2003) suggest that common eider populations may be stabilizing and possibly rebounding (Suydam et al. 2009). However, the local population of Pacific common eider in Bathurst Inlet still seem to be experiencing a population decline. Between 1995 and 2008 the number of Pacific common eider breeding in Bathurst Inlet area declined by an additional 43 to 50% from almost 17,000 (Cornish and Dickson 1997) to less than 10,000 individuals (Raven and Dickson 2009).

The population status of Thayer's gull in Canada, is likely unchanged since the 1970s (Environment Canada 2011b). However, since Canada hosts a large percentage of the global breeding population of Thayer's gull (more than 80 % of global population) with approxiately 10,000 to 25, 000 breeding birds, the conservation of this species is of very high priority (Environment Canada 2011b).

The population status of glaucous gull in Canada has likely modelerately decreased in abundance since 1970 (Environment Canada 2011a). However, pouplation data from much of the species' range is lacking. The population estimate in Canada is approximately 25,000 to 50,000 breeding birds which constitues less than 20 % of the global population. Thus, while the population in Nunavut is considered sensitive (CESCC 2011), the conservation priority status in Canada is considered low (Environment Canada 2011a).

Many breeding areas and marine staging areas (used for moulting or foraging) are identified as Key Terrestrial Habitat Sites (KTHSs) and Key Marine Habitat Sites (KMHSs) for migratory birds by the Canadian Wildlife Service (Mallory and Fontaine 2004; Latour et al. 2008), or are designated as Important Bird Areas (IBAs) by partnership of conservation organizations including Bird Studies Canada, Nature Canada, and Birdlife International (IBA 2012b; Environment Canada 2014). The marine wildlife

RSA falls within the Bathurst Inlet and Elu Inlet KMHS. This area was designated as a KMHS as it hosts greater than 10% of the Canadian population of common eider and Thayer's gull which is greater than the percentage of 'sustainable loss' that the population of common eider can tolerate (estimated sustainable loss for common eider is 8 to 9% of the population; Environment Canada 2014).

Habitat Use

A variety of terrestrial and marine nesting and moulting habitat are used by various species of seabirds and seaducks. This section focuses on the habitat use of species of concern listed as sensitive in Nunavut that regularly occur within the RSA and nest in marine habitats (common eider, Thayer's gull, and glaucous gull).

Pacific common eider are predominately associated with marine habitats throughout the year, spending little more than a month in terrestrial areas to nest (Dickson 2012b). For Pacific common eider, small, coastal islands are important nesting habitat (Goudie, Robertson, and Reed 2000; Dickson 2012b). For the remainder of the year, which encompasses the annual migrations (including staging), moulting, and wintering periods, Pacific common eider are found in marine habitats. During these times, habitat use appears to be concentrated in productive habitats with access to food. For example, Dickson (2012b) suggests that moult sites for Pacific common eider are likely selected because they provide shelter, protection from predators, and an abundance of food required to replace flight feathers.

Thayer's and glaucous gulls utilize a variety of coastal terrestrial and marine environments across the year. Both species nest in coastal terrestrial environments; typical nesting habitats is tall, coastal cliffs (including those located on islands) and other areas of steep topography near coasts that provide protection from terrestrial predators (such as foxes; Snell 2002; Weiser and Gilchrist 2012). Nesting areas for both species are rarely located far inland; however, nesting habitats for glaucous gull have also been documented on islands of freshwater lakes, where they may find protection from predators (Weiser and Gilchrist 2012). Outside of the nesting season, Thayer's and glaucous gulls are dispersed across coastal and marine habitats used for feeding and resting. During migrations, glaucous gull travel along coastlines and are rarely recorded in offshore areas, whereas Thayer's gull may utilize both near shore and offshore environments during annual migrations (Snell 2002; Weiser and Gilchrist 2012).

Distribution and Migration

Seabirds and seaducks are generally present in the Arctic from May through October, with variation amongst species in the lengths of time spent on their breeding grounds along the coasts of the Arctic. The spring migration period spans from May through early June, while the fall migration period spans from August through October (Mallory and Fontaine 2004). Nesting is generally initiated by June and seabirds spend one to two months following nesting raising their young, after which they move to marine staging areas to moult and gain resources for the upcoming migration. This section outlines the distribution and migration patterns specific to species of conservation concern listed as sensitive in Nunavut that regularly occur within the RSA and nest in marine habitats (common eider, Thayer's gull, and glaucous gull).

The Bathurst Inlet and Elu Inlet KMHS, which overlaps with the marine RSA, and the associated KTHS that encompasses many of the island chains in northern Bathurst Inlet and Elu Inlet to the east, including small islands within Parry Bay and Melville Sound, are important breeding areas for Pacific common eider and for supporting colonies of other seabirds such as glaucous gulls and Thayer's gull (Hoover, Dickson, and Dufour 2010; Dickson 2012b).

The Pacific common eider in the marine RSA primarily belong to the Nauyak Lake nesting colony located just off of Parry Bay on the Kent Peninsula (Dickson 2012b). At least 9,000 individuals breed in

this area and the general area including Victoria Island, Bathurst Inlet, Elu Inlet, and the central Queen Maud Gulf support more than 80% of Canada's population of common eiders (Dickson et al. 2005). In addition to breeding, the islands in Parry Bay just south and west of the Nauyak Lake nesting colony, represent an important moulting location especially for female eiders with fewer females staging in Melville Sound, while males staged in Bathurst Inlet, Dolphin and Union Strait, Cape Parry and Cape Bathurst on the eastern portion of the fall migration route (Dickson 2012b). The timing of use and movements to and from these moulting and staging areas differs between males and females. Male common eider typically move from breeding areas to moult and stage for the fall migration in early July; moulting areas are utilized from mid-July through mid-October depending on location. Males that moult in Bathurst Inlet within the marine RSA use the area from late July through early October, after which they will depart to the west for wintering areas outside the marine RSA (Dickson 2012b). In contrast, females use habitats in Parry Bay and Melville Sound for moulting and staging from late July through mid- to late October (Dickson 2012b), departing to the west at a time when ice formation in marine habitats begins. Individuals breeding in the Nauyak Lake nesting colony typically return to marine habitat within the marine RSA in the spring in early June (Dickson 2012b), after which they return to terrestrial nesting areas.

Traditional Knowledge supports these observations on the distribution of eiders; Inuit have commented on the abundance of eider ducks in the Elu inlet area near the island chains at the mouth of Bathurst Inlet, where they hunt for eiders in the spring (Banci and Spicker 2016). Eiders are an important species to local Inuit, as they are hunted as a food source by coastal Inuit on islands within Melville Sound and Elu Inlet (Banci and Spicker 2016) in the marine RSA as well as on the Kent Peninsula (Banci and Spicker 2016).

There are no identified nesting colonies of Thayer's or glaucous gull within the marine RSA. These two species are thought to be relatively widely distributed in the marine RSA, utilizing suitable rocky and rugged coastlines for nesting and rearing of young from May to August. Of the two species, Thayer's gull appear to arrive to breeding sites earlier (early May) than glaucous gull (late May) (late May; Snell 2002; Weiser and Gilchrist 2012). Following the fledging of young in late August, Thayer's or glaucous gull begin their fall migration and move westward along the coasts toward wintering grounds in Alaska and off the West Coast (Snell 2002; Weiser and Gilchrist 2012).

11.2.7.2 Baseline Information on Seabirds and Seaducks

Baseline data collection for seabirds and seaducks in the RSA included:

- aerial surveys conducted in spring and summer from 2006 to 2015 for detection of waterbirds on coastal transects in the Roberts Bay survey block and Doris North Survey block;
- dedicated seabird surveys conducted in July and August of 2009 and 2010 in a survey block covering Hope Bay, Roberts Bay and Reference;
- seabird Barge survey conducted in September 2010 in Melville Sound, upper Bathurst Inlet, and the Coronation Gulf; and
- seabird nest surveys conducted in 2006, 2009 and 2010 on small islands (<20 ha) within and surrounding Reference Bay, Roberts Bay, and Hope Bay.

Of the species with potential to occur in the marine RSA, a total of 17 species have been observed from 2006 to 2015 within the RSA including four species listed as sensitive in Nunavut (king and common eider, glaucous gull, and long-tailed duck; Table 11.2-6). The following assessment includes those species that have been documented in marine habitats during surveys conducted for the Phase 2 Project within the marine wildlife RSA (Section 11.2.7.5). Potential effects to this species group will

vary temporally as fewer species are expected to use marine habitats during the nesting and brood-rearing period as compared to migration periods. Additional seabird and seaduck species occur outside of the marine wildlife RSA; these species are not considered within the effects assessment but are summarized in Section 11.2.1.

Aerial Surveys over Marine Areas

Pair and Brood Coastal Surveys

Aerial surveys for waterbirds and seabirds were conducted between 2006 and 2015. Surveys were conducted in early and late summer during all years between 2006 and 2015 (Table 11.2-7). These surveys were conducted as part of the waterbird pair (late-June/early-July) and brood (late-July/early-August) surveys flown over the Roberts Bay and the Doris survey blocks (Volume 4, Section 9, Section 9.2.5.8). Transects within each of these survey blocks were 16 km long oriented in an east-west direction, and spaced 2 km apart. Each survey block contained six transects. However, only transects that covered marine areas were considered for the seabird data summary. This included five transects from the Roberts Block (R2 to R6) and three transects from the Doris Block (D6 to D8).

Table 11.2-7. Survey Timing of Pair and Brood Surveys, 2006 to 2015

Year	Pair Survey	Brood Survey
2006	June 21 to 28	August 9
2007	June 27	August 6
2008	July 5	July 29 and 30
2009	July 7	July 27 and 28
2010	July 6	July 27 and 28
2011	July 7	July 27 and July 28
2012	June 22	August 4
2013	June 12 to 22	August 4 and 5
2014	June 21	July 27 and 28
2015	June 24 and 25	August 4 and 5

Transects were flown by helicopter, flying an average of 80 to 100 km/h at 45 m altitude. Surveyors recorded waterfowl within 400 m on either side of the aircraft, yielding an 800 m-wide belt transect during the pair surveys and within 200 m on either side of the aircraft, yielding a 400 m-wide belt transect during the brood surveys. Waterbirds observed over terrestrial habitat on these transects were also removed from the data summary. Marine bird data reported in Section 11.2.7.5 includes only observations that were observed in marine habitat or the shoreline of the coastal mainland defined by a 100 m buffer inland from the shore. Waterbird data reported on marine islands were included as marine observations and reported in this Section. Observations of waterbirds during surveys conducted between 2006 and 2015, occurring in terrestrial habitat, are summarized in the Terrestrial Wildlife Section (Volume 4, Section 9, Section 9.2.11.5).

Overall, a total of 369 waterbirds were observed in marine habitats during the waterbird surveys conducted between 2006 and 2015. A greater number of seabirds and seaducks were detected in marine habitat during the brood surveys (231 individuals) relative to pair surveys (138 individuals). Glaucous gulls were the most commonly detected species during surveys accounting for a little over a quarter of the seabirds and seaducks detected (97 individuals), followed by red-breasted mergansers (54 individuals), Pacific loons (38 individuals), herring gulls (29) and common eiders (22 individuals) (Figure 11.2-7). An additional 12 eider were detected that could not be identified to species and were

most likely common eider. Waterbirds were most abundant during surveys conducted in 2010, and species richness was also highest during this year (Figure 11.2-8).

During the pair surveys, conducted in late June early July between 2006 and 2015, a total of 138 waterbirds were observed in marine habitats. The most commonly detected species were Pacific loon (24 individuals), glaucous gull (17 individuals), common eider (13 individuals), long-tailed duck (12 individuals), and red-breasted merganser (11 individuals) and (Figure 11.2-7). The total number of seabirds and seaducks detected in marine habitat, were highest in 2010 (37 birds) and lowest in 2007 with no birds detected in the marine RSA during the pair survey (Figure 11.2-8). Species richness was highest in 2010 and 2015 with 11 species detected during pair surveys and lowest in 2007 with no species detected in marine habitats (Figure 11.2-8).

During the brood surveys conducted in late-July early August between 2006 and 2015, a total of 231 waterbirds were detected in marine habitats. The most commonly detected species were glaucous gull (80 individuals), red-breasted merganser (43 individuals), herring gull (24 individuals), Pacific loon (14 individuals), and Canada goose (12 individuals; Figure 11.2-7). A large number of eider were also detected (19 individuals), although approximately half (10 individuals) could not be identified to species. Total number of seabirds and seaducks detected in marine habitat within the survey area, were highest in 2010 (51 birds) and lowest in 2007 when no birds were detected (Figure 11.2-8). Across brood surveys, species richness was highest in 2010 with a total of 11 species detected and lowest in 2007 when no species were detected in marine habitats (Figure 11.2-8).

Dedicated Seabird Surveys

In 2009 and 2010, seabird specific surveys were conducted in the marine areas surrounding Hope Bay, Roberts Bay and Reference Bay. Marine transects from the northern survey block (Roberts Bay Block) and the northern three transects (D6, D7, and D8) of the Doris Block used for waterbird surveys were extended to the west to include greater coverage of the marine areas and islands in Hope Bay (Figure 11.2-7). In addition, two additional transects were added to the north side of the Roberts Bay Block (Figure 11.2-7) to include greater coverage of Reference Bay as well as a part of Melville Sound at the entrances of Hope Bay, Roberts Bay and Reference Bay (Rescan 2010, 2011a).

Overall, the dedicated seabird survey block contained 11 transects spaced 2 km apart running in an east-west direction. The eight northern-most transects were 23 km long while the three southern transects designed to survey lower Hope Bay were 17.5 km long. Surveys were carried out using a helicopter travelling at a speed of 80 to 100 km/h and from an altitude of 45 m, with observers recording seabirds within 200 m on either side of the aircraft for a transect width of 400 m. Although land-based birds were counted while travelling over the terrestrial habitat, results herein only consider seabird observations made in the marine environment. The total survey area for each inlet and its overall coverage with respect to the entire survey block is shown in Table 11.2-8.

Table 11.2-8. Transect Characteristics of Dedicated Seabird Surveys in 2009 and 2010

Basin	Area[1] (km^2)	Transect Length[2] (km)	Transect Area[3] (km^2)	Transect Coverage (%)
Roberts Bay	39.8	32.7	13.1	32.9
Hope Bay	80.5	45.4	18.2	22.6
Reference Bay	57.2	23.5	9.4	16.4

[1] Total survey area for each inlet.
[2] Total added length of transects within each survey area.
[3] Total Area surveyed within each survey area based on observation of seabirds 200 m on either side of the transects.

Figure 11.2-7

Seabird Species Abundance during Pair and Brood Waterbird Surveys, 2006 to 2015

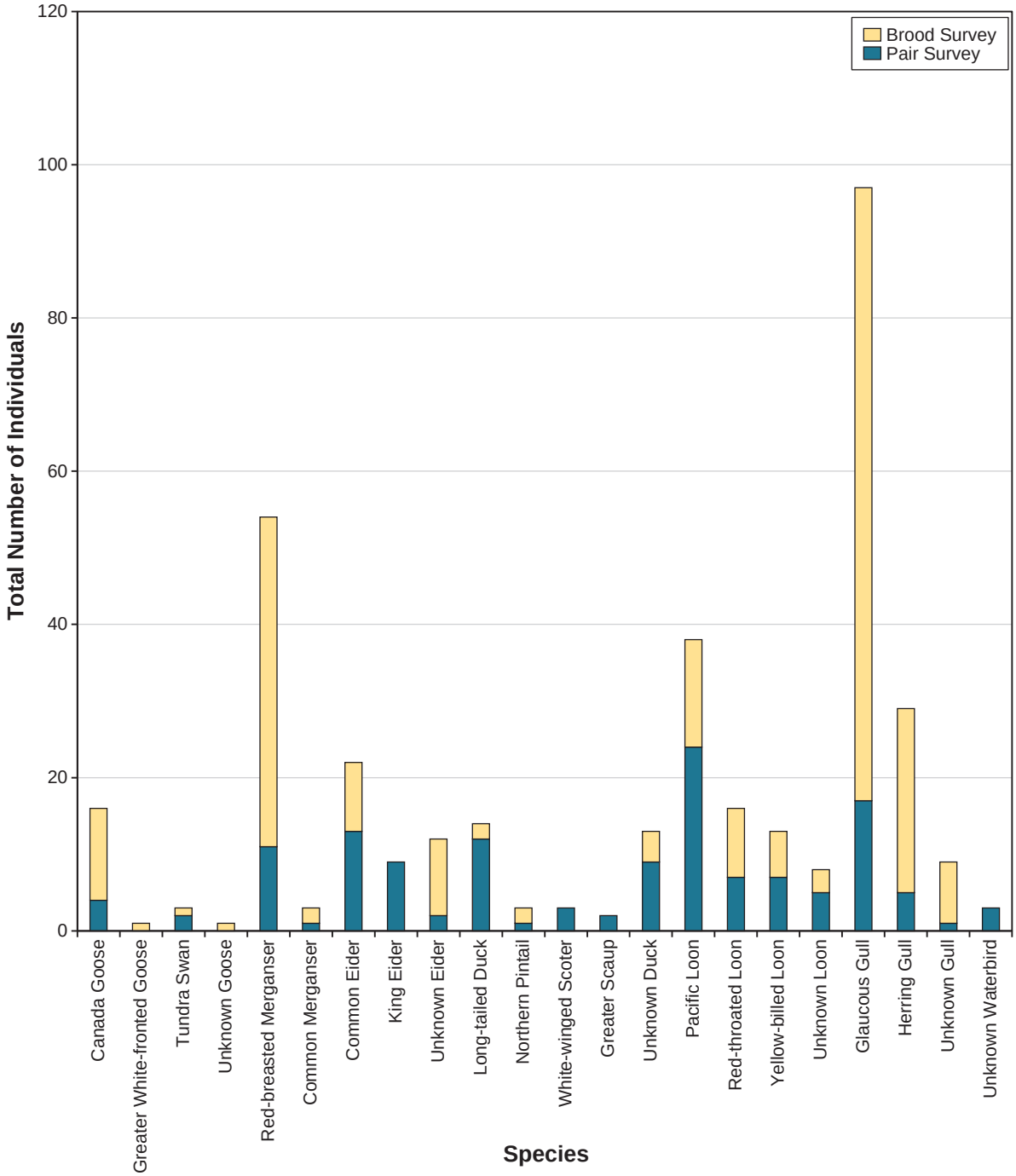
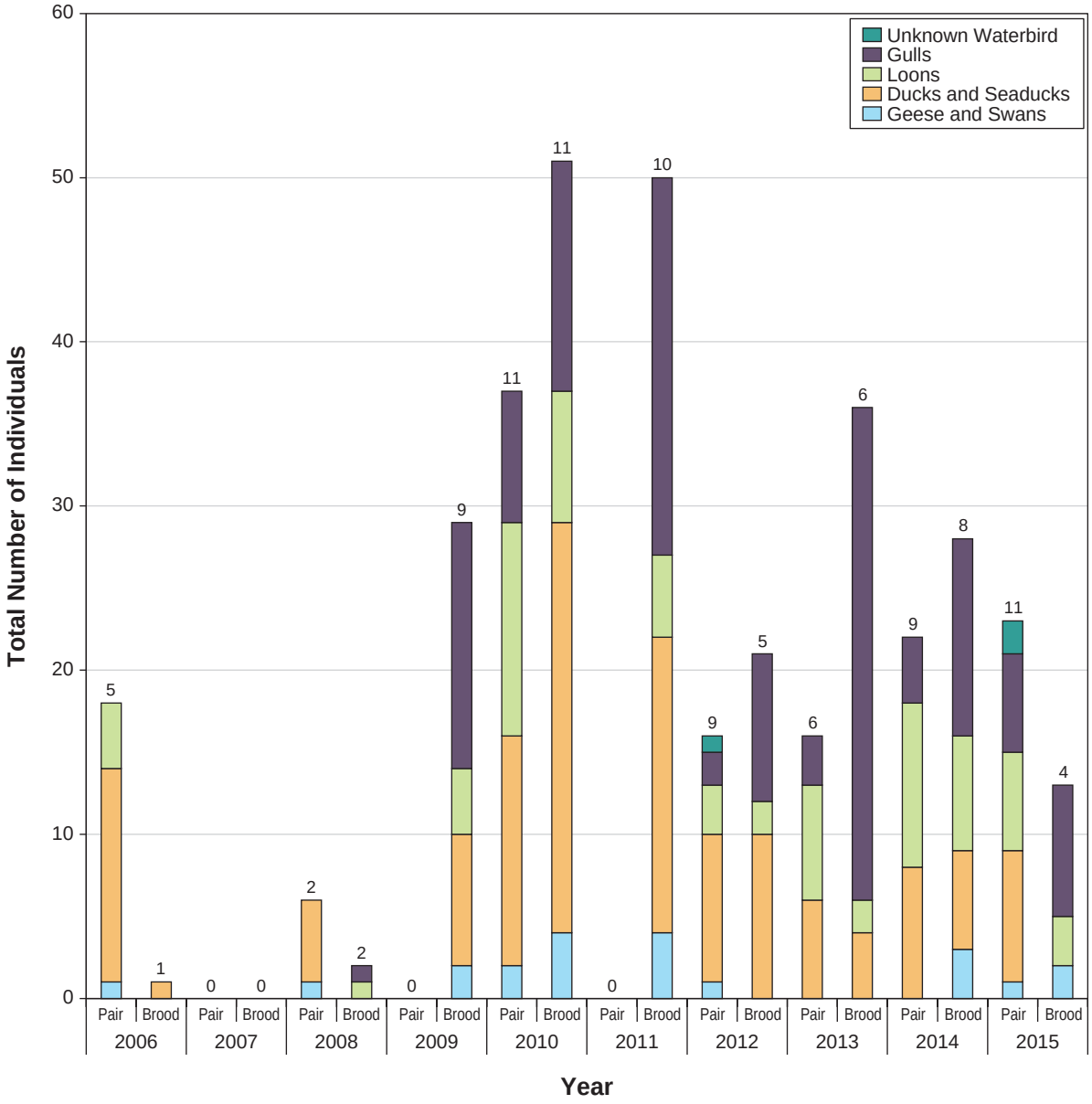


Figure 11.2-8

Annual and Seasonal Variation in Seabird Abundance and Species Richness, 2006 to 2015



Surveys were timed to coincide with two important periods: the northern migration/establishment of nesting territories in July (early summer) and the brood rearing/fall staging period in August (late summer). In 2009, one survey was conducted during the early summer period on July 13, and five surveys were conducted during the late summer period on August 15, 18, 21, 22, and 23. In 2010, three surveys were conducted during the early summer period on July 10, 11, and 28, and four surveys were conducted during the late summer period on August 14, 17, 21, and 24.

During the early summer seabird survey conducted in 2009, ten species of seabirds totalling 246 individuals were observed (Table 11.2-9). The most abundant seabirds were: long-tailed ducks (85 individuals), Pacific loons (56 individuals), common eiders (44 individuals), and red-breasted mergansers (26 individuals; Table 11.2-9). The majority of these seabirds were observed in close proximity to islands or the mainland. In 2010, eight species of seabirds totalling 346 individuals were observed (Table 11.2-9). The most abundant species observed during these surveys were: herring gull (94 individuals), red-breasted merganser (78 individuals), glaucous gull (56 individuals), common eider (42 individuals), and Pacific loon (36 individuals; Table 11.2-9). While a greater total number of individuals were observed during the 2010 surveys relative to 2009, the average number of birds per survey was higher (1.5 times higher; Table 11.2-9) in 2009 as the average number of birds detected during the surveys conducted in 2010 was 108 ± 27.4.

During the late summer seabird survey conducted in 2009, a total of 10 species (average of 5.8 species per survey) totalling 367 individuals (average of 73.4 individuals per survey) were detected (Table 11.2-9). The most abundant species observed were: Pacific loon (117 individuals), red-breasted merganser (82 individuals), glaucous gull (50 individuals), long-tailed duck (34 individuals) and common eider (27 individuals; Table 11.2-9). In 2010, a total of eight species (average of 7.3 species per survey) totalling 624 individuals (average of 156 individuals per survey) were detected (Table 11.2-9). The most abundant species observed were: herring gull (222 individuals), glaucous gull (125 individuals), red-breasted merganser (125 individuals), common eider (106 individuals) and Pacific loon (31 individuals). No broods were observed during any of the surveys conducted in either 2009 or 2010.

During both years of dedicated seabird surveys, temporal and spatial differences were observed in seabird observations. During the early summer surveys, Roberts Bay had the highest abundance of waterbirds relative to Hope Bay and Roberts Bay, and abundance was greater in 2009 relative to 2010 (Table 11.2-9). During the late summer surveys, abundance was highest in Reference Bay in 2009 (30.8 ± 15.7) and Hope Bay in 2010 (110 ± 15.4) and overall abundance was greater in 2010 (156 ± 23.1) relative to 2009 (69.4 ± 26.4). The total number of birds in Hope Bay ranged from 72 to 208 in July, and from 138 to 440 in August. In Reference Bay, the number of individual birds ranged from 41 to 71 in July and from 150 to 154 in August. Roberts Bay had the most variable number of birds recorded: from 45 to 133 in July and from 34 to 75 in August.

In 2010, mean species richness was consistently highest in Hope Bay (5.7 ± 0.7 in July and 5.3 ± 0.8 in August); species richness was more variable at Reference Bay (3.0 ± 0.6 in July and 5.0 ± 0.7 in August), and Roberts Bay (6.0 ± 0.8 in July and 3.3 ± 1.0 in August). The numbers of species observed in each inlet in August, 2010 are similar to those recorded in August, 2009. However, in July 2009, both the average number of birds recorded per survey and richness of Roberts Bay was higher than those recorded in either Reference Bay or Hope Bay.

Flocks of Seabirds Observed During Aerial Surveys

During both the pair and brood coastal surveys and the dedicated seabird surveys, flocks of seabirds were mapped within the RSA to identify potential staging areas used by seabirds during the summer months (Figure 11.2-5). Flock of seabirds were identified as groups of birds consisting of greater than

10 individuals, and categorized as small sized flocks (11 – 24 individuals), medium sized flocks (25 – 49 individuals), medium-large sized flocks (50 – 100 individuals) and large sized flocks (> 100 individuals).

The majority (94%, n=64) of flocks observed (n=68) consisted of small flocks (11 to 24 birds) and medium flocks (25 to 49 birds). Larger flocks of birds (>50 individuals) were rarely observed during surveys conducted within the marine RSA, accounting for only 6% of the flocks observed. Large flocks that were observed consisted of a flock of long-tailed duck (85 individuals) observed in mid-July of 2009 off the northern tip of the peninsula separating Hope Bay and Roberts Bay, a flock of herring gulls (50 individuals) observed in both mid-July and mid-August of 2010 off an island north of Hope Bay and a flock of common eider (172 individuals) observed in late June of 2014 in a small patch of open water on the northern tip of the peninsula separating Hope Bay and Roberts Bay (Figure 11.2-9). In general, flocks of seabirds were concentrated around the shoreline and islands within the marine RSA.

Summer Seabird Barge Survey

A seabird barge survey was conducted in conjunction with the summer marine mammal survey aboard the *Sea Commander* vessel from September 10 to 12, 2010 (see Section 11.2.6.5 for survey details). Surveys were conducted on a barge following a single transect in the marine wildlife RSA (Figure 11.2-10).

During the barge survey, relatively few seabird and seaduck species were observed in the water (Figure 11.2-10). Two seabird species were recorded in the water during the summer seabird barge survey in September 2010; common murres and Pacific loons along with one seaduck; long-tailed duck (Figure 11.2-10). In addition, unknown loons and unknown gulls were observed. These unknown birds could belong to the several gull and loon species known to occur in the area.

Two common murres were observed near the narrow entrance into Melville Sound (Figure 11.2-10). Two Pacific loons were observed in the same general area as the common murres. A third Pacific loon was observed in upper Bathurst Inlet, along with the unknown species of gulls (Figure 11.2-10). Additional seabirds including common murre, Pacific loon, Thayer's Gull, glaucous gull and unidentified species of loon and gulls were observed flying in the RSA during the survey.

Seabird Nest Surveys

Ground-based searches for nesting seabirds were conducted in July 2006, July 2009, and July 2010 on islands smaller than 20 ha (Golder 2007; Rescan 2010, 2011a). Past surveys conducted in the region reported that common eider nest colonies with the greatest number of nests occurred on small islands less than 5 ha in size (Cornish and Dickson 1997). Thus, islands less than 20 ha were determined to have the greatest potential for supporting eider nests. A total of 13 islands were surveyed in 2006; 12 in Hope Bay and 1 in Roberts Bay. In 2009 and 2010, all three inlets were surveyed. Out of a possible 91 islands under 20 ha in size in the inlets, 41 and 87 islands were surveyed in 2009 and 2010, respectively. A map of the islands in the Phase 2 Project area is presented in Figure 11.2-11.

In 2006, two people spaced approximately 10 m apart systematically searched the entire area of each island and recorded nests, species, and clutch size. During the 2009 and 2010 surveys, all islands were accessed by helicopter from July 10 to July 15 (2009) and July 19 to July 23 (2010), except when the topography or small size of the island prevented a safe landing. When safe landing was possible, two or three people spaced approximately 20 m apart walked transects until the entire island was covered. A final transect of the perimeter of each surveyed island was also conducted and all vegetation patches were thoroughly examined. All nests, species, and clutch sizes were noted and additional incidental observations of birds in flight or on the water were also recorded. When landing was not possible, the perimeter of the island was circled by helicopter and seabird observations were recorded.

Table 11.2-9. Marine Bird Abundance and Species Richness during Seabird Bird Surveys, 2009 to 2010

Species	July 2009[1]				August 2009[1]				July 2010[1]				August 2010[1]			
	Hope Bay	Reference Bay	Roberts Bay	Total	Hope Bay	Reference Bay	Roberts Bay	Total	Hope Bay	Reference Bay	Roberts Bay	Total	Hope Bay	Reference Bay	Roberts Bay	Total
Geese and Swans																
Canada Goose	0	0	0	0	0	0	18	18	0	0	0	0	0	0	0	0
Tundra Swan	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0
Diving Ducks																
Common Eider	39	0	5	44	8	11	8	27	32	9	1	42	70	31	5	106
King Eider	0	0	0	0	0	0	0	0	8	0	0	8	0	3	0	3
Greater Scaup	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0
Long-tailed Duck	0	0	85	85	4	30	0	34	0	0	0	0	0	0	0	0
Red-breasted Merganser	16	8	2	26	61	17	4	82	34	17	27	78	80	42	3	125
White-winged Scoter	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Loons																
Pacific Loon	13	24	19	56	27	64	26	117	21	7	8	36	11	17	3	31
Red-throated Loon	0	0	1	1	3	0	0	3	2	2	0	4	5	0	2	7
Yellow-billed Loon	0	2	0	2	1	2	3	6	0	6	0	6	2	2	1	5
Gulls																
Glaucous Gull	1	1	12	14	18	21	11	50	20	28	8	56	82	36	7	125
Herring Gull	0	5	5	10	7	9	3	19	91	2	1	94	190	19	13	222
Unidentified Waterbird	2	1	1	4	9	0	0	9	0	0	0	0	0	0	0	0
Total Birds	72	41	133	246	138	154	75	367	208	71	45	324	440	150	34	624
Avg. # Birds / survey	72.0	41.0	133.0	246.0	27.6 ± 8.1	30.8 ± 15.7	11.4 ± 3.0	69.4 ± 26.4	69.3 ± 16.8	23.7 ± 3.5	15.0 ± 7.2	108.0 ± 27.4	110.0 ± 15.4	37.5 ± 14.5	8.5 ± 3.5	156.0 ± 23.1
Species Richness	5	5	8	10	8	7	8	10	7	7	5	8	7	7	7	8
Avg. Species Richness	5	5	8	10	4.6 ± 0.4	3.6 ± 1.0	2.8 ± 0.6	5.6 ± 0.7	5.7 ± 0.7	3.0 ± 0.6	6 ± 0.8	3.5 ± 0.4	5.3 ± 0.8	5.0 ± 0.7	3.3 ± 1.0	7.3 ± 0.5

[1] *A total of one survey was conducted in July 2009, five surveys in August 2009, three surveys in July 2010 and four surveys in August 2010.*

Figure 11.2-9
Flocks of Seabirds and Seaducks Observed in the Marine Wildlife Regional Study Area, 2006 to 2015