Baffinland

TECHNICAL SUPPORTING DOCUMENT

Mary River Project | Phase 2 Proposal | FEIS Addendum | August 2018

TSD 15

Conceptual Freshwater Offsetting Plan





FRESHWATER OFFSETTING PLAN TECHNICAL SUPPORTING DOCUMENT SUMMARY

The Conceptual Freshwater Fish Habitat Offsetting Plan Technical Supporting Document identifies conceptual fish habitat offsetting measures to maintain no net loss, and demonstrates that the proposed offsetting measures will offset serious harm to fish and loss of productive capacity that could result from the Phase 2 Proposal. The Phase 2 Proposal builds on the extensive baseline studies and assessments carried out since 2011 for the larger Approved Project and is thus closely linked to the FEIS and previous addendums. This document is used as input to the assessment of effects on freshwater fish and fish habitat.

Fish habitat losses will occur as a result of construction of four rail bridges and encroachment of the North Railway on an unnamed lake at rail km 71.The km 71 lake is a narrow and shallow waterbody that flows to Tom River. The proposed offsetting measures will be sized to achieve a 2:1 compensation ratio and offset these fish habitat losses.

The proposed offsetting measures include:

- Placement of cobbles and boulders to improve rearing and foraging habitat quality
- Excavation/reconstruction of the lake outlet to improve habitat connectivity with Tom River
- Excavation of lake bed material to increase water depth
- Excavation/reconstruction of the lake inlet streams to improve habitat connectivity with two pothole lakes located immediately east

This is a conceptual plan that will require detailed study and analysis in order to be implemented and is subject to feedback from agencies, stakeholders, and community groups during the review of the Phase 2 Proposal. Further study is required to assess habitat benefits of the proposed km 71 lake enhancements.

RÉSUMÉ DU DOCUMENT D'ASSISTANCE TECHNIQUE SUR LE PLAN DE COMPENSATION DES IMPACTS SUR L'EAU DOUCE

Le document d'assistance technique sur le plan de compensation conceptuel des impacts sur l'habitat du poisson d'eau douce identifie les mesures conceptuelles de compensation de l'habitat du poisson afin d'annuler la perte nette et démontre que les mesures compensatoires proposées compenseront les dommages sérieux aux poissons et la perte de capacité de production pouvant découler de la proposition de la phase 2. La proposition de la phase 2 est fondée sur les études préliminaires et les évaluations complètes réalisées depuis 2011 pour l'ensemble du projet approuvé et est donc étroitement liée à l'énoncé des incidences environnementales (EIE) et aux addendas précédents. Ce document est utilisé pour l'évaluation des impacts sur les poissons d'eau douce et leur habitat.

Des pertes d'habitat du poisson surviendront à la suite de la construction de quatre ponts ferroviaires et de l'empiétement de la voie ferrée du Nord sur un lac sans nom au km 71.Le lac du km 71 est un plan d'eau étroit et peu profond qui se jette dans la rivière Tom. Les mesures de compensation proposées seront ajustées de manière à atteindre un ratio de compensation de 2:1 et compenseront ces pertes d'habitat du poisson.

Les mesures de compensation proposées comprennent :

- Mise en place de galets et de blocs pour améliorer la qualité de l'habitat d'élevage et d'alimentation
- Excavation/reconstruction de la décharge du lac pour améliorer la connectivité de l'habitat avec la rivière Tom
- Excavation du matériau du lit du lac pour augmenter la profondeur de l'eau
- Excavation/reconstruction des cours d'eau d'entrée du lac pour améliorer la connectivité de l'habitat avec deux lacs en cuve situés immédiatement à l'est

Il s'agit d'un plan conceptuel qui nécessitera une étude et une analyse détaillées avant sa mise en œuvre et qui fera l'objet de commentaires de la part des organismes, des intervenants et des groupes communautaires lors de l'examen de la proposition de la phase 2. D'autres études sont nécessaires pour évaluer les avantages des améliorations proposées de l'habitat pour le lac du km 71.

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- ᑐᐊᑉᐱᖅᓯᐃᓂᖅ ᐅᔭᕋᓯᓪᔪᕐᓂᓪᓗ ᑰᖓᓄᑦ ᐱᐅᓯᕆᐊᕋᓯᓪᓗᒍ ᐃᕐᑲᓗᐃᑦ ᓯᕚᕐᑭᕝᕙᒃᓴᓇᔭᖓᑦ ᐊᒻᒪᓗ ᓂᕿᒃᓴᖅᓯᐅᕐᕙᐊ ᐱᐅᓂᖅᓴᓂᒃ ᓂᕿᕐᑲᕐᑯᓕᕐᑯᓪᓗᒍ
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- ᐃᓗᑦᑐᖅᑎᖅᑕᐅᓂᖓ/ᓴᓇᔭᐅᒃᑲᓐᓂᕐᓂᖕᒋᓪᓗ ᑕᓯᕐᒧᑦ ᑰᖓᓛᒃᑐᑦ ᐊᑯᐊᖕᒋᑦ ᐱᐅᓯᕆᐊᕋᓯᓪᓗᒍ ᑲᑎᙵᔪᓐᓇᕐᓂᖓ ᑕᓯᓛᕐᓄᑦ ᑲᓇᓐᓇᖓᓂ ᐃᓂᖅᑳᒃ

ᐅᓇ ᑕᐅᑐᙳᐊᓚᐅᔪᖅ ᐸᕐᓇᐅᑎᕗᑦ ᐱᑕᖅᑲᓇᐊᖅᑲᖅᑐᖅ ᐃᓗᐃᑦᑑᔪᒥᒃ ᖃᐅᔨᓴᐃᓂᕐᒥᒃ ᕿᒥᕐᕈᓇᕐᓂᕐᒥᓪᓗ ᐊᑐᓕᖅᑎᑕᐅᓂᐊᕈᓂ ᑭᖑᕝᕚᓂᖓ ᑖᓐᓇᓗ ᐊᓯᔾᔨᖅᑕᐅᔪᓐᓇᖅᑐᓂ ᓚᕙᒻᑯᑦ ᑎᒥᖕᒋᓄᑦ, ᐃᓚᐅᖅᑕᐅᓂᓕᖕᓄᑦ, ᓄᓇᓕᖕᓂᓪᓗ ᑲᑐᔾᔨᖅᑲᑎᒌᖕᒋᓄᑦ ᑖᓐᓇ ᕿᒥᕐᕈᔭᐅᑎᓪᓗᒍ ᐱᓕᕆᐊᑉ ᒪᕿᑎᓕᖅᑕᖓᓂ ᐅᒃᑑᑎᖓ. ᖃᒃᑲᓐᓂᐊᒍᑦ ᖃᐅᔨᓴᕆᐊᓖᑦ ᕿᒥᕐᕈᓐᑕᐅᓂᐊᖅᐳᑎᒃ ᓇᔪᓚᕆᔭᐅᓃᑦ ᐃᒪᕐᒥᓂᒃ ᐱᐅᓯᕆᐊᕆᓂᐅᑉ ᐱᕚᓪᓕᐅᑎᖕᒋᓂᒃ ᐊᑐᖅᑕᐅᔪᒫᑉ ᑭᓚᒥᑕ 71 ᑕᓯᖓᑕ ᐱᐅᓯᕆᐊᕆᔭᐅᓇᓂᑎᖕᒋᓐᓂᒃ.

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT – PHASE 2 PROPOSAL



TECHNICAL SUPPORTING DOCUMENT NO. 15
CONCEPTUAL FRESHWATER OFFSETTING PLAN

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TABLE OF CONTENTS

PAGE

TABLES

FIGURES

APPENDICES

ABBREVIATIONS

the project	Mary River Project
Baffinland	Iron Mines Corporation
BMPs	Best Management Practices
CPUE	catch per unit effort
CRA	Commercial, Recreational, or Aboriginal
DFO	Fisheries and Oceans Canada
EA	Environmental Assessment
EIS	Environmental Impact Statement
FEIS	Final Environmental Impact Statement
HTOs	Hunter and Trapper Organizations
IFMPs	Integrated Fisheries Management Plans
INAC	Indigenous and Northern Affairs Canada
IQ	Inuit Qaujimajatuqangit
LSAs	Local Study Areas
Mtpa	million tonnes per annum
NCLA	Nunavut Land Claims Agreement
NIRB	Nunavut Impact Review Board
NSA	Nunavut Settlement Area
NSC	North/South Consultants Inc.
NuPPAA	Nunavut Planning and Project Assessment Act
NWMB	Nunavut Wildlife Management Board
PDAs	Potential Development Areas
RSAs	Regional Study Areas
SARA	Species at Risk Act
The Offsetting Plan	Conceptual Freshwater Fish Habitat Offsetting Plan

1 – INTRODUCTION

1.1 REPORT PURPOSE AND ORGANIZATION

The development of the Phase 2 Proposal for the Mary River Project will result in unavoidable loss of freshwater fish habitat, and this may cause serious harm to fish as defined by the *Fisheries Act*. The scope of this report addresses residual impacts to fish habitat of the Mary River Project in the freshwater aquatic environment, and identifies conceptual fish habitat offsetting measures to maintain no net loss.

The purpose of this Conceptual Freshwater Fish Habitat Offsetting Plan (the Offsetting Plan) is to demonstrate that the proposed offsetting measures will offset serious harm to fish and loss of productive capacity that could result from the Phase 2 Proposal. The Offsetting Plan has the following objectives:

- Describe the residual effects of the Project that may result in serious harm to fish, which may occur during the construction, operations, closure, and post-closure phases
- Describe the fish species being affected by the proposed Project activities and the importance of the affected habitat to the fish population and Commercial, Recreational, or Aboriginal (CRA) fisheries
- Describe the conceptual plans to offset the loss of fish productive capacity
- Outline a monitoring plan to assess the effectiveness of fish habitat created to offset habitat losses

The organization of the report is based on Fisheries and Oceans Canada (DFO) guidance concerning the Fisheries Protection Policy, fish habitat offsetting, and the content of applications for *Fisheries Act* Authorization (DFO, 2013a; 2013b; 2013c). The offsetting measures will be incorporated to a future permit application for authorization of serious harm to fish habitat as required by the *Fisheries Act*. This application will be developed and submitted during the environmental assessment (EA) of the Project using preliminary engineering design, other analyses, and information as described in this conceptual plan.

1.2 REGULATORY GUIDANCE

The Federal Fisheries Protection Policy Statement and the Proponents Guide to Offsetting (DFO, 2013a; 2013b) provide direction for interpreting the broad powers mandated in the *Fisheries Act*. These documents outline DFO's objective of maintaining or enhancing ongoing productivity and sustainability of CRA fisheries. DFO is guided by the following principles (DFO, 2013a):

- **Avoid harm** - Whenever possible, DFO's preference is to maintain the productivity of Canada's fisheries by avoiding impacts to fish and fish habitat. Proponents are responsible for managing and mitigating impacts resulting from their projects.
- **Promote sound decision-making** - In making regulatory decisions, DFO will be informed by the best available science, technical information, and traditional knowledge and be guided by the application of precaution and a risk-based approach to decision-making.
- **Enable best-placed delivery** - Other entities across Canada may be well-placed to achieve and deliver the objectives of the fisheries protection provisions. DFO will seek to collaborate with partners who have the knowledge, capacity, and interest in fisheries conservation and protection when these align with DFO's mandate, priorities, and objectives.

- **Employ a standards-based approach** - DFO will develop and support the use of standards that provide clarity and certainty to proponents while maintaining the sustainability and ongoing productivity of Canada's fisheries.
- **Consider the ecosystem context** - The consideration of cumulative effects on the state, resiliency, and natural biodiversity of the ecosystem will guide DFO in achieving the objectives of the Fisheries Protection Policy Statement.

Under these principles, DFO works with proponents and government agencies to ensure that projects are designed to maintain fish habitat while recognizing the potential or existing land use value. In cases where losses of fish habitat cannot be avoided by project development, habitat replacement or enhancement may be accepted as offsetting measures on a case by case basis. Offsetting is interpreted through the Policy as follows:

> *"An offset measure is one that counterbalances unavoidable serious harm to fish resulting from a project with the goal of maintaining or improving the productivity of the Commercial, Recreational, or Aboriginal Fishery. Offset measures should support available fisheries management objectives and local restoration priorities" (DFO, 2013a).*

Once it has been determined that a *Fisheries Act* Authorization is required in order for a project to proceed, four factors described in Section 6 of the *Act* must be considered by the Minister before an Authorization can be issued:

1. The contribution of the relevant fish to the ongoing productivity of CRA fisheries
2. Fisheries management objectives
3. Whether there are measures and standards to avoid, mitigate, or offset serious harm to fish that are part of a CRA fishery, or that support such a fishery
4. The public interest

An offsetting plan is intended to describe measures to offset any residual impacts that will cause serious harm to fish and should also demonstrate that the offsetting measures will maintain or improve the productivity of the impacted fishery. Other factors to be considered in an offsetting plan include:

- Opportunities to mitigate existing impacts or constraints to fish and fish habitat
- Aboriginal Group's traditional access to fish in the area, traditional uses, and ecological knowledge
- Compliance of offsetting plans with recovery planning for species listed under the *Species at Risk Act* (SARA)
- Risk of failure and the time lag until offsetting habitats become fully functional
- Potential for the proposed project to adversely affect the offsetting works in the future
- Intrinsic value of habitat to be enhanced compared with the productive capacity gained through habitat enhancement
- Perpetuity of offsetting works

In addition to the above factors, the following criteria were also considered in the development of this Offsetting Plan:

- Site specificity - to the extent possible the offset measures should be implemented within the sub watersheds that are within the local study area (LSA)
- Locally valued fish species - the offset measures selected for implementation should consider the interests of local fisheries use

- High probability of success with measurable results - the offset measures selected for implementation should be associated with a high likelihood of success to make a meaningful contribution to the local fishery, and should be measurable

1.3 PHASE 2 PROPOSAL OVERVIEW

The Mary River Project is an operating iron ore mine located in the Qikiqtani Region of Nunavut (Figure 1.1). Baffinland Iron Mines Corporation (Baffinland; the Proponent) is the owner and operator of the Project. As part of the regulatory approval process, Baffinland submitted a Final Environmental Impact Statement (FEIS) to the Nunavut Impact Review Board (NIRB), which presented in-depth analyses and evaluation of potential environmental and socioeconomic effects associated with the Project.

In 2012, NIRB issued Project Certificate No 005 which provided approval for Baffinland to mine 18 million tonnes per annum (Mtpa) of iron ore, construct a railway to transport the ore south to a port at Steensby Inlet which operates year-round, and to ship the ore to market. The Project Certificate was subsequently amended to include the mining of an additional 4.2 Mtpa of ore, trucking this amount of ore by an existing road (the Tote Road) north to an existing port at Milne Inlet, and shipping the ore to market during the open water season. The total approved iron ore production was increased to 22.2 Mtpa (4.2 Mtpa transported by road to Milne Port, and 18 Mtpa transported by rail to Steensby Port). This is now considered the Approved Project. The 18 Mtpa Steensby rail project has not yet been constructed, however 4.2 MTPA of iron ore is being transported north by road to Milne Port currently. Baffinland recently submitted a request for a second amendment to Project Certificate No.005 to allow for a short-term increase in production and transport of ore via road through Milne Port from the current 4.2 Mtpa to 6.0 Mtpa.

The Phase 2 Proposal (the third project certificate amendment request) involves increasing the quantity of ore shipped through Milne Port to 12 Mtpa, via the construction of a new railway running parallel to the existing Tote Road (called the North Railway). The total mine production will increase to 30 Mtpa with 12 Mtpa being transported via the North Railway to Milne Port and 18 Mtpa transported via the South Railway to Steensby Port. Construction on the North Railway is planned to begin in late 2019. Completion of construction of the North Railway is expected by in 2020 with transportation of ore to Milne Port by trucks and railway ramping up as mine production increases to 12 Mtpa by 2020. Shipping from Milne Port will also increase to 12 Mtpa by 2020. Construction of the South Railway and Steensby Port will commence in 2021 with commissioning and a gradual increase in mine production to 30 Mtpa by 2024. Shipping of 18 Mtpa from Steensby Port will begin in 2025.

Phase 2 also involves the development of additional infrastructure at Milne Port, including a second ore dock. Shipping at Milne Port will continue to occur during the open water season, and may extend into the shoulder periods when the landfast ice is not being used to support travel and harvesting by Inuit. Various upgrades and additional infrastructure will also be required at the Mine Site and along both the north and south transportation corridors to support the increase in production and construction of the two rail lines.

The proposed layout of the Mine Site associated with the Phase 2 Proposal is shown on Figure 1.2. The alignment of the North Railway next to the Milne Inlet Tote Road and within the Northern Transportation Corridor is shown on Figure 1.3. The proposed layout of Milne Port is shown on Figure 1.4. Detailed maps of the North Railway are provided in Appendix A.

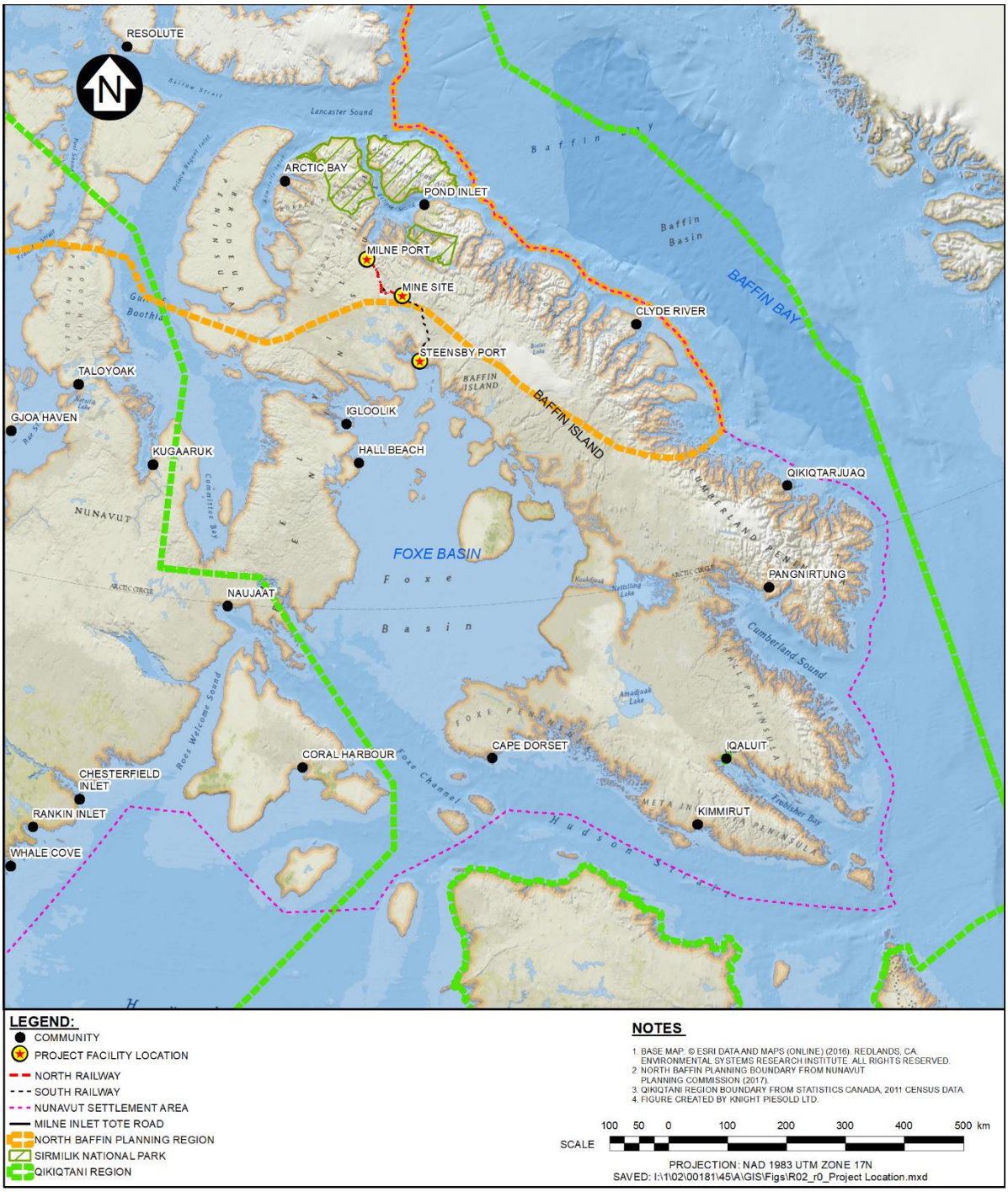


Figure 1.1 Project Location Map

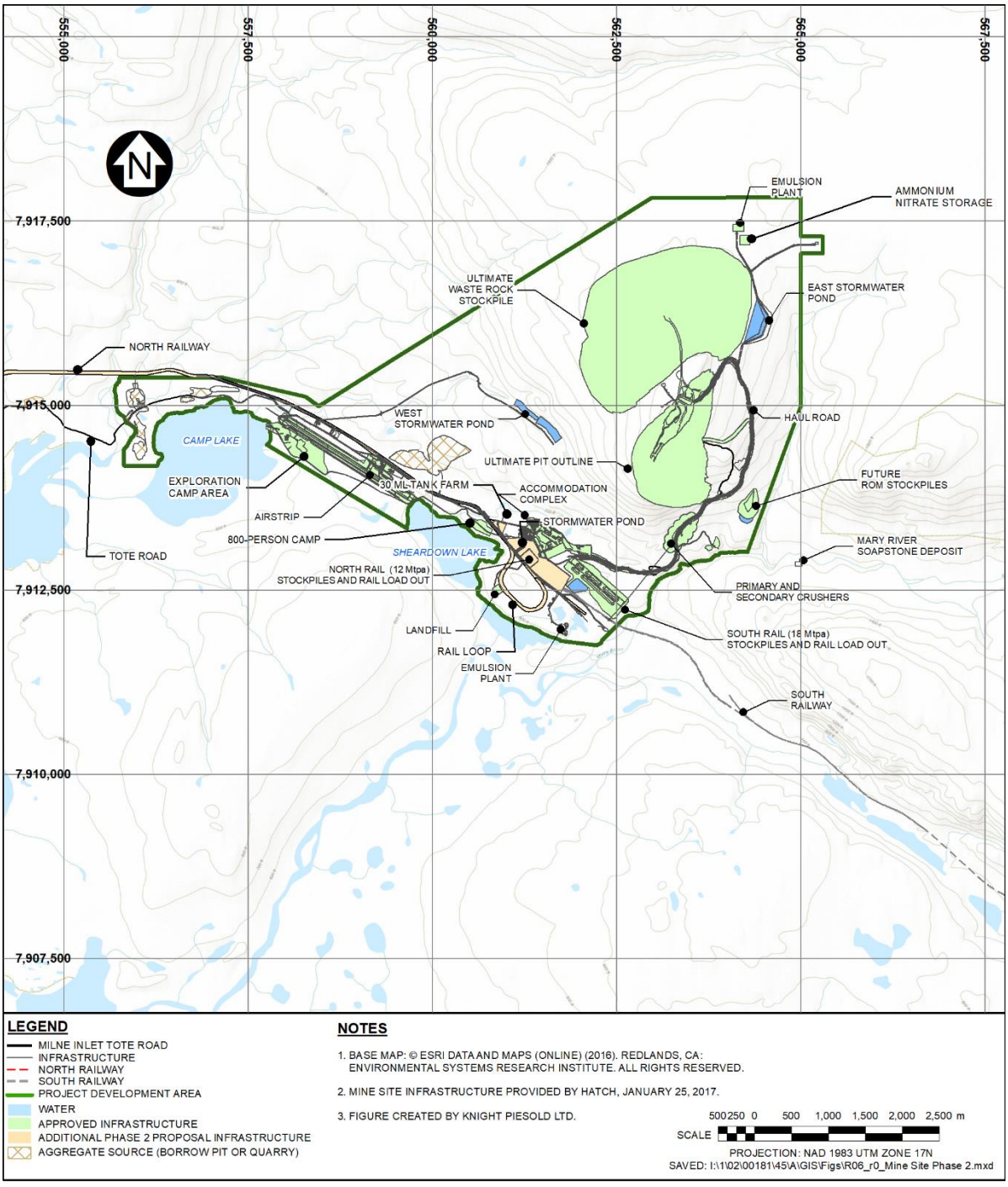


Figure 1.2 Mine Site - Phase 2 Proposal Layout

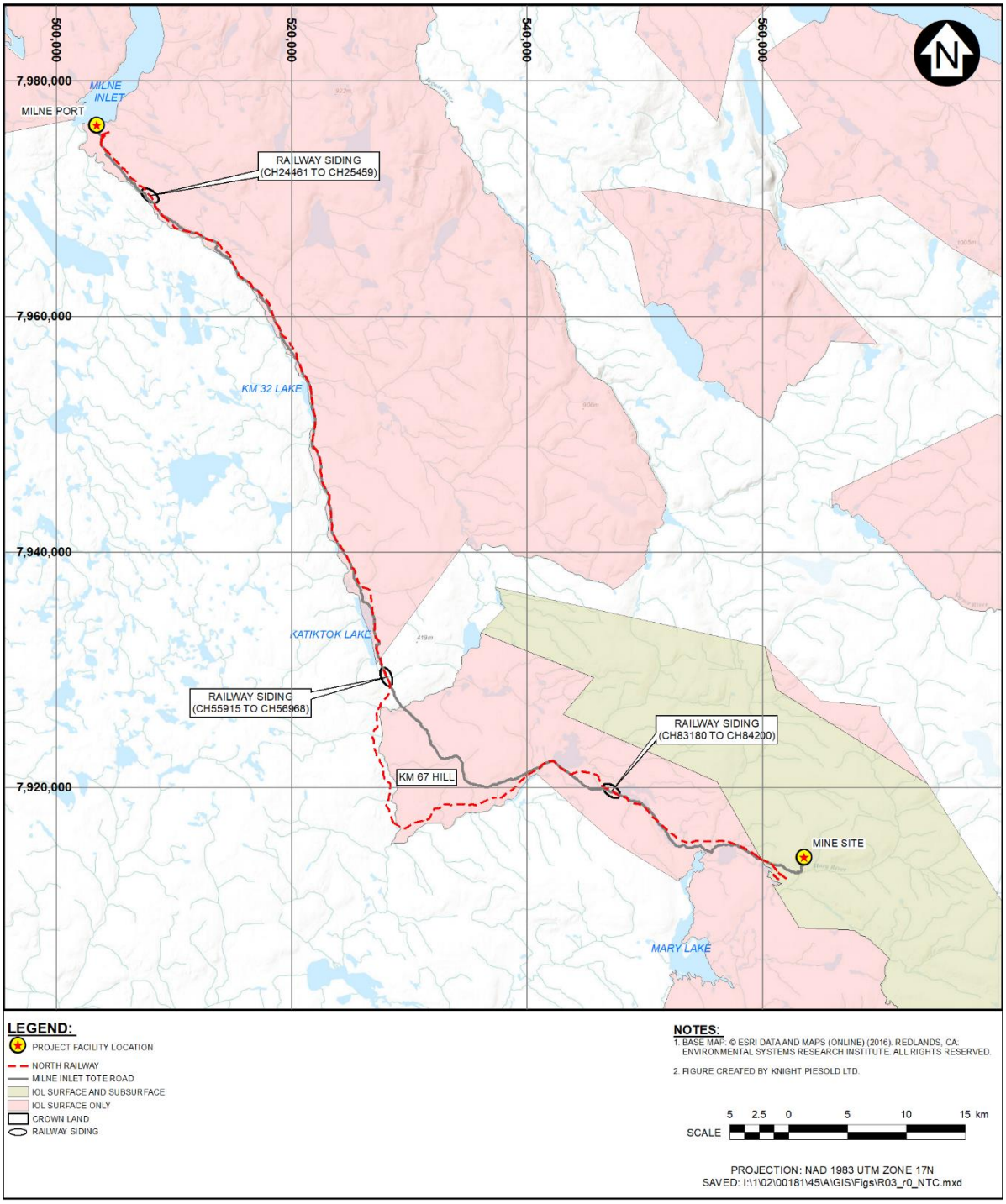


Figure 1.3 Northern Transportation Corridor

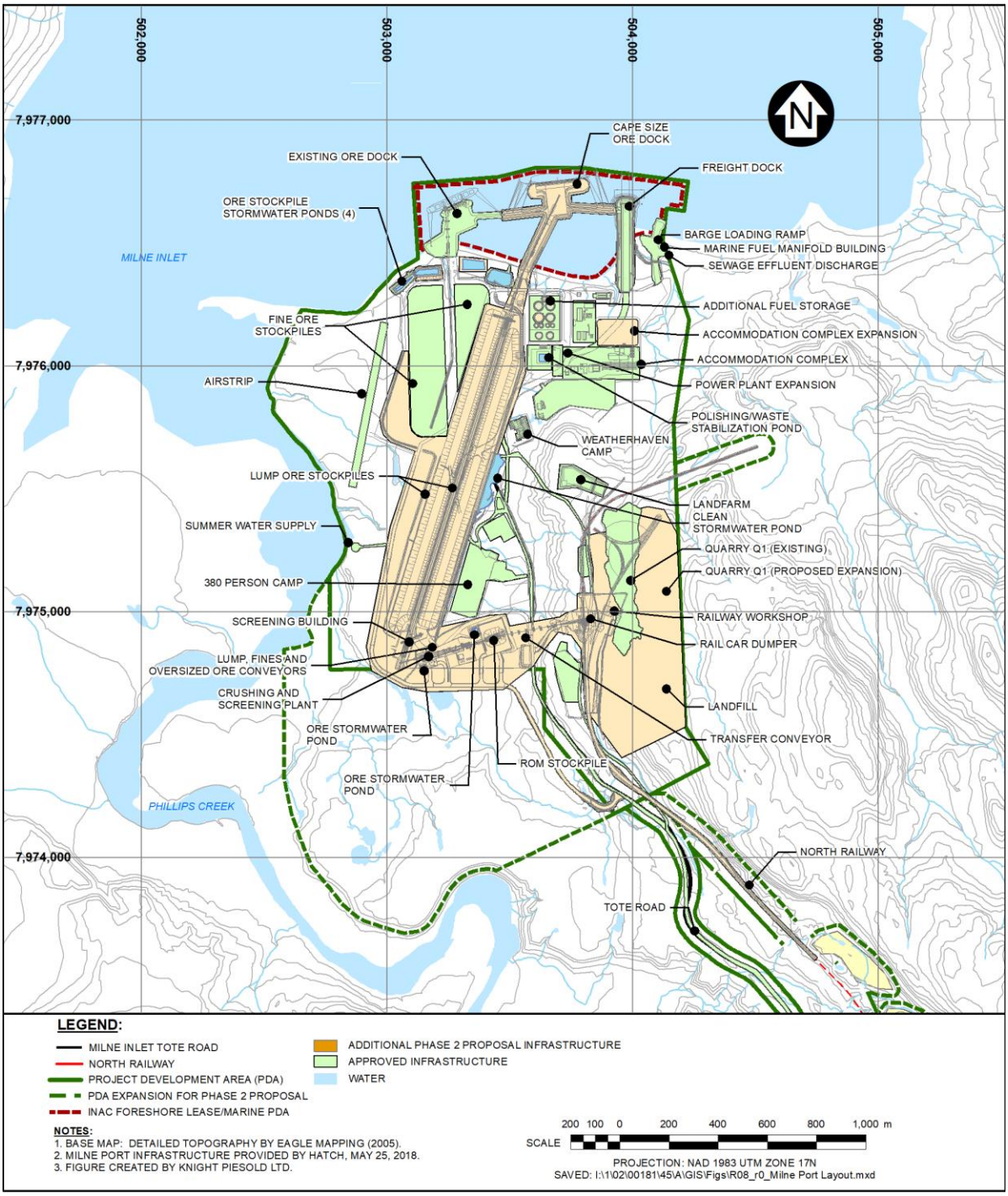


Figure 1.4 Milne Port - Phase 2 Proposal Layout

2 – CONSULTATION

2.1 ABORIGINAL

Baffinland plans to undertake consultation on the offsetting plan with community representatives from Pond Inlet in 2018.

2.2 REGULATORY

Baffinland plans to undertake consultation on the offsetting plan with federal government agencies (DFO, Indigenous and Northern Affairs Canada (INAC), and Transport Canada) in 2018.

3 – FRESHWATER BIOTA AND AQUATIC HABITAT BASELINE

The following section is summarized from existing fisheries baseline and assessment reports for the Mary River Project (Baffinland, 2012; NSC, 2012; NSC, 2014; NSC, 2018), annual monitoring reports (Baffinland, 2014; 2015a; 2015b; 2016a; 2016b; 2017), and literature related to fish species biology (Johnson, 1980; Richardson et al. 2001). The locations of waterbodies discussed in this report are shown on Figure 1.4.

3.1 SPATIAL BOUNDARIES

Spatial boundaries set the maximum spatial extent within which the environmental assessment is conducted. These boundaries were established in the FEIS in accordance with the requirements of the EIS Guidelines (NIRB, 2015).

The Phase 2 Proposal is largely contained within the footprint of the Approved Project. The potential development areas (PDAs) established in the FEIS and FEIS Addendum for the Mine Site and the South Railway project components remain unchanged. Additionally, the shipping routes remain unchanged from the Approved Project. The Milne Port PDA has expanded slightly both on land and within the marine environment, and a new PDA has been established for the North Railway. Overall, the total PDA will increase by approximately 15%. The Terrestrial, Freshwater, and Marine Regional Study Areas (RSAs) are unchanged.

3.2 FISH SPECIES PROFILES

There are only two fish species – Arctic char (*Salvelinus alpinus*) and ninespine stickleback (*Pungitius pungitius*) - present in the freshwater study area. While both are generally abundant and widespread in distribution, ninespine stickleback are absent from the freshwater lakes and streams that were surveyed near the Milne Inlet coast.

3.2.1 Arctic char

Arctic char is a cold-water fish species in the family Salmonidae, native to alpine lakes and arctic and subarctic coastal waters. Its distribution encompasses circumpolar nearshore marine waters and adjacent freshwater habitats, and occurs as anadromous (sea-run) and freshwater resident forms. Arctic char are important components of northern aquatic ecosystems and are economically and culturally significant to northern communities particularly in Canada. In addition to subsistence fisheries, small-scale commercial and recreational fisheries exist in various parts of Nunavut where Arctic char resources are locally abundant (e.g., Cambridge Bay and Cumberland Sound).

Spawning by Arctic char takes place in freshwater in the fall, between September and November, over gravel beds in lakes or rivers. Incubation occurs over the winter with hatched juveniles emerging the following spring. In the Canadian Arctic in general, spawning takes place in lakes, because most rivers freeze completely in winter. Arctic char are classified as iteroparous as they are capable of spawning more than once in a lifetime. Overwintering habitat for Arctic char occurs in lakes and large rivers that do not freeze to the bottom in winter. Anadromous Arctic char must return to freshwater to overwinter as they are unable to survive marine conditions in winter. Resident Arctic char that utilize small streams in summer as rearing habitat must return to overwintering habitat in order to survive winter conditions. Before freeze-up both mature and immature Arctic char migrate to overwintering habitats. Upstream migration by anadromous Arctic char typically occurs during late August or September, sometimes

starting as early as late July. Most individuals home to their natal system to spawn and, but to a lesser degree, overwinter. Straying and mixing of stocks appears to be more common in anadromous Arctic char than in other salmonids.

Anadromous Arctic char migrate downstream to the ocean at ice-break up during the spring or early summer, although juveniles may rear from three to nine years in freshwater before attempting their first ocean migration and adults may spend a year in freshwater before spawning. The marine phase of the anadromous Arctic char life cycle typically lasts 30 to 60 days, a period during which most of the feeding and growth takes place.

Streams within the Mary River Project freshwater study area freeze solid in winter. Lakes and possibly large rivers provide the only overwintering habitat for Arctic char across the freshwater study area. Many streams provide summer rearing and foraging habitat and potential protection from predators for juvenile Arctic char. Most of the drainage basins that support resident Arctic char either contain barriers preventing anadromous migrations and/or are distant from the coast. Nearshore zones of lakes provide summer rearing and foraging habitat and potential protection from predators for juvenile Arctic char. Lakes that are deep enough to avoid completely freezing in winter provide foraging and, in some cases, spawning habitat for adult Arctic char, and overwintering habitat for all life stages.

Arctic char occur throughout the Mary River Project freshwater study area affected by the Phase 2 Proposal. Most of the populations of Arctic char affected by the Phase 2 Proposal are land-locked.

3.2.2 Ninespine Stickleback

The ninespine stickleback is a species of fish in the Gasterosteidae family. It has a circumpolar distribution and in North America is found in east and central Canada, Alaska, the Northwest Territories, and Nunavut. The ninespine stickleback occupies both freshwater and marine habitats at higher latitudes. Spawning occurs in freshwater during the spring and summer in a nest constructed from aquatic plant material and rocks. It reaches a maximum length of 6 cm. It prefers ponds, lakes, estuaries, and low velocity areas of streams. Marine populations prefer nearshore areas and estuaries.

The ninespine stickleback occurs throughout the Mary River Project freshwater study area affected by the Phase 2 Proposal although it was not detected in coastal drainages near Milne Inlet. It was sampled from both lakes and streams. Ninespine stickleback that utilize small streams in summer as rearing habitat must return to freshwater lakes or deep rivers to survive winter conditions.

3.3 MINE SITE

Inuit Qaujimajatuqangit (IQ) collected as part of the Project indicated that Mine LSA waterbodies contain land locked Arctic char, with sea-run (i.e., anadromous) populations restricted to downstream waterbodies in the Ravn River system. It was generally felt that land-locked char within the Mine Area overwinter in lakes. Mary Lake was stated to support a population; however, no specific IQ was indicated with respect to populations within Camp and Sheardown Lakes.

Arctic char and ninespine stickleback are the only fish species found within the Mine LSA and surrounding area (NSC, 2014; NSC, 2018). Char are the dominant species, accounting for at least 98.6 % of the overall catch from all surveyed Mine Area lakes. The results of surveys in tributaries to the surveyed lakes indicated that this is also typically the dominant riverine species.

Artic char were found to be widely distributed in Mine Area lakes and streams. Overall gillnet catch per unit effort (CPUE) was highest in the north arm of Mary Lake, followed by Sheardown Lake SE, Angajurjualuk Lake, Mary Lake S, Sheardown Lake NW, and Camp Lake. Shoreline electrofishing catches of juveniles varied, but overall CPUE was highest in Sheardown Lake NW, followed by Sheardown Lake SE, Angajurjualuk Lake, Camp Lake, Mary Lake north, and Mary Lake south.

Arctic char were captured in all four surveyed Camp Lake tributaries, the two Sheardown Lake NW tributaries, the two Sheardown Lake SE tributaries, three of the four tributaries to the north basin of Mary Lake (Mary Lake North), and two of the three tributaries to the south basin of Mary Lake (Mary Lake South). Char were captured in six of the eight Mary River reaches sampled and between Mary Lake and the barrier falls on Tom River. None were captured upstream of the barrier falls in Mary River or Tom River.

3.4 NORTHERN TRANSPORTATION CORRIDOR

3.4.1 Milne Inlet Tote Road

The Milne Inlet Tote Road runs approximately 105 km from the Milne Port to the Mine Site. A total of 248 watercourse crossings were identified along the Milne Inlet Tote Road during the surveys completed prior to the initial road upgrades. Major watersheds along the Tote Road include Phillips Creek and the upper Ravn River including the Mary River subcatchment. Most of the streams crossed by the road flow downstream into these larger watercourses.

Streams within the first 15 km from the Milne Inlet terminus typically flow directly into Milne Inlet or into the reach of Phillips Creek downstream of an impassable set of falls. These streams often lack persistent flows, contain an abundance of barriers separating them from potential overwintering habitat, and are largely non fish-bearing.

Streams crossed from km 15 to km 61 (Phillips Creek catchment upstream of the falls) have fewer barriers, are accessible from overwintering lakes, and are typically characterized by smaller substrate sizes with riffle/pool habitat. Fish habitat is more abundant in this zone. Two lakes (at km 27 and km 32) provide suitable overwintering and nearshore juvenile Arctic char habitat. The zone between km 61 and km 75 is part of the upper Ravn River catchment and, like streams in the first 15 km of the Milne Inlet Tote Road, consists largely of intermittent or ephemeral drainages that are not fish-bearing and contain many barriers. The area between km 75 and km 83 is a relatively broad, flat terrain characterized by largely sandy watercourses that flow into or out of Muriel Lake, providing relatively abundant fish habitat.

Watercourses crossed by the remaining 20 km of the Milne Inlet Tote Road are mainly part of the Mary River sub catchment of the Ravn River watershed. This region includes many spring run-off drainages providing no fish habitat, but also several large streams in close proximity to Arctic char overwintering lakes (e.g., Mary Lake, Camp Lake), providing abundant fish habitat. Cobble/sand substrata and riffle/pool habitat dominates with water velocities occasionally exceeding 1.0 m/s. There are few downstream barriers.

3.4.2 North Railway

3.4.2.1 Stream Habitat

Streams within the first approximately 57 km of the proposed rail alignment closely parallel the existing Tote Road, with only a few minor deviations of up to 300 m from the road alignment. As such, stream habitat at the rail crossing and diversion locations closely resembles that described for the Tote Road.

From approximately km 57 to km 82, the rail alignment deviates up to nearly 7 km from the Tote Road. Smaller watercourses along this portion of the alignment flow into two branches of a major river (both branches are also crossed by bridges) that is part of the upper Ravn River watershed. One of these branches drains Muriel Lake and the other drains two large lakes to the northwest of Muriel Lake. The majority of these streams have not been previously assessed during field studies conducted along the Tote Road, or the rail crossings are downstream of known barriers near the road.

Watercourses within the first approximately 11 km of this section (to the west of a major unnamed river; km 57 to km 68) appear to be largely steep with low water levels and some lack defined channels. Many appear to have barriers to fish movement between the proposed crossing and the nearest potential overwintering location. As a result, most of these streams were deemed to be unlikely to be fish-bearing.

Gradients along the remainder of this section of the rail are much lower and connectivity with overwintering waterbodies more common, though surface flows still appear to be lacking at a number of crossings. Nonetheless, a greater number of the watercourses in this section (i.e., km 69 to km 82) are expected to be fish-bearing relative to the reach between km 58 and 68. Juvenile Arctic char remain the most abundant fish in streams along this portion of the rail alignment, but ninespine stickleback are expected to be more common based on observations from previous Tote Road studies. In addition, adult Arctic char may use the major rivers in the area as movement corridors.

The remainder of the proposed rail alignment (km 82 to km 102) largely parallels the Tote Road. Although there is a deviation of approximately 800 m between km 98 and 103, most of the streams on the rail alignment are crossed by the Tote Road farther downstream. The area in the vicinity of Muriel Lake is relatively broad, flat terrain characterized by largely sandy watercourses that flow into or out of the lake, and provide relatively abundant fish habitat.

Watercourses crossed by the most southern 7 km of the rail (km 102 to km 109) are mainly within the Mary River sub-catchment of the Ravn River watershed. This region includes many spring run-off drainages providing no fish habitat, but also several large streams in close proximity to Arctic char overwintering lakes (e.g., Mary Lake and Camp Lake), providing abundant fish habitat. Cobble/sand substrata and riffle/pool habitat dominates with water velocities occasionally exceeding 1 m/s. Juvenile Arctic char and increasing numbers of ninespine stickleback are likely to be present in watercourses along this portion of the alignment.

3.4.2.2 Lake Habitat

Sufficiently deep lakes provide overwintering and spawning habitat for Arctic char in drainages crossed by the rail alignment. Shallow lakes and ponds may provide summer feeding and rearing habitat for Arctic char and deeper ponds may provide overwintering habitat for ninespine stickleback. Many ponds

in the study area do not support either fish species due to insufficient depth and/or lack of connectivity with overwintering and spawning areas.

There are a number of deep lakes of varying size along Phillips Creek and the North Railway alignment. The largest of these lakes is Katiktok Lake located near the headwaters of Phillips Creek. These lakes provide abundant habitat for all life stages of Arctic char including spawning, feeding, and overwintering for adults. Muriel and David lakes are the largest lakes in the Upper Ravn catchment along the rail and Tote Road alignments. Both lakes also likely have resident Arctic char populations, providing habitat for all life stages. The Mary River sub-catchment includes two lakes (Camp and Sheardown Lakes) along the North Railway alignment. Both have been extensively studied as part of past baseline and ongoing monitoring programs for the Mary River Project. Both lakes have resident Arctic char populations and provide habitat for all life stages. There are also several ponds adjacent to the proposed rail alignment that drain into Camp Lake and are known to be fish-bearing. These ponds provide summer rearing habitat for ninespine stickleback and juvenile Arctic char.

3.5 MILNE PORT

The Milne Port study area includes a major coastal watershed (Phillips Creek), several small, coastal streams that drain directly into Milne Inlet, small, shallow headwater ponds near the coast, and deeper headwater lakes in the highlands to the southeast. In 2009-2010 a total of 18 lake and 33 stream sites within the Milne Port Area were surveyed for fish habitat and fish presence/absence (NSC, 2012). Only Arctic char were captured during fish surveys conducted in the Milne Port Area. Of the five headwater lakes surveyed Arctic char were captured only in only one lake. Small numbers were captured in the coastal reaches of small streams draining to Milne Inlet. Adults have been captured in Milne Inlet and known anadromous populations have been identified in the nearby Robertson River and Tugaat River (Moshenko, 1981; Read, 2004). These two rivers are the probable sources of anadromous Arctic char that use the lower reaches of Milne Port Area streams for summer foraging.

4 – FRESHWATER FISHERIES ASSESSMENT

4.1 FISHERIES MANAGEMENT OBJECTIVES

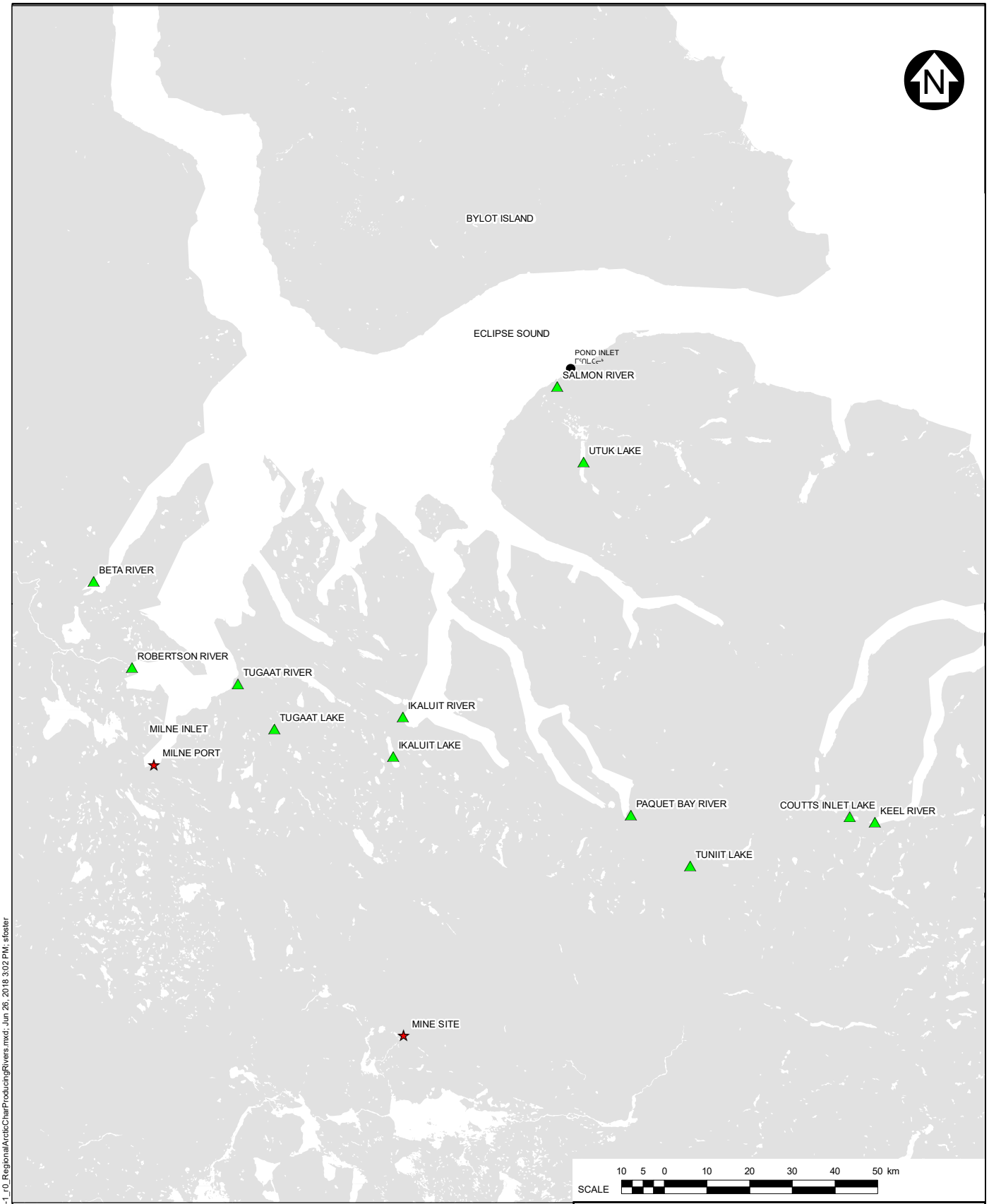
Arctic char in Nunavut is harvested by the Inuit both for subsistence and commercial purposes. These fisheries are concentrated near communities and are predominately conducted using gillnets and by angling. The Arctic char fisheries in the Nunavut Settlement Area (NSA) are co-managed by the DFO, Nunavut Wildlife Management Board (NWMB), Regional Wildlife Organizations, and Hunter and Trapper Organizations (HTOs), in accordance with the Nunavut Land Claims Agreement (NCLA), the *Fisheries Act* and its Regulations, and in some communities by local HTO bylaws (Kristofferson and Berkes, 2005). Commercial harvest of Arctic char has been ongoing in several communities since the 1950s, and has led to the development of Integrated Fisheries Management Plans (IFMPs) and management objectives for specific fisheries. The Cambridge Bay IFMP (DFO, 2015) includes the following long term fisheries management objectives:

- Conserve Arctic char stocks through sustainable use and effective fishery management
- Conserve bycatch species through effective fishery management
- Promote collaboration, participatory decision making, and shared responsibility with resource users, co-management organizations and other stakeholders
- Promote an economically viable and self-sufficient fishery based on high quality that maximizes social and economic benefits, while ensuring stocks remain healthy and abundant for future generations
- Promote compliance with legislation, regulations and management measures to achieve conservation and sustainable use

Short-term management objectives for the Cambridge Bay fishery are focussed on improving scientific knowledge, monitoring, conservation, communications, education, and compliance with fishing regulations (DFO, 2015). There are no specific fisheries management objectives for the Mary River Project area, although those developed for Cambridge Bay would potentially apply to all fisheries in Nunavut. In addition, the wildlife management objectives in the Nunavut Agreement centered around harvesting rights and wildlife management apply to the NSA.

4.2 ABORIGINAL

Subsistence fisheries for Arctic char are conducted in the marine environment and on several large river systems in the region by Pond Inlet community members. Harvest levels are co-managed by the NWMB and Mittimatalik HTO with technical advice from DFO. Some of the anadromous Arctic char producing rivers in the region include the Ikaluit River, Robertson River, Tugaat River, Beta River, Paquet Bay River, Salmon River, and Keel River. DFO has conducted multi-year surveys on several of these river systems to determine abundance and sustainable harvest rates (Read and Roberge, 1991; Read, 2000; Read, 2003; Read, 2004). The locations of these Arctic char producing rivers are shown on Figure 4.1.



LEGEND

- COMMUNITY
- REGIONAL ANADROMOUS ARCTIC CHAR PRODUCING RIVERS AND LAKES
- WATER
- LAND

NOTES:

1. BASE MAP: © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA DEPARTMENT OF NATURAL RESOURCES (2009). ALL RIGHTS RESERVED..

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	26JUN'18	ISSUED WITH REPORT	WOG	RF	WOG

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

REGIONAL ANADROMOUS ARCTIC CHAR PRODUCING RIVERS AND LAKES

Knight Piésold CONSULTING

P/A NO. NB102-181/42

REF NO. 1

FIGURE 4.1

REV 0

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4.3 COMMERCIAL

Commercial harvest of char has been ongoing in several Nunavut communities since the 1960s. Territory-wide combined commercial harvests between 2001 and 2008 ranged between 74,124 kg and 95,558 kg (round mass) out of a total quota that varied between 281,500 kg and 409,800 kg during these same years (Roux et al. 2011). Quotas are usually assigned to each river separately (the 'river-by-river' approach) and are often set in the absence of abundance estimates (Moore et al. 2014). To minimize the chances of over-exploitation, a system of exploratory licences is set in place where a conservative quota is assigned to a river, which is then fished for five consecutive years when biological information on the harvested catch is gathered (e.g., fork length, round mass, otolith age, sex, maturity, etc.). These data are then used to assess the sustainability of the current harvest level. Some mark recapture or weir enumeration estimates of abundance have been attempted in certain locations. Conservation measures for commercial fisheries include minimum gillnet mesh size and total harvest levels.

Commercial test fisheries have been conducted and/or proposed in the Pond Inlet Region to examine potential for future commercial char fishing areas (McGowan, 1985; Read, 2004; DFO, 2013d).

4.4 RECREATIONAL

Recreational fishing for Arctic char and other fish species is conducted throughout Nunavut subject to fishing area restrictions, general regulations, catch limits, and possession limits. A Sport Fishing Licence is required by anyone intending to sport fish in Nunavut outside of National Parks other than a beneficiary of the Nunavut Agreement. Licences are available from the DFO, most sport fishing lodges, sporting goods, hardware and convenience stores, as well as certain offices of the Royal Canadian Mounted Police (Nunavut Tourism, no date).

Moshenko (1981) reports that Arctic char from the Robertson River have been exploited by sport fishing since the 1960s. The Robertson River flows into Koluktoo Bay about 30 km by boat from Milne Port. In 1972, the Toonoonik Sahoonik Co-op of Pond Inlet opened a sport fishing camp at Koluktoo Bay. The camp generally operated from mid-August to early September and accommodated 16 persons in tents. The harvest during the 1979 fishing season was estimated to be 762 adult Arctic char. Most anglers came to Koluktoo Camp via Resolute or Nanisivik. The current and past status of this fishery since 1980 is unknown. No other targeted recreational fisheries were identified in the Pond Inlet region.

5 – SERIOUS HARM ASSESSMENT

5.1 INTRODUCTION

The current operating Project affects freshwater biota and habitat across three LSAs (Milne Port, Northern Transportation Corridor, and the Mine Site); previously assessed Project effects on freshwater biota and habitat are described in detail in the FEIS (Baffinland, 2012) and FEIS Addendum (Baffinland, 2013). The effects of the Phase 2 Proposal on fish and fish habitat are presented in NSC (2018). The primary project interactions and potential incremental effects to fish and fish habitat are listed in Table 5.1.

Table 5.1 Potential Incremental Effects to Fish and Fish Habitat

Project Interaction	Milne Port	Northern Transportation Corridor	Mine Site
Minor Realignments to the Milne Inlet Tote Road	No change	Minor realignment of short road sections and relocation of existing stream crossings	No change
Construction of North Railway	No change	Construction of watercourse crossings, pond/lake encroachments/infilling, and diversions along the North Railway	No change
Water Withdrawals	No change	Additional water sources for construction and operation of the Northern Transportation Corridor	No change
Dust Deposition	Increase in dust deposition due to increased stockpiling and shiploading of ore	Minor change	Decrease in dust deposition due to relocation of secondary crushing to Milne Port
Changes in Water and Sediment Quality	Minor change	Development of quarries, drilling, blasting, and excavation of rock cuts	Minor change

5.2 MINE SITE

The Phase 2 Proposal will not result in residual impacts to freshwater fish and fish habitat at the Mine Site. Changes to ore crushing and screening operations will reduce dust deposition relative to the FEIS Addendum. The water quality assessment concluded that effects of ore dust on water and sediment quality at the Mine Site would be of similar or lower magnitude than previously assessed in the FEIS and FEIS addendum and will not be significant. The effects of sediment deposition on lake substrates are expected to be similar to or less than predicted in the FEIS and FEIS Addendum. Potential construction effects on sediment and water quality will be mitigated by implementing of BMPs including DFO “Measures to Avoid Causing Serious Harm to Fish and Fish Habitat” (DFO, 2016). Monitoring is proposed to confirm the water and sediment quality assessment predictions. There will no loss of freshwater fish habitat or serious harm to fish at the Mine Site from the Phase 2 Proposal.

5.3 NORTHERN TRANSPORTATION CORRIDOR

The North Railway will cross, divert, or encroach/infill at a total of 465 sites in waterbodies along the corridor. All sites were assessed for the potential to support Arctic char using remote imagery and through field studies. A total of 298 of these sites were identified as not supporting Arctic char. A total of 167 sites were identified as occurring in known, probable, potential, or unlikely Arctic char habitat (hereafter referred to as “char habitat”). Streams that support Arctic char that will be crossed by the North Railway are perennial or intermittent streams with predominantly gravel and cobble/boulder substrates (NSC, 2018).

Construction of rail infrastructure in or near watercourses or waterbodies is expected to have a negligible effect on Arctic char with implementation of appropriate mitigation measures. Environmental protection measures that would be implemented as applicable include those identified by DFO in “Measures to Avoid Causing Serious Harm to Fish and Fish Habitat” (DFO, 2016), and would be developed in detail during planning for construction of the stream crossings.

5.3.1 Bridges

Four bridges will be installed along the North Railway alignment at CV-15-5, CV-70-3, CV-85-3, and CV-102-1. For each of the bridges, abutments will encroach on stream channels and will require placement of support piers and rip-rap within river channels. The total area potentially lost due to instream placement of bridge piers and abutments is approximately 50 m^2. An additional 2,400 m^2 will be altered by placement of rip-rap armouring around abutments and piers. The total area of fish habitat that will be lost or altered by installation of the four bridges will be approximately 2,450 m^2.

The direct habitat loss to fish-bearing streams at bridge installations is not expected to result in a loss of productive capacity or negative impact to CRA fisheries. There are no direct impacts to spawning or overwintering habitat related to direct habitat loss at bridge crossings, although indirect effects are possible to resident Arctic char that migrate between summer and fall/winter habitats. Bridges are unlikely to impede fish passage as they will be appropriately sized to pass large flood flows. Offsetting is recommended as a conservative measure to address direct habitat loss at bridge sites designated as important char habitat.

5.3.2 Culverts

Of the 402 culvert stream crossings along the North Railway, 142 will be placed in Arctic char stream habitat. The culvert crossings affect perennial or intermittent streams with predominantly gravel and cobble/boulder substrates and provide summer juvenile rearing habitat only. No spawning or overwintering habitat exists in any streams in the study area; spawning habitat is limited to lakes with sufficient depth to avoid completely freezing in winter. None of the waterbodies affected by the North Railway infrastructure support permanent populations of anadromous char, due to the lack of connectivity between marine habitat (e.g., Milne Inlet) and all freshwater spawning habitat (i.e., lakes with sufficient depths) in the study area.

All culvert installations were designed on the basis of a 200-year return period flow, and a 10-year, three-day delay flow was incorporated into culvert designs for all fish-bearing streams. The culverts are therefore large relative to normal capacity requirements (Hatch, 2017). To the extent possible, the natural channel width will be maintained within crossing structures.

Maintaining channel width and providing substrate within culverts will likely result in some colonization by lower trophic level biota and habitat use by fish, but for the purposes of this assessment, it is assumed that all culvert placements in fish-bearing streams will represent a habitat loss equivalent to the area of natural stream bed occupied. The total culvert footprint area, including rip-rap aprons, in streams that support Arctic char is estimated as 30,990 m^2.

The direct habitat loss to fish-bearing streams at culvert installations is not expected to result in a loss of productive capacity or negative impacts to CRA fisheries. There are no direct impacts to spawning or overwintering habitat related to direct habitat loss at culvert crossings. The direct habitat loss at culvert installations on the North Railway is localized in extent and low in magnitude relative to the total available habitat. Juvenile Arctic char stream rearing habitat is not expected to be limiting to fish populations in the region, and therefore the incremental changes in available rearing habitat are unlikely to affect fish numbers at the population level. However, it is likely that a subset of fish-bearing streams with high connectivity to important lake (and river) spawning and overwintering habitats have increased importance towards the maintenance of resident char populations The cumulative area impact to fish-bearing streams on the North Railway warrants construction and post-construction monitoring to confirm uncertainty and impact predictions.

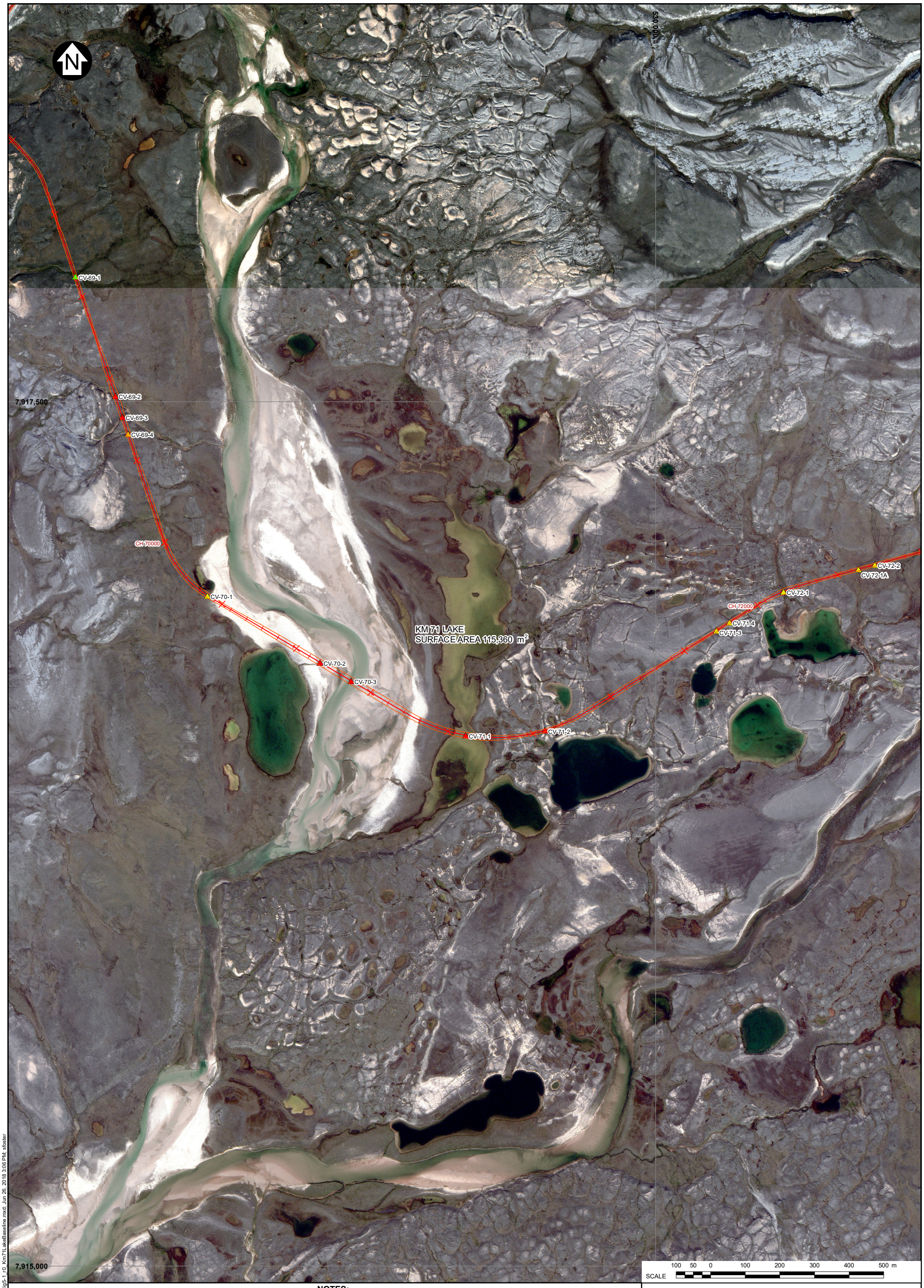
Culverts can impede fish passage due to excessive culvert length or flow velocity, or to a combination of length and flow velocity. Fish-bearing culverts will be assessed on a case-by-case basis to install appropriate fish passing promoting measures during the final detailed engineering design phase of the Project. To mitigate for potential fish passage issues at the culvert crossings, numerous design features that promote fish passage may be considered and will be incorporated wherever feasible. With implementation of design and mitigation measures, effects of culvert installations on fish passage are assumed to be negligible.

5.3.3 Lake Encroachments

A total of 12 potential encroachment or infill sites in Arctic char pond/lake habitat along the North Railway were identified through the desktop assessment. The affected lake habitat is predominantly used for rearing and foraging by Arctic char. Most of the affected ponds are known or suspected to be relatively shallow with substrates comprised primarily of fines and habitat quality is expected to be marginal.

Only one lake at rail km 71 (crossed at CV-71-1) is expected to provide important char rearing and foraging habitat although the affected area is shallow. The km 71 lake is a narrow and shallow 12 ha waterbody that flows to the adjacent river as shown on Figure 5.1. The railway will result in the displacement of approximately 1,250 m^2 of shallow lake habitat. All other ponds/lakes that are known to or could potentially support Arctic char that will be affected by the railway provide marginal habitat (NSC, 2018).

The direct habitat loss at pond/lake infill sites could potentially result in a loss of productive capacity where important char habitat is directly affected. Due to the localized extent of lake infills there is no anticipated negative impacts to CRA fisheries. The availability of pond/lake rearing habitat on the North Railway is considerably less than stream rearing habitat, and could potentially support spawning and overwintering by Arctic char and ninespine stickleback. Offsetting is recommended as a conservative measure to address direct habitat loss at pond/lake infill sites designated as important char habitat.



LEGEND:

- RAILWAY CHAINAGE (m)
- MILNE INLET TOTE ROAD
- PROPOSED NORTH RAILWAY
- RAIL FOOTPRINT

RAIL CROSSING FISH HABITAT ASSESSMENT

- NO
- UNLIKELY
- POTENTIAL
- YES, PROBABLE

NOTES:

1. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N.
2. DETAILED WATER AND ORTHO IMAGERY BASED ON EAGLE MAPPING (2005).

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MARY RIVER PROJECT

Km 71 LAKE BASELINE CONDITIONS AND NORTH RAILWAY FOOTPRINT

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P/A NO. NB102-181/42

REF NO. 1

FIGURE 5.1

REV 0

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5.3.4 Diversions

Cuts will be made at a total of 31 streams or low points along the North Railway alignment and flow from each cut will be diverted to adjacent watercourses or waterbodies along the alignment. Diversions will directly affect Arctic char habitat in twelve streams that are known or designated as potentially supporting Arctic char upstream and/or downstream of the cuts. Three of the cuts will result in alteration to downstream char stream habitat due to flow reductions. The area of altered stream habitat due to flow reductions associated with diversions at CV-58-7, CV-60 4a, and CV-61-3 is approximately 6,000 m^2 (NSC, 2018).

The direct habitat loss to fish-bearing streams associated with stream diversions on the North Railway is not expected to result in a loss of productive capacity or negative impacts to commercial, recreational, or aboriginal fisheries. Juvenile Arctic char stream rearing habitat is not expected to be limiting to fish populations in the region, and therefore the incremental changes in available rearing habitat are unlikely to affect fish numbers at the population level. Flow reductions associated with the diversions at CV-58-7, CV-60-4a, and CV-61-3 warrants post construction monitoring to confirm uncertainty and impact predictions related to downstream flow reductions.

5.4 MILNE PORT

The Phase 2 Proposal will not result in residual impacts to freshwater fish and fish habitat at Milne Port. The proposed works and construction activities are located within the Milne Port PDA, and the directly affected streams and ponds do not support fish. Potential construction effects on sediment and water quality will be mitigated by implementing of Best Management Practices (BMPs) including DFO “Measures to Avoid Causing Serious Harm to Fish and Fish Habitat” (DFO, 2016). There will no loss of freshwater fish habitat at Milne Port from the Phase 2 Proposal.

5.5 CONCLUSIONS

With implementation of design measures to provide for fish passage at the stream culvert installations where Arctic char are known or suspected to be present, the rail infrastructure would result in the loss/alteration/displacement of approximately 66,600 m^2 (6.86 ha) of Arctic char habitat (NSC, 2018). The direct habitat loss to fish-bearing streams at culvert installations and diversions is not expected to result in a loss of productive capacity or negative impacts to CRA fisheries. No offsetting measures are recommended for culvert installations and diversions.

The direct habitat loss to fish-bearing streams at bridge installations is not expected to result in a loss of productive capacity or negative impact to CRA fisheries. The magnitude of fish habitat losses at bridge sites totals 2,450 m^2 as shown in Table 5.2. Offsetting is recommended as a conservative measure to address direct habitat loss at bridge sites designated as important char habitat.

The direct habitat loss at lake infill sites could potentially result in a loss of productive capacity and serious harm to fish where important char habitat is directly affected. The magnitude of fish habitat losses at lake infill sites totals 1,250 m^2 as shown in Table 5.2. Offsetting is recommended as a conservative measure to address direct habitat loss at pond/lake infill sites designated as important char habitat.

Table 5.2 Serious Harm to Freshwater Fish Habitat

Site	Habitat Type	Habitat Classification	Habitat Loss (m^2)	Serious Harm
Bridges (CV-15-5, CV-70-3, CV-85-3, and CV-102-1)	River	Important	2,450	Yes
Km 71 Lake (CV-71-1)	Lake	Important	1,250	Yes
Totals			**3,700**	**Yes**

The cumulative area impact to fish-bearing streams on the North Railway warrants future monitoring to confirm uncertainty and impact predictions.

6 – CONCEPTUAL OFFSETTING PLAN

6.1 APPROACH

Avoidance of activities that have the potential to incur serious harm to fish has been integral to the design and engineering of the Project, and has been accomplished in two ways. First, the number, duration, and spatial extent of alterations of fish habitat have been reduced, to the extent possible, by relocating and/or re-engineering mine components or activities that could potentially result in serious harm to fish. Second, measures have been developed to mitigate the spatial extent, duration, and magnitude of any unavoidable effects to fish habitat that may be considered serious harm to fish.

For any residual impacts to fish habitat resulting from the proposed Project, the approach to identify appropriate fish habitat offsets has been guided by the following:

- DFO's Fisheries Productivity Investment Policy guidance
- Provincial fisheries management objectives
- Technical feasibility
- Stability and permanence
- Biological relevance
- Cost-effectiveness of options to meet offsetting guiding principles

The technical feasibility of the proposed offsetting options was assessed in consideration of the unique site conditions present, including climate, topography, geomorphology, hydrology, site accessibility, and the type of physical works proposed. To satisfy DFO's Fisheries Protection Policy guidance, the technical feasibility, biological relevance, and effectiveness of the offsetting works will be determined during long-term monitoring.

The assumption in most cases is that a 2:1 gain-to-loss ratio is necessary to satisfy DFO's Fisheries Productivity Investment Policy guidance. Fish habitat offsetting ratios greater than those applied may be required if the offsetting plan includes options that utilize techniques with long lag-times before they become fully functional. Baffinland intends to construct the agreed-upon offsetting works as quickly as possible to reduce lag-time effects. Equivalency of the proposed offsets is also considered relative to the productivity, importance, and quality of net fish habitat losses identified in the serious harm assessment.

6.2 OFFSETTING OPTIONS CONSIDERED

An initial list of potential offsetting options was developed for the Mary River Project as summarized in Table 6.1.

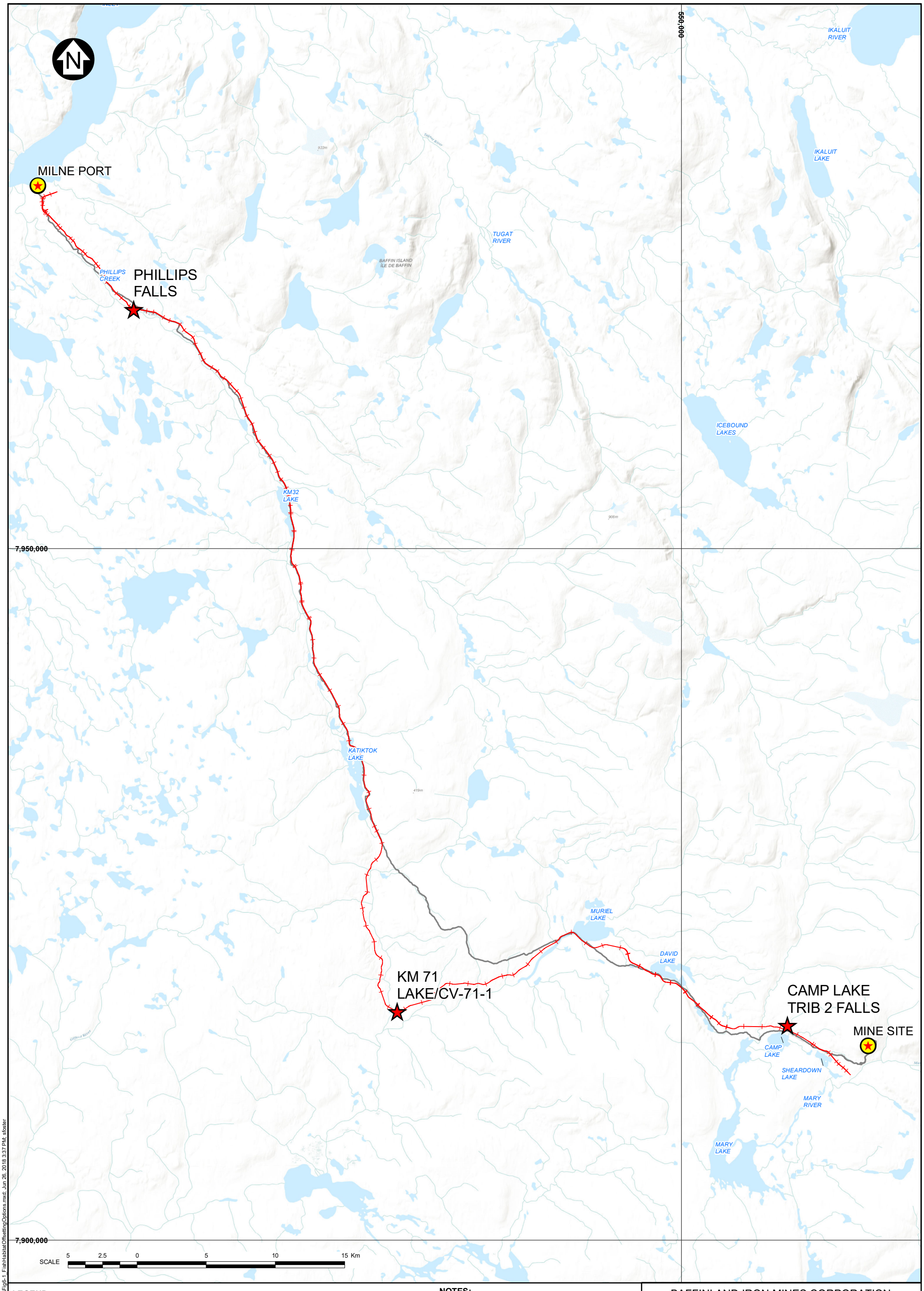
Table 6.1 List of Potential Offsetting Options

No.	Offsetting Options	Description
1	Stream habitat enhancement	Physical works to enhance Arctic char stream foraging or rearing habitat
2	Lake habitat enhancement	Physical works to enhance Arctic char lake spawning, foraging, or rearing habitat
3	Increasing lake levels	Constructing dams to increase existing lake levels and areas
4	Lake fertilization	Addition of chemical fertilizers to increase lake productivity
5	Fish introductions	Introducing Arctic char to barren lake systems
6	Fish ladder	Construction of a fish ladder to allow upstream fish migration
7	Fish barrier removal	Physical removal of fish barrier to allow upstream fish migration
8	Biological research	Resources to support Arctic char biological research
9	Fisheries management	Resources to support Arctic char fisheries management
10	Fish habitat restoration	Physical works to repair damaged fish habitat
11	Watershed diversions	Manipulation of watershed areas to improve fish habitat connectivity

Potential options were evaluated by consideration of multiple criteria including:

- Previous FEIS content and community input
- Adherence to DFO's principles for offsetting
- Appropriate site-specific locations within the project area
- Self-sustaining
- Technically feasible and economically viable
- Provide similar "in-kind" habitat as an offset

Several offsetting options were short-listed for further assessment following application of the above criteria. The options are described in the following sections, and those with site-specific locations are shown on Figure 6.1.



LEGEND:

- PROJECT FACILITY LOCATION
- FISH HABITAT OFFSETTING OPTIONS
- NORTH RAILWAY
- MILNE INLET TOTE ROAD

NOTES:

1. BASE MAP: ESRI ONLINE MAPPING.
2. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:250,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.

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BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

LOCATIONS OF FISH HABITAT OFFSETTING OPTIONS

Knight Piésold CONSULTING

P/A NO.	REF NO.
NB102-181/42	1

FIGURE 6.1 REV 0

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6.3 KM 71 LAKE HABITAT ENHANCEMENTS

The proposed North Railway crosses an unnamed lake at rail km 71. The km 71 lake is a narrow and shallow waterbody that flows to Tom River as shown on Figure 5.1. The proposed offsetting measures include:

- Placement of cobbles and boulders to improve rearing and foraging habitat quality
- Excavation/reconstruction of the lake outlet to improve habitat connectivity with Tom River
- Excavation of lake bed material to increase water depth
- Excavation/reconstruction of the lake inlet streams to improve habitat connectivity with two pothole lakes located immediately east

The proposed offsetting measures will be sized to create at minimum of 7,400 m^2 of fish habitat. Combined these measures will achieve a 2:1 compensation ratio and offset fish habitat losses from construction of four rail bridges and encroachment of the North Railway on the km 71 lake. Further study is required to assess habitat benefits of the proposed km 71 lake enhancements.

6.4 INCREASING LAKE LEVELS

Increasing lake levels and surface areas by constructing embankments at lake outlets was evaluated as a potential offsetting option for several lakes in the region. Camp lake, David Lake, Katiktok Lake, and km 32 Lake were considered due to the low profile of their lake basins and proximity to the Tote Road. Embankment heights would be limited to several metres to allow for upstream fish passage in the constructed outlet channel. Further study is required to assess habitat benefits of increasing lake levels. Agnico (2018) proposes to raise Whale Tail Lake levels by 1 m to create fish habitat as part of the offsetting strategy for the Meadowbank Gold Project.

6.5 FISH LADDER

Phillips Creek is a large river that drains western Baffin Island and discharges into Milne Inlet. A waterfall, approximately 10 m high, located 13 km upstream from Milne Inlet currently prevents upstream fish migration. Phillips Creek is not considered an important watershed for anadromous Arctic char production due to the presence of these falls and absence of accessible overwintering lakes, although deep sections of the lower river may support overwintering and spawning activity. Anadromous Arctic char occur in some Arctic river systems in the absence of overwintering lakes. For example, the Hornaday River located in the Northwest Territories near Paulatuk provides migratory, spawning, and overwintering habitat for adult Arctic char, and is presumably a nursery/ rearing area for juveniles (Gallagher et al. 2017). The Phillips Creek watershed includes several lakes upstream of the falls. One offsetting option under consideration to compensate for lost fish habitat due to mine development is to provide upstream migration past these falls.

The contributing watershed area at the falls is 1,100 km^2 and mean annual discharge is estimated to be 8 m3/s based on unit discharge estimates for the region (Baffinland, 2012). Mean monthly flows in August and September, when the majority of upstream anadromous Arctic char migration occurs in the region, are estimated to be 16 m^3/s and 7 m^3/s, respectively.

Fish migration would be provided by constructing a concrete fish ladder, as shown on Figure 6.2. The upstream inlet would be designed to provide a fishway flow of approximately 1-2 m^3/s during August and September. The spacing of weirs and slots within the fishway would be designed to meet target depth and velocity conditions for Arctic char passage, and the location and alignment of the outlet would be selected to attach fish into the fishway and encourage use.

Site conditions at this location are not ideal for the construction of a fishway, due primarily to the large excavations required to meet target fishway grades and proximity to km 11 of the proposed North Railway. However, this concept to be transferred to another site if better conditions are identified. As an alternative to the fishway it may also be possible to physically remove the rock constriction by drill and blast excavation, and allow Phillips Creek to regrade the channel bed at high flows. Removal of the fish barrier would provide anadromous Arctic char with potential access to several mainstem lakes on upper Phillips Creek that are deep enough to provide spawning and overwintering habitat. Further study is required to assess the feasibility and benefits of the fish ladder concept at this location. Baffinland will support investments in a fishway on Phillips Creek or at another regional location to address offsetting requirements with support from community stakeholders and DFO.

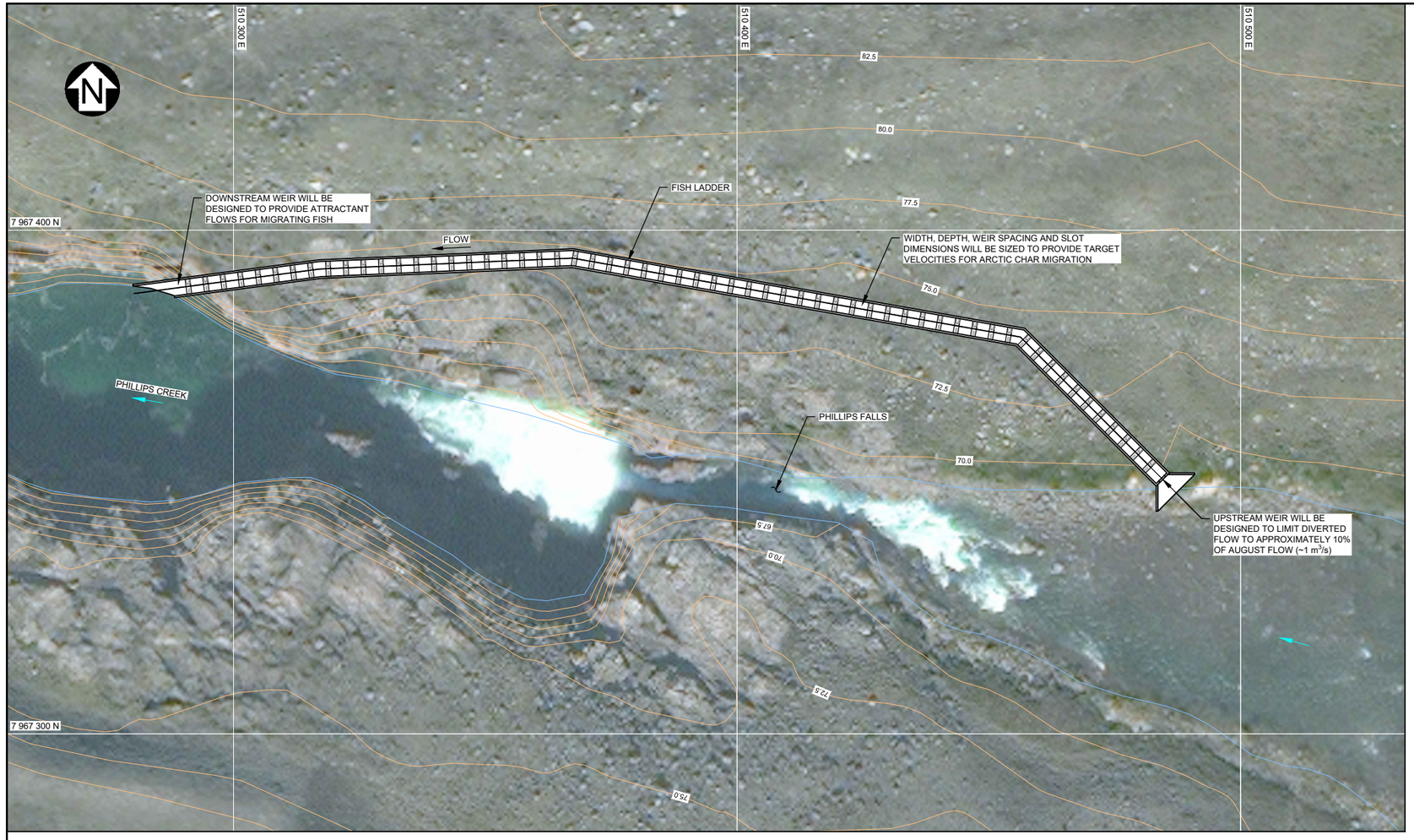
6.6 FISH BARRIER REMOVAL

Camp Lake is located immediately west of the Mary River Project mine site and supports a resident population of Arctic char. Juvenile char from this population utilize accessible portions of inlet tributaries to Camp Lake during the summer months for rearing. Tributary CLT-2 is the largest tributary of Camp Lake with a catchment area of 8.3 km^2 at hydrology station H04 (Baffinland, 2012). Falls on Tributary CLT-2 located 600 m upstream from Camp Lake prevent juvenile Arctic char from accessing the upper watershed. The location of the CLT-2 falls is shown on Figure 6.3. Baseline fish studies have confirmed these falls are the upper limit of fish distribution in the CLT-2 watershed. One offsetting option under consideration to compensate for lost fish habitat due to mine development is to provide upstream migration past these falls.

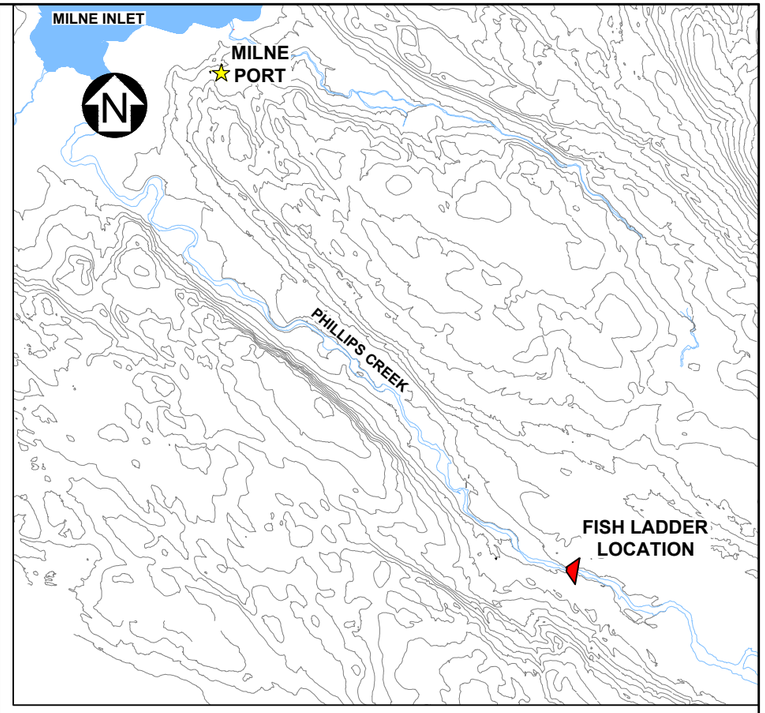
Fish migration would be provided by constructing machine access to the falls and physically removing the rock constriction by drill and blast excavation. Removal of the fish barrier would provide resident Arctic char with potential access to over 4 km of mainstem tributary habitat above the falls. Further study is required to assess the feasibility and benefits of fish barrier removal at this location. Baffinland will support investments in fish barrier removals to address offsetting requirements with support from community stakeholders and DFO.

6.7 FISH INTRODUCTIONS

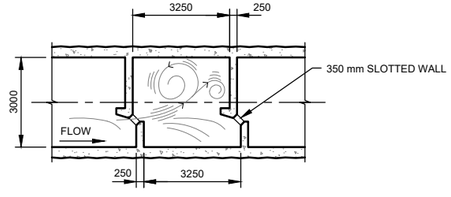
Resident Arctic char are present in lakes throughout the region with the exception of some high elevation lakes that are non fish-bearing and inaccessible to fish due to downstream barriers. Regional lakes where Arctic char presence is known through IQ or baseline studies and candidate lakes for fish introductions are shown on Figure 6.4. Fish presence is unknown in these lakes but since they occur at higher elevations near the headwaters of drainages there is a reasonable chance that some or all of them are non fish-bearing.



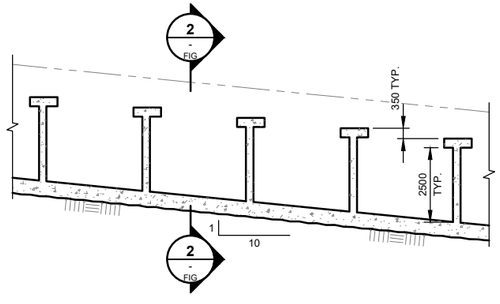
PLAN
SCALE A



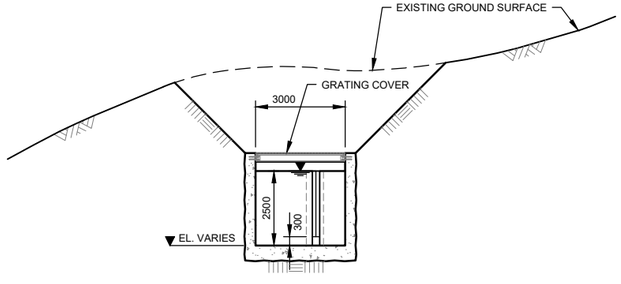
KEY PLAN
SCALE C



TYPICAL PLAN
FISH LADDER CHANNEL
SCALE B



TYPICAL LONGITUDINAL SECTION
FISH LADDER CHANNEL
SCALE B



2 FIG — **TYPICAL SECTION**
SCALE B

NOTES:

1. COORDINATE GRID IS UTM NAD83, ZONE 17.
2. CONTOUR INTERVAL IS 2.5 METRES.
3. ALL DIMENSION ARE IN MILLIMETRES AND ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.
4. FISH LADDER GEOMETRY TO BE DETERMINED TO PROVIDE TARGET DEPTHS AND VELOCITIES FOR ARCTIC CHAR.

SCALE C: 1 0.5 0 1 2 3 4 5 km
SCALE B: 2 1 0 2 4 6 8 10 m
SCALE A: 10 5 0 10 20 30 40 50 m

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MARY RIVER PROJECT

PHILLIPS CREEK FALLS CONCEPTUAL OFFSETTING OPTION

Knight Piésold CONSULTING

P/A NO. NB102-181/42 | REF NO. 1

FIGURE 6.2 | REV 0

LEGEND:

- CREEK
- NORTH RAILWAY
- CONTOUR 1 m
- RAIL FOOTPRINT

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NOTES:

1. BASE MAP: DETAILED WATER AND ORTHO IMAGERY BASED ON EAGLE MAPPING (2005).
2. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:3,500 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
4. CONTOUR INTERVAL IS 1 METRE.

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MARY RIVER PROJECT

CAMP LAKE TRIBUTARY 2 FALLS CONCEPTUAL OFFSETTING OPTION

Knight Piésold CONSULTING

P/A NO.	REF NO.
NB102-181/42	1

FIGURE 6.3 REV 0

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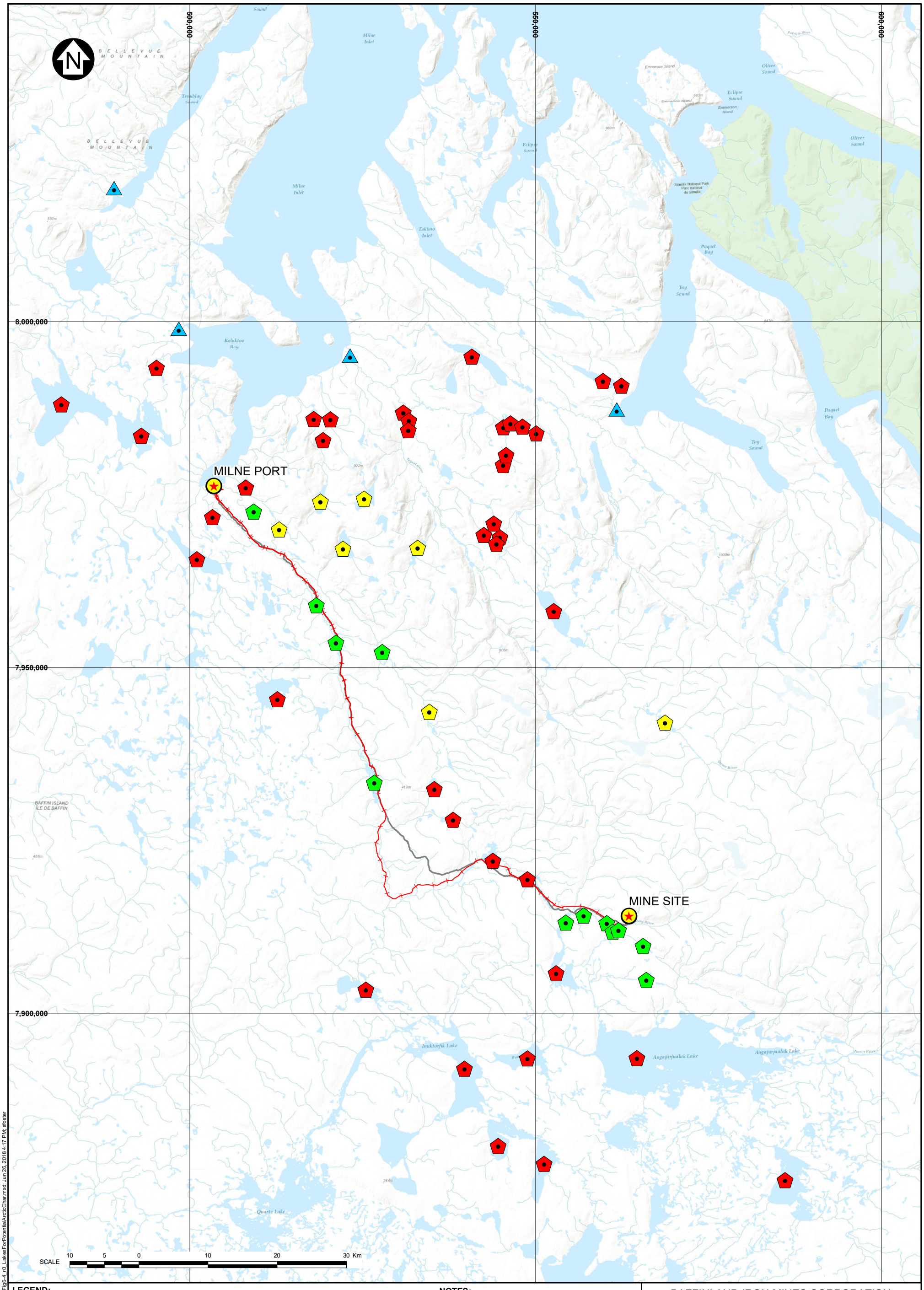

LEGEND:

- PROJECT FACILITY LOCATION
- PROPOSED RAIL ALIGNMENT
- MILNE INLET TOTE ROAD
- FISH BEARING LAKES - IQ
- FISH BEARING LAKES - BASELINE
- CANDIDATE OFFSETTING LAKES
- ANADROMOUS CHAR RIVERS

NOTES:

1. BASE MAP: ESRI ONLINE MAPPING.
2. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:500,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.

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BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

CANDIDATE LAKES IDENTIFIED FOR POTENTIAL INTRODUCTIONS OF ARCTIC CHAR

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P/A NO. NB102-181/42

REF NO. 1

FIGURE 6.4

REV 0

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The proposed offsetting option is to introduce Arctic char to one or more non fish-bearing lakes in the region to establish self-sustaining lake populations. Arctic char would be captured from several local waterbodies and transported by helicopter to non fish-bearing lakes for release. Further study is required to identify non fish-bearing lakes with favourable characteristics to support a resident Arctic char population, and determine how many fish should be introduced, timing, and source populations. Provided the candidate lakes are deeper than 10 m, have suitable lake bed materials and slopes to support spawning, and have accessible inlet tributaries, then there is a good chance that fish introductions to barren lakes would be successful. The offsetting benefit would be to establish new populations of resident Arctic char in existing regional lakes. Baffinland will support investments in fish introductions to non fish-bearing lakes to address offsetting requirements with support from community stakeholders and DFO.

6.8 COMPLEMENTARY MEASURES

DFO (2013b) defines complementary measures as investments in data collection and scientific research related to maintaining or enhancing the productivity of commercial, recreational or Aboriginal fisheries. In areas where there are limited opportunities for measures to offset fisheries productivity losses and where there is limited understanding or data on fisheries populations, complementary measures may be considered in addition to other offsetting measures.

Complementary measures could potentially include investments in research related to the regional biology of Arctic char to address information gaps, or studies directed at anadromous populations that support a subsistence, recreational, or potential commercial fishery. Complementary measures could also include resources to support monitoring of fisheries or conducting test fisheries. Candidate river systems in the region for fisheries related complementary measures include the Robertson River, Alpha River, Tugaat River, and Ikaluit River. These rivers are shown on Figure 4.1 in relation to the Project.

DFO (2013b) states that complementary measures may comprise up to 10% of the required amount of offsetting. Agnico (2018) reports that DFO has indicated that it would be acceptable for 60% of offsetting to consist of complementary measures for the Meadowbank Gold Project Whale Tail Pit, given the need for knowledge regarding how fish populations and communities in the north respond to habitat changes. Baffinland will support investments in complementary measures to address offsetting requirements with support from community stakeholders and DFO.

6.9 FISH HABITAT BALANCE

The net balance of fish habitat losses and offsets is presented in Table 6.2 assuming proposed offsetting measures from km 71 lake only. As proposed, the km 71 offsetting measures result in an offsetting ratio that equals 2:1.

Table 6.2 Fish Habitat Balance

Site	Habitat Loss (m^2)	Required Offsetting at 2:1 Ratio	Proposed Offsetting (m^2)	Offsetting Ratio
Serious Harm (rail bridges)	2,450	4,900		
Serious Harm (Km 71 Lake)	1,250	2,500		
Offsetting (Km 71 Lake)			7,400	
Totals	**3,700**	**7,400**	**7,400**	**2**

7 – OFFSETTING PLAN IMPLEMENTATION AND MONITORING

7.1 TIMELINE AND CONSTRUCTION PHASES

Baffinland will construct the offsetting plan works as soon as possible following issuance of the DFO Authorization and completion of feasibility studies. In most cases construction will occur during the ice-free open water season from July to October, although activities such as drilling and blasting could occur during the winter months to avoid direct impacts to fish.

7.2 CONSTRUCTION MITIGATION

Baffinland will develop a construction mitigation plan to address the effects of constructing the offsetting works. These measures will be similar to those developed for other aspects of the project when working in and around water.

7.3 PERMITTING

7.3.1 Application for Fisheries Act Authorization

The Mary River Project is undergoing a reconsideration of its Project Certificate No. 005 pursuant to the *Nunavut Planning and Project Assessment Act* (NUPPAA). For Project planning purposes, it is assumed that this process will result in a positive EA recommendation by the NIRB Board and a positive decision from the INAC Minister. The territorial and federal permits directly related to the construction of the Project cannot be issued until NIRB issues a positive decision on the reconsideration and the INAC Minister accepts this recommendation, and NIRB issues and amended Project Certificate.

Subsection 35(1) of the *Fisheries Act* prohibits the carrying on of a work, undertaking, or activity that results in serious harm to fish that are part of a CRA fishery or to fish that support such a fishery. The Minister of Fisheries and Oceans may issue an authorization with terms and conditions in relation to a proposed work, undertaking, or activity that may result in serious harm to fish under Paragraph 35(2)(b) of the *Fisheries Act*. The *Fisheries Act* Applications Regulations set out the information requirements and documentation that must be submitted by an applicant requesting such an authorization.

DFO (2013c) provides additional guidance concerning the information requirements and review process for applications for authorization:

- All applicants are encouraged to engage DFO early in the planning process to confirm whether an authorization is required to carry on their work, undertaking, or activity and to discuss the requirements set out in the *Fisheries Act* Applications Regulations before submitting such an application.
- All applications must be made in writing to the Minister and sent to one of the DFO Regional Offices.
- From the date of receipt of an application, the Minister has 60 calendar days to determine if the application is complete or incomplete, and to notify the applicant of this determination. If the application is not complete, the notification will identify the information or documentation that must still be provided by the applicant.

- From the date of the notification that the application is complete, the Minister has 90 calendar days to issue an authorization or notify the applicant that the authorization is denied.
- Applicants will be notified in writing when an authorization is issued or refused.

The DFO Minister cannot issue an Authorization until a federal EA decision is made that allows a project to proceed.

7.3.2 Nunavut and Other Permits

The following is a list of additional permits and authorizations that may be required construct offsetting measures:

- Financial security for use of Inuit owned land
- Modification to the Type A water licence for work in and around water
- Permit for sampling and handling of fish species

The list is preliminary and pending further discussions with regulators.

7.4 MONITORING

DFO (2013c) requires monitoring and reporting on offsetting measures as conditions of the authorization permit. Construction compliance monitoring will be conducted to minimize the environmental effects of construction activities. Effectiveness monitoring will be conducted to ensure the offsetting works are functioning as designed. Detailed monitoring plans will be developed in consultation with DFO to identify the appropriate metrics for assessing the performance of the offsetting works (DFO, 2012). The monitoring conditions suggested by DFO (2013c) include:

- Dated photographs of works undertakings, activities or operations related to mitigation measures and photographs of completed offsetting measures
- Timelines for monitoring and reporting
- Monitoring and inspection records
- Details of any mitigation changes, corrective actions or contingency measures that were followed in the event that mitigation or offsetting measures did not function as described
- The methodology and criteria that will be used to evaluate the success of the offsetting measures

DFO (2013c) requires that monitoring and reporting of offsetting measures are undertaken for a period of time sufficient to allow for:

- Biological or physical changes to be reflected in the data collected
- Possible adjustments to the monitoring to better estimate changes in fishery productivity
- The restored habitat to reach full ecological functionality (that is, supporting fish reproduction, growth, and survival)

The proponent is normally responsible for the maintenance or repair of the offsetting measures as conditions of the *Fisheries Act* authorization. The requirements for adjustments and contingencies to the offsetting measures will be included in the terms and conditions of the authorization.

Proponents are responsible for implementing offsetting plans and monitoring their effectiveness, as well as for reporting on implementation and the results of monitoring. Monitoring must be designed to

confirm that the offsetting measures have been effective in counterbalancing the serious harm to fish and may identify the need for additional measures should deficiencies be found.

Starting one year after construction, Baffinland will commence a five year monitoring program to demonstrate the success of the constructed offsetting measures. Surveys of Arctic char populations will be conducted annually, and will be carried out by qualified professional biologists. Fish assessment metrics such as catch per unit effort, age, length, and weight will be considered as part of the study design. Physical parameters such as lake levels, lake inflow and outflow, water temperature, lab water quality, and in-situ water quality will be incorporated to the monitoring plan. Criteria (performance measures) for the effectiveness monitoring will be developed through discussions with DFO and other interested parties. If offsetting objectives have not been achieved by year three of the monitoring program, effectiveness monitoring will continue. By year five, if successful criteria still have not been achieved, a work plan will be developed and additional offsetting works will be undertaken and monitoring will continue until performance measures have been met.

The results of compliance and effectiveness monitoring will be compiled annually and submitted to DFO for review. After the third year of effectiveness monitoring, a summary report will be written with recommendations based on the success of the offsetting measures.

7.5 INFORMATION GAPS AND NEXT STEPS

This is a conceptual plan that will require detailed study and analysis in order to be implemented subject to feedback from agencies, stakeholders, and community groups during the review of the Phase Proposal. Baseline studies will be conducted in summer 2018 to refine the proposed offsetting measures. Uncertainties will be addressed and presented in the Fish Habitat Offsetting Plan submitted as part of the application for authorization under the *Fisheries Act*.

The offsetting concepts proposed by this plan achieve the objective to demonstrate that the proposed offsetting measures will offset serious harm to fish and fish habitat from the Phase 2 Proposal.

8 – REFERENCES

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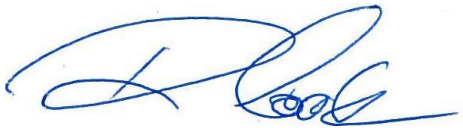
9 – CERTIFICATION

This report was prepared and reviewed by the undersigned.

Prepared:

Oscar Gustafson, R.P.Bio.
Specialist Environmental Scientist | Associate

Reviewed:



Richard Cook, P.Geo.(Ltd.)
Specialist Environmental Scientist | Associate

Approval that this document adheres to Knight Piésold Quality Systems:

APPENDIX A

NORTH RAILWAY ALIGNMENT

(Pages A-1 to A-33)

MILNE INLET

502,500

7,975,000

SHEET 1

SHEET 2

MTO CABIN

CV-179 CV-180 CV-181 CV-182 CV-183

KM 1 KM 2 KM 3 KM 4

LP2 LP3 LP5 LP7 W10A W10B LD-1 LD-2 LD-3 Q1

CV-178 CV-177 CV-176 CV-175 CV-174

PHILLIPS CREEK (MP-MRY-2)

Tower #0 Tower #1

START CH 220 CH 2000

CV-0-1 CV-0-2 CV-0-3 CV-1-1 CV-1-2 CV-1-3 CV-1-4 CV-1-5 CV-1-6

WP-87 (B) WP-86 (B) WP-85 (B)

RN401

SCALE 100 50 0 100 200 300 400 500 m

LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA
- **FISH HABITAT ASSESSMENT**
- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY
- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
- EXPLOSIVES FACILITIES
- RAPTOR NEST
- STREAMS DIVERTED BY LARGE CUTS
- STREAMS RECEIVING DIVERSION
- COMMUNICATION TOWERS
- APPROVED WATER SOURCE
- PROPOSED CONSTRUCTION WATER SOURCE
- POTENTIAL DEVELOPMENT AREA (MINE, PORT)
- POTENTIAL DEVELOPMENT AREA (TOTE ROAD, NORTH RAIL)
- MILNE INLET TOTE ROAD
- QUARRY AREA
- BRIDGE LOCATIONS

EXISTING BORROW AREA RECLAMATION PRIORITY (FROM EBA TETRATECH, 2014)

- A+ VERY HIGH PRIORITY
- A HIGH PRIORITY
- B MODERATE PRIORITY
- C LOW PRIORITY; STABLE (NOT SHOWN ON THIS FIGURE)

FLOW DIRECTION

NOTES:

1. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N.
2. DETAILED WATER AND ORTHO IMAGERY BASED ON AUGUST 2016 SATELLITE IMAGERY PROVIDED BY BAFFINLAND.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	19JUN18	ISSUED WITH TRANSMITTAL	RAC	DJA	RAC

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 1 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

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LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA
- **FISH HABITAT ASSESSMENT**
- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY
- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
- EXPLOSIVES FACILITIES
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MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 2 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

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LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA
- **FISH HABITAT ASSESSMENT**
- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY
- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
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MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 3 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

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7,967,500

510,000

CV-148
CV-147
CV-146-2
CV-146-3
CV-146
CV-9-1
CV-146-1
CV-145
KM 12
CH 10000
Phillips Creek
SHEET 4
CV-10-1
CV-144
CV-143
CV-142
CV-141
CV-140
CV-10-2
CV-10-3
CV-139
CV-138
CV-10-4
CV-10-5
CV-11-1
CV-137
Tower #3
WP-79 (A)
CV-11-2
RN450
CV-11-3
CV-136
KM 13
RN400
CV-11-4
CV-135
CV-11-5
Q10
LD-6
CV-134
CV-12-1
CV-133
CV-12-2
CV-12-3
CV-12-4
CV-131-1
CV-132
CV-131
CV-12-5
CV-13-1
SHEET 5

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 21 22 23 24 25 26 27 28 29 30 31 32 33

SCALE 100 50 0 100 200 300 400 500 m

LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA
- FISH HABITAT ASSESSMENT
  - FISH BEARING
  - NONE
  - POTENTIAL
  - PROBABLE
  - UNLIKELY
- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
- EXPLOSIVES FACILITIES
- RAPTOR NEST
- STREAMS DIVERTED BY LARGE CUTS
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- BRIDGE LOCATIONS

EXISTING BORROW AREA RECLAMATION PRIORITY
(FROM EBA TETRATECH, 2014)

- A+ VERY HIGH PRIORITY
- A HIGH PRIORITY
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FLOW DIRECTION

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REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	19JUN18	ISSUED WITH TRANSMITTAL	RAC	DJA	RAC

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MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 4 OF 33)

Baffinland

P/A NO. NB102-181/45

REF NO. NB18-00286

FIGURE B.4

REV 0

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LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA
- FISH HABITAT ASSESSMENT
  - FISH BEARING
  - NONE
  - POTENTIAL
  - PROBABLE
  - UNLIKELY
- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
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MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 5 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

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WP-73 (B)
CV-16-1
Q13
SHEET 5
RN438
KM 19
CV-16-2
CV-126
CV-16-3
SHEET 6
WP-72 (A+)
KM 20
CV-17-1
CH 18000
WP-71A(A+)
CV-125
CV-18-1
CV-18-2
CV-124
WP-71 (A+)
RN14
CV-18-3
KM 21
CV-18-4
Phillips Creek
7,962,500
CV-19-1
CV-123
CV-19-2
515,000
CV-122
WP-68 (A)
SHEET 7
KM 22
7,965,000
SCALE 100 50 0 100 200 300 400 500 m

LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA
- FISH HABITAT ASSESSMENT
  - FISH BEARING
  - NONE
  - POTENTIAL
  - PROBABLE
  - UNLIKELY
- SECTION OF RAIL WITHIN A ROCK CUT
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BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 6 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

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LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA
- **FISH HABITAT ASSESSMENT**
- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY
- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
- EXPLOSIVES FACILITIES
- RAPTOR NEST
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- MILNE INLET TOTE ROAD
- QUARRY AREA
- BRIDGE LOCATIONS

EXISTING BORROW AREA RECLAMATION PRIORITY
(FROM EBA TETRATECH, 2014)

- A+ VERY HIGH PRIORITY
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- B MODERATE PRIORITY
- C LOW PRIORITY; STABLE (NOT SHOWN ON THIS FIGURE)
- FLOW DIRECTION

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0	19JUN18	ISSUED WITH TRANSMITTAL	RAC	DJA	RAC

NOTES:

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2. DETAILED WATER AND ORTHO IMAGERY BASED ON AUGUST 2016 SATELLITE IMAGERY PROVIDED BY BAFFINLAND.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 7 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

SHEET 7

SHEET 8

SHEET 9

517,500

7960,000

7,957,500

KM 26 LAKE

Phillips Creek

CV-22-4
CV-23-1
CV-197
WP-65 (B)
CV-23-2
CV-118
KM 26
CV-23-3
CV-23-4
CH 24000
CV-198
WP-64 (B)
CV-199
CV-24-1
KM 27
CV-117
CV-24-2
CV-24-3
CV-116
CV-115
CV-25-2
WP-62A (B)
KM 28
CV-25-3
CV-26-1
CH 26000
WP-6 (A)
CV-200
CV-26-3
KM 29

SCALE 100 50 0 100 200 300 400 500 m

LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA
- **FISH HABITAT ASSESSMENT**
- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY
- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
- EXPLOSIVES FACILITIES
- RAPTOR NEST
- STREAMS DIVERTED BY LARGE CUTS
- STREAMS RECEIVING DIVERSION
- COMMUNICATION TOWERS
- APPROVED WATER SOURCE
- PROPOSED CONSTRUCTION WATER SOURCE
- POTENTIAL DEVELOPMENT AREA (MINE, PORT)
- POTENTIAL DEVELOPMENT AREA (TOTE ROAD, NORTH RAIL)
- MILNE INLET TOTE ROAD
- QUARRY AREA
- BRIDGE LOCATIONS

EXISTING BORROW AREA RECLAMATION PRIORITY
(FROM EBA TETRATECH, 2014)

- A+ VERY HIGH PRIORITY
- A HIGH PRIORITY
- B MODERATE PRIORITY
- C LOW PRIORITY; STABLE (NOT SHOWN ON THIS FIGURE)

FLOW DIRECTION

NOTES:

1. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N.
2. DETAILED WATER AND ORTHO IMAGERY BASED ON AUGUST 2016 SATELLITE IMAGERY PROVIDED BY BAFFINLAND.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	19JUN18	ISSUED WITH TRANSMITTAL	RAC	DJA	RAC

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 8 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

SAVED: I:\1\02\00181\45\AIG\IS\Figs\NB18-00286\A.rdM.ap 10.5 Versions\B01_rA (Fig B.4 1to10K Detailed NTC Figures).mxd; Jun 19, 2018 2:02 PM; sfoster

SHEET 8

SHEET 9

SHEET 10

7,957,500

520,000

7,955,000

520,000

CV-200
CV-26-3
KM 29
CV-26-4
WP-61B (A)
WP-61A(A+)
CV-26-5
CV-27-1
CV-27-2
CV-114
CV-27-3
KM 30
CV-27-4
Phillips Creek
CV-27-5
CV-201
CV-28-1
CH 28000
CV-28-2
CV-113
KM 31
CV-28-3
CV-28-4
CV-28-5
CV-28-6
CV-112
CV-28-7
CV-29-1
KM 32
CV-29-2
CV-111
CV-29-3
CV-110
CV-29-4
Km 32 Lake

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 21 22 23 24 25 26 27 28 29 30 31 32 33

SCALE 100 50 0 100 200 300 400 500 m

LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA
- **FISH HABITAT ASSESSMENT**
- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY
- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
- EXPLOSIVES FACILITIES
- RAPTOR NEST
- STREAMS DIVERTED BY LARGE CUTS
- STREAMS RECEIVING DIVERSION
- COMMUNICATION TOWERS
- APPROVED WATER SOURCE
- PROPOSED CONSTRUCTION WATER SOURCE
- POTENTIAL DEVELOPMENT AREA (MINE, PORT)
- POTENTIAL DEVELOPMENT AREA (TOTE ROAD, NORTH RAIL)
- MILNE INLET TOTE ROAD
- QUARRY AREA
- BRIDGE LOCATIONS

EXISTING BORROW AREA RECLAMATION PRIORITY
(FROM EBA TETRATECH, 2014)

- A+ VERY HIGH PRIORITY
- A HIGH PRIORITY
- B MODERATE PRIORITY
- C LOW PRIORITY; STABLE (NOT SHOWN ON THIS FIGURE)
- FLOW DIRECTION

NOTES:

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0	19JUN18	ISSUED WITH TRANSMITTAL	RAC	DJA	RAC

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 9 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

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LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA
- **FISH HABITAT ASSESSMENT**
- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY
- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
- EXPLOSIVES FACILITIES
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- POTENTIAL DEVELOPMENT AREA (TOTE ROAD, NORTH RAIL)
- MILNE INLET TOTE ROAD
- QUARRY AREA
- BRIDGE LOCATIONS

EXISTING BORROW AREA RECLAMATION PRIORITY
(FROM EBA TETRATECH, 2014)

- A+ VERY HIGH PRIORITY
- A HIGH PRIORITY
- B MODERATE PRIORITY
- C LOW PRIORITY; STABLE (NOT SHOWN ON THIS FIGURE)
- FLOW DIRECTION

NOTES:

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BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 10 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

SHEET 10
CV-33-1
CV-33-2
CV-33-3
CV-33-4
CV-103
CV-33-5
KM 36
CV-102
CV-33-6
CV-33-7
CH 34000
7,950,000
Phillips Creek
CV-101
CV-34-1
KM 37
CV-100
SHEET 11
CV-34-2
CV-099
CV099
CV-35-2
KM 38
CV-098
CV-35-4
CH 36000
SHEET 12
CV-097
KM 39
7,947,500
SCALE 100 50 0 100 200 300 400 500 m

LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA
- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
- EXPLOSIVES FACILITIES
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- POTENTIAL DEVELOPMENT AREA (TOTE ROAD, NORTH RAIL)
- MILNE INLET TOTE ROAD
- QUARRY AREA
- BRIDGE LOCATIONS

FISH HABITAT ASSESSMENT

- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY

EXISTING BORROW AREA RECLAMATION PRIORITY (FROM EBA TETRATECH, 2014)

- A+ VERY HIGH PRIORITY
- A HIGH PRIORITY
- B MODERATE PRIORITY
- C LOW PRIORITY; STABLE (NOT SHOWN ON THIS FIGURE)

FLOW DIRECTION

NOTES:

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BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 11 OF 33)

Baffinland

P/A NO. NB102-181/45

REF NO. NB18-00286

FIGURE B.4

REV 0

SAVED: I:\1\02\00181\45\A\GIS\Figs\NB18-00286\A\rcMap 10.5 Versions\B01_rA (Fig B.4 1to10K Detailed NTC Figures).mxd; Jun 19, 2018 2:04 PM; sfoster

7,947,500

522,500

7,945,000

KM 39

CV-097

KM 40

Tower #6

RN22

Phillips Creek

CV-37-1

CH 38000

SHEET 12

CV-38-1

CV-096

KM 41

CV-38-2

CV-095

CV-094

CV-38-3

Q19

LD-9

KM 42

CV-39-1

CV-093

SHEET 13

CH 40000

SCALE 100 50 0 100 200 300 400 500 m

LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA

FISH HABITAT ASSESSMENT

- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY

- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
- EXPLOSIVES FACILITIES
- RAPTOR NEST
- STREAMS DIVERTED BY LARGE CUTS
- STREAMS RECEIVING DIVERSION

- COMMUNICATION TOWERS
- APPROVED WATER SOURCE
- PROPOSED CONSTRUCTION WATER SOURCE
- POTENTIAL DEVELOPMENT AREA (MINE, PORT)
- POTENTIAL DEVELOPMENT AREA (TOTE ROAD, NORTH RAIL)
- MILNE INLET TOTE ROAD
- QUARRY AREA
- BRIDGE LOCATIONS

EXISTING BORROW AREA RECLAMATION PRIORITY
(FROM EBA TETRATECH, 2014)

- A+ VERY HIGH PRIORITY
- A HIGH PRIORITY
- B MODERATE PRIORITY
- C LOW PRIORITY; STABLE (NOT SHOWN ON THIS FIGURE)

FLOW DIRECTION

NOTES:

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BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 12 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

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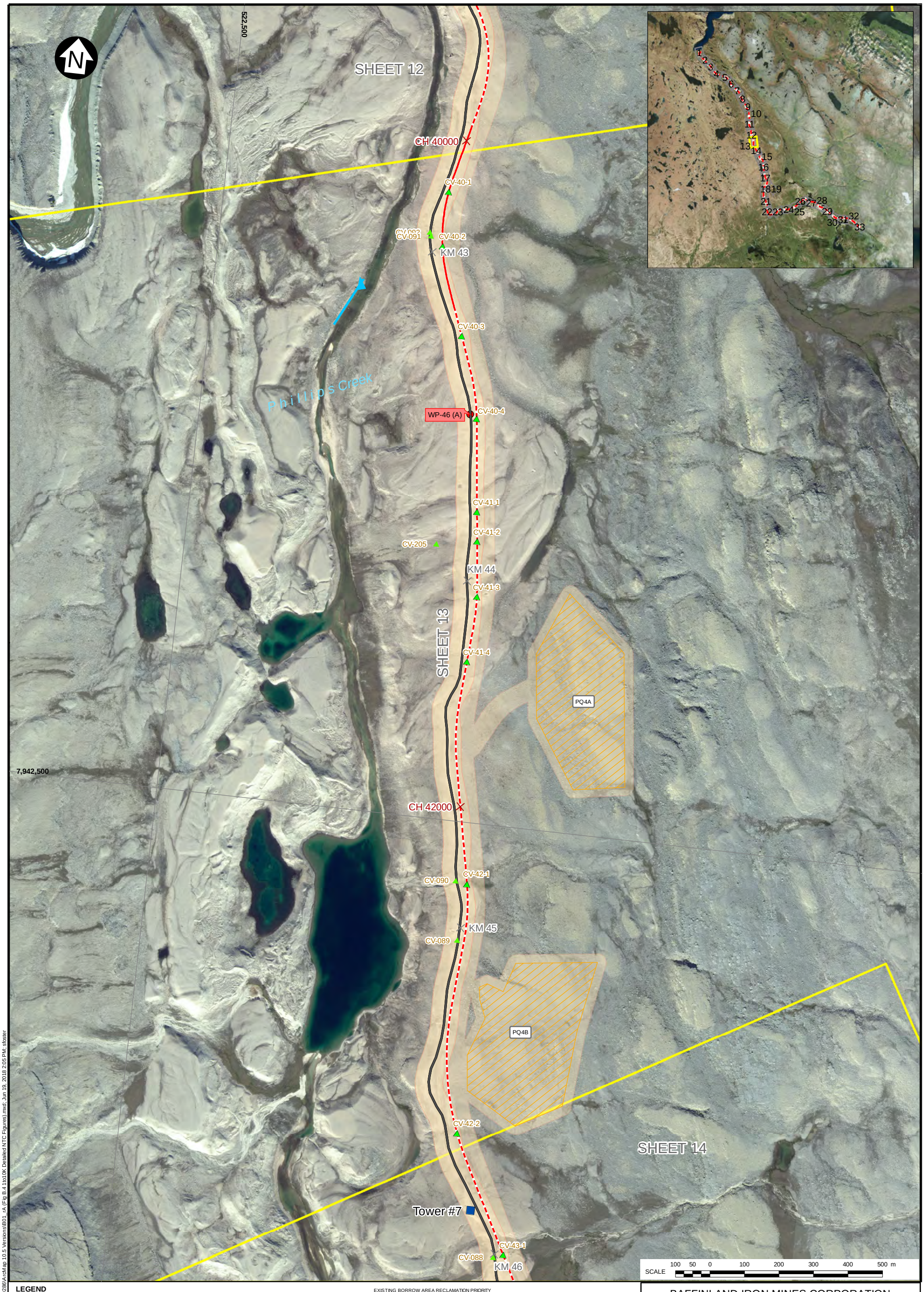

LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA
- **FISH HABITAT ASSESSMENT**
- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY
- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
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- APPROVED WATER SOURCE
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- POTENTIAL DEVELOPMENT AREA (MINE, PORT)
- POTENTIAL DEVELOPMENT AREA (TOTE ROAD, NORTH RAIL)
- MILNE INLET TOTE ROAD
- QUARRY AREA
- BRIDGE LOCATIONS

EXISTING BORROW AREA RECLAMATION PRIORITY
(FROM EBA TETRATECH, 2014)

- A+ VERY HIGH PRIORITY
- A HIGH PRIORITY
- B MODERATE PRIORITY
- C LOW PRIORITY; STABLE (NOT SHOWN ON THIS FIGURE)

FLOW DIRECTION

NOTES:

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0	19JUN18	ISSUED WITH TRANSMITTAL	RAC	DJA	RAC

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 13 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

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522,500

7,940,000

Tower #7

CV-088

CV-43-1

KM 46

SHEET 13

Phillips Creek

CV-43-2

CV-43-3

CV-087

CV-43-4

CV087

CV-086

CV-43-5

CV-085

SHEET 14

CH 44000

CV-44-1

LD-10

KM 47

CV-44-2

CV-084

Q21

RN24

CV-083

CV-44-3

KM 48

CV-45-1

CH 46000

CV-46-1

CV-206

KM 49

SHEET 15

Tower #8

CV-46-2

PQ5A

SCALE 100 50 0 100 200 300 400 500 m

LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA

FISH HABITAT ASSESSMENT

- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY

- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
- EXPLOSIVES FACILITIES
- RAPTOR NEST
- STREAMS DIVERTED BY LARGE CUTS
- STREAMS RECEIVING DIVERSION

- COMMUNICATION TOWERS
- APPROVED WATER SOURCE
- PROPOSED CONSTRUCTION WATER SOURCE
- POTENTIAL DEVELOPMENT AREA (MINE, PORT)
- POTENTIAL DEVELOPMENT AREA (TOTE ROAD, NORTH RAIL)
- MILNE INLET TOTE ROAD
- QUARRY AREA
- BRIDGE LOCATIONS

EXISTING BORROW AREA RECLAMATION PRIORITY
(FROM EBA TETRATECH, 2014)

- A+ VERY HIGH PRIORITY
- A HIGH PRIORITY
- B MODERATE PRIORITY
- C LOW PRIORITY; STABLE (NOT SHOWN ON THIS FIGURE)

FLOW DIRECTION

NOTES:

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0	19JUN18	ISSUED WITH TRANSMITTAL	RAC	DJA	RAC

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 14 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

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525,000

KM 49

Tower #8

CV-46-2

SHEET 14

CV-46-3

CV-46-4

KM 50

CV-46-6

CV-082

7,937,500

CV-47-1A

CV-081

CV-47-1B

CV-080

KM 51

Phillips Creek

WP-40 (A)

PQ5B

CV-47-1

CV-47-2

CV-079

CV-47-3

WP-39 (B)

CV-207

CH 48000

CV-48-1

CV-48-2

SHEET 15

KM 52

CV-078

CV078

WP-37 (A+)

CV-48-3

Q23

CV48-4

CV-49-1

CV-077

KM 53

CV-49-2

KM 54

525,000

CV-49-3

7,935,000

KATIKTOK LAKE

SHEET 16

CV-076

CH 50000

CV-50-1

SCALE 100 50 0 100 200 300 400 500 m

LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA

FISH HABITAT ASSESSMENT

- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY

- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
- EXPLOSIVES FACILITIES
- RAPTOR NEST
- STREAMS DIVERTED BY LARGE CUTS
- STREAMS RECEIVING DIVERSION

- COMMUNICATION TOWERS
- APPROVED WATER SOURCE
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- POTENTIAL DEVELOPMENT AREA (MINE, PORT)
- POTENTIAL DEVELOPMENT AREA (TOTE ROAD, NORTH RAIL)
- MILNE INLET TOTE ROAD
- QUARRY AREA
- BRIDGE LOCATIONS

EXISTING BORROW AREA RECLAMATION PRIORITY (FROM EBA TETRATECH, 2014)

- A+ VERY HIGH PRIORITY
- A HIGH PRIORITY
- B MODERATE PRIORITY
- C LOW PRIORITY; STABLE (NOT SHOWN ON THIS FIGURE)

FLOW DIRECTION

NOTES:

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BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 15 OF 33)

Baffinland

P/A NO. NB102-181/45

REF NO. NB18-00286

FIGURE B.4

REV 0

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LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA
- **FISH HABITAT ASSESSMENT**
- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY
- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
- EXPLOSIVES FACILITIES
- RAPTOR NEST
- STREAMS DIVERTED BY LARGE CUTS
- STREAMS RECEIVING DIVERSION
- COMMUNICATION TOWERS
- APPROVED WATER SOURCE
- PROPOSED CONSTRUCTION WATER SOURCE
- POTENTIAL DEVELOPMENT AREA (MINE, PORT)
- POTENTIAL DEVELOPMENT AREA (TOTE ROAD, NORTH RAIL)
- MILNE INLET TOTE ROAD
- QUARRY AREA
- BRIDGE LOCATIONS

EXISTING BORROW AREA RECLAMATION PRIORITY
(FROM EBA TETRATECH, 2014)

- A+ VERY HIGH PRIORITY
- A HIGH PRIORITY
- B MODERATE PRIORITY
- C LOW PRIORITY; STABLE (NOT SHOWN ON THIS FIGURE)

FLOW DIRECTION

NOTES:
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2. DETAILED WATER AND ORTHO IMAGERY BASED ON AUGUST 2016 SATELLITE IMAGERY PROVIDED BY BAFFINLAND.

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BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 16 OF 33)

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

SAVED: I:\1\02\00181\45\A\GIS\Figs\NB18-00286\A\rcMap 10.5 Versions\B01_rA (Fig B.4 1to10K Detailed NTC Figures).mxd; Jun 19, 2018 2:06 PM; sfoster

SHEET 16

SHEET 17

SHEET 18

7,932,500

527,500

7,930,000

KATIKTOK LAKE

CV-53-2

KM 58

CH 54000

Tower #9

CV-061

CV-54-1

KM 59

CV-54-2

CV-55-1

CV-060-1

CV-55-2

CV-55-3

CV-060

CV-060-2

KM 60

CH 56000

PQ6A

RAILWAY SIDING (CH55915 to CH56968)

CV-059

CV-56-1

CV-059-1

PROPOSED ORE HAUL TRUCK MAINTENANCE FACILITY

TEMPORARY ORE TRANSFER AREA

TEMPORARY MOBILE CAMP

KM 61

PQ6B

SCALE 100 50 0 100 200 300 400 500 m

LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA

FISH HABITAT ASSESSMENT

- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY

- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
- EXPLOSIVES FACILITIES
- RAPTOR NEST
- STREAMS DIVERTED BY LARGE CUTS
- STREAMS RECEIVING DIVERSION

- COMMUNICATION TOWERS
- APPROVED WATER SOURCE
- PROPOSED CONSTRUCTION WATER SOURCE
- POTENTIAL DEVELOPMENT AREA (MINE, PORT)
- POTENTIAL DEVELOPMENT AREA (TOTE ROAD, NORTH RAIL)
- MILNE INLET TOTE ROAD
- QUARRY AREA
- BRIDGE LOCATIONS

EXISTING BORROW AREA RECLAMATION PRIORITY (FROM EBA TETRATECH, 2014)

- A+ VERY HIGH PRIORITY
- A HIGH PRIORITY
- B MODERATE PRIORITY
- C LOW PRIORITY; STABLE (NOT SHOWN ON THIS FIGURE)

FLOW DIRECTION

NOTES:

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BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 17 OF 33)

Baffinland

P/A NO. NB102-181/45

REF NO. NB18-00286

FIGURE B.4

REV 0

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RAILWAY SIDING (CH55915 to CH56968)

PROPOSED ORE HAUL TRUCK MAINTENANCE FACILITY

TEMPORARY MOBILE CAMP

TEMPORARY ORE TRANSFER AREA

SHEET 17

SHEET 18

SHEET 19

SHEET 20

RN375

RN378

RN33

PQ6B

KM 61

KM 62

KM 63

Tower #10

LD-12

Rail Sand Pit

Explosives Area No. 3

CH 58000

CH 60000

CV-059-1

CV-058

CV-57-1

CV-57-2

CV-057

CV-58-1

CV-58-2

CV-58-3

CV-58-4

CV-58-4a

CV-58-6

CV-59-1

CV-59-2

CV-59-3

CV-59-4

CV-59-5

CV-60-1

CV-60-2

CV-60-3

CV-60-4

CV-056

CV-055

CV-054

CV-053

CV-052

CV-051

WP-31 (B)

WP-30 (B)

WP-30 (B)

WP-29 (A)

WP-29 (A+)

527,500

7,927,500

SCALE 100 50 0 100 200 300 400 500 m

LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA
- FISH HABITAT ASSESSMENT
- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY
- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
- EXPLOSIVES FACILITIES
- RAPTOR NEST
- STREAMS DIVERTED BY LARGE CUTS
- STREAMS RECEIVING DIVERSION
- COMMUNICATION TOWERS
- APPROVED WATER SOURCE
- PROPOSED CONSTRUCTION WATER SOURCE
- POTENTIAL DEVELOPMENT AREA (MINE, PORT)
- POTENTIAL DEVELOPMENT AREA (TOTE ROAD, NORTH RAIL)
- MILNE INLET TOTE ROAD
- QUARRY AREA
- BRIDGE LOCATIONS

EXISTING BORROW AREA RECLAMATION PRIORITY (FROM EBA TETRATECH, 2014)

- A+ VERY HIGH PRIORITY
- A HIGH PRIORITY
- B MODERATE PRIORITY
- C LOW PRIORITY; STABLE (NOT SHOWN ON THIS FIGURE)

FLOW DIRECTION

NOTES:

1. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N.
2. DETAILED WATER AND ORTHO IMAGERY BASED ON AUGUST 2016 SATELLITE IMAGERY PROVIDED BY BAFFINLAND.

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0	19JUN18	ISSUED WITH TRANSMITTAL	RAC	DJA	RAC

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 18 OF 33)

Baffinland

P/A NO. NB102-181/45

REF NO. NB18-00286

FIGURE B.4

REV 0

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LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA
- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
- EXPLOSIVES FACILITIES
- RAPTOR NEST
- STREAMS DIVERTED BY LARGE CUTS
- STREAMS RECEIVING DIVERSION
- COMMUNICATION TOWERS
- APPROVED WATER SOURCE
- PROPOSED CONSTRUCTION WATER SOURCE
- POTENTIAL DEVELOPMENT AREA (MINE, PORT)
- POTENTIAL DEVELOPMENT AREA (TOTE ROAD, NORTH RAIL)
- MILNE INLET TOTE ROAD
- QUARRY AREA
- BRIDGE LOCATIONS

FISH HABITAT ASSESSMENT

- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY

EXISTING BORROW AREA RECLAMATION PRIORITY
(FROM EBA TETRATECH, 2014)

- A+ VERY HIGH PRIORITY
- A HIGH PRIORITY
- B MODERATE PRIORITY
- C LOW PRIORITY; STABLE (NOT SHOWN ON THIS FIGURE)

FLOW DIRECTION

NOTES:

1. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N.
2. DETAILED WATER AND ORTHO IMAGERY BASED ON AUGUST 2016 SATELLITE IMAGERY PROVIDED BY BAFFINLAND.

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MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 19 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

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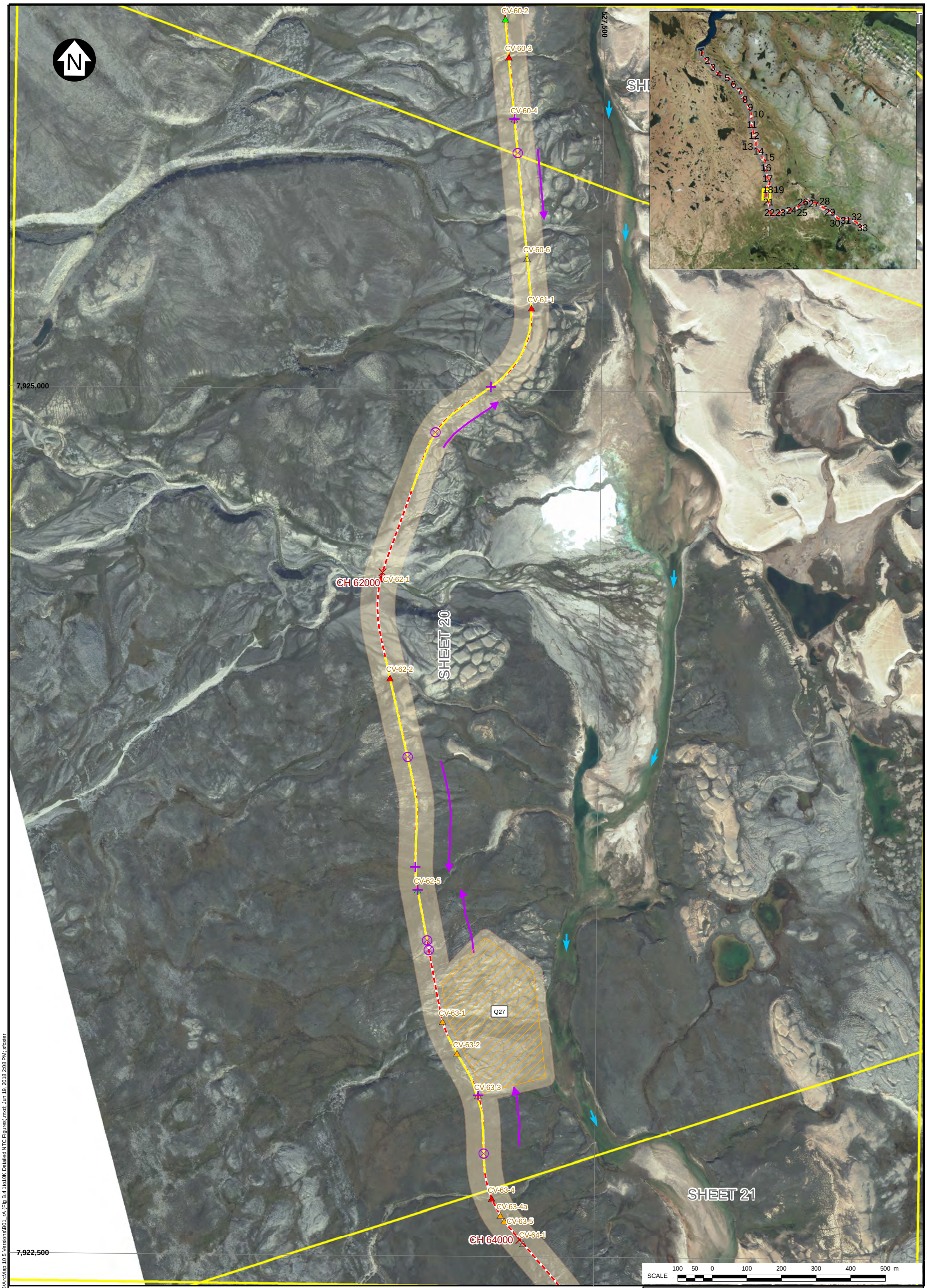

LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA
- **FISH HABITAT ASSESSMENT**
- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY
- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
- EXPLOSIVES FACILITIES
- RAPTOR NEST
- STREAMS DIVERTED BY LARGE CUTS
- STREAMS RECEIVING DIVERSION
- COMMUNICATION TOWERS
- APPROVED WATER SOURCE
- PROPOSED CONSTRUCTION WATER SOURCE
- POTENTIAL DEVELOPMENT AREA (MINE, PORT)
- POTENTIAL DEVELOPMENT AREA (TOTE ROAD, NORTH RAIL)
- MILNE INLET TOTE ROAD
- QUARRY AREA
- BRIDGE LOCATIONS

EXISTING BORROW AREA RECLAMATION PRIORITY
(FROM EBA TETRATECH, 2014)

- A+ VERY HIGH PRIORITY
- A HIGH PRIORITY
- B MODERATE PRIORITY
- C LOW PRIORITY; STABLE (NOT SHOWN ON THIS FIGURE)

FLOW DIRECTION

NOTES:

1. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N.
2. DETAILED WATER AND ORTHO IMAGERY BASED ON AUGUST 2016 SATELLITE IMAGERY PROVIDED BY BAFFINLAND.

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NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 20 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

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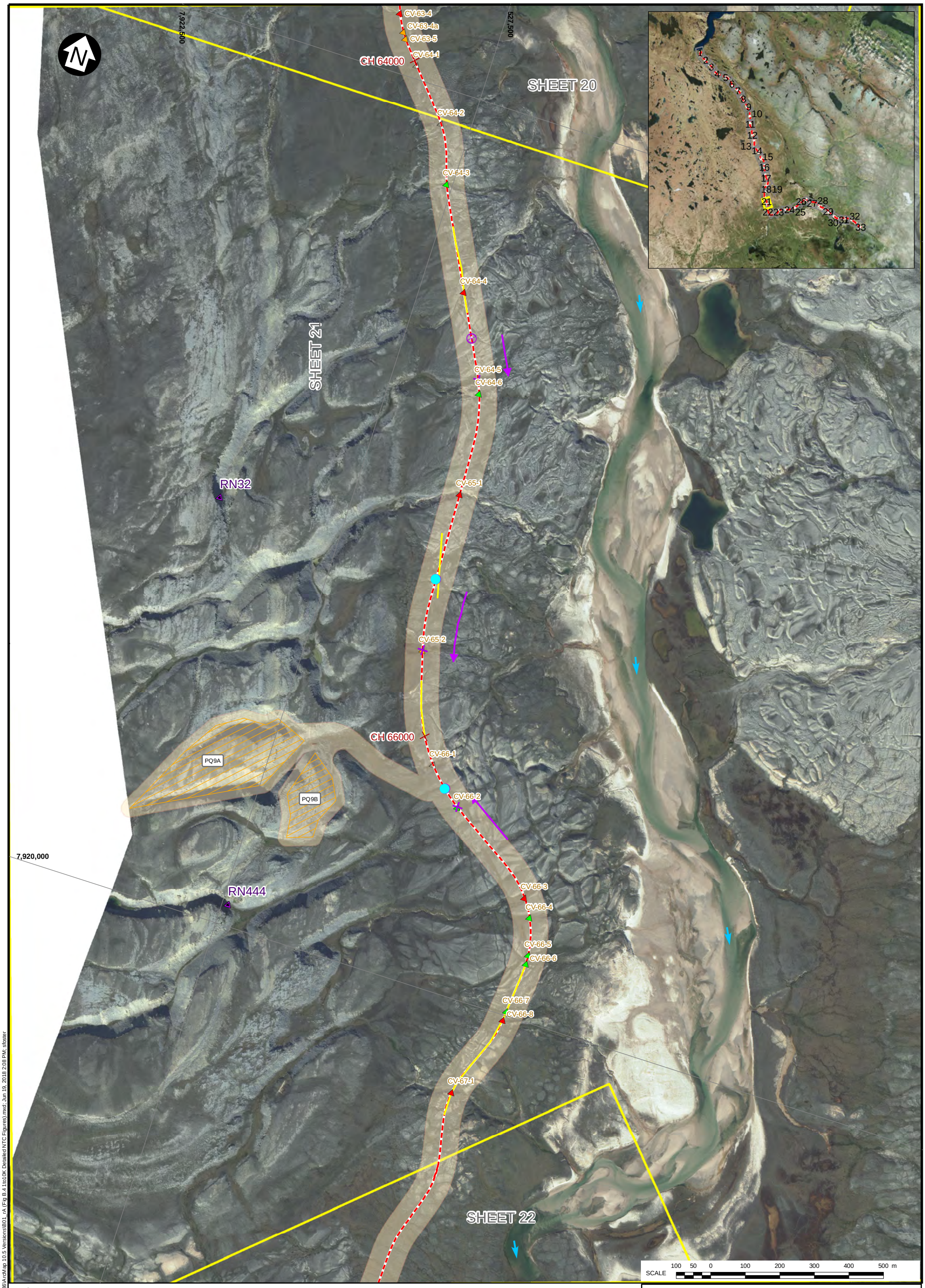

LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA
- **FISH HABITAT ASSESSMENT**
- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY
- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
- EXPLOSIVES FACILITIES
- RAPTOR NEST
- STREAMS DIVERTED BY LARGE CUTS
- STREAMS RECEIVING DIVERSION
- COMMUNICATION TOWERS
- APPROVED WATER SOURCE
- PROPOSED CONSTRUCTION WATER SOURCE
- POTENTIAL DEVELOPMENT AREA (MINE, PORT)
- POTENTIAL DEVELOPMENT AREA (TOTE ROAD, NORTH RAIL)
- MILNE INLET TOTE ROAD
- QUARRY AREA
- BRIDGE LOCATIONS

EXISTING BORROW AREA RECLAMATION PRIORITY
(FROM EBA TETRATECH, 2014)

- A+ VERY HIGH PRIORITY
- A HIGH PRIORITY
- B MODERATE PRIORITY
- C LOW PRIORITY; STABLE (NOT SHOWN ON THIS FIGURE)
- FLOW DIRECTION

NOTES:

1. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N.
2. DETAILED WATER AND ORTHO IMAGERY BASED ON AUGUST 2016 SATELLITE IMAGERY PROVIDED BY BAFFINLAND.

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BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 21 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

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527,500

RN385

7,917,500

CH 68000

CV-67-2

CV-68-1

CV-68-2

CV-68-1a

CV-68-3

CV-68-4

CV-68-5

CV-69-1

CV-69-2

CV-69-3

CV-69-4

SHEET 22

CH 70000

CV-70-1

CV-70-2

Bridge 2
CV-70-3

CV-70-3
(BRIDGE 2)

CV-71-1

CV-71-2a

CV-71-3

CV-71-4

CH 72000

CV-72-1

CV-72-1a

CV-72-2

CV-72-3

CV-72-3a

CV-72-4

CV-73-1

SHEET 23

SCALE 100 50 0 100 200 300 400 500 m

LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA

FISH HABITAT ASSESSMENT

- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY

- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
- EXPLOSIVES FACILITIES
- RAPTOR NEST
- STREAMS DIVERTED BY LARGE CUTS
- STREAMS RECEIVING DIVERSION

- COMMUNICATION TOWERS
- APPROVED WATER SOURCE
- PROPOSED CONSTRUCTION WATER SOURCE
- POTENTIAL DEVELOPMENT AREA (MINE, PORT)
- POTENTIAL DEVELOPMENT AREA (TOTE ROAD, NORTH RAIL)
- MILNE INLET TOTE ROAD
- QUARRY AREA
- BRIDGE LOCATIONS

EXISTING BORROW AREA RECLAMATION PRIORITY
(FROM EBA TETRATECH, 2014)

- A+ VERY HIGH PRIORITY
- A HIGH PRIORITY
- B MODERATE PRIORITY
- C LOW PRIORITY; STABLE (NOT SHOWN ON THIS FIGURE)

FLOW DIRECTION

NOTES:

1. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N.
2. DETAILED WATER AND ORTHO IMAGERY BASED ON AUGUST 2016 SATELLITE IMAGERY PROVIDED BY BAFFINLAND.

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NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 22 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

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CV-72-1a
CV-72-2
CV-72-3
CV-72-3a
CV-72-4
CV-73-1
SHEET 22
PQ10A
PQ10B
CH 74000
SHEET 23
CV-74-1
CV-74-2
CV-74-3
CV-74-4
CV-75-1a
CV-75-1
CV-75-2
CH 76000
SHEET 24
532,500
7,917,500
SCALE 100 50 0 100 200 300 400 500 m

LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA
- **FISH HABITAT ASSESSMENT**
- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY
- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
- EXPLOSIVES FACILITIES
- RAPTOR NEST
- STREAMS DIVERTED BY LARGE CUTS
- STREAMS RECEIVING DIVERSION
- COMMUNICATION TOWERS
- APPROVED WATER SOURCE
- PROPOSED CONSTRUCTION WATER SOURCE
- POTENTIAL DEVELOPMENT AREA (MINE, PORT)
- POTENTIAL DEVELOPMENT AREA (TOTE ROAD, NORTH RAIL)
- MILNE INLET TOTE ROAD
- QUARRY AREA
- BRIDGE LOCATIONS

EXISTING BORROW AREA RECLAMATION PRIORITY (FROM EBA TETRATECH, 2014)

- A+ VERY HIGH PRIORITY
- A HIGH PRIORITY
- B MODERATE PRIORITY
- C LOW PRIORITY; STABLE (NOT SHOWN ON THIS FIGURE)
- FLOW DIRECTION

NOTES:

1. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N.
2. DETAILED WATER AND ORTHO IMAGERY BASED ON AUGUST 2016 SATELLITE IMAGERY PROVIDED BY BAFFINLAND.

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BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 23 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

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LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA

FISH HABITAT ASSESSMENT

- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY

- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
- EXPLOSIVES FACILITIES
- RAPTOR NEST
- STREAMS DIVERTED BY LARGE CUTS
- STREAMS RECEIVING DIVERSION

- COMMUNICATION TOWERS
- APPROVED WATER SOURCE
- PROPOSED CONSTRUCTION WATER SOURCE
- POTENTIAL DEVELOPMENT AREA (MINE, PORT)
- POTENTIAL DEVELOPMENT AREA (TOTE ROAD, NORTH RAIL)
- MILNE INLET TOTE ROAD
- QUARRY AREA
- BRIDGE LOCATIONS

EXISTING BORROW AREA RECLAMATION PRIORITY
(FROM EBA TETRATECH, 2014)

- A+ VERY HIGH PRIORITY
- A HIGH PRIORITY
- B MODERATE PRIORITY
- C LOW PRIORITY; STABLE (NOT SHOWN ON THIS FIGURE)

- FLOW DIRECTION

NOTES:

1. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N.
2. DETAILED WATER AND ORTHO IMAGERY BASED ON AUGUST 2016 SATELLITE IMAGERY PROVIDED BY BAFFINLAND.

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MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 24 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

537,500

SHEET 24

CV-79-0
CV-79-1
CV-80-1
CH 80000
CV-80-1a

CV-212

CV-80-2a
CV-80-2
CV-80-2b
CV-80-3
CV-80-4
CV-80-5
CV-81-1

SHEET 25

CV-81-2
CV-81-3
CV-033
CV-81-4
CH 82000
CV-82-1
KM 76

540,000

CV-82-2
PQ12A
CV-82-3

SHEET 26

CV-82-4
CV-83-1
BG-33

SCALE 100 50 0 100 200 300 400 500 m

LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA
- **FISH HABITAT ASSESSMENT**
- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY
- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
- EXPLOSIVES FACILITIES
- RAPTOR NEST
- STREAMS DIVERTED BY LARGE CUTS
- STREAMS RECEIVING DIVERSION
- COMMUNICATION TOWERS
- APPROVED WATER SOURCE
- PROPOSED CONSTRUCTION WATER SOURCE
- POTENTIAL DEVELOPMENT AREA (MINE, PORT)
- POTENTIAL DEVELOPMENT AREA (TOTE ROAD, NORTH RAIL)
- MILNE INLET TOTE ROAD
- QUARRY AREA
- BRIDGE LOCATIONS

EXISTING BORROW AREA RECLAMATION PRIORITY
(FROM EBA TETRATECH, 2014)

- A+ VERY HIGH PRIORITY
- A HIGH PRIORITY
- B MODERATE PRIORITY
- C LOW PRIORITY; STABLE (NOT SHOWN ON THIS FIGURE)
- FLOW DIRECTION

NOTES:
1. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N.
2. DETAILED WATER AND ORTHO IMAGERY BASED ON AUGUST 2016 SATELLITE IMAGERY PROVIDED BY BAFFINLAND.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	19JUN18	ISSUED WITH TRANSMITTAL	RAC	DJA	RAC

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 25 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

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LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA
- **FISH HABITAT ASSESSMENT**
- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY
- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
- EXPLOSIVES FACILITIES
- RAPTOR NEST
- STREAMS DIVERTED BY LARGE CUTS
- STREAMS RECEIVING DIVERSION
- COMMUNICATION TOWERS
- APPROVED WATER SOURCE
- PROPOSED CONSTRUCTION WATER SOURCE
- POTENTIAL DEVELOPMENT AREA (MINE, PORT)
- POTENTIAL DEVELOPMENT AREA (TOTE ROAD, NORTH RAIL)
- MILNE INLET TOTE ROAD
- QUARRY AREA
- BRIDGE LOCATIONS

EXISTING BORROW AREA RECLAMATION PRIORITY
(FROM EBA TETRATECH, 2014)

- A+ VERY HIGH PRIORITY
- A HIGH PRIORITY
- B MODERATE PRIORITY
- C LOW PRIORITY; STABLE (NOT SHOWN ON THIS FIGURE)
- FLOW DIRECTION

NOTES:
1. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N.
2. DETAILED WATER AND ORTHO IMAGERY BASED ON AUGUST 2016 SATELLITE IMAGERY PROVIDED BY BAFFINLAND.

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BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 26 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

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LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA
- **FISH HABITAT ASSESSMENT**
- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY
- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
- EXPLOSIVES FACILITIES
- RAPTOR NEST
- STREAMS DIVERTED BY LARGE CUTS
- STREAMS RECEIVING DIVERSION
- COMMUNICATION TOWERS
- APPROVED WATER SOURCE
- PROPOSED CONSTRUCTION WATER SOURCE
- POTENTIAL DEVELOPMENT AREA (MINE, PORT)
- POTENTIAL DEVELOPMENT AREA (TOTE ROAD, NORTH RAIL)
- MILNE INLET TOTE ROAD
- QUARRY AREA
- BRIDGE LOCATIONS

EXISTING BORROW AREA RECLAMATION PRIORITY (FROM EBA TETRATECH, 2014)

- A+ VERY HIGH PRIORITY
- A HIGH PRIORITY
- B MODERATE PRIORITY
- C LOW PRIORITY; STABLE (NOT SHOWN ON THIS FIGURE)
- FLOW DIRECTION

NOTES:

1. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N.
2. DETAILED WATER AND ORTHO IMAGERY BASED ON AUGUST 2016 SATELLITE IMAGERY PROVIDED BY BAFFINLAND.

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BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 27 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA

FISH HABITAT ASSESSMENT

- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY

- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
- EXPLOSIVES FACILITIES
- RAPTOR NEST
- STREAMS DIVERTED BY LARGE CUTS
- STREAMS RECEIVING DIVERSION

- COMMUNICATION TOWERS
- APPROVED WATER SOURCE
- PROPOSED CONSTRUCTION WATER SOURCE
- POTENTIAL DEVELOPMENT AREA (MINE, PORT)
- POTENTIAL DEVELOPMENT AREA (TOTE ROAD, NORTH RAIL)
- MILNE INLET TOTE ROAD
- QUARRY AREA
- BRIDGE LOCATIONS

EXISTING BORROW AREA RECLAMATION PRIORITY
(FROM EBA TETRATECH, 2014)

- A+ VERY HIGH PRIORITY
- A HIGH PRIORITY
- B MODERATE PRIORITY
- C LOW PRIORITY; STABLE (NOT SHOWN ON THIS FIGURE)

- FLOW DIRECTION

NOTES:

1. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N.
2. DETAILED WATER AND ORTHO IMAGERY BASED ON AUGUST 2016 SATELLITE IMAGERY PROVIDED BY BAFFINLAND.

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BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 28 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

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LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA
- **FISH HABITAT ASSESSMENT**
- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY
- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
- TEMPORARY HAUL ROAD
- EXPLOSIVES FACILITIES
- RAPTOR NEST
- STREAMS DIVERTED BY LARGE CUTS
- STREAMS RECEIVING DIVERSION
- COMMUNICATION TOWERS
- APPROVED WATER SOURCE
- PROPOSED CONSTRUCTION WATER SOURCE
- POTENTIAL DEVELOPMENT AREA (MINE, PORT)
- POTENTIAL DEVELOPMENT AREA (TOTE ROAD, NORTH RAIL)
- MILNE INLET TOTE ROAD
- QUARRY AREA
- BRIDGE LOCATIONS

EXISTING BORROW AREA RECLAMATION PRIORITY (FROM EBA TETRATECH, 2014)

- A+ VERY HIGH PRIORITY
- A HIGH PRIORITY
- B MODERATE PRIORITY
- C LOW PRIORITY; STABLE (NOT SHOWN ON THIS FIGURE)
- FLOW DIRECTION

NOTES:

1. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N.
2. DETAILED WATER AND ORTHO IMAGERY BASED ON AUGUST 2016 SATELLITE IMAGERY PROVIDED BY BAFFINLAND.

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0	19JUN18	ISSUED WITH TRANSMITTAL	RAC	DJA	RAC

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 29 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA

FISH HABITAT ASSESSMENT

- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY

- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
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FLOW DIRECTION

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NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 30 OF 33)

Baffinland

P/A NO.	REF NO.
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FIGURE B.4 REV 0

LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA
- **FISH HABITAT ASSESSMENT**
- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY
- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
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- EXPLOSIVES FACILITIES
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(FROM EBA TETRATECH, 2014)

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MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 31 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

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Camp Lake

SHEET 31

CAMP LAKE

CV-104-1

CV-104-2

CV-104-3

CV-104-4

CV-104-5

CV-105-1

CV-105-2

CV-105-3

CV-105-4

CV-106-1

CV-106-2

CV-106-3

CV-107-1

CV-107-2

CV-107-3

CV-107-4

CV-184

CV-185

CV-186

BG-01

LD-16

LD-17

KM 100

RN100

RN104

MARY RIVER EXPLORATION CAMP

AIRSTRIP

QMR2 (Q41)

SHEET 32

SHEET 33

Sheardown Lake

557,500

7,915,000

7,912,500

560,000

SCALE 100 50 0 100 200 300 400 500 m

LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA
- FISH HABITAT ASSESSMENT
  - FISH BEARING
  - NONE
  - POTENTIAL
  - PROBABLE
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MARY RIVER PROJECT

NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 32 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

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LEGEND

- TOTE ROAD km POST
- NORTH RAIL CHANAGE (m)
- LAYDOWN AREA
- **FISH HABITAT ASSESSMENT**
- FISH BEARING
- NONE
- POTENTIAL
- PROBABLE
- UNLIKELY
- SECTION OF RAIL WITHIN A ROCK CUT
- TOTE ROAD REALIGNMENT
- PROPOSED NORTH RAILWAY
- STREAM DIVERSION
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NORTH RAILWAY
DETAILED CONSTRUCTION PHASE LAYOUT
(SHEET 33 OF 33)

Baffinland

P/A NO.	REF NO.
NB102-181/45	NB18-00286

FIGURE B.4 REV 0

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