

APPENDIX 6E-1

BIRDS BASELINE REPORT

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT

2006-2008 AVIAN SURVEYS
ENVIRONMENTAL BASELINE STUDY REPORT



PREPARED FOR

Baffinland Iron Mines Corporation
1016 - 120 Adelaide Street West
Toronto, ON, M5H 1T1

PREPARED BY

Knight Piésold Ltd.
1650 Main Street West
North Bay, ON P1B 8G5

NB102-181/25-1
Rev 0
August 31, 2010

Knight Piésold
CONSULTING



ISO 9001, ISO 14001
OHSAS 18001

BAFFINLAND IRON MINES CORPORATION MARY RIVER PROJECT

2006-2008 AVIAN SURVEYS ENVIRONMENTAL BASELINE STUDY REPORT (REF. NO. NB102-181/25-1)

Rev. No.	Revision	Date	Approved
0	Issued in Final	August 31, 2010	<i>m</i>

Knight Piésold Ltd.

1650 Main Street West
North Bay, Ontario Canada P1B 8G5
Telephone: (705) 476-2165
Facsimile: (705) 474-0543
www.knightpiesold.com

Knight Piésold
CONSULTING

**BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT**

**2006-2008 AVIAN SURVEYS
ENVIRONMENTAL BASELINE STUDY REPORT
(REF. NO. NB102-181/25-1)**

EXECUTIVE SUMMARY

Baseline studies were conducted on birds within the Mary River Project area in 2006, 2007 and 2008 to:

- Determine species occurrence, abundance, distribution, and diversity within the Mary River Project (Project) Regional Study Area (RSA) and Local Study Area (LSA)
- Document the seasonal occurrence and habitat requirements of species migrating through the areas and/or breeding in them
- Facilitate the identification of any potential impacts of the Project on species occurrence, abundance, distribution, diversity, and habitat use patterns

In all three years, 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 it. 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. Fourteen Snow Goose nests were found within the RSA in 2006, 79 in 2007, and 171 in 2008. Survey techniques and timing were kept as similar as possible for all birds between the three years. Thus, the increased number

of Snow Goose nests in 2007 and 2008 is most likely the result of (1) a late snow melt and a late migration period in 2007 (late June, three weeks later than in 2006), which may have caused these birds to shorten their migration, and (2) an increase in Snowy Owl nests in 2008. Snow Geese nest close to Snowy Owls for protection from arctic foxes and often there are 3-5 goose nests within 50 m of a Snowy Owl nest.

Each June, thousands of 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, thousands of these geese returned again to rest, forage, and to moult their feathers, before continuing their migration south. The number of non-breeding geese that were seen moulting in July was approximately 30% higher in 2007 and 2008 than in 2006, which may also have been a consequence of a shortened breeding season in 2007 and an increase in local nesters in 2008 due to increased nesting of Snowy Owls.

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 near Deposit 4 and 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. Seventy-eight gull nests (mostly Glaucous Gulls) were found scattered throughout the RSA in 2006, 113 in 2007, and 90 in 2008.

**BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT**

**2006-2008 AVIAN SURVEYS
ENVIRONMENTAL BASELINE STUDY REPORT
(REF. NO. NB102-181/25-1)**

TABLE OF CONTENTS

	PAGE
EXECUTIVE SUMMARY	i
SECTION 1.0 - INTRODUCTION	1
1.1 BACKGROUND	1
1.2 STUDY OBJECTIVES	1
SECTION 2.0 - REGIONAL SETTING	3
2.1 AREAS DESIGNATED AS IMPORTANT BIRD HABITAT	3
2.1.1 Bylot Island Bird Sanctuary and Sirmilik National Park	3
2.1.2 Steensby Inlet	4
SECTION 3.0 - 2006-2008 SURVEY METHODS	5
3.1 EXISTING INFORMATION	5
3.2 INUIT KNOWLEDGE	5
3.3 SURVEYS	6
3.3.1 Aerial Surveys	6
3.3.2 Ground Surveys	8
SECTION 4.0 - 2006-2008 RESULTS	10
4.1 GENERAL FINDINGS	10
4.2 SPECIES OF CONCERN	12
4.3 RAPTORS	13
4.4 WATERFOWL (DUCKS, LOONS, AND GEESE)	14
4.5 SONGBIRDS, SHOREBIRDS, AND OTHER BREEDING BIRDS	15
4.6 GULLS	16
SECTION 5.0 - REFERENCES	17
SECTION 6.0 - CERTIFICATION	20

TABLES

Table 4.1 Rev 0 Bird Species Observed within the Project Area and Bylot Island

FIGURES

Figure 1.1 Rev 0	Project Location Map
Figure 1.2 Rev 0	Bird Study Area and Survey Locations
Figure 2.1 Rev 0	Important Ecological and Protected Areas
Figure 3.1 Rev 0	Locations of Point Count Surveys Along the Tote Road, Rail Alignment, and Control Areas
Figure 3.2 Rev 0	Locations of Point Count Surveys in the Mary River Camp Vicinity
Figure 4.1 Rev 0	Bird Locations from the Inuit Knowledge Study - Marine and Terrestrial
Figure 4.2 Rev 0	Bird Locations from the Inuit Knowledge Study - Terrestrial RSA
Figure 4.3 Rev 0	Cliff-Nesting Raptor Nests - North Portion
Figure 4.4 Rev 0	Cliff-Nesting Raptor Nests - Mid Portion
Figure 4.5 Rev 0	Cliff-Nesting Raptor Nests - South Portion
Figure 4.6 Rev 0	Distribution of Snowy Owl Sightings
Figure 4.7 Rev 0	Distribution of Loon Sightings - North Portion
Figure 4.8 Rev 0	Distribution of Loon Sightings - Mid Portion
Figure 4.9 Rev 0	Distribution of Loon Sightings - South Portion
Figure 4.10 Rev 0	Duck and Eider Sightings - North Portion
Figure 4.11 Rev 0	Duck and Eider Sightings - Mid Portion
Figure 4.12 Rev 0	Duck and Eider Sightings - South Portion
Figure 4.13 Rev 0	Distribution of Snow Goose Sightings - North Portion
Figure 4.14 Rev 0	Distribution of Snow Goose Sightings - Mid Portion
Figure 4.15 Rev 0	Distribution of Snow Goose Sightings - South Portion
Figure 4.16 Rev 0	Distribution of Snow Goose - Moulting Locations
Figure 4.17 Rev 0	Distribution of Snow Goose Nest Sites - North Portion
Figure 4.18 Rev 0	Distribution of Snow Goose Nest Sites - Mid Portion
Figure 4.19 Rev 0	Distribution of Snow Goose Nest Sites - South Portion
Figure 4.20 Rev 0	Distribution of Sandhill Crane Sightings
Figure 4.21 Rev 0	Distribution of Gull Sightings and Nest Sites

**BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT**

**2006-2008 AVIAN SURVEYS
ENVIRONMENTAL BASELINE STUDY REPORT
(REF. NO. NB102-181/25-1)**

SECTION 1.0 - INTRODUCTION

1.1 BACKGROUND

The Mary River Project ("the Project") is a proposed iron ore mine and associated facilities located on North Baffin Island in the Qikiqtani Region of Nunavut, as shown on Figure 1.1. The Project involves the construction, operation, closure, and reclamation of a 21 million tonne-per-annum (Mt/a) open pit mine that will operate for 21 years. The high-grade iron ore to be mined is suitable for international direct shipment after crushing and screening with no secondary processing or concentrating required. Three Mt/a of iron ore will be transported via an upgraded existing road to Milne Inlet where it will be stockpiled for shipment during the open water season. A railway system will transport an additional 18 Mt/a of the ore from the mine area to an all-season deep-water port and ship loading facility at Steensby Port where the ore will be loaded into ore carriers for overseas shipment through Foxe Basin. A dedicated fleet of cape-sized ice-breaking ore carriers and some non-icebreaking ore carriers and conventional ships will be used during the open water season to ship the iron ore to markets.

This environmental baseline study report has been prepared in support of an Environmental Impact Statement (EIS) for the Project, to be submitted by Baffinland to the Nunavut Impact Review Board (NIRB).

In addition to showing the bird study areas, Figure 1.2 shows the aerial extent of the proposed Project, which comprises:

- The mine site at Mary River (Deposit Nos. 1 and other mineralized zones)
- The existing Milne Inlet Tote Road
- Milne Inlet Port Site and adjacent marine areas
- The proposed railway between Mary River and Steensby Inlet
- The proposed Steensby Inlet Port Site and adjacent marine areas

1.2 STUDY OBJECTIVES

The main objectives of this three-year avian survey baseline study were to:

- Determine species occurrence, abundance, distribution, and diversity within the Mary River Project (Project) Regional Study Area (RSA) and Local Study Area (LSA)
- Document the seasonal occurrence and habitat requirements of species migrating through the areas and/or breeding in them

The long-term goals of this study, not reported herein, were to provide input for the planning, design and implementation of the Mary River Project in order to:

- Identify any potential impacts of the Project on bird species occurrence, abundance, distribution, diversity, and habitat use patterns
- Identify mitigation guidelines that will be able to detect and eliminate or minimize potential Project impacts
- Propose a monitoring program, if required, that can subsequently measure the effectiveness of these mitigation plans and procedures, and/or detect any unanticipated impacts

All field investigations of birds in the study area was conducted by Dr. Matthew Evans. Observational results, data interpretation, and discussion of the results were also provided by Dr. Evans and are presented in this report.

SECTION 2.0 - REGIONAL SETTING

The Mary River Project is located on northern Baffin Island, approximately 160 km southwest of Pond Inlet. The Regional Study Area (RSA) defined for terrestrial bird studies for the Project is shown on Figure 1.2, and extends from Milne Inlet to the north following an approximate 50 to 80-km wide corridor centred on the Milne Inlet Tote Road, Mary River mine site, and the proposed railway alignment from Mary River to Steensby Inlet encompassing the coastal areas of Steensby Inlet. The RSA was selected to include the region that may be subject to the indirect effects of the Project (towards the interior) and to provide data control sites beyond the range of Project impacts (closer to the boundaries).

The RSA is characterized by a wide variety of bird habitats and, therefore, is home to a large diversity of migratory species that use this area annually for breeding from late May through September. These habitats include: i) rocky uplands and steep cliffs which raptors use for nesting, ii) an extensive array of inland waterbodies (wetlands, lakes, streams and rivers) that loons, ducks, and geese rely on, iii) low-lying coastal plains, river deltas, and tundra used by Sandhill Cranes and various species of songbirds and shorebirds, and iv) coastal and marine environments for shorebirds and seabirds.

The Local Study Area (LSA) for terrestrial birds is defined by a 1 km corridor on each side of the Project components (described below in Section 3 - Methods). The LSA was selected to include the habitat within and directly adjacent to the Project Footprint that will likely be subject to direct and indirect effects of the Project.

2.1 AREAS DESIGNATED AS IMPORTANT BIRD HABITAT

Bird Studies Canada and other international conservation organizations have identified areas that are important to birds and are recognized as ecologically sensitive, potentially requiring special conservation measures. No areas within the Project study area have been designated as '*Important Bird Habitat*' or '*Important Bird Areas*'.

2.1.1 Bylot Island Bird Sanctuary and Sirmilik National Park

At the northern end of the Project study area, outside of the Project boundaries, and directly adjacent to the marine environment study area (described by North/South Consultants Inc. 2006), is Bylot Island Bird Sanctuary, which also forms a part of Sirmilik National Park, as shown on Figure 2.1. Bylot Island and Sirmilik National Park are home to more than 70 species of birds (Lepage et al. 1998) including large breeding colonies of Snow Geese (with Canada's largest Snow Goose colony), seabirds such as Thick-billed Murres and Black-legged Kittiwakes, and the endangered Ivory Gull on Brodeur Peninsula (Alexander et al. 1991). The avifauna in these two protected areas is among the most diverse in the Canadian Arctic and have been well studied (Tuck and Lemieux 1959, Kempf et al. 1978, Nettleship and Gaston 1978, Lepage et al. 1998). Both areas are sensitive to disturbance including marine pollution (Alexander et al. 1991) and have special federal and international protection under the *Migratory Birds Sanctuary*

Regulations (1997), the Migratory Birds Convention Act (1994), and Canada's National Parks Act (2000).

2.1.2 Steensby Inlet

Also outside of the Project boundaries in the northwestern portion of Steensby Inlet (southern part of the RSA), is an area that has been designated as '*Key Migratory Bird Habitat*' by the Canadian Wildlife Service (Alexander et al. 1991), as shown on Figure 2.1 and named as NU Site 20-Berlinguet Inlet by the CWS. This long, narrow stretch of low-lying tundra reaches west to Berlinguet Inlet and Bernier Bay and is used by thousands of breeding Snow Geese and Canada Geese (Reed and Dupuis 1980, Giroux et al. 1984), seabirds, sea ducks, shorebirds, and Peregrine Falcons (Reed and Dupuis 1980). Key Migratory Bird Habitat may require special conservation measures in the future, but currently, this area has no special protection status (Alexander et al. 1991).

SECTION 3.0 - 2006-2008 SURVEY METHODS

Avian field surveys were conducted between early-June and late-August, 2006-2008. Numerous surveys were conducted in each of the following areas during the spring migration, breeding season, and fall migration periods for all bird species present:

1. Within the Mary River Project mine site.
2. Along the existing Milne Inlet Tote Road and 1 km on either side of the Road.
3. The Milne Inlet Port Site and adjacent marine areas.
4. The candidate rail corridor heading south from Mary River to Steensby Inlet, and 1 km on either side of it.
5. The Steensby Inlet Port Site and adjacent marine areas south to Koch Island in Foxe Basin.

Appropriate control sites were established adjacent to all of these potential impact areas and were surveyed on either the same day or the next day using a pairwise before-after-control-impact design (Underwood 1994, Treweek 1996). In 2006, two alternative candidate rail corridors were being considered (one to the northeast and one to the southwest) therefore these were surveyed as potential impact areas in the 2006 surveys. After being discarded as potential routes, the survey sites along them were kept as control sites in the 2007 and 2008 bird surveys. One route was adjacent and parallel to the northwest Milne Inlet Tote Road and the other was adjacent and parallel to the southeast rail corridor proposal to the Steensby Port Site. Overall, this survey design comparing impacted areas and control sites will help to facilitate differentiation among natural variation, changes that may result from mining activities, and other changes that may be a result from influences such as climate change. Climate change is now affecting bird species' behaviour, ranges and population dynamics (The Nature Conservancy, 2010) and is especially apparent in the Arctic where average temperatures are expected to rise at twice the rate of the rest of the world (Arctic Council, 2004).

3.1 EXISTING INFORMATION

A literature review of bird studies focussing on the northern Baffin Island region was conducted in order to gather background information and to compile an initial bird species list for the RSA. Government biologists employed by the Government of Nunavut (GN) and the Canadian Wildlife Service (CWS) who were familiar with the region and Nunavut as a whole, were also contacted at various times throughout the duration of the study.

3.2 INUIT KNOWLEDGE

Traditional knowledge surveys to learn more about birds in the RSA were conducted in three nearby communities (Pond Inlet, Arctic Bay, and Igloolik). Forty-five interviews were conducted (16 in Pond Inlet, 13 in Arctic Bay, and 16 in Igloolik) and, where appropriate, information was recorded on maps based on the following questions.

- Which birds arrive first in the spring?
- Which birds are commonly seen in the summer?

- Which birds leave first in the fall?
- Are there any birds that winter in your area?
- Are there many cliffs in your land use area? Are any of those cliffs used by nesting raptors (e.g., falcons and hawks)?
- Which seabirds nest along the ocean? Can you show me on the map where they nest?
- Can you show me on the map where the tundra wetlands are that ducks and geese use in large numbers?
- Do you know of any places inland that are important for birds? Why do birds use these areas?
- Where do you go to hunt ducks and geese or to collect their eggs?

3.3 SURVEYS

Both aerial and ground-based surveys were carried out each year, with survey dates timed to coincide with avian annual cycles including spring migration, various stages of breeding, and fall migration. These surveys were conducted in the following periods:

- Late-May to early-June
- Mid- to late-June
- Mid- to late-July
- Mid- to late-August

Songbirds and shorebirds were an exception to this and were only surveyed during the breeding season (mid- to late-June and July) when these birds were engaged in conspicuous courtship and territorial behaviours that made them easy to census using point-count surveys and transect plots.

Each year, surveys were conducted as close to the same time as possible in order to try to address natural, annual and seasonal variations in bird diversity, density, distribution, and behaviour (e.g. time of migration or onset of nesting as accurately as possible). However, survey dates between years varied slightly due to different snow-melt dates, which influenced some breeding phenologies. Ultimately, sampling times were chosen to allow comparisons between years at the various life stages (e.g., number of breeding pairs, number of nests initiated, number of young fledged, etc.). All surveys were designed and conducted to (1) collect baseline data from potential impact areas and control sites, and (2) provide directions for future monitoring programs to allow comparisons using pairwise before-after-control-impact analyses (Underwood 1994, Treweek 1996).

3.3.1 Aerial Surveys

Systematic aerial surveys within the Project Footprint were designed to cover maximum area within the footprint and 1 km on either side of all proposed Project infrastructure (the LSA). Aerial surveys were also conducted on a regional basis to establish and survey control sites within the RSA. In addition to standard aerial transect lines, 28 permanent 10 x 10 km (100 km²) aerial survey plots were also established every

20 km along the two transportation routes (Milne Inlet Tote Road to the north, and the proposed railway alignment to Steensby Inlet to the south) and in nearby control sites as shown on Figure 1.2. Twelve study plots were established within the Project Footprint and 16 control plots were established outside the Project Footprint but within 30 km of a corresponding footprint plot. Project Footprint plots and their nearest corresponding control plots were always surveyed on the same day. All footprint plots and control plots were surveyed an equal number of times in each of the three years of the study.

Raptor Surveys

All cliff-nesting habitat within the RSA was surveyed systematically by helicopter each year and both active and inactive nests were recorded for Peregrine Falcons, Gyrfalcons, Rough-legged Hawks, and Ravens. Occupancy surveys were conducted in late May and early June each year to determine the number of active territories and nests of these species. Reproductive productivity surveys were conducted in mid to late June, mid to late July, and mid to late August each year to determine nesting and fledging success.

Occupancy and reproductive productivity were assessed and recorded for each nest in each territory at least three times within the Project Footprint and at several randomly selected territories in control areas. A territory was deemed occupied if a pair of Peregrines was present on more than one visit or if there was evidence of reproduction including eggs in a nest or an adult incubating.

Nest success was defined as the proportion of nests with at least one hatched egg and nest productivity was defined as the number of young observed in a nest at 35 days, which is a conservative modification of the guidelines in Cade et al. (1996) suggesting an age of 28 days. However, for birds in general, reproductive productivity is typically determined when nestlings have reached at least 80% of average age of fledging (Steenhof 1987), which is 34 days. Peregrines fledge about 43 days after hatching (Court et al. 1988).

Known territories and nest sites were checked in each subsequent year in an attempt to calculate re-use rates, which were determined by visiting known nest sites from a previous year and determining if they were occupied again in subsequent years. Re-use rates were calculated by dividing the number of occupied territories by the number of territories that were checked for occupancy.

Waterfowl Surveys

All wetlands, streams, rivers, and lakes within the Project Footprint, and within 1 km of either side of it, were systematically surveyed for waterfowl by helicopter on a weekly basis during the spring migration, breeding season, and fall migration periods. Survey techniques followed standardized protocol set forth by the U.S. Fish and Wildlife Service and the Canadian Wildlife Service (U.S. Department of the Interior & Environment Canada 1987).

Waterfowl surveys were designed to provide 100% coverage of all waterbodies within the Project Footprint and within the control plots. Occupancy surveys (breeding pair surveys) conducted in mid to late June assessed the courtship and egg-laying stages, and were used to categorize lakes as used or unused by breeding pairs prior to hatching. A lake was deemed to be occupied (or used) if at least one established breeding pair was seen on that lake in more than one survey. Productivity surveys (brood surveys) were conducted in mid to late July and mid to late August to categorize lakes as used or unused by females with broods (after hatch) and to calculate reproductive output rates for the various waterfowl species, both inside and outside of the Project Footprint. Data analysis was focused on determining the proportion of waterbodies used/unused and the habitat features that may affect these occupancy rates prior to any Project disturbances. All birds observed were counted and classified based on age (adult, juvenile, or duckling), sex, and whether they were alone, paired, or in a group.

Goose Surveys

Systematic aerial surveys were conducted throughout the RSA and LSA to census the number of Snow Goose and Canada Goose breeding pairs and nests in these areas. These surveys were performed at the same time as the waterfowl surveys and therefore were also conducted on a weekly basis during the spring migration, breeding season, and fall migration periods. Also, in early to mid June of each year, two separate line transect aerial surveys were conducted over the coastal plains near Steensby Port to census migrating Snow Geese and Canada Geese that use the Steensby Port area as a stop-over site, presumably on their way to breed on Bylot Island.

3.3.2 Ground Surveys

Songbirds and Shorebirds

Each year, songbirds and shorebirds were surveyed in mid to late June and July using standard point-count surveys and transect plots that followed the Program for Regional and International Shorebird Monitoring (PRISM) protocol (Bart et al. 2005, Canadian Wildlife Service 2006) with one modification. Because of the immense size of the RSA causing both time and personnel constraints, 1 ha (100 x 100 m) transect plots were used instead of the 12 ha (400 x 300 m) plots recommended by PRISM. Limiting surveys of these birds to the breeding season to assess courtship and territorial behaviour is standard protocol due to ease and confidence of observation.

Point-count surveys were primarily focused on songbirds and the transect plots were primarily focused on shorebirds, but all species seen or heard were recorded during both survey types. Birds were counted and classified based on age (adult, juvenile, young of the year), sex grouping (alone, paired, or in a group), and behaviour (e.g., singing, calling, displaying, chasing other birds). Surveys were not conducted on days that would affect the bird's behaviour and our ability to detect them such as on windy or rainy days.

Ground survey stations were systematically located every 20 km along the Tote Road and proposed railway as shown on Figures 1.2 and 3.1. Each of these survey stations

had corresponding control sites located nearby that were surveyed on either the same day or the next day. Survey locations in and around the Mary River Mine Site and Camp, Milne Inlet Camp, and Steensby Inlet Port were designed as stratified blocks based on habitat types, which was intended to maximize coverage of all habitat types found within these Project areas. Over 150 additional 'opportunistic' point-count surveys were conducted in locations scattered throughout the RSA both inside and outside of the Project Footprint as shown on Figure 3.2.

SECTION 4.0 - 2006-2008 RESULTS

4.1 GENERAL FINDINGS

Prior to the work reported here, no comprehensive avian surveys have been conducted within the Mary River terrestrial RSA. As such, Important Bird Areas have not been identified within the RSA by the Canadian Wildlife Service or others. Figure 2.1 shows the location of designated Important Bird Areas and other conservation features in the broader Baffin Island region. The northerly position of Important Bird Areas such as the Bylot Island Bird Sanctuary and others relative to the RSA suggests that many bird species may pass through portions of the RSA during spring and fall migrations.

Lepage et al. (1998) present a species list resulting from 18 years of study on Bylot Island, which ranks among the sites with the greatest abundance and diversity of birds in the Canadian High Arctic (Alexander et al. 1991). Long-term studies continue on Bylot Island, and a long-term record of species presence and trends in abundance has been maintained (Alexander et al. 1991, Lepage et al. 1998, Menu et al. 2002, Gauthier et al. 2004, Mallory and Fontaine 2004). Species observed and known to be breeding within the RSA during this three year Mary River study are presented in Table 4.1 along with those recorded on Bylot Island by Lepage et al. (1998). This table also lists the conservation status of each species according to the Government of Nunavut, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the *Species at Risk Act* (SARA).

Bird surveys for the Mary River Project recorded a surprisingly low diversity of species present and breeding within the RSA compared to species reported to be present and breeding on Bylot Island as follows.

- Bylot Island Long-term Study: 74 bird species present; 45 confirmed breeding (Lepage et al. 1998)
- 2006 Mary River Surveys: 39 species present; 27 confirmed breeding
- 2007 Mary River Surveys: 46 species present; 33 confirmed breeding
- 2008 Mary River Surveys: 44 species present; 33 confirmed breeding

Information collected from interviews with the Inuit as part of the Mary River Inuit Knowledge Study (MRIKS, 2008) is mapped on Figures 4.1 and 4.2 and reflects their intimate connection to the land and its resources. Although these interviews did not add new species to the list, they confirmed many of the species found in the surveys conducted throughout the RSA and marine environments.

Only in the northern portion of the RSA around Milne Inlet and Milne Inlet Tote Road and outer islands is species specific information from the interviews coded by colour in Figure 4.2. The rest of the RSA, including the Mary River mine site, the proposed Steensby Port location and surrounding lands west of the proposed rail line are located in the figures as areas important for birds in general.

Thousands of Snow Geese migrate over the RSA and/or use the area for migratory stop-over sites in the spring and fall as molting and foraging locations prior to fall migration. Included in these, are vast areas of tundra and wetland habitat within the terrestrial RSA from Steensby Inlet, stretching north-west along the west side of the rail alignment all the way to Milne Inlet, a distance of approximately 150 kilometres. Ishmael Katsak and Theresa Maktar (MRICKS, 2008) of Pond Inlet noted several large areas within the southwest portion of the terrestrial RSA has being important to Snow Geese and other waterfowl as nesting and foraging habitat (Figure 4.2). These same areas were observed by Knight Piésold scientists has becoming snow-free early in the spring due to the abundance of water, and being an important stopover area during spring migration.

From the interviews, it is clear that ducks and geese of all species are important to the Inuit for the harvest of the eggs and the use of various parts of the bird for ceremonial and practical purposes. The birds, eggs, and Eider down are all used. Down (sometimes with the birds' skin) is used for pillows or clothing, wings are used for sweeping tents, feathers are used for fletching on arrows, skin from the feet is used for making waterproof baskets, and the hollow bones have a variety of uses (Jacob Peterloosie, MRIKS, 2008).

Although, the elders described species they encountered from a harvest perspective and the focus of the questions was definitely to gather this type of information, they also recognized and acknowledged other species and the timing of their movements as indicators for historical and seasonal changes. These include weather patterns and seasonal fluctuations as witnessed by Ishmael Katsak, (MRIKS, 2008) in the earlier arrivals of Canada Geese in the spring indicating a general warming trend and anthropogenic sources of pollution (airplanes landing and taking off) affecting their feeding grounds (Ishmael Katsak, MRIKS, 2008).

Although there are a variety of bird habitat types throughout the RSA, the four most common general habitat types include the following.

- Rocky uplands and steep cliffs, which are used primarily by raptors for nesting
- Inland waterbodies such as wetlands, lakes, streams, and rivers, which are used primarily by loons, Ducks, and Geese
- Productive coastal plains, river deltas, and tundra, which are used predominantly by songbirds, shorebirds, Snowy Owls, and other upland birds such as sandhill cranes and ptarmigan
- Coastal and marine environments, which are used mainly by shorebirds, seabirds, loons, Eiders, and some other species of ducks

4.2 SPECIES OF CONCERN

A review of species listed by COSEWIC (2007), SARA, and the Government of Nunavut's Department of the Environment (CESCC 2006) identified the following species as potentially occurring within the RSA for the Mary River Project.

- **Ivory gull:** Endangered (COSEWIC 2006), Special Concern (SARA 2007), and May Be At Risk (CESCC 2006)
- **Peregrine falcon:** (*tundris subspecies*) Special Concern (COSEWIC 2007) and Secure (CESCC 2006)
- **Ross's gull:** Threatened (COSEWIC 2007, SARA 2007) and At Risk (CESCC 2006)
- **Red knot:** Special Concern (COSEWIC 2007) and Sensitive (CESCC 2006)
- **Short-eared owl:** Special Concern (COSEWIC 2008, SARA 2008) and Sensitive (CESCC 2006)

Ivory Gulls and Ross's Gulls were not recorded in the RSA by the 2006-08 baseline studies but have occasionally been observed in Foxe Basin in previous years (MRIKS, 2008). Ivory Gulls are thought to migrate through Foxe Basin and have been observed in Igloolik and in Cape Dorset ((Theo Ikummaq, MRIKS, 2008) suggesting that portions of the RSA may be a migratory pathway for Ivory Gulls en route to and from nesting grounds on Brodeur Peninsula on northern Baffin Island (Mark Mallory pers. comm.). A small number of Ross' Gulls are believed to nest on Prince Charles Island. There was one unconfirmed sighting of a breeding pair in the mid-1980s by Tony Gaston and one confirmed nest in the late-1990s by Vicky Johnson, both of the Canadian Wildlife Service (Mark Mallory pers. comm.).

Peregrine falcon populations across northern Canada have been recovering from near extinction in the late 1960s (Cade et al. 1988, Bromley 1992, Enderson et al. 1995, COSEWIC 2006) and were upgraded from being Threatened to being a Species of Special Concern in 1992 (COSEWIC 2006). *Tundris* Peregrine Falcons are abundant and widespread throughout the RSA. Thus, the RSA is considered an important breeding area for this species.

Red knot populations are well studied in North America and three subspecies are known to breed in high-arctic areas between Greenland and Alaska (Harrington 2001). The *islandica* subspecies (*Calidris cantus islandica*) is found in the eastern Arctic and was seen in the RSA in 2007 and 2008. This subspecies is listed as a Species of Special Concern and has been declining by as much as 17% over the past ten years (COSEWIC 2007).

Short-eared Owls are widely distributed in small numbers throughout Canada including low Arctic areas, but they are not typically found as far north as Canada's Arctic islands (Holt and Leasure 1993). A total of six Short-eared Owls were recorded within the RSA in 2007 and 2008

but were not confirmed to be breeding in the area. Austen (1994) suggested the decline in Short-eared Owls is mostly related to habitat loss and degradation on its wintering grounds, with continuing habitat loss and degradation on its breeding grounds in southern Canada and pesticide use as secondary threats.

All other species recorded in the RSA have not been listed by COSEWIC or SARA, but have been ranked by the Government of Nunavut (CESCC 2006).

4.3 RAPTORS

Five species of raptors were observed in the RSA including cliff-nesting Peregrine Falcons, Rough-legged Hawks, Gyrfalcons, ground-nesting Snowy Owls, and ground-nesting Short-eared Owls. Cliff-nesting raptors are known to be limited primarily by the availability of suitable nesting ledges and by the availability of adequate nearby foraging habitat (Newton 1979). Approximately 35% of the RSA and 30% of the LSA consists of suitable cliff-nesting habitat. Therefore, both the RSA and the LSA have an abundance of seemingly suitable cliff-nesting habitat with productive tundra foraging habitat nearby, particularly in the eastern and southern areas. Also, results from the three years of baseline studies indicate that this cliff-nesting habitat is not saturated with territorial raptors, and therefore, the availability of nesting habitat for Peregrine Falcons and other cliff nesting species does not appear to be limiting. Also, most of these cliffs are located in or close to productive tundra hunting grounds with abundant supplies of prey species such as ptarmigan, small birds, and small mammals. Approximately 30% of the RSA and 25% of the LSA consists of productive tundra.

All of the cliff nesting raptor species are known to have high nest site fidelity rates, meaning that they defend the same territories and use the same nest locations year after year. Figures 4.3 to 4.5 show the recorded nest locations for these cliff nesting raptors, including approximately 160 Peregrine Falcon nests with about 80 active in a given year, approximately 100 Rough-legged Hawk nests, and about 12 Gyrfalcon nests.

There were two distinct concentrations of Peregrine Falcon nest sites. One concentration (50 x 50 km area) included the Mary River Mine Site shown on Figure 4.4, with an average density over three years of 0.01 nests/km². The other nest concentration occurred at the Steensby Port Site (50 x 50 km area), also with an average density over the three years of 0.01 nests/km² as shown on Figure 4.5. For the entire area within the proposed Project Footprint, the three-year mean nest density was 0.04 nests/km². For the entire area outside of the Project Footprint, nest density was 0.001 nests/km². Comparing these values, Peregrine Falcon nest density was 40 times greater within the Project Footprint than within the remainder of the RSA.

The mean nest success rate inside the Project Footprint (70% over three years) was very similar to the mean nest success rate outside of the Project Footprint (71% over three years). The mean number of chicks per nest that survived to the age of 35 days (nest productivity metric) was 2.3. The territory reuse rate in 2007 was 88% and in 2008 it was 85%. Nest reuse rates in 2007 and 2008 were 80% and 77%, respectively.

The spatial distribution of Rough-legged Hawks throughout the RSA was similar to Peregrine Falcons but at lower densities, Gyrfalcon nests were identified only between the Mary River Mine Site and the Steensby Inlet Port Site, and individual Gyrfalcons were observed only between the Mary River Mine Site and Milne Inlet.

A few Snowy Owls were observed within the RSA in 2006 ($n = 24$) and in 2007 ($n = 23$), four Snowy Owl nests were recorded in 2006, and no nests were recorded in 2007 as shown on Figure 4.6. In 2008, Snowy Owls were observed in great abundance with over 160 observations and 105 nests, suggesting a large increase in the abundance of prey availability, which is primarily lemmings. Gilles Gauthier from the University of Laval, who leads the Bylot Island ecological studies, visited the Mary River site briefly in 2008 to track four female Snowy Owls that had been tagged with radio transmitters in 2007 on Bylot Island. Dr. Gauthier located these female owls and their respective nest sites. He then set lemming traps in the vicinity and reported a very high density of lemmings in the Mary River area, indicating that high lemming populations facilitated an increase in the Snowy Owl population in 2008 (Gilles Gauthier pers. comm.).

Three Short-eared Owls were seen in both 2007 and 2008 (none were seen in 2006) but no nests were found. These Owls are not typically found as far north as the Mary River RSA, although a few individuals have also been observed just north of the RSA on Bylot Island. Currently, however, there have been no confirmations of them breeding in the area (Lepage et al. 1998, Gilles Gauthier pers. comm.).

A number of occupied raptor nests are located in close proximity to Project activities and proposed areas of mine construction and operation including the following:

- Seven active Peregrine falcon nests and eight inactive raptor nests were identified within 500 to 1,000 m of the Milne Inlet Tote Road, and an eighth active nest is located within approximately 100 m of the Road at km 84.5 as shown on Figure 4.3
- Three Peregrine Falcon nests were identified in the Mary River exploration area as shown on Figure 4.4
- Two Peregrine Falcon nests (one nest active in 2006, the other active in 2007 and 2008), one active Rough-legged Hawk nest, and one active Common Raven nest are located near the proposed Steensby Inlet Port Site as shown on Figure 4.5

Due to the vast abundance and availability of suitable raptor nesting and foraging habitat in the RSA, disturbed birds will most likely move to new locations, although this may take a year or two and may cause some nest failures.

4.4 WATERFOWL (DUCKS, LOONS, AND GEESE)

Within the RSA, there are abundant wetlands, streams, rivers, and waterbodies of various sizes, ranging from small shallow ponds up to large deep lakes. These habitats are utilized by a high density but low diversity of waterbirds including loons, ducks, and geese. The three-year mean percentage of lakes occupied by waterfowl species within the LSA was 66%.

Figures 4.7 to 4.9 show the distribution of loons within the RSA recorded over the three-year study period. Four species of loon were observed including Red-throated Loon, Pacific Loon, Yellow-billed Loon, and the Common Loon (in order of decreasing abundance). The aerial study plots within the Mary River Mine Site location and their corresponding control plots have only a few small lakes (<1 ha). Waterfowl species were observed within 1 km of these study areas. A pair of Red-throated Loons and a pair of Yellow-billed Loons nested on Sheardown Lake, located 0.5 km south of the current runway at the Mary River Camp and approximately 3 km from Deposit No. 1. Both of these nests were depredated by Glaucous Gulls in all three years of the study.

Long-tailed Ducks were also plentiful in these areas and some Red-breasted Mergansers were seen in the rivers. No Red-breasted Merganser broods were observed in 2006, although several groups of non-breeders were seen. Some Red-breasted Merganser broods were seen in 2007 and 2008 (less than a dozen each year). Hundreds of King Eiders and Common Eiders migrated through the RSA each year. No eider nests were observed in 2006 and 2007, however, specific eider nest searches were not conducted. Rather, they were counted as part of other field work in 2008. In all three years, dozens of King and Common Eider broods were seen along the coastline of Steensby Inlet, indicating that this area was used for nesting. Figures 4.10 to 4.12 show the distribution of duck and eider sightings within the RSA.

Thousands of Snow Geese migrate over the RSA using the area for migratory stop-over sites in the spring and fall, including moulting locations prior to fall migration. Very few Snow Geese appear to nest within the RSA compared with the very large numbers of birds that move through the area on route to and from Bylot Island. Figures 4.13 to 4.19 show Snow Goose sightings, moulting locations, and nest locations within the RSA. Fourteen nests were located in the RSA in 2006, 79 nests in 2007, and 171 in 2008. Several thousand Snow Geese stopped in various lakes around Steensby Inlet in mid to late June to rest and to forage onshore before continuing their spring migrations northwards. From mid July to late August, thousands of geese used the Steensby area to rest, forage, and to moult their feathers before continuing their fall migration south. The number of non-breeding geese that were seen moulting in July of 2007 was substantially higher (approximately 30% higher) than in 2006 and 2008 and may have been a consequence of the late arrival of these birds and thus a shortened breeding season, which may have caused some birds to forego breeding.

4.5 SONGBIRDS, SHOREBIRDS, AND OTHER BREEDING BIRDS

Several species of songbirds and shorebirds migrate to this area annually to breed, and were predominantly found in the various types of lowland habitats (river deltas, coastal plains, tundra, and near wetlands) that offer an abundant source of insects and vegetation for foraging and nesting habitat. Regardless of an abundant supply of suitable habitat in the RSA, relatively low densities of songbirds and shorebirds were recorded in comparison to studies carried out on mainland Nunavut, N.W.T., Yukon, and Alaska (summarized in Weider and Hobaek 2000 and in Morrison et al. 2001). Eighteen species of songbirds and shorebirds were seen in the RSA and 15 of them nested in the area.

Bird densities in and around the upland areas of Deposit No. 1 at the Mary River Mine Site and at nearby control sites were low compared to the lowland areas adjacent to the Milne Inlet Tote Road and proposed railway alignment. Species that were most common around the deposits and corresponding controls were Snow Buntings, American Pipits, and Lapland Longspurs. The only shorebirds seen in these areas were Baird's Sandpipers and Common Ringed Plovers, but these were scarce. Surveys along the transportation routes revealed higher densities of the aforementioned species as well as Horned Larks, Common Redpolls, American Golden Plovers, Black-bellied Plovers, Red Knots, Sanderlings, Purple Sandpipers, Pectoral Sandpipers, Red-necked Phalaropes, Red Phalaropes, and Northern Wheatears.

Sandhill Cranes were widely distributed throughout the RSA with highest densities occurring in both lush wet tundra and dryer upland habitat between Mary River and Angajurjualuk Lake and between Cockburn Lake and Steensby Inlet as shown on Figure 4.20. Although several dozen pairs of Sandhill Cranes were observed migrating over the RSA in early June each year, no cranes were observed on the ground in areas near to the deposits.

4.6 GULLS

Inland observations of Gulls (Glaucous, Herring, Iceland, Mew, and Thayer's Gulls) were recorded opportunistically during other surveys and are shown on Figure 4.21. Seventy-eight gull nests (mostly Glaucous Gulls) were located in 2006, 113 nests were observed in 2007, and 90 nests were found in 2008. Ivory Gulls have been seen in and around the Foxe Basin but not within the terrestrial RSA. Aerial surveys conducted on seabirds and gulls around the shoreline and off-shore waters of Milne and Steensby Inlets in June, July, and August each year are presented in Volume 8, Section 5 - "Marine Environments".

SECTION 5.0 - REFERENCES

1. Alexander, S.A., R.S. Ferguson, K.J. McCormick. 1991. Key migratory bird terrestrial habitat sites in the Northwest Territories. Occasional Paper, Number 71, Environment Canada, Canadian Wildlife Service, Ottawa, Ontario.
2. Arctic Council, 2004. Impacts of a Warming Arctic: Arctic Climate Impact Assessment.
3. Austen, M.J., M.D. Cadman and R.D. James. 1994.
4. Bart, J., B. Andres, S. Brown, G. Donaldson, B. Harrington, V. Johnston, S. Jones, G. Morrison, and S. Skagen. 2005. The Program for Regional and International Shorebird Monitoring (PRISM). In: C.J. Ralph & T. R. Rich (eds.) Proceedings of the third international Partners in Flight International Symposium. US Forest Service, General Technical Report, Arcata, California, USA.
5. Bromley, M. 1992. Status report on the tundra Peregrine falcon (*Falco Peregrinus tundrius*) in Canada. Committee on the Status of Endangered Wildlife in Canada (COSEWIC), Ottawa, Ontario.
6. Cade, T.J., J.H. Enderson, C.G. Thelander, and C.M. White (Eds). 1988. Peregrine falcon populations: their management and recovery. The Peregrine Fund, Boise, Idaho.
7. Cade, T.J., J.H. Enders, and J. Linthicum. 1996. Guide to management of Peregrine Falcons at the eyrie. The Peregrine Fund, Boise, Idaho.
8. Canada's National Parks Act. 2000. Government of Canada, Ottawa, Ontario. <canlii.org/ca/sta/n-14.01/whole.html>.
9. Canadian Wildlife Service. 2006. 2006 PRISM field manual. Unpublished manuscript, Canadian Wildlife Service, Yellowknife, Northwest Territories, Canada.
10. CESSC (Canadian Endangered Species Conservation Council). 2006. Wild Species 2005: The General Status of Species in Canada. <www.wildspecies.ca>.
11. Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2006. COSEWIC Species Status Reports. Environment Canada, Ottawa, Ontario. <cosewic.gc.ca/eng/sct5/index_e.cfm>.
12. COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2007. COSEWIC Species Status Reports. Environment Canada, Ottawa, Ontario. <www.cosewic.gc.ca>.
13. Court, G. S., D. M. Bradley, C. C. Gates and D. A. Boag. 1988. The population biology of Peregrine Falcons in the Keewatin District of the Northwest Territories, Canada. In: Peregrine Falcon Populations: Their Management and Recovery, ed. By T. J. Cade,

- J. H. Enderson, C. G. Thelander and C. M. White, The Peregrine Fund, Inc., Boise, Idaho. Pp. 729–739.
14. Enderson, J.H., W. Heinrich, L. Kiff, and C.M. White. 1995. Population changes in North American Peregrines. Transactions of the North American Wildlife and Natural Resources Conference, 60:142-161.
 15. Gauthier, Gilles. Personal Communication. Professor, University of Laval, Avian Biologist on Bylot Island.
 16. Gauthier, G., J. Bety, J.-F. Giroux, and L. Rochefort. 2004. Trophic interactions in a high Arctic snow goose colony. Integrative and Comparative Biology, 44:119-129.
 17. Giroux, J.-F., Y. Bedard, and J. Bedard. 1984. Habitat use by greater Snow Geese during the brood-rearing period. Arctic, 37:155-160.
 18. Harrington, Brian A. 2001. Red Knot (*Calidris canutus*). In The Birds of North America, No. 62 (A. Poole and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.
 19. Holt, D.W. and S.M. Leasure. 1993. Short-eared Owl (*Asio flammeus*). In The Birds of North America, No. 62 (A. Poole and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.
 20. Kempf, C., X. Harmel, B. Sittler and A. Piantanida. 1978. Notes geomorphologies, ornithologiques et mammalogiques sur l'île Bylot et la region de Pond Inlet - Canada. Rapport d'expedition 1977. Scheltigheim, France: Group de recherché en ecologie arctique.
 21. Lepage, D., D.N. Nettleship, and A. Reed. 1998. Birds of Bylot Island and adjacent Baffin Island, Northwest Territories, Canada, 1979-1997. Arctic, 51:121-141.
 22. Mallory, Mark. Personal Communication. Seabird Biologist, Canadian Wildlife Service, Iqaluit, Nunavut.
 23. Mallory, M.L., and A.J. Fontaine. 2004. Key marine habitat sites for migratory birds in Nunavut and the Northwest Territories. Occasional Paper No. 109, Environment Canada, Canadian Wildlife Service. Ottawa, Ontario.
 24. Menu, S., G. Gauthier, and A. Reed. 2002. Changes in survival rates and population dynamics of greater Snow Geese over a 30-year period: implications for hunting regulations. Journal of Applied Ecology, 39:91-102.
 25. Migratory Birds Convention Act. 1994. <laws.justice.gc.ca/en/M-7.01>.
 26. Migratory Birds Sanctuary. 1997. <canadazette.gc.ca/partII/1998/19981111/html/sor522-e.htm.

27. Morrison, R.I.G., R.E. Gill, Jr., B.A. Harrington, S. Skagen, G.W. Page, C.L. Gratto-Trevor, and S.M. Haig. 2001. Estimates of shorebird populations in North America. Occasional Paper No. 104, Environment Canada, Canadian Wildlife Service. Ottawa, Ontario.
28. Nettleship, D.N., and A.J. Gaston. 1978. Patterns of pelagic distribution of seabirds in western Lancaster Sound and Barrow Strait, Northwest Territories, in August and September 1976. Occasional Paper No. 39, Environment Canada, Canadian Wildlife Service. Ottawa, Ontario.
29. Newton, I. 1979. Population Ecology of Raptors. T. & A. D. Poyser, Berkhamsted, England.
30. North/South Consultants Inc. 2006. Environmental screening for the Mary River Project, biological considerations related to seabirds and marine mammals. Draft Report.
31. Reed, A., and P. Dupuis. 1980. A preliminary report on greater Snow Geese and Atlantic brant investigations near Foxe Basin and northern Baffin Island, NWT, August 1980. Unpublished report, Environment Canada, Canadian Wildlife Service. Ottawa, Ontario.
32. SARA (Species at Risk Act). 2007. Government of Canada. <http://www.sis.ec.gc.ca/ec_species/ec_species_e.phtml>.
33. Steenhof, K. 1987. Assessing raptor reproductive success and productivity. In: Raptor Management Techniques Manual, edited by B. A. Giron Pendleton, B. A. Millsap, K. W. Cline, and D. M. Bird. Scientific Technical Series No. 10., National Wildlife Federation, Washington, D.C. pp. 157-170.
34. The Nature Conservancy, <http://www.naturecanada.ca/climate_change_birds.asp>, accessed Aug. 25, 2010.
35. Tuck, L. M., and L. Lemieux. 1959. The avifauna of Bylot Island. Dansk Ornithologisk Forenings Tidsskrift 53:137-154.
36. Treweek, J. 1996. Ecology and environmental impact assessment. Journal of Applied Ecology, 33:1991-1999.
37. Underwood, A.J. 1994. On beyond BACI: sample designs that might reliably detect environmental disturbances. Ecological Applications, 4:3-15.
38. U.S. Department of the Interior, Environment Canada. 1987. Standard operating procedures for aerial waterfowl breeding ground population and habitat surveys in North America. U.S. Fish and Wildlife Service, Patuxent, Maryland, U.S.A.; and the Canadian Wildlife Service, Ottawa, Ontario, Canada.
39. Weider, L.J., and A. Hobaek. 2000. Phylogeography and arctic biodiversity: a review. Annual Zoological Fennici, 37:217-231.

SECTION 6.0 - CERTIFICATION

This report was prepared, reviewed and approved by the undersigned.

Prepared by:


Matthew Evans, Ph.D.
Associate

Reviewed by:


Peter Quinby, Ph.D., Cert. Sen. Ecol.
Senior Environmental Scientist

Approved by:


Ken D. Embree, P.Eng.
Managing Director

This report was prepared by Knight Piésold Ltd. for the account of Baffinland Iron Mines Corporation. The material in it reflects Knight Piésold's best judgement in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, is the responsibility of such third parties. Knight Piésold Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions, based on this report. This numbered report is a controlled document. Any reproductions of this report are uncontrolled and may not be the most recent revision.

TABLE 4.1

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT

2006-2008 AVIAN SURVEYS
ENVIRONMENTAL BASELINE STUDY REPORT

BIRD SPECIES OBSERVED WITHIN THE PROJECT AREA AND BYLOT ISLAND

Print Aug/30/10 10:46:48

Common Name	Scientific Name	Bylot Island (LePage et al. 1979)	Mary River Study Area	Nunavut Gov't Status	COSEWIC Status	SARA Status
American Golden-Plover	<i>Pluvialis dominica</i>	S	B	sensitive	not listed	not listed
American Pipit	<i>Anthus rubescens</i>	S	B	secure	not listed	not listed
American Wigeon	<i>Anas americana</i>	S	...	undetermined	not listed	not listed
Arctic Tern	<i>Sterna paradisaea</i>	S	B	secure	not listed	not listed
Atlantic Puffin	<i>Fratercula arctica</i>	S	...	sensitive	not listed	not listed
Baird's Sandpiper	<i>Calidris bairdii</i>	S	B	secure	not listed	not listed
Bank Swallow	<i>Riparia riparia</i>	S	...	accidental	not listed	not listed
Black Guillemot	<i>Cepphus grylle</i>	B	...	secure	not listed	not listed
Black-bellied Plover	<i>Pluvialis squatarola</i>	S	B	sensitive	not listed	not listed
Black-headed Gull	<i>Larus ridibundus</i>	S	...	accidental	not listed	not listed
Black-legged Kittiwake	<i>Rissa tridactyla</i>	S	...	secure	not listed	not listed
Brant Goose	<i>Branta bernicla</i>	S	B	secure	not listed	not listed
Canada Goose	<i>Branta canadensis</i>	S	B	secure	not listed	not listed
Common Eider	<i>Somateria mollissima</i>	B	S	sensitive	not listed	not listed
Common Loon	<i>Gavia immer</i>	S	B	secure	not at risk	not listed
Common Raven	<i>Corvus corax</i>	S	B	secure	not listed	not listed
Common Redpoll	<i>Carduelis flammea</i>	S	...	secure	not listed	not listed
Common Ringed Plover	<i>Charadrius hiaticula</i>	S	B	secure	not listed	not listed
Dovekie	<i>Alle alle</i>	S	...	sensitive	not listed	not listed
Dunlin	<i>Calidris alpina</i>	S	...	secure	not listed	not listed
Franklin's Gull	<i>Larus pipixcan</i>	S	...	accidental	not listed	not listed
Glaucous Gull	<i>Larus hyperboreus</i>	S	B	secure	not listed	not listed
Great Black-backed Gull	<i>Larus marinus</i>	S	...	undetermined	not listed	not listed
Great Skua	<i>Stercorarius skua</i>	S	...	accidental	not listed	not listed
Greater White-fronted Goose	<i>Anser albifrons</i>	S	S	secure	not listed	not listed
Gyrfalcon	<i>Falco rusticolus</i>	S	B	secure	not at risk	not listed
Hoary Redpoll	<i>Carduelis homemanni</i>	S	S	secure	not listed	not listed
Horned Lark	<i>Eremophila alpestris</i>	S	B	secure	not listed	not listed
Iceland Gull	<i>Larus glaucoides</i>	S	S	secure	not listed	not listed
Ivory Gull	<i>Pagophila eburnea</i>	S	S	may be at risk	endangered	species of concern
Killdeer	<i>Charadrius vociferus</i>	S	...	undetermined	not listed	not listed
King Eider	<i>Somateria spectabilis</i>	B	S	sensitive	not listed	not listed
Lapland Longspur	<i>Calcarius lapponicus</i>	S	B	secure	not listed	not listed
Least Sandpiper	<i>Calidris minutilla</i>	S	...	secure	not listed	not listed
Long-tailed Duck	<i>Clangula hyemalis</i>	S	B	secure	not listed	not listed
Long-tailed Jaeger	<i>Stercorarius longicaudus</i>	B	S	secure	not listed	not listed
Mew Gull	<i>Larus canus</i>	S	B	undetermined	not listed	not listed
Northern Fulmar	<i>Fulmarus glacialis</i>	S	S	secure	not listed	not listed
Northern Pintail	<i>Anas acuta</i>	S	...	secure	not listed	not listed
Northern Waterthrush	<i>Seiurus noveboracensis</i>	S	...	accidental	not listed	not listed
Northern Wheatear	<i>Oenanthe oenanthe</i>	S	B	undetermined	not listed	not listed
Pacific Loon	<i>Gavia pacifica</i>	S	B	secure	not listed	not listed
Parasitic Jaeger	<i>Stercorarius parasiticus</i>	S	B	secure	not listed	not listed
Pectoral Sandpiper	<i>Calidris melanotos</i>	S	B	secure	not listed	not listed
Peregrine Falcon	<i>Falco peregrinus tundris</i>	S	B	secure	special concern	not listed
Pomarine Jaeger	<i>Stercorarius pomarinus</i>	B	S	secure	not listed	not listed
Purple Sandpiper	<i>Calidris maritima</i>	S	B	secure	not listed	not listed
Red Knot	<i>Calidris canutus islandica</i>	S	S	sensitive	special concern	not listed
Red Phalarope	<i>Phalaropus fulicarius</i>	S	B	sensitive	not listed	not listed
Red-breasted Merganser	<i>Mergus serrator</i>	B	S	secure	not listed	not listed
Red-necked Phalarope	<i>Phalaropus lobatus</i>	S	B	secure	not listed	not listed
Red-throated Loon	<i>Gavia stellata</i>	S	B	secure	not listed	not listed
Rock Ptarmigan	<i>Lagopus muta</i>	S	B	secure	not listed	not listed
Ross's Goose	<i>Chen rossii</i>	S	...	secure	not listed	not listed
Ross's Gull	<i>Rhodostethia rosea</i>	S	...	at risk	threatened	threatened
Rough-legged Hawk	<i>Buteo lagopus</i>	S	B	secure	not at risk	not listed
Ruddy Turnstone	<i>Arenaria interpres</i>	S	S	sensitive	not listed	not listed
Sabine's Gull	<i>Xema sabini</i>	B	...	secure	not listed	not listed
Sanderling	<i>Calidris alba</i>	S	B	sensitive	not listed	not listed
Sandhill Crane	<i>Grus canadensis</i>	S	B	secure	not at risk	not listed

TABLE 4.1

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT

2006-2008 AVIAN SURVEYS
ENVIRONMENTAL BASELINE STUDY REPORT

BIRD SPECIES OBSERVED WITHIN THE PROJECT AREA AND BYLOT ISLAND

Print Aug/30/10 10:46:48

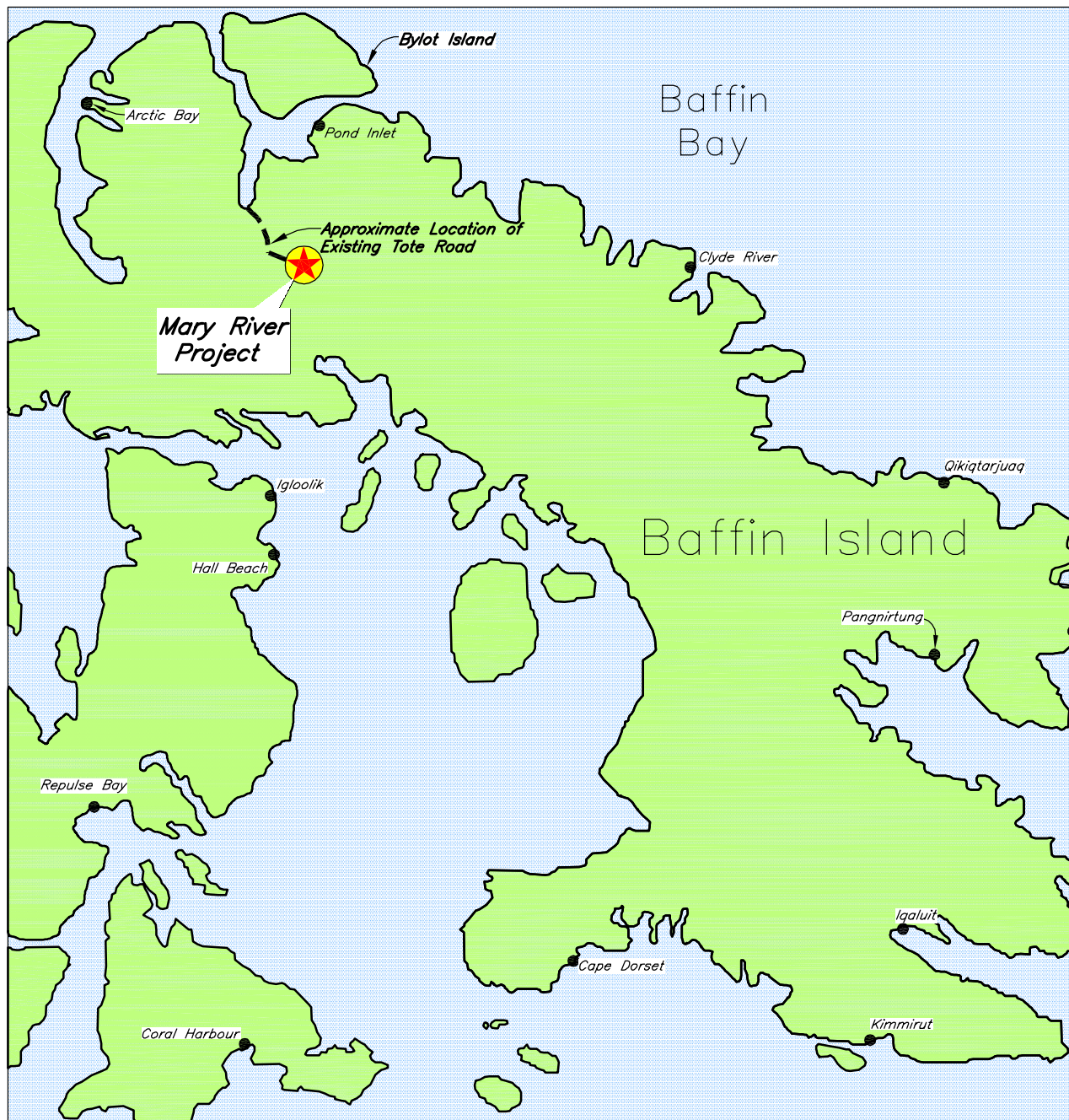
Common Name	Scientific Name	Bylot Island (LePage et al. 1979)	Mary River Study Area	Nunavut Gov't Status	COSEWIC Status	SARA Status
Savannah Sparrow	<i>Passerculus sandwichensis</i>	S	...	secure	not listed	not listed
Short-eared Owl	<i>Asio flammeus</i>	S	S	sensitive	special concern	special concern
Snow Bunting	<i>Plectrophenax nivalis</i>	S	B	sensitive	not listed	not listed
Snow Goose	<i>Chen caerulescens</i>	S	B	secure	not listed	not listed
Snowy Owl	<i>Bubo scandiacus</i>	S	B	secure	not at risk	not listed
Thayer's Gull	<i>Larus thayeri</i>	B	S	secure	not listed	not listed
Thick-billed Murre	<i>Uria lomvia</i>	B	S	secure	not listed	not listed
Tree Swallow	<i>Tachycineta bicolor</i>	S	...	accidental	not listed	not listed
Tundra Swan	<i>Cygnus columbianus</i>	B	S	secure	not listed	not listed
White-rumped Sandpiper	<i>Calidris fuscicollis</i>	B	...	secure	not listed	not listed
Yellow Warbler	<i>Dendroica petechia</i>	S	...	undetermined	not listed	not listed
Yellow-billed Loon	<i>Gavia adamsii</i>	S	B	secure	not at risk	not listed

I:\1102\00181\25\A\Report\Report 1, Rev. 0 - Avian Baseline\Table\Table 4.1 Bird species.xls\Table 4.1



NOTES:

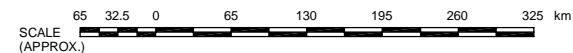
1. S=RECORDED BUT NOT A CONFIRMED BREEDER; B=CONFIRMED BREEDER; '...'=NOT RECORDED.

0	31AUG'10	ISSUED WITH REPORT NB102-181/25-1	ME	PO	KDE
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



LEGEND:

-  WATER
-  EXISTING COMMUNITY



BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

PROJECT LOCATION MAP

Knight Piésold
CONSULTING

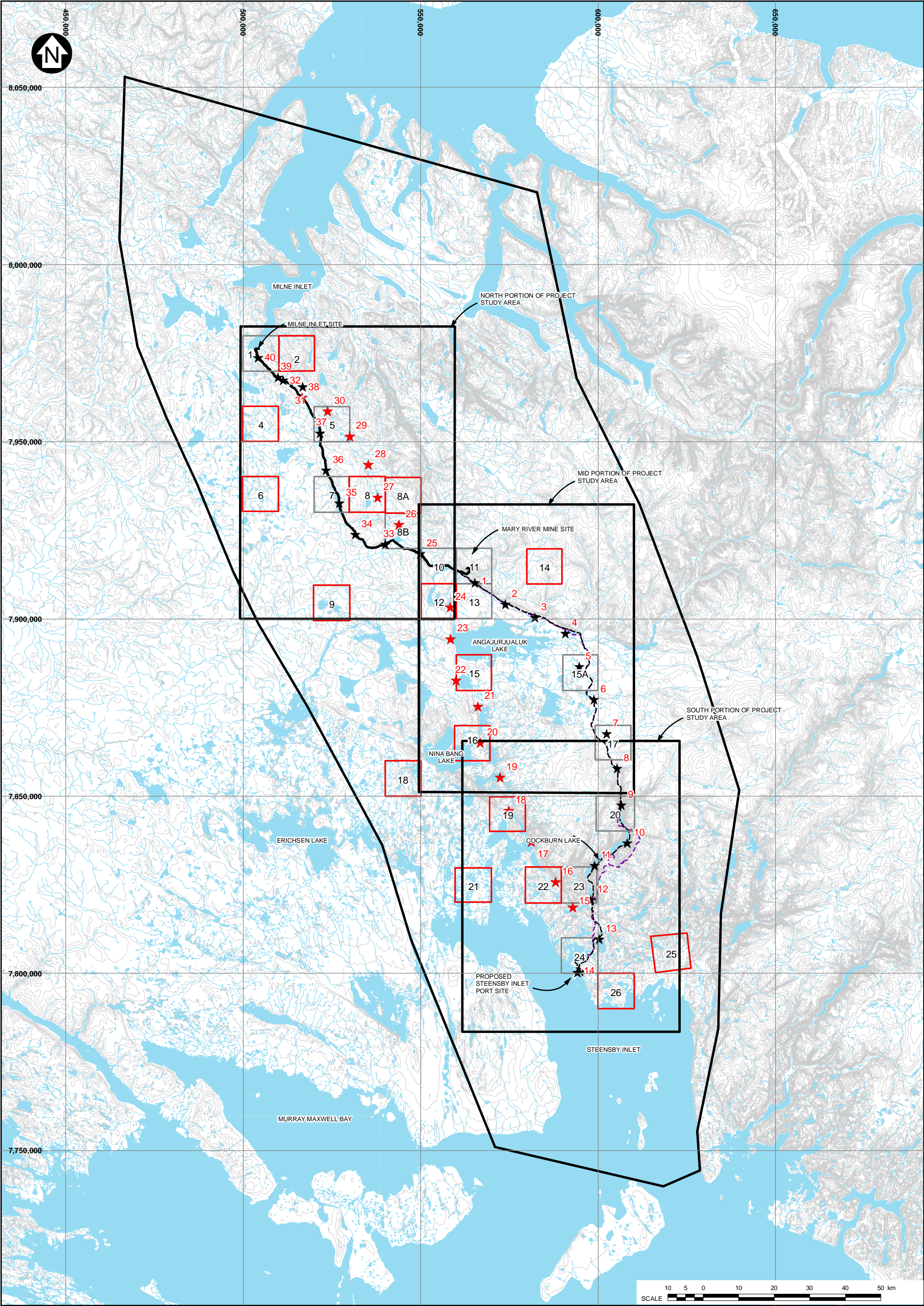
P/A NO.
NB102-181/25

REF NO.
1

FIGURE 1.1

REV
0

0	31AUG10	ISSUED WITH REPORT	MLT	ASM	PAQ	KDE
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D



LEGEND:

WATER

10 KM BY 10 KM AERIAL SURVEY PLOT - PROJECT FOOTPRINT

10 KM BY 10 KM AERIAL SURVEY PLOT - CONTROL SITE

STUDY AREA

RIVER/STREAM/DRAINAGE

MILNE INLET TOTE ROAD

PROPOSED RAILWAY ALIGNMENT

PROPOSED CONSTRUCTION ACCESS ROAD

★

★

GROUND SURVEY STATION - PROJECT FOOTPRINT

GROUND SURVEY STATION - CONTROL SITES

NOTES:

1. BASE MAP 1:250,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004).

2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.

3. CONTOURS ARE IN METRES. CONTOUR INTERVAL VARIES.

4. RAILWAY ALIGNMENT PROVIDED BY CANARAIL CONSULTANTS INC. (SEPTEMBER, 2008).

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

BIRD STUDY AREA AND SURVEY LOCATIONS

Knight Piésold

CONSULTING

P/A NO.

NB102-181/25

REF NO.

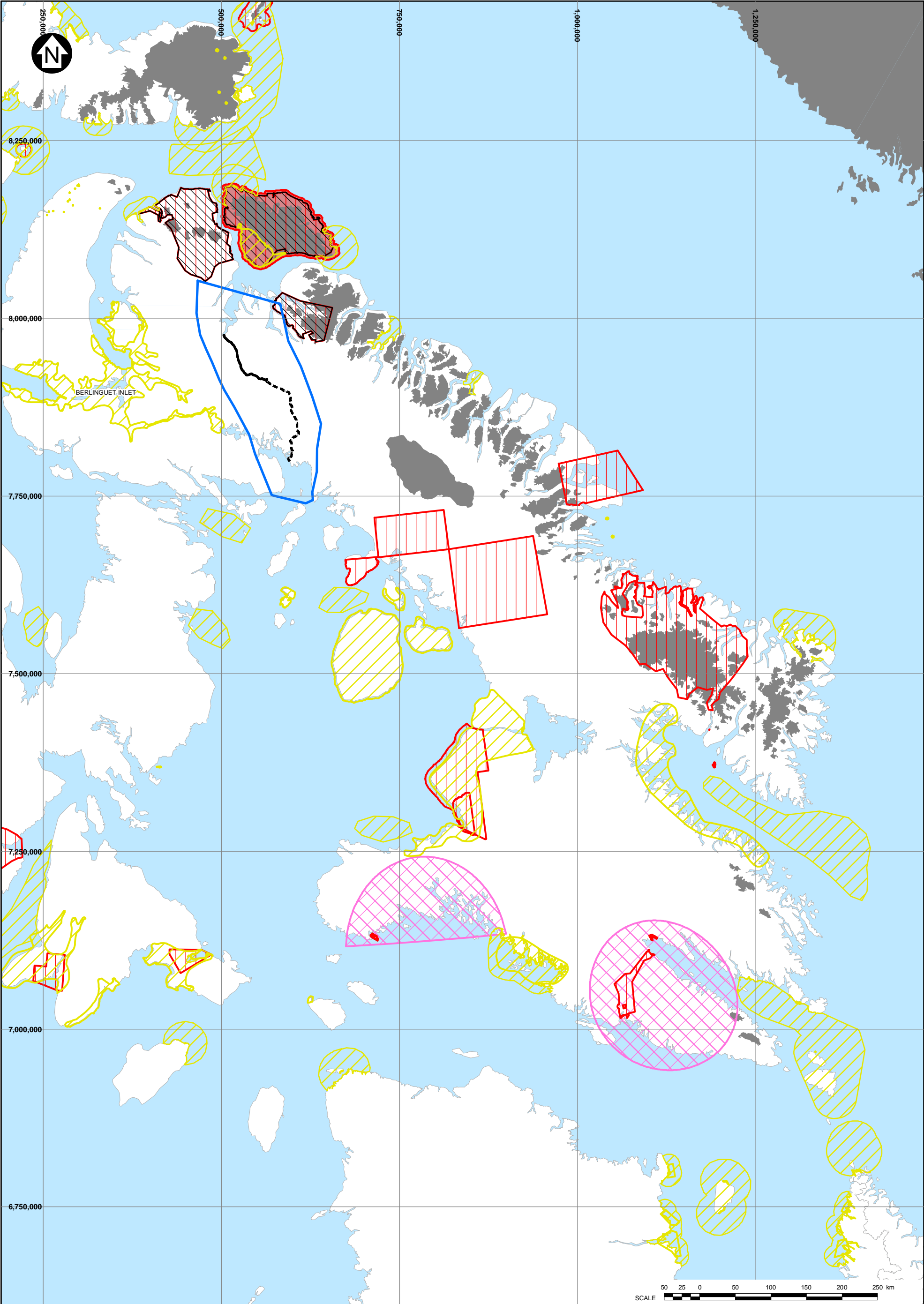
1

FIGURE 1.2

REV 0

0	31AUG10	ISSUED WITH REPORT	MLT	ASM	PAQ	KDE
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHKD	APPD

SAVED: I:\10200018125A\GIS\ArcView\figures\B19_r0.mxd; Aug 27, 2010 2:42:40 PM ammore



LEGEND:

SIRMILIK NATIONAL PARK

IMPORTANT TERRESTRIAL AND MARINE BIRD HABITATS

CRITICAL WILDLIFE AREA

WILDLIFE AREAS OF SPECIAL INTEREST (GYRFALCON & PEREGRINE FALCON)

MILNE INLET TOTE ROAD

PROPOSED RAILWAY ALIGNMENT

BYLOT ISLAND BIRD SANCTUARY

GLACIER

REGIONAL STUDY AREA BOUNDARY

NOTES:

1. BASE MAP 1:50,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004). ALL RIGHTS RESERVED.

2. CONSERVATION FEATURES PROVIDED BY THE GOVERNMENT OF NUNAVUT (2006) AND PARKS CANADA (2006).

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

IMPORTANT ECOLOGICAL AND PROTECTED AREAS

P/A NO.
NB102-181/25

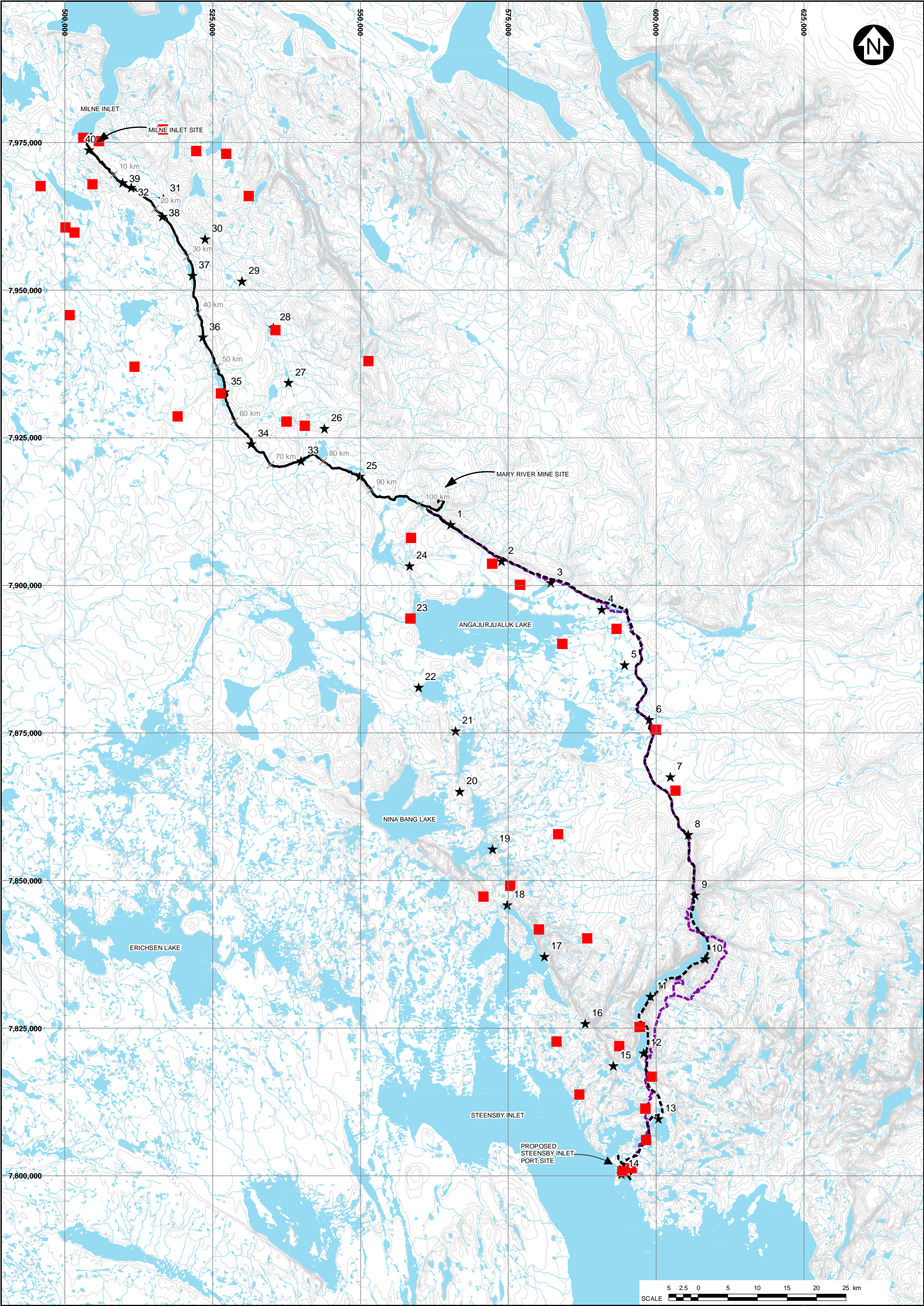
REF NO.
1

FIGURE 2.1

REV
0

0	31AUG10	ISSUED WITH REPORT	MLT	ASM	PAQ	KDE
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHKD	APPD

SAVED: I:\110200018125A\GIS\ArcView\figures\B20_r0.mxd; Aug 27, 2010 2:46:51 PM amooire



LEGEND:

- ★ POINT COUNT STATION (TRANSPORTATION)
- POINT COUNT STATION
- WATER
- RIVER/STREAM/DRAINAGE
- MILNE INLET TOTE ROAD
- PROPOSED RAILWAY ALIGNMENT
- PROPOSED CONSTRUCTION ACCESS ROAD
- × 10 km INTERVAL MARKER

NOTES:

1. BASE MAP 1:250,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004).
2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
3. CONTOURS ARE IN METRES. CONTOUR INTERVAL VARIES.
4. RAILWAY ALIGNMENT PROVIDED BY CANARAIL CONSULTANTS INC. (SEPTEMBER, 2008).

0	31AUG10	ISSUED WITH REPORT	MLT	ASM	PAQ	KDE
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHKD	APPD

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

LOCATIONS OF POINT COUNT SURVEYS
ALONG THE TOTE ROAD, RAIL ALIGNMENT,
AND CONTROL AREAS

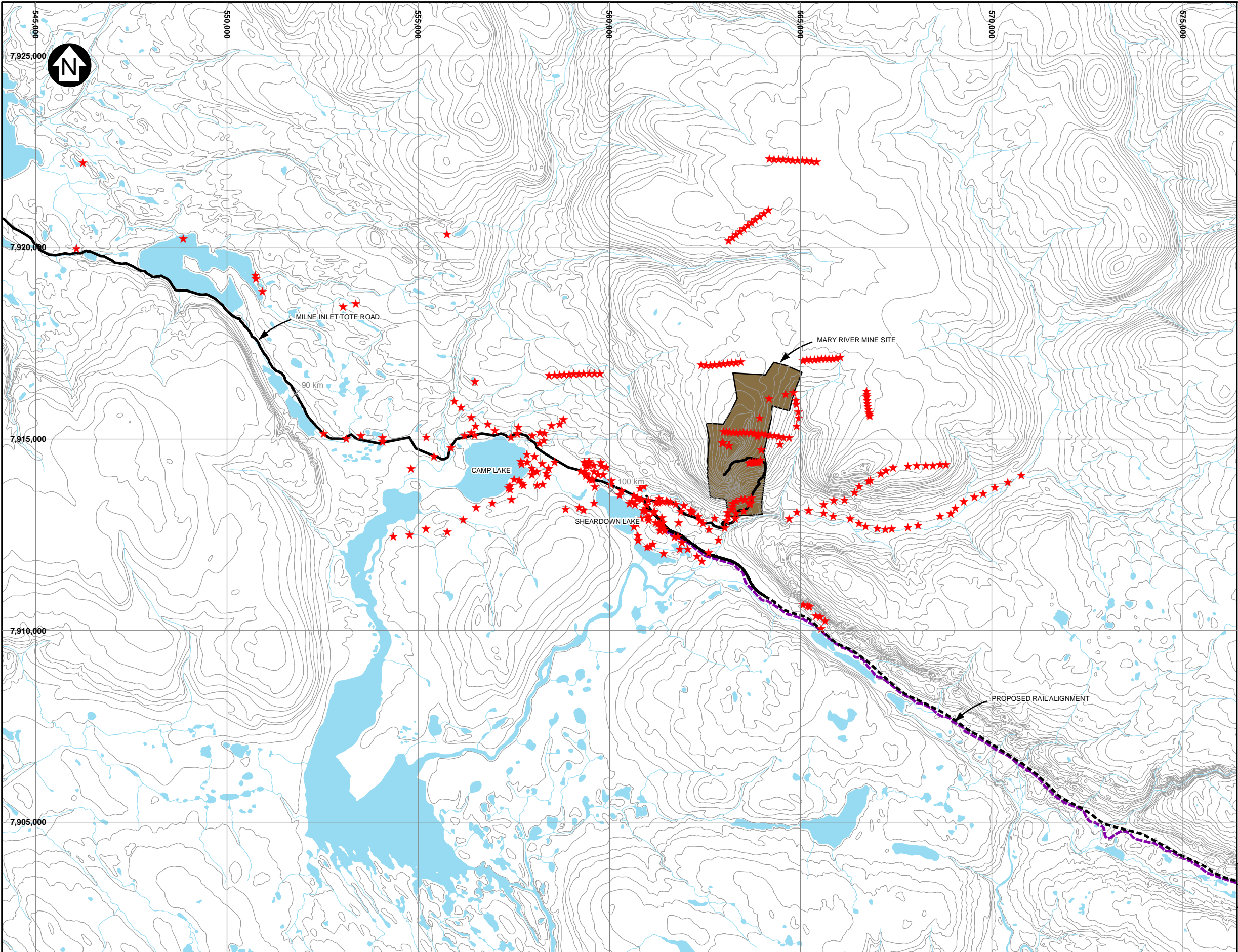
Knight Piésold
CONSULTING

P/A NO.
NB102-181/25

REF NO.
1

FIGURE 3.1

REV
0



LEGEND:

- WATER
- DEPOSIT NO. 1 MINING LEASE 2484
- RIVER/STREAM/DRAINAGE
- MILNE INLET TOTE ROAD
- PROPOSED RAILWAY ALIGNMENT
- PROPOSED CONSTRUCTION ACCESS ROAD
- 10 km INTERVAL MARKER
- POINT COUNT STATION

NOTES:

- BASE MAP (1:50,000) © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES, (2004). ALL RIGHTS RESERVED.
- COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
- CONTOURS ARE IN METRES. CONTOUR INTERVAL VARIES.
- PROPOSED RAIL ALIGNMENT PROVIDED BY CANARAIL CONSULTANTS INC. IN SEPTEMBER 2008.

SCALE 1 0.5 0 1 2 3 4 5 km

BAFFINLAND IRON MINES CORPORATION

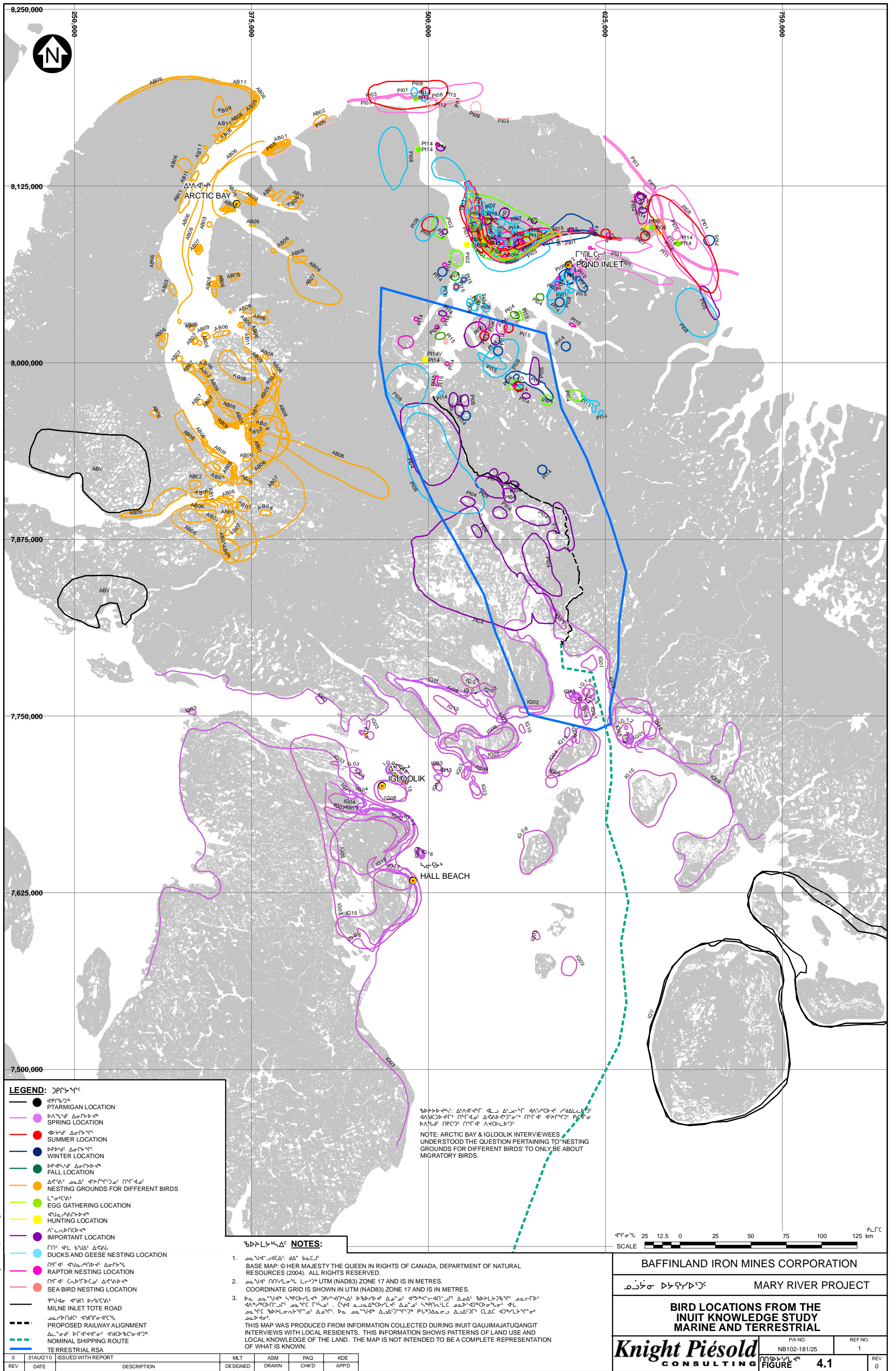
MARY RIVER PROJECT

LOCATIONS OF POINT COUNT SURVEYS
IN THE MARY RIVER CAMP VICINITY

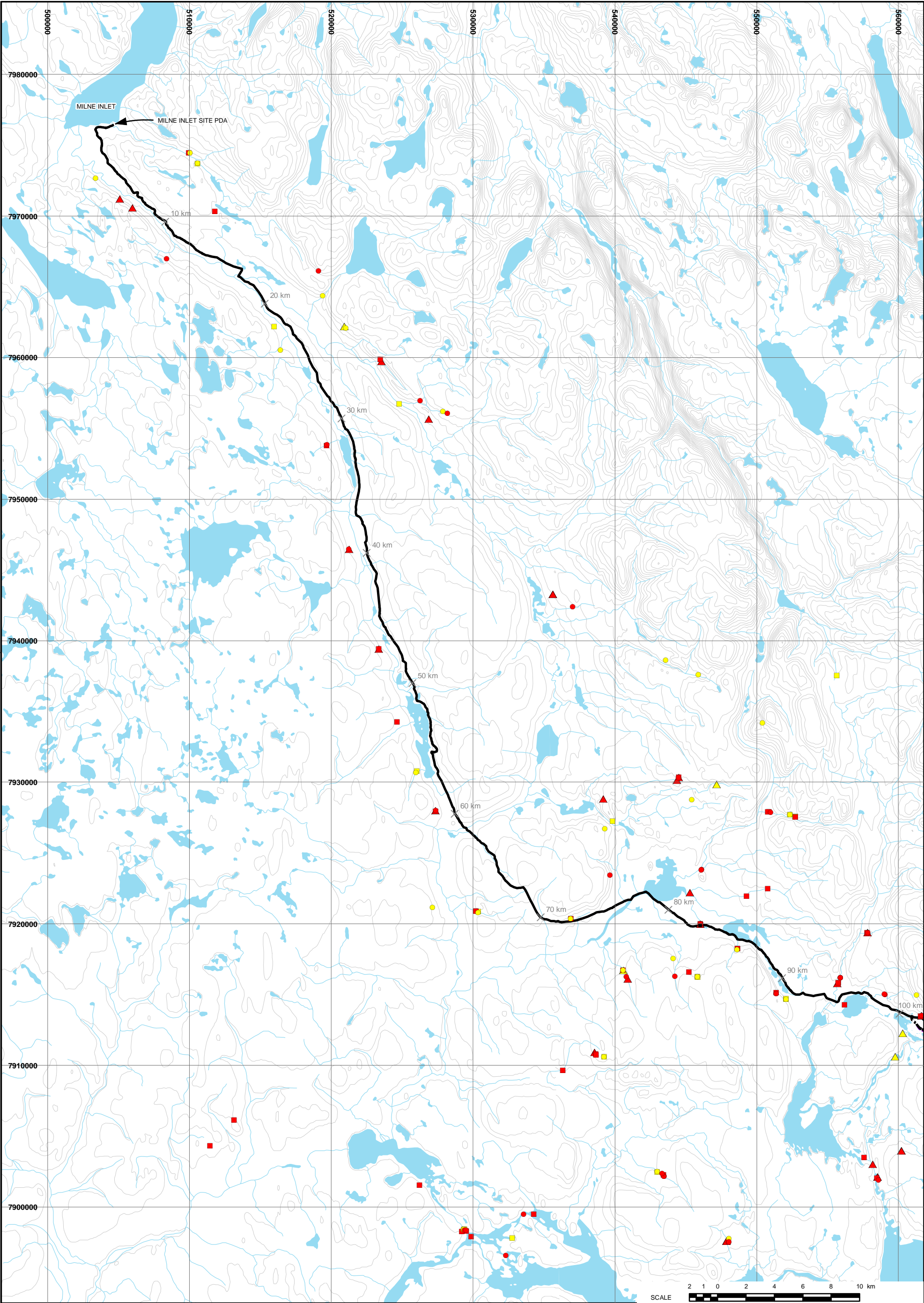
Knight Piésold CONSULTING	P/A NO. NB102-181/25	REF NO. 1	REV 0
	FIGURE 3.2		

SAVED: I:\102\0018125\A\G\ISAc View\figures\B35_10.mxd Sep 02, 2010 10:38:42 AM amore

0	31AUG'10	ISSUED WITH REPORT	MLT	ASM	PAQ	KDE
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D



SAVED: \\1102000181\28A\GIS\ArcView\figures\B03_r0.mxd; Aug 27, 2010 1:00:24 PM amore



- LEGEND:**
 - 2008 PEREGRINE NEST SITE
 - 2008 GYRFALCON NEST SITE
 - 2008 ROUGH-LEGGED HAWK NEST SITE
 - 2007 PEREGRINE NEST SITE
 - 2007 GYRFALCON NEST SITE
 - 2007 ROUGH-LEGGED HAWK NEST SITE
 - ▲ 2006 PEREGRINE NEST SITE
 - ▲ 2006 GYRFALCON NEST SITE
 - ▲ 2006 ROUGH-LEGGED HAWK NEST SITE
- WATER
 - DEPOSIT NO. 1 MINING LEASE 2484
 - RIVER/STREAM/DRAINAGE
 - MILNE INLET TOTE ROAD
 - PROPOSED RAILWAY ALIGNMENT
 - 10 km INTERVAL MARKER

- NOTES:**
 - BASE MAP 1:250,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004).
 - COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
 - CONTOURS ARE IN METRES. CONTOUR INTERVAL VARIES.
 - RAILWAY ALIGNMENT PROVIDED BY CANARAIL CONSULTANTS INC. (SEPTEMBER, 2008).
 - NEST SITE LOCATIONS ARE APPROXIMATE AND MAY INCLUDE MULTIPLE OBSERVATIONS FOR EACH NEST.

0	31AUG10	ISSUED WITH REPORT	MLT	ASM	PAQ	KDE
REV	DATE	DESCRIPTION	DESIGN	DRAWN	CHKD	APPD

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

CLIFF-NESTING RAPTOR NESTS
NORTH PORTION

Knight Piésold
CONSULTING

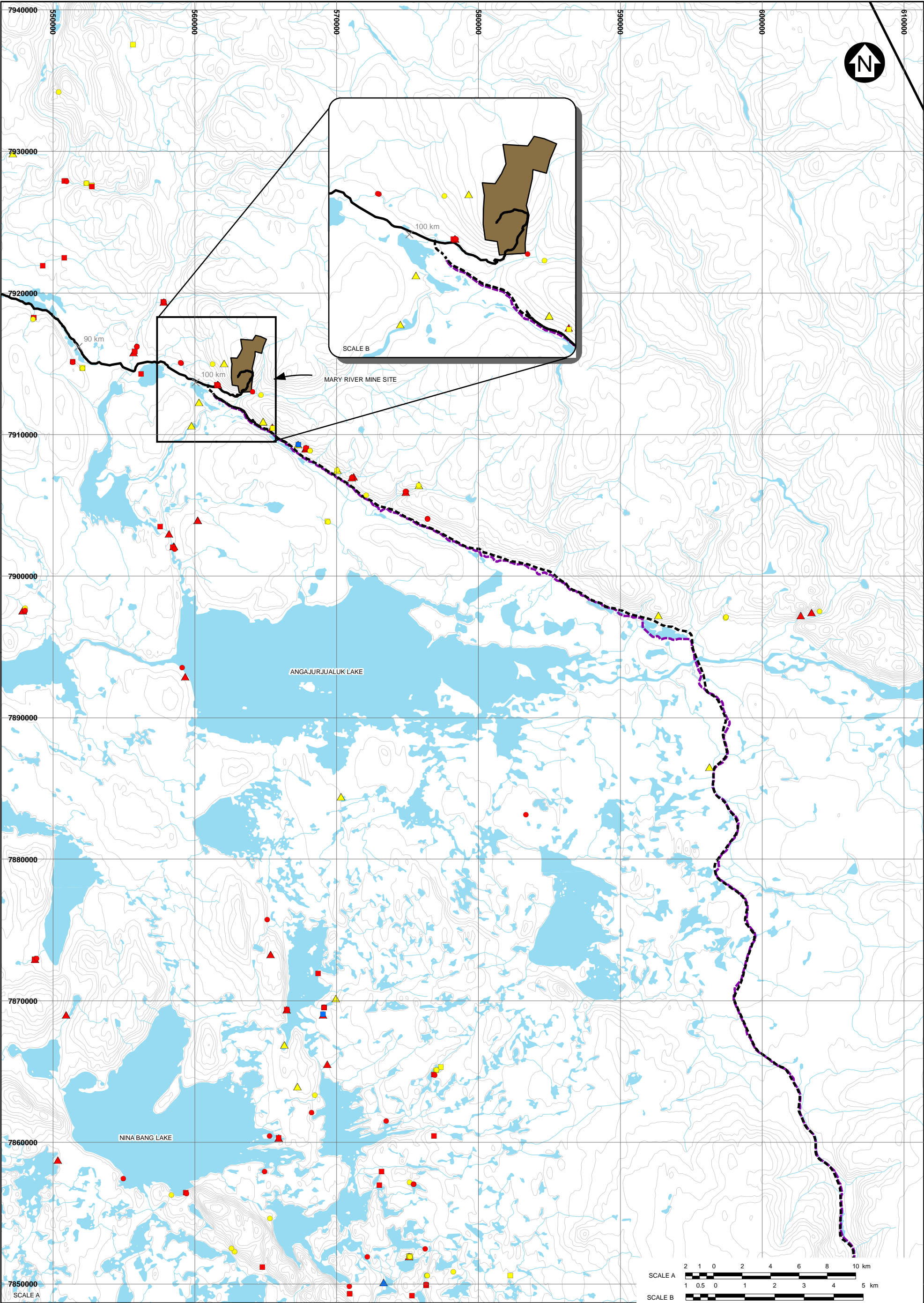
P/A NO.
NB102-181/25

REF NO.
1

FIGURE 4.3

REV
0

SAVED: \\11020001\1281A\GIS\ArcView\figures\B04_0.mxd; Aug 27, 2010 1:54:04 PM ammore



LEGEND:					
●	2008 PEREGRINE NEST SITE	■	WATER	—	DEPOSIT NO. 1 MINING LEASE 2484
●	2008 GYRFALCON NEST SITE	■	—	—	RIVER/STREAM/DRAINAGE
●	2008 ROUGH-LEGGED HAWK NEST SITE	■	—	—	MILNE INLET TOTE ROAD
●	2007 PEREGRINE NEST SITE	■	—	—	PROPOSED RAILWAY ALIGNMENT
●	2007 GYRFALCON NEST SITE	■	—	—	PROPOSED CONSTRUCTION ACCESS ROAD
●	2007 ROUGH-LEGGED HAWK NEST SITE	■	—	—	10 km INTERVAL MARKER
●	2006 PEREGRINE NEST SITE	■	—	—	
●	2006 GYRFALCON NEST SITE	■	—	—	
●	2006 ROUGH-LEGGED HAWK NEST SITE	■	—	—	

- NOTES:**
1. BASE MAP 1:250,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004).
 2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
 3. CONTOURS ARE IN METRES. CONTOUR INTERVAL VARIES.
 4. RAILWAY ALIGNMENT PROVIDED BY CANARAIL CONSULTANTS INC. (SEPTEMBER, 2008).
 5. NEST SITE LOCATIONS ARE APPROXIMATE AND MAY INCLUDE MULTIPLE OBSERVATIONS FOR EACH NEST.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

CLIFF-NESTING RAPTOR NESTS
MID PORTION

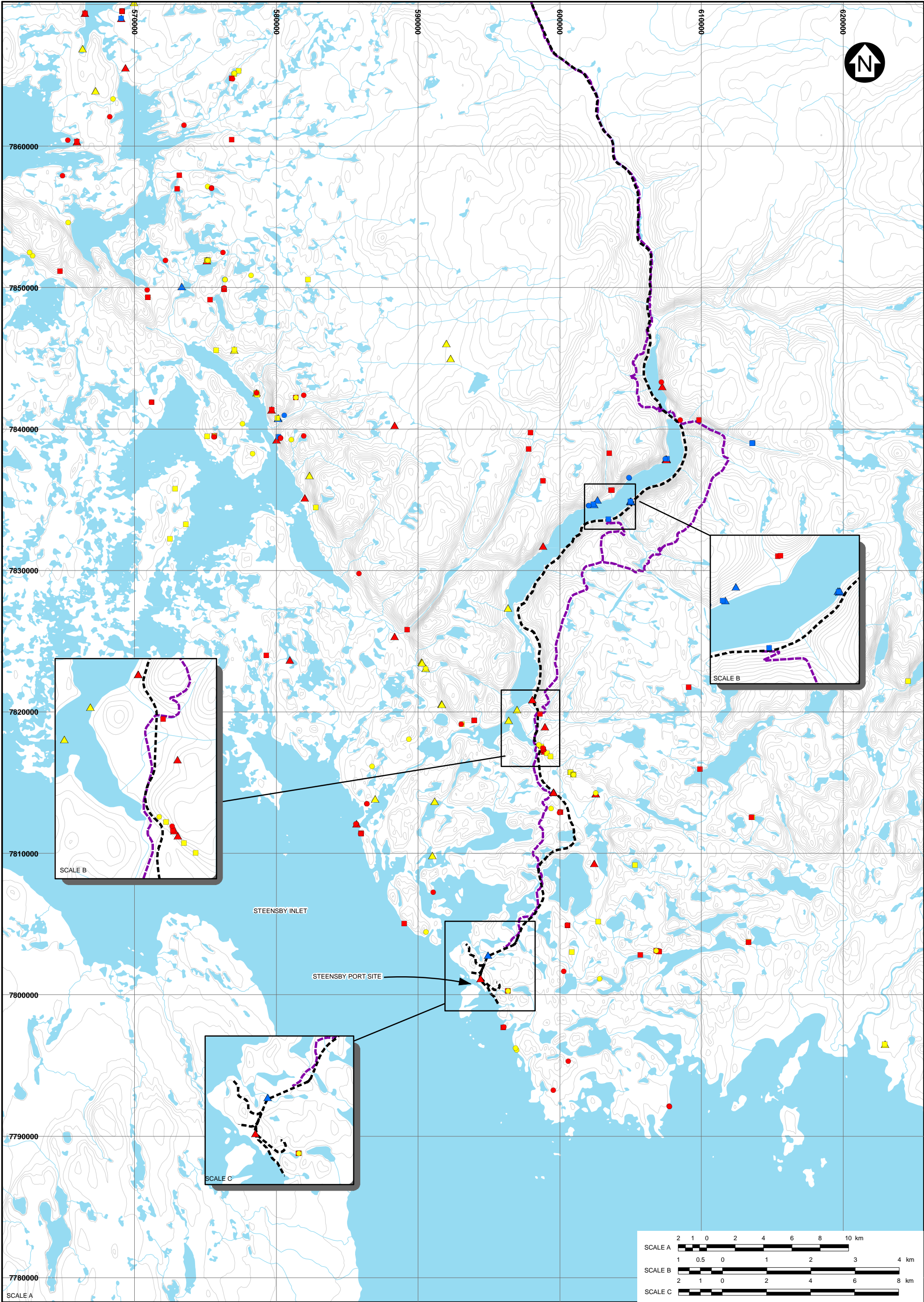
Knight Piésold
CONSULTING

P/A NO.
NB102-181/25

REF NO.
1

FIGURE 4.4

REV
0



LEGEND:					
●	2008 PEREGRINE NEST SITE	■	WATER		
●	2008 GYRFALCON NEST SITE	■	DEPOSIT NO. 1 MINING LEASE 2484		
●	2008 ROUGH-LEGGED HAWK NEST SITE	—	RIVER/STREAM/DRAINAGE		
■	2007 PEREGRINE NEST SITE	—	MILNE INLET TOTE ROAD		
■	2007 GYRFALCON NEST SITE	---	PROPOSED RAILWAY ALIGNMENT		
■	2007 ROUGH-LEGGED HAWK NEST SITE	---	PROPOSED CONSTRUCTION ACCESS ROAD		
▲	2006 PEREGRINE NEST SITE	×	10 km INTERVAL MARKER		
▲	2006 GYRFALCON NEST SITE				
▲	2006 ROUGH-LEGGED HAWK NEST SITE				

0	31AUG10	ISSUED WITH REPORT	MLT	ASM	PAQ	KDE
REV	DATE	DESCRIPTION	DESIGN	DRAWN	CHKD	APPD

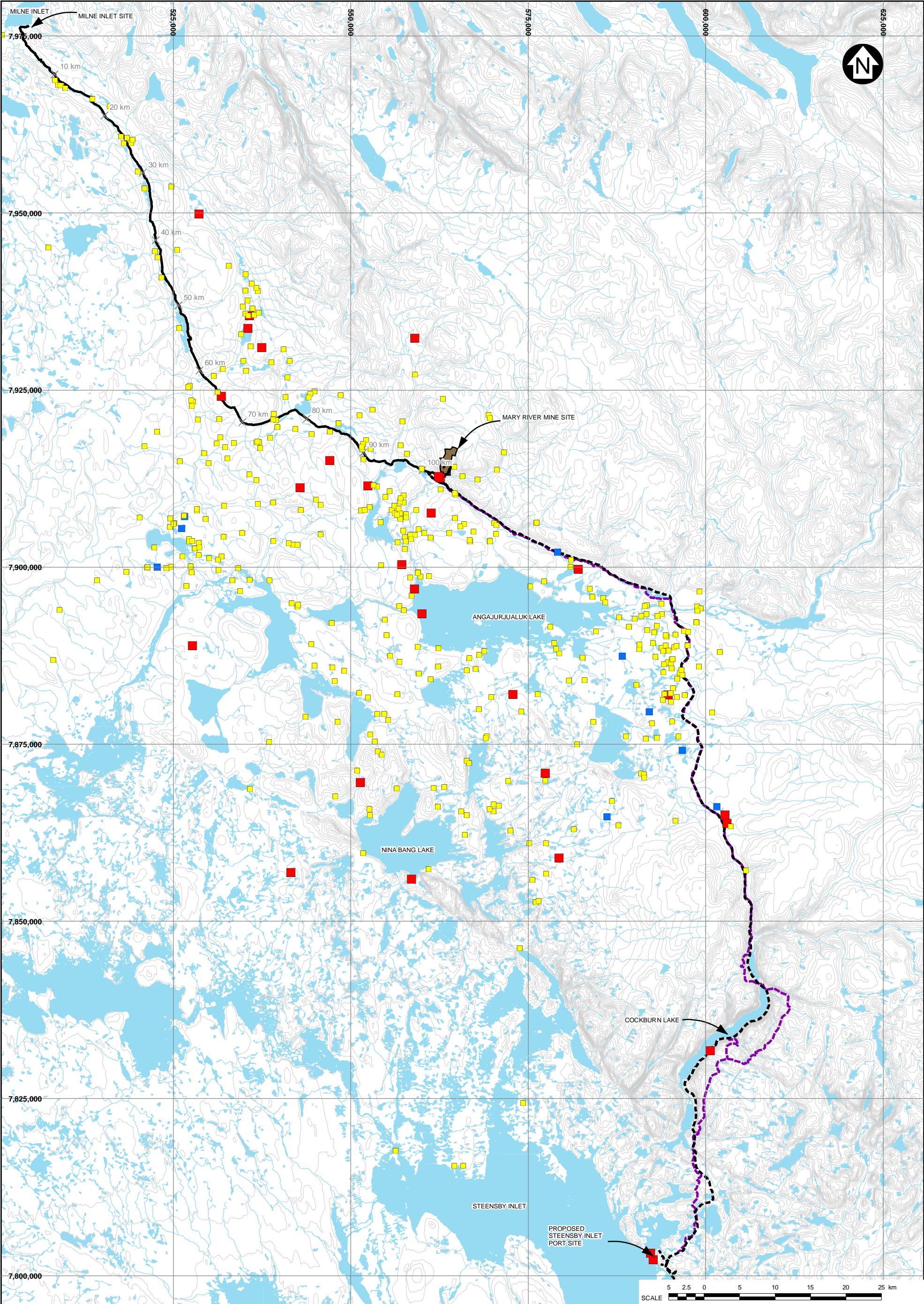
- NOTES:**
1. BASE MAP 1:250,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004).
 2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
 3. CONTOURS ARE IN METRES. CONTOUR INTERVAL VARIES.
 4. RAILWAY ALIGNMENT PROVIDED BY CANARAIL CONSULTANTS INC. (SEPTEMBER, 2008).
 5. NEST SITE LOCATIONS ARE APPROXIMATE AND MAY INCLUDE MULTIPLE OBSERVATIONS FOR EACH NEST.

210246820001228A GISArcViewFiguresB05_r0.mxd, Aug 27, 2010 2:16:14 PM ammore

SAVED: \1102000181\228A GISArcViewFiguresB05_r0.mxd, Aug 27, 2010 2:16:14 PM ammore

SCALE A		2 1 0 2 4 6 8 10 km	
SCALE B		1 0.5 0 1 2 3 4 km	
SCALE C		2 1 0 2 4 6 8 km	

BAFFINLAND IRON MINES CORPORATION	
MARY RIVER PROJECT	
CLIFF-NESTING RAPTOR NESTS SOUTH PORTION	
Knight Piésold CONSULTING	P/A NO. NB102-181/25
	REF NO. 1
FIGURE 4.5	
	REV 0



2008 SNOWY OWL SIGHTING

2007 SNOWY OWL SIGHTING

2006 SNOWY OWL SIGHTING

WATER

DEPOSIT NO. 1 MINING LEASE 2484

RIVER/STREAM/DRAINAGE

MILNE INLET TOTE ROAD

PROPOSED RAILWAY ALIGNMENT

PROPOSED CONSTRUCTION ACCESS ROAD

10 km INTERVAL MARKER

NOTES:

1. BASE MAP 1:250,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004).

2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.

3. CONTOURS ARE IN METRES. CONTOUR INTERVAL VARIES.

4. RAILWAY ALIGNMENT PROVIDED BY CANARAIL CONSULTANTS INC. (SEPTEMBER, 2008).

5. NEST SITE LOCATIONS ARE APPROXIMATE AND MAY INCLUDE MULTIPLE OBSERVATIONS FOR EACH NEST.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

DISTRIBUTION OF SNOWY OWL SIGHTINGS

Knight Piésold

CONSULTING

P/A NO.

NB102-181/25

REF NO.

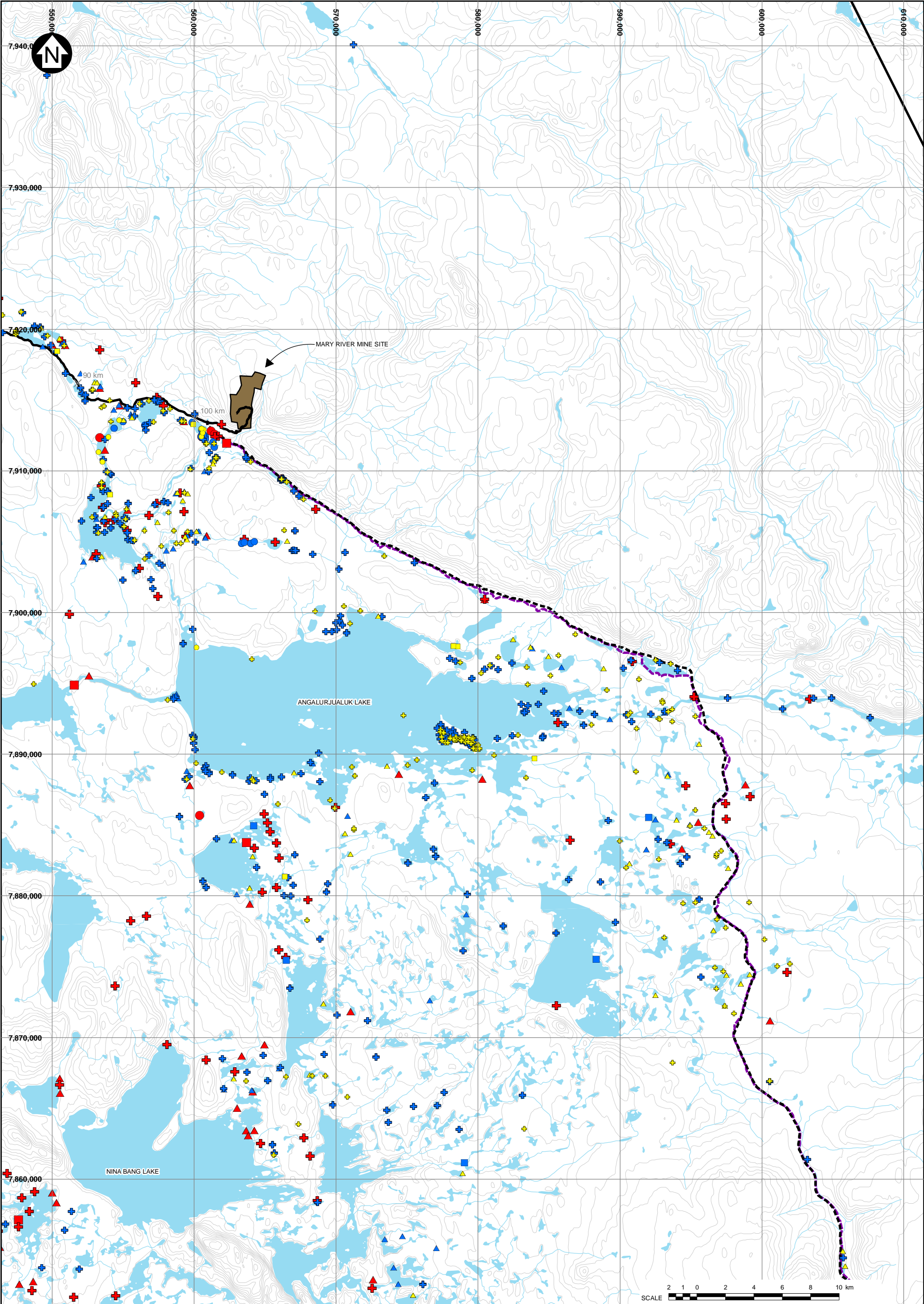
1

FIGURE 4.6

REV

0

SAVED: I:\10200018125A\GIS\ArcView\figures\B33_10.mxd; Aug 27, 2010 2:17:55 PM ammore



LEGEND:

▲

2008 RED-THROATED LOON

▲

2008 PACIFIC LOON

■

2008 COMMON LOON

●

2008 YELLOW-BILLED LOON

+

2007 RED-THROATED LOON

▲

2007 PACIFIC LOON

■

2007 COMMON LOON

●

2007 YELLOW-BILLED LOON

+

2006 RED-THROATED LOON

▲

2006 PACIFIC LOON

■

2006 COMMON LOON

●

2006 YELLOW-BILLED LOON

WATER

DEPOSIT NO. 1 MINING LEASE 2484

RIVER/STREAM/DRAINAGE

MILNE INLET TOTE ROAD

PROPOSED RAILWAY ALIGNMENT

PROPOSED CONSTRUCTION ACCESS ROAD

10 km INTERVAL MARKER

0	31 AUG 10	ISSUED WITH REPORT	MLT	ASM	PAQ	KDE
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHKD	APPD

- NOTES:**
1. BASE MAP 1:250,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004).
 2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
 3. CONTOURS ARE IN METRES. CONTOUR INTERVAL VARIES.
 4. RAILWAY ALIGNMENT PROVIDED BY CANARAIL CONSULTANTS INC. (SEPTEMBER, 2008).
 5. NEST SITE LOCATIONS ARE APPROXIMATE AND MAY INCLUDE MULTIPLE OBSERVATIONS FOR EACH NEST.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

DISTRIBUTION OF LOON SIGHTINGS
MID PORTION

Knight Piésold

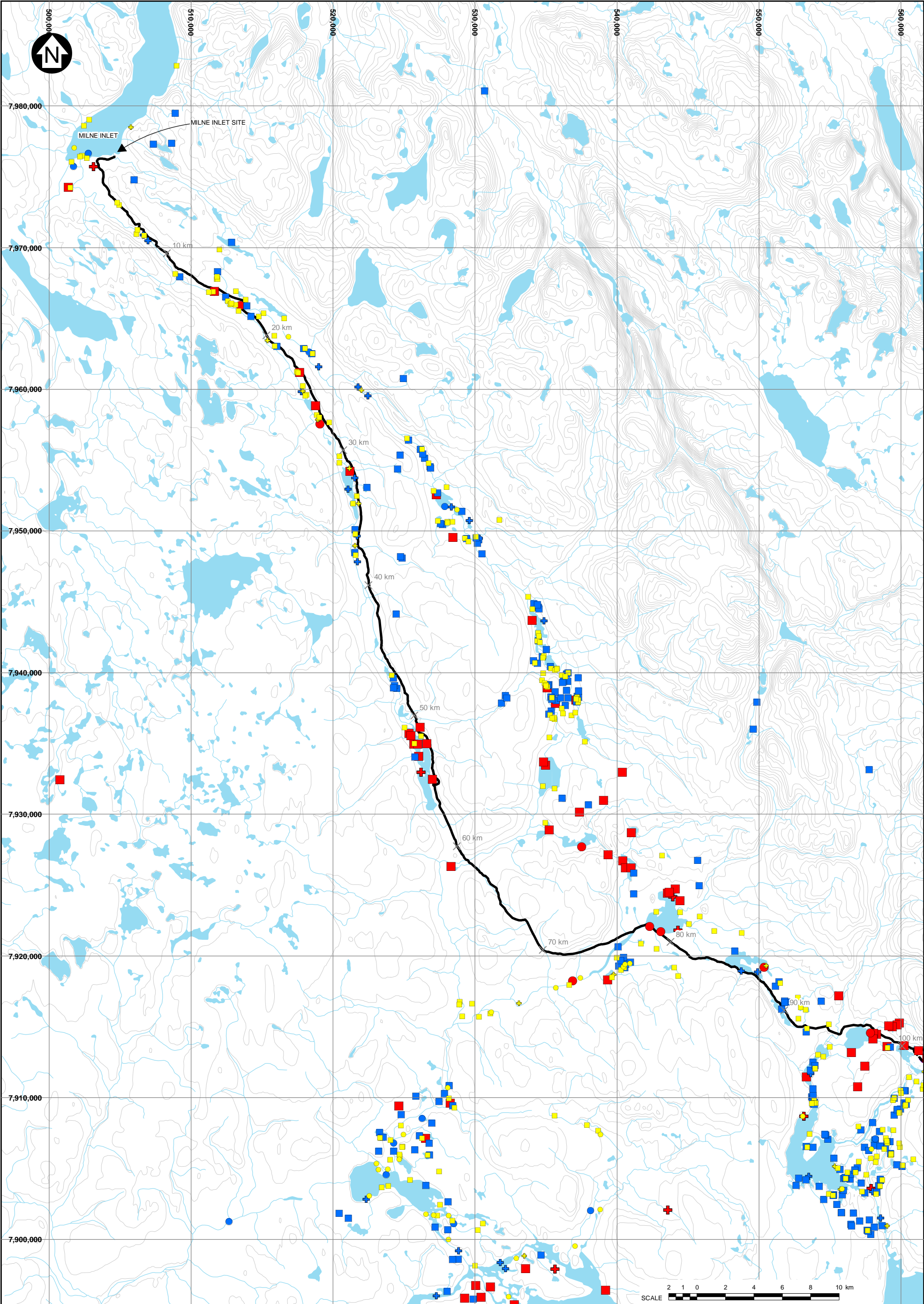
CONSULTING

P/A NO.
NB102-181/25

REF NO.
1

FIGURE 4.8

REV
0



LEGEND:

- 2008 COMMON EIDER
- 2008 KING EIDER
- 2008 LONG-TAILED DUCK
- 2008 RED-BREADED MERGANSER
- 2007 COMMON EIDER
- 2007 KING EIDER
- 2007 LONG-TAILED DUCK
- 2007 RED-BREADED MERGANSER
- 2006 COMMON EIDER
- 2006 KING EIDER
- 2006 LONG-TAILED DUCK
- 2006 RED-BREADED MERGANSER

- WATER
- DEPOSIT NO. 1 MINING LEASE 2484
- RIVER/STREAM/DRAINAGE
- MILNE INLET TOTE ROAD
- PROPOSED RAILWAY ALIGNMENT
- PROPOSED CONSTRUCTION ACCESS ROAD
- 10 km INTERVAL MARKER

NOTES:

- BASE MAP 1:250,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004).
- COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
- CONTOURS ARE IN METRES. CONTOUR INTERVAL VARIES.
- RAILWAY ALIGNMENT PROVIDED BY CANARAIL CONSULTANTS INC. (SEPTEMBER, 2008).
- NEST SITE LOCATIONS ARE APPROXIMATE AND MAY INCLUDE MULTIPLE OBSERVATIONS FOR EACH NEST.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

DUCK AND EIDER SIGHTINGS
NORTH PORTION

Knight Piésold
CONSULTING

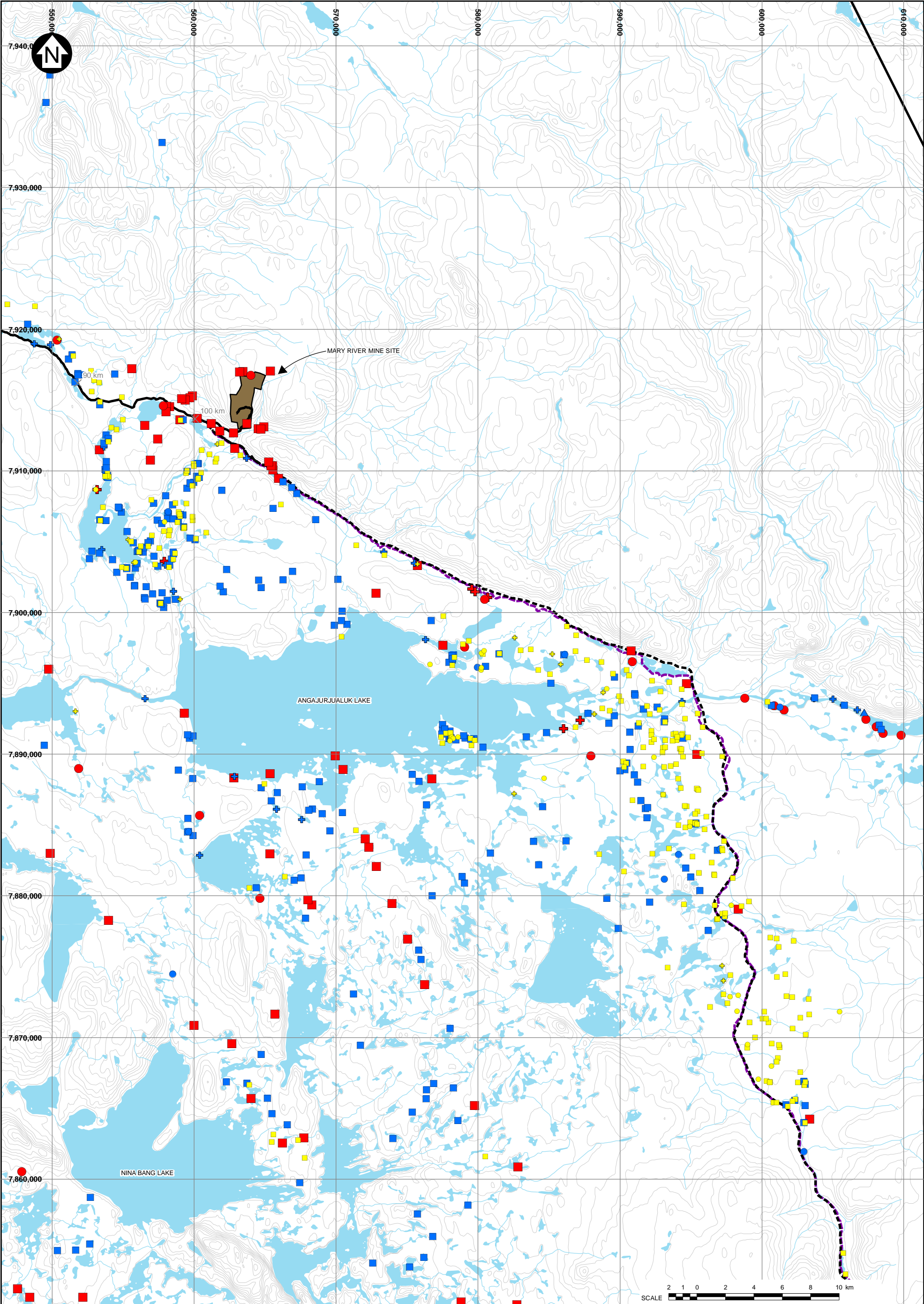
P/A NO.
NB102-181/25

REF NO.
1

FIGURE 4.10

REV
0

0	31AUG10	ISSUED WITH REPORT	MLT	ASM	PAQ	KDE
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHKD	APPD



LEGEND:

2008 COMMON EIDER

2008 KING EIDER

2008 LONG-TAILED DUCK

2008 RED-BREADED MERGANSER

2007 COMMON EIDER

2007 KING EIDER

2007 LONG-TAILED DUCK

2007 RED-BREADED MERGANSER

2006 COMMON EIDER

2006 KING EIDER

2006 LONG-TAILED DUCK

2006 RED-BREADED MERGANSER

WATER

DEPOSIT NO. 1 MINING LEASE 2484

RIVER/STREAM/DRAINAGE

MILNE INLET TOTE ROAD

PROPOSED RAILWAY ALIGNMENT

PROPOSED CONSTRUCTION ACCESS ROAD

10 km INTERVAL MARKER

NOTES:

1. BASE MAP 1:250,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004).

2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.

3. CONTOURS ARE IN METRES. CONTOUR INTERVAL VARIES.

4. RAILWAY ALIGNMENT PROVIDED BY CANARAIL CONSULTANTS INC. (SEPTEMBER, 2008).

5. NEST SITE LOCATIONS ARE APPROXIMATE AND MAY INCLUDE MULTIPLE OBSERVATIONS FOR EACH NEST.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

DUCK AND EIDER SIGHTINGS
MID PORTION

Knight Piésold

CONSULTING

P/A NO.

NB102-181/25

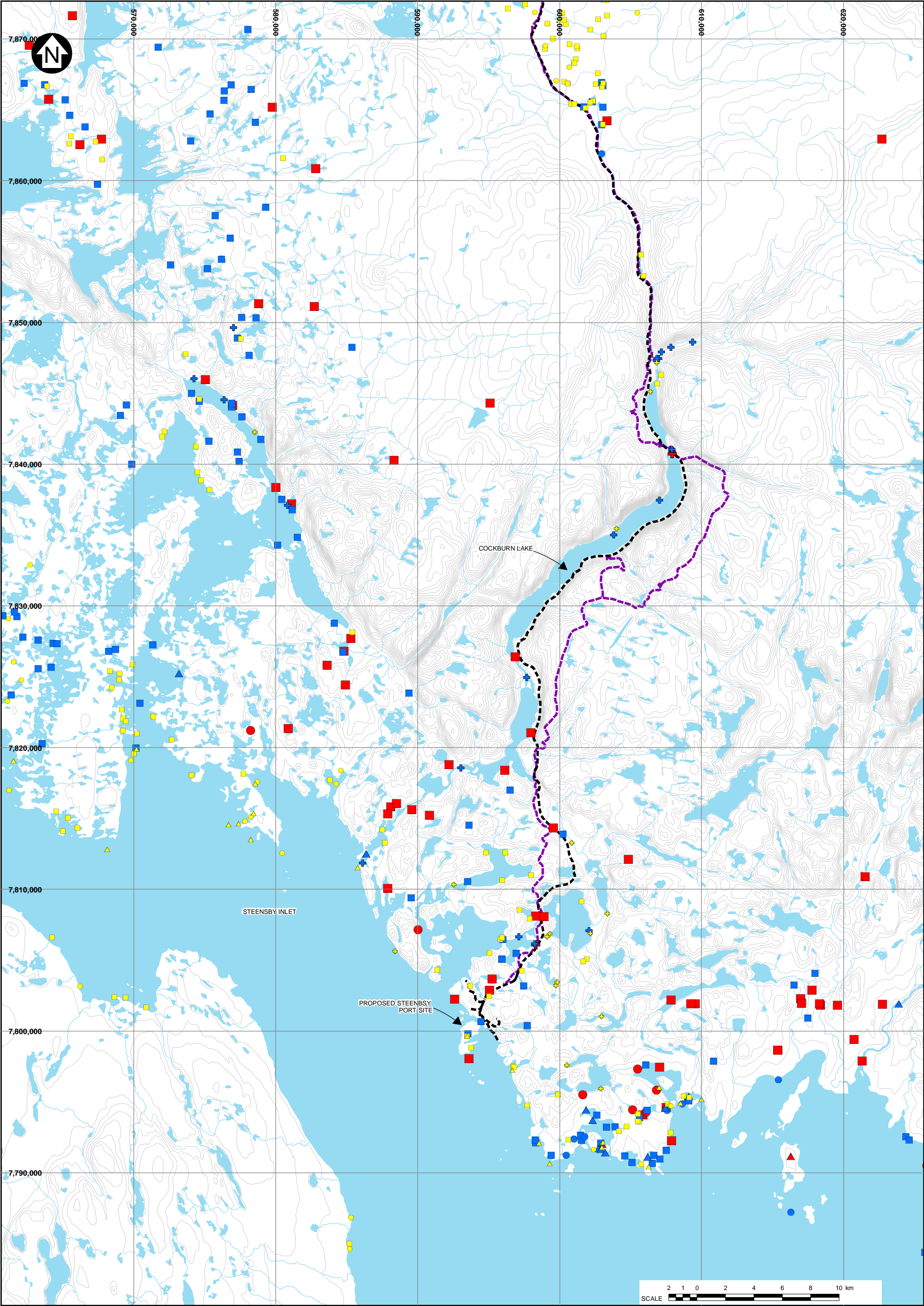
REF NO.

1

FIGURE 4.11

REV 0

SAVED: L:\1020018\125\AG\ISAc\view\figures\B25_10.mxd; Aug 27, 2010 2:56:45 PM amooore



LEGEND:

▲

2006 COMMON EIDER

●

2006 KING EIDER

■

2006 LONG-TAILED DUCK

+

2006 RED-BREASTED MERGANSER

▲

2008 COMMON EIDER

●

2008 KING EIDER

■

2008 LONG-TAILED DUCK

+

2008 RED-BREASTED MERGANSER

●

2007 COMMON EIDER

■

2007 KING EIDER

▲

2007 LONG-TAILED DUCK

+

2007 RED-BREASTED MERGANSER

■

WATER

■

DEPOSIT NO. 1 MINING LEASE 2484

—

RIVER/STREAM/DRAINAGE

—

MILNE INLET TOTE ROAD

PROPOSED RAILWAY ALIGNMENT

PROPOSED CONSTRUCTION ACCESS ROAD

×

10 km INTERVAL MARKER

NOTES:

1. BASE MAP 1:250,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004).

2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.

3. CONTOURS ARE IN METRES. CONTOUR INTERVAL VARIES.

4. RAILWAY ALIGNMENT PROVIDED BY CANARAIL CONSULTANTS INC. (SEPTEMBER, 2008).

5. NEST SITE LOCATIONS ARE APPROXIMATE AND MAY INCLUDE MULTIPLE OBSERVATIONS FOR EACH NEST.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

DUCK AND EIDER SIGHTINGS
SOUTH PORTION

Knight Piésold

CONSULTING

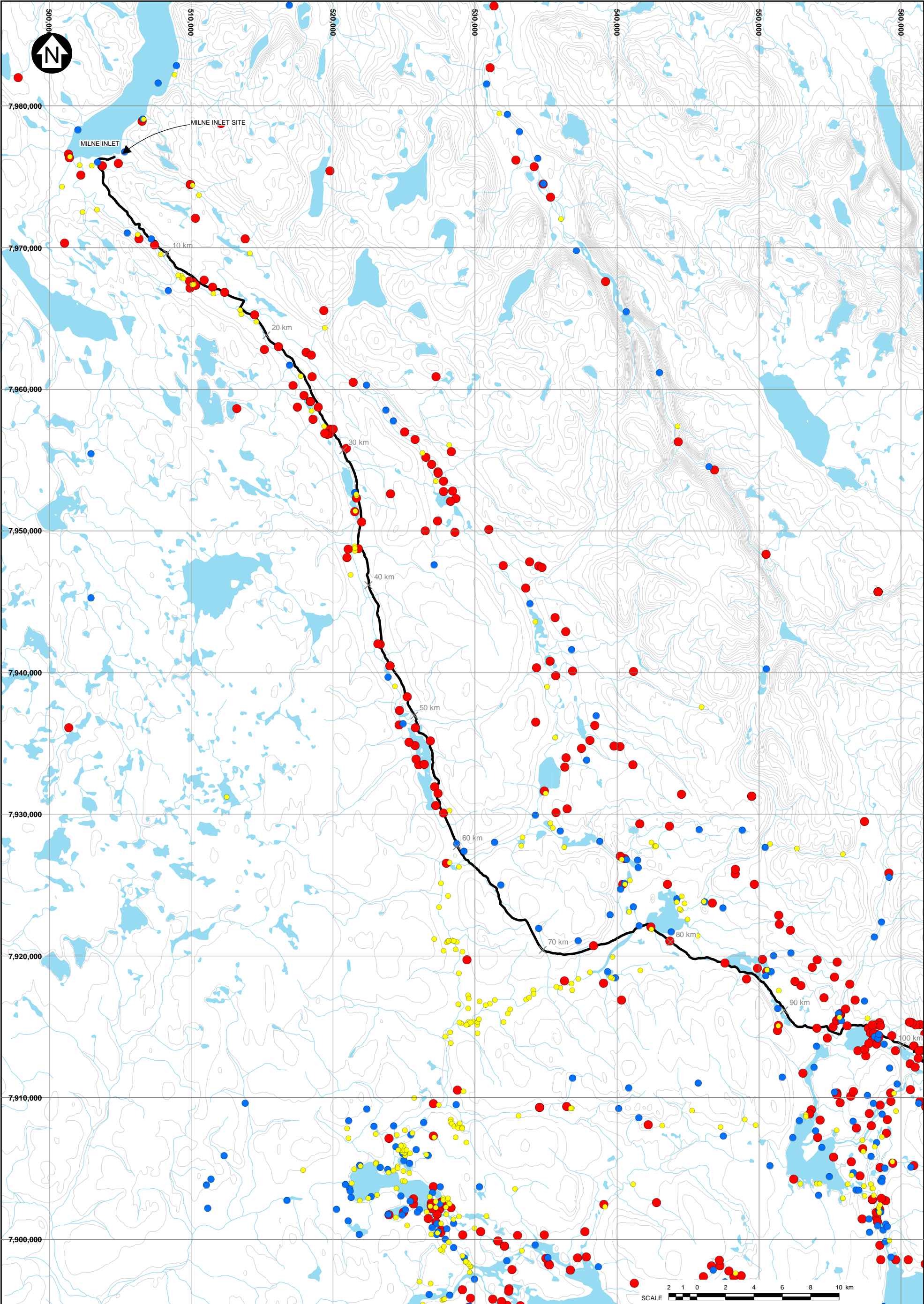
P/A NO.
NB102-181/25

REF NO.
1

FIGURE 4.12

REV
0

SAVED: L:\1020018\125\GIS\Ac\view\figures\B26_10.mxd; Aug 27, 2010 2:25:42 PM amooore



LEGEND:

2008 SNOW GOOSE

2007 SNOW GOOSE

2006 SNOW GOOSE

WATER

DEPOSIT NO. 1 MINING LEASE 2484

RIVER/STREAM/DRAINAGE

MILNE INLET TOTE ROAD

PROPOSED RAILWAY ALIGNMENT

PROPOSED CONSTRUCTION ACCESS ROAD

10 km INTERVAL MARKER

NOTES:

1. BASE MAP 1:250,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004).

2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.

3. CONTOURS ARE IN METRES. CONTOUR INTERVAL VARIES.

4. RAILWAY ALIGNMENT PROVIDED BY CANARAIL CONSULTANTS INC. (SEPTEMBER, 2008).

5. NEST SITE LOCATIONS ARE APPROXIMATE AND MAY INCLUDE MULTIPLE OBSERVATIONS FOR EACH NEST.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

DISTRIBUTION OF SNOW GOOSE SIGHTINGS
NORTH PORTION

Knight Piésold

CONSULTING

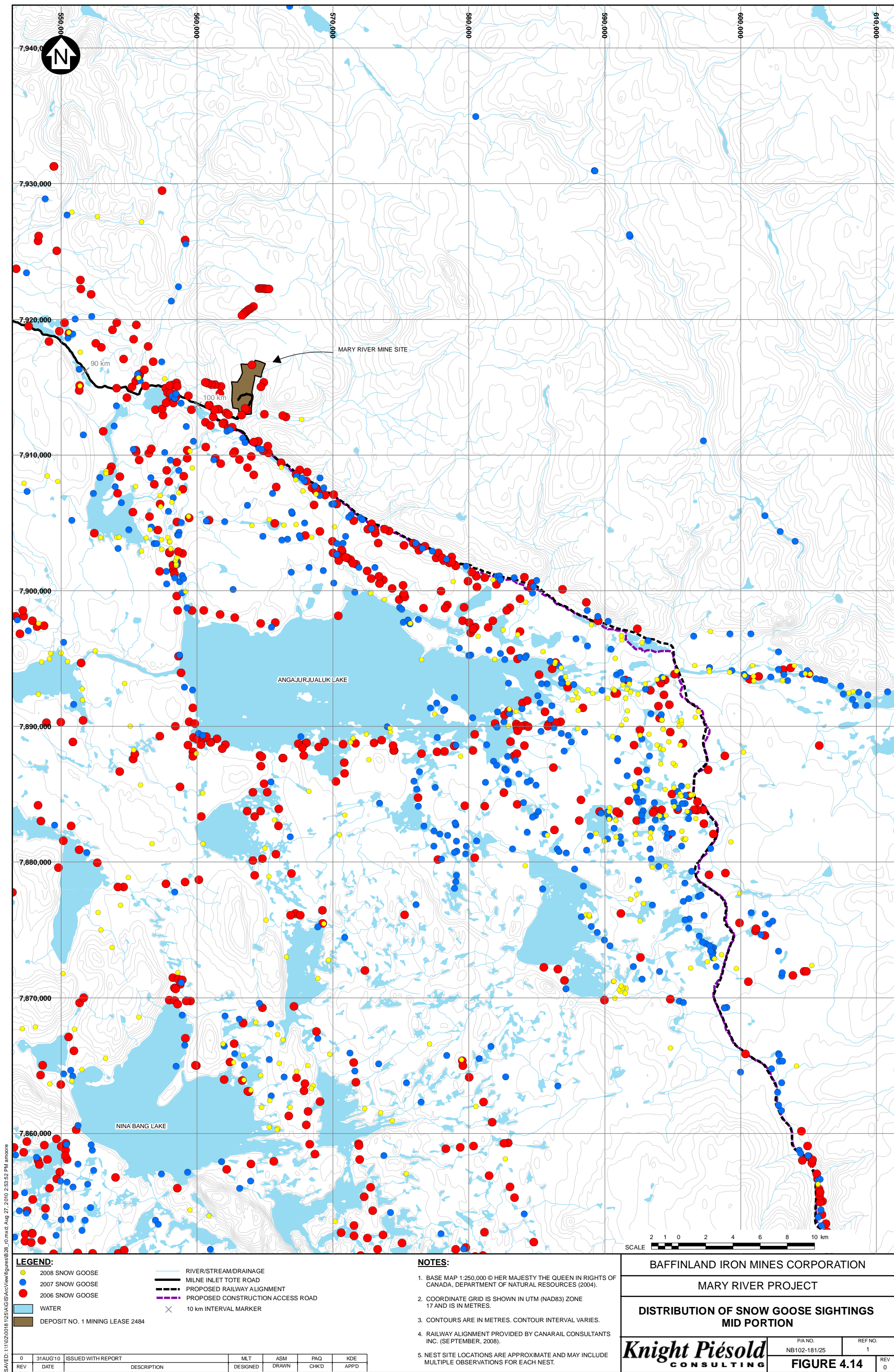
P/A NO.
NB102-181/25

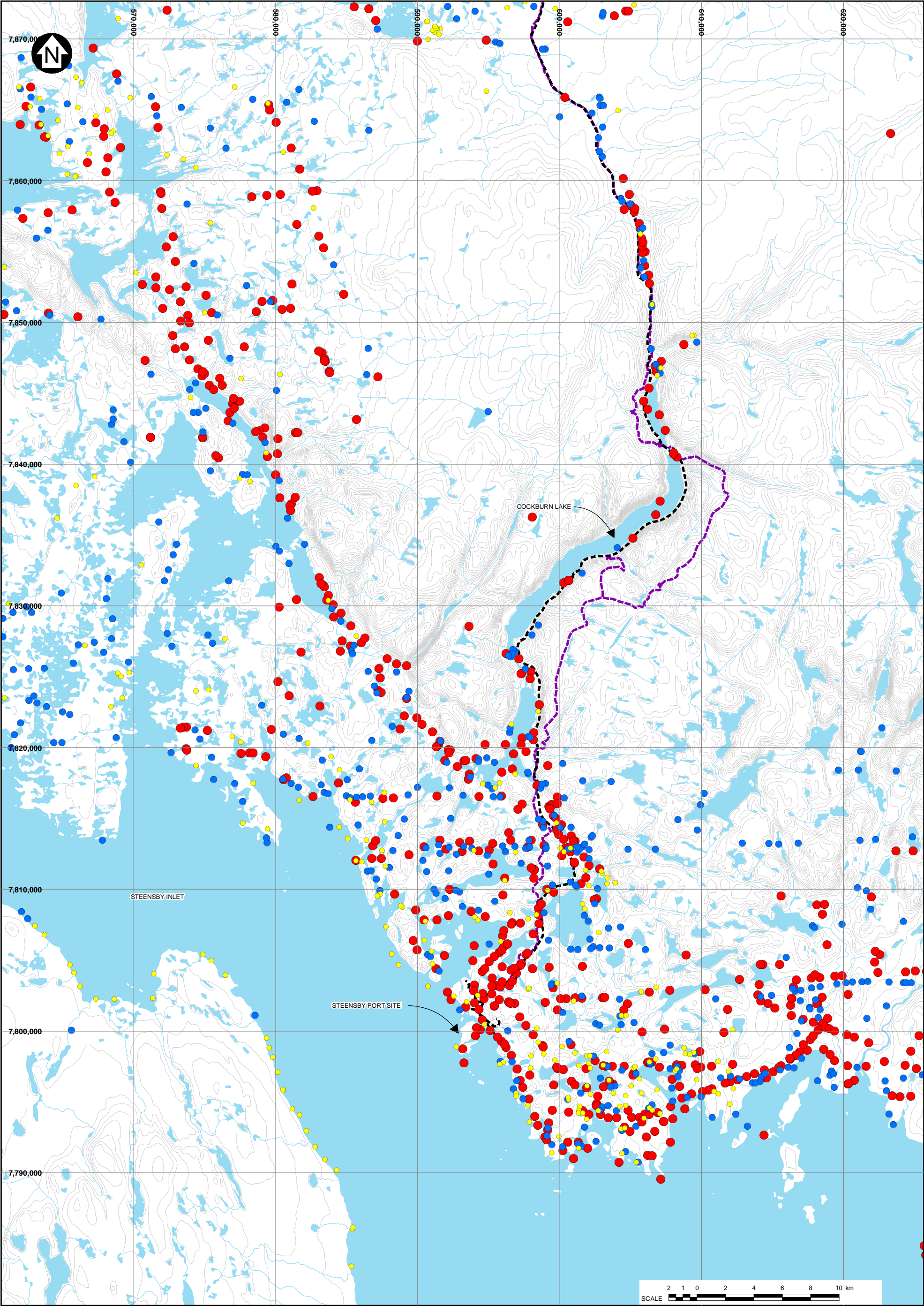
REF NO.
1

FIGURE 4.13

REV
0

SAVED: I:\102000\18125\A\GIS\ArcView\figures\B27_0.mxd; Aug 27, 2010 2:28:34 PM amooire





LEGEND:

2008 SNOW GOOSE

2007 SNOW GOOSE

2006 SNOW GOOSE

WATER

DEPOSIT NO. 1 MINING LEASE 2484

RIVER/STREAM/DRAINAGE

MILNE INLET TOTE ROAD

PROPOSED RAILWAY ALIGNMENT

PROPOSED CONSTRUCTION ACCESS ROAD

10 km INTERVAL MARKER

0	31AUG10	ISSUED WITH REPORT	MLT	ASM	PAQ	KDE
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D

NOTES:

1. BASE MAP 1:250,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004).
2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
3. CONTOURS ARE IN METRES. CONTOUR INTERVAL VARIES.
4. RAILWAY ALIGNMENT PROVIDED BY CANARAIL CONSULTANTS INC. (SEPTEMBER, 2008).
5. NEST SITE LOCATIONS ARE APPROXIMATE AND MAY INCLUDE MULTIPLE OBSERVATIONS FOR EACH NEST.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

DISTRIBUTION OF SNOW GOOSE SIGHTINGS
SOUTH PORTION

Knight Piésold

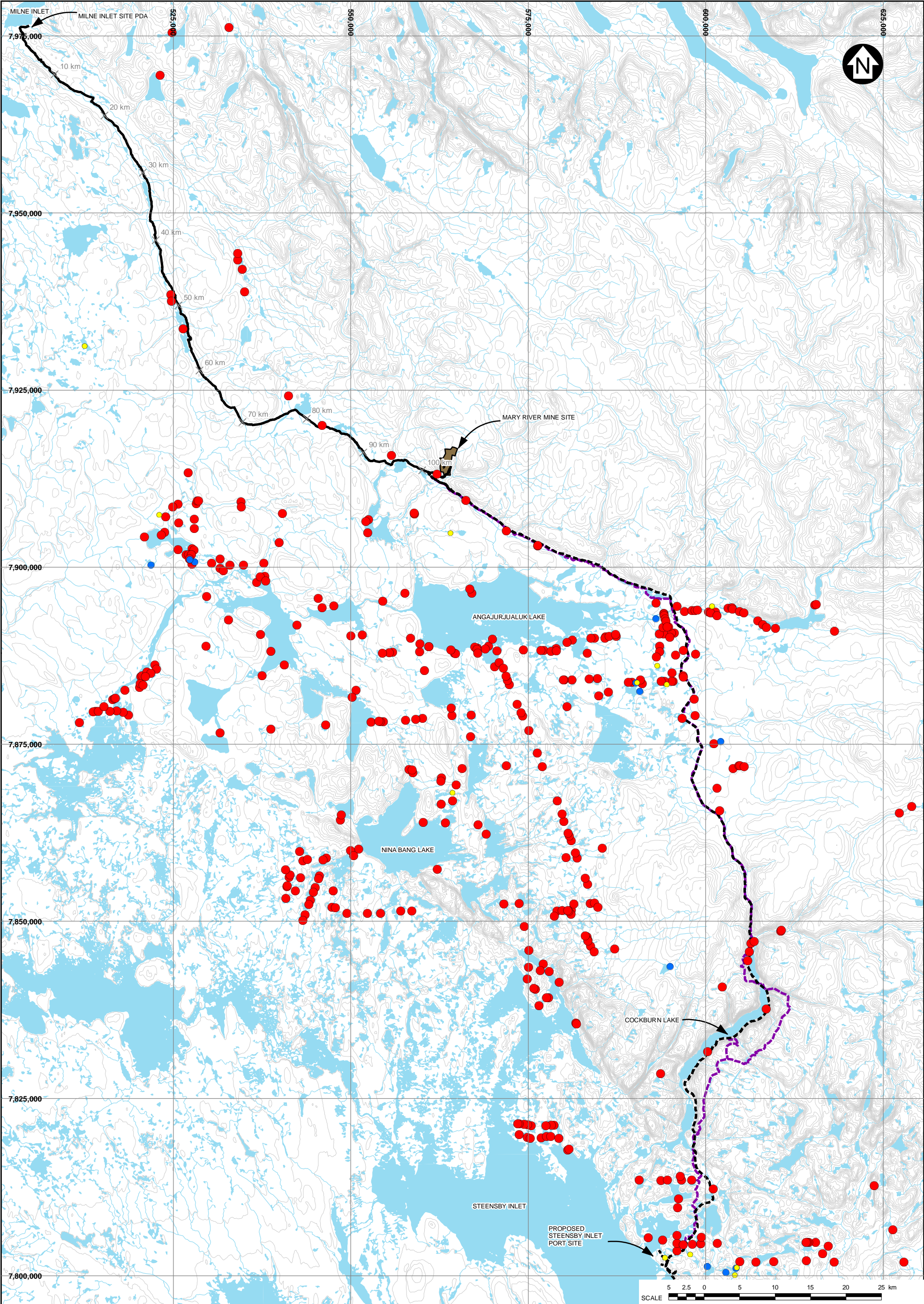
CONSULTING

P/A NO.
NB102-181/25

REF NO.
1

FIGURE 4.15

REV
0



LEGEND:

2008 SNOW GOOSE MOULTING LOCATION

2007 SNOW GOOSE MOULTING LOCATION

2006 SNOW GOOSE MOULTING LOCATION

WATER

DEPOSIT NO. 1 MINING LEASE 2484

RIVER/STREAM/DRAINAGE

MILNE INLET TOTE ROAD

PROPOSED RAILWAY ALIGNMENT

PROPOSED CONSTRUCTION ACCESS ROAD

10 km INTERVAL MARKER

NOTES:

- BASE MAP 1:250,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004).
- COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
- CONTOURS ARE IN METRES. CONTOUR INTERVAL VARIES.
- RAILWAY ALIGNMENT PROVIDED BY CANARAIL CONSULTANTS INC. (SEPTEMBER, 2008).
- NEST SITE LOCATIONS ARE APPROXIMATE AND MAY INCLUDE MULTIPLE OBSERVATIONS FOR EACH NEST.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

DISTRIBUTION OF SNOW GOOSE MOULTING LOCATIONS

Knight Piésold

CONSULTING

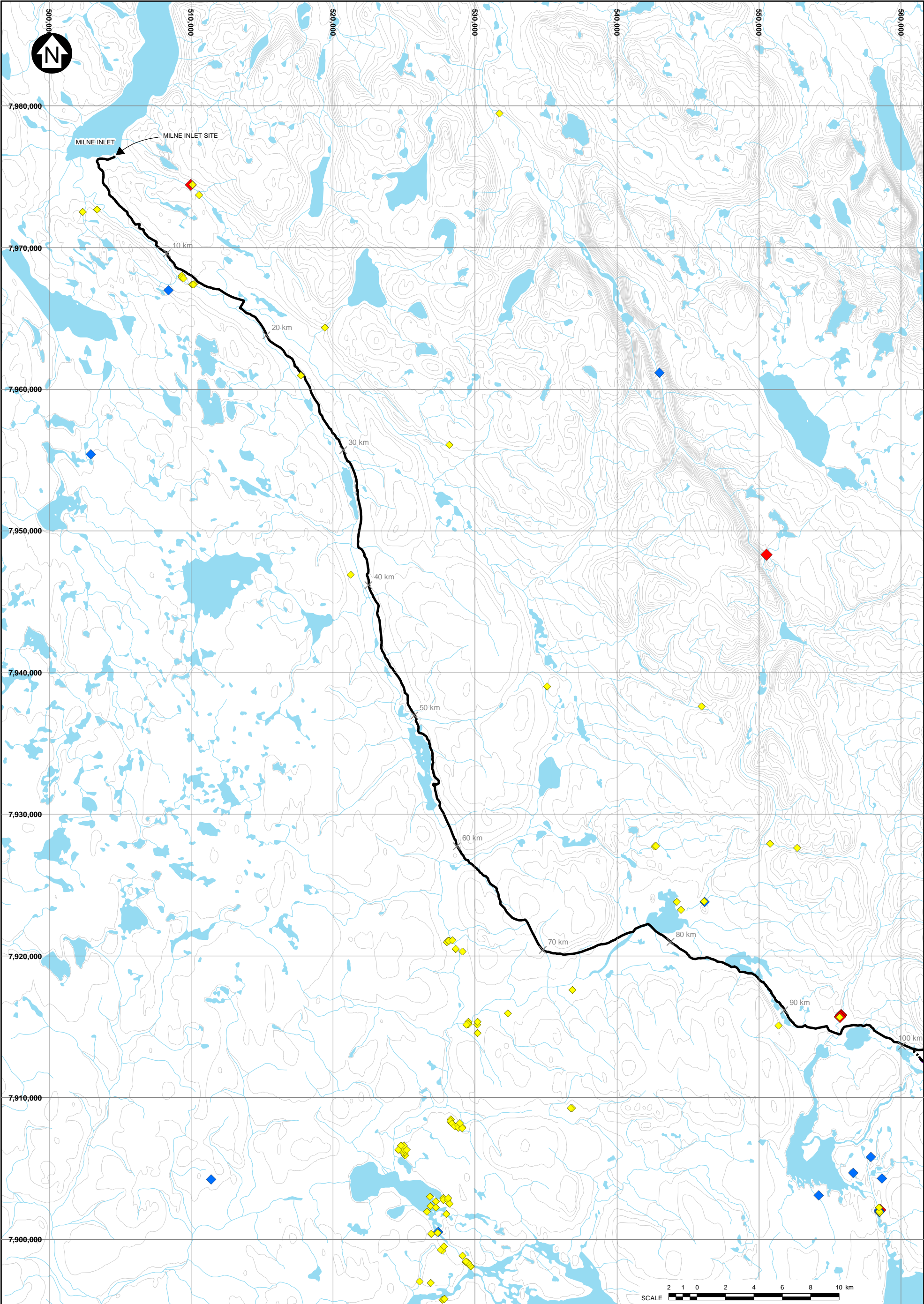
P/A NO.
NB102-181/25

REF NO.
1

FIGURE 4.16

REV
0

SAVED: I:\102000181250\GIS\ArcView\figures\934_10.mxd; Aug 27, 2010 3:12:56 PM ammore



2008 SNOW GOOSE NEST

2007 SNOW GOOSE NEST

2006 SNOW GOOSE NEST

WATER

DEPOSIT NO. 1 MINING LEASE 2484

RIVER/STREAM/DRAINAGE

MILNE INLET TOTE ROAD

PROPOSED RAILWAY ALIGNMENT

PROPOSED CONSTRUCTION ACCESS ROAD

10 km INTERVAL MARKER

NOTES:

1. BASE MAP 1:250,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004).

2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.

3. CONTOURS ARE IN METRES. CONTOUR INTERVAL VARIES.

4. RAILWAY ALIGNMENT PROVIDED BY CANARAIL CONSULTANTS INC. (SEPTEMBER, 2008).

5. NEST SITE LOCATIONS ARE APPROXIMATE AND MAY INCLUDE MULTIPLE OBSERVATIONS FOR EACH NEST.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

DISTRIBUTION OF SNOW GOOSE NEST SITES
NORTH PORTION

Knight Piésold

CONSULTING

P/A NO.

NB102-181/25

REF NO.

1

FIGURE 4.17

REV

0

0

31AUG10

ISSUED WITH REPORT

MLT

ASM

PAQ

KDE

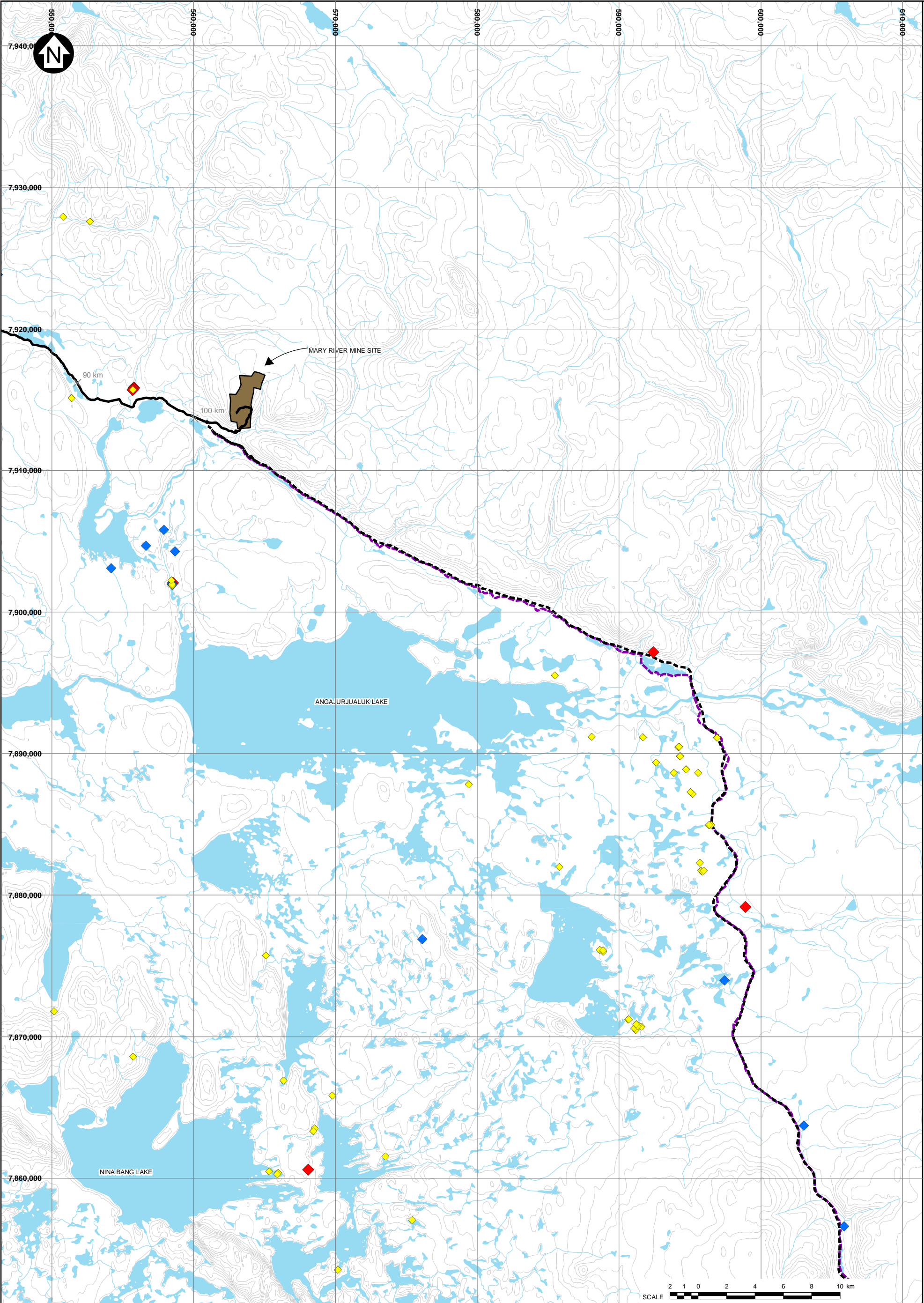
DESIGNED

DRAWN

CHKD

APPD

SAVED: I:\10200018125A\GIS\ArcView\figures\B30_10.mxd; Aug 27, 2010 3:11:28 PM ammore



LEGEND:

2008 SNOW GOOSE NEST

2007 SNOW GOOSE NEST

2006 SNOW GOOSE NEST

WATER

DEPOSIT NO. 1 MINING LEASE 2484

RIVER/STREAM/DRAINAGE

MILNE INLET TOTE ROAD

PROPOSED RAILWAY ALIGNMENT

PROPOSED CONSTRUCTION ACCESS ROAD

10 km INTERVAL MARKER

0	31AUG10	ISSUED WITH REPORT	MLT	ASM	PAQ	KDE
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHKD	APPD

NOTES:

1. BASE MAP 1:250,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004).
2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
3. CONTOURS ARE IN METRES. CONTOUR INTERVAL VARIES.
4. RAILWAY ALIGNMENT PROVIDED BY CANARAIL CONSULTANTS INC. (SEPTEMBER, 2008).
5. NEST SITE LOCATIONS ARE APPROXIMATE AND MAY INCLUDE MULTIPLE OBSERVATIONS FOR EACH NEST.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

DISTRIBUTION OF SNOW GOOSE NEST SITES
MID PORTION

Knight Piésold

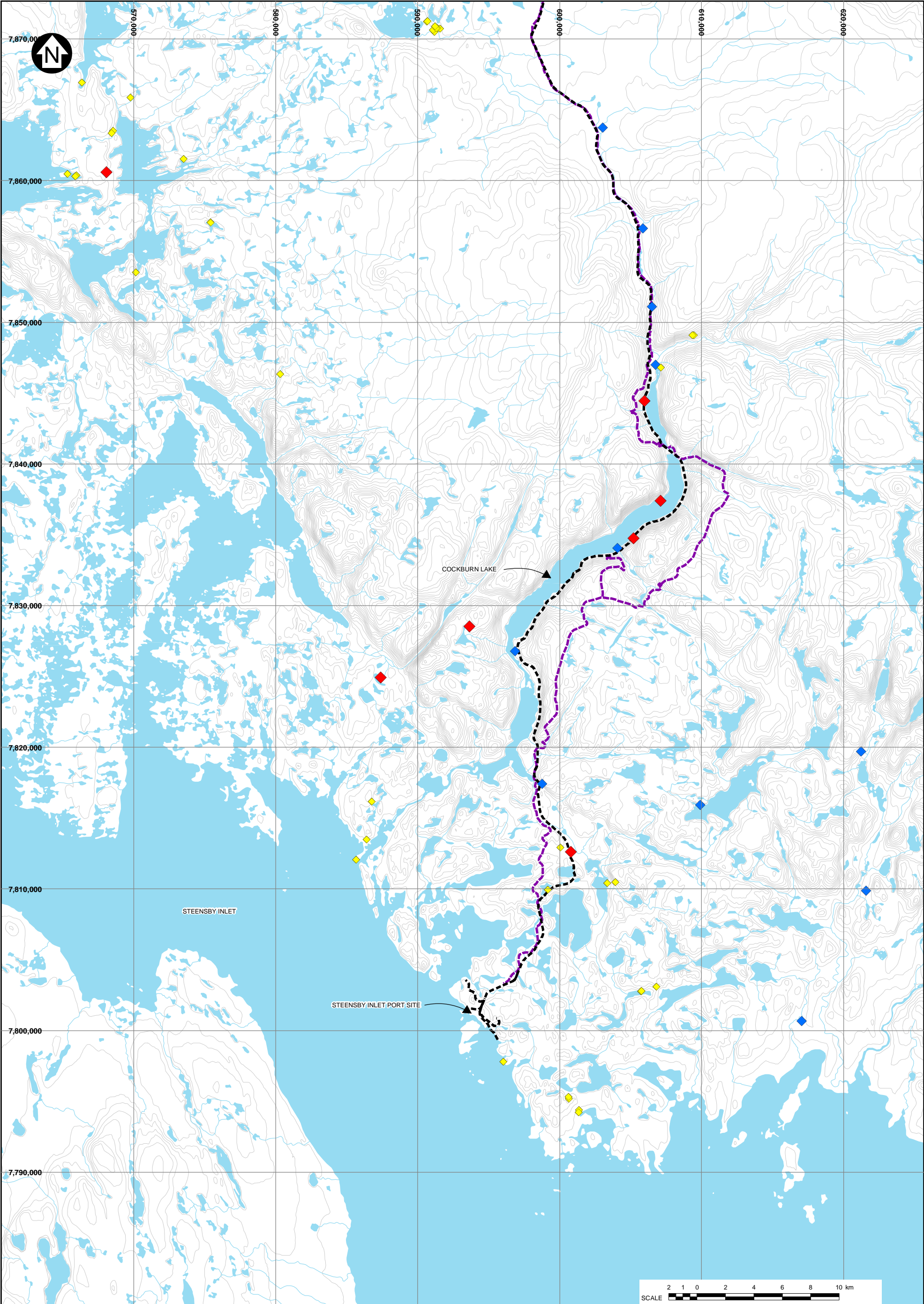
CONSULTING

P/A NO.
NB102-181/25

REF NO.
1

FIGURE 4.18

REV
0



LEGEND:

2008 SNOW GOOSE NEST

2007 SNOW GOOSE NEST

2006 SNOW GOOSE NEST

WATER

DEPOSIT NO. 1 MINING LEASE 2484

RIVER/STREAM/DRAINAGE

MILNE INLET TOTE ROAD

PROPOSED RAILWAY ALIGNMENT

PROPOSED CONSTRUCTION ACCESS ROAD

10 km INTERVAL MARKER

NOTES:

1. BASE MAP 1:250,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004).

2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.

3. CONTOURS ARE IN METRES. CONTOUR INTERVAL VARIES.

4. RAILWAY ALIGNMENT PROVIDED BY CANARAIL CONSULTANTS INC. (SEPTEMBER, 2008).

5. NEST SITE LOCATIONS ARE APPROXIMATE AND MAY INCLUDE MULTIPLE OBSERVATIONS FOR EACH NEST.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

DISTRIBUTION OF SNOW GOOSE NEST SITES
SOUTH PORTION

Knight Piésold

CONSULTING

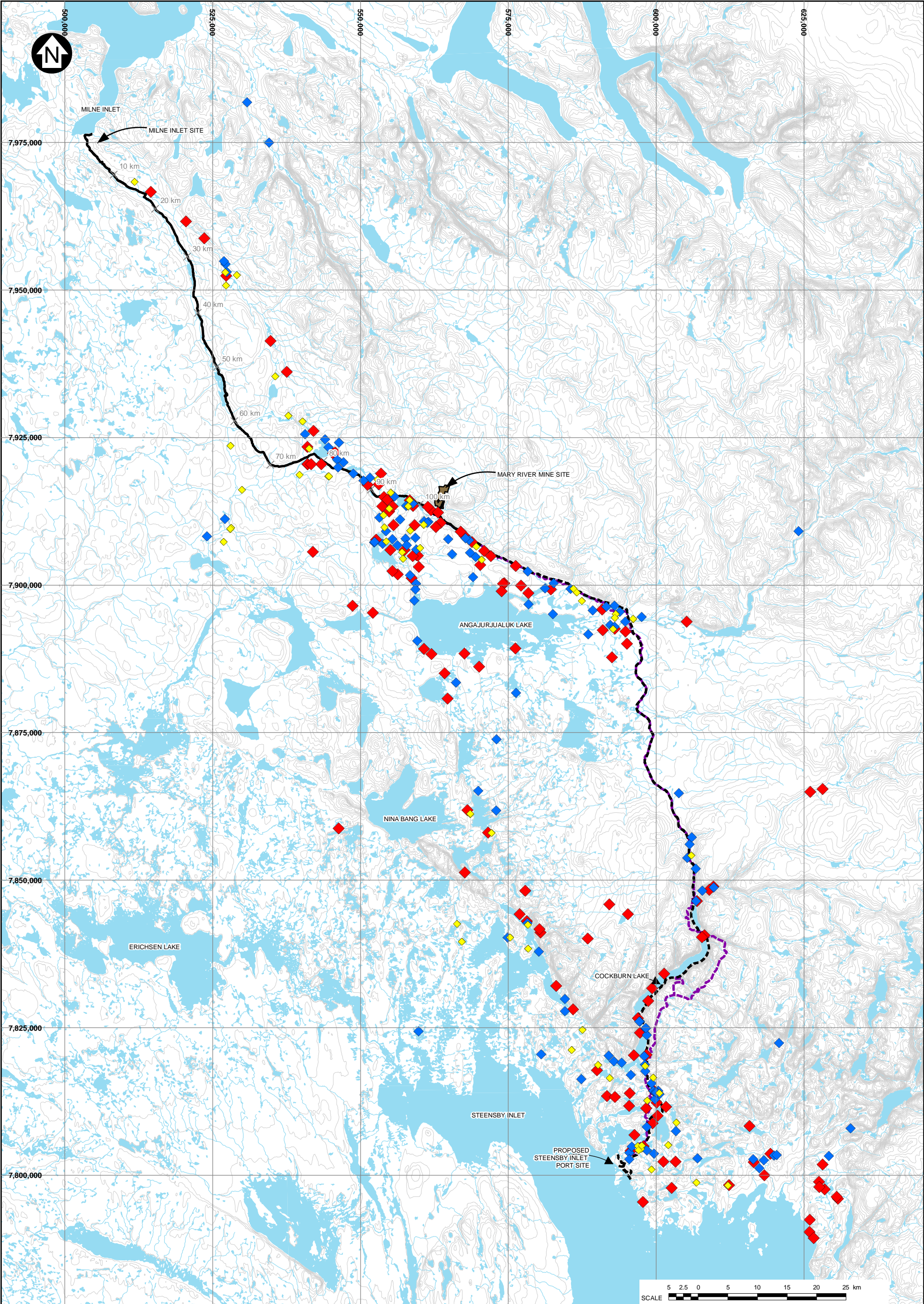
P/A NO.
NB102-181/25

REF NO.
1

FIGURE 4.19

REV
0

SAVED: I:\11020018\125\A\GIS\ArcView\figures\B32_0.mxd; Aug 27, 2010 3:17:27 PM ammore



LEGEND:

2008 SANDHILL CRANE SIGHTING

2007 SANDHILL CRANE SIGHTING

2006 SANDHILL CRANE SIGHTING

WATER

DEPOSIT NO. 1 MINING LEASE 2484

RIVER/STREAM/DRAINAGE

MILNE INLET TOTE ROAD

PROPOSED RAILWAY ALIGNMENT

PROPOSED CONSTRUCTION ACCESS ROAD

10 km INTERVAL MARKER

NOTES:

1. BASE MAP 1:250,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004).

2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.

3. CONTOURS ARE IN METRES. CONTOUR INTERVAL VARIES.

4. RAILWAY ALIGNMENT PROVIDED BY CANARAIL CONSULTANTS INC. (SEPTEMBER, 2008).

5. NEST SITE LOCATIONS ARE APPROXIMATE AND MAY INCLUDE MULTIPLE OBSERVATIONS FOR EACH NEST.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

DISTRIBUTION OF SANDHILL CRANE SIGHTINGS

Knight Piésold

CONSULTING

P/A NO.

NB102-181/25

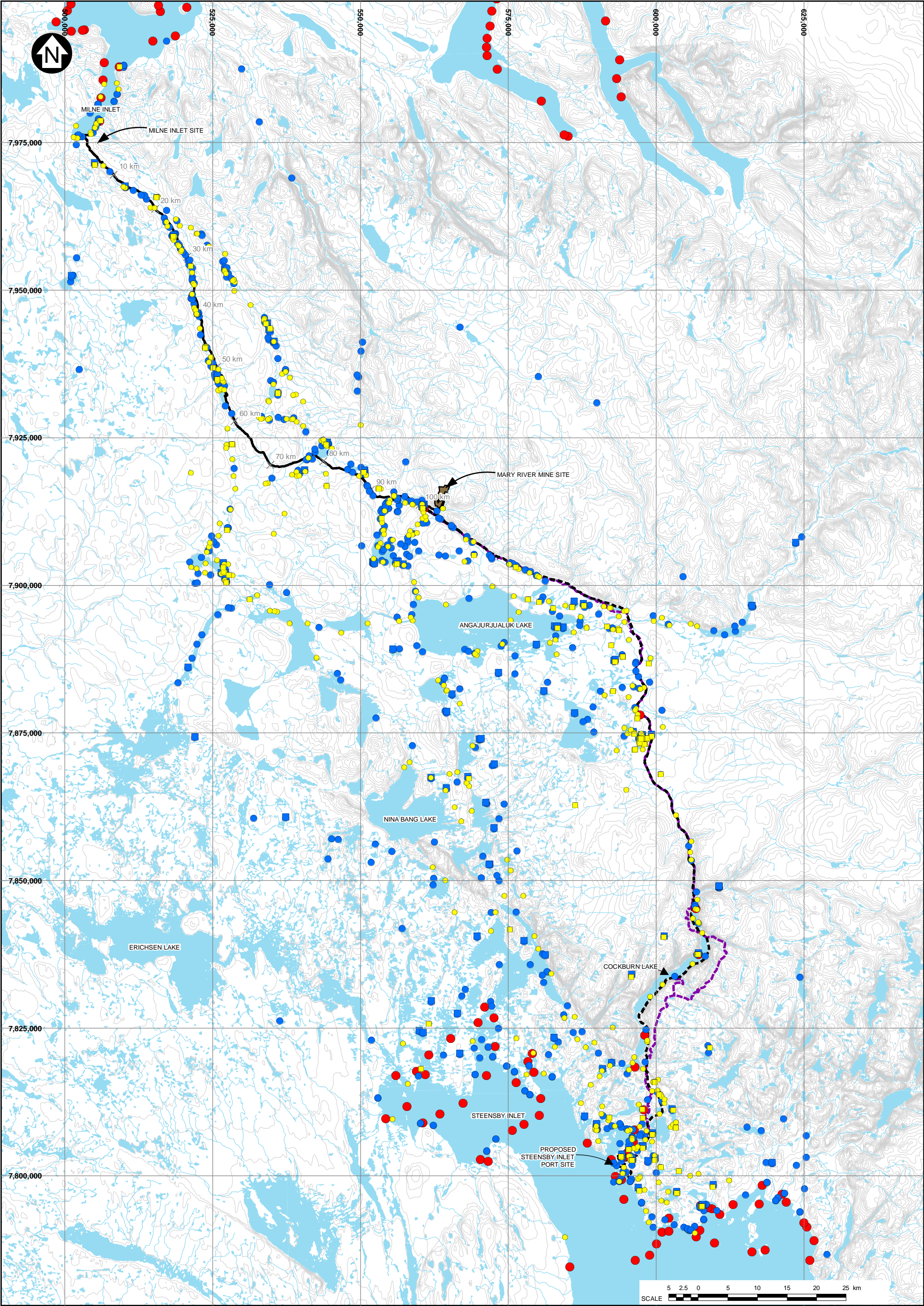
REF NO.

1

FIGURE 4.20

REV 0

SAVED: I:\1020018125\A\GIS\ArcView\figures\938_10.mxd; Aug 27, 2010 2:35:17 PM ammore



LEGEND:

- 2008 GLAUCOUS GULL
- 2008 GLAUCOUS GULL NEST
- 2007 GLAUCOUS GULL
- 2007 GLAUCOUS GULL NEST
- 2006 GULL
- 2006 GULL NEST
- WATER
- DEPOSIT NO. 1 MINING LEASE 2484
- RIVER/STREAM/DRAINAGE
- MILNE INLET TOTE ROAD
- PROPOSED RAILWAY ALIGNMENT
- PROPOSED CONSTRUCTION ACCESS ROAD
- 10 km INTERVAL MARKER

- NOTES:**
1. BASE MAP 1:250,000 © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004).
 2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
 3. CONTOURS ARE IN METRES. CONTOUR INTERVAL VARIES.
 4. RAILWAY ALIGNMENT PROVIDED BY CANARAIL CONSULTANTS INC. (SEPTEMBER, 2008).
 5. NEST SITE LOCATIONS ARE APPROXIMATE AND MAY INCLUDE MULTIPLE OBSERVATIONS FOR EACH NEST.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

DISTRIBUTION OF GULL SIGHTINGS AND NEST SITES

Knight Piésold
CONSULTING

P/A NO. NB102-181/25	REF NO. 1
FIGURE 4.21	
REV 0	

SAVED: I:\102000\18125A\GIS\ArcView\figures\B37_0.mxd; Aug 27, 2010 2:38:56 PM ammore