

APPENDIX E

Hydrological Assessment of Water Withdrawals

(Pages E-1 to E-64)

Prepared for
Baffinland Iron Mines Corporation
360 Oakville Place Drive
Suite 300
Oakville, Ontario
Canada L6H 6K8

Prepared by
Knight Piésold Ltd.
200-1164 Devonshire Avenue
North Bay, ON P1B 6X7
Canada

NB102-181/94-1

MARY RIVER PROJECT

WATER WITHDRAWAL NOTIFICATION AND HYDROLOGICAL ASSESSMENT - STEENSBY COMPONENT

Rev	Description	Date
0	Issued in Final	November 28, 2023

BR-46-1	ᐃᑦᑎᑦᑕᐅᓯᒐ ሜᓯᑦᑐᑦᑕ ᐃᓚᑦᑕ	-		300	5.7
ᑦᓯᑎᐃᑦ- ᐃᑦᓯᐅᑎᐃᑦᑕᑦᐃᑦ ᐃᑦᑕᐅᑎᐃᑦᑕᑦᐃᑦ ᑦᓯᑦᑕ ᑕᓯᑦᑕ	ᐃᑦᑎᑦᑕᐅᓯᒐ ሜᓯᑦᑐᑦᑕ ᑕᓯᑦᑕ ("ᑦᓯᑦᑕ ᑕᓯᑦᑕ")	100	-	160	ᐱᑕᑦᑕᓯᑦᑐᑦᑕ
BR-95-1	ᐃᑦᐱᓯᑦᑐᑦᑕᑦᐃᑦ ᑕᓯᑦᑕ	-	200,000	160	ᐱᑕᑦᑕᓯᑦᑐᑦᑕ
ᐃᑦᐱᓯᑦᑐᑦᑕᑦᐃᑦ ᐃᑦᓯᑦᑐᑦ ᐃᑦᓯᑦᑐᑦ ᑕᓯᑦᑕ		212.5		160	ᐱᑕᑦᑕᓯᑦᑐᑦᑕ
ᑦᓯᐃᑦ ᐃᑦᐱᓯᑦᑐᑦᑕᑦᐃᑦ ᑕᓯᑦᑕ				160	ᐱᑕᑦᑕᓯᑦᑐᑦᑕ
BR-137-1	ST352 ᐃᓚᑦᑕ	-	-	300	5.7
ST352 ᑕᓯᑦᑕ	ᐃᑦᑎᑦᑕᐅᓯᒐ ሜᓯᑦᑐᑦᑕ ᑕᓯᑦᑕ	-	150,000	-	ᐱᑕᑦᑕᓯᑦᑐᑦᑕ

ፌዴራል ፖሊስ (ፖሊስ):

- [illegible]

[illegible][illegible][illegible]

- $\Delta C_p^{\circ} \approx \Delta \dot{L}_m^{\circ}$
- $\Delta H_p^{\circ} \approx \Delta H_m^{\circ}$ / $\Delta S_p^{\circ} \approx \Delta S_m^{\circ}$ (ሁለቱም ለፍሳሽ ስራ)
- $\Delta G_p^{\circ} \approx \Delta G_m^{\circ}$ (ሁለቱም ለፍሳሽ ስራ)

EXECUTIVE SUMMARY

Baffinland Iron Mines Corporation (Baffinland) currently operates the Mary River Project (the Project) under Type A Water Licence No. 2AM-MRY1325 (herein referred to as, the Licence) (NWB, 2015). Part A of the Licence describes the scope of the Approved Project, which includes the 4.2 million tonnes per annum (Mtpa) “Early Revenue Phase” (ERP) operation currently underway, as well as the 18 Mtpa Steensby Component of the Project, inclusive of the Steensby Railway and Steensby Port. Baffinland is proposing to initiate construction of the Steensby Component of the Project in late 2024.

Minimal changes to water use are proposed from what was assessed in the Final Environmental Impact Statement (FEIS) (Baffinland, 2012). These changes include the following:

- The length of all-season construction access road that is separate from the railway has been reduced in favour of building construction access into the railway embankment and using winter roads (which were previously contemplated) to stage camps, equipment, and materials at key work fronts.
- Winter road alignments have been confirmed, as well as the associated water use for their construction.
- Minor increases in domestic water requirements, and the use of the 3 Km Lake water source into the operation phase. The operation phase water source (10 Km Lake) will continue to be carried forth as an alternate water source, if needed.
- Sewage will be treated in package sewage treatment plants at rail construction camps. Previously, sewage was going to be trucked to the Mine Site or Steensby Port for treatment in facilities at these locations. A modification request is being prepared as separate submission for this change.
- Changes to the Steensby Port layout have been proposed within the previously identified Potential Development Area (PDA).

Baffinland has refined its water needs for the Steensby Component of the Project, and proposed changes to the Project's water use include:

- Administrative and volumetric changes to the domestic and industrial water uses during construction
- Additional water withdrawals for winter road construction
- Additional dust suppression water withdrawal sites along the Steensby Railway

The overall maximum daily and annual limits of the current Licence will remain unchanged.

This document serves as notification under Part E, Item 9 of the Licence, which states:

The Licensee shall notify the Inspector and the Board at least ten (10) days in advance of using Water from any sources not identified in the Application or requiring approval as per Part E, Item 8.

This document also provides the information required under Part E, Item 14 of the Licence, which states:

14. The Licensee shall, where the use of Water of a sufficient volume would likely result in the drawdown of the source Water body involved or dewatering of the specific Water body is anticipated, submit the following for the approval of the Board in writing:

- a. the volume of Water required;*
- b. a hydrological overview of the Water body;*

c. details of impact; and

d. Proposed mitigation measures.

Proposed changes to water withdrawals are summarized in below.

Water Station	Waterbody Name	Domestic and Industrial Use		Dust Suppression	
		Camps	Winter Road	Daily Maximum Volume	Maximum Pumping Rate
		(m³/day)	(m³/season)	(m³/day)	(m³/min)
MS-MRY-1	Camp Lake	657.5	70,000	160	n/a
BR-0-1	Mary River	-	-	300	5.7
BR-25-1	Unnamed River	-	-	300	3.2
Ravn Camp Lake	Unnamed lake (“Ravn Camp Lake”)	245.2	40,000	160	n/a
BR-37-1/CV-R21	Ravn River	-	-	300	5.7
BR-46-1	Unnamed stream	-		300	5.7
Mid-Rail Camp Lake	Unnamed lake (“Nivek Lake”)	100	-	160	n/a
BR-95-1	Cockburn Lake	-	200,000	160	n/a
Cockburn tunnels camp		212.5		160	n/a
South Cockburn camp				160	n/a
BR-137-1	ST352 outlet stream	-	-	300	5.7
ST352 Lake	Unnamed lake	-	150,000	-	n/a

Note(s):

- Streams are shaded green and lakes are shaded blue.

Assessments were completed to determine if the proposed water withdrawals will comply with Fisheries and Oceans Canada (DFO) guidance regarding water extraction from streams and lakes beneath ice cover (DFO, 2010a and 2013a) and thresholds for withdrawals from lakes during open water established in the FEIS (Baffinland, 2012). All proposed water withdrawals are within applicable thresholds, except for an exceedance of the 10% threshold during June at the Ravn Camp Lake water station arising from winter water withdrawals. Considering several other factors, including that most of June flows occur in the second half of the month, and that fish do not start moving out of lakes into local streams until the end of June, this threshold exceedance is judged not to represent a significant effect to fish and fish habitat.

Withdrawals from other water stations in the Licence not assessed in this notification remain unchanged.

The potential impacts of flow withdrawal on fish and fish habitat can be assessed by understanding the mechanisms and stressors that cause effects in the aquatic environment. Water withdrawal has the potential to impact fish and fish habitat through the following mechanisms (DFO, 2010b):

- Placement of structures in water
- Entrainment in pumps / impingement on screens
- Use of industrial equipment near fish-bearing waters (i.e., risk of spills and inadvertent sedimentation and/or erosion)
- Oxygen depletion, loss of over-wintering habitat, and/or reductions in littoral habitat during winter water withdrawal from ice-covered waterbodies
- Changes in flow volumes or timing, duration, and frequency of flow

The following plans describe the mitigation measures Baffinland implements to protect fish and fish habitat during water withdrawals:

- Environmental Protection Plan (EPP; Baffinland, 2021a)
- Fresh Water Supply, Sewage and Wastewater Management Plan (FWSSWMP; Baffinland, 2018)
- Surface Water and Aquatic Ecosystems Management Plan (SWAEMP; Baffinland, 2021b)
- Spill Contingency Plan (SCP; Baffinland, 2021c)

The latest versions of these plans are found on Baffinland's online Document Portal:: <https://baffinland.com/document-portal/>.

The assessment determined that these proposed withdrawals are within applicable thresholds, with the exception of an exceedance of the 10% threshold during June at the Ravn Camp Lake water station. Considering several factors, including that most June flows occur in the second half of the month due to the timing of spring freshet, and that fish do not start moving out of lakes into local streams until the lake temperatures increase around the end of June, this threshold exceedance is judged not to represent a significant effect to fish and fish habitat.

TABLE OF CONTENTS

	PAGE
Executive Summary	i
Table of Contents	i
1.0 Introduction	1
2.0 Project Description	2
2.1 Proposed Changes to the Steensby Component	2
2.2 Domestic and Industrial Water Use	2
2.2.1 Construction Camps	2
2.2.2 Winter Roads	5
2.3 Dust Suppression	9
2.4 Summary of New Water Withdrawals	9
3.0 Community Engagement and Inuit Knowledge	12
3.1 Historic Consultation	12
3.2 Recent Community Consultation	13
3.3 QIA's 2019-2021 Tusaqtavut Studies	13
3.4 Baffinland's 2006-2010 Inuit Knowledge Studies	13
3.4.1 The Importance of Water	15
3.4.2 Inuit Use of Water Along Steensby Railway and Steensby Port	16
4.0 Hydrological Assessment	17
4.1 Overview	17
4.2 Waterbody Catchments	17
4.3 Available Streamflow Data	17
4.4 Hydrological Assessment - Streams	20
4.5 Hydrological Assessment - Lakes	25
4.5.1 Withdrawals During Ice Cover	25
4.5.2 Withdrawals During Open Water	27
5.0 Mitigation of Impacts to Fish and Fish Habitat	29
5.1 Effects of Water Withdrawal	29
5.2 Relevant Management Plans	29
5.3 Current Water Licence	30
5.4 Placement of Structures in Water	30
5.5 Entrainment in Pumps / Impingement on Screens	32
5.6 Use of Industrial Equipment	32
5.7 Changes in Flow Volumes or Timing, Duration, and Frequency of Flow	33

6.0	NIRB Self-Assessment Overview	35
7.0	Conclusions.....	37
8.0	References.....	39
9.0	Certification	41

TABLES

Table 2.1	Revisions to Domestic and Industrial Water Use During the Construction Phase	5
Table 2.2	Annual Water Requirements for Winter Road Construction	7
Table 2.3	Proposed Dust Suppression Water Stations	9
Table 2.4	Summary of Proposed New Water Withdrawals.....	10
Table 3.1	Summary of Engagement related to the Rail between January 2015 and October 2023	12
Table 4.1	Project Hydrometric Stations	18
Table 4.2	Estimated Long-Term Mean Streamflow	20
Table 4.3	Proposed Stream Water Stations for Dust Suppression Water Withdrawals	21
Table 4.4	Assessment of Winter Water Withdrawals.....	26
Table 4.5	Assessment of Water Withdrawals from Lakes During Open Water	28
Table 6.1	Self Assessment of Proposed Amendment to Approved Project	35
Table 6.2	Change in Factors Related to Section 90 (NuPPAA) Significance Criteria	36
Table 7.1	Proposed Water Stations	37

FIGURES

Figure 2.1	Steensby Railway - Construction Phase Layout.....	3
Figure 2.2	Steensby Port Layout.....	4
Figure 2.3	Construction Phase - Water Stations.....	6
Figure 2.4	Steensby Area Winter Roads.....	8
Figure 3.1	Fishing and Freshwater Values Identified in Tusaqtavut Studies	14
Figure 4.1	Project and Regional Hydrometric Stations	19
Figure 4.2	Hydrology Station H06 Annual and Monthly Flow Duration Curves	22
Figure 4.3	Flow Duration Curves for 15 Candidate Streams	23
Figure 4.4	Flow Duration Curves for Streams Meeting DFO's Threshold.....	24
Figure 5.1	Baffinland Water Pumps	30
Figure 5.2	Example Water Intake at Site CV-128	31

APPENDICES

Appendix A	Previously Issued IQ Study Maps
Appendix B	Catchment Boundaries

Abbreviations

the Project	Mary River Project
Baffinland	Baffinland Iron Mines Corporation
BCLOs	Baffinland Community Liaison Officers
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
DFO	Fisheries and Oceans Canada
EHS	Environmental, Health and Safety
EPP	Environmental Protection Plan
ERP	Early Revenue Phase
FDC	Flow Duration Curve
FEIS	Final Environmental Impact Statement
FWSSWMP	Fresh Water Supply, Sewage and Wastewater Management Plan
GIS	Geographical Information System
HTO	The Hunters and Trappers Organization
IQ	Inuit Qaujimajatuqangit
KP ("KP 95")	Kilometre post
MAD	Mean Annual Discharge
MAUD	Mean Annual Unit Discharge
MEWG	Marine Environment Working Group
MRIKS	Mary River Inuit Knowledge Study
Mtpa	Million tonnes per annum
NIRB	Nunavut Impact Review Board
NPC	Nunavut Planning Commission
NSC	North/South Consultants Inc.
NuPPAA	<i>Nunavut Planning and Project Assessment Act</i>
OHWL	Operational High Water Mark
PDA	Potential Development Area
QIA	Qikiqtani Inuit Association
SEMC	Socio-Economic Monitoring Report
SEMWG	Socio-Economic Environment Working Group
SWAEMP	Surface Water and Aquatic Ecosystems Management Plan
the Licence	Type A Water Licence No. 2AM-MRY1325
TEWG	Terrestrial Environment Working Group
Tote Road	Milne Inlet Tote Road
WSC	Water Survey of Canada

1.0 INTRODUCTION

Baffinland Iron Mines Corporation (Baffinland) currently operates the Mary River Project (the Project) under Type A Water Licence No. 2AM-MRY1325 (herein referred to as, the Licence) (Nunavut Water Board [NWB], 2015). Part A of the Licence describes the scope of the Approved Project, which includes the 4.2 million tonnes per annum (Mtpa) “Early Revenue Phase” operation currently underway, as well as the 18 Mtpa Steensby Component of the Project, inclusive of the Steensby Railway and Steensby Port. Baffinland is proposing to initiate construction of the Steensby Component of the Project in late 2024.

Part E of the Licence describes conditions applying to water use and management, including approved water sources, and site-specific, daily, and annual withdrawal limits.

Baffinland has refined its water needs for the Steensby Component of the Project, as described in this document. Proposed changes to the Project’s water use include:

- Administrative and volumetric changes to the domestic and industrial water uses during construction, as identified in Part E, Item 3 and Table 2 of the Licence
- Additional industrial water use for winter road construction, as contemplated in Part E, Item 3 of the Licence
- Additional dust suppression water withdrawal sites along the south railway, keeping with the overall daily and annual limits identified in Part E, Item 25, and Table 2-3 of the Licence

Each of these are described further in Section 2.

This document serves as notification under Part E, Item 9 of the Licence, which states:

The Licensee shall notify the Inspector and the Board at least ten (10) days in advance of using Water from any sources not identified in the Application or requiring approval as per Part E, Item 8.

This document also provides the information required under Part E, Item 14 of the Licence, which states:

14. The Licensee shall, where the use of Water of a sufficient volume would likely result in the drawdown of the source Water body involved or dewatering of the specific Water body is anticipated, submit the following for the approval of the Board in writing:

- a. the volume of Water required;*
- b. a hydrological overview of the Water body;*
- c. details of impact; and*
- d. Proposed mitigation measures.*

The following information is provided in this document:

- Section 2 - the volume of water required
- Section 3 - relevant community engagement and Inuit knowledge work
- Section 4 - hydrological assessment
- Section 5 - mitigation measures
- Section 6 - an assessment of effects following the implementation of mitigation measures

2.0 PROJECT DESCRIPTION

2.1 PROPOSED CHANGES TO THE STEENSBY COMPONENT

The Steensby Railway construction phase layout is presented on Figure 2.1, and the Steensby Port layout is presented on Figure 2.2. Minimal changes are proposed from what was assessed in the Final Environmental Impact Statement (FEIS; Baffinland, 2012). These changes include the following:

- The length of all-season construction access road that is separate from the railway has been reduced in favour of building construction access into the railway embankment and using winter roads (which were previously contemplated) to stage camps, equipment, and materials at key work fronts.
- Winter road alignments have been confirmed, as well as the associated water use for their construction.
- Minor increases in domestic water requirement, including the use of the 3 Km Lake water source into the operation phase. The operation phase water source (10 Km Lake) will continue to be carried forth as an alternate water source, if needed.
- Sewage will be treated in package sewage treatment plants at rail construction camps. Previously, sewage was going to be trucked to the Mine Site or Steensby Port for treatment in facilities at these locations. A modification request is being prepared as separate submission for this change.
- Changes to the Steensby Port layout have been proposed within the previously identified Potential Development Area (PDA).

This notification focuses on proposed changes to water withdrawals, including for domestic and industrial water uses and for dust suppression.

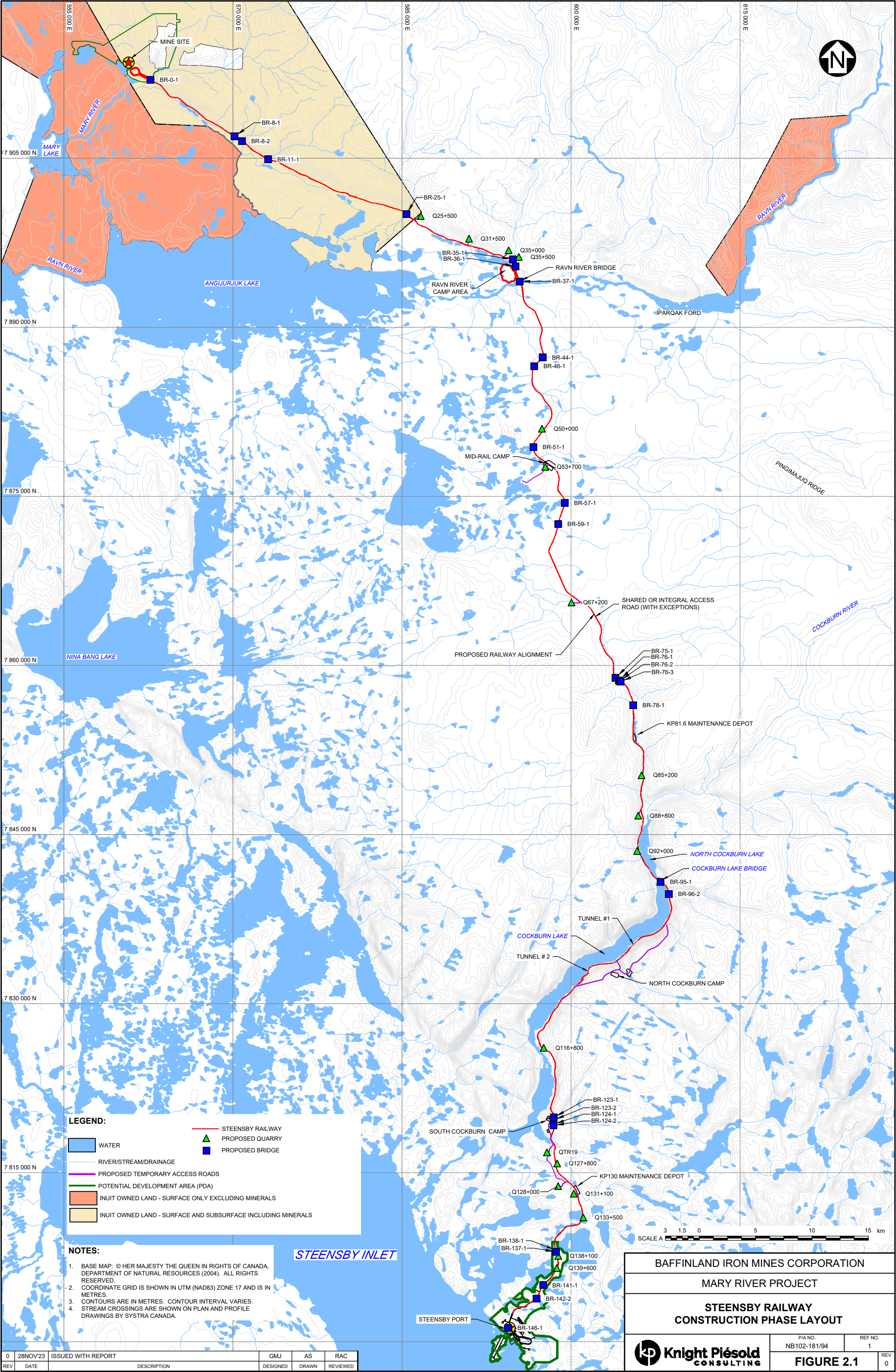
2.2 DOMESTIC AND INDUSTRIAL WATER USE

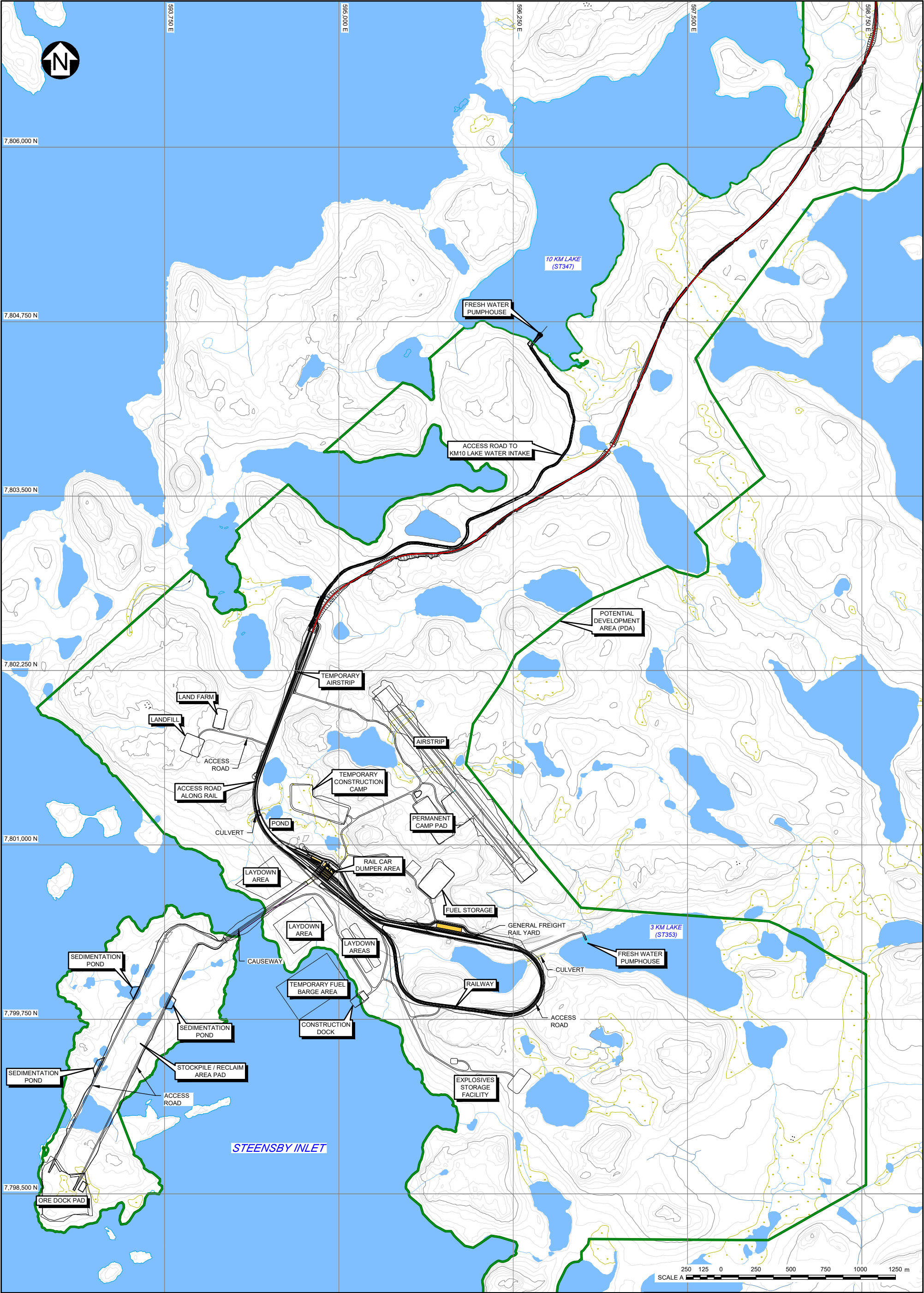
2.2.1 CONSTRUCTION CAMPS

Temporary construction camps will be constructed at kilometre post (KP) 35 (north of the Ravn River crossing), near the existing Mid-Rail Camp, east of the tunnels along Cockburn Lake, at the south end of Cockburn Lake, and at Steensby Port. Equipment maintenance and storage depots will be established at KP 81.6 and KP 130.

Water for temporary camps will be extracted from nearby water sources without permanent infrastructure in the same manner as water is extracted from Km 32 Lake for Milne Port. A permanent water intake/jetty will be constructed in 3 Km Lake at Steensby Port for the pioneering construction camp and permanent accommodation facility.

The proposed domestic and industrial water uses for camps are presented in Table 2.1. Several administrative changes are proposed as summarized in the notes following Table 2.1. Increased domestic and industrial water withdrawals are proposed at Ravn Camp Lake and Mid-Rail camp, and thus these are assessed in Section 4.





- LEGEND:**
- WATER
 - WETLAND
 - RIVER/STREAM/DRAINAGE
 - INFRASTRUCTURE
 - POTENTIAL DEVELOPMENT AREA (PDA)

- NOTES:**
- COORDINATE GRID IS UTM NAD83, ZONE 17.
 - STEENSBY INFRASTRUCTURE PROVIDED BY AUSENCO (OCT 13, 2023).
 - CONTOUR INTERVAL IS 5 METRES.
 - TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005).
 - POTENTIAL DEVELOPMENT AREA (PDA) PROVIDED BY AUSENCO, (NOV 7, 2023).

0	28NOV'23	ISSUED WITH REPORT	AMB	AS	RAC
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

STEENSBY PORT LAYOUT



P/A NO.
NB102-181/94

REF NO.
1

FIGURE 2.2

REV
0

Table 2.1 Revisions to Domestic and Industrial Water Use During the Construction Phase

Site	Source	Approved	Proposed	Change
		(m³/day)	(m³/day)	
Milne Port	Phillips Creek (summer)	367.5	367.5	No change; see Note 1
	Km 32 Lake (summer and winter)			
Mine Site	Camp Lake	657.5	657.5	No change
Steensby Port	10 Km Lake (ST347)	435.8	435.8	No change
	3 Km Lake (ST353)			
Ravn Camp	Camp Lake	145.2	-	Increase; see Note 2
	Ravn Camp Lake	-	245.2	
Mid-Rail Camp	Ravn Camp Lake (winter)	79.5		100
	Nivek Lake (summer)	79.5		
Cockburn North (Tunnels Camp)	Cockburn Lake	101.4	212.5	No change; see Note 4
Cockburn South Camp		111.1		
Daily Limit (m³/day)		1,888	1,888	No change
Annual Limit (m³/year)		689,000	689,000	No change

Note(s):

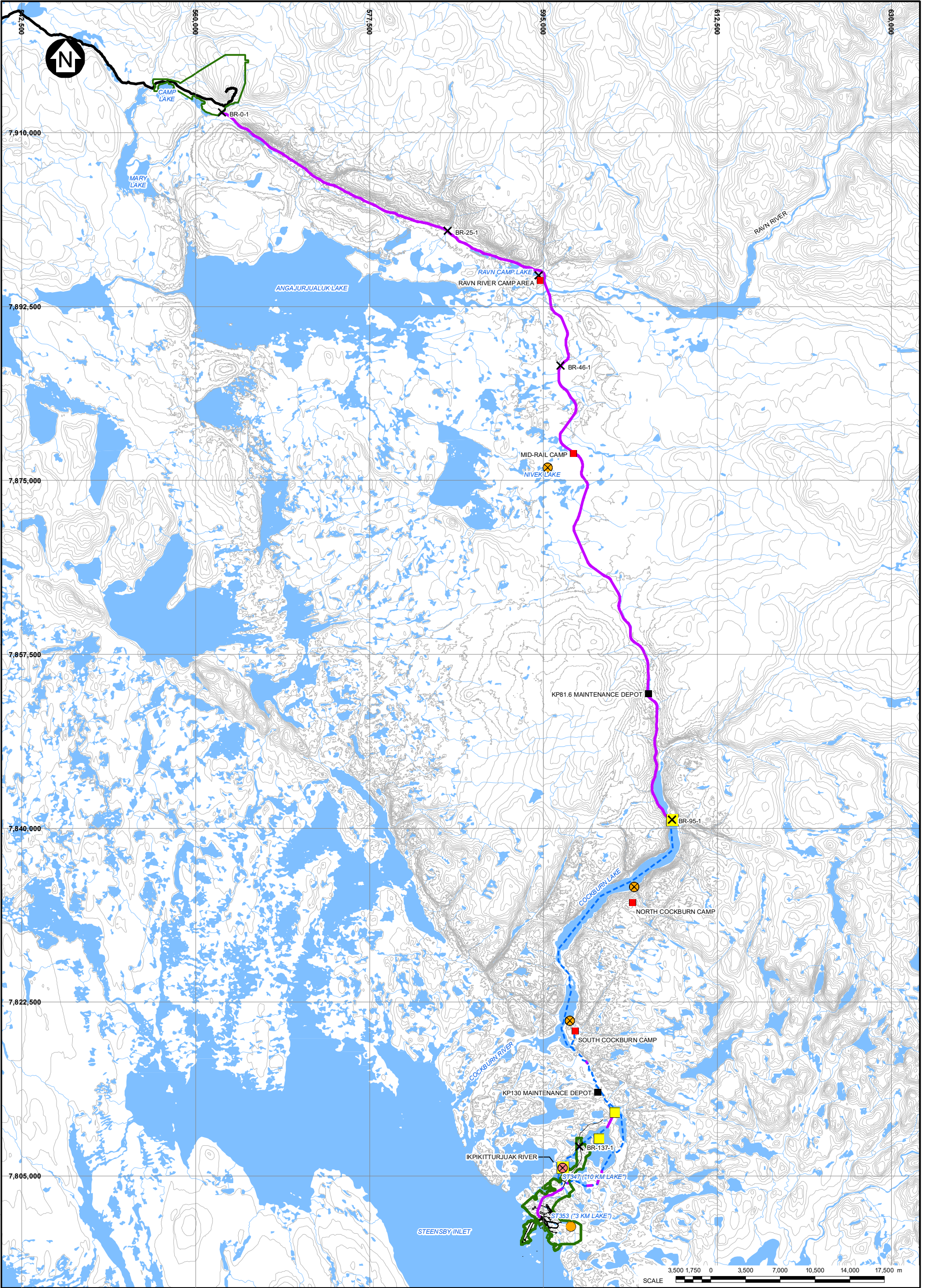
1. In practice, water withdrawals occur year-round from Km 32 lake, not only during summer. Winter withdrawals from Km 32 Lake were assessed in the FEIS.
2. The FEIS assessed and the original licence application proposed water withdrawals from an adjacent Unnamed ("Ravn") Lake. We believe reference to Camp Lake is a typographic error in the current Licence.
3. Withdrawals from Nivek Lake will increase from the approved 79.5 m³/day to 100 m³/day during open water conditions (summer), and from Ravn Camp Lake during ice cover conditions (winter). The total withdrawal from Ravn Camp Lake is 145.2 m³/day in the summer, and 145.2 + 100 = 245.2 m³/day in the winter.
4. Specifying a single maximum daily limit for the water body is preferred to provide flexibility regarding the volume of water each camp can withdraw.

2.2.2 WINTER ROADS

A construction access road will be constructed alongside the rail embankment, providing access to work fronts as construction of the embankment progresses. Winter roads will be used to provide early access to camps and work fronts as shown on Figure 2.3.

Winter roads will be constructed starting in November 2024, and annually throughout the construction phase. This will occur from the north (via the Mine Site) and the south (via Steensby Port). From the north, the winter road will parallel the railway alignment. A winter road will not be required where the construction access road has already been constructed.

The on-land portions of the winter road will be constructed by compacting the snow and applying water using the same approach used to construct winter roads elsewhere in Nunavut and the Northwest Territories.



LEGEND:

- POTENTIAL DEVELOPMENT AREA (PDA)
- WATER
- RIVER/STREAM/DRAINAGE
- PROPOSED WINTER ROAD ON ICE
- PROPOSED WINTER ROAD OVER LAND
- PROPOSED CONSTRUCTION CAMP
- PROPOSED MAINTENANCE DEPOT

WATER STATION TYPE

- DUST SUPPRESSION
- DOMESTIC AND INDUSTRIAL USE
- WINTER ROAD CONSTRUCTION
- DUST SUPPRESSION & DOMESTIC AND INDUSTRIAL USE & WINTER ROAD CONSTRUCTION

0	26NOV23	ISSUED WITH REPORT	GMU	AS	RAC
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED

- NOTES:**
1. BASE MAP AND CONTOURS PROVIDED BY EAGLE MAPPING (2008).
 2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
 3. CONTOURS ARE IN METRES. CONTOUR INTERVAL VARIES.
 4. RAILWAY ALIGNMENT PROVIDED BY SYSTRA (NOV 13, 2023).
 5. STEENSBY INFRASTRUCTURE PROVIDED BY AUSENCO, (NOV 7, 2023).
 6. MINE RAIL LOOP PROVIDED BY SYSTRA, (NOV 8, 2023).

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

CONSTRUCTION PHASE
WATER STATIONS

Knight Piésold
CONSULTING

PIA NO. NB102-181/94	REF NO. 1
FIGURE 2.3	
REV 0	

SAVED: I:\1102\0018194\AIGIS\Figs\02 R0.mxd, Nov 28, 2023 2:10 PM, asmpson

Water withdrawals for winter road construction will not exceed the total authorized use up to 1,888 m³ of water per day, to a maximum of 689,000 m³ of water annually. An application rate of approximately 2,000 m³ of water per kilometer of winter road was used to estimate the water withdrawal requirements for overland winter road construction.

The following winter roads are proposed:

- **Mine to Cockburn Lake (KP 0 to KP 95)** - A winter road will be constructed within the railway right-of-way along segments where the construction access road has not already been constructed. Water to construct this portion of the road will be sourced from Camp Lake, the unnamed lake next to the Ravn River Camp, and Cockburn Lake.
- **Cockburn Lake (KP 95 to KP 125)** - The winter road will cross the lake. An allowance has been made for water withdrawals to strengthen the ice road, or to strengthen work areas at bridge BR-95-1 or at the tunnels.
- **Cockburn Lake to Steensby Port (KP 125 to KP 149)** - A winter road will be constructed across the ice in Steensby Inlet, travelling over inland lakes with small overland portages. Various potential winter road route options have been identified to access the KP 130 Maintenance Depot (Figure 2.4). These routes will be subject to additional ground truthing before a preferred route is selected. An allowance has been made in the Cockburn Lake water withdrawals should the winter road be constructed from north to south (i.e., from KP 125 at the south end of Cockburn Lake to KP 149 at Steensby Port).

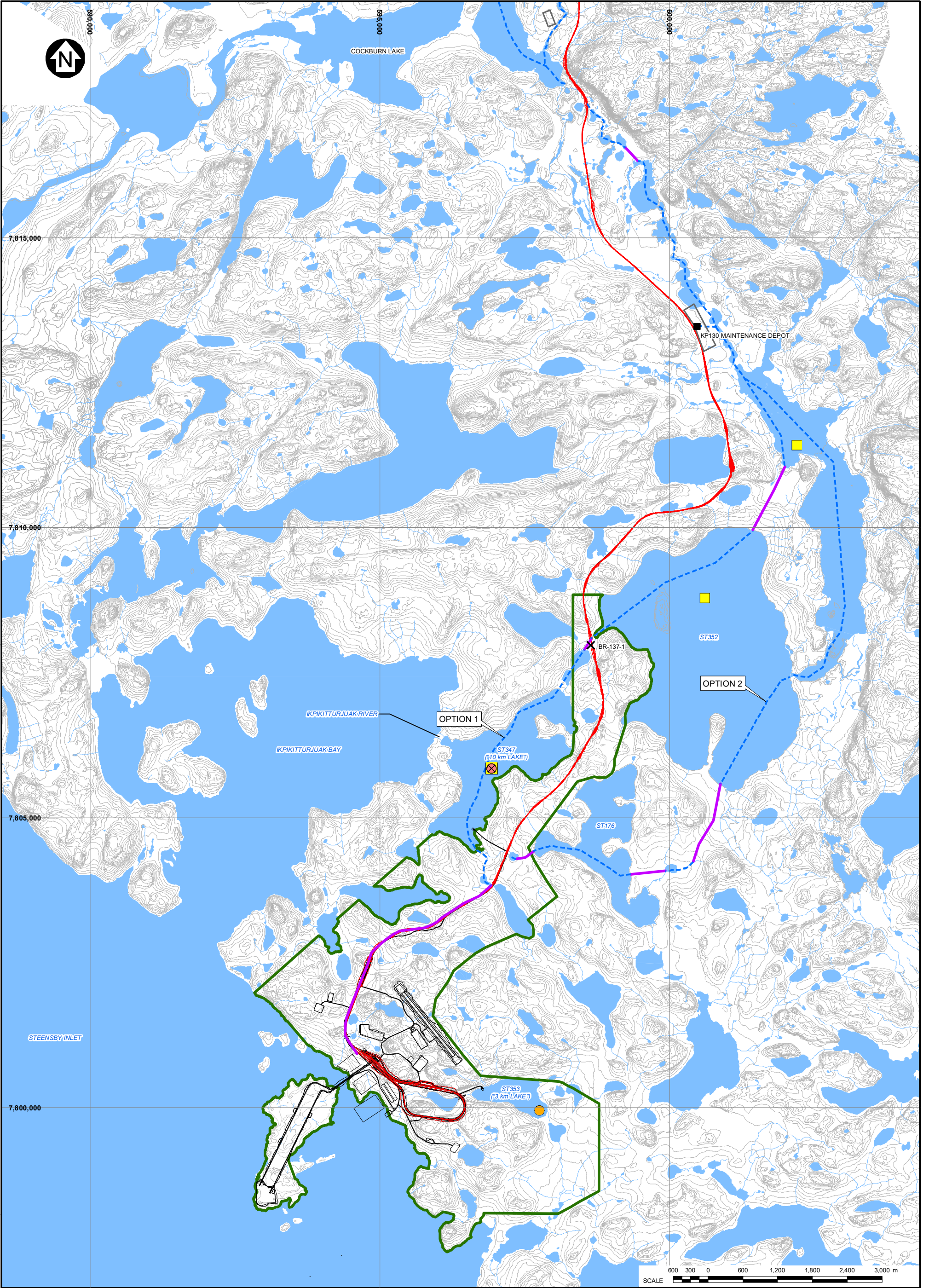
The estimated water requirements from the identified water sources are summarized in Table 2.2. These water withdrawals are assessed in Section 4.

Table 2.2 Annual Water Requirements for Winter Road Construction

Construction Front	Winter Road Segment	Water Station	Distance (km)	Withdrawal Volumes (m³) [1]
Mine to Cockburn Lake	Rail KP 0 to KP 35	Camp Lake	35	70,000
	Rail KP 35 to KP 55	Unnamed ("Ravn") Lake	20	40,000
	Rail KP 55 to KP 95	Cockburn Lake	40	200,000
Cockburn Lake	Rail KP 95 to KP 125		30	
South Cockburn Lake to Port	Rail KP 125 to KP 149		24	
Steensby to KP 130 Depot	KP130 Depot Winter Road	ST352 Lake	9	50,000
		10 Km Lake (ST347) Lake	9	50,000
		Option 2 Unnamed Lake	12	150,000
Daily Limit (m³/day)				1,888
Annual Total (m³/year)				610,000

Note(s):

1. Winter road withdrawal volumes are a total for the winter season. Daily withdrawal volumes will vary depending on winter road construction progress and proximity to water sources.



LEGEND:

- POTENTIAL DEVELOPMENT AREA (PDA)
- WATER
- RIVER/STREAM/DRAINAGE
- PROPOSED WINTER ROAD ON ICE
- PROPOSED WINTER ROAD OVER LAND
- STEENSBY RAILWAY
- PROPOSED MAINTENANCE DEPOT

WATER STATION TYPE

- DUST SUPPRESSION
- DOMESTIC AND INDUSTRIAL USE
- WINTER ROAD CONSTRUCTION
- DUST SUPPRESSION & DOMESTIC AND INDUSTRIAL USE & WINTER ROAD CONSTRUCTION

- NOTES:**
1. BASE MAP AND CONTOURS PROVIDED BY EAGLE MAPPING (2008).
 2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
 3. CONTOURS ARE IN METRES. CONTOUR INTERVAL VARIES.
 4. RAILWAY ALIGNMENT PROVIDED BY SYSTRA (NOV 13, 2023).
 5. STEENSBY INFRASTRUCTURE PROVIDED BY AUSENCO, (NOV 7, 2023).
 6. MINE RAIL LOOP PROVIDED BY SYSTRA, (NOV 8, 2023).

REV	DATE	ISSUED WITH REPORT	DESCRIPTION	GMJ DESIGNED	AS DRAWN	RAC REVIEWED
0	28NOV23	ISSUED WITH REPORT				

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

STEENSBY AREA WINTER ROADS

Knight Piésold CONSULTING

PIA NO.
NB102-181/94

REF NO.
1

FIGURE 2.4

REV
0

2.3 DUST SUPPRESSION

Water will be used to reduce dust during rail and port construction. The period of water withdrawal for dust control is approximately mid-June to mid-September. Five new stream water sources and five lake water sources have been identified for dust suppression withdrawals along the Steensby Railway. The proposed dust suppression water stations are listed in Table 2.3.

Table 2.3 Proposed Dust Suppression Water Stations

Water Station	Waterbody	Coordinates		Proposed Water Withdrawal
		Northing	Easting	m ³ /day ³
MS-MRY-1	Camp Lake	577,778	7,914,721	160
BR-0-1	Mary River	562,686	7,911,959	300
BR-25-1	Unnamed stream	585,393	7,900,037	300
Ravn Camp Lake	Unnamed lake ("Ravn Camp Lake")	594,844	7,895,670	160
BR-37-1/CV-R21	Ravn River	595,444	7,894,058	300
BR-46-1	Unnamed stream	596,729	7,886,540	300
Mid-Rail Camp Lake	Unnamed lake ("Nivek Lake")	594,451	7,876,250	160
BR-95-1	Cockburn Lake	592,388	7,818,370	160
Cockburn tunnels camp				160
South Cockburn camp				160
BR-137-1	Outlet stream of ST352	598,662	7,807,979	300
Daily Limit (m ³ /day)				1,500
Annual Limit (m ³ /year)				547,500

Note(s):

- Streams are shaded green, and lakes are shaded blue.
- Dust suppression is considered an open water withdrawal and may occur between June 15 and September 15 (93 days).
- All water stations will not be drawn from daily, so this should not be considered a cumulative water withdrawal volume.

The proposed daily water withdrawals presented in Table 2.4 represent a maximum daily draw associated with each of the water stations. All water stations will not be drawn from daily, so this should not be considered a cumulative water withdrawal volume. The trucks will draw from the closest approved water source up to a daily limit of 1,500 m³/day and an annual limit of 547,000 m³/year, as specified in Part E, Item 25 of the Licence. These daily and annual limits are shared with the approved dust suppression withdrawals associated with the Milne Inlet Tote Road (Tote Road) water stations. These water withdrawals are assessed in Section 4.

2.4 SUMMARY OF NEW WATER WITHDRAWALS

Table 2.4 summarizes the cumulative water withdrawals for domestic and industrial uses, winter road construction, and dust suppression. These cumulative totals are assessed in Section 4.

Table 2.4 Summary of Proposed New Water Withdrawals

Water Station	Waterbody Name	Domestic and Industrial Use		Dust Suppression	Description of Change(s)
		Camps	Winter Road		
		(m³/day)	(m³/season)	(m³/day)	
MS-MRY-1	Camp Lake	657.5	70,000	160	<ul style="list-style-type: none">No change to camp use (remains at 657.5 m³/day)New winter road construction withdrawalDust suppression volume increased from 86 to 160 m³/day
BR-0-1	Mary River	-	-	300	<ul style="list-style-type: none">New dust suppression site
BR-25-1	Unnamed River	-	-	300	<ul style="list-style-type: none">New dust suppression site
Ravn Camp Lake	Unnamed lake (“Ravn Camp Lake”)	245.2	40,000	160	<ul style="list-style-type: none">Camp water withdrawal increased from 145.2 m³/day to 245.2 m³/dayNew winter road construction withdrawalDust suppression volume increased from 86 to 160 m³/day
BR-37-1/CV-R21	Ravn River	-	-	300	<ul style="list-style-type: none">New dust suppression site
BR-46-1	Unnamed stream	-		300	<ul style="list-style-type: none">New dust suppression site
Mid-Rail Camp Lake	Unnamed lake (“Nivek Lake”)	100	-	160	<ul style="list-style-type: none">Camp water withdrawal increased from 79.5 to 100 m³/dayNew dust suppression withdrawal of 160 m³/day
BR-95-1	Cockburn Lake	-	200,000	160	<ul style="list-style-type: none">No overall change to camp water withdrawalNew winter road construction withdrawalNew dust suppression site
Cockburn tunnels camp		212.5		160	
South Cockburn camp				160	

Water Station	Waterbody Name	Domestic and Industrial Use		Dust Suppression	Description of Change(s)
		Camps	Winter Road		
		(m ³ /day)	(m ³ /season)	(m ³ /day)	
BR-137-1	ST352 outlet stream	-	-	300	<ul style="list-style-type: none"> New dust suppression site
ST352 Lake	Unnamed lake	-	50,000	-	<ul style="list-style-type: none"> New winter road construction withdrawal site
10 Km Lake	Unnamed lake	-	50,000	-	<ul style="list-style-type: none"> New winter road construction withdrawal site
Option 2 Unnamed Lake	Unnamed lake	-	50,000	-	<ul style="list-style-type: none"> New winter road construction withdrawal site

3.0 COMMUNITY ENGAGEMENT AND INUIT KNOWLEDGE

3.1 HISTORIC CONSULTATION

Consultation activities related to the Project have been ongoing since 2005, leading to the FEIS (Baffinland, 2012). Volume 2, Appendix 2A of the 2012 FEIS presents the consultation record up to 2012. Additionally, Inuit Qaujimajatuqangit (IQ) collected through interviews and workshops was incorporated in the Steensby Railway and Steensby Port designs and presented in the 2012 FEIS. Feedback expressed by communities and Inuit organizations during the Nunavut Impact Review Board (NIRB) review are summarized in the Final Hearing Report (NIRB, 2012).

There has been continuous engagement for the project since the Project was approved by the NIRB. The summary of engagement activities where the rail was discussed post-FEIS is provided in Table 3.1.

Table 3.1 Summary of Engagement related to the Rail between January 2015 and October 2023

Activity	Description
Public Meetings	23+ Meetings / Open Houses
IQ Workshops	8 in Pond Inlet and 2 in Arctic Bay
Community Group Meetings	80+ Meetings with The Hunters and Trappers Organization's (HTO's) and Hamlets, and others
Nunavut Tunngavik Inc. (NTI) and Qikiqtani Inuit Association (QIA) Meetings	16+ Meetings
Working Groups	21+ Meetings with the Terrestrial Environment Working Group (TEWG), Marine Environment Working Group (MEWG), Socio-Economic Monitoring Report (SEMC), and Socio-Economic Environment Working Group (SEMWG)
Site Visits	Workshops and Community Member Site Visits to the Mary River Project Site 1 Trip to Nain, Labrador 1 Community Risk Assessment Workshop in Trois- Rivières, Québec 2 Community Risk Assessment and IQ Workshops at the Mine Site 1 crossing rail workshop at the Mary River Mine 1 community site visit to the Mary River Mine
Survey	205 Community Members Surveyed
Baffinland Community Liaison Officers (BCLOs)	1 Staffed in each North Baffin Community

3.2 RECENT COMMUNITY CONSULTATION

In 2023, Baffinland reintroduced the Steensby component of the Approved Project to stakeholders, with the following events:

- Community updates on Steensby, Hamlet Councils and HTOs, February 14 to March 30, 2023.
- Steensby Railway and Fisheries Habitat Offsetting Workshop, Hamlet Council Members and HTAs in Igloodik and Sanirajak, May 9-18, 2023.
- Steensby Railway and Steensby Port Workshop, QIA representatives, June 15-16, 2023.
- Steensby Railway and Fisheries Habitat Offsetting Workshop Pond Inlet, Hamlet Council Members, MHTO, and QIA, July 11-12, 2023.
- Steensby Railway and Steensby Port Fisheries Habitat Offsetting Verification Workshops, Mittimatalik HTO and Igloodik and Sanirajak HTAs, October 3-6, 2023.

Fisheries impacts and offsetting has been a focal point for recent engagement. However, this is tied to water use. One theme that emerged from these meetings was that the communities do not want to see natural habitats disturbed unnecessarily as part of offsetting. Also, they wish to see some community benefit accrue from this Project.

3.3 QIA'S 2019-2021 TUSAQTAVUT STUDIES

To understand the potential impacts of the Mary River Project on land use and the Inuit way of life, the QIA worked with the communities of Pond Inlet, Igloodik, Sanirajak, Arctic Bay, and Clyde River to conduct a series of studies (the Tusaqtavut Studies) of Inuit land use. Between 2019 and 2021, 137 community members from these five communities were interviewed. Fishing and freshwater were identified as valued components in the studies.

Figure 3.1 presents the fishing and freshwater valued identified from the interviews during this study. The specific locations of the identified values have been randomized within a 1 km buffer. However, it does suggest that fishing and freshwater values were identified around the Steensby Port, and possibly on the Cockburn River.

3.4 BAFFINLAND'S 2006-2010 INUIT KNOWLEDGE STUDIES

The Mary River Inuit Knowledge Study (MRIKS) was conducted by Baffinland from 2006 through 2010 (KP, 2014). Objectives of the study included obtaining local knowledge of wildlife, land use, and areas of cultural significance to support Project decision-making and the environmental assessment process.

The study included individual interviews with 46 knowledge holders in the three communities of Arctic Bay, Igloodik, and Pond Inlet, and workshops in seven communities: Arctic Bay, Clyde River, Sanirajak, Igloodik, Pond Inlet, Cape Dorset, and Kimmirut. The results of Inuit knowledge studies were incorporated to the FEIS report (Baffinland, 2012) and FEIS Addendum report (Baffinland, 2013) for the ERP. A database was eventually assembled that consists of research agreements, interview questions, audio recordings of interviews, written interview transcripts in Inuktitut and English, and the keyword summaries and maps that were the main products of the study (KP, 2014).

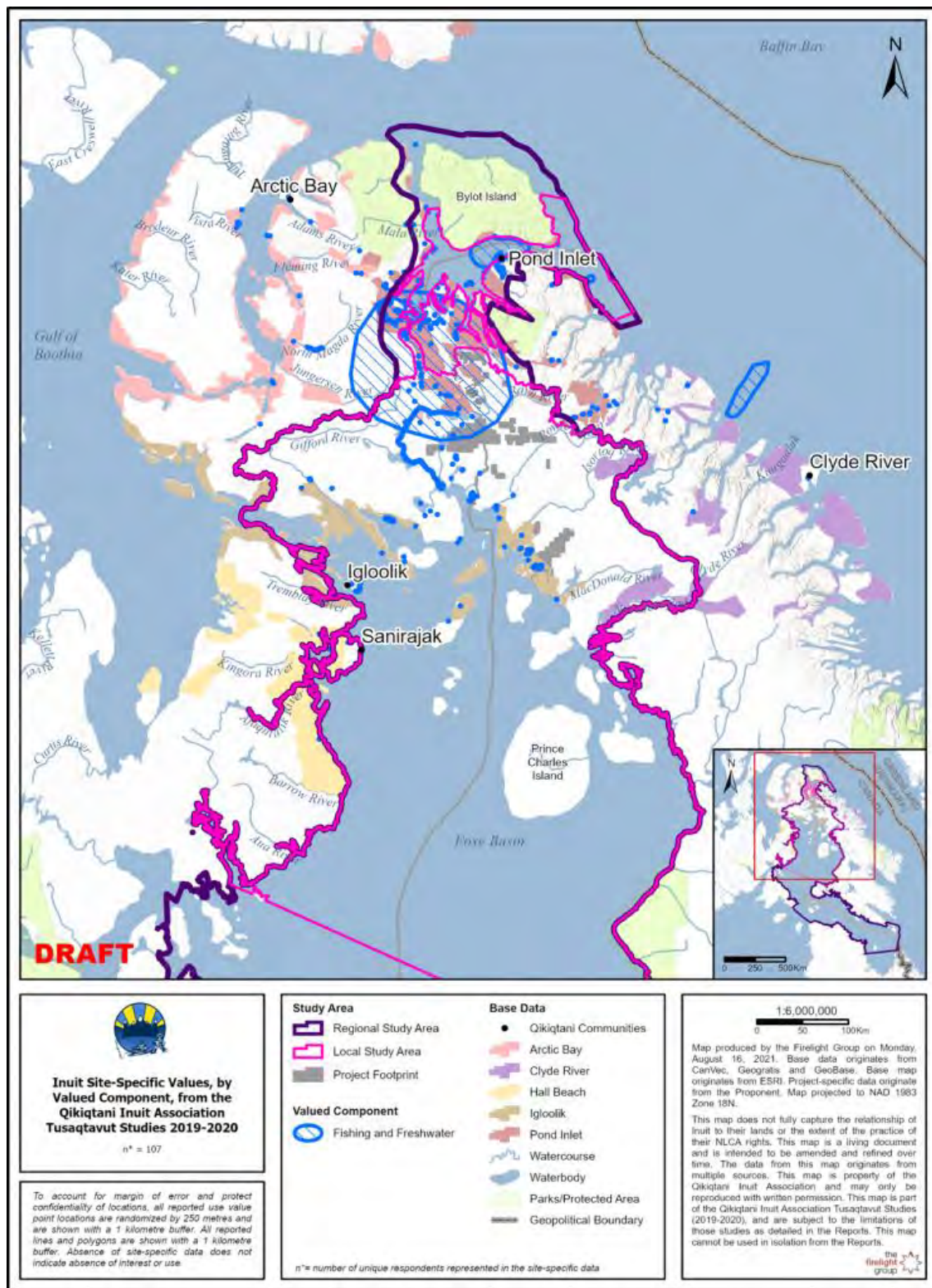


Figure 3.1 Fishing and Freshwater Values Identified in Tusaqtavut Studies

Several interview questions produced information on areas of importance to Inuit. This included questions regarding travel routes and camps, water, and areas important for fishing.

Relevant figures presenting the above information are included in Appendix A, as follows:

- Figure 1.4 Travel Routes - Project Study Area (Interview Results)
- Figure 1.8 Camping Locations - Project Study Area (Workshop Results)
- Figure 1.12 Special Places - Project Study Area (Interview Results)
- Figure 3.20 Water and Ice Features - Project Study Area (Interview Results)
- Figure 5.2 Fish Locations - Project Study Area (Interview Results)

The results of the review are provided below.

3.4.1 THE IMPORTANCE OF WATER

Several study participants stated that good drinking water was of primary importance for well-being, and water is also an important source of food (fish).

It's vitally important you get some water for drinking purposes. But lakes are also important because when I go fishing to a lake and I stay there for a long time and when I become thirsty I can drink the water from the lake. Yea, there are a whole lot of lakes in this area here. For example, the residents of Pond Inlet we go to this lake to go fishing. (PI-03, Pond Inlet)

Several elders emphasized the need to have a good water source near to camp sites.

We made sure to camp nearby water sources such as lakes, rivers and streams so we had water nearby our camp... This has always been one of the case for all time, when choosing a camp site, we had to be sure to have a water source nearby... Lakes and rivers are all important as we camp or live around those for our water source and we fish off the lakes and rivers during the run... Having water is essential to us and water keeps us alive. (Elijah Panipakoocho, Pond Inlet)

We have always had to live nearby lakes for our water source and we even use it as storage or deep freeze with our meat supplies. This lake is where the river runs from where we fish. ... These lakes are very, very important to me. Some campers camp where there are no lakes, and in early fall they have no water source at all, so it is important to live or camp nearby lakes. (Ikey Kigutikkarrjuk, Arctic Bay)

While out on the land, hunters and travellers consume water from ice, snow, lakes and rivers. In winter, snow is relied upon as a water source. Water from glaciers was identified by many study participants as the best available water.

Only when you have good drinking water are you more lively and when you don't have good drinking water it is unpleasant and you always look for a source of good drinking water... When you're at Qaurnak in the summertime and the icebergs arrive you have an excellent source of drinking water... When we were camping out there we had excellent drinking water. Water is very important to our livelihood. (Jochabed Katsak, Pond Inlet)

Our waters are frozen for longer periods of time. There is a lot of snow that we can also use for water. They are clean as they are frozen more than half the time. Outside of the community there are lakes that have clean water. Lakes up here freeze often and there is an abundance of it to be used for

drinking. There is a lot of that in our environment. We can get our water anywhere. We can either use ice or snow. (AB-13, Arctic Bay)

The lakes and rivers are an important source of food, fish are caught from their depths and mammals are hunted from the water. During the open water period, major rivers are generally preferred over smaller watercourses, and in particular, rivers with a gravel bottom, with an awareness that smaller streams or streams with finer substrate (and hence lower flow) are more likely to contain harmful bacteria. Inuit commonly observe the water to see if it is foggy or murky, since it is believed that clear water is the best water to consume.

After there's no longer some ice we didn't just fetch water from ordinary streams but major rivers seemed to have better drinking water source and also rivers have little germs... we were discouraged from drinking from small streams or lakes. Only we were told to drink water from major rivers such as if the river had gravel bottom. That's a very good drinking water and everyone has known that for a long time... if it's for making tea then you can easily identify if it's poor source of drinking water and the tea tends to turn black and you can tell that it is not good drinking water by sampling the tea you can notice it right away so tea is an excellent source of identifying the quality of drinking water because they tend to turn black and then you know. (Jochabed Katsak, Pond Inlet)

Tea is said to be a good indicator of water quality. Also, nowadays people reportedly boil their water before consuming.

3.4.2 INUIT USE OF WATER ALONG STEENSBY RAILWAY AND STEENSBY PORT

Based on review of the IQ study figures in Appendix A, travel routes exist alongside the first 37 km of railway from the mine to the Ravn River. The Ravn River crossing (BR37-1) area is where trails connect the Mary River area to destinations to the east and northeast towards Clyde River (Figure 1.4 in Appendix A). From this point south, several crossings were identified between the Ravn River (KP 37) and the north end of Cockburn Lake (KP 95), and then again between the south end of Cockburn Lake (KP 125) and Steensby Port (KP 149). Few camps were identified along the length of the railway (Figure 1.8 in Appendix A). No waters of importance were identified along the railway during the study (Figure 3.20), though Cockburn Lake and River are known to support fish populations (Figure 5.2 in Appendix A).

There are, however, several camps identified on the coast in the vicinity of Steensby Port (Figure 1.8 in Appendix A). The remains of an old camp belonging to an Iglulingmiut are located adjacent to the port area.

The 100 m long Ikpikitturjuak River within the port area was identified as a river of importance on Figure 3.20 in Appendix A). The Ikpikitturjuak River connects the unnamed lake identified as ST347 or 10KM Lake in the water licence with the ocean. This river and lake support an anadromous char population and was studied in the 1980s for its potential as a commercial fishery (North/South Consultants Inc. [NSC], 1987). The Steensby Port coastal area was identified as a camp location and a collection area for significant resources (Figure 1.12 in Appendix A).

It is acknowledged that the results of the study show patterns of land use and local knowledge of the land, and that the information collected, and maps are not a complete representation of what is known.