

SECTION 5.0 - BASELINE STUDIES

5.1 SOCIO-ECONOMIC SETTING

The Inuit of the North Baffin region have experienced tremendous social and cultural change over the course of a few decades. Recent changes, particularly residential schools, have affected family integrity and by implication, social cohesion. Elders are becoming more engaged in community life and in the learning of the younger generation. A shift toward western middle-class expectations appears to be taking place among Inuit youth.

The five communities of northern Baffin Island in the immediate vicinity of the Mary River Project, listed alphabetically, include Arctic Bay (280 km), Clyde River (415 km), Hall Bay (192 km), Igloolik (155 km), and Pond Inlet (160 km). The location of the communities is shown on Figure 2-1.1 (Appendix 1A). Each of these communities has historical socio-economic and ecosystem ties to the Project area.

Harvesting from the land (hunting, trapping, and fishing) is a key livelihood component for many residents of North Baffin. Supplementing the in-kind income generated through harvest activities, residents earn money through employment and various social transfers. Other income generating activities include arts and crafts, carving, prints, tapestries, and wall hangings. Residents have expressed enthusiasm for wage-based work, even when this means working in remote locations away from the community. The annual economic value of subsistence harvesting in Nunavut has been estimated to be between \$30 million and \$50 million a year. Estimates put the arts and crafts industry at more than \$20 million per year, with more than 2,500 people deriving all or part of their income from this industry.

A limited wage economy exists in Nunavut, but there is a difference in the way residents participate; 60% of Nunavut's adult Inuit population is in the labour force, although 28% of that group is unemployed. Comparatively, nearly 91% of Nunavut's small non-Inuit population is in the labour force, with a 4% unemployment rate.

Nunavut relies on federal transfer payments for at least 90% of its revenue. Government employment is a mainstay of the wage economy with many of Nunavut's small businesses and retail outlets established to support government needs, or those of public servants. The public sector accounts for a large portion of Nunavut's economic activity. Government jobs in administration, education, and health areas account for about half of all employment earnings in the territory. Construction has been growing as the government infrastructure has been established.

These communities have a subsistence economy and have experienced dramatic population growth over the last 20 years. Over 70% of the population is under the age of 25. Underemployment and lack of opportunities is causing social stress. Community Elders recognize that the communities must position themselves to enter the wage economy.

For many North Baffin households, harvest of country food provides an important contribution to overall well-being. In all five communities, caribou, ringed seal, and arctic char are of major importance. In addition, walrus is a major species of importance in Hall Beach and Igloolik, while narwhal is a key component of the harvest among households in Arctic Bay, Pond Inlet, and to a lesser degree, Clyde River.

5.1.1 Socio-economic Baseline Studies

The socio-economic baseline presents information and data needed to assess the socio-economic impacts of the Project and to understand how the Project fits into the local social and economic environment. The baseline report is structured to meet several specific objectives:

- Identify socio-economic conditions and trends that may interact with the Project;
- Identify variability in socio-economic indicators across communities and social groups;
- Present data to help measure contributions of the Project to the achievement of community development objectives; and
- Describe conditions in areas that will be monitored should the Project proceed.

Qualitative data gathered from the community-based research for the Project provide insight into the perceptions, expectations, values, concerns, and aspirations of study area residents. Analysis of this qualitative data helped to frame the issues of importance to study area residents and provided the essential structure of the socio-economic baseline report. These perceptions also set the quantitative (statistical) data in a context that allowed for better interpretation.

Study area-specific statistical data were compiled mainly from government sources, including standard and customized 2006 Statistics Canada Census data, standard and customized Statistics Canada tax file data, and a range of Government of Nunavut data. In addition, data provided by the major employers involved during the exploration and bulk sample activities were compiled.

5.1.2 Population Characteristics

Inuit and Non-Inuit Components of the Population

The population of the North Baffin region consists mostly of Inuit (94%), with non-Inuit accounting for just 6% of the area's population. The balance between Inuit and non-Inuit in Iqaluit is more even, with 60% Inuit and 40% non-Inuit. While the Inuit population has a very young age profile, nearly all non-Inuit residents in North Baffin are of working age. In Iqaluit, 58% of the population - 66% of the male population - age 40 to 64 are non-Inuit. Non-Inuit men also account for a majority of Iqaluit's male population age 25 to 39 years of age. The demographic data suggest non-Inuit residents move to local study area (LSA) communities primarily to work and that relatively few are raising families or living out their retirement years in these communities.

Gender Ratios

The ratio of non-Inuit males to females is approximately even in the younger half of the working-age population. In the older age categories there are substantially more men, with a ratio of roughly 60% males to 40% females in both North Baffin and Iqaluit. Among the Inuit population, more males than females are resident in North Baffin, across all age groups. The opposite picture is seen in Iqaluit, where the number of Inuit females is greater than that of males.

Stability of Residency

The Inuit population of North Baffin communities was very stable over the past decade. Decentralization of territorial government jobs to Igloodik and Pond Inlet during this period did not lead to major relocation of Inuit workers from other communities. This contrasts sharply with the non-Inuit population of North Baffin, where only 1-in-3 (35%) non-Inuit residents resided in the same community five years earlier. The level of instability of the non-Inuit population was even slightly higher during the five years leading up to the previous census in 2001.

The residential stability of the Inuit population in Iqaluit is less than that in North Baffin. In the five years leading up to 2006, 2-in-10 Inuit moved to Iqaluit from another community, province, or territory. This level of mobility declined from a rate of 1-in-4 (24%) before 2001. Stability of the non-Inuit population is considerably higher in Iqaluit than it is in North Baffin, and appears to be trending toward greater permanency. Before 2001, 41% of this population had been resident in the capital for at least five years. By 2006, this stable population had increased to 50%.

Net Migration into the Baffin Region

There are indications of an increasing net movement of Inuit from communities in the north to urban centres in the south. During the 10-year period between the 1996 and 2006 censuses, the Inuit population in regions outside traditional Inuit lands, or “Inuit Nunaat,” increased 62% from 6,795 to 11,000 individuals. In 2006, Inuit living outside Inuit Nunaat accounted for 21.8% of the 50,480 Inuit living in all regions of Canada.

As suggested by the analysis of the non-Inuit component of the LSA population, there has been tremendous movement between southern points-of-origin and Iqaluit and North Baffin, with nearly half the population changing-over within five years. The majority of this group comes to pursue employment opportunities and, as indicated by the age profile, does not settle permanently in the region.

Tax filer data indicate that during the period from 1997 through 2002—leading up to division of Nunavut from the Northwest Territories (NWT), and for several years into the establishment of the territorial government—the net flow of people between the Baffin region and other parts of Canada was mostly into the region. Since 2002, this has reversed, with more people leaving the Baffin region than moving into the

region. This net migration is small, however, in the order of 150 individuals per year, or less than 1% of the total population of the region.

Other regions of Nunavut as well as the Atlantic region of Canada have consistently seen more people leave for the Baffin region than they saw arrive from the Baffin region. Since 1995/96, 548 more individuals moved to the Baffin region from Atlantic Canada than returned to that region. By contrast, the Baffin region provided a net contribution of 497 people to the population of Ontario during the same period, as well as 373 to the NWT and 383 to western Canada.

Family Structure

Most Inuit across the LSA live with immediate family members. Among non-Inuit residents, a substantial number either live alone or with unrelated individuals. In North Baffin, 94% of Inuit live with immediate family members (i.e., in a “census family”). Only 3% live either alone or with unrelated people, with the remaining 3% living with relatives. Perhaps unexpectedly, this picture extends to Iqaluit as well. The picture for non-Inuit is rather different, with approximately 3-in-4 living with immediate family members, while most of the remainder either live alone—14% in Iqaluit and 21% in North Baffin—or with unrelated people—9% for Iqaluit and 6% for North Baffin.

Children in Single-Parent and Two-Parent Families

In Nunavut, 1-in-4 children live with a single parent and the remaining three-quarters live with two parents. The incidence of children living in single-parent families in Iqaluit is similar to the territorial average at 26%, while in North Baffin communities the rate ranges from 26% in Hall Beach and Igloolik to 20% in Arctic Bay, Pond Inlet, and Clyde River. In comparison, approximately 22% of Canadian children live in single-parent families, suggesting that the incidence in the LSA is in line with the national situation.

Language

The Inuktitut language is prevalent in North Baffin LSA communities. Nearly all Inuit residents of the North Baffin LSA learn this language as their mother tongue, and for 9-in-10 residents, Inuktitut is the language most commonly spoken at home. A portion of the population, ranging from 6% in Hall Beach to 24% in Igloolik, consists of unilingual Inuktitut speakers. In North Baffin, nearly 2-in-3 Inuit work in settings where Inuktitut is the prevalent language.

The linguistic picture in Iqaluit is dramatically different from that of North Baffin. In the capital, slightly more than one-fifth of the Inuit population did not learn Inuktitut as their mother tongue and fewer than half speak Inuktitut at home. Only 20% of Inuit in Iqaluit speak Inuktitut in the workplace and only 3% are unilingual Inuktitut speakers. It seems clear that while Inuktitut is healthy in North Baffin, it is under considerable threat in Iqaluit.

5.1.3 Education and Training

Early Childhood Education

Early childhood education (pre-school) opportunities are not widely available across the study area. Before-school and after-school programs, which are important for parents working during the day, are absent in nearly all LSA communities, except for Clyde River, where an after-school program has been in place since 2008. The level of service in Iqaluit is better, with full-day and part-day preschool programs and after-school programs available.

Grade 12 Graduation

The number of high school graduates has been increasing both in Iqaluit and across North Baffin over the past 20 years. In total, 390 North Baffin and 393 Iqaluit residents have graduated from high school since 1987. However, while Grade 12 enrolment in Iqaluit and Pond Inlet has increased in recent years, it has declined elsewhere in the LSA.

Post-Secondary Qualifications and Training

While education levels are low across the study area, many residents of the RSA have been engaged in training and upgrading through the local college system and through various specialized programs. Arctic College, which has Adult Learning Centres in every community, reports that between 1,200 and 1,350 Nunavummiut enrol in full-time programs at the college. This equates to roughly one-quarter of the population between 20 and 29 years of age, or one-fifth of the 20- to-34-year-old age group.

The focus of post-secondary training varies between Inuit males and females. Inuit men acquired post-secondary qualifications in areas such as construction trades and mechanical/repair technology, culinary services, corrections officer/services, peace officer/police, fire protection, heavy-truck driver, commercial driver, heavy-equipment operation, and commercial fishing. Inuit women have focused more on the fields of business, management, public administration, social and behavioural sciences, law, and education. Some men, particularly in Iqaluit, have also pursued programs focused on business, management, and public administration.

Literacy and Numeracy

Low baseline levels of literacy and numeracy present a major challenge to labour force development in the LSA and across Nunavut. In a report on adult learning in Nunavut, the largest group of adult learners in the territory are said to be at the lowest two levels of the four-level scale used in the International Adult Literacy and Skills Survey.

5.1.4 Livelihood and Employment

Importance of the Land-Based Economy to North Baffin Livelihoods

The land-based economy is a major component of the livelihoods of many residents of the LSA, particularly in North Baffin. The North Baffin land-based economy generates productive work equivalent to an estimated 356 full-time jobs annually, or approximately one-third the labour demand from the formal wage economy in the region. This amount of work roughly translates to 0.6 million hours of labour.

The harvest effort of residents of the five North Baffin LSA communities is estimated to yield approximately 830,000 kg of food. The cost to purchase an equivalent amount of imported food through local retailers is estimated at \$12 million. This is the in-kind value to households of harvest activity in the land-based economy. Since retail foods are subsidized through the food mail (and now through the Nutrition North) program, the “economic value” of the land-based harvest should take this into account, leading to a total economic value of the land-based harvest of approximately \$20 million.

Demand for Workers in the Formal Labour Market

The current amount of work opportunity generated by the wage economies of the study area amounts to the equivalent of 3,700 to 3,900 full-time, year-round jobs, of which 1,100 are located in North Baffin and 2,600 to 2,800 in Iqaluit. This equates to approximately 2 million hours of work in the North Baffin labour market each year, and 4.7 million hours of work in the Iqaluit labour market.

The number of jobs occupied by women has generally increased at a greater rate than those occupied by men. In North Baffin, the growth in demand for male labour has not kept pace with the growth of the Inuit male population. In Iqaluit, male-occupied job growth and Inuit male population growth rates appear to have increased at similar rates. The jobs occupied by women are more narrowly concentrated in public sector industries. While these sectors might be fairly stable in terms of boom and bust cycles, they are less likely to experience dramatic growth, suggesting that women coming into the labour market might need to find work in sectors not traditionally filled by women.

In terms of the skills required by the LSA labour market, approximately 18% of occupations in North Baffin, and 21% in the Iqaluit labour markets require a university education. One-quarter to one-third of occupations in the study area require college or apprenticeship levels of training and skills. A similar number of occupations require high school education and/or occupation-specific training. The remainder of jobs can be accessed by unskilled workers capable of undertaking on-the-job training.

Supply of Workers to the Formal Labour Market

A total of 2,255 North Baffin residents worked to “fill” 1,100 North Baffin jobs, a rate of 2 workers per job. In Iqaluit, 3,665 individuals worked to fill the 2,600 to 2,800 jobs in that labour market, a rate of 1.3 to 1.4 workers per job. Wage-earners in North Baffin deliver 1.7 to 2 million hours less than they would if they

were all working full-time, full-year. Wage earners in Iqaluit deliver 3 million hours less than they would if they all worked full-time, year-round.

Demand among residents for wage employment in the study area is very high, even when this work requires working in remote locations away from the community. Inuit employment in North Baffin is characterized by many individuals earning small levels of income, well under what full-time work would pay, and a small number earning full-time, year-round income levels. The picture of Inuit employment in Iqaluit suggests a blend of work patterns with many individuals earning small wage income and many earning full-time wage levels. Most residents working in full-time jobs in Iqaluit work these jobs year-round. In North Baffin, many more full-time workers are engaged in these jobs for only short periods. The highest rate of short-term employment among full-time workers is among the younger North Baffin male workforce. Women who work full-time jobs in North Baffin are more likely to work year-round than are men.

Experience from the Mary River Exploration and Bulk Sample Activities

A total of 1.3 million hours of fly-in/fly-out labour was delivered during the Mary River exploration and bulk sample activities by 776 workers from across Canada over a three-year period. Of this labour, 0.4 million hours were provided by 265 North Baffin residents, and 212 residents of Iqaluit. Women accounted for 11% of the total number of people involved at the Project. During peak activity in 2008, 0.8 million hours were worked at the Project, of which 0.2 million hours were provided by residents of the LSA.

Approximately 4-in-6 workers hired from North Baffin worked for at least three rotations of two weeks in, followed by two weeks back home. However a substantial number, 1-in-5, did not complete one full 14-day rotation. Among workers hired from Iqaluit, 1-in-8 did not complete one full rotation. Both North Baffin and Iqaluit labour forces continued to supply new workers for the three-year period for which data were analyzed. Therefore, the Project definition phase did not “tap out” the study area labour force.

Sources of Income in LSA Households

In addition to the \$12 million in-kind income generated for North Baffin households through harvest activities in the land-based economy, residents gain monetary income through employment and various social transfers. In 2007, personal income reported by residents of the five North Baffin LSA communities amounted to \$83 million and income reported by Iqaluit residents amounted to \$196 million. Among the resident Inuit population, earned income accounts for between 70% (Clyde River) and 81% (Pond Inlet) of total income. Most of the remaining income, ranging from 17% (Pond Inlet) to 27% (Clyde River) is derived from government transfers. Other income, such as investment income, accounts for less than 3% of total income. In Iqaluit, the role of government transfers is much lower than in North Baffin communities, accounting for only 8% of the total income of the Inuit population of the city.

5.1.5 Human Health and Well-Being

Population Health Status

Life expectancy at birth in Nunavut is 10 years shorter than it is for the Canadian population overall. From 1999 to 2001, life expectancy at birth in Nunavut was 68.7 years. Life expectancy at age 65 is similar among the male populations of Canada and Nunavut. However, while Canadian women age 65 can expect to live an additional 20.6 years, in Nunavut, women's average life expectancy at age 65 is 11.4 years.

In Nunavut the birth rate is roughly twice that of Canada generally, while the incidence of pre-term delivery and low birth weight are both high in Nunavut relative to Canada overall. Nunavut's infant mortality rate has been improving. It is, however, much higher than in other regions of Canada.

The major causes of death in Nunavut are cancer, suicide, heart disease, and accidents. The profile of causes of death in Nunavut differs from that of Canada overall. Age-standardized death rates for Canadian provinces and territories can be used to compare death rates in Nunavut's young population with those of the aging Canadian population:

- The proportion of deaths by suicide in Nunavut is nearly four times that of Canada;
- Transportation-related deaths are more than twice as common in Nunavut as in Canada;
- Cancer accounts for a slightly higher share of deaths in Nunavut than in Canada;
- Heart and other cardiovascular disease account for a lower share of deaths in Nunavut; and
- Other causes of death account for a greater share of deaths in Canada than in Nunavut.

Community Perspectives on Social and Cultural Change

The Inuit of the North Baffin region have experienced tremendous social and cultural change over the course of a few decades. During the Arctic Bay working group conference several participants spoke about the effect that recent changes, particularly the residential schools, have had on family integrity and by implication social cohesion. Indication that Elders are becoming more engaged in community life and in the learning of the younger generation came out of community research. In addition, though, a shift toward western middle-class values and expectations was observed to be taking place among Inuit youth.

Social change is clearly related to livelihood options. A shift from traditional to wage economy livelihoods was clearly identified by an Elder in Pond Inlet as being related to an understanding that the capacity of the environment has become inadequate to support today's population's food needs. Many other comments were made about the importance of employment both for gaining self-reliance as well as to support traditional harvesting activities. Finally, the importance of strong social networks in supporting people's ability to take on the challenges of fly-in/fly-out rotational work was raised.

Alcohol and Drugs in the LSA

Tobacco smoking rates in Nunavut are also high. Smoking during pregnancy has major adverse effects on fetal development, contributing to low-birth weight and pre-term delivery. The relationship between indoor smoking and respiratory problems has recently been highlighted in a study of Nunavut housing and respiratory disease.

Alcohol abuse is an issue that concerns many residents, health practitioners, social service providers and those involved in the justice system. On the health side, use of alcohol during pregnancy is known to cause brain damage in the fetus, leading to serious consequences for the individual born with fetal alcohol spectrum disorder (FASD). Community perceptions and concerns related to substance abuse, along with local alcohol policies and other related issues include the following:

- Perception that alcohol and drugs becoming more prevalent;
- Misuse of income on substances affects individuals, families, and the community;
- “If there is more money then there is potentially more availability of substances to abuse”;
- “...but, even those without jobs are said to be able to purchase alcohol”;
- Some are making an active effort to quit using drugs;
- Drug/alcohol-free workplace is desirable: “Access to a drug-free place will be good for people”; and
- FASD is a concern. Education to warn pregnant women not to drink is noticed by some.

In the Baffin Region, Iqaluit is the only “open” community, while Kimmirut, Pangnirtung, and Sanikiluaq are the only “dry” communities. The five communities of the North Baffin LSA each have policies in place to restrict access to alcohol. Bootleg alcohol, however, is considered to be widely available at a high cost.

Incidents of Reported Crime

The rate of violent crime in Nunavut is the highest across Canada, varying from between six and eight times the national rate during the period 1999 to 2007. Within the LSA, violent crime across North Baffin has been slightly over half the rate in Iqaluit.

A territorial breakdown of crime incidents provides insight into the nature of this violence. The rate of sexual assault across the territory reached a peak in 2003 at over ten times the national rate. While rates of sexual assault continued to be high into the later part of the decade, a decline has been noted, with the 2008 rate being the lowest of the ten year period. Assaults with weapons and those causing bodily harm have increased consistently and dramatically over the decade.

Accidents and Unintentional Injury

Potential years of life lost (PYLL) among the male population across Nunavut is 3,465 per 100,000 population per year. The corresponding rate for Nunavut women is 673 per 100,000 population. This is the equivalent of roughly 110 PYLL per year for men and women due to unintentional injury in the North Baffin LSA and 140 PYLL in Iqaluit. Workplace injury frequency is measured in days of work lost or modified. In the Nunavut/NWT mining sector an average of 27 days of lost/modified work is experienced per 200,000 hours of labour supplied. Over a three-year period these territories experienced one workplace fatality, which could be equivalent to up to 60 PYLL.

Food Security

For many North Baffin households, the harvest of country food provides an important contribution to overall wellbeing. In all five communities, caribou, ringed seal, and arctic char are of major importance. In addition, walrus is a major species of importance in Hall Beach and Igloolik, while narwhal is a key component of the harvest among households in Arctic Bay, Pond Inlet, and to a lesser degree, Clyde River. The rate of subsidy that is effectively applied to country food harvests is estimated to average approximately \$1.23/kg of edible food. This equates to between one-tenth to one-fifth the subsidy rate applied to southern foods transported for sale in the North Baffin LSA.

The amount of nutritious, perishable food shipped per person in the LSA has increased steadily since 1999. During the decade total per capita shipments have increased by 52%. This observed increase in per capita retail food consumption would be consistent with an increasing reliance on retail foods to meet household nutritional requirements. A positive relationship appears to exist between increasing income reported by women and the amount of nutritious, perishable foods purchased from retailers.

5.1.6 Economic Development and Self-Reliance

Sectors of the Economy

The public sector accounts for a large portion of Nunavut's economic activity. Public sector jobs in administration, education, and health areas account for about half of all employment earnings in the territory. Public administration accounted for \$271 million, or 24%, of the territory's total \$1.1 billion GDP in 2008. Education and health expenditures account for another \$202 million. Combined, these public expenditures account for more than 40% of the territory's GDP.

Nunavut's mining sector is once again expanding following closure, in the previous decade, of the Nanisivik and Polaris mines in the LSA and the Lupine and Jericho mines in the Kitikmeot region. The Meadowbank Mine outside the study area in the Kivalliq region is expected to begin contributing over \$90 million to Nunavut's GDP. Medium-term prospects for expansion in the sector include Newmont's Hope Bay development in Kitikmeot and AREVA Resources' Kiggavik project in the Kivalliq region. The Mary River

Project is the only project in the LSA that has progressed to project description and feasibility study stage. A major challenge for the territory is to develop the labour force and entrepreneurial capacity to participate in the economic activity generated by the mining sector. The shortage of skilled workers is expected to lead to local workers filling between 15% and 20% of Meadowbank jobs (Conference Board of Canada 2010). Major investments in training will be required to improve these numbers. Communities, government, and the mining companies must work effectively together to achieve the potential for the mineral sector to contribute to sustainable community development.

The construction industry in Nunavut is driven by a combination of government-funded infrastructure projects and major private sector developments such as the Meadowbank Mine Project. Territorial government planned capital expenditures for the North Baffin LSA total \$32.3 million for the planning period 2010/11 to 2014/15, with another \$33 million planned for Iqaluit. Across the territory, \$381.6 million in capital expenditures is envisioned over this period.

The transportation sector provides a critical link between Nunavummiut in small communities to the specialized medical and educational services available only in larger centres. For the 2010/2011 fiscal year, for example, the territorial government has budgeted \$47.9 million for medical travel, an expenditure item that has increased at a rate of 6.9% year-over-year, from a level of \$32.6 million in 2005/06. Goods imported into Nunavut by air and marine transport totalled \$900 million in 2008, and the Iqaluit airport was among the top 20 busiest airports in Canada, based on number of flights. In spite of the tremendous importance of air and marine transport, the sector is largely based outside the territory and transportation contributes less than \$21 million to the territorial GDP. The high cost of transportation means that many Nunavummiut face limited mobility options.

Nunavut has a small commercial fishery based on turbot and shrimp fished offshore primarily in Baffin Bay and Davis Strait. Nunavut's share of this fishery has grown significantly during the past half decade. In addition to the offshore fishery, commercial char production is carried out at plants in Pangnirtung, Iqaluit, Rankin Inlet, and Cambridge Bay. Although the economic value is modest, the quality of this product is high and potential for value-added processing and marketing, including supplying the local Nunavut market where high retail food prices are the norm, continues to be realized. A modest commercial caribou and musk ox harvest is also carried out, the former predominantly from Coral Harbour and the latter from Cambridge Bay. As with the char fishery, these products represent high-value specialties that sell for premium prices. Given the importance, and precedence under the NLCA, of the traditional non-commercial harvest of these species, the potential for expansion of commercial fish and wildlife operations is subject to inherent biological limitations.

Most visitors to Nunavut come to the territory for work activities. These business travelers account for approximately three-quarters of all Nunavut visitors. Between 3,000 and 6,000 visitors come to the territory each year for non-work purposes and this component spends between \$6 to \$12 million annually. An

amount of \$500,000 is estimated to be allocated each year across the North Baffin LSA to tourism activities outside business travel and sport-hunting. In addition to spending by tourists who come to visit friends and family living in the north, these expenditures also include those of cruise ship visitors (\$15,000 in one community) visitors to the national park, and adventure tourists.

Community Economic Development (CED)

The municipalities of the LSA regularly undertake broad planning processes that engage many groups in the community. These processes offer an opportunity to reflect on strengths and challenges faced by the community. This self-reflection typically addresses social issues, cultural change, and issues related to education, business, and economic development. Reflection on how well local organizations are working together to address common goals is an important outcome of this process, as this can improve institutional capacity at the local level. It can be expected that with recent establishment of the Regional Socio-Economic Monitoring Committees, which involve the hamlet mayors, the CED planning process could link in with monitoring progress in key areas.

Infrastructure gaps are frequently suggested as important barriers to business, social, and cultural development in communities across the LSA. Hamlet CED plans call for many types of infrastructure: space for small businesses, workshop space for carvers, visitor centres, fish plants, swimming pools, day cares, youth centres, healing centres.

Major economic projects are widely seen to present opportunities to support achievement of local development aspirations. The mechanisms that drive these opportunities typically include project effects on human resources development through training and employment, expansion of local business opportunities by raising the level of disposable income available to purchase local goods and services, and by offering opportunities to supply goods and services to the Project, and in development of local and regional infrastructure through direct contributions as well as through increased government revenue.

Local wealth is a significant component for community development. In 2007 personal income reported by residents of the five North Baffin LSA communities and Iqaluit amounted to \$83 million and \$196 million respectively.

Contracting and Business Opportunities

The LSA business community is small, reflecting the small populations and low income levels of these communities. This is particularly the case in the North Baffin LSA communities, where two dozen businesses are registered with Nunavut Tunngavik Inc. (NTI) as Inuit firms, and/or with the Nunavummi Nangminiaqtunik Ikajuuti (NNI) program as Nunavut firms. The business sector in Iqaluit is substantially larger, with a total of 129 enterprises registered with NNI, NTI, or both. In addition to these are a number of businesses that have not registered with either NTI or NNI. These include incorporated and unincorporated enterprises such as local bed and breakfasts, taxi services, outfitters, and others. For

example, while there are seven businesses from Arctic Bay registered with NNI and/or NTI, the Arctic Bay Economic Development Plan (2007) identified 26 local businesses. A total of 25 local businesses were identified in the Pond Inlet CED Plan (2010), compared with the 11 listed with NNI and/or NTI.

Self-employment is an important indicator of entrepreneurial capacity, as it can be a stepping-stone toward larger-scale business activities. The level of self-employment across the Regional Study Area (RSA) is fairly low, as is the amount of income earned through self-employment activities. In 1996, a total of 270 Baffin residents reported income from self-employment business activities. By 2004, this number had increased to 410 individuals. Most (6 out of 10) of these self-employed entrepreneurs live in Iqaluit, with the remaining 40% distributed across the other Baffin communities. In the North Baffin LSA, approximately 70 individuals earned self-employment income in 2004.

Most North Baffin LSA residents reporting self-employment income earned less than \$5,000 through their business activities. In Iqaluit, self-employment earnings are a little higher, with half of self-employment income earners reporting more than \$5,000, and 1-in-5 reporting \$35,000 or more. Of the self-employment income earners in Iqaluit, 1-in-4 had family incomes with no other source of market income. Most people who report self-employment income however, live in families where a wage income is also earned. This other income can be substantial.

In Iqaluit in 2004, 100 of the 240 self-employment income earners, or 42%, had family wage incomes of \$85,000 or more. In the rest of the Baffin region, a similar proportion of self-employment earners (24%) have no other family wage income. In these communities, however, the level of other family wage income is lower, with only 41% of families having wage incomes of \$35,000 or more, suggesting that employment income plays an important role as a spring-board to self-employment. While a few families rely on self-employment as their main source of income, it is more common that self-employment activities are nurtured by the wage employment earnings of either the self-employed person or a family member, or both. This pattern appears to be stronger in Iqaluit than it is in the other Baffin region communities.

Supply of Goods and Services to the Mining Sector

During the Mary River Project definition phase, from 2006 through August 2010, \$49.7 million worth of goods and services were procured by Baffinland from vendors based in the North Baffin LSA and Iqaluit. Of this amount, \$10 million was purchased from businesses based in North Baffin, 3% of total procurement, and \$39.9 million from vendors based in Iqaluit, or 11% of total procurement.

5.2 BIOPHYSICAL TERRESTRIAL ENVIRONMENT

Superficial landforms and deposits in the Mary River Project area are associated with widespread glaciation on Baffin Island. Surface geology consists of locally abundant sediment deposits from glaciers and rivers. Occasional outcrops of granitic and sedimentary rock formations occur. The North Baffin region containing the Mary River area lies within the Committee Belt, a granite-greenstone terrain mixed with sedimentary and

volcanic rock. The mountains to the east are older than 540 million years old, and the lowland plateaus to the west are about 250 to 540 million years old.

The Project is situated in the Northern Arctic Ecozone. The climate is semi-arid and permafrost coverage is continuous extending to a depth of 500 metres, with an active layer of up to 2 metres. The extremely cold temperatures of the region, combined with the permafrost, result in a short period of runoff that typically occurs from June to September. All rivers and creeks, with the exception of the very largest systems, freeze during the winter months. Due to the combination of low temperatures, low infiltration, the vegetative cover is minimal and surface water is abundant. The region is dotted with thousands of small lakes and streams.

The region experiences near 24-hour darkness with less than two hours of twilight from November to January. During the winter months the treeless topography and fine powdery snow produce blowing snow conditions, resulting in restricted visibility. Frost-free conditions occur from late June to late August. There is continuous daylight from May to August. The months of July and August usually experience the greatest precipitation. From September to November, temperature and the number of daylight hours decreases, and by mid-October the mean daily temperature is generally well below 0°C. The highest snowfall typically occurs during this period.

Air quality and noise levels in the Project area are typical of remote environment. Freshwater quality measurements in the Mary River area indicate naturally elevated concentrations of dissolved oxygen, turbidity, aluminium, and iron. Some average values for pH, as well as cadmium and mercury in fresh water are greater than levels recommended by the guidelines of Canadian Council of Ministers of the Environment.

Vegetation is relatively sparse in much of the Project area and is generally consistent with flora of arctic regions. No plant species considered to be “rare” in Canada were found to occur in the survey locations.

Terrestrial mammals in the region include barren-ground caribou of the North Baffin herd, wolf, arctic and red fox, ermine, arctic hare, and lemmings.

North Baffin caribou are currently present at low densities and their numbers seem to vary in accordance with a 60- to 70-year cycle. The last period of caribou abundance in the regional study area was 1980 to 2000, and the previous period of low abundance was the 1940s. Caribou are expected to remain at low numbers for the next couple of decades. There is evidence that caribou occur throughout the entire region. While some populations of caribou migrate between preferred habitats in summer and winter, North Baffin caribou appear to be non-migratory and are likely to be found relatively equally in many locations throughout the Project area.

Migratory bird species observed in the Mary River study area include snow geese, ducks, eiders, loons, and mergansers. Raptors found include rough-legged hawks, peregrine falcons, gyrfalcons, and snowy owls. Relatively low densities of songbirds and shorebirds were recorded throughout the region.

There are two fish species in the freshwater environment: arctic char and a minnow species named nine-spine stickleback. The inland waters near the Project mainly contain landlocked arctic char, though anadromous or sea run char are present in a lake next to Steensby Port and up the Cockburn River system next to a portion of the railway.

5.2.1 Meteorology and Climate

The North Baffin region is located within the Northern Arctic and the Arctic Cordillera Ecozones. Northern Baffin Island has a semi-arid climate with relatively little precipitation. The region experiences near 24-hour darkness with less than two hours of twilight from November to January. During winter months the treeless topography and fine powdery snow produce blowing snow conditions resulting in restricted visibility. Steam fog may occur in areas of open water, but does not persist more than a few miles downwind. Ice fog is infrequent, Frost-free conditions are short and occur from late June to late August. There is continuous sunshine from May to August. The months of July and August bring maritime influences and are usually the wettest (snow may still occur). Fog increases at this time due to southerly winds. From September to November, temperature and the number of daylight hours start to decrease, and by mid-October the mean daily temperature is well below 0°C. The highest amount of snowfall typically occurs during this period. A condition called “Arctic white out” often occurs during this time, where diffuse white clouds blend into the white snow-covered landscape, reducing visibility and increasing the likeliness of disorientation. This condition can also occur in April and May.

5.2.2 Air Quality, Noise and Vibration

Ambient air quality sampling equipment was deployed at the proposed Mary River mine site area in July 2007 to measure baseline ambient TSP, PM₁₀, SO₂, NO₂, O₃ and dust. The monitoring results from this short-term air quality baseline monitoring program indicate that all the parameters measured are well below applicable indicator thresholds.

Monitored data from the Mary River program were generally lower - and often much lower - than values for the Northwest Territories Environmental Protection Division long-term monitoring stations. Maximum values from the baseline ambient air quality data from the Mary River monitoring program will be used as baseline levels.

A baseline assessment of ambient noise levels at the proposed mine and port locations were completed and determined that noise levels are faint. Sound exposures ranged from 25-30 dBA in the locations sampled.

5.2.3 Landforms, Soils and Permafrost

The Mary River iron deposits are located within the Mary River Group, an assemblage of Late-Archean metasedimentary to metavolcanic rocks that have been folded and preserved in greenstone belts. The

Mary River Group greenstone belts are present as fragmented remnants stretching from Bylot Island south to Ege Bay, with a maximum thickness of 4,000 m.

Iron formations occur in varying thicknesses discontinuously within the Mary River Group meta sedimentary units but are typically not present in economically extractable thicknesses or configurations except in the Mary River area. The high-grade iron ore at Deposit Nos. 1, 2, 3 and 4 were discovered in 1962, and these initial hematite-magnetite mineralized zones were mapped out within extensive belts of banded iron formation in the area over the next three years. As typified at Deposit No. 1, the high-grade iron formations are inter layered with thin bands of chlorite-actinolite schist, staurolite-garnet-mica schist and banded iron formation across their strike width, with the entire assemblage up to 400 m-thick.

The Project Mine Site area is located in a major glaciofluvial outwash deposit in what appears to be a classic "U" shaped valley. In addition to the glaciofluvial deposits, there appears to be some direct glacial deposition consisting of kames, moraines, and eskers in and around the southeastern portion of Sheardown Lake. The outwash valley is essentially a relatively flat plane with very little local relief, the major exceptions being along bodies of water, esker deposits and adjacent to the edges of the valleys. The walls of the valley are generally steep and abrupt and when looked at from a distance, distinct terrace levels are easily distinguished.

The Milne Inlet Tote Road alignment generally follows a glacial valley oriented northwest-southeast to the Mary River Camp/Mine area. The surficial deposits along this alignment include till veneer or blankets on the higher elevations with some drumlins and moraines (in places). Glaciofluvial outwash sediments (gravel and sand) forming braided floodplains, terraces and fans or stratified glacial drift (gravel and sand) are typically found in the valley floors. Limited bedrock exposure is present along the Milne Inlet Tote Road.

The dominant landforms and deposition features in the Milne Inlet area are typically of glacial activity, marine and mechanical forms in various degrees. Glacial activity is not overly apparent on the immediate site but is more pronounced in the higher elevations south of the site. Marine and mechanical features are most predominant with terraces and strand (beach) lines formed by marine action which have been cut by mechanical features, some of which may be attributed to permafrost. Wind appears to have been responsible for some drifting on the finer grained soils on the lower part of the site. Recently deposited colluvium is present on many of the slopes and side hills in the area. The action of surface water has produced numerous sharp gullies along water-ways. Marine clays were also noted at some locations at the site.

The topography of the Rail Alignment to Steensby Port is generally quite hilly, with the exception of the Ravn River area which is relatively flat. Glaciated valleys are evident along a portion of the alignment. The surficial geology of the RSA is also characterized by the recent (relatively) glacial activity of Baffin Island. Surficial geology consists of several types of deposits including glacio-lacustrine sediments, alluvial

sediments (alluvial deposits), end moraine till, and till veneers and blankets. Occasional outcrops of pre-Quaternary bedrock and sedimentary rock formations are also common along the southern section of the Rail Alignment.

Near surface bedrock is dominant in the Steensby Port area. Limited overburden is in the form of marine sediments and localized deposits of till. The majority of the overburden is located in depressions between the numerous bedrock outcrops and is typically overlain by a significant layer of wet organics and boulders.

Project-area soils were classified based on the Canadian System of Soil Classification (Soil Classification Working Group, 1998), and included primarily Cryosols (permanently frozen soils or soils with permafrost within 100-200 cm of soil surface) and Brunisols (soils with weak B horizon development). In general, Project area soils have weakly developed horizons, with a general lack of organic material accumulation. Fine to medium-textured soil materials were generally cryoturbated, and patterned ground phenomena related to permafrost and freeze-thaw cycling were also commonly observed.

Permafrost is defined as soil or rock that remains below 0 °C for at least two years. The Mary River Project is located in a zone of continuous permafrost. The active layer through the Project area typically ranges from approximately 1 to 2 m but may be greater in areas where there is loose, sandy soil at the edges of lakes or ponds and less in areas with significant layer of wet organics at surface. Unfrozen zones termed “taliks” can exist within areas of continuous permafrost below lakes, under major rivers or near the coast. Taliks may exist under lakes within the terrestrial RSA, particularly larger lakes such as Mary Lake, Angajurjualak Lake and Cockburn Lake.

5.2.4 Vegetation

Vegetation baseline studies were conducted in proximity to the Project from 2005-2008. A total of 760 plots were surveyed, covering the deposit and proposed mine infrastructure area, the Tote Road and proposed rail route to Milne Inlet, and the proposed south rail routes to Steensby Inlet. Locations within the proposed Steensby and Milne Port area were also surveyed.

Based on the information compiled from the vegetation plots, a vegetation classification system was developed and a species list was compiled. No plant species considered to be “rare” in Canada were found to occur in the survey locations. To help develop an understanding of Inuit Qaujimajatuqangit regarding the traditional use of plants by Inuit, studies were carried out with elders in Pond Inlet. Metals analysis of samples of surface soil and plant foliage from baseline stations in the Local Study Area was conducted to establish a baseline of metal concentrations in plants and soil.

Vegetation of the study areas was generally consistent with flora of arctic regions and was characterized by short plant heights growing on rocky, sandy or silt soils of low nutrient content. Percent cover was dependant on slope aspects substrate and moisture regimes.

5.2.5 Ecological Land Classification

The purpose of the Ecological Land Classification (ELC) was to predict the abundance of selected plant species and/or guilds for the RSA from continuous spatial habitat data and to use these maps of plant species/guilds as well as spatial habitat data to characterize habitat suitability for wildlife. The Mary River ELC includes a descriptive and a quantitative component. The descriptive component was derived from work done by the Federal Government of Canada in the late 1970s and early 1980s. The quantitative component involved the development of a GIS-based model using field data, maps of habitat conditions, statistical analyses, and spatial modeling. A total of 45 variables related to wildlife habitat were incorporated into the model. The ELC model was used in combination with field data regression analysis and expert opinion to produce habitat suitability for avian VECs.

5.2.6 Terrestrial Wildlife and Habitat

The terrestrial and wildlife habitat baseline report provides the most extensive and thorough summary of North Baffin Island caribou currently in existence. It summarizes and synthesizes the history of government surveys, local harvest, IQ, habitat use, and terrestrial wildlife surveys, and is one of the most in-depth analyses of caribou habitat selection completed in Nunavut.

Results and synthesis of information indicates that north Baffin Island caribou currently occur at low densities and their abundance seems to be cyclical. Inuit harvest data and IQ suggest a roughly 60-to70-year cycle of abundance. The cyclical pattern of caribou abundance is similar to patterns described on Greenland and south Baffin Island. The cause of these changes in abundance is currently unknown. The last period of caribou abundance in the RSA was 1980 to 2000. Caribou numbers are expected to gradually increase in the Mary River Region, but might not recover to historical “highs” until the 2050s. There is evidence that caribou occur throughout the entire region and, therefore, use most of the RSA as some form of habitat. Analyses of habitat use show a greater probability of caribou occurrence for some habitats in summer and winter, but the probability of occurrence of caribou is relatively equal in many locations throughout the Project area.

Wolves and foxes are the dominant carnivores in the RSA and exist at low densities. Very little information was collected on carnivores because they were so rarely observed. Information in published journal articles was supplemented with anecdotal and IQ information specific to the Project area for this baseline.

Baseline studies were conducted on birds within the Project area to determine species occurrence, abundance, distribution, and diversity within the RSA and LSA. Seasonal occurrence and habitat requirements of species migrating through the RSA and LSA areas and/or breeding in them were also documented. In all three years of study, numerous ground-based and aerial surveys were conducted in each of the five component areas (Milne Inlet, Milne Inlet Tote Road, the Mine Site, railway, and Steensby

Port), as well as several appropriate control areas, during the spring migration, breeding season, and fall migration periods for all bird species present.

Forty-six species were seen in the Project study area and 38 of these species nested in the area. Several Peregrine falcon, Rough-legged hawk, and Gyrfalcon nests were found throughout the area in all three years indicating that the area is well used by these species and that they are well distributed throughout the area. A few Snowy Owls were seen in the area in 2006 and 2007, but nearly 200 sightings were recorded in 2008. Only four Snowy Owl nests were found in 2006 and no nests were found in 2007, however, in 2008 105 nests were found. Three Short-eared Owls were seen in both 2007 and 2008 (none were seen in 2006) but no nests were found. Short-eared Owls are not known to occur this far north but that may be due to the lack of research that has taken place in this area.

Breeding Loons were common throughout the RSA in all three years of the study. Four species of loon were seen: Red-throated Loons, Pacific Loons, Yellow-billed Loons, and Common Loons (in order of decreasing abundance). Long-tailed Ducks were also very plentiful in these areas. Some breeding Red-breasted Mergansers were seen in the rivers in 2007 and 2008. No Red-breasted Merganser broods were seen in 2006, although several groups of non-breeders were seen then on a semi-regular basis. Hundreds of King Eiders and common Eiders migrated through the RSA in all three years and although no nests were found in 2006 and 2007, dozens of King and Common Eider broods were seen along the coastline of Steensby Inlet every year, indicating that this area was used for nesting and brood-rearing.

Thousands of Snow Geese also migrated over the RSA each year in the spring and fall. Over 250 Snow Goose nests were found within the RSA over the 3 years of study. Each June, Snow Geese stopped over on various lakes around Steensby Inlet to rest and to forage on-shore before continuing their spring migrations northwards. In July and August of each year, these geese returned again to rest, forage, and to moult their feathers, before continuing their migration south.

Relatively low densities of songbirds and shorebirds were recorded throughout the RSA in all three years compared to other studies on mainland Nunavut and NWT. Very few of these species were found foraging or nesting in or around Deposits 1, 2, and 3 at the Mary River site. Exceptions were Snow Buntings and American Pipits observed in low densities. Higher densities and diversity levels of songbirds and shorebirds were found in low-lying tundra and wetlands found along the two transportation corridors (the Milne Inlet Tote Road to the north, and the proposed railway alignment from Mary River to Steensby Inlet).

Several hundred Glaucous Gulls were observed throughout the RSA, in both marine and inland environments, as were a few Herring, Iceland, Mew, and Thayer's Gulls. Almost 300 gull nests (mostly Glaucous Gulls) were found scattered throughout the RSA over the three years of study.

5.2.7 Hydrology and Hydrogeology

Hydrologic information within the Mary River Project area was obtained from site specific stream gauges and regional data. Field specific data was obtained for locations along the PDA including areas around the Mine Site, Milne Port, Steensby Port and the transportation corridors that will connect the Mine Site to these Ports. In combination field and regional hydrologic information was used as the basis for in assessing aspects of engineering design and environmental assessment of Project activities.

Stream flow usually begins in early to mid-June as temperatures climb above 0°C, and ends in late September to late October. Within the Project area runoff increases very rapidly as a relatively low proportion of precipitation is lost to infiltration, evaporation or transpiration as it makes its way into the channels. Shallow permafrost, cool temperatures and lack of vegetative cover increase this effect. In catchments with significant lakes, these events were attenuated, producing lower peaks and longer duration flow events.

There are numerous factors that can be attributed to the variation of flow described in the Project area. The proportion of lakes within a watershed has a profound effect on water flows. Lakes attenuate rapid runoff events as well diurnal fluctuations in runoff, resulting in much lower intensity and longer lasting storm event runoff and overall more steady flows. Lakes also act to evaporate larger volumes of water than does the surrounding land, therefore lowering the mean annual runoff in catchments with large lake components. Furthermore, because the lakes are still free of ice when precipitation begins to fall as snow and permafrost melt ends, rivers fed by lakes freeze up approximately a month later than systems that do not include lakes.

5.2.8 Surface and Groundwater Quality

Streams sampled for water quality within the Project area typically had naturally elevated concentrations or values for dissolved oxygen, turbidity, aluminum and iron. Some average values for pH exceeded the CCME guidelines as did average values for cadmium and mercury at most sites. Selenium routinely was reported at the CCME guideline. When all areas for stream sampling were compared based on Water Quality Index values, the sampling locations within the area between Camp Lake and Milne Port indicated the highest value of 99.5, or “excellent” water quality.

Lake profiling indicated that dissolved oxygen and temperature in Mary Lake, Sheardown Lake and Camp Lake all showed vertical thermal stratification in late July and early August. In late August and early September the lakes were isothermic and uniformly mixed throughout the water column. Average values for pH exceeded the CCME range of 6.5 to 8.5 for lakes within the Mine Site area (Mary Lake, Camp Lake and Sheardown Lake). Cadmium and Mercury were at or above CCME guidelines in Mary Lake. Parameters that were at or above the CCME guidelines in Camp Lake and the northwest and southeast basins of Sheardown Lake included cadmium, mercury and selenium.

In areas where sediment samples were collected, the streambeds were typically cobbles and boulders with the samples being collected from the riffle pools behind the larger boulders. Sediment quality at stream and lake sites across the project area were generally good with naturally higher levels of chromium, copper and, to a lesser extent, arsenic, cadmium, mercury, lead and zinc.

5.2.9 Freshwater Biota and Habitat

The freshwater biota and habitat baseline studies provided a synthesis of information related to freshwater biota, including fish and lower trophic level communities, and aquatic habitat. Freshwater biota and aquatic habitat was characterized for Milne and Steensby Ports, the Mine Site area, the Milne Inlet Tote Road and the railway and access road areas.

Site specific data was collected for aquatic habitat (streams and lakes), primary producers (e.g. phytoplankton and aquatic plants), secondary producers (e.g. zooplankton and invertebrates), fish populations and movements and baseline metals in Arctic char (*Salvelinus alpinus*). Only two fish species were present in the study areas - Arctic char and ninespine stickleback (*Pungitius pungitius*). Both species were generally abundant and widespread in distribution, however, ninespine stickleback were absent from the freshwater lakes and streams that were surveyed near the Milne Inlet coast.

All streams with the possible exception of large rivers freeze solid in winter. Lakes provide the only overwintering habitat for both species. Lakes also provide spawning habitat for Arctic char across the study areas. Many streams provide rearing and foraging habitat and potential protection from predators for juvenile Arctic char. Most of the drainage basins that support Arctic char either contain barriers preventing anadromous migrations and/or are distant from the coast and most populations in the five study areas are land-locked. Nearshore zones of larger lakes also provide rearing and foraging habitat and potential protection from predators for juvenile Arctic char, foraging and, in some cases, spawning habitat for adult Arctic char, and overwintering habitat for all life stages. Mercury concentrations in Arctic char muscle exceeded guidelines for human consumption in some fish captured, although concentrations were similar to those reported for other land-locked Arctic char populations.

In general, the lower trophic level communities were found to be similar to other areas of the Canadian Arctic. As is typical of Arctic ecosystems, the freshwater environment is relatively nutrient-poor and primary productivity is relatively low. In general, Arctic freshwater ecosystems are characterized by relatively low diversity of zooplankton communities due to low temperatures and nutrients. Results of the baseline studies for Mine Area lakes are consistent with this generalization. The benthic invertebrate communities in the Mine Area are generally moderately diverse, although higher diversity is found in some small tributaries, and are dominated by chironomids.

5.3 MARINE ENVIRONMENT

5.3.1 Marine Physical Environment

The marine physical environment varies across the Project area. Milne Inlet is comprised of a fjord system having water depths reaching over 800 m with depths commonly between 150 and 300 m. Closer to the proposed Milne Port location is a characteristic U-shaped cross-sectional profile common to fjords that has a maximum water depth of approximately 150 m. Phillips Creek and a smaller creek to the east discharge into the inlet and have formed a sand, fjord-head deltaic complex along the southern shore with small estuaries. Hudson Strait is generally between 200 and 400 m in depth with depths north of Ungava Bay reaching 1,000 m. Foxe Basin is a broad shallow depression and is characterized by water depths commonly lower than 100 m. Water depth was in excess of 40 m over most of the area surveyed in 2008. Southern Steensby Inlet is marked by two north-south longitudinal troughs reaching maximum depths of about 145 m, shoaling to a depth of 40-60 m near the proposed port area.

Climatic conditions are similar throughout the Project area with cold, dark conditions throughout the winter and cool to moderate temperatures with 24 hours light during the summer months. Precipitation is primarily snow with moderate rainfall during summer.

Tides and currents vary substantially between Milne Inlet and Steensby Inlet. Milne Inlet tidal currents were generally small (<0.05 m/s) while tidal currents in Steensby Inlet are estimated between 0.2 and 0.4 m/s.

Winter water temperature and salinity in Milne Inlet are uniform with depth at -1.5°C and 32 practical salinity units (psu) respectively. Surface water temperatures of 4.5°C have been measured in the summer, decreasing to approximately -1.5°C at a depth of 45 m. Salinities of 23 psu at the surface were typical of open water conditions.

5.3.2 Marine Water and Sediment Quality

The water quality of Milne Inlet and Steensby Inlet was circumneutral, hard, and clear with moderate amounts of nutrients. Nutrient concentrations tended to be higher in deep waters than they were near the surface, and a distinct upper layer of water was observed. Nutrients are generally higher during the ice cover season than during the open-water season. Overall, nutrient concentrations are generally within range of those found in nearby arctic waters.

The major elements in water samples collected from Milne Inlet and Steensby Inlet reflect those typical of marine waters (e.g., chloride, sodium, sulphate, magnesium, etc.). Several metals (including cadmium and iron) are present in such low concentrations that they are generally below the analytical level of detection. Mercury concentration at Milne Inlet exceeded the CCME guideline for the protection of marine aquatic life in two samples collected from Milne Inlet.

Sediments in shallow areas of Steensby Inlet tended to have a higher amount of coarse material than those in deeper areas; this was not observed for Milne Inlet sediments. Metal concentrations are higher in sediments with a higher proportion of fines and are similar to concentrations reported in literature. Petroleum compounds measured in Milne Inlet were low, also reflective of the literature. Concentrations of arsenic, cadmium, chromium, copper, lead, mercury, and zinc are always below the respective Probable Effects Levels and Interim Sediment Quality Guidelines. Metal concentrations at Steensby Inlet are higher in sediments with higher proportions of fines, similar to trends observed in previous studies of the region. Concentrations of arsenic, cadmium, chromium, copper, lead, mercury, and zinc are always below the Probable Effects Levels and most were below the Interim Sediment Quality Guidelines.

5.3.3 Marine Biological Environment

Observations made with underwater video imagery formed the basis of the nearshore seabed habitat mapping at the Port Sites. Vegetation cover was the dominant biotic feature in nearly all observations, with bladed kelps and filamentous red algae being the dominant flora. Overall, the nearshore subtidal vegetation cover is somewhat less in the Milne Inlet survey area than observed at Steensby Inlet. Associated fauna at Milne Inlet is depth stratified, generally sparse, and was most often observed in places where algal cover was low. Brittle stars, sea urchins and bivalve siphons are all commonly observed in Milne Inlet.

Surveys revealed that the coastal habitats of Milne Inlet and Steensby Inlet are typical of periglacial coastal environments where most of the shoreline is dominated by either rock or coarse sediment beaches comprised of poorly sorted boulder, cobble, pebble, and sand. Limited open-water seasons and the coarse nature of the shorelines results in complex, poorly organized shoreline morphology. The presence of sea ice limits the development of intertidal biota, although rockweed was commonly observed along the shore.

Abundances in the nearshore algal community were estimated from analysis of the georeferenced underwater video imagery collected at Milne Inlet. The degree of cover varied with water depth and included benthic bladed kelp, foliose red and filamentous red algae.

Cyclopoid copepod *Oithona similis* dominates the Milne Inlet zooplankton community, followed by *Calanus finmarichus*/*glacialis* and *Calanoid copepodites*. *C. finmarichus*, *Pseudocalanus minutus*, *O. similis*, *Harpacticoida*, *Sagitta elegans*, and *Fritillaria borealis* were also present in samples. Zooplankton samples were collected from water depths that ranged to 150 m, and the dominant species were similar to those identified within that depth range in Lancaster Sound in 1979. Calanoida had the highest average density in 2008, followed by the chordate Larvacea, and Thoracica. In 2010, Thoracica had the highest average density followed by Calanoida and Larvacea. Species dominance and richness were similar between the two years. The species *P. minutus* and *Balanus sp.* (nauplius or cypris) were present in 100% of samples in both years, while *F. borealis*, *C. finmarichus*, and unidentified polychaete larvae were occasionally absent. In 2010, Harpacticoida and unidentified Calanoid copepodites were also present in 100% of samples. The

dominance of copepods within Steensby Inlet samples appears to be typical for the region, as reported in the literature.

A total of 146 benthic infauna species were identified from Milne Inlet. *Polychaetes* and *ostracods* were the most abundant taxa in Milne Inlet, although copepods, amphipods and several species of bivalves were also common. As reported in previous studies of the Canadian Arctic, the abundance and community composition of benthic infauna in Milne Inlet varies with depth.

The distribution and abundance of epifauna were classified from underwater towed videography. Samples were collected opportunistically during Steensby Inlet algal sampling in the same years. Like the infauna samples, epifauna species are stratified by depth. Although barnacles and bacterial mats were commonly at shallow depths and feather stars are common in deeper waters, anemones are the most abundant taxa at all depths. Polychaetes, usually followed by either Malacostraca or Ostracods, were the most abundant taxa of the 202 benthic infauna species identified from the Steensby Inlet samples. Benthic invertebrate community composition and densities changed with depth with the highest benthic infauna densities occurred between 10 m and 45 m.

The nearshore marine fish community in the vicinity of the Milne Port is characterized by low species diversity and abundance. Arctic char, fourhorn sculpin, shorthorn sculpin, Arctic staghorn sculpin, and Greenland cod were captured during the experimental gillnetting program, with sculpin species accounting for 80% of the catch. Muscle samples collected from the Arctic char catch contained an average mercury concentration below the Health Canada commercial export limit of 0.5 ug/g. Although few Arctic char were captured at the Milne Port site, the nearby Tugaat and Robertson Rivers support anadromous char populations.

In general, the marine fish community near the Steensby Port documented during Project specific studies was characterized by low species diversity and abundance. Arctic char, fourhorn sculpin, shorthorn sculpin, and Atlantic lumpfish were captured during experimental gillnetting programs. Arctic char were by far the most common species observed, comprising 90.6% of the total catch. The average concentration of mercury within muscle tissue samples collected from the Arctic char catch was below the Health Canada commercial export limit of 0.5 ug/g.

5.3.4 Marine Wildlife and Marine Habitat

Volume 8, Section 5.0 presents the baseline marine mammal information for the Project area. In total twenty-two marine mammal species are known or expected to occur in the identified RSA including the proposed shipping routes in Baffin Bay and Davis Strait. Species accounts are provided for all species; however, emphasis is placed on species which regularly occur within the RSA. Only one mysticete or baleen whale species, the bowhead whale (*Balaena mysticetus*), occurs regularly in the RSA. Narwhal (*Monodon monoceros*) and beluga (*Delphinapterus leucas*) are abundant in the RSA; other Odontocetes

that occur (albeit in low numbers) in the RSA include killer whales (*Orcinus orca*) and northern bottlenose whales (*Hyperoodon ampullatus*). Pinniped species which occur regularly in the RSA include ringed seal (*Pusa hispida*), bearded seal (*Erignathus barbatus*), harp seal (*Pagophilus groenlandicus*), and walrus (*Odobenus rosmarus*). Polar bears (*Ursus maritimus*) also occur throughout the RSA.

Bowhead Whale

Bowhead whales occur seasonally in the RSA and are typically found alone or in small groups. Bowheads are adapted to living in areas of heavy unconsolidated ice and can navigate extensive distances under ice although they are capable of breaking up to 20 cm of ice in order to breathe. Feeding and calving usually takes place in nearshore, sheltered, shallow waters in summer. During open-water periods bowhead distribution is likely driven by the distribution of the various prey species. Bowheads are baleen whales (filter feeders), eating pelagic crustaceans as well as epibenthic invertebrates. Traditionally, bowheads have been observed feeding along the floe edge and their presence is often dependent on the tides.

There are four recognized bowhead stocks, one of which (the Eastern Canada-West Greenland stock) occurs within the RSA. This stock ranges throughout the eastern and central northern Arctic and from northern Baffin Bay to Hudson Strait. Bowhead whales within Davis Strait and Baffin Bay were commercially overexploited in the early 1900's, reduced from an estimated 11,800 whales to perhaps as low as 1,000. The stock has shown a significant recovery in recent decades and may now number greater than 14,000.

Along the proposed northern shipping route, bowhead whales occur during summer and fall. They may summer along the east coast of Baffin Island, or move westward through Lancaster Sound during June and July to feed and nurse calves in inlets and sounds within the Canadian arctic archipelago. The IQ suggests that the number of bowheads using Eclipse Sound appears to be increasing in recent years. It is thought that fall migrants wintering in Davis Strait follow the east coast of Baffin Island south to wintering areas, whereas whales that winter along the west coast of Greenland may cross north Baffin Bay and then move south.

The number of bowheads within the Foxe Basin-Hudson Bay region is estimated to be over 2,000. Bowheads congregate to feed and nurse calves in spring and summer around Southampton Island, along the western Hudson Bay coast, and in a relatively small area in northern Foxe Basin between Igloodik and Fury and Hecla Strait. The IQ indicates that bowheads observed near Hall Beach in spring migrate from southern Foxe Basin. Migrations are not well documented, though most movement is thought to take place through the western and central portion of Foxe Basin and may be influenced by ice cover. During summer, this species tends to select areas of high ice cover, presumably to reduce the risk of predation by killer whales. Northern Hudson Bay, Foxe Basin, and Admiralty Inlet have been identified as summering areas, with whales moving farther into inlets and bays as the ice breaks up. In summer months, bowhead whales north of Igloodik consist primarily of juveniles and females with calves, suggesting that this location is a

nursing area. Aerial surveys of the Foxe Basin area identified small numbers of bowheads in northwest Foxe Basin but not Steensby Inlet.

Hudson Strait has been identified as a primary wintering area for bowhead whales. Bowheads begin winter migrations in October as the sea ice begins to form, heading south towards northeastern Hudson Bay and Hudson Strait. In 1981, over 1,300 bowheads were estimated in Hudson Strait and were observed during aerial surveys.

Beluga Whale

Beluga whales have a circumpolar distribution and occur seasonally within the RSA. They are opportunistic feeders, consuming a wide array of fish and invertebrates. Mating is thought to peak prior to mid-April with calving likely occurring in offshore areas during late spring migration. A limited amount of calving may also occur near estuaries and bays that is supported by IQ indicating that Koluktoo Bay and the southern portion of Milne and Navy Board inlets may be calving areas.

Four of the seven recognized populations in Canada occur in the RSA, including the Eastern High Arctic-Baffin Bay, Western Hudson Bay, Eastern Hudson Bay population, and Ungava Bay populations. The Eastern High Arctic Baffin Bay population (estimated at >20,000) summers in the Canadian Arctic archipelago and winters in the loose pack ice of two distinct areas; along the west coast of Greenland and in the North Water Polynya in northern Baffin Bay. Beluga from the smaller population wintering in the North Water begin entering Lancaster Sound in late April or early May with peak movements occurring in late June to July depending on ice conditions. Belugas wintering off the west coast of Greenland generally occupy similar geographic areas between years. Large numbers from the Eastern High Arctic Baffin Bay population migrate past Bylot Island during spring on their way to summering areas concentrated near Somerset Island. Only a small number of animals move into areas inland of Bylot Island, ostensibly for calving and feeding. Eastward fall migrations begin in September, and are concentrated almost exclusively along the southern coast of Devon Island. Belugas were observed in Eclipse Sound, Eskimo Inlet, Koluktoo Bay, Milne Inlet, and White Bay during aerial surveys.

All four populations of beluga in the RSA are known or expected to occur along or in the vicinity of the southern shipping route. Beluga from the Eastern High Arctic Baffin Bay population enter into northern Foxe Basin during spring and remain in the general area of eastern Fury and Hecla Strait throughout the summer. These beluga typically remain in shallower waters where feeding is thought to occur.

The Western Hudson Bay and Eastern Hudson Bay populations occur in the southern shipping route waters from late October through April when the whales are in their wintering grounds, and during fall migrations from summering areas in late September and October. Beluga whales from both populations occur in the vicinity of Igloolik, Hall Beach, and likely Steensby Inlet during July to early September. The very small (possibly extirpated) Ungava Bay beluga population possibly occur year-round within the RSA. The most

recent population estimate for the Western Hudson Bay population is about 57,000. The Eastern Hudson Bay population has been in decline.

The wintering location of the Western Hudson Bay beluga population has not been confirmed but it is thought to be primarily in Hudson Strait. Spring migration to summering areas occurs during late April to May. The majority of animals likely follow the eastern coast of Hudson Bay south to the Belcher Islands, and then across through the pack ice to the Manitoba coast in late May and early June. A small number move westwards towards Southampton Island. Belugas generally remain within estuaries along the coast and in September begin a northward migration towards Southampton Island.

Based on aerial survey results, beluga whales were widespread in Steensby Inlet, Foxe Basin and Hudson Strait but abundance varied with location and month.

Narwhal

Narwhals generally inhabit deep arctic waters of Baffin Bay, the eastern Canadian Arctic, and the Greenland Sea but are seldom found south of 61°. Their diet is thought to be similar to that of beluga, consisting primarily of small cod, flatfish such as Greenland halibut, squid, and other small fish and invertebrates.

Narwhals prefer coastal areas that provide deep water and protection from the wind during summer. They appear to favour deep fjords and the continental slope during winter, in areas where water depths are 1,000 to 1,500 m and marine water upwelling increases biological productivity. Narwhals are highly social animals and can be found in small numbers groups of hundreds or thousands during migration.

Based largely on summer distributions, two tentative populations of narwhal occur in Canadian waters; the Hudson Bay population and the Baffin Bay population. However, narwhals are currently assessed as a single population in the eastern Arctic. Narwhals occur throughout the northern shipping route year-round but are found in the RSA primarily during the open-water period. Those that winter in Baffin Bay typically summer in the eastern Canadian Arctic, moving to summering areas in Melville Bay, Eclipse Sound, Smith Sound, and beyond Lancaster Sound. Important summering areas identified within Baffin Bay include Eclipse Sound, Inglefield Bredning, and Smith Sound-Kane Basin.

Recent estimates indicate that approximately 45,000 narwhal summer around Somerset Island, while over 27,000 inhabit waters in the Prince Regent and Gulf of Boothia area, with approximately 20,000 in the Eclipse Sound area, 10,000 in the East Baffin Island fjord areas, and 5,000 in Admiralty Inlet. Survey results from the late 1980's and early 1990's indicated that summer distribution of narwhal within Eclipse Sound, Milne Inlet, Koluktoo Bay, and Tremblay Sound is influenced by presence and distribution of ice and killer whales.

Narwhals begin to migrate out of their summering areas in groups of a few hundred to several thousand just before freeze-up begins in late September. Those summering near Somerset Island enter Baffin Bay north

of Bylot Island in mid to late October. Populations summering in Pond Inlet begin migrating down the east coast of Baffin Island in late September. Narwhals generally arrive in their wintering areas in November. The Baffin Bay narwhal population winters at two discrete areas in the pack ice in central Baffin Bay, and in polynyas at the north end of Baffin Bay.

Narwhals were identified in aerial surveys throughout in Eclipse Sound, Milne Inlet, and Koluktoo Bay. Narwhale observed during a typical survey often numbered in the thousands. Narwhals were also frequently seen in Tremblay Sound and White Bay. Aerial surveys documented fine scale movements of large groups of narwhal between various areas of Eclipse Sound and surrounding fjords.

A much smaller number of narwhal inhabit waters along the southern shipping route. The Hudson Bay population was estimated to be almost 2,000 in the year 2000, though it may be as many as 3,500 during summer months. The timing and routes of migration used by the Hudson Bay narwhal population are less understood than those of the Baffin Bay population. This population is thought to winter in eastern Hudson Strait and move towards summering areas located primarily in the Repulse Bay area north of Southampton Island during late June while some may move north towards Fury and Hecla Strait, in the vicinity of Igloolik. Fall migrations to Hudson Strait begin in late August or early September, depending on ice conditions. A small number of narwhals that winter in Baffin Bay are thought to move through Fury and Hecla Strait into northern Foxe Basin during spring migrations in April and May.

Aerial surveys confirmed that narwhal occur in relatively low numbers in Foxe Basin; there were no sightings in Steensby Inlet. Narwhal were most abundant in Hudson Strait during April and June surveys when a small number of individuals were recorded.

Walrus

Walrus have a discontinuous circumpolar distribution and are migratory, moving with the ice. They winter in the offshore pack ice of Davis Strait and along the west coast of Greenland, the North Water Polynya off eastern Devon Island and northern Labrador, as well as in Foxe Basin ranging from the floe edge along the north side of Rowley Island and south to the Melville Peninsula. Walruses are primarily benthic feeders on bivalve molluscs and other invertebrates, and are generally confined to shallow coastal waters up to 100 m.

Four extant stocks occur within Canadian waters however these may be further subdivided. Three of the four identified stocks occur within the confines of the RSA; the Baffin Bay (High Arctic) population, the Foxe Basin population, and the North Hudson Bay-Davis Strait population.

The Baffin Bay walrus population is estimated between 1,700 and 3,000 individuals with summering populations in Kane Basin, Buchanan and Princess Marie bays, Jones Sound, eastern Ellesmere Island, and the Lancaster Sound-Barrow Strait area. Walrus along the northern shipping route winter in the North Water and other polynyas among the Canadian Arctic islands, inhabiting northwest Baffin Bay north from Pond Inlet to Kane Basin, Lancaster Sound, Barrow Strait, and Jones Sound. They are also distributed

along the west coast of Greenland. Walrus move westward along the southern coast of Devon Island during spring to summering areas in the Canadian Arctic islands. Only a few individuals are now observed among the inlets and fjords south of Bylot Island. Aerial surveys within the vicinity of Eclipse Sound recorded two walrus; one in Eclipse Sound and one in Milne Inlet.

Walrus are considerably more abundant along the southern shipping route. They are year-round residents in northern Foxe Basin, overwintering in small polynyas and shore lead systems near the outlet of Fury and Hecla Strait, to the east of Hall Beach, and among the islands (Rowley, Koch, and the Spicer Islands) located farther to the east of Hall Beach and south of Steensby Inlet. Their distribution appears to be driven by ice and open-water conditions during winter. During the open water period, they move onto beaches and coasts among the islands south of Steensby Inlet and onto drifting pans of ice. Walrus have been observed within Steensby Inlet during late summer, but the degree to which they use other locations within Steensby Inlet is uncertain. The Foxe Basin walrus population is estimated to be approximately 5,500.

Walrus were abundant within northern Foxe Basin portion of the aerial survey route in 2006. They were observed in pack ice or open water with walrus densities in northwest Foxe Basin estimated at about seven times higher than those observed in northeast Foxe Basin or southern Foxe Basin. During the aerial surveys, two terrestrial walrus haulout sites were observed, one at Manning Islands (mid-way between Hall Beach and Spicer Islands) and the other at Bushnan Rock (a small sandy islet west of the gap between Rowley and Koch Islands). Walrus densities in Hudson Strait were lower than any observed in Foxe Basin.

Ringed Seal

The ringed seal is an important element of the Arctic marine system, both as main prey of polar bears, and as a major consumer of marine fish and invertebrates. Ringed seals occur year-round along both proposed shipping routes and in the vicinity of both proposed port sites and are a major traditional food source for the Inuit.

Ringed seals establish a series of breathing holes and subnivean lairs, with many of these structures created shortly after fall freeze up. Birth lairs are constructed on the landfast ice in mid-March and pups are born in April. Landfast ice is preferred for breeding rather than pack ice. The population of ringed seals in the Canadian Arctic is estimated to be at least a few million.

Ringed seals are common throughout Baffin Bay as well as along the length of West Greenland. During winter and spring, ringed seals concentrate on stable shorefast ice, though in areas where fast ice is limited, as in Baffin Bay, increased numbers may occupy offshore pack ice. As ice breaks up during summer, they disperse as solitary animals or small groups throughout open-water areas or to coastal. Though ringed seals were originally thought to remain in the same general region throughout the year recent evidence suggests that some members of the population, particularly juveniles, may undertake extensive seasonal movements.

Ringed seals are abundant and have been observed throughout along the proposed northern shipping route, occurring throughout Baffin Bay and Davis Strait, Eclipse Sound, Koluktoo Bay, Navy Board and Pond Inlet.

Ringed seals are abundant along the proposed southern shipping route, occurring throughout Foxe Basin, including the landfast ice of Steensby Inlet and Hudson Strait. Southern Steensby Inlet, Igloolik, Hall Beach, Murray Maxwell Bay, and Rowley Island into Fury and Hecla Strait have been described as important hunting and/or pupping areas for ringed seal.

Bearded Seals

The bearded seal has a patchy circumpolar distribution as far north as 85°N. There is no reliable abundance estimate for bearded seals in Canadian waters; however, some have suggested an estimate of >190,000. Bearded seals typically occur alone or in small groups. Whelping occurs between late April and early May, and pups are typically born on unstable pack ice where they are weaned after 12-18 days. Bearded seals eat a wide variety of foods and are generally considered to be benthic feeders that prey on an array of benthic invertebrates and fish, although pelagic fish are also a food source.

Bearded seal distribution is largely determined by the presence of shallow water but they usually move into areas of open water <200 m deep when the pack ice retreats, while some individuals associate with ice year-round. They are seldom found in fast ice areas, but are widely dispersed in open water areas of pack ice where leads and cracks are frequent, and where ice pans are sufficient for haul out sites.

Bearded seals are considered common in the RSA. Large numbers of bearded seals occur around north eastern Baffin Island and in Lancaster Sound. The many polynyas of northern Foxe Basin support several colonies of bearded seals and is thought to be an area of high density for bearded seals.

During aerial surveys in support of the Project, bearded seals were present in all areas of Foxe Basin and Hudson Strait, and most sightings occurred from April to August 2008 when they are easily observed basking on sea ice. During aerial surveys in June 2008, most bearded seals were sighted near the mouth of Steensby Inlet; densities were lower in northwest Foxe Basin, northeast Foxe Basin, southern Foxe Basin, and Hudson Strait. Bearded seals were observed in small numbers during springtime seal surveys in Eclipse Sound and Milne Inlet in 2007 and 2008.

Harp Seals

Harp seals occur in the northern Atlantic and Arctic oceans below 84°N. Three geographically distinct populations occur in the North Atlantic Basin but only one of which occurs in the RSA, the Northwest Atlantic population. This is the largest population, including a total of ~5.9 million animals. This population spends the summer off west Greenland and in the Canadian Arctic.

Harp seal whelping occurs from late February to mid March on first year ice or landfast ice offshore Newfoundland and Labrador and in the Gulf of St. Lawrence. Harp seals enter Lancaster Sound in July and August via migration routes along the fast ice edge off east Baffin or across Baffin Bay from Greenland. Generally harp seals enter Pond Inlet and Navy Board Inlet at the end of July. They concentrate at the mouth of Navy Board Inlet and occasionally within Eclipse Sound throughout August and September. Harp seals were sighted in relatively high numbers during aerial surveys in Eclipse Sound and Milne Inlet. Harp seals were seen frequently in large groups of 10-50, and in one case 400. Most sightings were in Eclipse Sound. The September exodus from Lancaster Sound proceeds along the north coasts of Devon and Ellesmere islands, and then either across Smith Sound to Greenland, or along the east coast of Baffin. By October, most seals have left the Canadian High Arctic and Greenland.

Smaller numbers of harp seals also move westward into Hudson Bay and Foxe Basin during spring. Some animals move south along the east coast of Hudson Bay, reaching Southampton Island and occasionally as far south as the Belcher Islands near James Bay. Others head west across northern Hudson Bay and disperse along the west coast of the bay and Foxe Basin. There were relatively few sightings of harp seals in Hudson Strait during aerial surveys in 2008.

Polar Bear

Polar bears have a circumpolar distribution and occur in relatively low densities throughout most of the ice-covered areas in the RSA. Polar bears tend to be more abundant along shore lead systems and polynyas during winter, where less consolidated ice cover provides habitat for prey species. Non-pregnant females, juveniles, and adult males remain active on the pack ice throughout the year, often moving considerable distances with the ice. The distribution and population size of polar bears is likely regulated by the extent of sea ice and the distribution and numbers of their primary prey, the ringed seal.

Female polar bears give birth to 1-3 cubs every 3 to 4 years. Mating occurs from April to June, and females give birth the following December or January in maternity dens, which are excavated in accumulations of snow on stable parts of landfast ice, offshore pack ice, and most often on land within approximately 50 km of the coast. Dens are created in the fall and bears leave their dens in April.

The global polar bear population is estimated at 22,000 to 25,000, of which at least 15,500 occur in Canada or in subpopulations shared with Canada. Three subpopulations of polar bears occur within the RSA: Foxe Basin, Baffin Bay, and Davis Strait with each subpopulation numbering around 2,000.

Along the northern shipping route, polar bears are distributed throughout Baffin Bay, Lancaster Sound, and along coastal areas. Polar bears from the Baffin Bay subpopulation occupy drifting pack ice and landfast ice between Baffin Island and west Greenland during winter, but can concentrate along the Lancaster Sound fast ice edge. Bears are also concentrated along landfast ice edges across Pond and Navy Board inlets during spring. Bylot Island and coastal Baffin Island are used as summer retreats when sea ice melts and

also provide denning habitat for pregnant females. The Davis Strait subpopulation occurs in the Labrador Sea, eastern Hudson Strait, Davis Strait south of Cape Dyer, and an undetermined portion of southwest Greenland. Polar bears are harvested domestically as well as during commercial spring sport hunt based out of Pond Inlet. Small numbers of polar bears were observed during aerial surveys during the open-water season in Milne Inlet, Eclipse Sound, and Eskimo Inlet and on landfast ice in Milne Inlet, Koluktoo Bay, and Navy Board Inlet.

Polar bears from the Foxe Basin subpopulation range over Foxe Basin, northern Hudson Bay and western Hudson Strait during winter and move ashore during the open-water period, concentrating on Southampton Island and along the Wager Bay and other coasts within Foxe Basin. During aerial surveys polar bears were observed on landfast ice, pack ice, terrestrial areas, and in open-water areas primarily in northern Foxe Basin but also in Hudson Strait.