UPDATED AQUATIC EFFECTS MONITORING PROGRAM FRAMEWORK

DECEMBER 2013

TABLES

FIGURES

SCHEDULES

1 INTRODUCTION

The Aquatic Effects Monitoring Program (AEMP) will aim to address issues identified during the environmental assessment (EA) process that could potentially affect the aquatic receiving environments surrounding the project development. Building from earlier baseline monitoring, the AEMP describes the general monitoring strategy designed to detect effects to the freshwater aquatic environment.

The AEMP is a monitoring program designed to:

- Detect short-term and long-term effects of the Project's activities on the aquatic environment resulting from the Project
- Evaluate the accuracy of impact predictions
- Assess the effectiveness of planned mitigation measures
- Identify additional mitigation measures to avert or reduce environmental effects

The AEMP addresses key issues identified in the Final Environmental Impact Statement (FEIS) that have the potential to affect the freshwater environment valued ecosystems components (VECs). The freshwater VECs are:

- Water quantity
- Water and sediment quality
- Freshwater biota and fish habitat

Baffinland has implemented mitigation measures to minimize adverse effects. Several management and monitoring plans are intended to inform the "adaptive management" process, which relies on the early identification of potential problems and the development of additional mitigation options to address these potential problems.

The AEMP is designed to detect project-related impacts at temporal and spatial scales that are ecologically relevant (i.e., on a basin spatial scale). The program targets flows, water and sediment quality, primary productivity (phytoplankton), benthic community structure and fish (specifically Arctic Char) within the streams and lakes potentially affected by project activities.

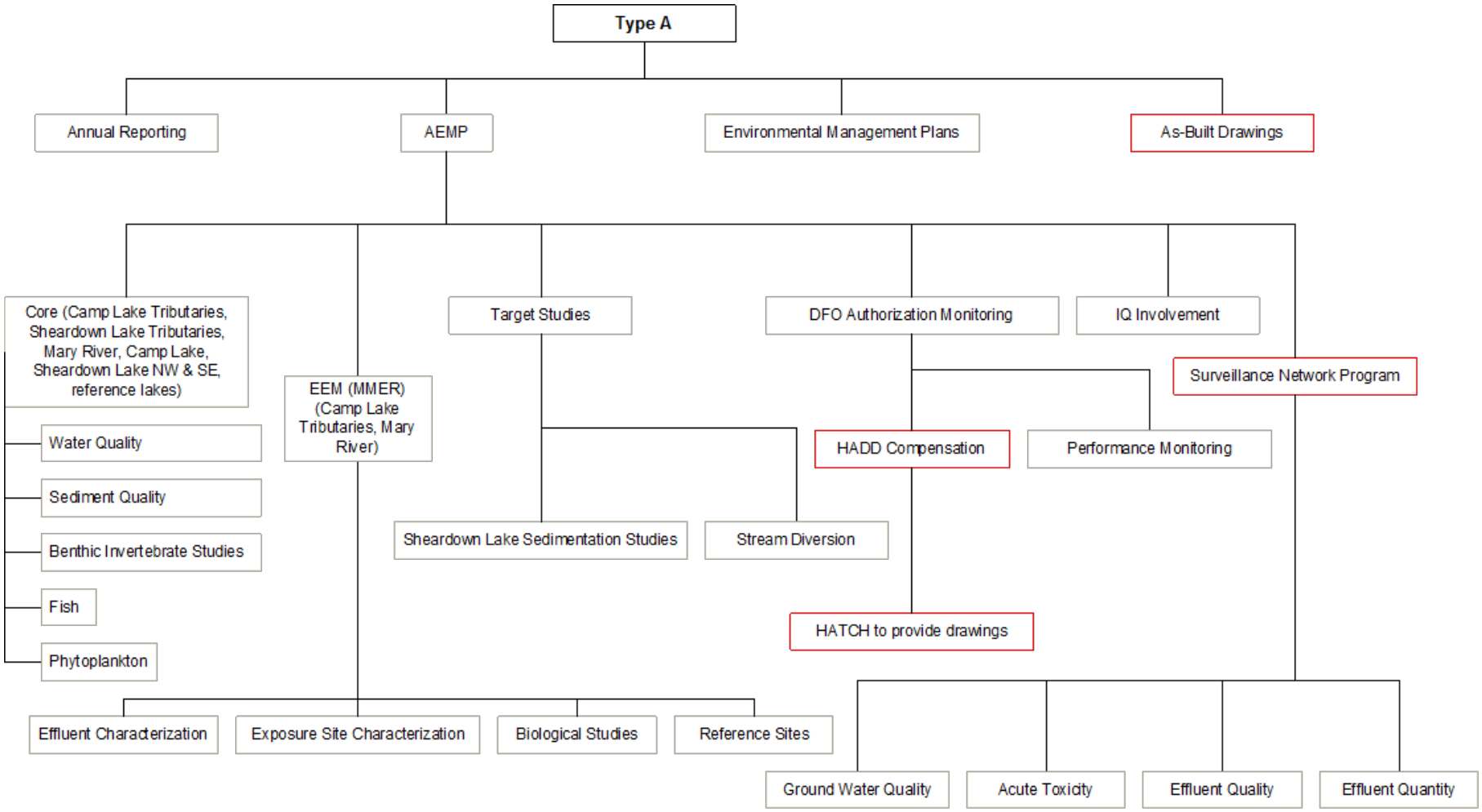
The proposed approach is to structure the AEMP to serve as an overarching 'umbrella' into which the results of all related monitoring programs for the approved Type A Water Licence are captured (NWB, 2013).

Based on the definition of water management areas established by the Nunavut Water Regulations, the Mary River Project is located within two water management areas:

- Eclipse Sound Water Management Area # 48 basically encompasses Baffinland's land lease on Inuit Owned Land. It encompasses all facilities at Milne Inlet, the Tote Road, the Mine Site and the northern portion of the Railway.
- Gifford Water Management Area # 21 encompasses the southern portion of the Railway and the Steensby Port facilities.

The AEMP will be implemented in two phases. Phase I has been initiated under this AEMP Framework with the issuance of the Water Licence (NWB, 2013) and deals with construction phase of the project and non-mining related activities. This document describes the conceptual AEMP framework presented on Figure 1.1.

Figure 1.1 AEMP Framework



Phase II will be implemented with the start of the mining operation as described in the future AEMP Plan.

This AEMP Framework is an update of an earlier AEMP Framework prepared in February 2013. This update includes the following additional information:

- Updates to the text and schedules to reflect the contents of the Type A Water Licence issued to Baffinland
- Summaries of the outcome of the baseline integrity reviews completed on the various aquatic components of the AEMP
- Information on reference stream and lake work completed in 2013
- An updated EEM study design summary based on exposure site and reference site characterization work completed in 2013
- Details of a lake sedimentation monitoring study completed in 2013

Baffinland notes that an addendum to its FEIS (the FEIS Addendum; Baffinland, 2013) is currently under review that if approved will permit the company to transport 3.5 Mt/a of iron ore out of Milne Port during the open water season. Baffinland intends to capture this potential project change in the future AEMP Plan prior to mine operation.

2 ISSUES AND CONCERNS ASSOCIATED WITH THE PROJECT

2.1 INTRODUCTION

Potential effects on aquatic ecosystems are presented below for each of the Project components within the two geographical areas for the construction and operation phases of the Project. Since abandonment and reclamation activities are similar in nature to construction activities, the concerns identified for the construction phase are also relevant for the closure phase.

2.2 MINE SITE (WATER MANAGEMENT AREA 48)

The Mine Site includes the infrastructure required to support mining activities (camp, maintenance shops, fuel depots, wastewater treatment facility (WWTF), laydown areas, waste handling and storage facilities, landfill site and landfarm, explosives storage, manufacture and use). The freshwater supply for the Mine Site will be drawn from Camp Lake (Schedule 1). Two quarries will be developed within the Mine Site area to provide aggregate material for the site development.

Potential aquatic effects at the Mine Site are listed in Table 2.1.

2.3 MILNE PORT (WATER MANAGEMENT AREA 48)

The construction period at Milne Port began in the summer of 2013 following issuance of the Type A Water Licence (NWB, 2013). Milne Port will serve as the main staging areas for material and equipment required for the construction activities at the Mine Site and the northern section of the railway. The site includes the airstrip, fuel depots, camp and WWTF, laydown areas, maintenance facilities, and, temporary waste transit areas. Two sites have been identified for the fresh water supply for this facility (Schedule 1). Two quarries will be developed to provide aggregate for the site development.

At Milne Port, all site drainage is channeled to a central ditch that discharges into Milne Inlet. Treated sewage effluent as well as treated oily water effluent also discharge to this ditch at a distance of approximately 200 m from the Milne Inlet shoreline. As a result, site drainage and effluent discharge have no effects on the freshwater receiving environment. The original location of this ditch will be relocated to the east as a result of the final development plan for Milne Port.

The concerns for potential freshwater aquatic effects during the construction, operation and closure of the Milne Port site are listed below:

<u>Water Quantity</u>

- Withdrawal of water from Philips Creek (summer) and KM 32 Lake (winter)

<u>Water and Sediment Quality</u>

- Quarry management (runoff quality, ARD potential, residual ammonia from blasting activities)
- Construction of water intakes - TSS/turbidity
- Spills caused by accidents and malfunctions

Freshwater Biota and Fish Habitat

- Low magnitude effects to fish and fish habitat related to water quality changes

The discharge criteria for the effluent and runoff water quality are presented in Schedule 2. The precise coordinates for the location of all controlled discharges from the Milne Port site are presented in Schedule 3.

2.4 TOTE ROAD (WATER MANAGEMENT AREA 48)

The Milne Inlet Tote Road connects Milne Port to the Mine Site. All material received at Milne Port will be transported by truck on the Tote Road. Realignment and re-grading of some road sections will be required. Select water crossings may be rebuilt as part of the ongoing maintenance of the road. A number of borrow pits have been identified along the Tote Road that will provide the necessary aggregate and material for ongoing road maintenance and road improvement.

The concerns for potential aquatic effects during construction, operation and closure of the Tote road are related to:

Water and Sediment Quality

- Dustfall from road traffic and related effects on water quality
- Drainage management from borrow pits

Freshwater Biota and Fish Habitat

- Construction and ongoing maintenance of stream crossing
- Changes in water quality that may affect biota
- Bank erosion, stability, blockage, integrity of the water crossings, fish passage

2.5 RAILWAY (WATER MANAGEMENT AREAS 48 AND 21)

Ore will be transported from the Mine Site to the Steensby Port by railway. The concerns for potential aquatic effects occur mainly during the construction period of the railway embankment. Four construction camps (with sewage treatment plant and waste incinerators) will be established at the onset of the construction period. Sewage effluent from these camps will be transported by truck to either the Mine Site or the Steensby Port sewage treatment facilities for treatment. There will be no local discharges of treated effluent (trucked to Steensby or Mine site sewage treatment plant). Domestic water supply and water required for construction activities will be drawn from a number of local lakes (Schedule 1). A number of quarries will be developed along the railway alignment in order to provide the necessary rock and aggregate required for the rail embankment, stream crossing and bridge construction.

The concerns for potential aquatic effects during construction, operation and closure of the railway are related to the loss or alteration of fish habitat:

Water Quantity (Potable Water and Construction Activities)

- Water withdrawals affecting downstream flows

Water and Sediment Quality

- Surface runoff water quality (TSS, spills, dust from traffic)
- Quarry management (runoff water quality, TSS, ARD, blasting and ammonia)

Table 2.1 Potential Residual Effects to the Mine Site Aquatic Environment

VEC	CONCERN	PATHWAY	INDICATOR
Water Quantity	Withdrawal of water from Camp Lake		Volume withdrawn
	Flow diversion from Sheardown Lake		Visual – water level
Water and Sediment Quality	Earthworks	Surface runoff discharging to Camp Lake, Sheardown Lake, lake tributaries and Mary River	TSS, dust, spills
	Construction activities		TSS, dust, spills
	Site drainage		TSS, dust, spills
	Quarry site drainage		TSS, dust, spills, residual ammonia
	Fuel tank farms	Discharges from secondary containment areas to receiving environment – surface drainage	Hydrocarbons
	Waste storage area		Metals
	Bermed storage area		Metals, hydrocarbon
	Landfarm		Metals, hydrocarbon
	Landfill		Metals, hydrocarbon
	Treated Sewage Effluent (exploration camp)	Outfall to Sheardown Lake	BOD, TSS, nutrient
	Treated Sewage Effluent (main camp)	Outfall to Mary River	BOD, TSS, nutrient
	Treated Effluent from Oily Water Treatment Plant	Outfall to Mary River	TSS, hydrocarbon
	Waste rock stockpile drainage	Discharge to Camp Lake tributary	TSS, metals, nutrients
	Waste rock stockpile drainage	Discharge to Mary River	TSS, metals, nutrients
	ROM stockpile drainage	Discharge to Mary River	TSS, metals, nutrients
	Ore stockpile drainage	Discharge to Mary River	TSS, metals, nutrients
	Mine pit dewatering	Discharge to Camp Lake tributary	TSS, metals, nutrients/blasting residues
	Mine pit water post closure	End of life mine life pit water quality	Metals
	Dust	TSS in runoff	TSS
Freshwater Biota and Fish Habitat	Footprint of facilities in water bodies – water crossings	Loss of habitat – crossing of Mary River , Camp Lake tributaries	Habitat compensation
	Integrity of water crossing	Alteration of habitat	Erosion, blockage
	Fish passage	Alteration of habitat	Blockage, barrier
	Water diversions – changes in streams	Alteration or loss of habitat	Low flow and barrier to fish passage
	Changes in water and sediment quality (point and non-point sources)	Effects on Arctic Char health and condition; effects on lower trophic level biota (Arctic Char habitat)	Arctic char health and condition; population metrics; benthic invertebrate community metrics
	Dust Deposition	Alteration of habitat	Increased sediment deposition in streams and lakes Benthic invertebrate community metrics
		Deposition on Arctic Char eggs – reduced egg survival	Sedimentation rates in Arctic Char spawning habitat
Groundwater quality	Landfill	seepage in groundwater	Metals

Freshwater biota and fish habitat

- Stream/river crossings - flow velocity, TSS, erosion, fish stranding, fish passage and integrity of the water crossing
- Lake and river encroachment - loss of habitat, TSS (construction)
- Changes in water quality (e.g., dust, sewage effluent) - effects on Arctic Char health and condition/habitat
- Blasting near water (blasting overpressure) along Cockburn Lake

2.6 STEENSBY PORT (MANAGEMENT AREA 21)

The iron ore will be sized and stockpiled at Steensby Port prior to being loaded into the ore carriers for shipment. Steensby Port will contain large infrastructure required for ongoing support of the Port, the railway operation as well as the mine. The infrastructure at Steensby will include an airstrip, maintenance facilities (vehicles and railway), fuel depots, camps, a WWTF, warehouses, laydown areas, waste handling and storage facilities, landfill site, landfarm, explosives storage facilities, a freight dock, an ore stockpile and the ore loading dock. The freshwater supply for the Steensby Port will be drawn from two local lakes (Schedule 1). Two quarries will be developed to provide aggregate for the development of the site.

At the Steensby site, surface drainage will be directed toward Steensby Inlet. Treated sewage effluent and treated oily water will discharge to Steensby Inlet via an outfall at a 35 m depth. As a result, site drainage and effluent discharge have minimal effects on the freshwater receiving environment.

The concerns for potential freshwater aquatic effects during the construction, operation and closure of the Steensby port are related to:

Water Quantity

- Withdrawal of water from 3 KM Lake (dust suppression and other minor uses) and ST347 Lake (permanent camp)

Water and Sediment Quality

- Quarry management (runoff quality, ARD potential, residual ammonia from blasting activities)
- Construction of water intakes - TSS/turbidity
- Spills caused by accidents and malfunctions

Freshwater Biota and Fish Habitat

- Stream/river crossings - flow velocity, TSS, erosion, fish stranding, fish passage and integrity of the water crossing
- Lake and river encroachment - loss of habitat, TSS (construction)
- Construction of water intakes - avoidance of spawning areas

The discharge criteria for the effluent and runoff water quality are presented in Schedule 2. The precise coordinates for the location of all controlled discharges from the Steensby Site are presented in Schedule 3.

3 PROBLEM FORMULATION FOR AQUATIC EFFECTS MONITORING

3.1 WATER QUANTITY

Article 20 Inuit Water Rights of the Nunavut Land Claims Agreement (NLCA) formally recognizes the importance of water quantity and flow to the Inuit. Under the NLCA, Inuit require compensation if a project or activity will substantially affect the quantity of water flowing through Inuit-Owned Lands. Therefore, water quantity has been identified as a VEC. The water quantity VEC can be defined as the spatial and temporal variability of the volume of water within the RSA that may be subject to alteration by Project activities.

Conditions applying to water use and management have been outlined in Part E of the issued water licence (NWB, 2013). These conditions will be adhered to throughout the life of the Project and applicable timeframe of this licence. Baffinland will not exceed 1,589 m^3/day and 580,000 m^3/year total water use from all sources during the construction phase of the Project. During the operation phase of the Project Baffinland will not exceed 630 m^3/day or 230,000 m^3/year for total domestic camp and industrial water use from all sources. All water sources for the Project are summarized in Schedule 1 with their associated co-ordinates (in degrees, minutes and seconds of latitude and longitude) as required by Part I (7) of the water licence (NWB, 2013).

Key Issues and Pathways for Water Quantities

Key issues identified for freshwater quantity are listed below:

- Water Withdrawal
- Water Diversion (stream diversion or changes to flow patterns in a specific watershed)
- Drainage flows (runoff) or effluent discharge

Key Indicators and Benchmarks

The key indicators for water quantity are listed below:

- Water withdrawn for consumption

The benchmarks are the water quantities authorized under the Type A Water Licence, which are presented in Schedule 1.

Diversions, Drainage Flows (Runoff) and Effluent Discharges

Diversions, drainage flows and effluent discharges are mainly impacted at the Mine Site and have potential effects on fish habitat due to reduction or increase in flows that result from the site development. This is discussed in Section 3.3.1.

3.2 WATER AND SEDIMENT QUALITY VEC

Key Issues and Pathways

Key issues considered for the surface water and sediment quality VEC are summarized in Table 3.1.

Table 3.1 Key Issues for Water and Sediment Quality at the Mine Site

PATHWAY	KEY ISSUES	LOCATION	PROJECT PHASES
Surface runoff	Uncontrolled runoff at construction site Erosion and sediment entrainment Site drainage control Spills and contamination Drainage from quarry sites	All	Construction Operation Closure
Discharges from secondary containment	Fuel depots/storage - contact water may be contaminated with hydrocarbon/petroleum products	Milne Port, Mine Site, Railway construction, Steensby Port, Quarry sites	Construction Operation Closure
Discharge of brine used for drilling in permafrost	Salinity of the discharge	Railway tunnels	Construction
Pooling water in landfarm	Pooling water maybe contaminated with hydrocarbon/petroleum product and may require treatment prior to discharge	Milne Port Mine Site Steensby Port	Construction Operation Closure
Pooling water in landfill	Pooling water maybe contaminated with metals, hydrocarbon/petroleum product and may require treatment prior to discharge	Mine Site Steensby Port	Construction Operation Closure
Treated sewage effluent discharges	Effectiveness of treatment - pH, flows, Biological oxygen demand (BOD), Faecal Coliform (FC), TSS, nutrient, metals, oil and grease	Sheardown Lake Mary River outfall	Construction Operation Closure
Treated oily water treatment plant discharge	Effectiveness of treatment - pH, flows, TSS, metals, oil and grease	Mary River outfall	Construction Operation Closure
Dustfall	TSS in runoff, sediment deposition on stream and lake bottoms	Mine Site	Construction Operation Closure
Run of mine ore stockpile contact water	Metals, TSS	Mary River	Operation
Ore stockpile contact water	Metals, TSS	Mary River	Operation
Mine pit dewatering	Metals, TSS, blasting residue (ammonia)	Camp Lake Tributary	Operation
Waste rock stockpile runoff – west pond	ARD, metals, TSS, blasting residue (ammonia)	Camp Lake Tributary	Operation Closure Post-closure
Waste rock stockpile runoff – east pond	ARD, metals, TSS, blasting residue (ammonia)	Mary River	Operation Closure Post-closure
Mine pit water	ARD, metals	Mine pit	Post-closure

Key Indicators and Benchmarks

For the detection of potential effects on the water and sediment quality VECs, the list of key indicators that are considered to be the most relevant and important elements of the VECs are separated into four categories as follows:

- General Parameters
- Metals
- Nutrients
- Petroleum Hydrocarbons

The benchmarks identified represent a level of change where adverse effects may be expected to occur. In the case of water and sediment quality, it is important to note that the benchmarks do not relate to water or sediment quality in itself, but rather to known effects on aquatic receptors that rely on water and sediment to exist.

The benchmarks used for the identification of potential aquatic effects on the water and sediment quality VECs will be developed as described in Section 9.

3.3 FRESHWATER AQUATIC BIOTA AND HABITAT

Key Issues and Pathways

Arctic Char (*Salvelinus alpinus*) are the primary freshwater biota of interest regarding potential effects of the Project on the aquatic environment. Potential linkages between the Project components/activities and Arctic Char are presented on Figure 3.1. These linkage pathways can be categorised into three key issues as follows:

- Key Issue #1: Potential effects on the health and condition of Arctic Char
- Key Issue #2: Potential effects on Arctic Char habitat
- Key Issue #3: Potential effects on direct mortality of Arctic Char

Key Indicators and Benchmarks

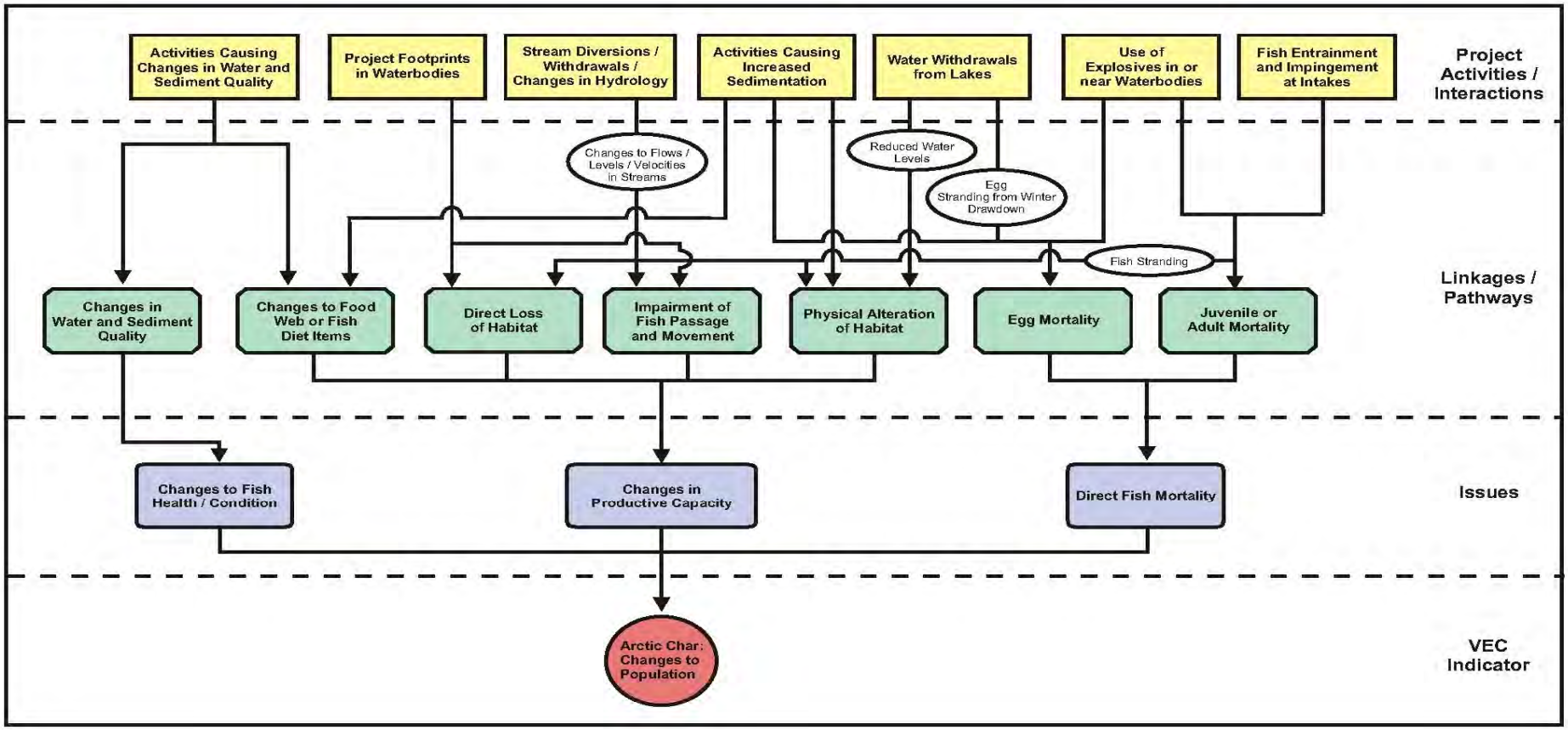
3.3.1 Potential effects on the Health and Condition of Arctic Char

Project-related changes in water and/or sediment quality have the potential to affect the health and condition of Arctic Char. The major pathways of effects are based on the residual effects identified in the water and sediment quality assessment. Linkages considered for potential effects include three general categories:

- Point source discharges (treated sewage effluent, waste rock stockpile runoff, ore stockpile runoff, mine pit water, run of mine stockpile runoff, and exploration drilling runoff)
- Aqueous non-point sources (NPS; including effects related to sediment and erosion, release of blasting residues, general site runoff, development of quarries and borrow pits)
- Dust emissions and introduction to surface waters

Effects considered under this key issue relate to sub-lethal effects of Project-related changes in water and/or sediment quality on fish health and condition.

The key indicators are Arctic Char length/weight, age, condition and CPUE. A discussion regarding potential benchmarks for this indicator is presented in Section 9.4.



BAFFINLAND IRON MINES CORPORATION		
MARY RIVER PROJECT		
LINKAGE DIAGRAM ILLUSTRATING PROJECT ACTIVITIES/PATHWAYS OF POTENTIAL EFFECTS - ARCTIC CHAR		
NORTH/SOUTH CONSULTANTS INC.	P/A NO. NB102-181/33	REF. NO. NB13-00586
	FIGURE 3.1	REV 0

3.3.2 Potential Effects on Fish Habitat

Project activities with the potential to affect Arctic Char habitat include the following:

- Placement of Project infrastructure in water bodies (e.g., water intakes, sewage outfalls, stream crossings, lake encroachments, laydown areas)
- Various Project-related effects pathways that may alter other aquatic biota that are food sources for Arctic Char or form a component of the food web and thus may affect the productive capacity of their habitat (i.e., lower trophic level biota)
- Project-related effects on sedimentation rates that may result in alteration of habitat quality (e.g., due to dust deposition)
- Project-related changes to hydrology and subsequent effects on aquatic habitat (e.g., water withdrawal, stream diversion)
- Project-related effects on fish passage, with subsequent effects on the availability of habitat, including:
  - Stream crossing construction and operation
  - Changes in hydrology that may alter hydraulic conditions necessary for fish passage (e.g., stream velocities, water depth)

Most of these key issues relate to construction activities in or near water bodies.

The following changes are associated with mine site development:

- Water withdrawn from Camp Lake for domestic and industrial consumption will be discharged (after treatment) to the Mary River
- Water withdrawal from Camp Lake will affect lake water levels and outflow discharge
- Drainage patterns where the Mine site infrastructures/facilities are located will be altered. Most site runoff will be redirected to Mary River. As a result, less runoff will discharge to Sheardown Lake and Camp Lake. Tributaries of Sheardown Lake will be impacted. Lower flows may create barriers to fish passage.
- Mine pit dewatering will be directed to the waste rock sedimentation pond which discharges into a Camp Lake tributary, thus diverting flows from the Mary River

The key indicators for potential effects on Arctic Char habitat are as follows:

- Benthic invertebrate community – metrics may include densities and indices such as Chironomidae proportion, Shannon`s Equitability, Simpson`s Diversity index, and total taxa richness
- Primary productivity - Chlorophyll *a*
- Arctic Char - length/weight, age, condition, CPUE

A discussion regarding potential benchmarks for this indicator is presented in Section 9.4.

3.3.3 Potential Effects on Direct Fish Mortality

Project-related activities with the potential to cause direct mortality of Arctic char that are considered include the following:

- Effects of sedimentation on mortality of eggs
- Potential egg stranding related to winter drawdown at water source lakes
- Blasting in or near Arctic Char habitat
- Placement of Project infrastructure in Arctic Char habitat (i.e., potential spawning areas)
- Potential for entrainment and/or impingement of Arctic Char eggs and juveniles at water intakes
- Potential fish stranding related to water diversions and/or alterations in discharge or water levels

Potential effects of sedimentation on survival (hatching success) of Arctic Char eggs will be addressed through monitoring sediment deposition rates in Sheardown Lake as a target study (see Section 8). Potential for winter drawdown to cause egg stranding will be addressed through monitoring of water levels as the primary indicator, supported by information on Arctic char population monitoring (e.g., year class strengths, recruitment). Potential effects of blasting in or near Arctic Char habitat is addressed through the blasting management and monitoring program (see Section 4.11). The potential for placement of Project infrastructure to cause direct mortality of Arctic Char (i.e., placement of infrastructure on fish eggs) is addressed through mitigation and management, specifically through avoidance of potential spawning areas and/or by adherence to timing windows to avoid the egg incubation period. Potential for entrainment and impingement of fish at water intakes will be mitigated through adherence to Department of Fisheries and Oceans (DFO) Freshwater intake end-of-pipe fish screen guideline (DFO, 1995). The last potential pathway of effect will be addressed through a follow-up target study to confirm fish passage at Mine area streams affected by water diversions (see Section 8.1.2).

Key indicators for potential effects on direct fish mortality may include sedimentation monitoring, water level monitoring, monitoring during blasting and follow up monitoring at the mine site tributaries.

3.3.4 Potential Effects of Blasting on Fish

Blasting will be conducted to support the construction and operation phases of the Project. DFO "Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters" (Wright and Hopky, 1998) are intended "*to provide information to proponents on the conservation and protection of fish, marine mammals, and their habitat from impacts arising from the use of confined or unconfined explosives in or near Canadian fisheries waters*." As indicated by Wright and Hopky (1998), "*the detonation of explosives in or adjacent to fish habitat has been demonstrated to cause disturbance, injury and/or death to fish and marine mammals, and/or the harmful alteration, disruption or destruction of their habitats, sometimes at a considerable distance from the point of detonation*."

The concern for potential effects due to blasting overpressure mainly arises for the railway construction along Cockburn Lake where significant blasting is required for the following project components:

- The railway embankment on the east flank of Cockburn Lake
- The tunnel construction

The key indicator for potential effects will be determined according to the DFO decision regarding the application for authorization under the *Fisheries Act*.

3.3.5 Stream and River Crossing Construction and Lake Encroachments

Construction of watercourse crossings along the railway, railway access road, and Milne Inlet Tote Road have the potential to cause the following effects:

- Stranding of Arctic Char due to the need for isolation of the watercourses. This effect will be mitigated through the use of appropriate timing windows for construction when possible and through fish salvage operations when required.
- Potential impediments to fish passage at stream crossings due to changes in water levels, flows and/or velocities. This potential pathway of effect would be addressed through follow-up monitoring at selected stream crossings (i.e., a subset) to evaluate fish passage. This monitoring is described in detail in Section 4.15.5.

4 AEMP RELATED MONITORING PROGRAMS

This section presents an overview of environmental monitoring that relates to and supports the AEMP.

4.1 METEOROLOGICAL STATIONS

Three meteorological stations have been established, one each at the mine site, Steensby Port, and Milne Port locations. The stations record air temperature, relative humidity, precipitation, wind direction, and wind speed. Data collected from the meteorological stations are establishing a climatic record in key project areas.

4.2 SITE HYDROLOGY

Stream flow has been monitored at the Mary River Project since 2006, with up to 16 seasonal stream gauges operated at various times on smaller river/creek systems, and 4 year-round hydrometric stations operated by the Water Survey of Canada since that time.

Table 4.1 summarizes the stream flow record.

A long-term hydrological record does not exist for the North Baffin Region. Stream flow data has been collected at the Project site since 2006. Baffinland continues to operate seven seasonal stream gauges, six of which are located in the vicinity of the mine site (Figure 4.1) and include the following stream gauges relevant to the AEMP:

- Camp Lake Tributary 1 – which will receive mine effluent from the west pond (Station H05)
- Mary River – which will receive mine effluent from the east pond, ROM pond and ore stockpiles along with treated sewage effluent from the camp (Station H06)
- Sheardown Lake Tributary 1 – which will experience decreased flows due to diversions associated with the west pond (Station H11)

The data quality to date has been good though the record is relatively short. Baffinland has committed to maintaining a hydrometric network as the project moves forward.

4.3 AIR QUALITY MONITORING

The Air and Noise Abatement Management Plan provides guidance on management of air emissions and noise from construction and operation activities. The plan also describes the air quality monitoring that will be carried out for the Project.

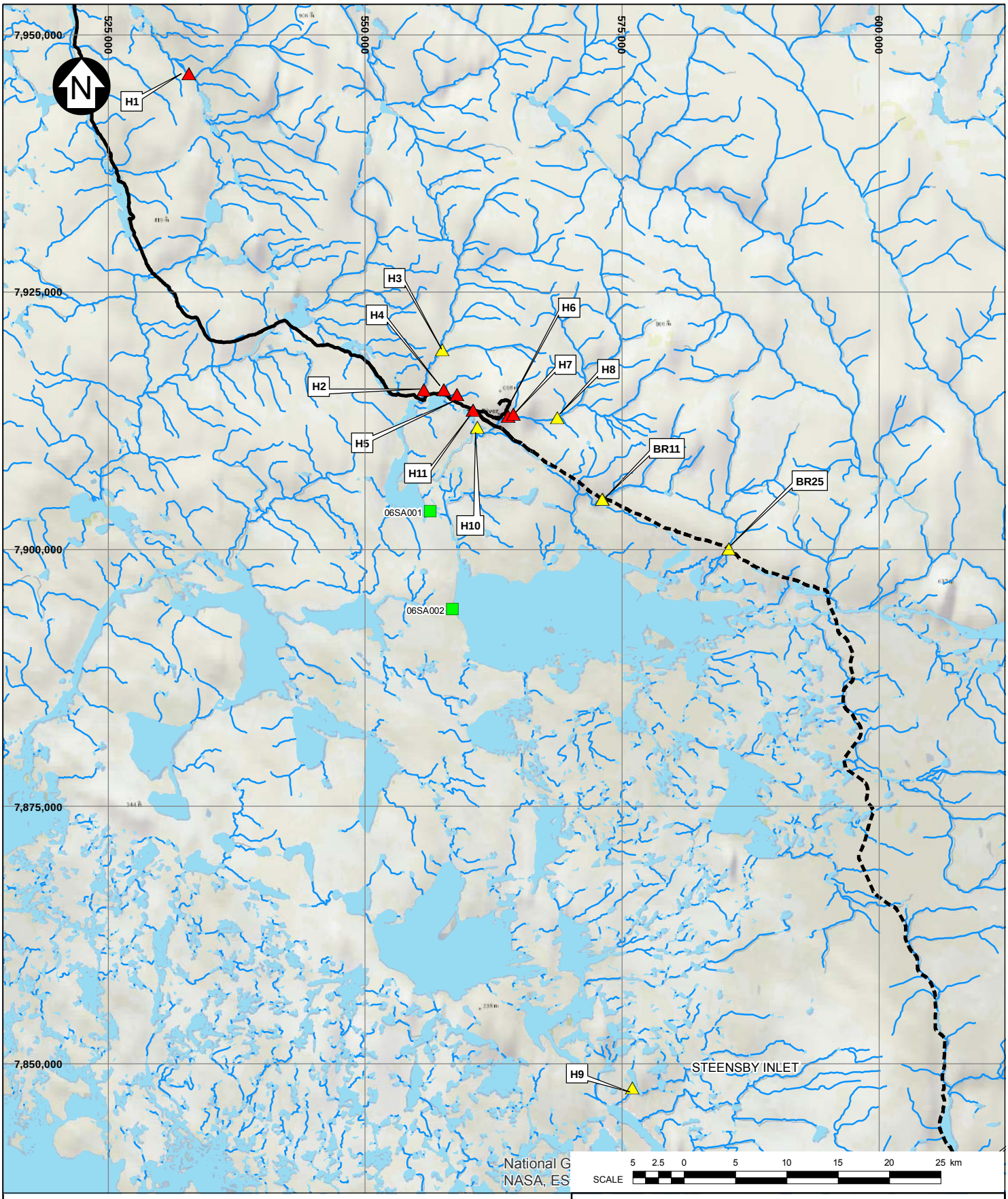
Passive and active air quality monitoring will be conducted at Milne Port, the Mine Site and Steensby Port. Active monitoring will involve measuring total suspended particulate (TSP) in areas of activity at the mine site and Steensby Port. Passive sampling will include collecting sulphur dioxide (SO_2), nitrogen dioxides (NO_2), ozone (O_3), and dustfall samples simultaneously.

During both construction and operation, the monitoring program will focus on TSP and dust deposition. Air quality data will be collected via active (TSP) and passive sampling methods (SO_2, NO_2, O_3, and dustfall, including metal deposition). Snow-core sampling will be used to determine dust fall at specified locations. Dustfall monitoring is being conducted at transects along the Milne Inlet Tote Road. Emission testing is being conducted on Project incinerators. The approach, indicators, thresholds and proposed response actions are described in the Air and Noise Abatement Management Plan.

Table 4.1 Project Stream Gauging Record

STATION ID	STATION TYPE	PERIOD OF RECORD	DRAINAGE AREA (km^2)	COORDINATES (UTM)		
				Zone	Easting	Northing
H01	Stream flow	2006-2008, 2011-2013	250	17W	532831	7946247
H02	Stream flow	2006-2008, 2010, 2012, 2013	210	17W	555712	7915514
H03	Stream flow	2006-2008, 2010	30.5	17W	557485	7919401
H04	Stream flow	2006-2008, 2010, 2012, 2013	8.3	17W	557639	7915579
H05 (Camp Lake Tributary L1)	Stream flow	2006-2008, 2010-2013	5.3	17W	558906	7915079
H06 (Mary River)	Stream flow	2006-2008, 2010-2013	240	17W	563922	7912984
H07	Stream flow	2006-2008, 2011, 2013	14.7	17W	564451	7913194
H08	Stream flow	2006-2008	208	17W	568732	7912881
H09	Stream flow	2006-2008	158	17W	576011	7847687
H10	Water Level	2008	8.2	17W	560905	7911838
H11 (Sheardown Lake Tributary)	Stream flow	2011-2013	3.6	17W	560503	7913545
H12	Water Level	2011, 2012	-	17W	597867	7800065
BR11	Stream flow	2008, 2012	53	17W	573122	7904914
BR25	Stream flow	2008, 2012	113	17W	585420	7900082
BR96-2	Stream flow	2008, 2012	31	17W	609300	7839474
BR137	Stream flow	2008,2010-2012	314	17W	598663	7807981
Isortoq River	Stream flow	2006-2012	7170	18W	432810	7780920
Mary River	Stream flow	2006-2012	690	17W	556360	7903750
Ravn River	Stream flow	2006-2012	8220	17W	558020	7894160
Rowley River	Stream flow	2006-2012	3500	18W	411230	7818830

Air quality monitoring program is a supporting monitoring program to the AEMP as dustfall monitoring may be able inform the findings of effects to the aquatic environment, as well as measure changes in dustfall due to changes in the Project or in the application of mitigation measures.



LEGEND:

- ACTIVE STREAM FLOW GAUGING STATION
- INACTIVE STREAM FLOW GAUGING STATION
- WATER SURVEY OF CANADA HYDROMETRIC STATION (2006-2012)
- MILNE INLET TOTE ROAD
- PROPOSED RAIL ALIGNMENT
- RIVER/STREAM/DRAINAGE
- WATER

NOTES:

1. BASE MAP: © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004). ALL RIGHTS RESERVED.
2. COORDINATE GRID IS SHOWN IN UTM NAD83 ZONE 17 AND IS IN METRES.
3. PROPOSED RAIL ALIGNMENT PROVIDED BY CANARAIL CONSULTANTS INC. IN OCTOBER 2010.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	15NOV'13	ISSUED WITH TRANSMITTAL	DKK	AS	RAC	RAC

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

MINE SITE HYDROLOGY MONITORING STATION LOCATIONS

Knight Piésold CONSULTING

P/A NO. NB102-181/33

REF NO. NB13-00586

FIGURE 4.1

REV 0

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4.4 HABITAT COMPENSATION

Baffinland must obtain appropriate authorizations or letters of advice from the DFO for construction activities at water crossings. Section 35 of the *Fisheries Act* prohibits the harmful alteration, disruption or destruction of fish habitat and provides the Minister with the power to authorize terms and conditions which would allow projects to proceed in compliance with the Act. The DFO (1998) defines HADD as, "*any meaningful change in one or more habitat components that can reasonably be expected to cause a real reduction in the capacity of the habitat to support the life requisites of fish."* A HADD occurs when the physical, chemical, or biological features of a water body are sufficiently altered, such that habitat becomes less suitable for one or more life history processes of fish. Habitat compensation is an option for achieving no net loss when residual impacts of projects on habitat productive capacity are deemed harmful after other less invasive options have been implemented. Habitat compensation involves replacing the loss of fish habitat with newly created habitat or improving the productive capacity of some other natural habitat. Depending on the nature and scope of the compensatory works, habitat compensation may require, multiple seasons of post-construction monitoring. A No Net Loss Habitat Compensation and Monitoring Plan is a requirement of an HADD authorization.

Mitigation measures are likely to be implemented during the project's planning, design, construction and/or operation phases in order to protect fish and fish habitat. The mitigation plans are prepared and implemented by the Company with advice typically provided by DFO staff.

Commonly used mitigation measures can include:

- Working within fisheries timing windows to minimize interference with fish migration and spawning
- Selecting the least harmful equipment/materials/construction methods
- Ensuring fish passage around obstructions during and after construction
- Implementing measures to control siltation at construction sites

Upgrades to some of the existing Tote Road crossings will be required to support the construction phase of the project and the installation of new crossings will be required as part of the railway construction and operation.

Permanent or temporary water crossings are authorized under the Type A Water License provided the Department of Fisheries and Oceans has granted authorizations for undertaking the proposed work.

4.4.1 Tote Road Upgrade (Water Management Area 48)

The Bulk Sampling Program was completed in 2007-2008 and confirmed the quality and marketability of the Mary River iron ore. As part of the Bulk Sampling Program initiative, upgrades to the original Milne Inlet Tote Road (Tote Road) were necessary to facilitate the transport of the iron ore to the coast at Milne Inlet, where the iron ore was transported via sealift to Europe for testing. Currently the road is used as a means of transport of personnel, equipment, and supplies, between the Mary River and Milne Inlet Camps. The Tote Road, which was first established in the 1960's, runs approximately 105 km from the Mary River exploration camp to Milne Inlet. It was designated as a public use road during the Nunavut Land Claims Agreement and is defined as such in the North Baffin Land Use Plan.

The upgrades completed in 2009, included adjustments to the road alignment to facilitate haul road travel, road bed improvements, road widening and installation of drainage crossings along the route. The Tote Road upgrades were designed to enhance the flow conditions of the waterways, reduce potential erosion-related effects, and improve the opportunity for fish to access upstream habitat.

To summarize for conceptual design purposes, crossings were grouped into five main categories based on catchment area, geometry and estimated peak flows. The main groupings are as follows:

- Extra-Small crossings with upstream watershed areas of less than 0.5 km^2
- Small crossings with upstream watershed areas between 0.5 km2 and 2.5 km^2
- Medium crossings with upstream watershed areas between 2.5 km2 and 7.5 km^2
- Large crossings with upstream watershed areas between 7.5 km2 and 30 km^2
- Extra-Large crossings with upstream watershed areas greater than 30 km^2

Corrugated steel culvert pipes (CSP) were used for most crossings. Modified sea containers were used for the four Extra-Large crossings (three of the Extra-Large crossings use a combination of corrugated steel culvert pipes and sea containers).

The DFO issued a HADD authorization for approximately 8,500 m^2 of fish habitat that was to be disturbed for the Tote Road upgrade project. Based on subsequent monitoring, this estimate was revised to 7,850 m^2 of disturbance with habitat compensation measures to be implemented that would restore and enhance approximately 15,000 m^2 of habitat. The original Fisheries Act Authorization and Fish Habitat No Net Loss and Monitoring Plan (the Plan) to support the construction of 25 crossings identified as HADD (and 14 crossings identified as Habitat Compensation) were issued and approved in 2007. The HADD crossings were primarily classified within the Extra-Large, Large, Medium, and Small categories. The Plan outlined the measures necessary to mitigate and compensate, to the greatest possible extent practicable, the impacts to fish habitat at the Tote Road watercourse crossings. The plan also described a monitoring plan to be implemented during and after construction. This plan has been implemented during the period of construction (2007-2009) and post construction from 2009 to the present. Annual reports for the above have been submitted to DFO for the years 2007 to 2011.

A large number of crossings mainly within the Small and Extra-Small categories were determined to be of low quality habitat and Letters of Advice were issued by the DFO to facilitate and construct these crossing upgrades along the road.

It is anticipated that future upgrades for crossings required for the Tote Road in the coming years can be accommodated by means of either:

- Amendments to the existing FA and addendums to the currently approved No Net Loss Plans for HADD
- Letters of Advice issued by DFO, for crossings that are of low value fish habitat

Watercourses initially identified as HADD (n = 25) and compensation (n = 14) sites were each assessed for the quality of available fish habitat at least once between 2006 and 2009 (Baffin land 2009). Sites identified as not fish-bearing waters were typically visited only once while others were assessed on multiple occasions to monitor for potential changes. In 2010, any fish-bearing sites that showed some change in the quality and/or accessibility of fish habitat since they were initially assessed were revisited for detailed habitat surveys. Of these sites, seven required some level of additional monitoring in 2011. Two HADD (BG-01 and CV-225) and two LOA (BG-27, CV-112) crossings where fish access improvement structures were constructed in 2010 (North/South Consultants Inc., 2010) required fish passage surveys in July 2011, to assess long term success of the structures. Two other HADD crossings (CV-129 and CV-114) were identified, during 2010 surveys, as being at least partial barriers to fish movements. Construction of fish access improvement structures and initial monitoring surveys at these two sites were completed in 2011. At HADD crossing CV-078, a potential for stranding of fish in isolated

plunge pools downstream of overflow culverts was identified during the 2010 survey. This site was assessed in more detail in 2011 and necessary compensation will be completed by spring 2012.

To determine fish use of available habitat and fish passage success at these sites, 50 m reaches upstream and downstream of each crossing were sampled with a backpack electrofisher (Smith Root model LR-24). Electrofisher settings and duration were recorded for each reach fished. All captured fish were identified to species, measured for fork length (mm), and returned to the area from which they were sampled. Size range, mean length, and CPUE (measured as the number of fish captured per minute of electrofishing) were calculated and tabulated by watercourse and reach.

4.4.2 Railway Construction (Water Management Area 21)

The Water License application included eight (8) design descriptions for crossings at the following locations:

- AR-BR-37-1
- AR-CV-144-1
- BR-37-1
- CV-17-1
- CV-51-2
- CV-52-2
- CV-76-3
- CV-8-2

Pursuant to the No Net Loss provisions of the *Fisheries Act*, Baffinland is negotiating an overall "Fish Habitat Compensation Agreement" with the DFO for a HADD as it relates to the Project as a whole. HADD compensation specific to the water crossings is an integral part of this Compensation Agreement.

As background information for the Fish Habitat Compensation Agreement, a "fish habitat rating" was assigned for water crossings along the railway corridor on the basis of stream characterization undertaken during the environmental baseline studies. Details of these assessments are provided in the FEIS, presented in Volume 3, Appendix 3B, Attachment 7 (Baffinland, 2012). A summary of these assessments is provided in Table 4.2.

Table 4.2 Summary of Water Crossing Decision Table

FISH HABITAT RATING	TABLE 2-16 BRIDGES CROSSINGS	TABLE 2-17 CULVERT CROSSINGS	TABLE 2-18 TEMPORARY ACCESS ROAD	TOTAL NUMBER OF CROSSINGS (TEMPORARY + PERMANENT)
Important	16	28	29	73
Marginal	3	18	28	49
None or "0"	11	162	158	331
Total Crossings	30	208	215	

These baseline field studies completed recently by Baffinland indicate a poor rating for "fish habitat" for at least 173 of the proposed permanent crossings and 158 of the temporary access crossings. Although all crossings will require a DFO authorization under the Fisheries Act, the concern for HADD focuses mainly on the crossing rated as "important" (63) and to a lesser extent, crossings rated as "marginal" (49) for fish habitat. Construction of some of the crossings classified as Marginal and all crossings classified as "None" may be facilitated by means of Letters of Advice issued by the DFO. Mitigation and monitoring measures to be implemented during construction activities for crossings along the Rail Alignment and

post-construction monitoring will be largely developed and implemented based on Tote Road upgrade experience and lessons learned from 2007 to the present.

4.4.3 Construction of Water Crossings and Lake Encroachment

Potential Impacts

Construction of stream crossings and lake encroachments could increase TSS and in turn potentially affect aquatic biota, including Arctic Char. Construction activities that entail isolation of construction works (e.g., cofferdams/diversions) may also strand fish. Construction of lake encroachments could potentially affect Arctic Char eggs if construction activities occurred during the spawning and egg incubation period in Arctic Char spawning habitat.

Mitigation

In general, mitigation of potential impacts to Arctic Char may include, but are not necessarily limited to:

- Construction of stream crossings will be conducted when practicable during the ice-cover season. This will mitigate potential effects on fish which are absent from streams in winter.
- Potential for direct mortality of Arctic char eggs due to placement of Project encroachments in water bodies will be mitigated through avoidance of infrastructure placement on Arctic char spawning habitat.
- Timing windows will be adhered to the extent practicable to minimize and avoid effects on fish.
- A salvage fishery will be completed where required during stream crossing construction (i.e., behind work areas that are isolated such as cofferdams). Fish would be collected and live-released.

As is the case for all crossings with fish habitat, fish passage will be accommodated in the crossing design. With culverts properly sized to maintain or enhance fish passage capabilities, the potential for negative effects is negligible with the appropriate mitigation measures put in place. The release of sediment associated with the construction works during the flowing water season will be minimized by using standard accepted practices including limiting the time spent in-stream to the maximum extent possible, and the application of sediment and erosion control measures. The longer term potential effects of the crossing on channel morphology and erosion will be minimized by incorporating bank protection measures, as necessary and overflow swales to pass high flood flows.

4.4.4 Construction Monitoring

Drawings for construction will be developed and approved by DFO in accordance with the Fisheries Authorization (FA) prior to commencing construction activities. Construction monitoring will ensure that measures and works specified in the fisheries authorization will be implemented and functioning as intended.

Environmental monitoring to be adopted will be based on the methodologies applied during the 2007-2008 Tote Road upgrades and subsequent post-construction monitoring. Final details of monitoring methodologies and monitoring forms to be used will be provided in the Fish Habitat and No Net Loss Monitoring Plan to be submitted for approval to DFO prior to the commencement of crossing construction activities. Examples of pre-construction, construction, post construction, and turbidity monitoring forms that detail the type of information to be collected are presented in Schedule 8.

During in-water construction of fish habitat crossings (designated as HADD and others) as well as corresponding compensation sites, a designated environmental inspector will be on site to ensure

implementation of the designs as intended. During periods of flow, the construction of HADD authorized crossings will be monitored for turbidity downstream of the crossings where possible. Crossings will be visually inspected immediately after road construction to confirm that the installations are functioning as intended and that fish access has been maintained or enhanced. Positive and/or negative effects will be documented.

Turbidity has been shown to affect fish habitat. Suspended solids in turbid water can clog fish gills, reduce growth rates, decrease resistance to disease, and prevent egg and larval development. Settled particles can smother eggs of fish and aquatic insects.

During road construction, on-site visual monitoring of turbidity will be conducted, and will be used to ensure that various mitigation measures are implemented, including:

- Minimizing timing of in-water work
- Limiting fording to one-time, where possible
- Implementing and maintaining effective sediment and erosion control measures
- Delaying work if it is visibly apparent that char are migrating through the particular crossing

To document site conditions during and after construction and decommissioning, turbidity will be monitored in watercourses with fish habitat both upstream and downstream of construction activities where possible.

Turbidity will be measured during construction, as well as approximately 2 weeks after construction activity is completed at each monitored watercourse crossing. In comparing background data with post-construction data, factors affecting turbidity, such as weather conditions and stream flow, will be considered. Turbidity measured post construction will be compared with upstream turbidity measured during construction.

4.4.5 Post Construction Monitoring - Performance Monitoring

The general approach to post construction performance monitoring is presented below.

Potential Impacts

Stream crossings may impede upstream or downstream fish passage, which in turn may result in loss of available habitat (i.e., inability to access habitat upstream of a culvert) and/or fish stranding (i.e., inability to move downstream into lakes for overwintering). Stream crossings may also cause increases in turbidity and TSS in watercourses due to erosion of the crossing structure and/or shoreline or the re-suspension of sediments.

Mitigation

The primary mitigation for these potential effects is mitigation by design. That is, stream crossings have been designed to facilitate fish passage and to minimize or prevent effects of turbidity/TSS through implementation of appropriate sediment and erosion control measures. Issues regarding the performance of stream crossings identified during follow-up monitoring may be managed through implementation of corrective measures.

Monitoring

Monitoring of stream crossings located in Arctic Char habitat will be conducted similar to monitoring along the Tote Road as part of the Fish Habitat No Net Loss and Monitoring Plan submitted to and approved by the DFO for that project component and summarized in annual reports.

In general, stream crossings located in Arctic Char habitat will be inspected visually during the initial years of operation, during low and high flow conditions (where feasible), to assess the integrity of the structures and connectivity between downstream and upstream habitats. The composition and quality of the habitat at each crossing will also be assessed and compared with pre-construction data to monitor for significant changes that may affect Arctic Char use. Such changes can occur as a result of erosional processes associated with the crossings that may result in accumulation of finer substrates than are naturally present. The frequency of inspections may be reduced based on the outcome of initial monitoring. For example, a majority of the crossings along the Tote Road showed no change in habitat composition or fish accessibility during the first few years of monitoring (2008-2010) and the frequency of inspections for these crossings has since been reduced with the concurrence of the DFO. In addition, a subset of stream crossings located in Arctic Char habitat will be visually assessed for the presence of Arctic Char and fish passage. Stream velocities will be measured, the presence of Arctic Char upstream and downstream of the culverts and connectivity will be visually assessed. If required (i.e., visual inspection is inconclusive), electrofishing may be conducted to confirm passage of Arctic Char. Corrective measures will be implemented should issues be identified through the monitoring program.

4.4.6 Habitat Compensation Works - Performance Monitoring

A Fish Habitat No Net Loss Compensation and Monitoring Plan will be developed to compensate for the HADD originating from the Project. The compensation works will be monitored to ensure they are functioning as intended and to allow for modifications to improve performance if required.

4.5 OTHER ENVIRONMENTAL MANAGEMENT AND MONITORING PLANS

A number of management and monitoring plans (EMMPs) were developed as part of the FEIS and/or the Type A Water Licence. These plans include:

- Environmental Protection Plan
- Surface Water and Aquatic Ecosystems Management Plan
- Quarry and Borrow Pit Management Plan
- Waste Water Management Plan
- Waste Management Plan
- Hazardous Materials and Hazardous Waste Management Plan
- Explosives Management Plan
- Blasting Management Plan
- Waste Rock Management Plan
- Emergency Response and Spill Contingency Plan
- Abandonment and Reclamation Plan

The above management plans all have linkages to water, and the issues and concerns identified in Section 2 involve mitigation measures identified in the above plans. Like the AEMP, these plans are living documents which will be updated periodically throughout the Project life to account for changes in the Project, the success of mitigation measures and the results of monitoring.

4.6 INUIT QAUJIMAJATUQANGIT

The INAC (2009) AEMP Guidelines[1] reportedly provide a basis for incorporating traditional knowledge (in the case of Nunavut this is termed IQ or Inuit Qaujimajatuqangit) into AEMP programs in an efficient and effective manner. The guidelines recognize a need for a flexible process for developing and implementing AEMPs that provide opportunities for input by interested parties including local communities and organizations. This is to ensure that Inuit interests and needs are understood and respected, especially in regard to potential effects of land or water use in potentially affected watersheds. The INAC (2009) AEMP Guidelines present three key sources of IQ that contribute to an understanding of the environment.

1. Shared information within the community, and an oral history spanning multiple generations including specific observations, patterns of biophysical, social, and cultural phenomena, inferences relative to cause and effect, and predictions of the impacts of human activities. This information is obtained by means of direct observation and experience of the Inuit peoples.

2. Essential information on the use and management of the environment which can enhance understanding of cultural practices and social activities, land use patterns, archeological sites, harvesting practices, and harvesting levels, both now and in the past.

3. Information on the values that people place on the environment.

During the initial development of this AEMP Framework document, the Qikiqtani Inuit Association (QIA) was invited to attend and participate in stakeholder meetings so that IQ could be incorporated into AEMP development and the implementation process. During these meetings, several of the participants had extensive experience with past projects where attempts were made to incorporate IQ and western science based programs as part of the AEMP. These participants openly shared their experiences with meeting attendees especially in regard to the difficulties involved in successfully incorporating IQ into AEMPs which by their very nature are highly scientific and statistical. However, success was made, and based on suggestions and discussions between Baffinland and QIA, and the application of the INAC Guidelines (2009), the following initiatives are proposed for consideration.

- During future meetings, Baffinland and Inuit representatives familiar with the Project area could discuss the status of current IQ in relation to:
  - Baseline conditions within the study area and IQ knowledge in regards to the structure and function of the aquatic ecosystem in the Project Study Area (PSA).
  - Historic perspective and understanding of variability associated with the aquatic ecosystems.
  - Traditional direct and indirect resource uses by Inuit of the aquatic ecosystem within the PSA and validation of the potential effects of the Project on traditional activities as identified in the FEIS.
- As has been the practice over the last two years, Baffinland will continue to recruit and train local skilled Inuit environmental technologists to assist with future AEMP field sampling and monitoring programs. In this way, Baffinland Project staff can continue to mentor local Inuit in regards to the scientific and technical aspects of the AEMP and the Inuit can share their practical, historical, and traditional knowledge with Baffinland personnel.

[1] Guidelines for Designing and Implementing Aquatic Effects Monitoring Programs for Development Projects in the Northwest Territories: Overview Report, Indian and Northern Affairs Canada (INAC) Yellowknife, Northwest Territories, June 2009 Version

- Documentation of the above initiatives so that an IQ database as related to the AEMP can be developed, shared with others, and included in annual reports.

Periodic AEMP workshops will be held and QIA/community members who have expertise in the IQ aspects of aquatic ecosystems can participate and contribute to future program development and changes.

5 SURVEILLANCE NETWORK PROGRAM

5.1 SURVEILLANCE NETWORK PROGRAM OVERVIEW

The Surveillance Network Program (SNP) is a compliance-based monitoring program defined in the Type A Water Licence.

A number of effluent and waste discharges are regulated by the water licence, including:

- Mine effluent (pit water and runoff from ore and waste rock stockpiles)
- Treated sewage effluent
- Oily water
- Sewage sludge
- Solid waste landfilled on-site
- Hazardous and non-hazardous wastes taken off-site for disposal
- Landfill seepage/effluent
- Water from bulk fuel storage facility containment
- Hydrocarbon impacted soil treated in landfarms
- Waste rock

The coordinates for each discharge location are listed in Schedule 4 and are shown on the following figures:

- Mine Site Surveillance Network Program (Figure 5.1)
- Milne Port Surveillance Network Program (Figure 5.2)
- Steensby Port Surveillance Network Program (Figure 5.3)

The discharge location, monitoring parameters and frequency details of each station are summarized in Schedule 4. Some SNP stations will be utilized for monitoring of contact mine water under the MMERs (Section 6). The SNP results are integrated into interpretation and recommendations of the annual AEMP program.

5.2 EFFLUENT QUANTITY

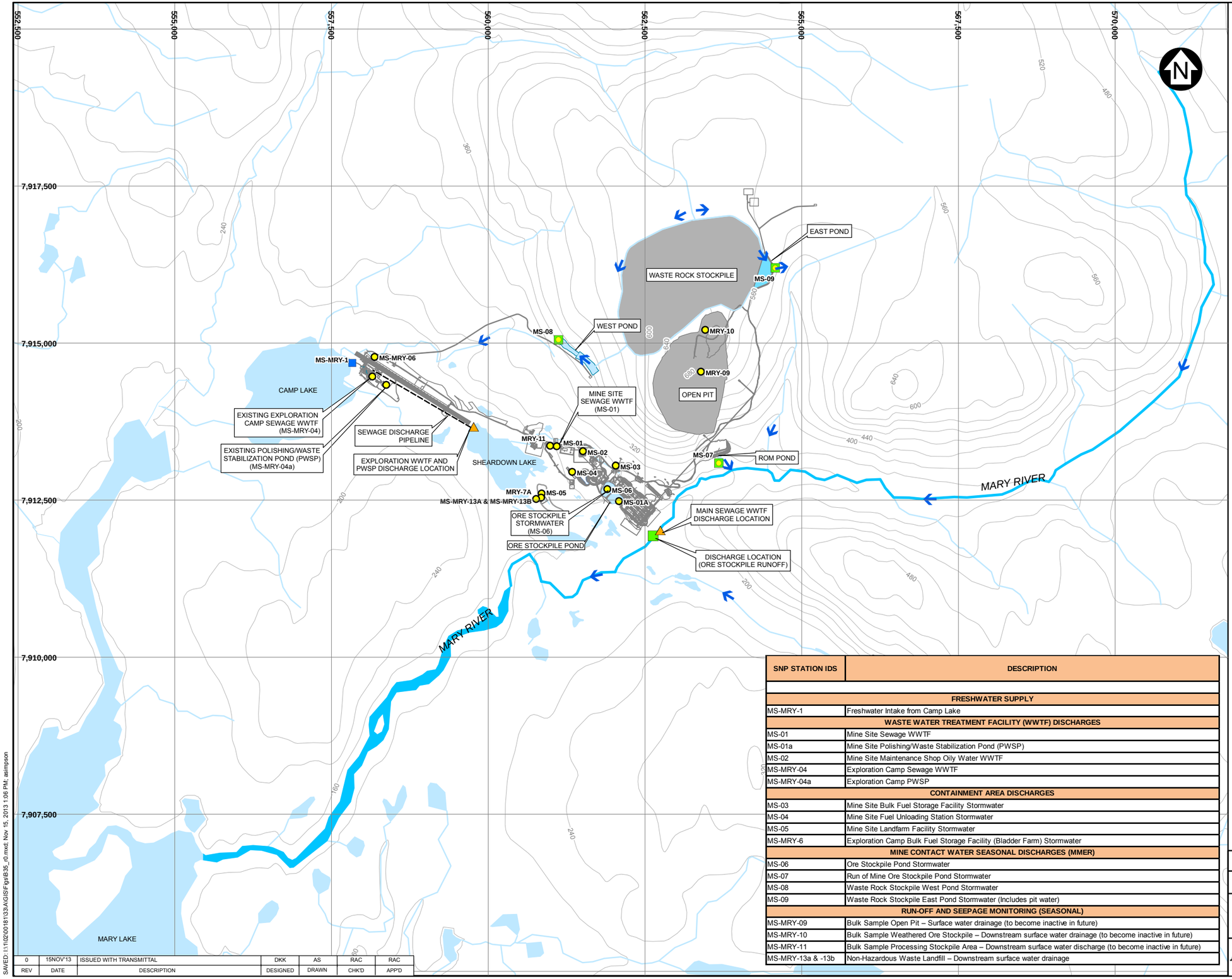
The Type A Water Licence requires the reporting of monthly and annual volumes of effluents and wastes discharged by the Project, listed in Section 5.1.

5.3 EFFLUENT QUALITY

Schedule 3 presents the discharge quality criteria specified in the Type A Water Licence. Effluent quantity and quality together provide concentration and loadings data for downstream receiving environments.

5.4 ACUTE TOXICITY

Periodic acute toxicity testing for end of pipe sewage effluent discharge locations provides data on possible acute impacts to effluent exposure areas. Testing of treated sewage effluent is required by the licence to confirm that the effluent is not acutely toxic.



LEGEND:

- PROPOSED SURVEILLANCE NETWORK PROGRAM (SNP) STATION
- MINE EFFLUENT DISCHARGE LOCATION
- TREATED SEWAGE DISCHARGE LOCATION
- FRESHWATER INTAKE LOCATION
- EXISTING TOTE ROAD
- PROPOSED RAILWAY ALIGNMENT
- PROPOSED CONSTRUCTION ACCESS ROAD
- PROPOSED SITE INFRASTRUCTURE
- RIVER/STREAM/DRAINAGE
- WATER

SURVEILLANCE NETWORK PROGRAM (SNP):

- FIRST LEVEL OF MONITORING FOCUSES ON DISCHARGE QUALITY.
- THERE IS OFTEN AN OVERLAP WITH SNP STATIONS AND EEM STATIONS REQUIRED UNDER THE METAL MINING EFFLUENT REGULATION (MMER).

SNP STATION IDS	DESCRIPTION
FRESHWATER SUPPLY	
MS-MRY-1	Freshwater Intake from Camp Lake
WASTE WATER TREATMENT FACILITY (WWTF) DISCHARGES	
MS-01	Mine Site Sewage WWTF
MS-01a	Mine Site Polishing/Waste Stabilization Pond (PWSP)
MS-02	Mine Site Maintenance Shop Oily Water WWTF
MS-MRY-04	Exploration Camp Sewage WWTF
MS-MRY-04a	Exploration Camp PWSP
CONTAINMENT AREA DISCHARGES	
MS-03	Mine Site Bulk Fuel Storage Facility Stormwater
MS-04	Mine Site Fuel Unloading Station Stormwater
MS-05	Mine Site Landfarm Facility Stormwater
MS-MRY-6	Exploration Camp Bulk Fuel Storage Facility (Bladder Farm) Stormwater
MINE CONTACT WATER SEASONAL DISCHARGES (MMER)	
MS-06	Ore Stockpile Pond Stormwater
MS-07	Run of Mine Ore Stockpile Pond Stormwater
MS-08	Waste Rock Stockpile West Pond Stormwater
MS-09	Waste Rock Stockpile East Pond Stormwater (Includes pit water)
RUN-OFF AND SEEPAGE MONITORING (SEASONAL)	
MS-MRY-09	Bulk Sample Open Pit – Surface water drainage (to become inactive in future)
MS-MRY-10	Bulk Sample Weathered Ore Stockpile – Downstream surface water drainage (to become inactive in future)
MS-MRY-11	Bulk Sample Processing Stockpile Area – Downstream surface water discharge (to become inactive in future)
MS-MRY-13a & -13b	Non-Hazardous Waste Landfill – Downstream surface water drainage

NOTES:

1. BASE MAP: © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004). ALL RIGHTS RESERVED.
2. COORDINATE GRID IS UTM NAD83 ZONE17.
3. CONTOUR ARE IN METRES. CONTOUR INTERVAL VARIES.
4. LAKE SAMPLE LOCATIONS VARY SLIGHTLY DURING WINTER MONTHS DUE TO ICE CONDITIONS.

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BAFFINLAND IRON MINES CORPORATION

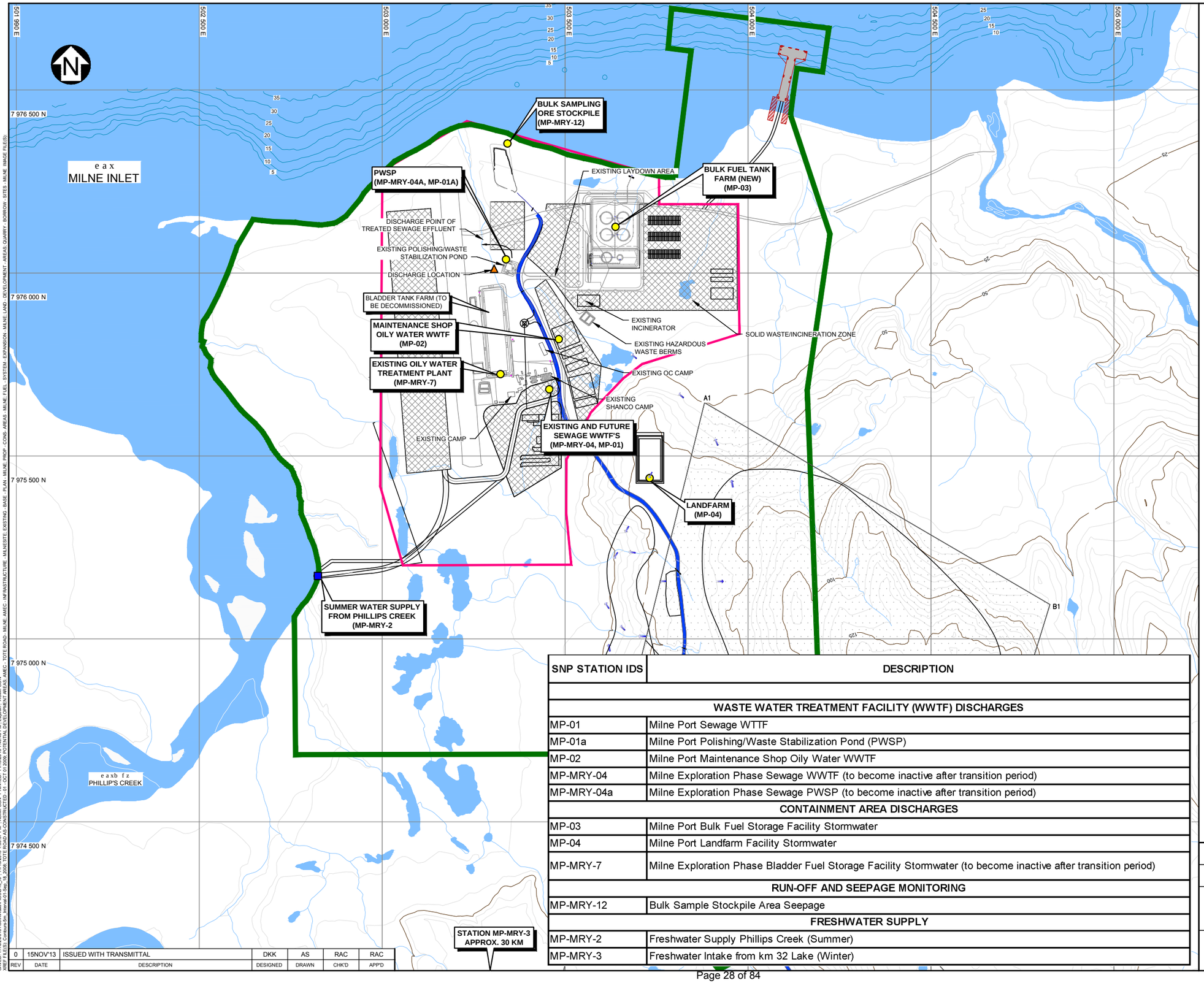
MARY RIVER PROJECT

MINE SITE SURVEILLANCE NETWORK PROGRAM (SNP)

Knight Piésold CONSULTING

P/A NO. NB102-181/33 | REF NO. NB13-00586

FIGURE 5.1 | REV 0



SNP STATION IDS	DESCRIPTION
WASTE WATER TREATMENT FACILITY (WWTF) DISCHARGES	
MP-01	Milne Port Sewage WTTF
MP-01a	Milne Port Polishing/Waste Stabilization Pond (PWSP)
MP-02	Milne Port Maintenance Shop Oily Water WWTF
MP-MRY-04	Milne Exploration Phase Sewage WWTF (to become inactive after transition period)
MP-MRY-04a	Milne Exploration Phase Sewage PWSP (to become inactive after transition period)
CONTAINMENT AREA DISCHARGES	
MP-03	Milne Port Bulk Fuel Storage Facility Stormwater
MP-04	Milne Port Landfarm Facility Stormwater
MP-MRY-7	Milne Exploration Phase Bladder Fuel Storage Facility Stormwater (to become inactive after transition period)
RUN-OFF AND SEEPAGE MONITORING	
MP-MRY-12	Bulk Sample Stockpile Area Seepage
FRESHWATER SUPPLY	
MP-MRY-2	Freshwater Supply Phillips Creek (Summer)
MP-MRY-3	Freshwater Intake from km 32 Lake (Winter)

grQ/ q5

LEGEND:

- wu6 WATER
- w i Q/ z LAYDOWN AREA
- f4g6FfZM4g6Ff==sJ6 RIVER/STREAM/DRAINAGE
- e a x i x}d t syv\bj=4 MILNE INLET TOTE ROAD
- k8N x4gbsgwNExo4 n=4n}ysJg8i5 POTENTIAL DEVELOPMENT AREA
- N7j5 fl i z FLOW DIRECTION
- MONITORING LOCATION
- FRESHWATER INTAKE LOCATION
- DISCHARGE LOCATION

NOTES:

1. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005).
2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
3. CONTOURS ARE IN METRES. CONTOUR INTERVAL IS 5 METRES.
4. SITE INFRASTRUCTURE PROVIDED BY SIKUMIUT (NOVEMBER, 2012).
5. CONTOURED BATHYMETRY PROVIDED BY ENTERPRISES NORMAND JUNEAU INC., DATED SEPTEMBER 9, 2010 (CONTOUR INTERVAL 1m).

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SCALE A

BAFFINLAND IRON MINES CORPORATION

k]l]/i s/C4ys3i6 MARY RIVER PROJECT

MILNE PORT SURVEILLANCE NETWORK PROGRAM (SNP)

Knight Piésold CONSULTING

P/A NO. NB102-181/33 | REF NO. NB13-00586

ttCs/3ymJ6 **FIGURE 5.2** | REV 0

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XREF FILE(S): CONT - STEENSBY - 01 - SEPT 22 2008; 04 - Catchments - NAD83 - Jul 8 2008; STEENSBY_CATCHMENTS; SteensbyQuarryBoundaries_OCT182010; AMEC - INFRASTRUCTURE - STEENSBY; RAILWAY ALIGNMENT AND CONST ACCESS RD - MARY RIVER STEENSBY 2010 -12AUG2010; POTENTIAL DEVELOPMENT AREAS; REFUGE (Farm Crossings) - Aug 12 2010 IMAGE FILE(S);

SNP STATION IDS	DESCRIPTION
WASTE WATER TREATMENT FACILITY (WWTF) DISCHARGES	
SP-01	Steensby Sewage WWTF
SP-01a	Steensby Polishing/Waste Stabilization Pond (PWSP) (Location TBD)
SP-02	Steensby Maintenance Shop Oily Water WWTF
SP-03	Floating Construction Camp Sewage WWTF
CONTAINMENT AREA DISCHARGES	
SP-04	Steensby Bulk Fuel Storage Facility Stormwater
SP-05	Steensby Marine Fuel Storage Facility Stormwater
SP-06	Steensby Landfarm Facility Stormwater
MINE CONTACT WATER SEASONAL DISCHARGES	
SP-07	Steensby Ore Stockpile Stormwater
RUN-OFF AND SEEPAGE MONITORING	
SP-08	Steensby Landfill Seepage
FRESHWATER SUPPLY	
SP-09	Freshwater Intake at 3 km Lake
SP-10	Freshwater Intake at ST 347 Lake (Permanent Camp)