ISO 9001:2000
FS 87377

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT

SITE WATER MANAGEMENT PLAN
(REF. NO. NB102-00181/10-5)

Rev. No.	Revision	Date	Approved
0	Issued in Final	October 25, 2007	KDE
1	Updated for 2008 Field Season	March 31, 2008	

Knight Piésold Ltd.
1650 Main Street West
North Bay, Ontario Canada P1B 8G5
Telephone: (705) 476-2165
Facsimile: (705) 474-8095
E-mail: northbay@knightpiesold.com

Knight Piésold
CONSULTING

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT

SITE WATER MANAGEMENT PLAN
(REF. NO. NB102-00181/10-5)

EXECUTIVE SUMMARY

This site water management plan was developed for use at Baffinland Iron Mines Corporation's Mary River Project. It is used by field staff to determine the surface water management requirements throughout the site. An earlier version of this report was prepared in October 2007 reflecting the project status at the end of the 2007 field season (Knight Piésold Ref. No. NB102-00181/10-5, Rev. 0, dated October 25, 2007). This report has been updated to reflect the state of the project for the 2008 field season. The following describes the specific sections of the report.

Drilling Descriptions

For the purposes of this water management plan, the drilling program has been divided into two types; exploration and geotechnical. Exploration drilling involves coring into bedrock while the geotechnical drilling consists primarily of drilling overburden. Both types of drilling will be completed using the same type of drill rigs; however, the quantity of water consumption is generally higher for the exploration drilling.

Hydrology and Predicted Flow Rates

The average anticipated surface water runoff flows for the area are presented. The effect of these flows is reviewed with respect to the quantities required for the drill rigs and in particular how the flows may affect the drill schedule. Some locations that are not situated near a larger water body may need to be completed during periods of highest flows to be within the requirements of the permits.

General Mitigation Measures

General surface water mitigation measures are discussed for use during the field season. The measures that may be used include silt fences, diversion/collection channels or berms, containment berms, in-ground sumps and portable containment sumps. Other measures will be used as required.

Water Management Areas

Each area where work is planned was reviewed and the following information provided; a description of the area including the site and the activities to be completed during the 2008 field work season, a description of the surface water quantity and direction within the area and mitigation measures expected to be required to control the surface water runoff.

Monitoring Requirements

A summary of the monitoring and reporting requirements that will be completed by the field crews are outlined. Adaptive management strategies are discussed to review the situation and modify the mitigation measures if required.

BAFFINLAND IRON MINES CORPORATION
ᓄᓗᔭᓂ ᐅᔭᕿᒃᓂᐊᕐᑐᑦ

ᐃᒥᕐᒥᒃ ᐊᑐᖃᑦᑕᕐᓂᖓᓄᑦ ᐸᕐᓇᐅᑎ
(REF. NO. NB102-00181/10-5)

ᓇᐃᒃᓕᒋᐊᕐᓯᒪᔪᑦ ᐅᖃᐅᓯᒃᓴᐃᑦ

ᐃᒥᕐᒥᒃ ᐊᑐᕐᓂᖓᓄᑦ ᐸᕐᓇᐅᑎ ᐊᕿᒃᑕᐅᓚᐅᕐᑐᖅ ᐊᑐᕐᓂᐊᕐᓗᑎᒃ Baffinland Iron Mine Corporation ᓄᓗᔭᓂ ᐅᔭᕿᒃᓂᐊᕐᑐᓄᑦ. ᐊᑐᕐᑕᐅᓂᐊᕐᑐᖅ ᐃᖃᓇᐃᔭᕐᑎᐅᔪᓄᑦ ᖃᐅᔨᓇᓱᒃᓗᑎᒃ ᖃᖓᓂᑦᑐᑦ ᐃᒥᐅᑦ ᐊᐅᓚᑕᐅᓂᖓ ᐱᔭᕆᐊᖃᕐᓂᖏᑦ ᐃᖃᓇᐃᔭᕐᕕᐅᔪᓕᒪᓂ ᓄᓇᖓᓂ. ᑎᑎᕋᕐᓯᒪᕙᒋᕐᑐᖃᓚᐅᕐᒪᑦ ᐅᓂᑲᕐᓯᒪᔪᓂ ᑎᑎᕋᕐᓯᒪᔪᓂᒃ ᐊᕿᒃᑕᐅᓚᐅᕐᑐᑦ ᐅᑐᐱᕆ 2007 ᒪᓕᒃᓯᒪᓪᓗᓂ ᐅᔭᕿᒃᓯᐅᕐᓂᖏᑦ ᖃᓄᐃᓕᕐᐸᓪᓕᐊᒃᒪᖓᑕ ᑎᑭᓪᓗᒍ ᐊᕋᒍᖓᓂ ᐅᑐᐱᕆ 25, 2007). ᑕᒃᑯᐊ ᑎᑎᕋᕐᓯᒪᔪᑦ ᓄᑕᖑᕆᐊᕐᓯᒪᔪᑦ ᐅᔭᕿᒃᓂᐊᕐᓂᐅᔪᖅ ᖃᓄᐃᑉᐸᓪᓕᐊᒃᒪᖓᑦ ᐊᕋᒍᖓᓂ 2008 ᐅᔭᕿᒃᓯᐅᕐᓇᕐᑎᓪᓗᒍ. ᐊᕕᒃᑐᕐᓯᒪᓪᓗᑎᒃ ᑎᑎᕋᕐᓯᒪᔪᑦ ᐅᓂᑲᓕᐊᖑᔪᒧᑦ.

ᓂᐅᕐᑐᕐᓗᑎᒃ ᖃᓄᐃᓕᖓᓂᖏᑦ

ᐱᔪᑎᒋᓪᓗᒍ ᐃᒥᕐᒧᑦ ᐊᑐᕐᑕᐅᓂᖓᓄᑦ ᐸᕐᓇᐅᑎᒧᑦ ᓂᐅᕐᑐᖃᑦᑕᕐᓂᐅᔪᖅ ᐊᕋᒍᖓᓂ 2007/2008 ᐊᕕᒃᑕᐅᒃᒪᑦ ᒪᕈᓕᓪᓗᓂ; ᕿᓂᕐᓂᖏᓐᓂ ᓂᐅᕐᑐᕐᑐᑦ ᐊᒻᒪᓗ ᐅᔭᕋᐃᑦ ᖃᓄᐃᓕᖓᓂᖏᓐᓂᒃ ᖃᐅᔨᓴᕐᑐᑦ. ᕿᓂᕐᓂᖏᑦ ᓂᐅᕐᑐᕐᓗᑎᒃ ᖃᐃᕐᓱᒧᑦ ᑎᑭᐅᑎᕙᒃᓗᓂ ᐅᖓᑕᓄᓪᓗ, ᐅᔭᕿᒃᓂᒃ ᖃᐅᔨᓴᕐᓗᑎᒃ ᓂᐅᕐᑐᕿᔭᕐᓗᑎᒃ ᖃᖓᓂᑦᑐᓂᒃ ᖃᐃᕐᓱᕐᒧᑦ ᑎᑭᓪᓗᒍ. ᑕᒪᕐᒥᒃ ᓂᐅᕐᑐᕐᓂᐅᔪᒃ ᐊᔨᒋᒥᒃ ᓂᐅᕐᑐᑎᖃᕐᓂᐊᕐᑐᒃ; ᑭᓯᐊᓂ ᕿᓂᕐᓂᖏᓐᓄᑦ ᓂᐅᕐᑐᕐᑎᓪᓗᒋᑦ ᐊᖏᓂᕐᓴᒥᒃ ᐃᒥᕐᒥᒃ ᐊᑐᕐᓂᐊᕐᓗᑎᒃ.

ᐃᒥᕐᒥᒃ ᖃᐅᔨᓴᕐᓂᖏᑦ ᐊᒻᒪᓗ ᐃᒪᐃᓐᓂᐊᕋᓱᒋᔭᐅᔪᖅ ᖃᓄᑎᒋ ᓱᒃᑲᑎᒋᓪᓗᓂ ᑯᕕᐸᓪᓕᐊᑎᒋᒃᒪᖓᑦ

ᑯᕕᕕᐅᖃᑦᑕᕐᓂᖓᓂᒃ ᖃᐅᔨᒪᓇᕐᓗᓂ ᖃᖓᓂᖓᕐᑐᒥᑦ ᐃᓂᒋᔭᐅᔪᒧᑦ. ᖃᓄᑎᒋ ᑯᒃᐸᓪᓕᐊᑎᒋᒃᒪᖓᑦ ᖃᐅᔨᓴᕐᑕᐅᓯᒪᓂᐊᕐᑐᖅ ᓂᐅᕐᑐᕐᑐᓄᑦ ᐊᑐᕐᑕᐅᔪᓐᓇᕐᒪᖓᓪᓗ ᐊᒻᒪᓗ ᐱᓗᐊᕐᑐᒥᒃ ᖃᓄᕐ ᑯᒃᐸᓪᓕᐊᑎᓪᓗᒋᑦ ᐊᑐᑎᖃᕐᓂᐊᕐᒪᖕ ᓂᐅᕐᑐᕐᑐᓄᑦ. ᐃᓚᖏᑦ ᓂᐅᕐᑐᕐᕕᐅᔪᑦ ᑕᓯᐅ ᖃᓂᒋᔭᓂᖏᑦᑐᑦ ᐃᒥᕐᑕᑐᐃᓐᓇᕆᐊᖃᕐᓂᐊᕐᓗᑎᒃ ᑯᒃᒥᖓᕐᑐᒥᑦ ᑯᒃᓂᖕ ᐃᒪᖅᑲᓚᖑᑎᓪᓗᒍ ᒪᓕᒃᓗᒍ ᐱᔪᓐᓇᐅᑎᖕ.

ᖃᓄᑐᐃᓐᓇᖅ ᐊᕿᒋᐊᕆᐊᓚᑦ ᐊᑐᕐᑕᐅᓂᐊᕐᑐᑦ

ᐃᒥᐅᑦ ᖃᖓᓂᑦᑐᑦ ᐊᕿᒋᐊᕆᐊᖃᕐᓂᖏᓐᓂᒃ ᐅᖃᐅᓯᐅᖃᑦᑕᕐᑐᑦ ᐊᑐᕐᑕᐅᕐᑯᓪᓗᒥᑦ ᐃᖃᓇᐃᔭᕐᓇᐅᑎᓪᓗᒍ. ᐊᕿᒋᐊᕐᕈᑎᒃ ᐊᕿᒋᐊᕈᑕᐅᔪᓐᓇᕐᑐᑦ ᐱᖃᓯᐅᑎᓪᓗᒋᑦ: ᐊᕙᓗᓯᒪᔪᖅ ᖃᑎᑦᑎᐸᓪᓕᐊᓪᓗᓂ ᓱᕈᕐᓂᒃ. ᑯᓚᐅᕐᑐᑎᒃᑐᓐᓂᑦ/ᑲᑎᕐᑎᓪᓗᑎᒃᑐᓐᓂᑦ ᑯᒃᕕᒃᒥᒃ ᐅᕙᓗᓐᓂᑦ ᑐᐊᐸᒃᒥᒃ ᐊᕙᓗᖅᑐᑎᒃ, ᐃᒥᒃᑯᕕᐅᓗᓂᓗ ᖃᑦᑎᒃᓯᓕᕐᓯᒪᔪᖅ ᑐᐊᐸᒃ, ᑯᐱᑦᑕᕐᐱᓚᐅᕐᑐᑎᒃᑐᓐᓂᑦ. ᐊᒻᒪᓗ ᑯᐱᑦᑕᕐᑭᑕᐅᓗᓂᐊᕐᓯᕐᒥᑦ ᐊᑐᕐᑕᐅᖃᑦᑕᕐᓂᐊᕐᒥᔪᑦ ᐱᔭᕆᐊᖃᕐᓯᓇᕐᓚᑕ.

ᐃᒥᕐᒥᒃ ᑲᒪᑦᑎᐊᕐᓂᕐᒧᑦ ᐊᑐᕐᑕᐅᓂᐊᕐᑐᑦ

ᐊᑐᓂ ᐃᖃᓇᐃᔭᕐᕕᐅᔪᑦ ᕿᒥᕈᔭᐅᓯᒪᔪᑦ ᖃᓄᐃᓕᐅᕐᓂᐊᕐᒪᖓᑕ ᐅᑯᓂᖓᓗ ᐊᕿᒃᓯᓯᒪᓪᓗᑎᒃ; ᐃᓂᒋᓂᐊᕐᑕᖓ ᓇᒥᓐᓂᐊᕐᒪᖓᑦ ᖃᓄᐃᓕᐅᖃᑦᑕᕐᓂᐊᕐᒪᖓᑕᓗ ᐱᔭᕆᕐᓯᒪᓂᐊᕐᓂᖏᓐᓂᒃᓗ ᐊᕋᒍᖓᓂ 2008 ᕿᓂᕐᑎᓪᓗᒋᑦ, ᖃᓄᑎᒋ ᐃᒪᖅᑎᕐᒥᒃ ᖃᐅᔨᓴᕐᑕᐅᓯᒪᓗᓂ ᐊᒻᒪᓗ ᓇᒧᖑᐅᕙᓪᓕᐊᒃᒪᖓᑕ ᐃᒥᐅᓂᖓ ᐊᒻᒪᓗ ᖃᓄᕐ ᐊᕿᒃᓯᓂᐊᕐᒪᖓᑕ ᐃᒥᖅᑯᕐᓂᖏᑦ ᓴᓗᒪᑎᑕᐅᓇᓱᒃᓗᑎᒃ ᐱᔭᕆᐊᖃᕐᓯᓇᕐᓚᑕ ᐃᒥᐅᓂᖕ ᑲᒪᒋᔭᐅᑎᐊᖅᑐᓂ.

ᖃᐅᔨᓴᕐᑕᐅᔭᕆᐊᓚᑦ

ᓇᐃᒃᓕᒋᐊᕐᓯᒪᔪᑦ ᖃᐅᔨᓴᕐᑕᐅᓂᐊᕐᑐᑦ ᐊᒻᒪᓗ ᐅᖃᐅᓯᐅᖃᑦᑕᕐᓂᖏᑦ ᐱᔭᕆᕐᑕᐅᓂᐊᕐᑐᑦ ᐃᖃᓇᐃᔭᕐᑎᐅᔪᓂᑦ ᑕᕙᓂᖅᑲᓯᐅᑎᔪᑦ. ᐊᕿᒋᐊᕐᑎᒃᓴᐃᑦ ᐅᖃᐅᓯᐅᓯᒪᓪᓗᑎᒃ ᕿᒥᕈᔭᐅᖃᑦᑕᕐᓗᓂᓗ ᖃᓄᐃᓕᖓᓂᖓ ᐊᒻᒪᓗ ᐊᕿᒋᐊᕐᑕᐅᖃᑦᑕᕐᑐᓂ ᐱᔭᕆᐊᖃᕐᓯᓇᕐᓚᑕ.

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT

SITE WATER MANAGEMENT PLAN
(REF. NO. NB102-00181/10-5)

TABLE OF CONTENTS

PAGE

TABLES

FIGURES

APPENDICES

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT

SITE WATER MANAGEMENT PLAN
(REF. NO. NB102-00181/10-5)

SECTION 1.0 - INTRODUCTION

1.1 PROJECT

The Mary River Project (the Project) is an iron ore exploration project in the North Baffin region of Nunavut. The Project is located about 160 km south of Mittimatalik (Pond Inlet) and 270 km southeast of Ikpiarjuk (Arctic Bay) as shown on Figure 1.1.

Knight Piésold Ltd. is conducting environmental, social and traditional knowledge baseline studies on behalf of Baffinland Iron Mines Corporation (Baffinland) for the Mary River Project. Knight Piésold is also conducting engineering studies to evaluate foundation conditions in advance of future applications that would be required to support a full-scale mining proposal.

The Mary River Project includes the following components which define the aerial extent of the project area as shown on Figure 1.2:

- Mary River Project site (Including Deposit Nos. 1, 2, 3, 3B and 4)
- Milne Inlet Tote Road
- Milne Inlet port site and adjacent marine areas
- Potential future railway heading south from Mary River to Steensby Inlet
- Potential future port site at Steensby Inlet and adjacent marine areas
- Potential future hydro-electric generating station location

This report provides updated information on the Site Water Management Plan for the work to be completed during the 2008 field season. This report will be updated if work programs change.

1.2 WATER LICENCE REQUIREMENTS

This document has been updated to fulfill the requirements of the Nunavut Water Board (NWB) water license 2BB-MRY0710 to resubmit the Site Water Management Plan (as stated on the license in Part B, Item 5(x)) and to provide an Environmental Monitoring Plan.

A summary of the specific requirements of the water licence as it relates to site water management is as follows:

- The volume of water extracted for the project for the purposes of this licence shall not exceed 515 cubic metres per day (approximately 60 cubic metres for potable water and the remainder for drilling purposes)

- GPS coordinates (in degrees, minutes, seconds) of all locations where water is used will be recorded and reported to the Inspector prior to use
- Daily quantities of water use will be measured and recorded, in cubic metres, for camp, drilling and other purposes
- Surface water samples will be collected throughout the Mary River Exploration Property, including Deposit No. 4, and at sites near Milne Inlet and Steensby Inlet. Subsequent laboratory analytical results are used to identify water quality trends and potential impacts to surface water.
- Quantities of domestic waste, sewage and hazardous waste hauled off-site for disposal will be measured and recorded, in cubic metres. The location and name of the disposal facility(s) and the date that waste was hauled off-site will be recorded.
- All water for domestic purposes shall be obtained from the following sources; Camp Lake (Monitoring Station MRY-1), Phillips Creek (Monitoring Station MRY-2), km 32 Lake (Monitoring Station MRY-3), an unnamed lake at km 32 along the Milne Inlet Tote Road, Deposit No. 4 Camp (location to be identified prior to use), an unnamed lake adjacent to Rail Camp, an unnamed lake near Steensby Inlet Camp, the alternate source for freshwater identified in the Application or at an alternate location approved by the Nunavut Water Board (NWB)
- All water intake hoses shall be equipped with a screen of an appropriate mesh size to ensure fish are not entrained and shall withdraw water at a rate such that fish do not become impinged on the screen
- Camps will not be located, nor material stored, on the frozen surface of a stream or lake, except where for immediate use
- Water Supply Facilities shall be maintained to the satisfaction of the inspector
- Streams will not be used as a water source unless authorized and approved by the NWB
- Water use for drilling will be taken from sources adjacent to drill locations or as otherwise approved by the NWB
- No land based drilling shall be conducted within 30 m of the ordinary high water mark of any water body, unless a request has been submitted and received by the NWB, ten (10) days in advance of drilling. The request must include a thorough description of the proposed activities and the following:
    - An appropriately scaled site map, complete with approximate GPS coordinates of planned drilling locations and the associated water bodies
    - Locations of waste deposition, that are consistent with Part F, Item 4
    - Mitigation measures that are planned to be in place, prior to, during drilling and following if required to protect waters
- Drill waste, including water, chips, muds and salts, in any quantity or concentration, from land-based drilling, will be disposed of in a properly constructed sump or an appropriate natural depression located at least 30 m from the ordinary high water mark of any adjacent water body, where direct flow into a water body is not possible and no additional impacts will be created
- If artesian flow is encountered, drillholes will be immediately sealed and permanently capped. If encountered, artesian flow will be reported to the NWB
- If the bottom of permafrost is broken through by the drill, the depth and location will be recorded and reported to the NWB

- If water is required in sufficient volume as to cause drawdown of the water body, approval by the NWB will be obtained 30 days prior to use. Details to be submitted include: volume required, hydrological overview of water body, details of impacts and proposed mitigation measures.
- Stream banks will not be cut and material shall not be removed from below the ordinary high water mark of any water body unless authorized
- The licensee will not cause erosion to the banks of any body of water and shall provide necessary controls to prevent such erosion
- With respect to access roads, pad construction, and other earthworks, debris and sediment will not be deposited into or on any water body. The materials will be deposited at least 30 m from the ordinary high water mark in such a fashion that they do not enter the water. Chemicals, fuels or wastes associated with this will not be allowed to enter any water body.
- Stream crossings will be located so as to minimize approach grades. Approaches will be stabilized during construction and upon completion in order to control runoff, erosion and subsequent siltation to any water body.
- Machinery will not travel up the streambed of a water body. Fording will be kept to a minimum and limited to one area and a one-time event for each piece of equipment, where possible. Equipment will be well cleaned and free of oil and grease and fluid leaks.
- Pollutants from machinery fording water crossings will not enter the water
- Activities will be conducted so as to minimize impacts on surface drainage, and will undertake corrective measures if surface drainage is impacted
- Sites will be prepared in such a manner as to prevent surface rutting
- Fill material used during construction will be from an approved source and free of contaminants
- Sediment and erosion control measures shall be implemented prior to and maintained during the operation to prevent entry of sediment into water
- Equipment storage holding areas will be located on gravel, sand or other durable land, at least 30 m from the ordinary high water mark of any water body to minimize impacts on surface drainage and water quality
- Equipment and vehicles will not be used unless the ground surface is in a state capable of fully supporting the equipment or vehicles without rutting or gouging. Overland travel of vehicles will cease if rutting occurs.
- An area will be designated for deposition of excavated and stockpiled material that is at least 30 m from the ordinary high water mark of any water body
- In-stream activity will be limited to low water periods, and will not be undertaken during fish migration, unless approved
- Except where approved, winter lake and stream crossings will be constructed entirely of water, ice, or snow, with disturbance minimized by situating ice bridges in areas with minimal approach grading and short crossing routes. Stream crossings will be removed or the ice notched prior to spring break-up.
- GPS coordinates (in degrees, minutes, seconds) will be determined for all locations of temporary and permanent storage areas where wastes associated with camp, drilling and infrastructure operation are deposited. These locations will be reported to the Inspector prior to depositing wastes.

- All waste disposal areas shall be located a minimum of 30 m from the ordinary high water mark of any water body, such that the quality, quantity, or flow of water is not impaired, unless otherwise approved
- All Polishing / Waste Stabilization Pond (PWSP) discharges will be released in a manner that minimizes surface erosion
- PWSP's will be bermed to ensure there is no seepage
- All greywater not directed to the Waste Water Treatment Facility (WWTF) will be contained in a sump located at least 30 m from the ordinary high water mark of any water body, at a site where direct flow into the water body is not possible and additional impacts are not created, unless otherwise approved
- Latrines will be located at least 30 m from the ordinary high water mark of any water body
- The Inspector will be notified of any discharge from waste facilities at least 10 days prior to the discharge

SECTION 2.0 - DRILLING PROGRAMS

2.1 EXPLORATION DRILLING

The exploration drilling program is carried out to identify the quality and quantity of the ore located at Mary River Deposit Nos. 1, 2, 3, 3B and 4, as well as providing information on geomechanical and geochemical aspects necessary for the mine design.

The following drills will be used during the 2008 field program and will be shared between the exploration and geomechanical/geotechnical drilling programs:

- One - LM30 drill (HQ and NQ core)
- Two - LF70 drills (PQ, HQ, NQ and/or BQ core)
- Three - LY38 drills (PQ, HQ, NQ and/or BQ core)
- Two or more additional drills (specific makes and models not yet determined)

Calcium chloride brine is used as the drilling fluid during the exploration drilling due to the cold temperatures at the site and the presence of permafrost. This prevents the drill rods from freezing in the deep exploration holes. During periods of drilling, the maximum water (brine) use rate is approximately 45 litres per minute (12 US gallons per minute) or 7.5 x 10^{-4} cubic metres per second per drill rig based on the capacity of the pumps serving the drills. Drilling additives are also used to increase operational efficiencies. Drilling additives include polymers such as DR-133 and W-OB.

A mixing station which produces the calcium chloride brine is a steel tank equipped with hydraulic mixers. Water is added to the tank from a water pumping station. Salt is transported to the mixing station in bags and is added to the tank to be mixed with the water. The entire station will be located more than 33 m from any water body. Special care is taken to ensure housekeeping measures are completed at all times at the salt mixing station. The quantity of salt added is kept to a minimum.

The water pumping stations will draw water from bodies of water of sufficient quantity (i.e. Mary River) so as not to cause drawdown of the water level in the water body. Screens will be placed over the intake hoses to ensure that fish are not entrained. The pumping rate will also kept at a rate to ensure that fish do not become impinged on the screens, and minimize water use.

2.2 GEOTECHNICAL DRILLING

The geotechnical program is conducted to identify and qualify the types and depth of soils at the project sites. Information from the geotechnical drilling is used to assist in foundation design for project infrastructure.

The geotechnical drilling program consists of overburden drilling and limited coring of bedrock to confirm bedrock contact. The holes drilled for the geotechnical program are generally shallow; most are less than 30 m deep.

The following drills will be used during the 2008 field program and will be shared between the exploration and geomechanical/geotechnical drilling programs:

- One - LM30 drill
- Two - LF70 drills
- Three - LY38 drills
- Two or more additional drills (specific makes and models not yet determined)

Calcium chloride brine will not been used for the geotechnical drilling. Less water is generally required for geotechnical drilling as opposed to exploration drilling. During periods of drilling, the maximum water use rate is approximately 38 litres per minute (10 US gallons per minute) or 6.3×10^{-4} cubic metres per second based on the capacity of the pumps servicing the drills.

The water pumping stations draw water from bodies of water of sufficient quantity so as not to cause drawdown of the water level in the water body. Screens have been placed over the intake hoses to ensure that fish are not entrained. The pumping rate is kept at a rate to ensure that fish do not become impinged on the screens, and to minimize water use.

SECTION 3.0 - GENERAL MITIGATION MEASURES

The following measures are used to mitigate potential environmental impacts due to issues from discharge of water from the water management areas. If a need is identified, additional measures will be implemented.

3.1 SILT FENCE

3.1.1 Description

Silt fences are a geotextile or fabric barrier that impedes the flow of surface water which potentially may cause suspended sediment to be deposited. Silt fences are typically supported using wooden stakes (usually attached to the fabric by the manufacturer) and may be placed using a variety of methods such as digging a trench and backfilling material to ensure stability. Attempts are made to install silt fence in lines of equal elevation (along contour lines) to prevent channelling or focusing of the runoff.

Standards for installation including trench excavation, insertion of fabric, and backfilling and compacting can be found on the Ontario Provincial Standard Drawing (OPSD) 219.110 - Light Duty Silt Fence Barrier and 219.130 - Heavy Duty Silt Fence Barrier.

3.1.2 Typical Locations of Use

Silt fences are used in areas where surface water could potentially come into contact with disturbed sites causing elevated suspended solids. Typical installation locations are:

- Downstream of drill rigs
- Along roads where surface runoff is expected
- Surrounding stockpiles of material or drill cuttings

3.1.3 Substitutes

Free standing silt fences are considered for use in areas where a typical silt fence is impractical for example on rock or impenetrable surfaces. Diversion/collection channels or berms are used in certain locations.

3.2 DIVERSION/COLLECTION CHANNEL OR BERM

3.2.1 Description

Diversion/collection channels or berms are used to locally direct surface water runoff.

When required, the structures are constructed using suitable materials to divert the surface water without causing erosion or suspension of additional sediment. Excavation of channels may be an option; however, construction of berms using soil or man-made structures such as sand bags/tubes are also evaluated.

3.2.2 Typical Locations of Use

Channels or berms are used in locations where it is required to divert or collect surface water. Diversion structures are installed to prevent runoff from entering a site where the surface soil has been disturbed and would cause suspension of sediment. Additionally collection channels or berms may be constructed to collect runoff emerging from an area of soil disturbance.

One possible use of a diversion/collection channel or berm is to ensure runoff is directed to a constructed mitigation measure such as an in-ground sump.

3.2.3 Substitutes

Silt fences can be used as an alternative to constructing a channel or berm.

3.3 CONTAINMENT BERM

3.3.1 Description

A containment berm can be constructed to establish a sump, basin or pond to contain or collect water. The sump could be used to contain discharge water to allow suspension of sediment prior to discharge or to temporarily contain the water for re-circulation. The berm is constructed using native soils or other suitable man-made products.

Care is taken when constructing berms to ensure the base is on a solid foundation. Soil placed to construct the berms is nominally compacted to provide strength for the structure. Berm heights are minimized (<1 m).

3.3.2 Typical Locations of Use

Containment berms are constructed across small valleys or around natural depressions to augment the capacity of the berms.

3.3.3 Substitutes

In-ground sumps or portable containment sumps or tanks can be used in place of a containment berm.

3.4 IN-GROUND SUMP

3.4.1 Description

An in-ground sump can be constructed to establish a sump, basin or pond to contain or collect water, similar to the containment berm. An in-ground sump is constructed by excavating a depression into soil to provide water containment. Excavated material from the sump can be used to construct a containment berm surrounding the sump to augment the capacity of the sump.

3.4.2 Typical Locations of Use

In-ground sumps are used in some areas where excavation of soil is possible.

3.4.3 Substitutes

Containment berms, or portable containment sumps or tanks can be used in place of an in-ground sump.

3.5 PORTABLE CONTAINMENT SUMP

3.5.1 Description

Portable containment sumps are used to establish a sump to contain water from a source such as a drill rig. The portable sump requires only minimal excavation or construction to provide a level base for the sump.

A series of portable containment sumps can be connected together to provide additional containment or settling capacity if required.

Collected sediment or drill cuttings from the portable containment sumps are removed from the sumps as necessary and disposed of in pit locations approved by Baffinland management and located at distances of at least 30 m from water bodies.

3.5.2 Typical Locations of Use

Portable containment sumps are used in areas where containment berms or in-ground sumps are impractical such as steep topography or in areas where overburden is not readily available.

3.5.3 Substitutes

Containment berms or in-ground sumps are used in place of a portable containment sump.

3.6 ACID ROCK DRAINAGE AND METAL LEACHING

3.6.1 Description

The potential for acid rock drainage (ARD) and metal leaching (ML) is considered to be low and is only a concern for the bulk sample pit and waste rock and weathered ore stockpile at Deposit No. 1. Temporary ore stockpiles are not considered to be an issue with respect to ARD and/or ML. If evidence of ARD and/or ML is noted, it will be confirmed that up gradient surface runoff is routed around the pit and/or stockpile of concern. Where necessary, readily available neutralizing material that is not ML will be placed in the pits and mixed with the waste rock and weathered ore stockpile to effectively neutralize any potential acid conditions. Nearby Cambrian-Ordovician dolostone and limestone south of the deposit or local acid buffering overburden material would be used as the neutralizing agent if necessary.

3.6.2 Typical Locations of Use

ARD and ML mitigation would be used in areas where ore is stored, crushed, stockpiled, excavated or otherwise handled.

3.6.3 Substitutes

Several local materials can be used as the neutralizing agent, including dolostone, limestone or acid-buffering overburden material.

SECTION 4.0 - HYDROLOGY AND PREDICTED SURFACE WATER RUNOFF RATES

The following sections present the information required by Part B (6) of the Nunavut Water Board (NWB) license 2BB-MRY0710 for the Mary River Project.

4.1 SURFACE WATER RUNOFF EVALUATION

The data presented in this report are based on updated evaluations based on field data collected during the 2006 and 2007 field seasons. As additional stream gauging data are collected for the Mary River Project area surface water runoff estimations will also improve.

A summary of the unit surface water runoff rates for the Mary River Project area is presented on Table 4.1. The locations of the stream gauging stations are shown on Figures 4.1 and 4.2. The runoff values indicate that from October to May there should be no runoff and that approximately half of the flows occur in July.

4.2 WATER USAGE FOR DRILLING

Based on the flow evaluation discussed in the previous section, special consideration for drill water requirements was made when creating the drilling schedules. Drilling in locations not adjacent to larger water bodies are scheduled during periods of high flow to ensure drawdown will not occur. Drillholes located adjacent to larger bodies of water are not water dependent and are completed at times convenient to the drilling schedule.

Drilling programs are undertaken such that any consumption of water from ponds, lakes and rivers will not result in measurable drawdown of the water bodies. A maximum drawdown threshold of 5% has been set for all water bodies, assuming no recharge of the water body. No water is used from streams where there is a potential for drawdown effect without first obtaining regulatory approval as required.

SECTION 5.0 - WATER MANAGEMENT AREAS

The following sections provide a site description, details of surface water quantity and direction and mitigation procedures for the water management areas.

5.1 MARY RIVER CAMP SITE

The location of the site is provided on Figures 1.1 and 1.2.

5.1.1 Description

- A personnel camp and associated support facilities to service approximately 200 people during peak periods
- Domestic water supply from adjacent Camp Lake
- Sewage treatment using pre-engineered facilities discharging to either storage pond or Sheardown Lake
- Gravel airstrip
- Helicopter landing pad
- Bulk and barrel fuel storage and handling areas

5.1.2 Surface Water Direction and Quantity

The catchment areas for the Mary River Camp Site are shown on Figures 5.1 and 5.2. Ultimately the surface water at the site is directed towards Camp, Sheardown and Mary Lakes. The estimated surface water runoff quantities for each catchment area are shown on Table 5.1.

5.1.3 Mitigation Procedures

The Mary River Camp Site is not expected to have significant areas of disturbed soils and as such should not have sediment and erosion issues. The site will be regularly monitored (as discussed in the Monitoring section of this report). If mitigation measures are required to control sediment and erosion they will be selected and installed as previously discussed in the section General Mitigation Measures.

5.2 MARY RIVER DRILLING AREA

The location of the site is provided on Figure 1.2.

5.2.1 Description

- No permanent structures or buildings
- A historic camp from the exploration work undertaken in the 1960's located on the way to the Deposit No. 1 has been partially remediated
- No new camps

- Exploration drilling focused on Deposits No 1, 2, 3 and 3B
- Geotechnical and exploration drilling
- Water pumping stations where water will be pumped from either Mary River or Sheardown Lake to the salt mixing stations
- Salt mixing stations where salt is mixed with the water to create a brine solution. This solution is pumped from the salt mixing stations to drill rigs used for exploration drilling. The brine may be heated in colder temperatures. Drill additives, as discussed earlier, will be added as required.
- Drill water discharge (using mitigation measures previously discussed)
- Fuel is stored at the Mary River Camp Site within the storage facility and transported to the drill sites and to the pumping stations as required
- Geophysical survey using ground penetrating radar (GPR) and resistivity methods at mine infrastructure area

5.2.2 Surface Water Direction and Quantity

The catchment areas for the Mary River Drilling Area are shown on Figure 5.2. Ultimately the surface water at the site is directed towards Camp, Sheardown and Mary Lakes. The estimated surface water runoff quantities for each catchment area are shown on Table 5.1.

During the field work seasons there is additional surface water discharge from the drill rigs. This flow is estimated to be a maximum of 12 gallons per minute per drill during periods of drilling. An estimated maximum of four drill rigs may operate at any one time at the Mary River Drilling Area.

5.2.3 Mitigation Procedures

Sediment and erosion control measures are periodically required and are installed as per the previous section: General Mitigation Measures. The site is regularly monitored (as discussed in the Monitoring section of this report).

Fuel required for drilling will be transported in fuel drums or double walled day tanks. Drip pans are used under the tanks to prevent fuel contamination.

5.3 MILNE INLET CAMP SITE

The location of the site is provided on Figures 1.1 and 1.2.

5.3.1 Site Description

- A personnel camp and associated support facilities to service approximately 60 people during peak periods of use
- Domestic water supply from Phillips Creek (Monitoring Location MRY-2) during the summer months and an unnamed lake along the Milne Inlet Tote Road at km 32 during the winter season

- Sewage treatment using pre-engineered facilities discharging to either storage pond or to Milne Inlet via a local drainage ditch
- Gravel airstrip
- Fuel storage areas for bulk fuel and barrel fuel, as well as waste storage areas. Each consists of a lined containment area.

5.3.2 Surface Water Direction and Quantity

The catchment areas for the Milne Inlet Camp Site are shown on Figure 5.3. The surface water at the site is ultimately directed to Milne Inlet. The estimated surface water runoff quantities for each catchment area are shown on Table 5.2.

5.3.3 Mitigation Procedures

The Milne Inlet Camp Site is not expected to have significant areas of disturbed soils and as such should not have sediment and erosion issues. The site is regularly monitored (as discussed in the Monitoring section of this report). If mitigation measures are required to control sediment and erosion they will be selected and installed as previously discussed in the General Mitigation Measures section.

5.4 MILNE INLET TOTE ROAD REFUGE STATIONS

The location of the sites is provided on Figure 1.2.

5.4.1 Description

- Small half size trailers located at km 33 and 68 of the Milne Inlet Tote Road
- Fuel storage area for 4 fuel drums per camp; no berms or liners
- Bottled water stored in trailers

5.4.2 Surface Water Direction and Quantity

The surface water at the km 33 refuge station ultimately reports to an unnamed lake and Philips creek, and the water at the km 68 refuge station ultimately reports to an unnamed creek.

5.4.3 Mitigation Procedures

The refuge station sites are not expected to have significant areas of disturbed soils and as such should not have sediment and erosion issues. The site is regularly monitored when in use (as discussed in the Monitoring section of this report). If mitigation measures are required to control sediment and erosion they are selected and installed as previously discussed in the section General Mitigation Measures.

5.5 STEENSBY INLET CAMP SITE

The location of the site is provided on Figures 1.1 and 1.2.

5.5.1 Description

- Seasonal drill camp with water flown in and toilet wastes incinerated on site
- Grey water sump used for kitchen and wash tent
- Airstrip - there is no fixed runway at the Steensby Inlet Camp Site. A seasonal on-ice runway is used during the winter near the site.
- Fuel storage area will consist of lined containment berm(s) with a capacity for approximately 2000 drums P50 and 2000 drums Jet-A (205 litre drums)
- Geotechnical drilling
- Water for drilling will be obtained from Steensby Inlet and other sources adjacent to the drilling locations
- Drill water discharge (using mitigation measures previously discussed)
- Geophysical survey using ground penetrating radar (GPR) at nearby lakes for water source bathymetry

5.5.2 Surface Water Direction and Quantity

The catchment areas for the Steensby Inlet Camp Site are shown on Figure 5.4. The surface water at the site ultimately reports to Steensby Inlet. The estimated surface water runoff quantities are shown on Table 5.3.

5.5.3 Mitigation Procedures

The Steensby Inlet Camp Site is not expected to have significant areas of disturbed soils and as such should not have sediment and erosion issues. The site is regularly monitored when in use (as discussed in the Monitoring section of this report). If mitigation measures are required to control sediment and erosion they are selected and installed as previously discussed in the section General Mitigation Measures.

5.6 STEENSBY INLET ON-ICE DRILLING AREA

The location of the site is provided on Figure 1.2.

5.6.1 Description

- No permanent structures or buildings
- No camps
- No fuel storage
- On-ice geotechnical drilling
- Water for drilling is taken from the ocean
- Drill water discharge
- On-ice probing (no water taking or discharge)

5.6.2 Mitigation Procedures

Only geotechnical drilling is completed on the ice, and no drill water is discharged on the ice. All water comes out of the hole at the casing/ocean bottom interface. If drilling continues into bedrock the drill water is discharged into a portable containment sump and removed from the ice. The water and cuttings contained in the portable containment sump are disposed of in a pit location at least 30 m from water to be determined by Baffinland and Knight Piésold.

No fuel is stored on the ice. Fuel required for drilling will be transported in fuel drums or double walled day tanks. Drip pans are used under the tanks to prevent fuel contamination.

5.7 RAIL CAMP

The location of the site is provided on Figures 1.1 and 1.2.

5.7.1 Description

- Seasonal drill camp with water from adjacent unnamed lake and toilet wastes incinerated on site
- Grey water sump used for kitchen and wash tent
- Airstrip - there is no fixed runway at the Rail Camp Site. A seasonal on ice runway will be used during the winter near the site.
- Fuel storage area will consist of two lined containment berms with a capacity for approximately 1000 drums P50 and 1000 drums Jet-A (205 litre drums)
- Geotechnical drilling
- Water for drilling will be obtained from lakes adjacent to the drilling locations
- Drill water discharge (using mitigation measures previously discussed)
- Geophysical survey using ground penetrating radar (GPR) at nearby lakes for water source bathymetry

5.7.2 Surface Water Direction and Quantity

The surface water at the site ultimately reports to an unnamed lake adjacent to the site.

5.7.3 Mitigation Procedures

The Rail Camp Site is not expected to have significant areas of disturbed soils and as such should not have sediment and erosion issues. The site is to be regularly monitored when in use (as discussed in the Monitoring section of this report). If mitigation measures are required to control sediment and erosion they are selected and installed as previously discussed in the section General Mitigation Measures.

5.8 PROPOSED RAIL ALIGNMENT

The alignment is shown on Figures 1.1 and 1.2.

5.8.1 Description

- Seasonal drill camp as detailed in the Rail Camp section
- No permanent structures or buildings
- No fuel storage
- Geotechnical drilling
- Water for drilling is obtained from sources adjacent to the drilling locations
- Drill water discharge (using mitigation measures previously discussed)
- Geophysical survey using ground penetrating radar (GPR) and resistivity methods

5.8.2 Surface Water Direction and Quantity

The catchment areas for the Proposed Rail Alignment are shown on Figure 5.5. The surface water along the corridor is ultimately directed to Cockburn River, Cockburn Lake, Ravn River and Angajurjualuk Lake. Specific surface water runoff quantities were not calculated for the transportation corridor due to the large catchment area and the minimal quantity of water required for the drilling.

5.8.3 Mitigation Procedures

Sediment and erosion control measures may be required and are installed as per the previous section General Mitigation Measures. The site is regularly monitored as discussed in the Monitoring section of this report.

Fuel required for drilling will be transported in fuel drums or double walled day tanks. Drip pans are used under the tanks to prevent fuel contamination.

5.9 STEENSBY INLET RAIL ALIGNMENT ON-ICE DRILLING

The alignment is shown on Figures 1.1 and 1.2.

5.9.1 Description

- No permanent structures or buildings
- No camps
- No fuel storage
- On-ice geotechnical drilling
- Water for drilling is taken from lakes and sources close to the drill sites
- Drill water discharge
- On-ice probing (no water taking or discharge)
- Geophysical survey using ground penetrating radar (GPR) at proposed bridge locations

5.9.2 Mitigation Procedures

Only geotechnical drilling is completed on the ice, and no drill water is discharged on the ice. All water comes out of the hole at the casing/lake bottom interface. If drilling continues into bedrock the drill water is discharged into a portable containment sump and removed from the ice. The water and cuttings contained in the portable containment sump are disposed of in a pit location at least 30 m from water to be determined by Baffinland and Knight Piésold.

No fuel is stored on the ice. Fuel required for drilling will be transported in fuel drums or double walled day tanks. Drip pans are used under the tanks to prevent fuel contamination.

5.10 PROPOSED HYDRO-ELECTRIC SITE

The location of the site is shown on Figure 1.2

5.10.1 Description

- No permanent structures or buildings
- No camps
- Fuel is stored at either the Milne Inlet or Steensby Inlet Camps within the storage facilities and flown to the drill sites as required
- Geotechnical drilling
- Water for drilling is taken from lakes adjacent to the drill sites
- Drill water discharge (using mitigation measures previously discussed)

5.10.2 Surface Water Direction and Quantity

Specific surface water runoff quantities were not calculated for the proposed hydro-electric site due to the large catchment area and the minimal quantity of water required for the drilling.

5.10.3 Mitigation Procedures

Sediment and erosion control measures may be required and are installed as per the previous section General Mitigation Measures. The site will be regularly monitored as discussed in the Monitoring section of this report.

5.11 BULK SAMPLE OPEN PIT OPERATIONS

The bulk sample pit location is provided on Figure 5.2.

5.11.1 Description

- Approximately 250,000 t bulk sample of iron ore from Deposit No. 1 will be removed from a pit within the Mary Lake catchment area
- Ore will be extracted by blasting with explosives and excavating at 5 to 10 m intervals, the pit will be approximately 20 m in depth and free draining (i.e.: side hill cut)
- Ore will be transported from the bulk sample pit to the ore crushing area by haul trucks
- Ore sample will be crushed in the crushing area using a portable crusher to produce a lump ore product and a fine ore product
- Lump and fine ore product will stored in separate piles
- No camps
- No fuel storage
- Acid rock drainage (ARD) and metal leaching (ML) tests have been conducted on the fresh ore, with results indicating that, due to the physical environment and the geochemistry of the ore, ARD and ML are very unlikely to occur (Knight Piésold letter NB07-00481)

5.11.2 Surface Water Direction and Quantity

The catchment areas for the bulk sample open pit operations are shown on Figures 5.1 and 5.2. Ultimately the surface water at the site is directed towards Mary River Camp, Sheardown and Mary Lakes. The estimated surface water runoff quantities for each catchment area are shown on Table 5.1.

5.11.3 Mitigation Procedures

Sediment and erosion control measures may be required and will be installed as per the previous section General Mitigation Measures. The site will be regularly monitored as discussed in the Monitoring section of this report. If evidence of ARD and ML is noted, up gradient surface run-off will be routed around the pits and stockpiles, and neutralizing material will be placed in the pit and mixed with the waste rock and weathered ore stockpile to effectively neutralize any potential acid. Nearby dolostone, limestone or local acid-buffering overburden material would be used as the neutralizing agent, if needed.

5.12 WEATHERED ORE / WASTE ROCK STOCKPILE

5.12.1 Description

- Two types of waste rock will be generated during the bulk sample program: a small volume of non-ore bearing waste rock and weathered ore
- Weathered ore will be stripped and stockpiled at a location shown on Figure 5.2. Waste rock will likely remain in the weathered ore stockpile.
- Acid rock drainage (ARD) and metal leaching (ML) tests have been conducted on the fresh ore, with results indicating that, due to the physical environment and the

geochemistry of the ore, ARD and ML are very unlikely to occur (Knight Piésold letter NB07-00481)

5.12.2 Surface Water Direction and Quantity

The catchment areas for the bulk sample open pit operations are shown on Figure 5.2. Ultimately the surface water in the area is directed towards Camp, Sheardown and Mary Lakes. The estimated surface water runoff quantities for each catchment area are shown on Table 5.1.

5.12.3 Mitigation Procedures

Sediment and erosion control measures may be required and will be installed as per the previous section General Mitigation Measures. The site will be regularly monitored as discussed in the Monitoring section of this report. If evidence of ARD and ML is noted, up gradient surface runoff will be routed around the pit and stockpiles, and neutralizing material will be placed in the pit and mixed with the waste rock and weathered ore stockpile to effectively neutralize any potential acid. Nearby dolostone, limestone or local acid-buffering overburden material would be used as the neutralizing agent, if needed.

5.13 CRUSHING OPERATIONS AT MARY RIVER

Crusher locations are provided on Figure 5.2.

5.13.1 Description

- A temporary crusher feed stockpile will be located north-east of Sheardown Lake at Mary River
- Temporary stockpiles of lump ore and fines will be located adjacent to the crusher
- Trucks will enter and exit the crushing area using roads from Deposit No. 1 and by the Milne Inlet Tote Road
- ARD and ML tests have been conducted on the fresh ore, with results indicating that, due to the physical environment and the geochemistry of the ore, ARD and ML are very unlikely to occur

5.13.2 Surface Water Direction and Quantity

The catchment areas for the stockpiles and crusher operations in the vicinity of the Mary River Camp are shown on Figure 5.2. Surface water in this area is directed towards Sheardown Lake. The estimated surface water runoff quantities for each catchment area are shown on Table 5.1.

5.13.3 Mitigation Procedures

Sediment and erosion control measures may be required and will be installed as per the previous section General Mitigation Measures. The site will be regularly monitored as discussed in the Monitoring section of this report.

5.14 TEMPORARY ORE STORAGE AT MILNE INLET

5.14.1 Description

- Temporary stockpiles of lump ore and fines will be located at Milne Inlet adjacent to the beach loading area
- Ore will be transported to Milne Inlet from the Mary River Area using the Milne Inlet Tote Road
- ARD and ML tests have been conducted on the fresh ore, with results indicating that, due to the physical environment and the geochemistry of the ore, ARD and ML are very unlikely to occur
- Location of the temporary stockpile is shown on Figure 5.3

5.14.2 Surface Water Direction and Quantity

The catchment areas for the stockpiles at Milne Inlet are shown on Figure 5.3. Surface water in this area is directed towards Milne Inlet. The estimated surface water runoff quantities for each catchment area are shown on Table 5.2.

5.14.3 Mitigation Procedures

Sediment and erosion control measures may be required and will be installed as per the previous section General Mitigation Measures. The site will be regularly monitored as discussed in the Monitoring section of this report. The stockpiles will be located a minimum of 30 m from the normal high water mark of Milne Inlet and other water bodies.

5.15 BULK FUEL STORAGE AREAS

Described in sections detailing camp and refuge station descriptions.

5.16 MILNE INLET TOTE ROAD

5.16.1 Description

- Historic dirt road constructed in the mid 1960’s (Tote Road / bulk sampling road)
- The existing 105 km Tote Road running between Milne Inlet and the Mary River camp is being upgraded to support transport of the bulk sample from Deposit No. 1
- Select water crossings along the road are being upgraded through the installation of culverts and modified sea containers as per Department of Fisheries and Oceans (DFO) approval

- Two temporary refuge stations, one at km 33 and one at km 68 consisting each of a half size trailer and 4 drum fuel storage area
- No permanent structures or buildings
- The Milne Inlet Tote Road is shown on Figures 1.1 and 1.2

5.16.2 Surface Water Direction and Quantity

The catchment areas for the Milne Inlet Tote Road are shown on Figure 5.6. Ultimately the surface water north of Katiktok Lake discharges in Milne Inlet via Phillips Creek and surface water south of Katiktok Lake eventually flows into Mary River via Camp, Sheardown and Mary Lakes. Specific surface water runoff quantities were not calculated for the transportation corridor due to the large catchment area and the minimal quantity of water required for road construction and maintenance.

5.16.3 Mitigation Procedures

The Milne Inlet Tote Road is currently being upgraded to a year-round all-weather road to support a heavier traffic volume during the bulk sample program. Sediment and erosion control measures are installed when required as per the previous section General Mitigation Measures. The area is regularly monitored (as discussed in the Monitoring section of this report).

5.17 ASSOCIATED CONSTRUCTION MATERIAL AND QUARRY OPERATIONS

5.17.1 Description

- Granular material borrow pits (sand and gravel up to cobble sized material) will be developed to support road upgrades for the bulk sampling road and camp infrastructure
- Three primary areas have been identified for borrow pits: Borrow Area 1 near Milne Inlet, Borrow Area 2 near km 63 of the Milne Inlet Tote Road, Borrow Area 3 near Mary River camp. In addition to these three primary areas, suitable borrow material will be used in areas directly adjacent to the Tote Road, within the right-of-way.
- Surficial borrow materials will be obtained by stripping and excavation of the active layer
- Processing of borrow materials will be limited to screening using a grizzly and segregation of material into temporary stockpiles
- Excavation will not occur within 30 m of a watercourse, and seasonal drainage ways will be re-established during pit development
- Rock quarries may be developed for various construction purposes
- Potential rock quarry locations are near Milne Inlet and Mary River
- Rock will be obtained through drilling and blasting
- Quarrying will not occur within 30 m of a watercourse, and drainage will be re-established during quarry development

- Acid rock drainage (ARD) and metal leaching (ML) tests have been conducted on rock samples, with results indicating that, due to the physical environment and the geochemistry of the rock, ARD and ML are very unlikely to occur from quarry materials
- No camps
- No fuel storage
- Locations of the primary borrow sites and rock quarries are shown on Figure 5.6

5.17.2 Surface Water Direction and Quantity

The catchment areas for the borrow and quarry operations are shown on Figure 5.6. Specific surface water runoff quantities were not calculated due to the number of large catchment areas that would be involved.

5.17.3 Mitigation Procedures

Sediment and erosion control measures may be required and will be installed as per the previous section General Mitigation Measures. Berms and other drainage measures will be established as needed to limit erosion and maintain positive drainage to minimize water ponding. Contouring, berming and silt fences will be applied as necessary for sediment and erosion control. The site will be regularly monitored as discussed in the Monitoring section of this report.

SECTION 6.0 - MONITORING

In addition to specific monitoring and reporting requirements under the regulatory approvals such as the water license, QIA land lease, land use permits and fisheries authorization as well as monitoring of project effects associated with execution of the bulk sample program, routine inspections of various aspects of the operations will be undertaken. Routine water management related inspections will be conducted at drill sites, camp sites and related infrastructure, roadways, bulk sample pit and ore handling facilities.

Routine inspections and water license monitoring is outlined below.

6.1 ROUTINE INSPECTIONS

6.1.1 Drill Sites

Pre-drilling inspection of the immediate area surrounding the drill site will be completed as part of the safety/environmental inspection prior to the setup of the drill by drilling and other site personnel.

Particular items for review are:

- Drillhole coordinates
- Water source coordinates
- Site photo
- Water source photo
- Distance to nearest water source
- Archaeological approval
- Completed wildlife survey

Routine daily inspections of the immediate area surrounding the drills will be completed as part of the safety/environmental inspection on a daily basis by drilling or other site personnel.

Particular items for review are:

- Fuel leaks
- Drip Pans
- Equipment condition
- Sediment and erosion control measures
- Water intakes
- Water management systems
- Flow meter readings

Post-drilling inspection of the immediate area surrounding the drill site will be completed as part of the safety/environmental inspection after the drill has been removed from site by drilling and other site personnel.

Particular items for review are:

- All materials and debris removed from site
- Quantity of equipment, rods or casing left in the hole
- Site photo
- Water source photo
- Water use assessment
- Environmental concerns
- Wildlife concerns

Pre and Post-Drilling water sampling will be completed for each on-ice drillhole.

The methodology for the water sampling is:

- Select a location a maximum of 30 m from the proposed drillhole location
- Auger a hole through the ice and clear the hole of ice cuttings
- Use a bailer to obtain a water sample from below the bottom of the ice
- Transfer the water sample to the sample bottles
- Repeat the steps to collect a second sample following completion of the drillhole

6.1.2 Camp Sites and Temporary Refuge Stations

Routine camp and temporary refuge station inspections will be completed.

Particular items for review are:
- Fuel leaks
- Sediment and erosion control structures

6.1.3 Roadways

Routine inspections will be completed along the roadways, particularly the Milne Inlet Tote Road and the access road between the Mary River Camp and Mary River Drilling Area.

Particular items for review are:
- Any rutting by vehicles
- Sediment and erosion control structures

6.1.4 Bulk Sample Open Pit Operations

Routine inspections will be completed at the bulk sample open pit areas.

Particular items for review are:

- Sediment and erosion control structures
- Evidence of ARD and ML

6.1.5 Weathered Ore / Waste Rock Stockpile

Routine inspections will be completed at the weathered ore/waste rock stockpile.

Particular items for review are:

- Sediment and erosion control structures
- Evidence of ARD and ML

6.1.6 Temporary Ore Storage at Mary River and Milne Inlet

Routine inspections will be completed at the temporary ore storage areas at Mary River and Milne Inlet.

Particular items for review are:

- Sediment and erosion control structures
- Evidence of ARD and ML

6.1.7 Bulk Fuel Storage Areas

Routine inspections will be completed at the bulk fuel storage areas.

Particular items for review are:

- Evidence of hydrocarbon staining or leaks from containment devices
- Full-time supervision of fuel transfer operations
- Sediment and erosion control structures

6.1.8 Ore Processing Area

Routine inspections will be completed at the ore processing area.

Particular items for review are:

- Sediment and erosion control structures
- Evidence of ARD and ML

6.1.9 Associated Construction Material Quarry Operations

Routine inspections will be completed at the borrow and quarry areas.

Particular items for review are:

- Sediment and erosion control structures
- Evidence of ARD and ML

6.2 WEEKLY WATER QUALITY MONITORING

The weekly monitoring program will be completed by on-site personnel and will involve the following:

- Surface water sampling from the locations shown on Figure 6.1. Additional sample locations will be added as required to ensure representative samples are taken downstream of all activities. The samples will be shipped for laboratory analysis for the following parameters as required:

  Calcium, Magnesium, Sodium, Potassium, Aluminium, Arsenic, Boron, Barium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Strontium, Thallium, Vanadium, Zinc, Tin, pH, Conductivity, Alkalinity as $CaCO_3$, TDS (COND-CALC), TSS (total suspended solids), Turbidity, Phenols, N-NH_3, SO_4, Cl, Br,N-NO_2, N-NO_3, NO_2 + NO_3 as N, Mercury, Hardness as $CaCO_3$, TOC (total oxygen content), DOC (dissolved oxygen content), Benzene, Toluene, Ethyl Benzene, Oil and Grease

A comparison of the sampling results to the Canadian Council of Ministers for the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Aquatic Life will be completed.

6.3 WASTE DISPOSAL MONITORING

6.3.1 Monitoring Stations

Signs will be posted in appropriate areas at Monitoring Stations, and will be located and maintained to the satisfaction of the Inspector. Monitoring Stations will be maintained at the following locations:

Monitoring Station Number	Description	Status
MRY-1	Water supply for the Mary River Camp at Camp Lake	Active-volume
MRY-2	Summer water supply for the Milne Inlet Camp at Phillips Creek	Active-volume
MRY-3	Winter water supply for Milne Inlet Camp at the Km 99 lake (See Note 1)	Active-volume
MRY-4	Mary River Camp sewage discharge at the WWTF	Active
MRY-4a	Mary River Camp sewage discharge from the PWSP	
MRY-5	Milne Inlet Camp sewage discharge at the WWTF	Active
MRY-5a	Milne Inlet Camp sewage discharge from the PWSP	
MRY-6	Water collected within the Bulk Fuel Storage Facility at Mary River prior to release	
MRY-7	Water collected within the Bulk Fuel Storage Facility at Milne Inlet prior to release	
MRY-8	Minewater and surface drainage either pumped or released from the Hematite Open Pit	

Monitoring Station Number	Description	Status
MRY-9	Minewater and surface drainage either pumped or released from the mixed ore (Hematite and Magnetite) Open Pit	Active
MRY-10	Surface discharge from the weathered ore stockpile	
MRY-11	Surface discharge from the lump ore and fine ore stockpiles at the processing area	
MRY-12	Surface discharge from the lump ore and fine ore stockpiles at the processing area	

Notes:

1. The winter water supply for the Milne Inlet Camp is at km 32 not km 99.
2. Monitoring Station MRY-8 is no longer required as there will only be one open pit which will be monitored by MRY-9.

The monitoring locations are shown on Figure 6.1.

6.3.2 Bulk Sample Open Pit

All discharge from the bulk sample open pit will be analyzed and discharge at Monitoring Station MRY-9 will not exceed the following limits:

Parameter	Maximum Average Concentration (mg/L)	Maximum Concentration of Any Grab Sample (mg/L)
Total Arsenic	0.5	1.00
Total Copper	0.30	0.60
Total Lead	0.20	0.40
Total Nickel	0.50	1.00
Total Zinc	0.5	1.00
Total Suspended Solids	15.0	50.0
Oil and Grease	No visible sheen	N/A
Waste discharged will have a pH between 6.0 - 9.5		

6.3.3 Waste Water Treatment Facility (WWTF)

All sewage will be discharged to a Waste Water Treatment Facility at Mary River and Milne Inlet unless otherwise approved.

All sewage discharged from the Waste Water Treatment Facility at Monitoring Stations MRY-4 and MRY-4a, at Mary River, will not exceed the following quality standards:

Parameter	Maximum Average Concentration
BOD_5	30 mg/L
Total Suspended Solids	35 mg/L
Fecal Coliform	1000 CFU/100 mL
Oil and Grease	No visible sheen
pH	between 6.0 - 9.5

All sewage discharged from the Waste Water Treatment Facility at Monitoring Stations MRY-5 and MRY-5a, at Milne Inlet, will not exceed the following quality standards:

Parameter	Maximum Average Concentration
BOD_5	100 mg/L
Total Suspended Solids	120 mg/L
Fecal Coliform	10,000 CFU/100 mL
Oil and Grease	No visible sheen
pH	between 6.0 - 9.5

6.3.4 Monitoring Station Discharge

Effluent discharged from Monitoring Stations MRY-4 and MRY-4a, and MRY-5 and MRY-5a will be demonstrated to be acutely non-toxic in accordance with test procedures measuring acute lethality to Rainbow trout, Oncorhynchus mykiss (Environment Canada's Environmental Protection Series Biological test Method EPS/1/RM/13) and Daphnia magna (Environment Canada's Environmental Protection Series Biological Test Method EPS/1/RM/14). Testing will occur once annually during open water season.

Samples will be collected at Monitoring Stations MRY-4 and MRY-5 every four weeks during discharge and at Monitoring Stations MRY-4a and MRY-5a once prior to discharge and every 4 weeks thereafter. Samples will be analyzed for: Biochemical Oxygen Demand (BOD), total suspended solids (TSS), pH, fecal coliforms, oil and grease (visual).

6.3.5 Bulk Fuel Storage Facilities

Effluent discharged from the Bulk Fuel Storage Facilities at Monitoring Stations MRY-6 and MRY-7 will meet the following effluent quality standards:

Parameter	Maximum Average Concentration (µg/L)
Benzene	370
Toluene	2
Ethyl benzene	90
Lead	1
Oil and Grease	15,000 and no visible sheen

6.4 ADAPTIVE MANAGEMENT STRATEGIES

Housekeeping and operational measures have been instituted at the salt mixing stations and increased use of sumps and silt curtains at the exploration drill sites have been put in place to further reduce the potential risks for salt related impacts. Work procedures will continuously be adapted with the goal to reduce salt use, reduce water use and reduce the potential effects related to water management on the environment.

Baffinland is committed to continual improvement in its work activities in the aim of reducing risks to the environment and improving operational effectiveness. The strategy employed at Baffinland is regular monitoring supported by operational change and adoption of other mitigating measures if warranted.

SECTION 7.0 - QA/QC PLAN

The Surface Water Sampling Program - Quality Assurance & Quality Control Plan (QA/QC Plan Ref. No. NB102-00181/10-7, Rev. 1) is included in Appendix A of this report. The QA/QC Plan has been prepared to fulfil the requirement of Part I, Item 9 of the License No. 2BB-MRY0710 issued by the NWB to Baffinland on July 27, 2007.

The QA/QC best practices that are outlined are designed to provide guidance to field staff and analytical laboratories in order to maintain a high level of confidence in the water quality data generated from the Mary River Project. The plan addresses best practice methods for water samples collected from lakes, streams and rivers, treated wastewater effluent, drinking water and site drainage.

For a more detailed and comprehensive outline, please refer to the appended report.

SECTION 8.0 - CERTIFICATION

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

Prepared by:

C. A. (Andy) Phillips, P.Eng.
Senior Engineer

Reviewed by:

Steven R. Aiken, P.Eng.
Manager Environmental Services

Approved by:

Ken D. Embree, P.Eng.
Managing Director

TABLE 4.1

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT

SITE WATER MANAGEMENT PLAN

MONTHLY UNIT RUNOFF SUMMARY

Gauging Station	Drainage Area (km^2)	2006				2007				Average (2006 and 2007)			
		Jun	Jul	Aug	Sep	Jun	Jul	Aug	Sep	Jun	Jul	Aug	Sep
H1	**248.7**	0.0209	0.0582	0.0214	0.0139	0.0147	0.0262	0.0153	0.0042	0.0178	0.0422	0.0184	0.0090
H2	**217.5**	0.0231	0.0883	0.0247	0.0141	0.0203	0.0358	0.0186	0.0052	0.0217	0.0620	0.0216	0.0097
H3	**30.4**	0.0337	0.1096	0.0227	0.0134	0.0097	0.0280	0.0147	0.0035	0.0217	0.0688	0.0187	0.0084
H4	**9.4**	0.0524	0.0923	0.0295	0.0165	0.0172	0.0237	0.0150	0.0050	0.0348	0.0580	0.0222	0.0107
H5	**5.4**	0.0556	0.1067	0.0252	0.0137	0.0207	0.0189	0.0183	0.0048	0.0381	0.0628	0.0218	0.0093
H6	**240.0**	0.0127	0.0753	0.0217	0.0137	0.0201	0.0426	0.0191	0.0026	0.0164	0.0589	0.0204	0.0082
H7	**14.7**	0.0086	0.0784	0.0176	0.0095	0.0238	0.0329	0.0170	0.0039	0.0162	0.0556	0.0173	0.0067
H8	**208.4**	0.0108	0.0584	0.0118	0.0098	0.0183	0.0340	0.0166	0.0039	0.0146	0.0462	0.0142	0.0068
H9	**157.6**	0.0134	0.0410	0.0129	0.0129	0.0130	0.0092	0.0062	0.0038	0.0132	0.0251	0.0096	0.0084
Average		0.0257	0.0787	0.0208	0.0131	0.0175	0.0279	0.0157	0.0041	0.0216	0.0533	0.0182	0.0086
5th Percentile		0.0095	0.0479	0.0123	0.0096	0.0110	0.0131	0.0096	0.0029	0.0137	0.0319	0.0114	0.0068
Minimum		0.0086	0.0410	0.0118	0.0095	0.0097	0.0092	0.0062	0.0026	**0.0132**	**0.0251**	**0.0096**	**0.0067**

I:\102-00181-10\Assignment\Report\Report 5, Rev. 1 - Updated Site Water Management Plan\[Tables 4.1 and 5.1 to 5.3.xls]Table 4.1

31-Mar-08

Notes:

1. The flows for October to May were assumed to be zero based on field observations in 2007.
2. Table has been developed from field data collection.
3. All units are $m^3/s/km^2$ unless otherwise stated.

Rev. 1 - Updated for 2008 Field Season

TABLE 5.1

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT

SITE WATER MANAGEMENT PLAN

MARY RIVER AREA - ESTIMATED CATCHMENT RUNOFF RATES

Catchment No.		**MR-01**	**MR-02**	**MR-03**	**MR-04**	**MR-05**	**MR-06**	**MR-07**	**MR-08**	**MR-09**	**MR-10**	**MR-11**	**MR-12**	**MR-13**	**MR-14**	**MR-15**	**MR-16**	**MR-17**	**MR-18**	**MR-19**	**MR-20**
	Unit Runoff Rate	**Runoff Rate**																			
	(cu.m/s/sq.km)	**(cu.m/s)**	**(cu.m/s)**	**(cu.m/s)**	**(cu.m/s)**	**(cu.m/s)**	**(cu.m/s)**	**(cu.m/s)**	**(cu.m/s)**	**(cu.m/s)**	**(cu.m/s)**	**(cu.m/s)**	**(cu.m/s)**	**(cu.m/s)**	**(cu.m/s)**	**(cu.m/s)**	**(cu.m/s)**	**(cu.m/s)**	**(cu.m/s)**	**(cu.m/s)**	**(cu.m/s)**
Catchment Area (sq.km)		874.50	248.70	6,311.00	217.50	7,663.40	122.97	30.40	9.39	10.45	3.58	5.41	14.70	85.43	114.20	18.02	8.61	1.48	21.75	15.66	73.02
January	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
February	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
March	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
April	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
May	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
June	0.0132	11.53	3.28	83.21	2.87	101.04	1.62	0.40	0.12	0.14	0.05	0.07	0.19	1.13	1.51	0.24	0.11	0.02	0.29	0.21	0.96
July	0.0251	21.94	6.24	158.34	5.46	192.27	3.09	0.76	0.24	0.26	0.09	0.14	0.37	2.14	2.87	0.45	0.22	0.04	0.55	0.39	1.83
August	0.0096	8.38	2.38	60.45	2.08	73.40	1.18	0.29	0.09	0.10	0.03	0.05	0.14	0.82	1.09	0.17	0.08	0.01	0.21	0.15	0.70
September	0.0067	5.86	1.67	42.29	1.46	51.35	0.82	0.20	0.06	0.07	0.02	0.04	0.10	0.57	0.77	0.12	0.06	0.01	0.15	0.10	0.49
October	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
November	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
December	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

I:\102-00181-10\Assignment\Report\Report 5, Rev. 1 - Updated Site Water Management Plan\[Tables 4.1 and 5.1 to 5.3.xls]Table 5.1

31-Mar-08

Notes:

1. The Unit Runoff Rate is obtained from Table 4.1 and is the minimum average monthly unit runoff rate for the catchment areas listed.
2. The maximum drill water consumption rate for the exploration/geomechanical and geotechnical drilling are 7.5 x 10^{-4} m^3/s and 6.3 x 10^{-4} m^3/s respectively.

Rev. 1 - Updated for 2008 Field Season

TABLE 5.2

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT

SITE WATER MANAGEMENT PLAN

MILNE INLET AREA - ESTIMATED CATCHMENT RUNOFF RATES

Catchment No.		MI-01	MI-02	MI-03	MI-04	MI-05	MI-06
	Unit Runoff Rate	Runoff Rate					
	(cu.m/s/sq.km)	(cu.m/s)	(cu.m/s)	(cu.m/s)	(cu.m/s)	(cu.m/s)	(cu.m/s)
Catchment Area (sq.km)		5.27	3.59	4.11	62.32	5.61	7.96
January	0	0.00	0.00	0.00	0.00	0.00	0.00
February	0	0.00	0.00	0.00	0.00	0.00	0.00
March	0	0.00	0.00	0.00	0.00	0.00	0.00
April	0	0.00	0.00	0.00	0.00	0.00	0.00
May	0	0.00	0.00	0.00	0.00	0.00	0.00
June	0.0132	0.07	0.05	0.05	0.82	0.07	0.10
July	0.0251	0.13	0.09	0.10	1.56	0.14	0.20
August	0.0096	0.05	0.03	0.04	0.60	0.05	0.08
September	0.0067	0.04	0.02	0.03	0.42	0.04	0.05
October	0	0.00	0.00	0.00	0.00	0.00	0.00
November	0	0.00	0.00	0.00	0.00	0.00	0.00
December	0	0.00	0.00	0.00	0.00	0.00	0.00

I:\102-00181-10\Assignment\Report\Report 5, Rev. 1 - Updated Site Water Management Plan\[Tables 4.1 and 5.1 to 5.3.xls]Table 5.2

31-Mar-08

Notes:

1. The Unit Runoff Rate is obtained from Table 4.1 and is the minimum average monthly unit runoff rate for the catchment areas listed.
2. The maximum drill water consumption rate for the exploration/geomechanical and geotechnical drilling are 7.5×10^{-4} m^3/s and 6.3×10^{-4} m^3/s respectively.

Rev. 1 - Updated for 2008 Field Season

TABLE 5.3

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT

SITE WATER MANAGEMENT PLAN

STEENSBY INLET AREA - ESTIMATED CATCHMENT RUNOFF RATES

Catchment No.		SI-01	SI-02	SI-03
	Unit Runoff Rate	Runoff Rate		
	(cu.m/s/sq.km)	(cu.m/s)	(cu.m/s)	(cu.m/s)
Catchment Area (sq.km)		13.68	21.77	1.99
January	0	0.00	0.00	0.00
February	0	0.00	0.00	0.00
March	0	0.00	0.00	0.00
April	0	0.00	0.00	0.00
May	0	0.00	0.00	0.00
June	0.0132	0.18	0.29	0.03
July	0.0251	0.34	0.55	0.05
August	0.0096	0.13	0.21	0.02
September	0.0067	0.09	0.15	0.01
October	0	0.00	0.00	0.00
November	0	0.00	0.00	0.00
December	0	0.00	0.00	0.00

I:\102-00181-10\Assignment\Report\Report 5, Rev. 1 - Updated Site Water Management Plan\[Tables 4.1 and 5.1 to 5.3.xls]Table 5.3

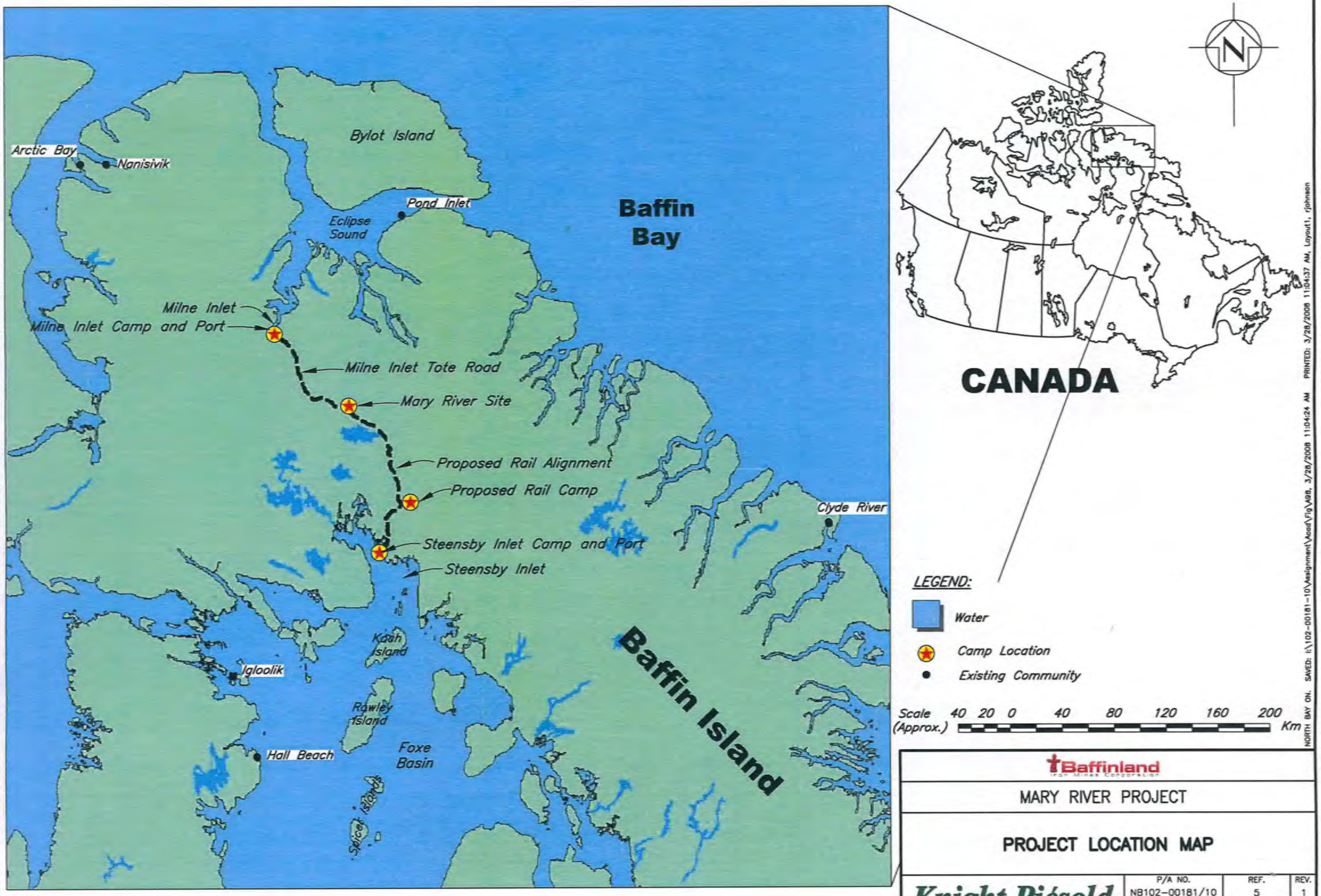
31-Mar-08

Notes:

1. The Unit Runoff Rate is obtained from Table 4.1 and is the minimum average monthly unit runoff rate for the catchment areas listed.
2. The maximum drill water consumption rate for the exploration/geomechanical and geotechnical drilling are 7.5×10^{-4} m^3/s and 6.3×10^{-4} m^3/s respectively.

Rev. 1 - Updated for 2008 Field Season

XREF FILE(S):   IMAGE FILE(S): 4 Baffinland logo-big corp Baffinland logo_new NORTH BAFFINLAND



Baffinland
Iron Mines Corporation

MARY RIVER PROJECT

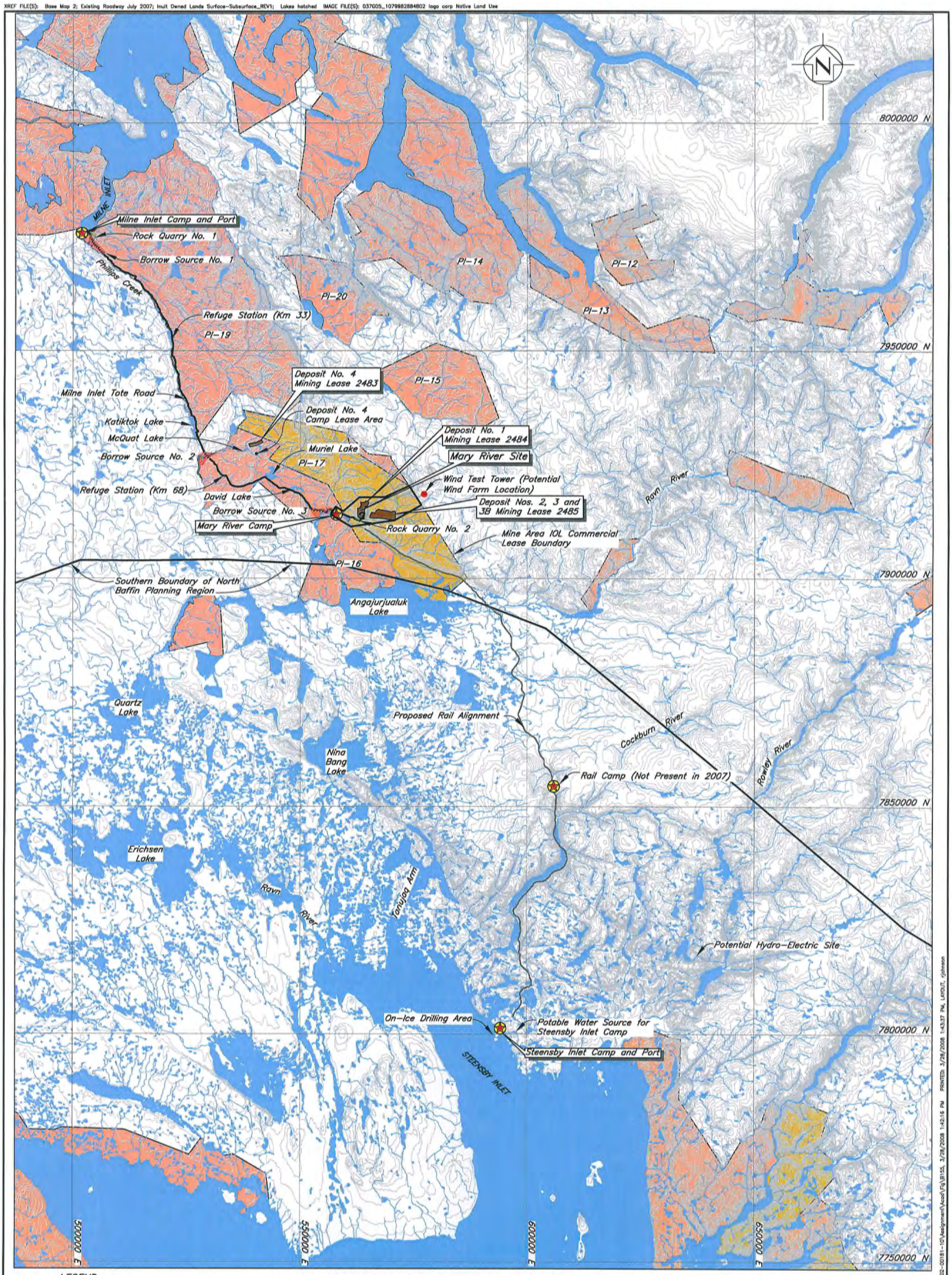
PROJECT LOCATION MAP

Knight Piésold CONSULTING	P/A NO.	REF.	REV.
	NB102-00181/10	5	1

FIGURE 1.1

NORTH BAY ON. SAVED: I:\102-00181-10\Assignment\Acad\Fig\A98, 3/28/2008 11:04:24 AM PRINTED: 3/28/2008 11:04:37 AM, Layout1, rjohnson

XREF FILE(S): Base Map 2; Existing Roadway July 2007; Inuit Owned Lands Surface-Subsurface_REV1; Lakes hatched IMAGE FILE(S): 037G05_1079982884802 logo corp Native Land Use



LEGEND:

- River/Stream/Drainage
- Milne Inlet Tote Road
- Proposed Rail Alignment
- Contour
- 🟦 Water
- 🟥 Inuit Owned Land-Surface Only Excluding Minerals
- 🟨 Inuit Owned Land-Surface and Subsurface Including Minerals
- 🟫 Mineral Lease Boundary
- ☐ Crown Land
- ▨ Existing Borrow Area (IOL Commercial Lease)
- ▨ Existing Rock Quarry (IOL Commercial Lease)

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. Contours are in metres. Contour interval varies.
4. Proposed Rail Alignment provided by Canarail Consultants Inc. in late 2007.

Scale 10 5 0 10 20 30 40 Kilometres

Baffinland
Iron Mines Corporation

MARY RIVER PROJECT

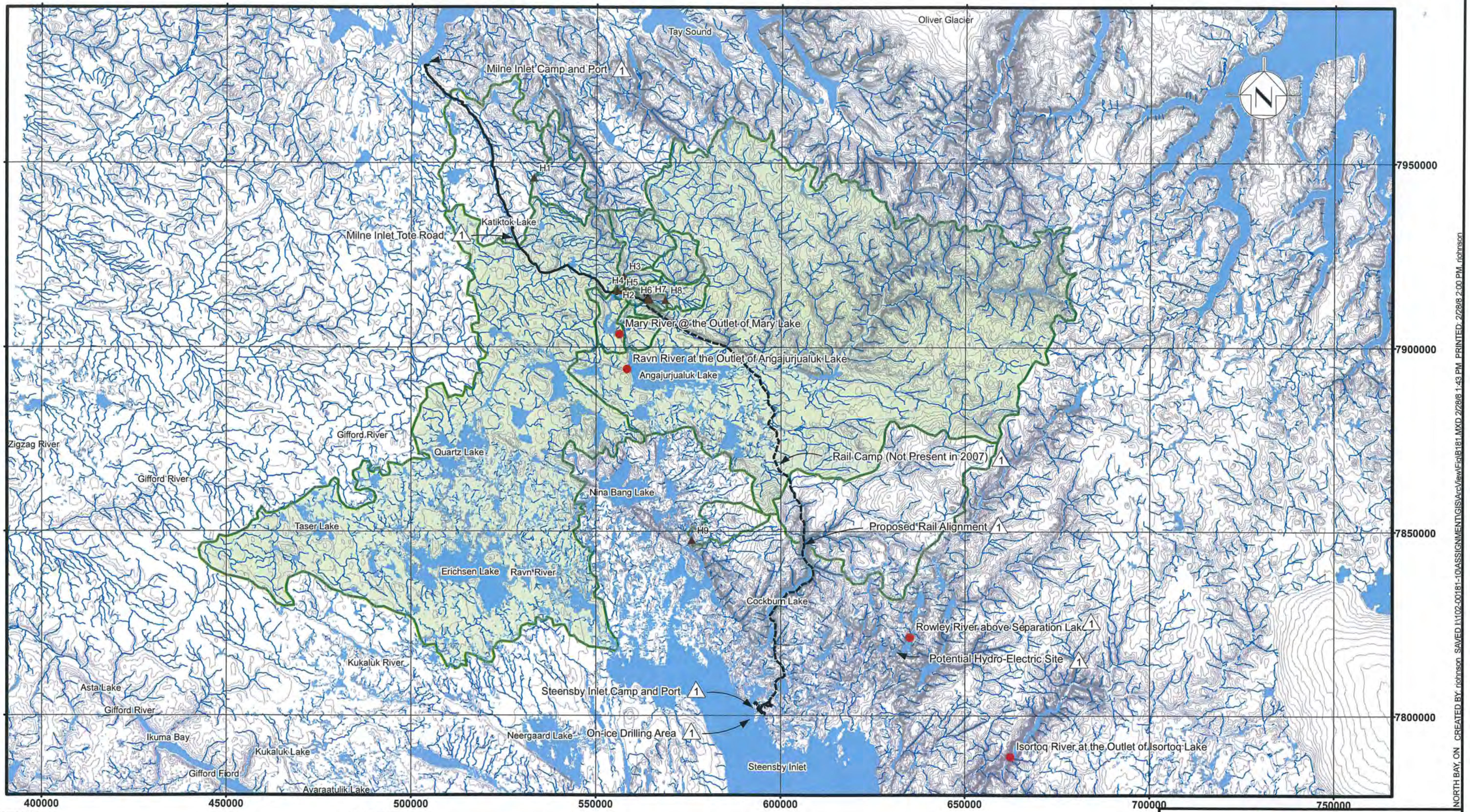
LOCATION OF PROJECT ACTIVITIES

Knight Piésold
CONSULTING

P/A NO.	REF.	REV.
NB102-00181/10	5	1

FIGURE 1.2

NORTH BAY ON, SAVED: I:\102-00181-10\Assignment\Acad\Fig\B155, 3/28/2008 1:42:16 PM PRINTED: 3/28/2008 1:43:37 PM, LAYOUT, rjohnson



LEGEND:

- ▇ Water
- ▨ Ravn River Catchment
- ─ River/Stream/Drainage
- ━ Milne Inlet Tote Road 1
- --- Proposed Rail Alignment 1
- ─ Catchment Boundary
- ▲ Streamflow Gauging Station
- ● WSC Station

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. Contours are in metres. Contour interval varies. 1
4. Proposed rail Alignment provided by Canarail Consultants Inc. in late 2007. 1

Scale 10 5 0 10 20 30 40 50 Km

Baffinland
Iron Mines Corporation

MARY RIVER PROJECT

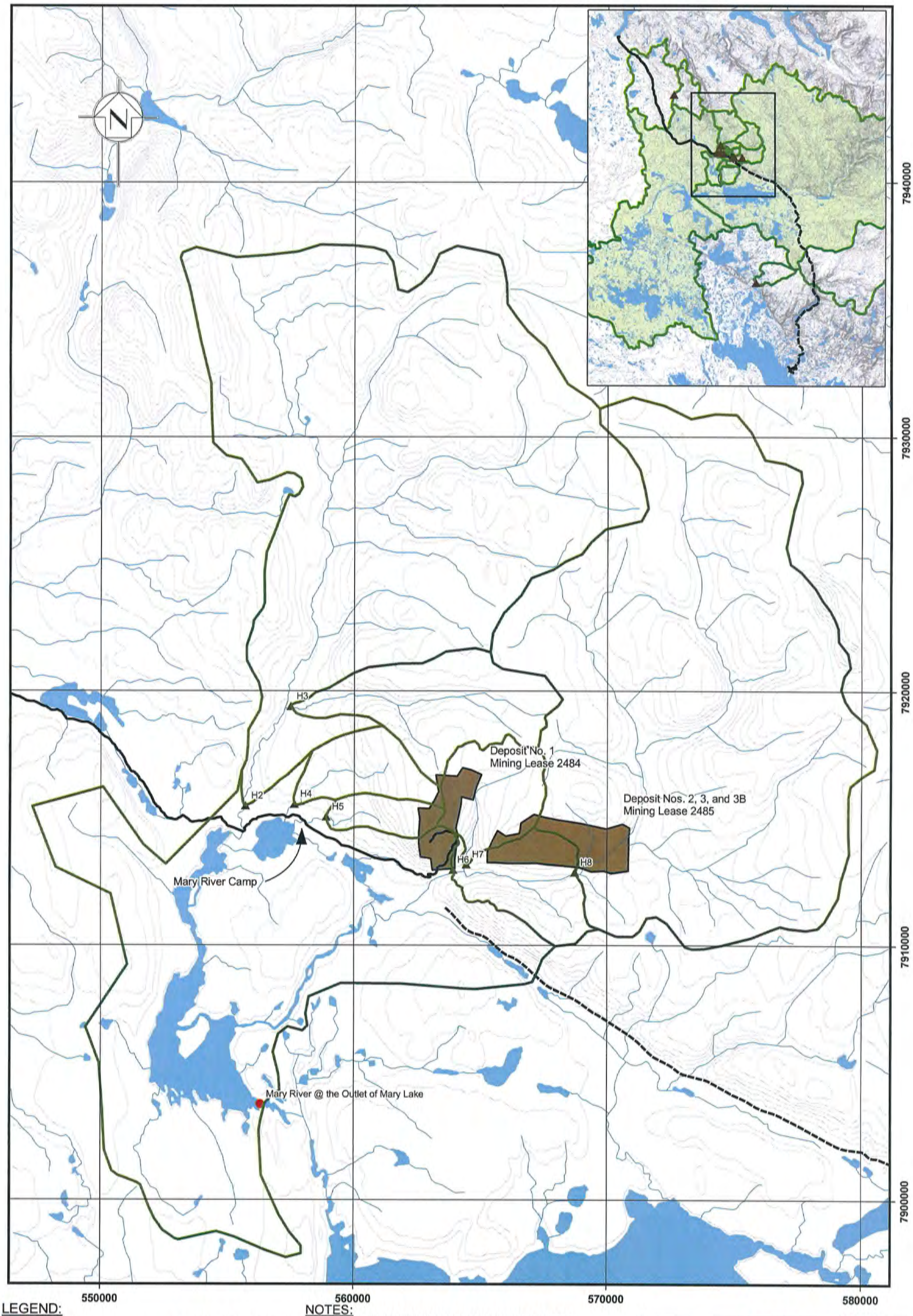
STREAMFLOW GAUGING STATIONS
MARY RIVER PROJECT SITE
AND SURROUNDING AREA

Knight Piésold
CONSULTING

P/A NO.	REF.	REV.
NB102-00181/10	5	1

FIGURE 4.1

NORTH BAY, ON CREATED BY: rjohnson SAVED I:\102-00181-10\ASSIGNMENT\GIS\ArcView\Fig\B181.MXD 2/28/8 1:43 PM PRINTED: 2/28/8 2:00 PM, rjohnson



LEGEND:

- 🟦 Water △1
- ▨ Mineral Lease Boundary
- ─ River/Stream/Drainage
- ─ Milne Inlet Tote Road △1
- ╌ Proposed Rail Alignment △1
- ─ Estimated Catchment Boundary △1
- ▲ Streamflow Gauging Station
- ● WSC Station

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. Contours are in metres. Contour interval varies. △1
4. Proposed Rail Alignment provided by Canarail Consultants Inc. in late 2007. △1

Scale 2 1 0 2 4 6 8 10 Km △1

Baffinland
Iron Mines Corporation

MARY RIVER PROJECT

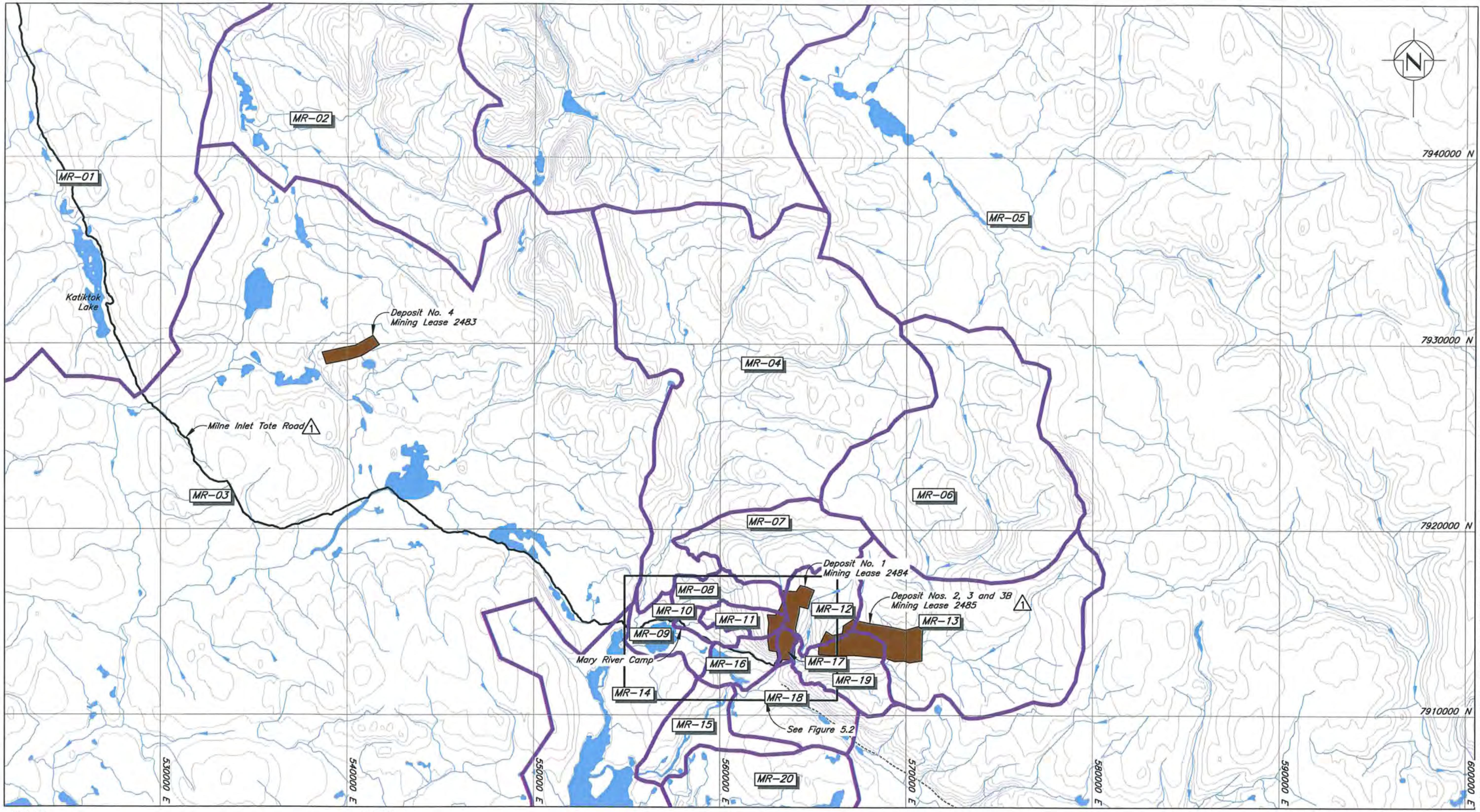
STREAMFLOW GAUGING STATIONS
MARY RIVER WATERSHED

Knight Piésold
CONSULTING

P/A NO.	REF.	REV.
NB102-00181/10	5	1

FIGURE 4.2

NORTH BAY, ON. CREATED BY: rjohnson SAVED I:\102-00181-10\ASSIGNMENT\GIS\ArcView\Figure\B183.MXD 2/28/8 2:11 PM PRINTED: 2:21 PM 2/28/8 rjohnson



LEGEND:

🟦 Water

MR-03 Catchment Area Name

🟫 Mineral Lease Boundary

River/Stream/Drainage

Direction of surface water runoff

Milne Inlet Tote Road 1

Proposed Rail Alignment 1

Estimated Catchment Boundary

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. Contours are in metres. Contour interval varies.
4. Catchment areas calculated using Mapinfo.
5. Proposed Rail Alignment provided by Canarail Consultants Inc. in late 2007.

Scale 2 1 0 2 4 6 8 10 Kilometres

CATCHMENT	AREA (km²)
MR-01	874.5
MR-02	248.7
MR-03	6311
MR-04	217.5
MR-05	7663.4
MR-06	122.97
MR-07	30.40
MR-08	9.385
MR-09	10.45
MR-10	3.58

CATCHMENT	AREA (km²)
MR-11	5.412
MR-12	14.70
MR-13	85.43
MR-14	114.2
MR-15	18.02
MR-16	8.61
MR-17	1.48
MR-18	21.75
MR-19	15.66
MR-20	73.02

Baffinland
Iron Mines Corporation

MARY RIVER PROJECT

MARY RIVER AREA
CATCHMENT AREAS

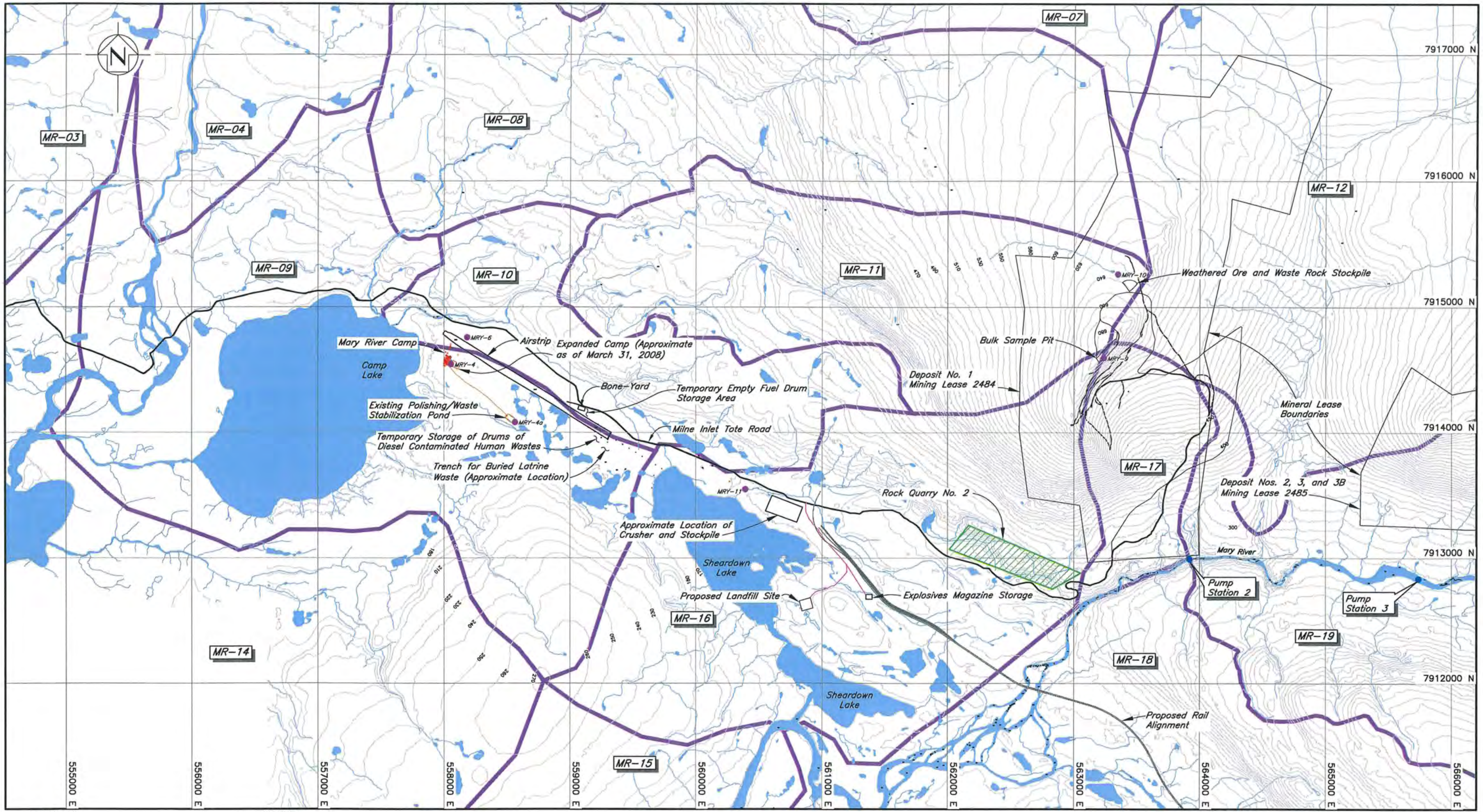
Knight Piésold
CONSULTING

P/A NO.	REF.	REV.
NB102-00181/10	5	1

FIGURE 5.1

NORTH BAY ON. CREATED BY: rjohnson SAVED: I:\102-00181-10\Assignment\Acad\Fig\B151, 3/28/2008 1:24:34 PM PRINTED: 3/28/2008 1:24:57 PM, Layout1, rjohnson

XREF FILE(S): Base Map_Overall_RC; CATHCMENTS nad83; Deposit Boundaries IMAGE FILE(S): Baffinland logo-big corp



LEGEND:

- ▨ Water
- ▨ Rock Quarry Location
- River/Stream/Drainage
- ● Water Licence Monitoring Location
- Milne Inlet Tote Road
- Drill Road
- Proposed Rail Alignment

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 10 metres.
4. Layout as of December 31, 2007 provided by BH Martin/Genivar and Baffinland.
5. Some infrastructure not shown for clarity.

Scale 300 150 0 300 600 900 1200 1500 Metres

Baffinland
Iron Mines Corporation

MARY RIVER PROJECT

MARY RIVER DRILLING AREA CATCHEMENT AREAS

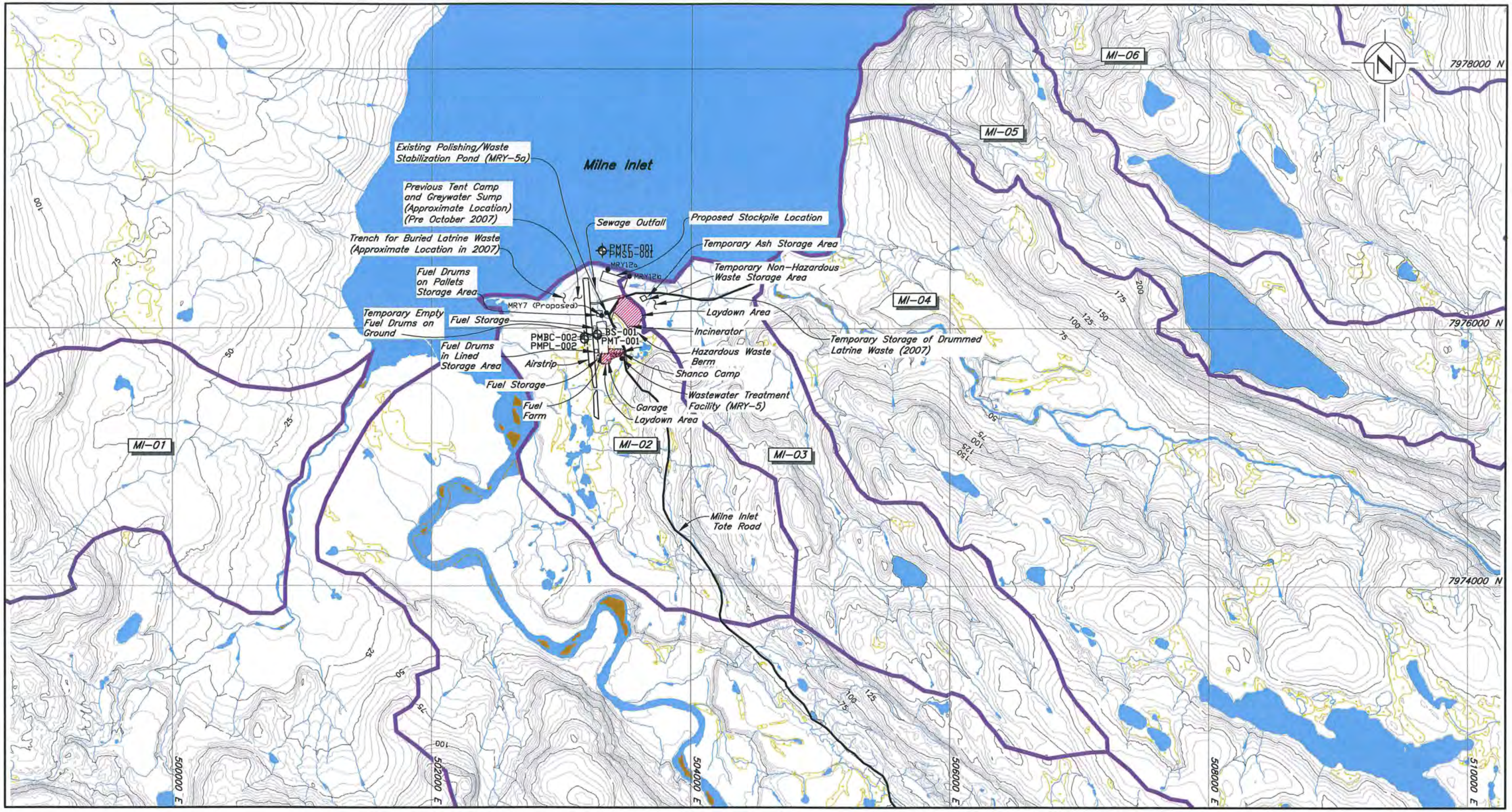
Knight Piésold
CONSULTING

P/A NO.	REF.	REV.
NB102-00181/10	5	1

FIGURE 5.2

XREF FILE(S): PROJECT SITE PLAN 2m INTERVAL_REV2; Mine_Site_Water Hatch; Basemap_2.5m interval IMAGE FILE(S): 070820_Sheardown_Lake_North_BathyJL Baffinland logo-big corp Baffinland logo-big corp EagLogo 037G05_1079982884802 Baffinland logo-big corp EagLogo Native Land Use

NORTH BAY ON. SAVED: I:\102-00181-10\Assignment\Acad\Fig\B156, 3/28/2008 4:27:29 PM PRINTED: 3/28/2008 4:28:30 PM, Layout1, rjohnson



LEGEND:

🟦 Water

▨ Wetlands

▨ Laydown Area

River/Stream/Drainage

Direction of surface water runoff

Milne Inlet Tote Road

⊕ Drillhole Completed in 2007

MRY-5 ● Water License Monitoring Location

Estimated Catchment Boundary

MI-01 Catchment Area Name

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. Catchment areas calculated using Mapinfo.
5. Layout provided by BH Martin/Genivar and Baffinland (as of December 31, 2007).

CATCHMENT	AREA (km²)
MI-01	5.27
MI-02	3.59
MI-03	4.11
MI-04	62.32
MI-05	5.61
MI-06	7.96

Scale 300 150 0 300 600 900 1200 1500 Metres

Baffinland

MARY RIVER PROJECT

MILNE INLET AREA
CATCHMENT AREAS

Knight Piésold
CONSULTING

P/A NO. NB102-00181/10
REF. 5
REV. 1

FIGURE 5.3

NORTH BAY ON. CREATED BY: rjohnson SAVED: I:\102-00181-10\Assignment\Acad\Fig\B152, 3/28/2008 1:31:30 PM PRINTED: 3/28/2008 1:31:49 PM, Layout1, rjohnson

XREF FILE(S): Milne base; Milne Buildings IMAGE FILE(S): Baffinland logo-big corp

LEGEND:

- 🟦 Water
- ▨ Wetland
- River/Stream/Drainage
- Direction of surface water runoff
- Estimated Catchment Boundary △1
- ---- Proposed Rail Alignment △1
- ST-01 Catchment Area Name △1

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. Catchment areas calculated in Mapinfo.
5. Proposed Rail Alignment provided by Canarail Consultants Inc. in late 2007. △1

Scale 300 150 0 300 600 900 1200 1500 Metres

CATCHMENT	AREA (km²)
ST-01	13.68
ST-02	21.77
ST-03	1.99

Baffinland Iron Mines Corporation

MARY RIVER PROJECT

STEENSBY INLET AREA CATCHMENT AREAS

Knight Piésold CONSULTING

P/A NO.	REF.	REV.
NB102-00181/10	5	1

FIGURE 5.4

NORTH BAY ON. CREATED BY: rjohnson SAVED: I:\102-00181-10\Assignment\Acad\Fig\B153, 3/28/2008 1:34:55 PM PRINTED: 3/28/2008 1:35:19 PM, Layout1, rjohnson

XREF FILE(S): PROPOSED 07 DRILLHOLES (AKER)_steensby; STEENSBY_2; Drillhole and Test Pits_2006_ALL; Aker - Steensby rail loops IMAGE FILE(S): Baffinland logo-big corp EagLogo DRAFT Wind Roses_Page_3

XREF FILE(S): Southern Route; M_TITLE; Updated Rail alignment (01.11.08) IMAGE FILE(S): Baffinland logo-big corp

LEGEND:

▇	Water
—	River/Stream/Drainage
→	Direction of surface water runoff
—	Proposed Rail Alignment 1
▬	Estimated Catchment Boundaries 1

NOTES:

1. Base Map: © Her Majesty the Queen in Rights of Canada, Department of Natural Resources 1 (2004). All rights reserved.
2. Coordinate grid is shown in UTM (NAD83) Zone 17 and is in metres.
3. Contours are in metres. Contour interval Varies.
4. Proposed Rail Alignment provided by Canarail Consultants Inc. in late 2007. 1

Baffinland
Iron Mines Corporation

MARY RIVER PROJECT

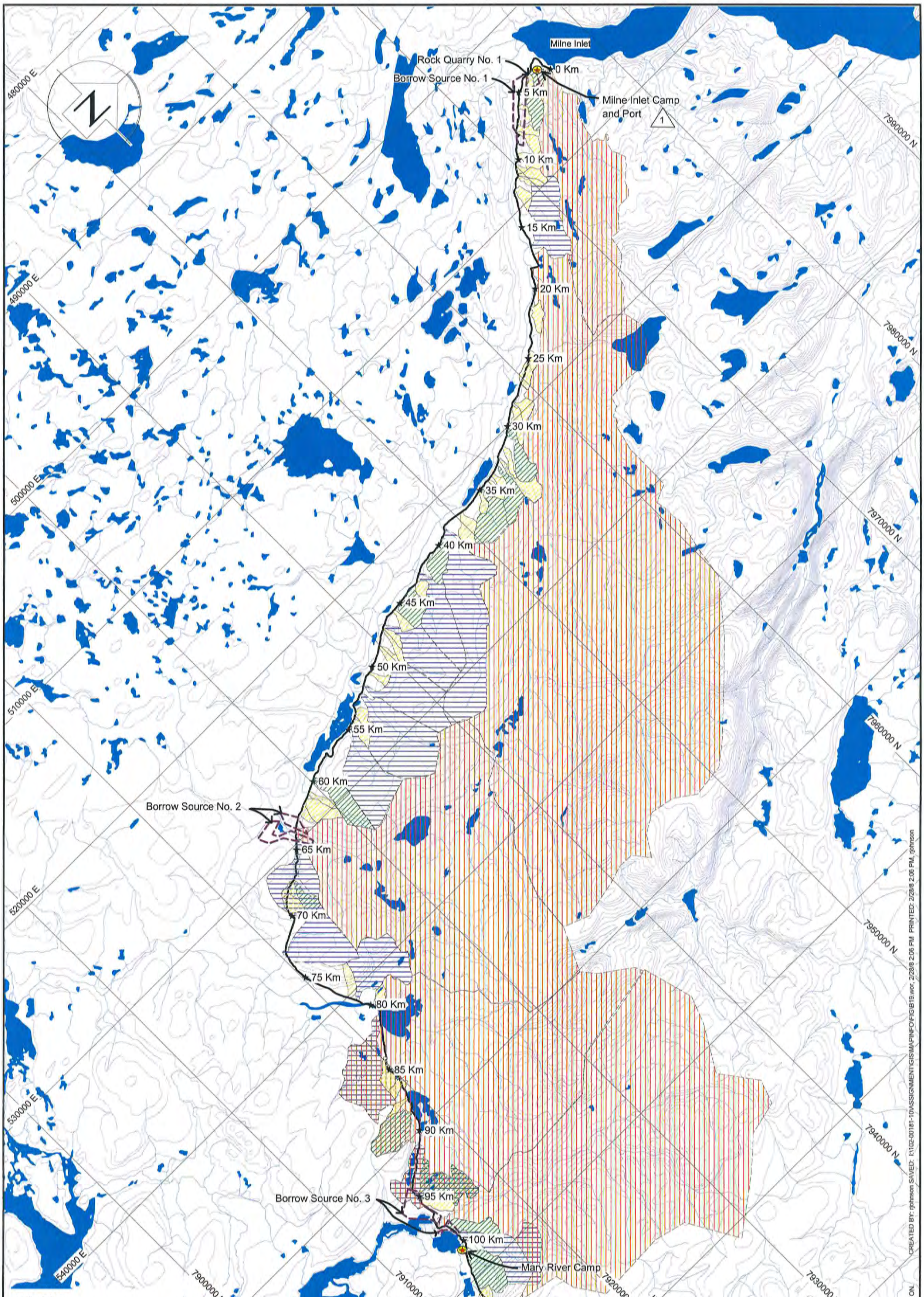
PROPOSED RAIL ALIGNMENT
CATCHMENT AREAS

Knight Piésold
CONSULTING

P/A NO.	REF.	REV.
NB102-00181/10	5	1

FIGURE 5.5

NORTH BAY ON. CREATED BY: rjohnson SAVED: I:\102-00181-10\Assignment\Acad\Fig\B154, 3/28/2008 1:36:24 PM PRINTED: 3/28/2008 1:40:15 PM, rjohnson



LEGEND:

🟦	Water
▨	Small Catchment
▨	Medium Catchment
▤	Large Catchment
▥	Extra-Large Catchment
—	River/Stream/Drainage
—	Milne Inlet Tote Road △1
- -	Borrow Sources and Rock Quarries

NOTES:

1. Base Map: © Her Majesty the Queen in Rights of Canada, Department of Natural Resources (2004). All rights reserved. (Government of Canada, 2006)
2. Coordinate grid is shown in UTM (NAD83) Zone 17 and is in metres.
3. Contours are in metres. Contour interval varies.
4. Milne Inlet Tote Road surveyed by Knight Piesold (2006). △1
5. Catchments based on July 2006 inspections.

Scale 0 5 10 Km △1

NORTH BAY, ON. CREATED BY: rjohnson SAVED: I:\102-00181-10\ASSIGNMENT\GIS\MAPINFO\FIG\B19.wor, 2/28/8 2:06 PM PRINTED: 2/28/8 2:06 PM, rjohnson

Baffinland
Iron Mines Corporation

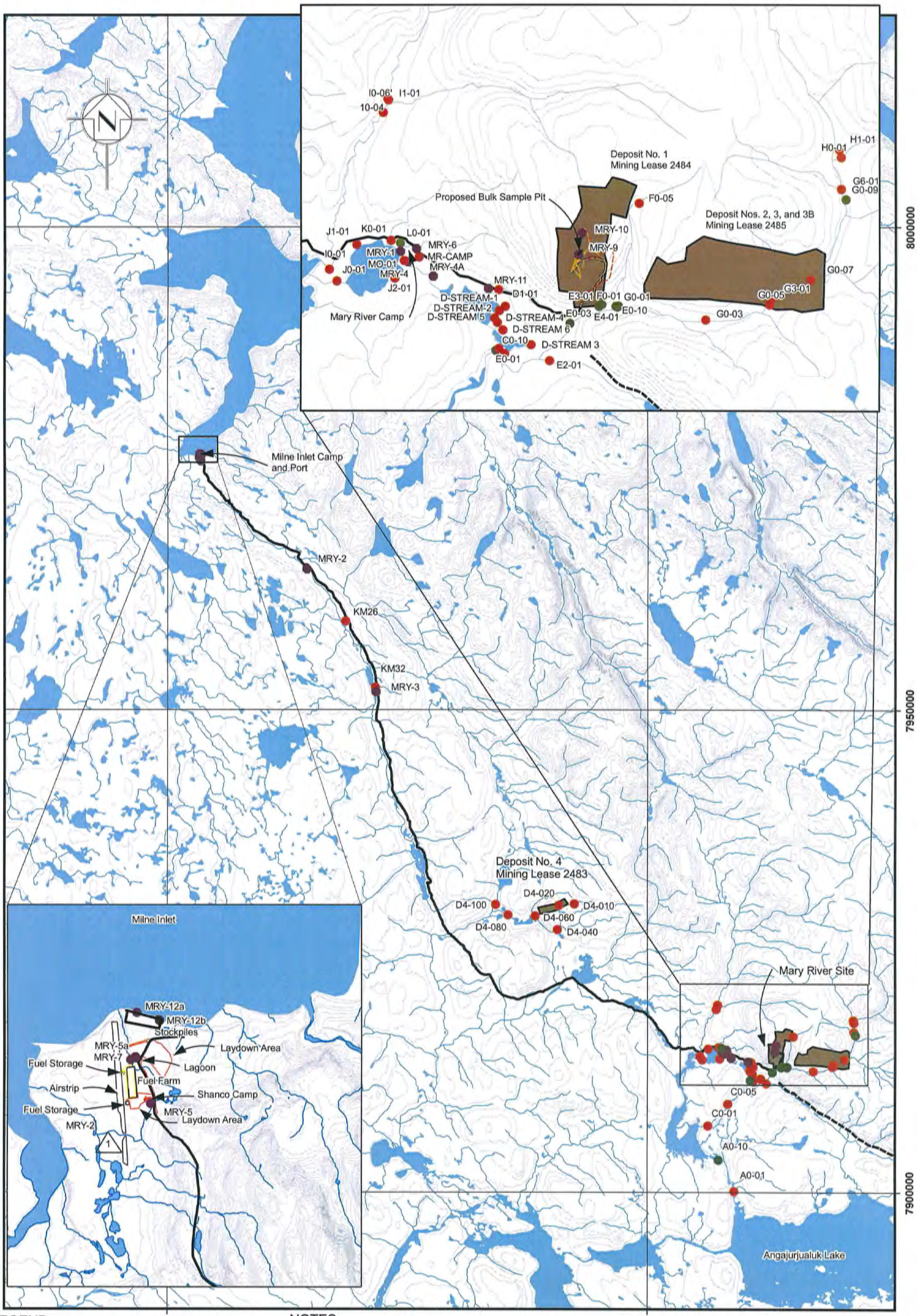
MARY RIVER PROJECT

MILNE INLET TOTE ROAD
CATCHMENT AREAS

Knight Piésold
CONSULTING

P/A NO.	REF.	REV.
NB102-00181/10	5	1

FIGURE 5.6



NORTH BAY, ON. CREATED BY: rjohnson SAVED: I:\102-00181-10\ASSIGNMENT\GIS\ArcView\Figure\B182.MXD 3/20/8 1:15 PM PRINTED: 1:20 PM 3/20/8 rjohnson

LEGEND:

- 🟦 Water
- 🟫 Mineral Lease Boundary
- — River/Stream/Drainage
- — Milne Inlet Tote Road
- - - - Proposed Rail Alignment
- — Existing Trails for Drills
- - - - Proposed Pit/Stockpile Road
- ● Water Licence Monitoring Location
- ● Weekly Water Quality Sample Site
- ● Seasonal Water Quality Sample Site

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. Contours are in metres. Contour interval varies.
4. Proposed Rail Alignment provided by Canarail Consultants Inc. in late 2007.
5. Water licence monitoring locations provided by Baffinland.
6. Layouts for Milne Inlet and mary River provideed by B.H. Martin/GENIVAR and Baffinland (as of December 31, 2007). Some infrastructure at Milne Inlet and Mary River not shown for clarity.

Baffinland
Iron Mines Corporation

MARY RIVER PROJECT

SURFACE WATER SAMPLING LOCATIONS

Knight Piésold
CONSULTING

P/A NO.	REF.	REV.
NB102-00181/10	5	1

FIGURE 6.1

APPENDIX A

SURFACE WATER SAMPLING PROGRAM - QUALITY ASSURANCE & QUALITY CONTROL PLAN (REF. NO. NB102-00181/10-7, REV. 1)

- Report 90 pages

ISO 9001:2000
FS 87377

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT

SURFACE WATER SAMPLING PROGRAM
QUALITY ASSURANCE AND QUALITY CONTROL PLAN
(REF. NO. NB102-00181/10-7)

Rev. No.	Revision	Date	Approved
0	Issued in Final	October 25, 2007	KDE
1	Issued for 2008 Field Season	March 31, 2008	mr

Knight Piésold Ltd.

1650 Main Street West
North Bay, Ontario Canada P1B 8G5
Telephone: (705) 476-2165
Facsimile: (705) 474-8095
E-mail: northbay@knightpiesold.com

Knight Piésold
CONSULTING

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT

SURFACE WATER SAMPLING PROGRAM
QUALITY ASSURANCE AND QUALITY CONTROL PLAN
(REF. NO. NB102-00181/10-7)

TABLE OF CONTENTS

TABLES

APPENDICES

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT

SURFACE WATER SAMPLING PROGRAM
QUALITY ASSURANCE AND QUALITY CONTROL PLAN
(REF. NO. NB102-00181/10-7)

SECTION 1.0 - INTRODUCTION

1.1 INTRODUCTION

This Quality Assurance and Quality Control (QA/QC) Plan has been prepared to fulfill the requirement of Part I, Item 9 of License No. 2BB-MRY0710 issued by the Nunavut Water Board to Baffinland Iron Mines Corporation (Baffinland) on July 27, 2007.

Part I, Item 9 of the Water License states:

> *The Licensee shall submit a Quality Assurance/Quality Control Plan, prepared in accordance with the INAC document "Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class "B" Licensees in Collecting Representative Water Samples in the Field, 1996" to an Analyst for approval within ninety (90) days of the issuance of the license (amendment). The plan shall include analysis of field blanks and certified reference material, and replicate sampling in order to assess accuracy, precision and field contamination.*

In accordance with the stipulations of the Water License, this Surface Water Quality Sampling Program QA/QC Plan has been prepared following the general recommendations presented in *Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class "B" Licensees in Collecting Representative Water Samples in the Field and for Submission of a QA/QC Plan* (INAC, 1996). A copy of the guidelines is included in Appendix A.

1.2 QA/QC PLAN OBJECTIVES

For the purposes of this report, QA/QC is defined as:

- ***Quality Assurance*** - System of activities used to achieve quality control.
- ***Quality Control*** - Set of best practice methods and procedures used to ensure quality of data in terms of precision, accuracy and reliability.

The QA/QC best practices outlined in this document are designed to provide guidance to field staff and analytical laboratories in order to maintain a high level of confidence in the water quality data generated from the Mary River Project.

SECTION 2.0 - SAMPLE COLLECTION

2.1 GENERAL

The samples will be collected following the general recommendations presented in *Quality Assurance (QA) and Quality Control (QC) Guidelines for use by Class "B" Licensees in Collecting Representative Water Samples in the Field and for Submission of a QA/QC Plan* (INAC, 1996). A copy of the guidelines is included in Appendix A.

2.2 WATER QUALITY MONITORING LOCATIONS

The QA/QC Plan addresses the collection of freshwater surface water quality samples related to monitoring programs being carried out in support of Baffinland's Mary River Project, namely:

1. Collection of environmental surface water samples from area lakes, streams and rivers.
2. Collection of effluent samples from the current and future wastewater treatment facilities located at Mary River and Milne Inlet.
3. Collection of drinking water samples from camp potable water sources.
4. Collection of surface water discharges from future ore stockpiles and waste rock dumps.
5. Collection of surface water discharges from future bulk sample open pits.
6. Collection of water samples from fuel berms.
7. Collection of water samples representative of general site drainage.
8. Measurement of water sample field parameters (e.g. pH, conductivity, temperature etc.).

Exact locations and sampling frequency for designated monitoring stations are presented in the Site Water Management Plan (Knight Piésold, 2008).

2.3 SAMPLING METHODS AND EQUIPMENT

A summary of recommended water sample containers, sample volumes, method detection limits (MDL), sample preservatives and maximum sample hold times is presented in Table 2.1. Laboratory parameters such as pH, BOD, nitrite, nitrate, orthophosphate, fecal colliforms, chlorophyll and phenophytin typically have maximum sample storage times varying from 4 to 48 hours. Due to the remoteness of the site, it may not always be possible to get laboratory analysis done within the sample holding time window. During the preparation of this document the analytical laboratories were consulted with respect to maximum sample holding times. As a result, Table 2.1 presents a preferred and a maximum holding time for time sensitive parameters. Every effort will be made to get samples analysed within the preferred holding time window. If this is not possible, then the maximum holding time will apply.

Every effort will be made to prevent accidental freezing of bacteriological water samples (due to on-site climatic conditions) which could affect analytical results for these parameters.

For a complete list of the required sample analyses at each monitoring station, please refer to the Site Water Management Plan (Knight Piésold, 2008).

2.3.1 General Sampling Procedures

Generally, sampling procedures will consist of the following:

1. Sampler will wear a fresh pair of disposable nitrile gloves for each sampling event.
2. Sample bottles and preservative will be stored under clean conditions on site. Sample bottles will have the appropriate volume of preservative added in the field (or alternatively, sample bottles will be supplied by the analytical laboratory with preservatives already added).
3. A fresh sample bottle(s) will be used at each monitoring station. Sample bottles will *not* be re-used.
4. Sampling will be carried out by either: i) rinsing the sample bottle with source water three times before immersing the sample bottle to fill it (after which preservative is added, as required), or ii) if the sample bottles are provided pre-charged with preservatives then it is generally convenient to transfer water samples from the source to the sample bottle using a 1-2L plastic jug. Plastic jugs will be rinsed in the source water three times before filling the sample bottle. A dedicated jug will be used for different sample types (e.g. sewage effluent, fuel contaminated drainage and receiving waters). Sample jugs will be replaced on a regular basis before they become stained.
5. Prior to collecting the sample, the sampling jug will be rinsed in the source water three times. Rinse water will be disposed of so that it does not contaminate the source water where the sample will be collected.
6. Care will be taken to avoid disturbance of sediments and inclusion of disturbed suspended solids in the sample.
7. For samples *not requiring preservatives*, the sample bottle will be rinsed three times with source water before filling the bottle to the top.
8. For samples *requiring preservatives*, the sample bottle will be filled to the top (or to the indicator line marked on the bottle) and securely sealed. Note that for some volatile contaminants (e.g. BTEX), the sample bottle must be filled with zero headspace.
9. Sample details e.g. date, sample ID and analysis will be clearly marked on the bottle in indelible ink.
10. For *dissolved metals* analyses, if possible, the water sample will be filtered in the field immediately after sampling using a 0.45µm disposable filter and syringe. A fresh syringe and filters must be used at each monitoring station. Alternatively, sample filtration can be carried out by the analytical laboratory.
11. All samples will be sealed by ensuring their lids are tightly secured before placing the bottles into the coolers.
12. All samples will be placed in an iced cooler as soon as possible after collection.

2.3.2 Lake Sampling

For monitoring of water quality arising from vertical stratification in lakes, a depth sampler will be used (e.g. a ‘Van Dorn’ or ‘Kemmerer’). Generally, depth samplers consist of a clear polycarbonate sample tube with two spring mounted rubber bungs, one located at each end. The depth sampler is lowered to the correct depth attached to a cord, whereupon a metal weight is released. The weight slides down the cord and strikes a release mechanism button which releases the two bungs which then seal both ends of the tube. The water sample is then pulled back to the surface.

Regardless of the brand, water samplers that are used will be suitable for collection of water samples for ultra low metals analyses i.e. will have acrylic or PVC construction and silicone seals.

For depth sampling, the following considerations will be taken into account to ensure sample QA/QC:

1. Sampling station locations will be dependent upon the monitoring program objectives and the lake dimensions. Map coordinates for all lake sampling station locations will be recorded using a GPS unit.
2. The vertical stratification profile will be determined using a temperature probe equipped with a long cord with metre intervals marked on it.
3. The vertical temperature profile will be established by slowly lowering the temperature probe and recording the temperature change with depth.
4. Depending upon the purpose of the monitoring program, water quality samples may be collected from the different stratified layers. The depth sampler must be slowly lowered in the ‘open’ position (i.e. to let water enter it) until it reaches the required depth.
5. The depth sampler will be held at this depth for a few minutes to allow flushing of water inside it.
6. The metal weight (messenger) will be released (to activate the closing mechanism) and the depth sampler will be pulled back to the surface. Field measurements can be taken at depth or by filling a bottle with the sampled water and taking measurements from that immediately after sampling.
7. When collecting samples close to the lake bed care must be taken to ensure that the depth sampler does not disturb lake bed sediments (which could contaminate the sample).
8. Depending upon the lake area and depth, multiple sampling stations will likely be required to adequately characterize lake water quality.

2.3.3 River Sampling

Depending upon the size of the water body, river sampling methods are the same as those presented in Sections 2.3.1 and 2.3.2. To avoid inclusion of floating detritus in the sample, the sample bottle must be fully immersed in the river water. Care will be taken to ensure that disturbed sediments are not included in the sample.

When selecting water quality monitoring station locations on rivers, care will be taken where a tributary joins a river, since complete mixing of the two waters may not be achieved within several hundred metres downstream of the confluence (or further). When in doubt, vertical profile monitoring across the river's width using a field parameter such as pH, temperature or conductivity will be used to assess if complete mixing has occurred.

2.3.4 Sampling for Toxicity Testing

Sampling for sub-lethal toxicity testing is a condition of Environmental Effects Monitoring (EEM). Typically, a 4L effluent sample is sufficient. Depending upon the objectives of the toxicity testing, variables that will require confirmation prior to testing include:

- Type of effluent sample to be collected e.g. instantaneous grab sample, or composite sample collected over a period of time
- Type of dilution water to be used by the testing laboratory e.g. standard synthetic laboratory dilution water, receiving water collected upstream of the discharge etc.
- Preferred test organism e.g. *Daphnia magna* or rainbow trout

Brief details concerning laboratory methods are presented in Appendix D. For further details concerning acute lethality testing refer to Environment Canada (2002) and USEPA (2002).

2.4 QA/QC SAMPLES

For monitoring of QA/QC during sample collection and shipping, a set of QA/QC samples will be routinely submitted for analysis. Descriptions of the QA/QC samples that will be used (e.g. field blank, travel blank and field duplicate) are presented on Table 2.2. Ten percent of all samples will comprise QA/QC samples..

In the interest of transparency, the analytical laboratories will also be instructed to report the results of their own in-house QA/QC testing (e.g. results of random replicate analyses of submitted samples).

The results of QA/QC analyses will be routinely reviewed by Baffinland or their designate, and any anomalous results will be promptly investigated with the assistance of the analytical laboratory. Once the reason for the anomalous results is identified, Baffinland will ensure that operating procedures of field staff and/or the analytical laboratory will be altered in order to rectify the problem. Compliance monitoring and data management for water license sampling will be conducted by Baffinland, with the assistance of a designate as required.

2.5 MEASUREMENT OF FIELD PARAMETERS

Measurement of field parameters (e.g. temperature, pH, conductivity, redox potential, dissolved oxygen, etc.) will be carried out for each sample at the time of sampling. The required set of field parameters will vary according to sample type and monitoring objectives. For a complete list of required parameters please refer to the Site Water Management Plan (Knight Piésold, 2008). The exact methods used for monitoring field parameters will depend upon the type of monitoring probes being used. Field staff will read and be familiar with the instruction manual for the equipment being used on site.

Field staff will rinse the monitoring probe three times with the water to be monitored before immersing the probe in the water. Generally, the user will ensure that the probe being used has had sufficient time to equilibrate in the water before the reading is taken. This is generally regarded as the point at which the reading has stabilized.

Field parameter data will be recorded in notebooks, or preferably in a custom form designed for this purpose (see example in Appendix B). A copy of the data should be retained on site.

2.5.1 Monitoring Probe Calibration

Monitoring probes will be stored and calibrated in accordance with manufacturers' instructions. All probes will be calibrated before each sampling event and a written record of the calibration results will be maintained on site. Field staff will ensure that calibration solutions are of the correct specification and that they have not passed their expiry date (if applicable). Monitoring probes will be stored as per manufacturers' recommendations.

SECTION 3.0 - SAMPLE MANAGEMENT

3.1 SAMPLE SHIPPING AND CHAIN OF CUSTODY

Samples will be placed in iced coolers and shipped to the analytical laboratory as soon as possible after collection. Care will be taken to ensure that bottles are stored upright and are packed securely within the cooler. Preferably, leak-proof ice packs will be used for cooling the samples. If loose ice is used then this should be securely sealed in plastic bags to prevent leakage of melt water.

A chain of custody (COC) form will accompany the samples (see example forms presented in Appendix B). At a minimum, the COC form will list:

1. Project name and project assignment number.
2. Address of analytical laboratory, name of contact person and contact details.
3. Contact details and name of sampler.
4. Date and time of sampling.
5. Whether the sample has been filtered, or whether laboratory filtration is required.
6. List of sample I.D.'s, sample type (e.g. lake water, sewage effluent, etc.), number of sample bottles per sample and analysis requested.
7. Urgency of analysis (e.g. rush or normal). For rush samples the analytical laboratory should be notified ahead of time.
8. Whether sample contains preservative and if so, what preservative and when it was added.

SECTION 4.0 - LABORATORY ANALYSIS

4.1 LABORATORY ACCREDITATION

Currently, laboratory analysis of water samples is being carried out by three accredited analytical laboratories. Accutest Laboratories (‘Accutest’) located in Nepean, Ontario has been carrying out the majority of sample analyses due to its geographical proximity to site (with respect to sample holding times). ALS Laboratory Group (‘ALS’), located in Vancouver, BC has been used when ultra low level metals analysis has been required. Taiga Environmental Laboratory (‘TEL’), located in Yellowknife, NT will be completing the potable water testing starting in 2008. From Fall, 2007 onwards, all metals analyses are being carried out by ALS. AquaTox Testing and Consulting Inc. (‘AquaTox’) located in Guelph, Ontario will provide toxicity testing services. Details on analytical laboratory accreditation are presented in Appendix C.

4.2 ANALYTICAL DETECTION LIMITS

Required analytical laboratory method detection limits for a range of parameters are listed in Table 2.1. It should be noted that on occasion, a loss of analytical sensitivity can be encountered due to excessively high concentrations of parameters within a sample. If this is encountered, Baffinland or their designate will work with the analytical laboratory to try and resolve the problem.

4.3 LABORATORY ANALYTICAL METHODS

Analytical methods used by the analytical laboratories generally conform to the standard methods outlined in *Standard Methods for the Examination of Water and Wastewater* (APHA et al, 1989). For some parameters alternative standard analytical methods are used, as listed in Appendix D.

4.4 ANALYTICAL LABORATORY QA/QC PROCEDURES

Each analytical laboratory carries out their own routine in-house QA/QC checks, which include:

- Use of calibration check standards and drift control standards
- Use of surrogate standards and internal standards
- Replicate analyses on submitted samples
- Use of standard reference materials (SRM’s) and matrix spikes

Further details on the analytical laboratories in-house QA/QC protocols are presented in Appendix E.

SECTION 5.0 - DATA MANAGEMENT AND REPORTING

5.1 DATA MANAGEMENT

All water quality data collected by Baffinland or designate from the various environmental programs will be stored electronically in a spreadsheet database (Microsoft Excel) or using alternative software designed specifically for environmental data management.

QA/QC measures relating to data validation will include the following:

1. Designation of a suitable person to act as Water Quality Database Manager (WQDM).
2. Upon receipt, laboratory analytical data will be reviewed by the WQDM to check for completeness, typos, outlying values, etc. The analytical laboratory will be immediately notified of any anomalous results.
3. At a suitable frequency (e.g. once per month) the spreadsheet database should be updated by the WQDM using: i) results provided in electronic format by the analytical laboratories, and ii) copies of the field parameter monitoring records forwarded from site
4. The WQDM will be responsible for ensuring that a third party (e.g. another staff member) carries out a QA/QC check on a minimum of ten percent of newly entered data. A dated and signed record of these data QA/QC checks should be maintained on file.

5.2 REPORTING

All documents prepared by Baffinland or their designate for submission to the regulators will be reviewed by senior staff and Baffinland prior to issue, as per the company's standard practice and quality management system.

SECTION 6.0 - REFERENCES

1. APHA *et al*, 1989. Standard Methods for the Examination of Water and Wastewater; AHPA, AWWA and WPCF, 17th ed.

2. Environment Canada, 2002. Metal Mining Guidance Document for Aquatic Environmental Effects Monitoring. http://www.ec.gc.ca/eem/English/MetalMining/Guidance/default.cfm.

3. INAC, 1996. Quality Assurance (QA) and Quality Control (QC) Guidelines for Use by Class "B" Licenses in Collecting Representative Water Samples and the Field and for Submission of a QA/QC Plan. Prepared by Department of Indian and Northern Affairs Canada Water Resources Division and the Northwest Territories Water Board, July 1996.

4. Knight Piésold, 2008. Baffinland Iron Mines Corporation - Mary River Project - Site Water Management Plan, Ref. No. NB102-00181/10-5, Rev. 1. North Bay: Knight Piésold, 2008.

5. USEPA, 2002. Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms; 5th Ed., USEPA, ref. No. EPA-821-R-02-012.

SECTION 7.0 - CERTIFICATION

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

Prepared by: FOR

Quentin Hamilton, M.Sc., C.Chem
Senior Environmental Chemist

Reviewed by:

Steve Aiken, P.Eng.
Manager Environmental Services

Approved by:

Ken D. Embree, P.Eng.
Managing Director

TABLE 2.1

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT

SURFACE WATER SAMPLING PROGRAM - QUALITY ASSURANCE AND QUALITY CONTROL PLAN

SUMMARY OF RECOMMENDED WATER SAMPLE VOLUMES, METHOD DETECTION LIMITS, PRESERVATIVES AND SAMPLE STORAGE TIMES

Parameter	Method Detection Limit	Required Sample Bottle	Sample Preservative	Maximum Sample Storage Time	
				Preferred	Maximum
General Chemistry					
Total metals	variable	250mL plastic	0.5mL conc. nitric acid	6 months	-
Dissolved metals(1)	variable	250mL plastic	cool 4°C	7 days	-
Anions	variable	1L plastic	cool 4°C	7 days	-
TSS (4)	3 mg/L	1L plastic	cool 4°C	7 days	-
pH	0.01 pH unit	250mL plastic	cool 4°C	4 hours	14 days
Conductivity	0.2µS/cm	250mL plastic	cool 4°C	28 days	-
Total hardness	0.5mg/L	250mL plastic	cool 4°C	6 months	-
Total acidity / alkalinity	0.5mg/L	500mL plastic	cool 4°C	14 days	-
Nutrients					
BOD_5 (8)	5mg/L	1L plastic	cool 4°C	4 hours	7 days
Total ammonia	0.005mg/L	250mL plastic	2mL sulphuric acid, cool 4°C	28 days	-
Nitrate	0.005mg/L	500mL plastic	cool 4°C	48 hours	7 days
Nitrite	0.002mg/L	500mL plastic	cool 4°C	48 hours	7 days
Orthophosphate	0.002mg/L	250mL plastic	cool 4°C	48 hours	7 days
TOC (5)	0.01mg/L	125 ml, glas, amber	2ml HCl acid	28 days	-
Biological					
Chlorophyll	$0.2mg/m^3$	1 L amber glass	cool 4°C	72 hours	3 days (9)
Phenophytin	$0.2mg/m^3$	1 L amber glass	cool 4°C	72 hours	3 days (9)
Sub-lethal Toxicity Testing (7)	N/A	20L plastic tote	cool 4°C	7 days	
Bacterial					
Fecal coliforms	1MPN	125mL sterile plastic or glass	cool 4°C	6hrs	48hrs
Organics					
TPH (2)	1.0 mg/L	500mL brown glass (6)	2mL sulphuric acid	14 days	-
BTEX (3)	0.0005 mg/L	100mL two septum vial (6)	2mL sulphuric acid, cool 4°C	14 days	-

I:\102-00181-10\Assignment\Report\Report 7, Rev. 1 - QAQC Plan\[Tables 2.1 and 2.2.xls]Table 2.1

28-Mar-08

Notes:

1. Sample must be field filtered using a 0.45µm disposable filter and syringe.
2. Total petroleum hydrocarbons.
3. Benzene, toluene, ethyl benzene, xylenes.
4. Total suspended solids.
5. Total organic carbon.
6. Zero sample headspace.
7. Type of test organism selected will depend upon objectives of testing.
8. Biochemical oxygen demand - 5 day test.
9. For samples with pH >7, the sample may be preserved by filtering through a glass fibre filter and storing the filter and residue in an airtight plastic bag in a freezer for up to 3 weeks.

Rev. 1 - Issued for 2008 Field Season

TABLE 2.2

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT

SURFACE WATER SAMPLING PROGRAM - QUALITY ASSURANCE AND QUALITY CONTROL PLAN

SUMMARY OF RECOMMENDED FIELD QA/QC WATER SAMPLES

QA/QC Sample	Purpose	Description	Frequency	Prepared By
Field blank	Identification of potential contaminants arising from sample collection. The field blank vial is filled in the field and is then submitted as a routine sample.	100 mL vial containing deionized water	one per sample shipment	Field staff
Travel blank	Identification of potential contaminants arising from sample storage, shipping and laboratory handling. The travel blank accompanies the samples to the laboratory but is not taken out into the field.	100 mL sealed vial containing deionized water provided by analytical laboratory	one per sample shipment	Analytical laboratory
Field duplicate	Assesses sample variability and precision of laboratory analytical methods	Duplicate sample selected at random. The field replicate sample label should not identify which sampling station it came from.	10 percent of samples	Field staff

I:\102-00181-10\Assignment\Report\Report 7, Rev. 1 - QAQC Plan\[Tables 2.1 and 2.2.xls]Table 2.2
28-Mar-08

Note:
1. Ten percent of all samples will consist of QA/QC samples.

Rev. 1 - Issued for 2008 Field Season

APPENDIX A

▲R1

QUALITY ASSURANCE (QA) AND QUALITY CONTROL (QC) GUIDELINES FOR USE BY CLASS "B" LICENSEES IN COLLECTING REPRESENTATIVE WATER SAMPLES IN THE FIELD AND FOR SUBMISSION OF A QA/QC PLAN (INAC, 1996)

- Report 9 pages

QUALITY ASSURANCE (QA) AND QUALITY CONTROL (QC)

GUIDELINES

FOR USE BY CLASS "B" LICENSEES IN COLLECTING REPRESENTATIVE WATER SAMPLES IN THE FIELD

AND FOR SUBMISSION OF A QA/QC PLAN

JULY 1996

DEPARTMENT OF INDIAN AND NORTHERN AFFAIRS CANADA
WATER RESOURCES DIVISION
AND THE
NORTHWEST TERRITORIES WATER BOARD

Table of Contents

Appendixes

1.0 Introduction and Definitions

The purpose of this guideline is to provide an outline for Licensees to follow when preparing a site-specific Quality Assurance/Quality Control (QA/QC) plan. The QA/QC plan will help ensure that water samples taken in the field maintain a high degree of quality, so that they accurately reflect the physical and chemical nature of the water being tested.

This guideline is divided into three sections:

1) Sample Collection
2) Sample Handling
3) Lab Analysis

It is recognized that there may be different interpretations as to what is covered by "Quality Assurance/Control" due to the fact that certain Licensees have their own laboratories, while others only use commercial laboratories. For licence purposes, "Quality Assurance" and "Quality Control" refer to the following:

Quality Assurance: is the system of activities designed to better ensure that quality control is done effectively; while

Quality Control: is the use of established procedures to achieve standards of measurement for the three principal components of quality: precision, accuracy and reliability.

2.0 Sample Collection

2.1 Location

A QA/QC plan must identify the locations of all sampling stations and the markers used to identify the stations. If the Surveillance Network Program (SNP) of the Water Licence does not specify sampling locations, locations should be chosen with help from an Inspector.

Buoys and landmarks identify sampling stations in tailings ponds and lakes, while sign post positioning usually marks stream sample stations. Stations should be used repeatedly, with the same personnel and techniques to reduce operational error. The use of Global Positioning System (GPS) to identify Latitude and Longitude for sampling stations is recommended.

2.2 Sampling Equipment

The Plan must include a detailed section on the equipment used for sampling and the rationale behind the choices of equipment. Equipment and bottles should be selected so that they do not contaminate or otherwise alter the concentrations of parameters of interest.

Sampling devices, sample bottles and filtration devices should be constructed of non-metallic material. Most samples are now collected in containers constructed of high density polyethylene plastic. However, there are some exceptions, when testing for oil and grease or phenols glass containers are to be used. When conducting a fish bioassay, plastic drums are used while hydrocarbon based containers are not to be used for the collection of organic samples.

This section should also identify whether new or used bottles are used for each sample analysis. New bottles are preferred, but sample containers may be used repeatedly with proper handling measures.

If old bottles are used, a detailed description should be included, noting how they are maintained, stored and cleaned. Usually, this will closely resemble the product manufacturer's instructions. An example of how bottles should be cleaned is outlined below:

- Rinse well with hot tap water for one minute or more.
- Empty bottle and add 30% HNO_3 to approximately 1/3 container capacity. Shake well for three to four minutes.
- Rinse vigorously with hot tap water for two minutes.
- Rinse thoroughly three times with tap water and three times with distilled water.
- Store with 0.2% HNO_3 for a minimum of one week.
- Rinse again with distilled water at least three times.

Bottles that are to be used for bacteria testing should be acid washed or autoclaved if possible.

Note: Additional information on bottle washing is also available from Water

Resources Division.

2.3 Sampling Methods

This Section will include details on how the samples are collected and the equipment that is to be used for each section.

In lakes and ponds, regular sample bottles are used the majority of the time, but Van Dorn samples are often utilized. The sample or the sample bottle is usually lowered to mid depth and washed three times before collecting the sample on the fourth submersion. Approximately 2% of the sample container capacity should remain to provide for mixing, preservative addition and thermal expansion.

Stream water sampling is usually done by plunging a sample bottle toward the current and allowing it to fill. Once again, the bottle should be rinsed three times before filling and room should be left for preservative addition and mixing.

A glass bottle should be used when sampling for oil and grease with the sample being collected during the first submersion and not rinsed three times first.

This section should also describe how often field blanks and replicate samples are to be collected. Field blanks are samples of distilled/deionized water that are to be treated in exactly the same manner as the other samples. Blanks should therefore be taken to the field and handled and preserved as part of the sample program. They indicate when a sample may be contaminated and are indicative of general sample integrity. Replicate samples (duplicates and triplicates) are two or three samples collected from the same station at the same time. They help to ensure sample precision at the laboratory.

3.0 Sample Handling

3.1 Preservation

After collection, most samples must be preserved in order to prevent chemical or biochemical changes to the sample. The QA/QC plan must describe how samples from each station are to be preserved.

Preservation is generally done by the addition of certain chemicals into the bottle immediately after the sample is collected. **Table 1** is a general guide to preservatives and their appropriate concentrations. The QA/QC plan should contain more detailed information on the concentrations and amount of preservatives that will be used.

3.2 Sample Identification

The plan should include a description of the system used to identify samples. The system must provide positive sample identification and ensure that the identification is maintained. It is advisable to keep a logbook of samples that have already been delivered.

The identification can be maintained by marking the bottle itself or a label, with a water resistant, non-smear felt pen. The information should be clear to persons uninvolved in the sampling and may include such details as company name, sample area, SNP number, time and date.

3.3 Transportation

The section on transportation will describe how sample integrity will be ensured from the time of collection to completion of delivery. Delivery to the lab should be done as soon as possible after the samples have been collected.

Usually, samples are sealed and stored upright in a box with other samples to provide a snug, immobile storage space during transfer. Any samples that require refrigeration for preservation should be kept cool during transport.

4.0 Lab Analysis

4.1 Lab Accreditation

The Licensee will identify in the plan the name of the commercial laboratory that will be conducting the analyses. A letter must be provided from the commercial lab indicating that they are accredited to conduct analyses on each of the required sampling parameters. Ideally, the lab should be accredited by the Canadian Associated for Environmental Analytical Laboratories (C.A.E.A.L.) and should provide a certificate stating parameters for which they are accredited.

4.2 Detection Limits

Detection limits for the commercial lab should be identified for all parameters and should be reported when any SNP data is submitted.

4.3 Methodology

Descriptions should be included for any methods of analysis used that are not outlined in "Standard Methods for the Examination of Water and Wastewater".

4.4 Reporting Requirements

The Licensee shall outline the number of replicate samples that will be collected and submitted with each SNP report. It is recommended that one set of duplicates or triplicates from an assigned SNP site, as well as the results from field blanks, be submitted with each required SNP report. These will serve as an internal/external check for the Licensee and the commercial lab.

FOR FURTHER INFORMATION, CONTACT THE WATER RESOURCES DIVISION AT:

Box 1500
Yellowknife, NWT
X1A 2R3
(403)669-2651 Phone
(403)669-2716 Fax

Appendix 1
Table 1: General Summary of Special Sampling or Handling Techniques

Determination	Container	Minimum Sample Size (ml)	Preservation	Maximum Storage Recommended
BOD	Sterile polyethylene	1000	Refrigerate 4°C	24 hours
Conductivity	Polyethylene	500	Refrigerate 4°C	28 days
Total Cyanide	Polyethylene	500	Add NaOH to raise pH>12 refrigerate in dark	24 hours
Hardness	Polyethylene	100	Add Conc. HNO_3 to lower pH<2 OR (*) unpreserved	6 months
Metals, General	Polyethylene	250	For dissolved metals filter immediately, add Conc. HNO_3 to pH<2	6 months
Mercury	Glass (rinsed with 1 + 1 HNO_3)	500	Add Conc. HNO_3 or pH<2 or H_2SO_4 + 1 ml of 5% $K_2Cr_2O_7$, refrigerate 4°C	28 days
Nitrogen:				
Ammonia	Polyethylene	500	Analyze as soon as possible or add H_2SO_4 to pH<2, refrigerate OR (*) unpreserved	7 days
Nitrate	Polyethylene	100	Analyze as soon as possible or refrigerate	48 hours
Oil and Grease	Glass or wide-mouth calibrated	1000	Add H_2SO_4 to pH<2, refrigerate	28 days
pH	Polyethylene	–	Analyze immediately	2 hours
Suspended Solids	Polyethylene	–	Refrigerate	7 days
Temperature	Polyethylene	–	Analyze immediately	0
Turbidity	Polyethylene	–	Analyze same day; store in dark up to 24 hours, refrigerate	24 hours
Bacteria	Polyethylene (sterilized)	–	None: Keep cool	6 - 48 hours

(*) Unpreserved = check with lab that will be analyzing the samples

Appendix 2

References:

Gilbert, Andrew (1993). "Echo Bay Mines Ltd. Environmental Laboratory Quality Assurance Plan".

Soniassy, R. (1980). "A Guide for the Collection of Water and Effluent Samples"; pp 1-16; INAC

"Standard Methods for the Examination of Water and Wastewater" (1989); AHPA, AWWA and WPCF, 17th edition.

Water Resources Division, Indian and Northern Affairs Canada (1990). "Generic Quality Assurance (QA) Plan Guidelines for Use by the Licensees in Meeting SNP Requirements for Submission of a QA Plan"; INAC.

APPENDIX B

▲R1

EXAMPLE FORMS

• Sample Chain of Custody	1 page
• Record of Water Sample Field Parameter Measurements	1 page
• Field Monitoring Data Form	1 page
• Analytical Request Form	1 page
• Chain of Custody Record	1 page

BAFFINLAND MARY RIVER PROJECT

SAMPLE CHAIN OF CUSTODY

FROM:

TO:

F.A.O.

Note:

No.	Sample I.D.	Sampling Date	Sampler	Sample Type	Sample Filtered?	No. of Bottles	Rush?	Analyses																	
								General Chemistry									*Nutrients*						*Bacterial*	*Organics*	
								Metals	Arsenic	Mercury	Anions	TSS	pH	Conductivity	Total Hardness	Total Alkalinity / Acidity	BOD_5	Total ammonia	Nitrate	Nitrite	Orthophosphate	TOC	Faecal coliforms	TPH	BTEX
1																									
2																									
3																									
4																									
5																									
6																									
7																									
8																									
9																									
10																									
11																									
12																									
13																									
14																									
15																									
16																									
17																									
18																									
19																									
20																									

BAFFINLAND MARY RIVER PROJECT

Record of Water Sample Field Parameter Measurements

No.	Sample I.D.	Sampling Date	Sampler	*Field Parameters*						Notes
				pH	Temperature (°C)	Conductivity (mS)	Redox (mV)	D.O. (mg/L)		
								mg/L	%	
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										

DATE AND TIME: ______________________

FIELD MONITORING DATA FORM

STATION ID: ______________________

Environmental Department office – 519-397-9092

Site Information

Coordinates: Northing (m): __________ Easting (m): __________ Zone: __________ Datum: __________

Climate: Temp. (°C): __________ Precipitation: __________ Cloud cover (%): __________

Wind speed (kn): __________ Wind direction: __________ Wave height (m): __________

Description: ____

Field Data

Water Quality Meter: ______________________ Last Calibration: ______________________

Snow Depth (m): ________ Freeboard (m): ________ Ice Thickness (m): ________ Water Depth (m): ________

No.	Depth (m)	Temp. (°C)	pH		DO			SpC (µS/cm)	Cond. (µS/cm)	Sal.	TDS (g/L)
			(units)	(mV)	(mg/L)	(%)	(ch)				
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											

Samples Information

Potable Water ☐	**Wastewater** ☐	**Surface Water** ☐
☐ Baffinland DW Micro	☐ Baffinland WW Micro	☐ Baffinland SW Micro
☐ Baffinland DW Chem	☐ Baffinland WW Chem	☐ Baffinland SW Chem
☐ Baffinland DW Metals	☐ Baffinland WW O&G Tot.	☐ Baffinland SW Metals
☐ Baffinland DW THMs		☐ Baffinland SW BTE
		☐ Baffinland SW O&G Tot.

Comments: ____

____

____

____

TECHNICIAN (please print): ______________________ SIGNOFF: ______________________

TAIGA ENVIRONMENTAL LABORATORY
LABORATOIRE ENVIRONNEMENTAL TAIGA

4601 – 52 Avenue, P.O. Box 1500, Yellowknife, NT, X1A 2R3
Tel: (867) 669-2788 • Fax: (867) 669-2718
www.taiga.gc.ca

Analytical Request Form

Page _1__ of _1__

REPORT TO :
Company/Client ID :
Address :
Attention :
Phone
Fax :
e-mail :
e-mail ☐ Fax ☐ Mail ☐

INVOICE TO : SAME Y / N
Company : **(no charge)**
Address : ____________________
____
Attention : ____________________
Phone : ____________ Fax : ____________
e-mail : ____________________
e-mail ☐ Fax ☐ Mail ☐

INFORMATION TO BE INCLUDED ON REPORT & INVOICE:
Quotation No : ____________________
Client Project No : ____________________
Sampler : ____________________

Relinquished By : ____________________
Signature : ____________________
Date : ____________________

SERVICE REQUESTED:
Regular Service ☐ Rush Service ☐
(Surcharge applies to rush service, please check with Laboratory for price and availability)
Note: Analysis may be subcontracted without prior notice.

Sample(s) are from a Drinking Water source servicing multiple households
Yes ☐

	TAIGA Sample ID (Laboratory use only)	**Client Sample ID**	**Location**	**Collected**		**Sample Type**	**Analysis Requested**						**No. of Containers**
				Date	**Time**								
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													

For water samples, please indicate if sample container was filtered (F) and/or preserved (P).

Date Received : ____________
Time Received : ____________
Received By : ____________

Sample(s) state at receipt: Temperature: _____ °C Frozen ☐
Comments : ____________________
____

Hazardous material? Y / N
Highly Contaminated? Y / N

CHAIN OF CUSTODY RECORD

ACCUTEST LABORATORIES LTD.

☐ 146 Colonnade Rd., Unit 8
Ottawa, ON K2E 7Y1
Ph: (613) 727-5692 Fax: (613) 727-5222

☐ 608 Norris Court
Kingston, ON K7P 2R9
Ph: (613) 634-9307 Fax: (613) 634-9308

LABORATORY USE ONLY
Report #: ____________

Company Name:	Address:	☐ Fax Results to: ____________
Report Attention:	City/Prov: Postal Code:	☐ E-mail Results to: ____________
Phone: Ext	Project # * Quotation #	☐ Copy of Results to: ____________
* Waterworks Name:	* Waterworks Number:	*Note that for drinking water samples, all exceedances will be reported where applicable legislation requires.*

Invoice to:
(if different from above)

____

____

SAMPLE ANALYSIS REQUIRED

⇦ Indicate: F=Filtered or P=Preserved

Sample ID	*** Date/Time Collected**	**Sample Matrix** i.e. Water, Soil, Paint	*** Sample Type** (see "Codes" below)	*** MOE Reportable?** Y = Yes N = No	**# of Containers**	**** Service Required** R=Rush S=Standard									**Criteria Required** (i.e. Reg.170, Reg.153, CCME, PWQO etc.)	**Laboratory Identification**

Sample Type Codes for Drinking Water Systems: **RW** = Raw Water, **RWFC** = Raw Water For Consumption, **TW** = Treated Water at point of entry to distribution, **DW** = Distribution/Plumbing Water
"MOE Reportable" refers to the requirements under the SDWA for immediate reporting of results, which are indicators of adverse water quality, to the Owner/Operator, MOE, and MOH Medical Officer.

Sampled By:	Date/Time:	Relinquished By:	Date/Time:	Comments	**Cooler Temp (°C) on Receipt**
Work Authorized By (signature):	Date/Time:	Received By Lab:	Date/Time:		

*** Indicates a required field.** If not complete, analysis will proceed only on verification of missing information. A quotation number is required, if one was provided.
**** There may surcharges applied to "Rush" service.** Please check with lab prior to submission of samples for rush analysis to confirm availability and pricing.

Page ____ of ____

Copies: White – Sampler, Yellow – Laboratory, Pink – With Report

Please print and submit to the laboratory 2 copies of this form with your samples.

APPENDIX C

▲R1

ANALYTICAL LABORATORY ACCREDITATION

• ALS Laboratory Group	2 pages
• Accutest Laboratories	2 pages
• Taiga Environmental Laboratory	2 pages
• Aquatox Testing & Consulting Inc.	2 pages

ALS LABORATORY GROUP

1.0 SCOPE

This Quality Manual describes the Quality Management System of the ALS Laboratory Group Environmental Division locations in Canada. Where appropriate, it refers to other documents for additional information. Throughout this manual, whenever ALS is used alone, it refers to the Environmental Division of the ALS Laboratory Group in Canada.

2.0 LOCATIONS, ACCREDITATIONS AND RECOGNITIONS

ALS has laboratories across Canada. Addresses and contact information are available by following the links at our web site: www.alsenviro.com.

Labs within our network are accredited or recognized by the following agencies, as appropriate to their fields of testing and geographical sectors.

- Canadian Association for Environmental Analytical Laboratories (CAEAL) – www.caeal.ca
- Standards Council of Canada (SCC) – www.scc.ca
- American Industrial Hygiene Association (AIHA) – IHLAP - www.aiha.org
- American Industrial Hygiene Association (AIHA) – EMLAP – www.aiha.org
- State of Washington Department of Ecology (WADOE) – www.ecy.wa.gov
- United States National Environmental Laboratory Accreditation Program (NELAP) - www.nj.gov/dep/oqa
- British Columbia Provincial Health Officer – EWQA – www.pathology.ubc.ca
- British Columbia Ministry of Environment – EDQA – www.env.gov.bc.ca
- Ontario Ministry of Environment – www.ene.gov.on.ca
- Health Canada Good Manufacturing Practices (GMP) - Establishment License - www.hc-sc.gc.ca

Copies of current certificates and licenses applicable to these programs are available on www.alsenviro.com. Scopes of accreditation and/or program information are available on the web sites linked above.

3.0 TERMS AND DEFINITIONS

The terms and definitions relevant to the national quality management system are described in a nationally controlled file. For instances where local and national documents describe similar terms and definitions, the local document takes precedence.

Refer to:

- ➢ Local Master List: DEFINITIONS OF KEY TERMS

ACCUTEST LABORATORIES

Methods of Quality Control

The objective of the Quality Assurance Program is to ensure that results provided by the laboratory to our clients or regulatory bodies are accurate and precise, as well as consistent over time. Various techniques; statistical, investigative, preventative, administrative, and corrective will be utilized to maximize the reliability of the data.

The analytical services provided by Accutest Laboratories are based on industry recognized methodologies published by the following:

- AWWA, APHA - "Standard Methods for the Examination of Water and Wastewater", 20th Edition, 1998.
- Ontario Ministry of Agriculture, Food, and Rural Affairs
- Ontario Ministry of the Environment
- ASTM - American Society for Testing Materials
- AOAC "Official Methods of Analysis"
- CCME
- USEPA 500, 600, and SW846 Series Methodologies, and
- other recognized regulatory and industry sources

Certification and Accreditation

Accutest maintains a rigorous program of certification and accreditation from several governing sources. In 1989 the laboratory received accreditation from the Ontario Ministry of Agriculture, Food, and Rural Affairs (**OMAFRA**) to provide analysis of farm soil for the agricultural community.

In 1991 the laboratory received certification from the Canadian Association of Environmental Analytical Laboratories (**CAEAL**), Registration Number 2602. The Kingston laboratory's registration number is 2970. In 1995, following an independent laboratory audit by CAEAL, under the direction of the Standards Council of Canada (**SCC**), Accutest achieved full accreditation for specific parameters to **ISO 17025** criteria (Registration Number 164).

For up to date accreditation details, the SCC's web site can be found at: www.scc.ca

CAEAL's web site is: www.caeal.ca

Accutest is a Ministry of Transportation for Ontario (**MTO**) approved laboratory for the analysis of chloride content in concrete.

Interlaboratory Studies

Accutest regularly takes part in interlaboratory studies. As part of the accreditation programs of both CAEAL/SCC and OMAFRA, the performance of Accutest is monitored through the analysis of unknown quality control samples submitted by an external agency.

TAIGA ENVIRONMENTAL LABORATORY

ACLAE

CAEAL

Canadian Association for Environmental Analytical Laboratories Inc.

Certificate of Accreditation

Taiga Environmental Laboratory
Department of Indian and Northern Affairs Canada
4601 - 52nd Avenue
Yellowknife, Northwest Territories

This laboratory is accredited in accordance with the recognised International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer joint ISO-ILAC-IAF Communiqué dated 18 June 2005).

Accreditation No. *A2635* Accreditation Date *January 3, 2005*

Issued on *May 30, 2007* Expiry Date *April 7, 2009*

Chief Executive Officer

ilac-MRA

ACLAE CAEAL

This certificate is the property of Canadian Association for Environmental Analytical Laboratories Inc. and must be returned on request; reproduction must follow guidelines in place at date of issue. For the specific tests to which this accreditation applies, please refer to the laboratory's scope of accreditation at www.caeal.ca.

AQUATOX TESTING & CONSULTING INC.

Canadian Association for Environmental Analytical Laboratories Inc.

Certificate of Accreditation

AquaTox Testing & Consulting Inc.
11B Nicholas Beaver Road, RR#3
Guelph, Ontario

This laboratory is accredited in accordance with the recognised International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer joint ISO-ILAC-IAF Communiqué dated 18 June 2005).

Accreditation No. *A2803*   Accreditation Date *January 3, 2005*

Issued on *March 14, 2007*   Expiry Date *March 14, 2010*

Chief Executive Officer

This certificate is the property of Canadian Association for Environmental Analytical Laboratories Inc. and must be returned on request; reproduction must follow guidelines in place at date of issue. For the specific tests to which this accreditation applies, please refer to the laboratory's scope of accreditation at www.caeal.ca.

APPENDIX D ▲R1

LABORATORY ANALYTICAL METHODS

ALS Laboratory Group	3 pages
Accutest Laboratories	3 pages
Taiga Environmental Laboratory	9 pages
Aquatox Testing & Consulting Inc.	3 pages

ALS LABORATORY GROUP

5.4 TEST METHODS AND METHOD VALIDATION

5.4.1 General

All ALS locations use appropriate methods for all tests performed, including those for estimating uncertainty and statistical techniques for analyzing data. Test methods are documented and include all instructions needed to operate equipment and protect the integrity of samples and analytical results. Test method instructions and support information is kept current and accessible where needed.

Deviations from test methods occur only if the deviation has been documented, technically justified, authorized, and accepted by the customer where applicable. Analytical department supervisors and managers have the authority to approve method deviations for the analysis of samples and to impose appropriate quality control into the analysis. If the deviation is judged to alter the outcome of a test, client acceptance of the deviation will be obtained prior to approval. Documentation follows the same requirements as for data quality and method objective -refer to section 4.9

5.4.2 Selection of Methods

Customers rely on ALS to select test methods that are appropriate to meet their needs and are appropriate for the tests performed. ALS uses the latest versions of published standard methods developed by organizations such as American Public Health Association, United States Environmental Protection Agency, NIOSH, Environment Canada, and other international, regional or regulatory organizations or equipment manufacturers whenever possible. When needed, the standard method will be supplemented with additional instructions to ensure consistency of application and performance. Where an appropriate standard method is not available ALS may develop and validate an in-house test method, or adopt a third party validated method. ALS provides method information to clients upon request and on test reports.

For published reference methods, each ALS location confirms it can properly operate the standard method before introducing the test into the laboratory. If the standard method changes in a manner that may affect test results, the confirmation is repeated.

Unique circumstances may occur where a customer specifies the methodology to be used. The customer will be notified if ALS deems the recommended method is inappropriate or out of date.

5.4.3 Laboratory Developed Methods

When in-house development of a test procedure is needed, qualified individuals are assigned to the planning and development stages of the project. The plan is updated as development progresses and all changes are effectively communicated among all involved.

5.4.4 Non-standard Methods

If it is necessary to use methods not covered by standard methods, customer agreement will be obtained and will include clear specification of their requirements and the purpose of the test. The developed method will be appropriately validated before use.

5.4.5 Validation of Methods

Method validations are conducted to confirm that the methods are fit for their intended use. The validations are as extensive as necessary to meet the needs of the given application. The extent depends on the source of the method. For example, standard methods used for their intended application require a less extensive validation than non-standard methods or standard methods used outside of their intended scope.

All results relating to the validation of a given method, including the procedure used for validation and a statement of whether the method is fit for the intended use are retained in method validation records.

As appropriate, the validation studies performed will verify the range and accuracy of the results obtained, including uncertainty, detection limit, selectivity of the method, linearity, repeatability and/or reproducibility, robustness and/or sensitivity to interference. Measurement uncertainty values are reviewed to ensure they are sufficient to meet customers needs.

5.4.6 Estimation of Measurement Uncertainty

ALS has procedures for estimating measurement uncertainty. The procedures are based on accepted practices of identifying components contributing to uncertainty, compiling data that represents or includes these components, evaluating the data using appropriate statistical calculations, and reporting in a manner that prevents misunderstanding of the result. In those cases where the nature of the test precludes calculation of uncertainty, ALS will at minimum identify the components of uncertainty and make a reasonable estimation where needed. This estimation will be based on knowledge of the performance of the method and validation data.

5.4.7 Control of Data

Automated calculations and data transfer systems are checked in a systematic manner when first programmed and re-verified appropriately when changes are made.

When computers and automated equipment are used for the acquisition, processing, recording, reporting, storage or retrieval of test data, ALS ensures:

- in-house developed software is sufficiently documented and validated
- procedures are implemented for protecting data, including integrity and confidentiality of entry, collection, storage transmission and processing – refer to sections 4.13, 5.1 and 5.10
- computers and automated equipment are maintained to ensure proper functioning and adequate environmental conditions – refer to section 5.1

Refer to:

- Local Master List: METHOD VALIDATION
- Local Master List: LIMS CALCULATIONS AND DATA TRANSFERS
- Local Master List: SOFTWARE DEVELOPED IN-HOUSE

ACCUTEST LABORATORIES

Details of Quotation

BOD5

ANALYTE	METHOD REFERENCE	MDL	UNITS
BOD5	BOD5 - AMBODEE1 SM 5210B	1	mg/L

Chlorophyll / Pheophytin

ANALYTE	METHOD REFERENCE	MDL	UNITS
Chlorophyll-a	Chlorophyll C SM10200H	0.2	mg/m3
Pheophytin-a	Chlorophyll C SM10200H	0.2	mg/m3

Knight P - SW (no metals)

ANALYTE	METHOD REFERENCE	MDL	UNITS
pH	pH in water : Auto - AMAPCAE1 C SM4500-H+B	1	
Conductivity	Conductivity : Auto - AMAPCAE1 C SM2510B	5	uS/cm
Alkalinity as CaCO3	Alkalinity : Auto - AMAPCAE1 SM 2320B	5	mg/L
TDS (COND - CALC)	solids in water - AMSOLWE1 C SM2540	5	mg/L
Turbidity	Turbidity - AMTURBE1 C SM2130B	0.1	NTU
Phenols	Phenols 4-AAP - AMPHACE1 C SM5530D	0.001	mg/L
N-NH3	NH3 water low - AMNH3LE1 C SM4500-NH3D	0.02	mg/L
SO4	Anions by IC - DX-100 SM 4110C	1	mg/L
Cl	Anions by IC - DX-100 SM 4110C	1	mg/L
Br	Anions by IC - DX-100 SM 4110C	0.05	mg/L
N-NO2	Low NO2 - SKALAR C SM4500-NO2-B	0.005	mg/L
N-NO3	NO2/NO3 SKALAR - AMNOXSE1 C SM4500-NO3-F	0.1	mg/L
NO2 + NO3 as N	NO2/NO3 SKALAR - AMNOXSE1 C SM4500-NO3-F	0.1	mg/L
TOC	DOC/TOC in water Combustion C SM5310B	0.5	mg/L
DOC	DOC/TOC in water Combustion C SM5310B	0.5	mg/L
Total Suspended Solids	solids in water - AMSOLWE1 C SM2540	2	mg/L
Total P	Low Total P C SM4500-PF	0.003	mg/L
Total Kjeldahl Nitrogen	TKN low water - AMTKNLE1 C SM4500-Norg-C	0.1	mg/L

Reg 170 - Schedule 23

ANALYTE	METHOD REFERENCE	MDL	UNITS
Ba	ICP-MS PE6100 EPA 200.8	0.01	mg/L
B	ICP-MS PE6100 EPA 200.8	0.01	mg/L
Cd	ICP-MS PE6100 EPA 200.8	0.0001	mg/L
Cr	ICP-MS PE6100 EPA 200.8	0.001	mg/L
As	ICP-MS PE6100 EPA 200.8	0.001	mg/L
Se	ICP-MS PE6100 EPA 200.8	0.001	mg/L
Sb	ICP-MS PE6100 EPA 200.8	0.001	mg/L
Hg	Hg in water - AMHGCTE1 M SM3112B-3500B	0.0001	mg/L
U	ICP-MS PE6100 EPA 200.8	0.001	mg/L

SUBDIV. BACTI

ANALYTE	METHOD REFERENCE	MDL	UNITS
Total Coliforms	Bacteria - AMBCOLM1 SM 9222B	0	ct/100mL
Faecal Coliforms	Bacteria - AMBCOLM1 SM 9222B	0	ct/100mL

Faecal Streptococcus	Bacteria - AMBCOLM1 SM 9222B	0	ct/100mL
Escherichia Coli	Bacteria - AMBCOLM1 SM 9222B	0	ct/100mL
Heterotrophic Plate Count	SPC - AMBCOLM1 SM9215D	0	ct/1mL

SUBDIV. SUPPLY NO BACTI

ANALYTE	METHOD REFERENCE	MDL	UNITS
Fe	ICP-MS PE6100 EPA 200.8	0.03	mg/L
Mn	ICP-MS PE6100 EPA 200.8	0.01	mg/L
Hardness as CaCO3	Alkalis by FAA - AMAMFAE1 SM 3111B-3500B	5	mg/L
Alkalinity as CaCO3	Alkalinity : Auto - AMAPCAE1 SM 2320B	5	mg/L
pH	pH in water : Auto - AMAPCAE1 C SM4500-H+B	1	
Conductivity	Conductivity : Auto - AMAPCAE1 C SM2510B	5	uS/cm
F	F Autotitrator C SM4500-FC	0.1	mg/L
Na	ICP metals - AMMICPE8 M SM3120B-3500C	2	mg/L
N-NO3	NO2/NO3 SKALAR - AMNOXSE1 C SM4500-NO3-F	0.1	mg/L
N-NO2	NO2/NO3 SKALAR - AMNOXSE1 C SM4500-NO3-F	0.1	mg/L
N-NH3	NH3 water low - AMNH3LE1 C SM4500-NH3D	0.02	mg/L
SO4	Anions by IC - DX-100 SM 4110C	1	mg/L
Cl	Anions by IC - DX-100 SM 4110C	1	mg/L
Phenols	Phenols 4-AAP - AMPHACE1 C SM5530D	0.001	mg/L
Turbidity	Turbidity - AMTURBE1 C SM2130B	0.1	NTU
Colour	Colour - AMCOLSE1 C SM2120C	2	TCU
Ca	ICP metals - AMMICPE8 M SM3120B-3500C	1	mg/L
Mg	ICP metals - AMMICPE8 M SM3120B-3500C	1	mg/L
Tannin & Lignin	Tannin & Lignin - AMTNLNE1 C SM5550B	0.1	mg/L
Total Kjeldahl Nitrogen	TKN low water - AMTKNLE1 C SM4500-Norg-C	0.1	mg/L
K	ICP metals - AMMICPE8 M SM3120B-3500C	1	mg/L
DOC	DOC/TOC in water Combustion C SM5310B	0.5	mg/L
H2S	H2S water - AMH2SCE1 C SM4500-S2-D	0.01	mg/L
Ion Balance	Ion Balance C Ion Balance	0.01	
TDS (COND - CALC)	solids in water - AMSOLWE1 C SM2540	5	mg/L

TSS

ANALYTE	METHOD REFERENCE	MDL	UNITS
Total Suspended Solids	solids in water - AMSOLWE1 C SM2540	2	mg/L

TAIGA ENVIRONMENTAL LABORATORY

CAEAL Directory of Laboratories

Logged In A	
Member:	
Password:	
Logout	

Home | List | Laboratory Identification

Membership Number: 2635
Laboratory Name: Taiga Environmental Laboratory
Parent Institution: Department of Indian and Northern Affairs Canada
Address: 4601 - 52nd Avenue Yellowknife, Northwest Territories X1A 2R3
Contact: Ms. Angelique Ruzindana
Phone: (867) 669-2781
Fax: (867) 669-2718
Email: ruzindanaa@inac-ainc.gc.ca

Click for PT Directory | Showing Accreditation Directory

Scope of Accreditation

Soil

Appendix No/Name

071 Polycyclic Aromatic Hydrocarbons (PAH) - Soil

Method	**Method Reference**	**Lab Method ID**
GC/MS - EXTRACTION	based on USEPA SW 846 METHODS 3500 B, 3541, 3630 C, 8100, 8310	TEL 047 - PAH IN SOIL

	Parameters	**RDL Range**
PT-025207	Acenaphthene	.01 - .05 µg/g
PT-025208	Acenaphthylene	.01 - .05 µg/g
PT-025209	Anthracene	.01 - .05 µg/g
PT-005789	Benzo (a) anthracene	.01 - .05 µg/g
PT-005790	Benzo (a) pyrene	.01 - .05 µg/g
PT-005791	Benzo (b) fluoranthene	.01 - .05 µg/g
PT-005792	Benzo (g,h,i) perylene	.01 - .05 µg/g
PT-005793	Benzo (k) fluoranthene	.01 - .05 µg/g
PT-025210	Chrysene	.01 - .05 µg/g
PT-025211	Dibenzo (a,h) anthracene	.01 - .05 µg/g
PT-005794	Fluoranthene	.01 - .05 µg/g
PT-025212	Fluorene	.01 - .05 µg/g
PT-005795	Indeno (1,2,3 - cd) pyrene	.01 - .05 µg/g
PT-025213	Naphthalene	.01 - .05 µg/g
PT-005796	Phenanthrene	.01 - .05 µg/g
PT-005797	Pyrene	.01 - .05 µg/g

Soil

Appendix No/Name

072 BTEX - Soil

Method	**Method Reference**	**Lab Method ID**
GC/MSD - PURGE AND TRAP	based on USEPA 5030 B, 602, 502.2	TEL 038

	Parameters	**RDL Range**
PT-026153	Benzene	.01 - .05 mg/kg
PT-026154	Ethylbenzene	.01 - .05 mg/kg
PT-026155	m/p-xylene	.01 - .05 mg/kg

PT-026156	o-xylene	.01 - .05 mg/kg
PT-026157	Toluene	.01 - .05 mg/kg

Soil

Appendix No/Name

074 Purgeable Hydrocarbons- Soil

Method	**Method Reference**	**Lab Method ID**
GC/FID - PURGE AND TRAP	CWS-PHC CCME TIER 1	TEL 056

	Parameters	**RDL Range**
PT-026640	F1: C6-C10	1 - 5 mg/kg

Soil

Appendix No/Name

075 Petroleum Hydrocarbons (PHC) - Soil

Method	**Method Reference**	**Lab Method ID**
SOXTHERM EXTRACTION - GRAVIMETRIC	based onUS EPA SW-846 METHODS 5030, 8000, 8015, 8260 B	TEL 046

	Parameters	**RDL Range**
PT-027183	F4: Gravimetric	

Soil/Sediment

Appendix No/Name

030 Moisture - Soil

Method	**Method Reference**	**Lab Method ID**
GRAVIMETRIC	based on CCME Tier 1	TEL007

	Parameters	**RDL Range**
	Moisture	

Soil/Sediment

Appendix No/Name

073 Petroluem Hydrocarbons (PHC) - Soil

Method	**Method Reference**	**Lab Method ID**
GC/FID - PURGE AND TRAP	based on USEPA SW 846 METHODS 3500 B, 3541, 3630 C, 8100, 8310	TEL 045

	Parameters	**RDL Range**
PT-016194	F2: C10-C16	10 - 50 mg/kg
PT-016195	F3: C16-C34	10 - 50 mg/kg
PT-016196	F4: C34-C50	10 - 50 mg/kg

Soil/Sediment

Appendix No/Name

079 Metals - Soil/Sediment

Method	**Method Reference**	**Lab Method ID**
ICP/MS	EPA SW-846 METHOD 3050 A	TEL 061 - METALS IN SOIL / SEDIMENT

	Parameters	**RDL Range**
PT-027299	Aluminum	
PT-027300	Antimony	
PT-026701	Arsenic	.1 - .5 µg/g
PT-027301	Barium	
PT-027302	Beryllium	
PT-027303	Boron	
PT-026702	Cadmium	.1 - .5 µg/g
PT-027304	Chromium	
PT-027305	Cobalt	
PT-026706	Copper	.5 - 2.5 µg/g
PT-027306	Iron	
PT-026703	Lead	.1 - .5 µg/g
PT-027307	Manganese	
PT-026704	Mercury	10 - 50 ng/g
PT-027308	Nickel	
PT-027309	Strontium	
PT-027310	Tin	
PT-027311	Titanium	
PT-027312	Uranium	
PT-027313	Vanadium	
PT-026705	Zinc	.5 - 2.5 µg/g

Water (Inorganic)
Appendix No/Name
001 Alkalinity - Water

Method	Method Reference	Lab Method ID
TITRIMETRIC	based on APHA 2320 B	TEL003

	Parameters	RDL Range
PT-005713	Alkalinity (pH 4.5)	.1 - .5 mg/L

Water (Inorganic)
Appendix No/Name
003 Conductivity - Water

Method	Method Reference	Lab Method ID
CONDUCTIVITY METER	based on APHA 2510 B	TEL002

	Parameters	RDL Range
PT-005715	Conductivity (25ÝC)	.1 - .5 µs/cm

Water (Inorganic)
Appendix No/Name
004 Biochemical Oxygen Demand (BOD) - Water

Method	Method Reference	Lab Method ID
D.O. METER	based on APHA 5210 A-B	TEL 019: BIOCHEMICAL OXYBEN DEMAND

	Parameters	RDL Range
PT-005755	BOD (5 day)	
PT-027614	CBOD (5 day)	

Water (Inorganic)
Appendix No/Name
007 Silica - Reactive - Water

Method	Method Reference	Lab Method ID
AUTO COLOR	based on APHA 4500-SiO2 F	TEL012

	Parameters	RDL Range
PT-005723	Reactive Silica	.01 - .05 mg/L

Water (Inorganic)
Appendix No/Name
009 Phosphorus - Water

Method	Method Reference	Lab Method ID
AUTO COLOR - DIGESTION	based on APHA 4500 P B, D	TEL015

	Parameters	RDL Range
	Dissolved Phosphorus	
PT-005753	Total Phosphorus	.01 - .05 mg/L

Water (Inorganic)
Appendix No/Name
011 Solids - Water

Method	Method Reference	Lab Method ID
GRAVIMETRIC	based on APHA 2540 C, D	TEL008

	Parameters	RDL Range
PT-020339	Total Dissolved Solids	10 - 50 mg/L
PT-005754	Total Suspended Solids	1 - 5 mg/L

Water (Inorganic)
Appendix No/Name
013 Dissolved Metals - Water

Method	Method Reference	Lab Method ID
ICP/MS	based on US EPA 200.8	TEL035

	Parameters	RDL Range
PT-005729	Aluminum	.0005 - .0025 mg/L
	Antimony	
	Arsenic	
PT-005730	Barium	.0001 - .0005 mg/L
PT-005731	Beryllium	.0001 - .0005 mg/L
PT-005732	Boron	.0005 - .0025 mg/L
PT-005733	Cadmium	.00005 - .00025 mg/L
	Cesium	

PT-005734	Chromium	.0001 - .0005 mg/L
PT-005735	Cobalt	.0001 - .0005 mg/L
PT-005736	Copper	.0001 - .0005 mg/L
PT-019043	Iron	.05 - .25 mg/L
PT-005738	Lead	.0001 - .0005 mg/L
	Lithium	
PT-005739	Manganese	.0001 - .0005 mg/L
PT-005740	Molybdenum (Parameter suspended on 12/18/2007)	.0001 - .0005 mg/L
PT-005741	Nickel	.0001 - .0005 mg/L
	Rubidium	
	Selenium	
PT-005742	Silver	.0001 - .0005 mg/L
PT-005743	Strontium	.0001 - .0005 mg/L
PT-005744	Thallium	.0001 - .0005 mg/L
PT-005745	Tin	.0001 - .0005 mg/L
PT-005746	Titanium	.0001 - .0005 mg/L
PT-005747	Uranium	.0001 - .0005 mg/L
PT-005748	Vanadium	.0001 - .0005 mg/L
PT-005749	Zinc (Parameter suspended on 12/18/2007)	.0001 - .0005 mg/L

Water (Inorganic)

Appendix No/Name

015 pH - Water

Method	**Method Reference**	**Lab Method ID**
pH METER	based on APHA 4500 H+ B	TEL001

	Parameters	**RDL Range**
PT-005759	pH	

Water (Inorganic)

Appendix No/Name

022 Ammonia - Water

Method	**Method Reference**	**Lab Method ID**
AUTO COLOR	based on APHA 4500-NH3 G	TEL013

	Parameters	**RDL Range**
PT-005726	Ammonia	.005 - .025 mg/L

Water (Inorganic)

Appendix No/Name

028 Turbidity - Water

Method	**Method Reference**	**Lab Method ID**
NEPHELOMETRY	based on APHA 2130 B	TEL006

	Parameters	**RDL Range**
PT-005756	Turbidity	.05 - .25 NTU

Water (Inorganic)

Appendix No/Name

029 Organic Carbon - Water

Method	**Method Reference**	**Lab Method ID**
INFRARED	based on APHA 5310 B	TEL033

	Parameters	**RDL Range**
PT-005727	DOC	.5 - 2.5 mg/L
	TOC	

Water (Inorganic)

Appendix No/Name

040 Phosphate - Water

Method	**Method Reference**	**Lab Method ID**
AUTO COLOR	based on APHA 4500P D	TEL015

	Parameters	**RDL Range**
PT-005728	Phosphate	.001 - .005 mg/L

Water (Inorganic)

Appendix No/Name

042 Major Ions - Water

Method	**Method Reference**	**Lab Method ID**
ION CHROMATOGRAPHY	based on APHA 4110 B	TEL055

	Parameters	RDL Range
PT-016148	Calcium	.1 - .5 mg/L
PT-016149	Magnesium	.1 - .5 mg/L
PT-016150	Potassium	.1 - .5 mg/L
PT-016151	Sodium	.1 - .5 mg/L

Water (Inorganic)

Appendix No/Name

054 Total Metals - Water

Method	Method Reference	Lab Method ID
ICP/MS	based on US EPA 200.8	TEL035

	Parameters	RDL Range
PT-020340	Aluminum	.01 - .05 mg/L
PT-016153	Arsenic	.1 - .5 µg/L
PT-020341	Barium (Parameter suspended on 12/18/2007)	.0001 - .0005 mg/L
	Beryllium	
PT-020342	Boron	.0005 - .0025 mg/L
	Cadmium	
	Cesium	
PT-020343	Chromium	.0001 - .0005 mg/L
PT-020344	Cobalt	.0001 - .0005 mg/L
PT-020345	Copper	.0001 - .0005 mg/L
PT-020346	Iron	.05 - .25 mg/L
PT-020347	Lead	.0001 - .0005 mg/L
	Lithium	
PT-020348	Manganese	.0001 - .0005 mg/L
	Mercury	
PT-020349	Molybdenum	.0001 - .0005 mg/L
PT-020350	Nickel	.0001 - .0005 mg/L
	Rubidium	
PT-005752	Selenium	.1 - .5 µg/L
	Silver	
PT-020351	Strontium	.0001 - .0005 mg/L
PT-020352	Thallium	.0001 - .0005 mg/L
	Tin	
PT-020353	Titanium	.0001 - .0005 mg/L
	Uranium	
PT-020354	Vanadium	.0001 - .0005 mg/L
PT-020355	Zinc (Parameter suspended on 12/18/2007)	.01 - .05 mg/L

Water (Inorganic)

Appendix No/Name

059 Major Anions - Water

Method	Method Reference	Lab Method ID
ION CHROMATOGRAPHY	based on APHA 4110 B	TEL 055

	Parameters	RDL Range
PT-018530	Chloride	.5 - 2.5 mg/L
PT-018531	Fluoride	.1 - .5 mg/L
PT-018532	Nitrate	.01 - .05 mg/L
PT-018535	Nitrite	.01 - .05 mg/L
PT-018534	Sulfate	1 - 5 mg/L

Water (Inorganic)

Appendix No/Name

060 Hexane Extractable Material (Oil and Grease) - Water

Method	Method Reference	Lab Method ID
SOLID PHASE EXTRACTION	based on US EPA 1664 A REVISION A	TEL 024: HEM AND SGT-HEM

	Parameters	RDL Range
	Mineral Oil and Grease	
PT-021431	Total Oil and Grease	5 - 25 mg/L

Water (Inorganic)

Appendix No/Name

061 Chemical Oxygen Demand (COD) - Water

Method	Method Reference	Lab Method ID
REFLUX - COLORIMETRIC	based on APHA 5220 D	TEL 016

Parameters **RDL Range**

PT-005757	COD	5 - 25 mg/L

Water (Inorganic)
Appendix No/Name
063 Color - Water

Method	**Method Reference**	**Lab Method ID**
HACH - SPECTROPHOTOMETRIC	based on APHA 2120 A, B, C	TEL 051

	Parameters	**RDL Range**
	Apparent Color	
	True Color	

Water (Inorganic)
Appendix No/Name
064 Total and Dissolved Nitrogen - Water

Method	**Method Reference**	**Lab Method ID**
DIGESTED - COLORIMETRIC	based on NLET SOP 01-1150	TEL014

	Parameters	**RDL Range**
	Dissolved Nitrogen	
	Total Nitrogen	

Water (Inorganic)
Appendix No/Name
066 Alkalinity - Water

Method	**Method Reference**	**Lab Method ID**
AUTO TITRIMETRIC	based on SM 2320 A, B	TEL 057:PC TITRATE

	Parameters	**RDL Range**
PT-025171	Alkalinity (pH 4.5)	.1 - .5 mg/L

Water (Inorganic)
Appendix No/Name
067 pH - Water

Method	**Method Reference**	**Lab Method ID**
AUTO - pH METER	based on SM 4500-H+ A, B	TEL 057:PC TITRATE

	Parameters	**RDL Range**
PT-025173	pH	

Water (Inorganic)
Appendix No/Name
068 Conductivity - Water

Method	**Method Reference**	**Lab Method ID**
AUTO CONDUCTIVITY METER	based on SM 2510 B	TEL 057:PC TITRATE

	Parameters	**RDL Range**
PT-025172	Conductivity (25ÝC)	.1 - .5 μs/cm

Water (Inorganic)
Appendix No/Name
078 Residual Chlorine - Water

Method	**Method Reference**	**Lab Method ID**
HACH	based on APHA METHOD 4500-CL G	TEL049

	Parameters	**RDL Range**
PT-016197	Residual Chlorine	.01 - .05 mg/L

Water (Inorganic)
Appendix No/Name
080 Mercury - Water

Method	**Method Reference**	**Lab Method ID**
ATOMIC FLUORESCENCE MERCURY ANALYSIS SYSTEM	EPA 245.7	TEL 062: MERCURY IN WATER

	Parameters	**RDL Range**
PT-027314	Mercury	

Water (Inorganic)
Appendix No/Name
081 Phosphorus - Water

Method	**Method Reference**	**Lab Method ID**
SKALAR SAN CONTINUOUS FLOW ANALYZER	SM 4500-P D STANNOUS CHLORIDE METHOD	TEL 063: PHOSPHORUS BY SKALAR

	Parameters	**RDL Range**
PT-027297	Phosphate	
PT-027298	Total Phosphorus	

Water (Microbiology)

Appendix No/Name

041 Fecal Coliforms - Water

Method	**Method Reference**	**Lab Method ID**
MEMBRANE FILTRATION (mFC)	based on APHA 9222 D	TEL017

	Parameters	**RDL Range**
PT-005762	Fecal Coliforms	

Water (Microbiology)

Appendix No/Name

045 Coliforms - Water

Method	**Method Reference**	**Lab Method ID**
MOST PROBABLE NUMBER (QUANTI-TRAY)	based on IDEXX QUANTI-TRAY	TEL053

	Parameters	**RDL Range**
PT-016174	Escherichia coli (E. coli)	
PT-016176	Total Coliforms	

Water (Microbiology)

Appendix No/Name

055 Fecal streptococcus - Water

Method	**Method Reference**	**Lab Method ID**
MOST PROBABLE NUMBER (QUANTI-TRAY)	based on IDEXX QUANTI-TRAY	TEL053

	Parameters	**RDL Range**
	Fecal Streptococcus	

Water (Organic)

Appendix No/Name

069 Polycyclic Aromatic Hydrocarbons (PAH) - Water

Method	**Method Reference**	**Lab Method ID**
GC/MS	based on USEPA SW 846 METHODS	TEL 041 - PAH IN WATER

	Parameters	**RDL Range**
PT-025174	Acenaphthene	.01 - .05 μg/L
PT-025175	Acenaphthylene	.01 - .05 μg/L
PT-025176	Anthracene	.01 - .05 μg/L
PT-016177	Benzo (a) anthracene	.01 - .05 μg/L
PT-016178	Benzo (a) pyrene	.01 - .05 μg/L
PT-016179	Benzo (b) fluoranthene	.01 - .05 μg/L
PT-016180	Benzo (g,h,i) perylene	.01 - .05 μg/L
PT-016181	Benzo (k) fluoranthene	.01 - .05 μg/L
PT-025177	Chrysene	.01 - .05 μg/L
PT-025178	Dibenzo (a,h) anthracene	.01 - .05 μg/L
PT-016182	Fluoranthene	.01 - .05 μg/L
PT-016183	Indeno (1,2,3 - cd) pyrene	.01 - .05 μg/L
PT-025179	Naphthalene	.01 - .05 μg/L
PT-016184	Phenanthrene	.01 - .05 μg/L
PT-016185	Pyrene	.01 - .05 μg/L

Water (Organic)

Appendix No/Name

070 BTEX - Water

Method	**Method Reference**	**Lab Method ID**
GC/MSD - PURGE AND TRAP	based on USEPA METHOD 5030 B, 602, 502.2	TEL 037 (BTEX)

	Parameters	**RDL Range**
PT-005765	Benzene	5 - 25 μg/L
PT-005770	Ethylbenzene	5 - 25 μg/L
PT-005771	m/p-xylene	5 - 25 μg/L
PT-005772	o-xylene	5 - 25 μg/L
PT-005773	Toluene	5 - 25 μg/L

Water (Organic)

Appendix No/Name

077 Trihalomethanes (THMs) - Water

Method	Method Reference	Lab Method ID
GC/MS - PURGE AND TRAP	based on USEPA 5030 B, 602, 502.2	TEL039 (THM)

	Parameters	RDL Range
PT-005766	Bromodichloromethane	1 - 5 µg/L
PT-005767	Bromoform	1 - 5 µg/L
PT-005768	Chlorodibromomethane	1 - 5 µg/L
PT-005769	Chloroform	1 - 5 µg/L

AQUATOX TESTING & CONSULTING INC.

AQUATOX

AquaTox Testing & Consulting Inc.
11B Nicholas Beaver Rd.
RR 3
Guelph ON N1H 6H9
Tel: (519) 763-4412 Fax: (519) 763-4419

To:	Cheryl Wray	From:	Lesley Novak, M.Sc.
Company:	Baffinland Iron Ore	☐	For Your Information
Date:	October 15, 2007	☐	For Your Approval
File:	162704515	☐	For Your Review
		x	As Requested

Reference: **Toxicity Testing Services**

I am pleased to provide you with a quotation for toxicity testing services for wastewater effluent monitoring (Table 1).

AquaTox's laboratory is accredited for all of the tests listed in Table 1. A copy of our SCC/CAEAL Certificate of Accreditation along with our scope of testing (which lists all of the specific tests that we are currently accredited for) can be provided at your request.

We appreciate your past support and look forward to a continued association. Please call me if you have any questions or require additional information.

AquaTox Testing & Consulting Inc.

Lesley Novak

Lesley Novak, M.Sc.
Vice President, Senior Aquatic Toxicologist
Tel: 519-763-4412
Fax: 519-763-4419
lnovak@aquatox.ca

AquaTox Testing & Consulting Inc.
11B Nicholas Beaver Rd.
RR 3
Guelph ON N1H 6H9
Tel: (519) 763-4412 Fax: (519) 763-4419

QUOTATION NO.: 162704515

CLIENT: Cheryl Wray
Baffinland Iron Ore
cheryl.wray@baffinland.com

PERIOD: October 15th to December 31st, 2008

DESCRIPTION: Toxicity Testing Services

Table 1. Summary of toxicity testing costs.

Test	**Method**	**Unit Cost**
48-h single concentration test using *Daphnia magna*	EPS 1/RM/14	$165
96-h single concentration test using rainbow trout	EPS 1/RM/13	$220
48-h multiple concentration (LC50) test using *Daphnia magna*	EPS 1/RM/14	$260
96-h multiple concentration (LC50) test using rainbow trout	EPS 1/RM/13	$385

TERMS AND CONDITIONS:

- Costs do not include collection or transportation of samples to our laboratory.
- Costs are based on turnaround of 15 business days from completion of test.
- Cost excludes applicable taxes (e.g., G.S.T., P.S.T.).
- Toxicity testing services to be provided on an as needed basis.
- AquaTox will provide all sampling materials including pails, lids, liners, coolers, sample bottles, self-adhesive return labels and chain-of-custody forms for all samples (at no additional cost).
- Limitation of Liability: The CLIENT (Baffinland Iron Ore) releases AquaTox Testing & Consulting Inc. (AquaTox) from any liability and agrees to defend, indemnify and hold AquaTox harmless from any and all claims, damages, losses, and/or expenses, direct and indirect, or consequential damages, including but not limited to lawyer's fees and charges and court and arbitration costs, arising out of, or claimed to arise out of, the performance of the services, excepting liability arising from the sole negligence of AquaTox. It is further agreed that the total amount of all claims the CLIENT may have against Aquatox under these Terms and Conditions, including but not limited to claims for negligence, negligent misrepresentation and breach of contract, shall be strictly limited to the lesser of professional fees paid to AquaTox for the services or five hundred thousand dollars ($500,000). No claim may be brought against AquaTox more than two (2) years after the cause of action arose. As the CLIENT's sole and exclusive remedy under these Terms and Conditions any claim, demand or suit shall be directed and/or asserted only against AquaTox and not against any of AquaTox's employees, officers or directors.
- Submission of samples assumes acceptance of these Terms and Conditions

APPENDIX E

▲R1

ANALYTICAL LABORATORY QA/QC PROCEDURES

• ALS Laboratory Group	4 pages
• Accutest Laboratories	2 pages
• Taiga Environmental Laboratory	20 pages
• Aquatox Testing & Consulting Inc.	3 pages

ALS LABORATORY GROUP

Refer to:

- Local Master List (where applicable): FIELD SAMPLING
- Local Master List (where applicable): SUB-SAMPLING

5.8 HANDLING OF SAMPLES

ALS procedures for sample handling include transportation conditions, receipt, handling, protection, storage, retention, and disposal. The procedures are designed to protect the integrity of the test samples and the interests of the customer and ALS.

ALS requests that our customers use our Chain of Custody (COC) for every shipment of samples. The form includes sufficient space to record field sampling date, time and location of sampling, sample ID and information relating to the integrity of the field sample. COCs are shipped with field supplies, and are also available on the alsenviro.com web site.

Samples are given a unique identification upon receipt. The identification is retained by the sample throughout its life in the laboratory, and ensures samples are not confused either physically or in records or reports. Where appropriate, the system allows for subdivision of test items and transfer within and from the laboratory.

Abnormalities or other departures from specified sampling or transportation procedures are documented. Where there is doubt concerning the integrity of the sample, its identification or suitability for testing, or the requested tests, the customer is consulted for further instructions before proceeding, and the discussion is documented.

All ALS locations have appropriate facilities to securely maintain sample integrity, both before testing and where archiving for future testing is required. Sample storage and handling criteria are recorded in individual test methods. Traceability and monitoring of critical temperatures is maintained and discussed in section 5.6.

Refer to:

- Local Master List: SAMPLE RECEIPT AND LOGIN
- Local Master List: SAMPLE STORAGE

5.9 ASSURING THE QUALITY OF TEST RESULTS

ALS has established quality control (QC) procedures for monitoring the validity of tests performed by its laboratories. Individual test methods specify the in-batch quality control requirements, frequency of use and data quality objectives. Where appropriate, in-batch QC is recorded on control charts to detect trends, statistical techniques are used to monitor method performance, and planned action is taken to correct problems and prevent incorrect results from being reported. In-batch QC tools include reference samples, control samples and standards, verification standards, blanks, duplicates, surrogates and spikes as appropriate to the field of testing.

ALS laboratories participate in an extensive proficiency testing program where available. Where appropriate proficiency testing samples are not available, other monitoring tools are used.

Samples may be maintained for retesting where the integrity of the test result will not be compromised by the additional storage time.

All test data is reviewed and approved prior to release to the customer. The data review process includes manual transcription review, data-set review, inter-parameter relationship evaluation where appropriate to the tests performed, and report review. Manual transcriptions are reviewed for transcription errors. Data set review is conducted by authorized individuals and includes confirmation that quality control criteria are met and that anomalous data are qualified. Report review confirms that requested tests have been carried out and that all report information and formatting is correct for the specific customer.

Refer to:

- Local Master List: DATA QUALITY AND METHOD OBJECTIVES
- Local Master List: RECHECKS
- Local Master List: CONTROL CHARTS
- Local Master List: RELATIONAL CHECKS
- Local Master List: PROFICIENCY TESTING PROGRAMS
- Local Master List: DATA VALIDATION AND AUTHORIZATION

5.10 REPORTING RESULTS

All information listed below is either included in the final report or kept on file at ALS in the case of abbreviated or customized reports, and can be provided upon request.

- Title
- Name and address of the laboratory issuing the report
- Location where each test was conducted
- Unique identification of the test report on each page, and the total number of pages
- Customer name and address
- Identification of test method(s) used
- Unique identification of each sample, description of the sample such as matrix and customer identification, and condition where applicable
- Date of sample receipt
- Date of analysis
- Test results and units
- Report Qualifiers
- Name, function, and signature of the person authorizing the report
- Statement that the results relate only to the samples identified in the report

Other information necessary for the interpretation of results or requested by the customer may also be included in reports, such as test method deviations or exclusions, specific test conditions, uncertainty estimations, date of sampling, location of sampling and other sampling information.

Statements of compliance, opinions and interpretations may be included on test reports for specific analyses. In all such cases, the basis on which they have been made will be documented, and they will be clearly identified in the test report.

ALS obtains subcontract laboratory results in hard or electronic reports. When these results are presented to the customer in ALS reports, the identification of the subcontractor is clearly indicated on the final report.

When test reports are transmitted by telephone, facsimile, e-mail or other electronic means, the procedure for protecting the integrity and confidentiality of data includes:

- only providing results to those individuals specified by the client for each sample submission
- use of a standardized facsimile cover page that relates the procedures to follow if received in error
- use of an e-mail footer that relates the procedures to follow if received in error

It is ALS practice to never disclose information about a client's analysis to a third party without the prior consent of the client, or unless compelled to by law. If we are obligated by law to disclose such information, we will inform the client prior to doing so.

Final results are reported in a manner that minimizes the possibility of misunderstanding or misuse.

Test report amendment(s) are made by issuing a replacement report identifying that a revision was made and describing all changes in the cover page comment section.

Refer to:

- Local Master List: REPORTING TEST RESULTS

6.0 REFERENCES

ISO/IEC 17025:2005(E) General Requirements for the competence of testing and calibration laboratories, Second Edition, 2005-05-15. L:\Quality System Documents\External Documents\17025 (E) 2005.pdf

Program, policy and guidance documents of the following accreditation bodies:

- Canadian Association for Environmental Analytical Laboratories (CAEAL), located at: www.caeal.ca
- Standards Council of Canada (SCC), located at: www.scc.ca
- American Industrial Hygiene Association (AIHA), located at: www.aiha.org
- National Environmental Laboratory Accreditation Conference (NELAC), located at: www.epa.gov/nelac

ACCUTEST LABORATORIES

In-house QA/QC

Utmost care is taken to provide our clients with analytical data of the highest quality. Accutest maintains several layers of data approval where, at any point in the analytical process, the reviewer has the authority to reject a data set based upon rigid QA/QC protocol. In addition, the following steps are taken during routine analyses, though not limited to:

- reagent blanks/standard reference materials are analyzed within each sample batch
- where appropriate, internal standards and/or spikes are analyzed within each sample batch to verify instrument calibration
- all reagents are prepared from ACS or better grade chemicals
- a minimum of 10% of all samples are analyzed in duplicate
- samples are retained for 2 months after receipt
- all standard, blank, and spike values are catalogued for reference
- travel blanks, field blanks, equipment blanks, and travel spikes are provided on request

Instrumentation

Accutest operates and maintains the following analytical instruments in a high degree of repair and routine calibration for the tests performed:

- Varian Star 3900 Gas Chromatograph, 70-Port Autosampler, Varian 2200 Mass Spectrometer (GC/MS);
- Varian CP-3800 Gas Chromatograph, SOLATek 72-Port Autosampler, Varian 2200 Mass Spectrometer (GC/MS) in parallel with a Flame Ionization Detector (FID);
- Varian CP-3800 Gas Chromatograph, SOLATek 72-Port Autosampler, Varian 2100T Mass Spectrometer (GC/MS) in parallel with a Flame Ionization Detector (FID);
- Agilent 6890N Gas Chromatograph, 7683 Autosampler, 5973 Mass Selective Detector (GC/MS);
- Varian CP-3800 Gas Chromatograph, autosampler with direct injection, Varian 2000 Mass Spectrometer (GC/MS);
- Agilent 6890N Gas Chromatograph, autosampler with dual direct injection, dual FIDs;
- Varian CP-3800 Gas Chromatograph, autosampler with dual FIDs;
- Varian CP-3800 Gas Chromatograph, autosampler direct injection, dual analytical column, dual Electron Capture Detection (GC/ECD);
- Agilent 6890N Gas Chromatograph, autosampler direct injection, dual analytical column, dual Electron Capture Detection (GC/ECD);
- Varian ProStar HPLC with PDA and Fluoresence Detection, 84-Port Autosampler;
- Varian Vista AX ICP/AES;
- Perkin-Elmer Elan 6100 ICP/MS;
- Perkin-Elmer Elan 9000 ICP/MS;
- Atomic Absorption Spectrometers, Hydride Generator, Mercury Analyzer;
- Dionex Ion Chromatographs, Spectrophotometers, TOC Analyzers;
- Automated 56-Port PC-Titrate pH, Alkalinity, Conductivity analyzer; and
- pH and Specific Ion Meters, Turbidity Meter, COD Digestor, Incubators, Digestors, Filtration Apparatus, and Microscopes.

TAIGA ENVIRONMENTAL LABORATORY

TAIGA

Environmental Laboratory
Laboratoire Environnemental

Document ID: PRO 026 **Revision:** 1
Document Created: 15 November 2006
Document Title: Quality Assurance, Quality Control Protocols

Document Created By: Angelique Ruzindana, Quality Assurance Officer
Document Authorized By: Helene Harper, A/Laboratory Manager

Effective Date: 01-November-07
(Document expires after two years or with new revision)

DISCLAIMERS

Indian and Northern Affairs Canada and Taiga Environmental Laboratory cannot guarantee the accuracy of a document that is photocopied or in print form. Controlled copies will have a method identification, revision number and authorization personnel. The master document shall be stored on the read-only Q:\ drive in Microsoft® Word format. A working controlled copy in Adobe PDF shall be made available.

Changes to the documentation from prevision revisions shall be green for new text and blue for altered text. Changes shall only be applicable for last revision. Past revisions shall be controlled though the track change feature in the original MS Word Document.

Documents shall adhere to ISO/IEC 17025 requirements.

TABLE OF CONTENTS

1 Scope and Application

1.1 This procedure describes general quality control protocols for all analyses performed at the laboratory. More specific details are provided in each analytical method.

1.2 All method quality control is to be assessed (including charting, when specified) prior to entry on the LIMS system. Non-conformities must be addressed, and corrective actions taken, prior to final data entry.

1.3 A data validation checklist must be completed and submitted for approval with each analytical run, for each parameter. This checklist is used to ensure that adequate method quality control has been performed for each analysis.

2 Method Quality Control

The following section describes what quality control samples are to be incorporated into an analytical method and how they are to be used to assess the method performance on a daily and continuous basis. Refer to analytical methods for specific details on :

(1) which quality control samples are used,
(2) the level of quality control effort, and
(3) the control limits.

2.1 Reagent Blank

2.1.1 Definition

A reagent blank consists of an aliquot of purified water (Type I, deionized, or Type I UV$^+$ that is devoid of the parameter being measured) that is analyzed in exactly the same manner as a sample if the sample undergoes no pre-treatment prior to analysis.

2.1.2 Purpose

It is used to establish the calibration baseline, i.e. to monitor for contamination from reagents employed in the analysis. Reagent blanks can also be used to reduce carryover from standards or samples of high concentration.

2.1.3 Frequency

With each analytical run, analyze at least two reagent blanks, once at the beginning of the run, and at least once during the run. Repeat analysis of a reagent blank throughout the run at a minimum rate of 5% of the sample load. Also include the analysis of reagent blanks when new reagents are used, if calibration is repeated, and when contamination from sample carryover is encountered.

2.1.4 Assessment

The concentration of the blanks should not exceed the method detection limit. Higher values for reagent blanks indicate possible contamination with the reagents. Prepare new reagents and repeat the analysis.

2.2 Method Blank

2.2.1 Definition

A method blank consists of an aliquot of purified water (Type I, deionized, or Type I UV$^+$ that is devoid of the parameter being measured) that is carried through all steps of the analysis (including any preparatory procedures such as filtration, digestion, extraction, or auto-claving).

2.2.2 Purpose

It is used to monitor for contamination from equipment employed in the analysis.

2.2.3 Frequency

At least one method blank should be prepared with every batch of samples being prepared. At the beginning of each analytical run, analyze at least one method blank.

2.2.4 Assessment

The values of the method blanks should not exceed the method detection limit. High or erratic values indicate possible problems with the method or the equipment.
Identify possible areas of contamination and rectify, if possible.

- ***If the method blank is less than twice the method detection limit, a blank correction may be applied to all sample readings in the same batch.***
- ***Re-prepare or re-analyze the method blanks and samples if the value of the method blank is greater than twice the method detection limit.***

Note : If the value is below the detection limit, no blank correction is required.

2.3 Duplicate Samples

2.3.2 Definition

A laboratory duplicate sample is a separate aliquot of sample, prepared and analyzed in identical fashion to the original sample aliquot. Both aliquots are removed from the same sample container. In contrast, field duplicates consist of a sample that is collected twice and placed into two different sample containers, and are usually analyzed as two separate samples.

2.3.3 Purpose

Precision of a method is monitored by the analysis of laboratory duplicate samples. If the entire sample is consumed for one analysis, use field duplicates if available to assess precision.

2.3.4 Frequency

Perform a duplicate analysis on every 10th sample, regardless of the sample matrix or expected concentration, with a minimum of one duplicate analysis per run. Analyze at least one sample in between the duplicate samples being analyzed to avoid errors in reading or calculating concentrations (see example of typical analysis set-up below).

2.3.5 Calculations

Calculate the % <u>Relative Percent Difference (% RPD)</u> between the duplicate values:

$$\% \text{ RPD} = \frac{|\text{original sample value - duplicate sample value}|}{\text{average of the two values}} \times 100\%$$

2.3.6 Assessment

- For sample concentrations greater than or equal **3** times the Method Detection Limit (MDL), the basic criteria for acceptance (for inorganic analyses) is <u>RPD</u> ≤ 20%.
- For sample concentrations greater than or equal **3** times the Method Detection Limit (MDL), the basic criteria for acceptance (for organic analyses) is <u>RPD</u> ≤ 30%.
- For sample concentrations less than 3xMDL, the acceptance is <u>RPD</u> ≤ 30% .
- If available, use Range-Ratio charts to assess duplicate data (see below). Non-conformances are to be addressed by corrective actions (see below and Procedure 044).

2.4 Spiked Samples (Analyte Spike)

2.4.1 Definition

Known amounts of an analyte (standard) are added to an aliquot of sample, and measured.

2.4.2 Purpose

Effects of sample matrix on analyte measurements are determined by the use of spiked samples.

2.4.3 Frequency

Perform spike analyses on samples representative of the matrix analyzed routinely in the laboratory, on every 20th sample, with a minimum of one spike analysis per run.

2.4.4 Preparation

- If the original (unspiked) sample concentration is known beforehand, prepare the spike at a concentration that is 1 to 2 times higher.
- If the original (unspiked) sample concentration is unknown, prepare spikes at three different concentrations: one at the estimated concentration, and one each at an order of magnitude above and below the estimated concentration. After the sample concentration has been determined, use the spiked sample that is closest in concentration to the original sample for calculating recovery.

Calculations

$$\text{\% Recovery} = \frac{\text{Actual Value}}{\text{Theoretical Value}} \times 100\%$$

$$\text{Where: Theoretical Value} = \frac{(\text{spike vol. x stock conc.}) + (\text{sample vol. x sample conc.})}{\text{total volume of spike \& sample}}$$

Use the original sample concentration value, not the average of the original sample and its duplicate concentrations, when calculating the theoretical value.

In spikes in which there is no dilution of the original sample, an alternate calculation for spike recovery is available :

$$\% \text{ Recovery} = \frac{SSR - SR}{SA} \times 100$$

where SSR = Spiked Sample Result
SR = Sample Result
SA = Spike Added

2.4.5 Assessment

Recoveries should fall within the range of ***80 - 120%*** for inorganic analyses, and between ***70 - 130%*** for organic and metals analyses. Non-conformances are to be addressed by corrective action (see below and Procedure 044).

2.5 Control Standard

2.5.1 Definition

A Control Standard is a solution which contains the same analyte (s) as the calibration standards. It is prepared from a source that is independent of the source used to prepare the calibration standards.

2.5.2 Purpose

A Control Standard is used to monitor calibration accuracy and stability during an analytical run.

2.5.3 Frequency

Perform calibration check analyses at a rate of 10% of the sample load, or at a minimum of twice during the analytical run.

2.5.4 Preparation

It is prepared from a source that is independent of the source used to prepare the calibration standards. It may be prepared from a different stock solution, or purchased. The concentration of the control standard should fall within the range of the calibration standards.

2.5.5 Assessment

If the solution is prepared from an independent stock calibration standard, the control standard should read between 95 - 105% of the theoretical value of the standard.

If the control standard is purchased from an external source, the control standard should read within the 95% confidence interval (mean ± two standard deviations) as determined by the supplier. These values should be revised or established using (in-control) laboratory data on the materials.

The use of Shewhart control charts is required. If the value obtained is outside of the acceptable range, re-calibrate the instrument and repeat the last samples analyzed after the previous in-range control standard.

2.6 Reference Sample

2.6.1 Definition

The Reference Sample is a reference material, of matrix that is equivalent to that of the test samples, obtained from an external supplier. It has been analyzed by a technically valid procedure, and is accompanied by a certificate (CRM) or documentation of traceability to a certifying body (SRM). When used in the laboratory, the reference sample undergoes similar processing (including any preparatory steps) as the test samples.

2.6.2 Purpose

The Reference Sample is used to establish the accuracy and recovery of a measurement method.

2.6.3 Frequency

A Reference Sample is to be analyzed at least twice in each analytical run, once at the beginning and once at the end.

2.6.4 Assessment

The values and control limits are provided by the supplier or stated in the preparation instructions. Values should fall within the established control limits. The values may be revised or established using (in-control) laboratory data on the materials. Values are to be plotted on a Shewhart or X-Bar control chart; non-conformances are to be addressed by corrective actions (see below and Procedure 044).

2.7 Detection Limit Verification Sample

2.7.1 Definition

The detection limit verification sample is a sample with matrix similar to the samples being analyzed routinely, containing the analyte of interest at a concentration equal to the method detection limit.

2.7.2 Purpose

This is used to verify that the method is still capable of reading samples at the stated method detection limit.

2.7.3 Frequency

The detection limit verification sample is analyzed at least once during each analytical run.

2.7.4 Preparation

Use a sample known to contain the analyte of interest at a concentration equal to the method detection limit. If a sample is not available, a standard may be prepared (fresh daily), using a stock solution independent of the calibration standards.

2.7.5 Assessment

The concentration reading obtained from the detection limit verification sample (or standard) must be equal to the stated method detection limit, with an error of ± 10%. Non-conformances are to be addressed by corrective action (see below and Procedure 044). Re-assessment of the method detection limit may also be required.

2.8 Calibration Check Standard

2.8.1 Definition

Calibration check standards are standards prepared like the calibration standards, but analyzed as samples.

2.8.2 Purpose

Calibration check standards are used to monitor the stability of the calibration throughout the analytical run. The calibration check standard(s) may also be used to apply a drift correction, or be incorporated into a new calibration curve.

2.8.3 Frequency

A calibration check standard should be analyzed after every 20 samples.

2.8.4 Preparation:

Prepare as per the calibration standard (same stock solutions); the concentration(s) should fall around the mid-point of the calibration curve.

2.8.5 Assessment

The concentration of the standard(s) should not deviate from the nominal value of the standard(s) by more than 10%. If the value is outside of the acceptable range, apply a drift correction if possible, or re-calibrate by re-analyzing the complete set of calibration standards. All samples analyzed prior to the deviating calibration check standard should be re-analyzed after the new calibration.

2.9 Dilution Verifications

2.9.1 Definition:

Dilution verifications are either
- Method 1 : duplicates of analyzed dilutions (for methods that are not linear outside of the working calibration range), or
- Method 2 : comparisons of diluted and undiluted sample data for methods that have been validated to be linear outside of the working range (eg. atomic absorption, ICP methods).

2.9.2 Purpose:

Dilution verifications confirm that the correct dilution factors are used in the calculations of the final reported sample values.

A. Method 1 Dilution Duplicates

A.1 Frequency

- In each analytical batch, at least one dilution must be duplicated for each (final) dilution factor used within that batch of samples;
eg. If the batch contains samples requiring 2x and 1000 x dilutions (in order to bring the original samples within the working calibration range of the method), at least one duplicate dilution must be performed on a sample that required a 2x dilution, and at least one duplicate dilution must be performed on a sample that required a 1000x dilution.

- For each (final) dilution factor used, at least one dilution for every five dilutions must be verified;
eg. if ten samples required a final dilution of 5x, at least two of the sample dilutions must be verified by preparing and analyzing 5x duplicate dilutions.

A.2 Assessment:

The final concentrations (ie. dilution factor applied) of the duplicate diluted sample and the original diluted sample should have a difference of less than 10%.

Note: Indicate dilutions and verification duplicates clearly in the sample descriptions; eg. Original Sample: "264444 x5", Dilution Verification: "#264444 x5 dil dup". On the data print-outs, indicate values not being used by marking "↑" beside the values for samples/dilutions that are higher than the calibration range, and "↓" for dilutions that should be repeated at a lower level (ie. dilution factor used was too high, diluted sample value is too low).

B Method 2 Dilution Verifications

B.1. Frequency

Comparisons of undiluted and diluted samples should be made for every diluted sample.

B.2 Assessment

The magnitude of the dilution must correlate with the original and subsequent dilution values;
eg. (i) a sample that appears to read slightly outside of the linear range, should read close to mid-range of the linear range at a 2x dilution;
(ii) a 100x dilution should read 10x lower than a 10x dilution, if readings for both dilutions are within the linear working range.

Note: The final diluted values being reported and the dilution verifications must be clearly marked; eg. mark "↑" beside the values for samples/dilutions that are higher than the linear range, mark "↓" for dilutions that should be repeated at a lower level (ie. dilution factor used was too high, diluted sample value is too low).

2.10 Example of a typical analysis set-up:

Sampler position #	Sample Description
1	Calibration Blank
2-6	Calibration Standards
7	Rinse
8	Control Standard (to check calibration)
9	Rinse
10	Method Blank #1 (if different from calibration blank; eg. digested)
11	Detection Limit Verification Sample
12	Reference Sample (eg. digested) (if different from the Control Standard)
13-22	Samples #1-#10
23	Calibration Check Standard or Control Standard
24	Duplicate of sample 10
25-34	Samples #11-#20
35	5x Dilution of Sample #3
36	Duplicate of Sample #20
37	Spike of Sample #20
38	20 x Dilution of Sample #3
39	Calibration Check Standard or Control Standard
40	Reference Sample (if using)
41	Rinse
42	Method Blank # 2
43-52	Samples #21-#30

53	5x Dilution of Sample #20
54	5x Dilution of Sample #14 (dilution verification for 20x dilutions)
55	5x Dilution of Sample #20 duplicate (also a dilution verification of the 5x dilution)
56	5x Dilution of Spiked Sample #20
57	Duplicate of Sample #30
58	Calibration Check Standard or Control Standard
59	Rinse
60	Method Blank
61-70	Samples #31- #40
71	Duplicate of Sample #40
72	Spike of Sample #40
73-	Dilutions if required
	Dilution verifications, including 20x Dilution Duplicate of Sample #14
	Reference sample (if using)
	Calibration Check Standard or Control Standard
	Rinse
	Method Blank
Repeat from beginning, new data set	Calibration blank, calibration standards, etc.

3 Quality Control Charting

Control charts are used to determine whether measurement equipment or procedures are functioning properly or are "in-control", and to identify trends of positive or negative bias.

3.1 Shewhart Control Charts

These are used for monitoring equipment performance as well as method recoveries on control standards and certified reference materials. At the end of each month, the charts will be checked by the Quality Assurance Officer for approval. If the Control Charts are not available, the LIMS-generated and maintained lists/databases with values, limits, and trending are used to monitor method quality control.

3.1.1 Equipment Monitoring:

Equipment data (including refrigerators, walk-in coolers, ovens, and water purification systems) is plotted on Shewhart control charts on a daily basis. Charts are changed monthly. Initial operating limits are prescribed by equipment specifications and laboratory requirements. Deviations outside of these limits are to be addressed by adjustments, repairs, or replacement.

3.1.2 Recovery Monitoring:

Analytical data is plotted on Shewhart control charts with each analytical run. For spikes (inorganic analyses), the initial control limits are between 80 and 120% recovery. The initial warning and/or control limits for control standards and reference samples are as stated on accompanying certificates of analysis, in literature, or as determined by the laboratory from previous testing.

3.1.3 Criteria for evaluating Shewhart Control Charts:

- A chart is considered valid if 68% of the data fall within one standard deviation of the mean value.

Control Limits

- represent the 99% confidence interval.
- calculated as the mean (or true) value ± 3 s.d.
- NO DATA should exceed these limits

Warning Limits

- represent the 95% confidence interval.

- calculated as the mean (or true) value ± 2 s.d.
- NO TWO CONSECUTIVE POINTS should exceed these limits

Central Line (Mean)

- represents the mean value.
- NO SEVEN VALUES to be CONSECUTIVELY INCREASING OR DECREASING.
- If data is deemed out of control by any of the above criteria, take corrective action (see Procedure 044).
- To calculate new limits, or to revise existing limits, compile at least 20 sets of data deemed valid by the previous criteria. Obtain the mean and standard deviations to calculate the new warning and control limits.

3.2 X-Bar/Range Control Chart

The X-Bar/Range Control Chart is used to assess both the accuracy and precision of the analysis of a chosen reference material. For each analytical run, the average of a pair of duplicate data is plotted on the X-Bar portion of the chart while the absolute difference between the duplicate values (range) is plotted on the corresponding range portion of the chart.

- The X-Bar portion of the chart is utilized as a Shewhart chart (see above).
- The Range portion of the chart shows the precision of the reference material on a per-run basis.
- Initial statistics on the average range between duplicate values for the reference material are obtained from at least 10 pairs of data
- calculate the range (R) for n pairs of in-control reference data,with $n \geq 10$.
- using only valid range (R) values (ie. <10%), calculate the average range:
  - For pairs of data numbered 1 to n : average range = (R1 + R2 + ... Rn)/n
    - * the upper control limit = 3.27 * average range
    - * the upper warning limit = 2.51 * average range

- If data is deemed out of control for either the accuracy or precision of the reference material, take corrective action (see Procedure 044).

3.3 Range-Ratio Control Charts

Range-Ratio charts are to be used to assess sample duplicate data. The differences between the paired results are averaged for various concentrations, and critical range (Rc) values are obtained. Subsequent duplicate differences (hereafter referred to as the observed range, Ro) are then compared to the critical range for the corresponding concentration, and Range Ratios (Rr) are calculated:

Rr = Ro/Rc

- The Upper Control Limit (UCL) for Rr = 3.27
- The Upper Warning Limit (UWL) for Rr = 2.51
    - *If Rr is within the warning limits, accept the data.*
    - *If Rr is outside the control limit, reject the data.*
    - *If Rr is greater than the warning limit, but less than the control limit (ie. between 2.51 and 3.27), accept the measurements, but monitor the next duplicates.*
    - *If the next Rr is greater than the warning limit, reject the data since the system was last in control, and take corrective action. If the next Rr is less than the warning limit, accept the data.*

- Critical Ranges (Rc) should be updated as method or instrument changes are made, or at least annually. *At least 20 pairs of duplicate results should be used to calculate each critical range value.*
- Take corrective action (see below and Procedure 044) to determine causes of out-of-control data.

4 Corrective Action Protocol

Routine, on-the-spot corrective actions are to be documented as normal operating procedure, and noted in the parameter quality control record books and/or on the control charts as such. The Procedure 044 details the corrective actions and root-cause analysis of the deviations. Such actions include, followed in a step-wise fashion:

4.1 re-running the quality control sample.
4.2 re-preparing a spike or duplicate.
4.3 re-preparing standards and/or standard curve; if the curve is significantly different (>5%) from the previous curve, repeat analysis of samples.
4.4 re-running the samples using methods of addition to compensate for interferences; checking procedures, reagents, instrument for malfunction.
4.5 if the system is still not in control, contacting the area supervisor.
4.6 decision being made by the Quality Assurance Officer to edit, flag, or delete the data,
4.7 Laboratory Manager or designate to make proper notification to the clients.

5 References

5.1 APHA, AWWA, WPCF. "Standard Methods for the Examination of Waters and Wastewaters." 21st Edition, pages 1-8 to 1-11, 1020 Quality Assurance.

5.2 Eamonn Mullins "Statistics For the Quality Control Chemistry Laboratory." The Royal Society of Chemistry, 2003, pages 35-85.

AQUATOX TESTING & CONSULTING INC.

AQUATOX QA/QC PRACTICES RELATED TO TOXICITY TESTING

It is the policy of AquaTox to provide the highest standards of testing service to its clients by conducting tests in accordance with the required methods and client requirements. AquaTox is committed to good professional practice, quality service and compliance with CAN-P-4D.

AquaTox requires that all personnel concerned with testing activities within the laboratory familiarize themselves with the quality documentation and implement the policy and procedures in their work.

The overall QA objective is to develop and implement procedures for chain-of-custody, laboratory analysis and reporting that will provide accurate data. The purpose of the QA/QC program is to define goals for the level of QA effort; accuracy, precision, and sensitivity of analyses; and completeness, representativeness, and comparability of measurement data from the toxicity testing laboratory.

Quality Assurance (QA) and Quality Control (QC) practices for effluent toxicity tests include aspects of the test that affect the accuracy and precision of the data, including (1) sampling handling and storage, (2) laboratory conditions, (3) test organisms, (4) reference toxicants, and (5) record keeping and data evaluation. Below is a summary of our quality objectives and standard QA/QC practices related to the conduct of our ecotoxicity tests.

Quality Objectives

- To ensure a Quality System that is documented and incorporates adequate review and internal quality control.
- To ensure personnel are adequately supervised and are proficient to carry out assigned activities.
- To ensure test methods and related procedures are validated and incorporate adequate quality control.
- To ensure all equipment, supplies and services are functioning properly and/or meet required specifications.
- To ensure that facilities are adequate to carry out the testing activity.
- To ensure sample management procedures that incorporate adequate procedures for the security, receipt, identification, checking, routing, storage and disposal of all samples.
- To ensure data management procedures that incorporate adequate procedures for the security, recording, calculation, validation, authorization, transmittal, storage and disposal of all test data and related records.
- To ensure workload management procedures that incorporate acceptable turnaround time and verification of resource availability prior to the acceptance of additional testing.

QA/QC Data Related to Individual Toxicity Tests

Test Validity Criteria:

- A test will be considered valid if the test validity criteria stated in the test method are met. Otherwise the test should be repeated.

Reference Toxicant Testing:

- A reference toxicant test will be conducted on the same batch of organisms used for conducting the definitive test.
- Each reference toxicant test will be conducted following the same procedures and conditions used for the test substance(s) although may involve a reduced duration of exposure.

Use of Warning Chart:

- A warning chart will be made available when testing involves test organisms are cultured or tested by AquaTox on a regular basis.

A test result is suspect if it falls outside the warning limits. In this event, a thorough check of the testing conditions is conducted at this time.