Baffinland Iron Mines Corporation

BHM Project No. 16-094

BAFFINLAND IRON MINES CORPORATION

ANNUAL GEOTECHNICAL INSPECTIONS
MARY RIVER PROJECT
SECOND INSPECTION OF TWO
OCTOBER 2016

Prepared for:
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BARRY H. MARTIN

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November 15, 2016

Baffinland Iron Mines Corporation
2275 Upper Middle Road East, Suite 300
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Attention: Jeff Bush
jeff.bush@baffinland.com

RE: ANNUAL GEOTECHNICAL INSPECTIONS
BAFFINLAND IRON MINES CORPORATION
OUR REFERENCE NO. 15-097

1.0 INTRODUCTION

Barry H. Martin, P. Eng., Consulting Engineer, completed the eighth annual water licence geotechnical inspection of the following on-site engineered facilities as required by Licence No. 2AM-MRY 1325 of the Nunavut Water Board:

Pit Walls
Quarries
Landfills
Land Farms
Bulk Fuel Storage Facilities
Sediment Ponds
Collection Ponds
Polishing and Waste Stabilization Ponds

The inspection that took place October 5 to October 11th, 2016 is the second phase of a biannual inspection to be carried out within the open water shipping season at the two Baffinland sites, in Mary River at the mine site, and at Milne Inlet at the port facility. Although the shipping season extended into October, snow came early in mid September and although inspections were completed , the photos did not show well

The inspections were carried out in accordance with the guidelines set out in "Dam Safety Guidelines 2007" as published by the Canadian Dam Association.

The inspections were completed by Mr. Barry H. Martin, P. Eng., the design Engineer for the initial containment facilities both at Mary River and Milne Inlet, the runway extension, initial bridges on the

connecting road, the solid waste disposal site as well as continuing construction of select mine infrastructure.

The seven previous annual water licences geotechnical inspections were completed by Mr. Martin. You shall note that Hazardous Waste Containment Structures have been assigned new designations in the report as compared to previous years.

The facilities inspected are as per the following:

Mary River Site

Bulk Fuel Storage Containment
Generator Fuel Storage Facility Containment
Polishing/Waste Stabilization Pond No. 1
Polishing/Waste Stabilization Ponds Nos. 2 and 3 (constructed as a two-cell structure)
Helicopter Fuel Cell Containment
Barrel Fuel Containment (constructed as a two-cell structure)(MS-HWB-3 and MS-HWB-4)
Hazardous Waste Storage (MS-HWB-2)
Enviro-Tank Storage (constructed contiguous with hazardous waste storage and stove oil storage) (MS-HWB-1)
Stove Oil Storage (MS-HWB-5)
Jet Fuel Tank and Pump Containment
Solid Waste Disposal Site
Minesite Steel Fuel Tank Farm Containment
Quarry
Crusher Pad Drainage Containment
Waste Pile Drainage Containment
Jet "A" Aircraft Containment
Hazardous Waste Containment (MS-HWB-6)

A site plan for the Mary River site showing most structures reviewed is attached.

Milne Inlet Site

Hazardous Waste Storage (constructed as a two-cell structure) (MP-HWB-3, and MP-HWB-4,)
Fuel Tank Farm
New Sewage Effluent Pond (PWSP)
Land Farm
Contaminated Snow Containment
Sediment Ponds East and West
Quarry
Loading Area Contaminated Storage (MP-HWB-1)
Fuelling Facility Containment

A site plan for the Milne Inlet site showing most structures reviewed is attached.

2.0 METHODOLOGY FOR INSPECTION

The geotechnical inspector was Barry H. Martin, P. Eng., who also reviewed the two sites for the first of the biannual inspections on July 28th to August 3rd, 2016 just as the annual shipping season commenced with the arrival of the first ship into port. This particular inspection took place just prior to the end of the shipping season. Although it was possible to complete inspections, snow came early at

Mary River in mid September, and as a result the inspections took place with 2" to 4" of snow on the ground.

The inspections primarily focused on the following aspects:

1. The structures were inspected for conformance with the design basis as presented in "as constructed" and "as-built" drawings (provided in the first and subsequent reports).

2. The structures were specifically inspected for settlement, cracking, and seepage through the berms.

3. The areas around the structures were examined for evidence of seepage.

4. Quarry walls were reviewed for relative stability. I note that the quarries are active removal areas and long term stability was not yet established.

5. New structures under construction were reviewed for conformity with design drawings.

6. Photographs were taken to document observations made during the inspection and are attached. These photos however are somewhat compromised by the slight snow cover.

3.0 MARY RIVER CAMP

3.01 General

Due to the very cold weather encountered during the inspection it was difficult to confirm moisture within the containment structures although ice was found in some.

A monitoring program is in place to test storm water that does accumulate within the containment structures. As reviewed, the water that does not meet the water licence effluent requirements is treated on site prior to release. In some cases, water collected within the structures has been pumped out.

At the Bulk Fuel Storage Facility Containment, the water that collects within the dyke is treated at the end of the containment structure. At the time of this inspection, the treatment equipment had been moved to another location.

As with the report last year, there are some new code names assigned to the containment structures.

We report on the new Jet "A" Fuelling Containment Structure and Hazardous Waste Containment for the first time.

As with the August report of this year there are new code names assigned to hazardous waste structures.

The Bulk Fuel Storage Containment (Exploration Phase Bladder Farm) is coming due for decommissioning but is still used to store barrels of fuel, lubricant cubes, and a large fuel tank at this time.

3.02 Bulk Fuel Storage Facility (Exploration Phase Bladder Farm)

General Conditions

The Bulk Fuel Storage Facility still exists but it is no longer utilized as a bulk fuel storage facility. There are a number of full fuel barrels and lubricant cubes now stored within the berms, as well as a large fuel tank.

The granular cover over the geotextile and liner is still in place within the containment structure awaiting land farming. There is water that is contained within the dykes at one end awaiting treatment.

There is now a ramp over the north end of the containment to permit access over the dyke for placing barrels and cubes for storage.

Stability

At the time of this initial review, water had not been removed for a period from within the containment and water was ponding above the level of the gravel within the bottom of the containment at the north end of the facility. This water was frozen in place as ice.

At the load-out end of the facility there was water ponding within the dykes as ice was present..

The soil structure is considered stable in the present condition and is in conformance with the design basis for the facility.

The presence of water within the structure and at the load-out area is an indication of the integrity of the liner.

The dykes have been built up this year to reinforce the concept of no loader travel over the dykes.

Recommendations

We have no recommendations with respect to this containment structure as it awaits decommissioning.

3.03 Generator Fuel Storage Containment (Exploration Phase)

This particular containment structure is currently being decommissioned. The fuel bladder that was contained within the dyke has been removed.

The granular fill over the geotextile and liner shall require landfarming with the material from the bulk fuel storage facility.

There is no indication that the liner is compromised and decommissioning should proceed when the granular cover is either moved to a land farm or other containment. There is ice within the structure.

3.04 Polishing/Waste Stabilization Pond #1

General Conditions

PWSP No. 1 continues to be utilized as a holding facility for sewage plant effluent that does not meet water effluent quality criteria.

Currently the pond is being used primarily as a repository for off spec sewage and sewage sludge forming in lift stations.

The supernatant from PWSP No. 1 is periodically decanted to PWSPs Nos. 2 and 3 where it is tested and treated as required to meet Water Licence effluent requirements.

At the time of our visit there was approximately fifty percent of capacity to accommodate further sewage and the structure readily conforms to its design intent.

Stability

Our review of this area around the pond at the base of the slopes showed no sign of seepage and hence we conclude that the liner has been effective in containing sewage and there are no tears or ruptures in the membrane, excepting some minor tears from past activity at the top of the dyke well above the allowable effluent level in the structure in the horizontal portion of the membrane.

A review of the top of the dyke showed no indication of cracking or settlement which would indicate stresses within the structure.

Many of the tears that had occurred in the liner on the top of the dyke have been patched during the period between reviews in 2008 and 2009 and are holding well. As well, there are no signs of weather related deterioration of the liner where it is exposed.

There appears to be no sign of erosion of the dykes, even with the precipitation that has occurred over the lifetime of the facility.

The minor settlements have had little effect on the integrity of the structure.

Recommendations

We have no recommendations with respect to this containment facility.

3.05 Polishing Ponds/Waste Stabilization Ponds #2 and #3

General Conditions

The structure was designed and constructed as a two-cell structure.

The supernatant from PWSP #1 is currently discharged to PWSPs Nos. 2 and 3. The treated effluent is tested for Water Licence effluent requirements, treated if necessary, and discharged to the environment.

At the time of our visit there was considerable freeboard to accommodate further sewage and the structure readily conforms to its design intent. Both cells were almost empty and contained less than one foot of liquid as an ice covered liquid which was the capacity allowed for sludge in the original design.

Stability

Our review of the area around the pond at the base of the slopes showed no sign of seepage and hence

we conclude that the liner has been effective in containing the sewage and there are no tears or ruptures in the membrane.

Longitudinal cracking which appeared in the dykes of PWSP #3 due to the melt of permafrost wedges in 2009 has not reoccurred and we consider this structure to be stable in its present condition.

Monitoring points have been set upon the top of the dyke and have been monitored since 2009. Settlements have occurred since that time. These settlements have not led to any stress cracks in the structure. Monitoring was discontinued last year.

There appears to be no sign of erosion of the dykes and plants are continuing to seed themselves on the dykes. This growth is minimal, however.

The small bubbles that were observed under the liner at the time of the last inspection were not evident with the colder weather that we have encountered

Recommendations

We have no recommendations with respect to this containment facility.

3.06 Helicopter Fuel Tank Containment

General Conditions

The structure was designed and constructed as a single cell structure that contains a 1000 gal fuel storage tank.

The structure currently conforms to its design intent.

In the past, a liner clad wood curb had been added to the top of the berm to prevent the erosion of gravel off the berm, caused by pulling the fuel hose from within the dyke out to the helicopters to provide them with fuel..

As it was the intent of the mine to use fuel that was available in barrels, a temporary cell had been constructed to contain the barrels with a one piece liner and wood timbers . This containment has been recently removed

Stability

Our review of the area around the pond at the base of the slopes showed no sign of seepage.

A review of the exterior and the top of the berms showed no sign of cracking or settlement which would indicate stress within the structure.

The structure is considered to be stable in its present condition.

Recommendations

We have no recommendations with respect to this structure.

3.07 Barrel Fuel Containment (Now MS-HWB-3 and MS-HWB-4)

General Conditions

This particular structure which we called "Barrel Fuel Containment" in our previous inspection reports is a two-cell structure which is currently used to accommodate cubes of lubricant and barrels in the east cell and cubes of lubricant and antifreeze in the west cell.

Stability

Our review of the area around this containment structure showed no sign of seepage. There is water ponding in this structure as evidenced by the ice in the cell.

A review of the exterior and top of the dyke showed no sign of cracking or settlement which would indicate stresses within the structure.

The structure is considered to be stable in its present condition. The ice confirms the integrity of the liner.

Recommendations

We have no recommendations at this time.

3.08 Hazardous Waste Storage (Now MS-HWB-2)

General Conditions

This particular cell was constructed contiguous with an existing cell, which is referred to on site as the "Enviro Tank Storage", from drawings by our office in 2010 and conforms to our drawings. It is also contiguous with the Stove Oil Storage cell.

This structure contains barrels and bags of hazardous waste.

Stability

Our review of the area around this cell at the base of the slopes, showed no sign of seepage. There is water ponding in this structure as evidenced by ice in the cell.
The structure appears to be stable in its present condition. The ice confirms the integrity of the liner.

Recommendations

There are no recommendations at this time.

3.09 Enviro Tank Storage (Now MS-HWB-1)

General Conditions

This particular structure is constructed contiguous with the Hazardous Waste Storage constructed in 2010 and the Stove Oil Storage cell. It was utilized as a wash down cell during the last season. It is currently not being usedand access is blocked

Stability

Last year there was concern for the integrity of this cell as the cell was dry and the geotextile was

exposed from heavy traffic during our initial inspection. During our second inspection, the cell was holding a small amount of water confirming limited integrity of the liner.

The cell is dry this year at both of the 2015 inspections raising concerns anew on the integrity of the liner.

Recommendations

We recommend that the geotextile over the liner be checked and the granular cover be made good prior to continuing use of this cell

3.10 Stove Oil Storage (Now MS-HwB-5)

General Conditions

This particular structure had been used to store barrels of stove fuel in 2011.

The structure again contains barrels of stove oil and some Jet "A" fuel.

This structure was constructed in accordance with a standardized drawing provided by this office utilizing a one piece liner.

Stability

Our review of the exterior at the base of the dyke showed no sign of seepage. This shows that there is reasonably little chance of tearing or rupture of the membrane having taken place.

A review of the exterior and the top of the dyke showed no sign of cracking or settlement which would indicate stresses with the structure.

There is ice contained within the cell confirming the integrity of the liner.

The structure is considered to be stable in its present condition.

3.11 Jet Fuel Tank and Pump Containment

General Conditions

This particular structure was reconstructed based on our recommendation of the 2012 Geotechnical Inspection.

The construction was completed in accordance with our recommendations for such structures and the liner was constructed as a one piece liner with geotextile protection on both sides and gravel over the geotextile as protection.

The construction appears proper and the structure is in good condition.

Minor water ponding confirms the integrity of the liner.

At this time as in our earlier inspection report this year, the jet fuel tank and pump have been removed and the cell is empty.

Stability

Our review of the area around the cell at the base of the slopes showed no sign of seepage and water is ponding within the cell.

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The structure is stable in its present condition.

Recommendations

There are no recommendations at this time.

3.12 Solid Waste Disposal Site

The solid waste disposal site is currently entering the second phase of its construction. The first lift of solid waste has been placed and covered fully and appears to be doing exactly what it was proposed to do at the design stage. Since our last inspection in July/August the first lift has been expanded.

Work is currently continuing on building a berm on three sides of the disposal site at a level above the existing lift in advance of placing another lift. The berm is being constructed as per the berm on the first level that served well over the past several years,

The blow fence has not been reinstalled yet. In the meantime, solid waste has been covered as it is installed and may be continued to be done to control "blow".

There has been a fence structure of sections of screen and pallets to control snow drift at the activity area of the waste disposal site.

3.13 Minesite Steel Fuel Tank Farm Containment

General Conditions

All work appears to be complete including the installation of the sump pits that shall be utilized to facilitate the removal of water that collects from precipitation. These sump pit are installed at both ends of the containment.

There is ice forming in the bottom of the containment confirming the integrity of the liner. This ponding of water and current forming of ice is above the cover on the bottom of the containment in some areas.

Stability

All work appears to have been completed in accordance with drawings and we have no concerns with the stability of this containment structure.

Recommendations

We currently have no recommendations with respect to this containment structure.

3.14 Quarry QMR2

General Conditions

The quarry has well defined benches. The quarry faces at the benches appear clean.

The quarry is inactive at this time but definitely not closed.

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The area where the road was undermined in September 2015 has undergone further quarrying and the access road is gone. This area is a fractured zone and subject to subsidence as we noted while on site.

Much of the blasted rock that was in the quarry at our last visit has now been removed

Care must be taken while quarrying in the unstable fractured zone.

3.15 Crusher Pad Drainage Containment

General Conditions

Although there was no moisture flowing to the catchment pond, it is evident that the ditches in place and the containment pond are operating as intended.

Stability

The structure has been completed in accordance with drawings included in our last report in a most satisfactory manner.

Recommendations

We have no recommendations with respect to this containment structure.

3.16 Waste Stockpile Drainage Containment

Stability

The dyke appears stable at this time.

This particular structure has now been completed. The structure is in place with only minor trimming required on the inlet side. The outfall hose to pump the supernatant water over to the Mary River watershed is in place with the pump in place on the dyke.

3.17 Jet "A" Fuel Containment

General Conditions

This cell was constructed to replace the containment structure near the Weatherhaven Camp.

This cell now contains two double walled tanks and is located north of the air terminal buildings.

Stability

The cell was constructed using a one piece enviroliner with geotextile and was constructed in accordance with standardized drawings prepared in the past for such construction by our office.

There is water ponding in the form of ice in the bottom of the cell confirming the integrity of the liner.

There were no signs of cracking of the dykes. A granular ramp has been constructed over the dyke to facilitate access for snow removal.

Recommendations

We have no recommendations with respect to this structure.

3.18 Hazardous Waste Containment (MS-HW-6)

General Conditions

Although it was constructed in 2012, we first reported on it in 2015.

It is located near the incinerator and is utilized to store barrels of ash from the incinerator. It is, however, empty at this time.

Stability

The cell was constructed utilizing a one piece enviroliner with geotextile and was constructed in accordance with standardized drawings prepared in the past for such construction by our office.

There is water ponding in the bottom of the cell confirming the integrity of the liner. This water is currently in the form of ice.

There were no signs of cracking of the dykes or seepage around the exterior of the dykes.

Recommendations

We have no recommendations with respect to this structure at this time..

3.19 Overview

This report is the second phase of the eighth annual Geotechnical Inspection at Mary River and Milne Inlet completed by this author on behalf of Baffinland Iron Mines Corporation and the second year of reporting covering the second of two inspections in one shipping season.

As set out in our past reports, there has been little or no erosion taken place from wind or rain and the dykes constructed of the sand/gravel soil have remained stable at slopes of 3:1 and 4:1.

As noted last year, there are only just now signs of settlement appearing at PSWP's 1, 2 and 3. The settlements are not differential settlements of the dykes but are minor overall settlements of the total structures with respect to the surrounding area.

These settlements appear to be settlements within the one metre ± active layer above the permafrost and are of little concern as the PWSP's are temporary structures and the settlements have no effect on the dyke stability.

It is expected that many of the structures that form the basis for the inspections set out in the biannual Geotechnical inspections shall be decommissioned as the mine facilities are finalized.

A number of these structures at Mary River are awaiting the construction of a land farm facility to facilitate the disposal of contaminated granular fill from the bottom of containment cells.

Mary River Photos

Bulk Fuel Storage Facility

Bulk Fuel Storage – Sump Installed

Generator Fuel Storage Containment

PWSP #1

PWSP #2

PWSP #3

Helicopter Fuel Tank Containment

Stove Oil Storage MS-HWB-1

Enviro Tank Storage MS-HWB-5

Solid Waste Disposal Site

Barrel Fuel Containment MS-HWB-3

Barrel Fuel Containment MS-HWB-4

Mary River Quarry

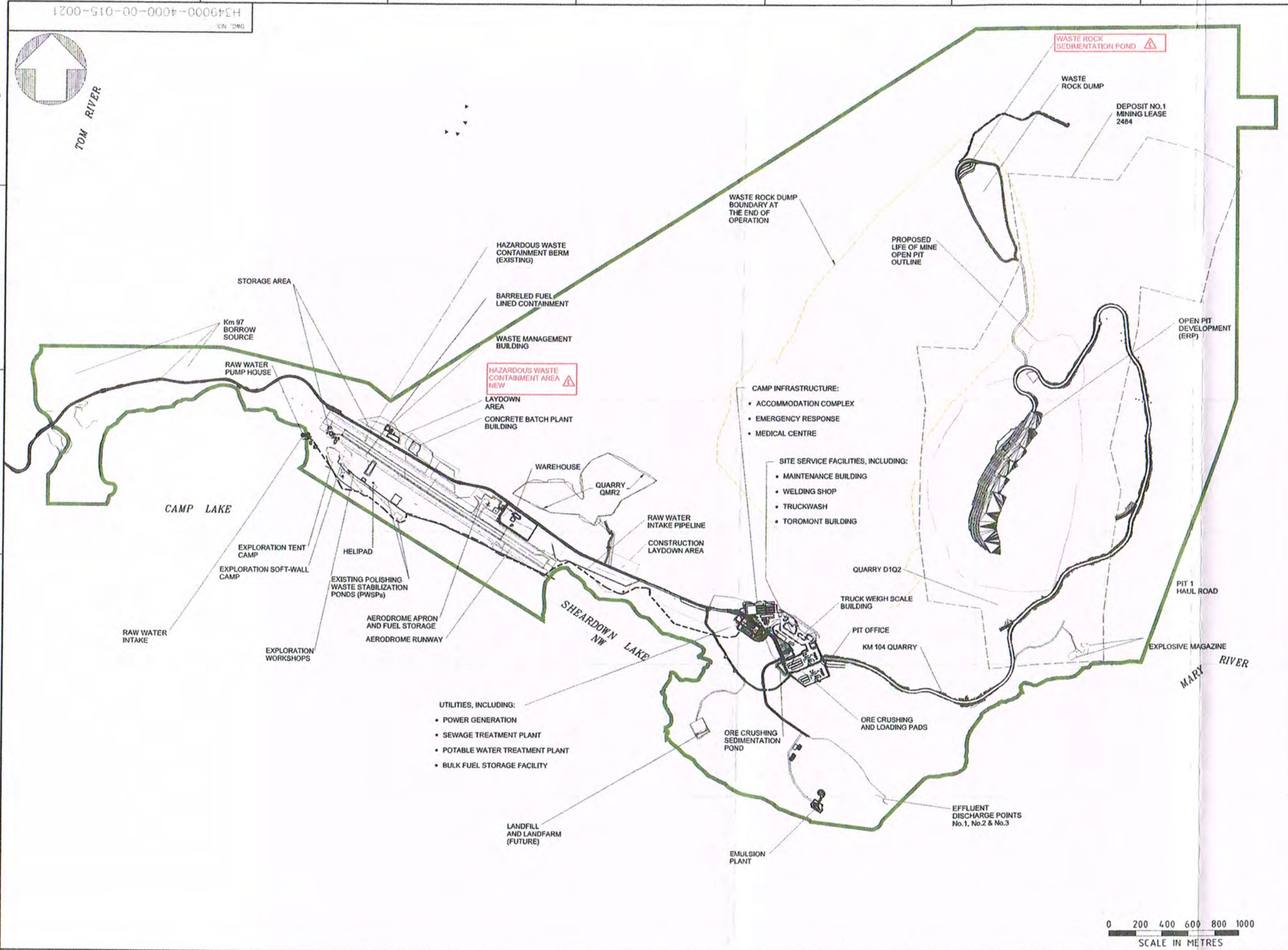
Crusher Pad Drainage Containment

Hazardous Waste Containment MS-HWB-6

Waste Pile Drainage Containment

Jet “A” Fuel Containment

Mary River Drawing


TOM RIVER
CAMP LAKE
SHEARDOWN NW LAKE
MARY RIVER
WASTE ROCK SEDIMENTATION POND
WASTE ROCK DUMP
DEPOSIT NO.1 MINING LEASE 2484
WASTE ROCK DUMP BOUNDARY AT THE END OF OPERATION
PROPOSED LIFE OF MINE OPEN PIT OUTLINE
OPEN PIT DEVELOPMENT (ERP)
HAZARDOUS WASTE CONTAINMENT BERM (EXISTING)
BARRELED FUEL LINED CONTAINMENT
WASTE MANAGEMENT BUILDING
HAZARDOUS WASTE CONTAINMENT AREA NEW
LAYDOWN AREA
CONCRETE BATCH PLANT BUILDING
STORAGE AREA
Km 97 BORROW SOURCE
RAW WATER PUMP HOUSE
WAREHOUSE
QUARRY QMR2
RAW WATER INTAKE PIPELINE
CONSTRUCTION LAYDOWN AREA
CAMP INFRASTRUCTURE:
• ACCOMMODATION COMPLEX
• EMERGENCY RESPONSE
• MEDICAL CENTRE
SITE SERVICE FACILITIES, INCLUDING:
• MAINTENANCE BUILDING
• WELDING SHOP
• TRUCKWASH
• TOROMONT BUILDING
QUARRY D1Q2
TRUCK WEIGH SCALE BUILDING
PIT OFFICE
KM 104 QUARRY
PIT 1 HAUL ROAD
EXPLOSIVE MAGAZINE
EXPLORATION TENT CAMP
EXPLORATION SOFT-WALL CAMP
HELIPAD
EXISTING POLISHING WASTE STABILIZATION PONDS (PWSPs)
AERODROME APRON AND FUEL STORAGE
AERODROME RUNWAY
RAW WATER INTAKE
EXPLORATION WORKSHOPS
UTILITIES, INCLUDING:
• POWER GENERATION
• SEWAGE TREATMENT PLANT
• POTABLE WATER TREATMENT PLANT
• BULK FUEL STORAGE FACILITY
ORE CRUSHING SEDIMENTATION POND
ORE CRUSHING AND LOADING PADS
EFFLUENT DISCHARGE POINTS No.1, No.2 & No.3
LANDFILL AND LANDFARM (FUTURE)
EMULSION PLANT
0 200 400 600 800 1000
SCALE IN METRES

MILNE PORT

MINE SITE

KEYPLAN

FOR INFORMATION

NOTES:

1. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
2. 2016 WORK SHOWN IN RED TEXT.

LEGEND:

WATER — QUARRY — BORROW AREA — ROAD — RIVER/STREAM/DRAINAGE — RAW WATER INTAKE PIPELINE — COMMERCIAL LEASE — PROJECT DEVELOPMENT AREA

REV.	ISSUE FOR	AUTH.	BY	DATE
C	ISSUED FOR USE	M.B.	J.B.	2015-10-15
B	ISSUE FOR USE	S.M.	T.M.	2014-12-10
A	ISSUE FOR USE	C.L.	A.G.	2014-10-31

ISSUE AUTHORIZATION

HATCH

DESIGNED BY C. LEISTNER DATE 2014-10-21
DRAWN BY J. BAJAGIC DATE 2014-10-21
CHECKED BY S. POTTER DATE 2014-10-21
DISCIP. ENGR. A. GRZEGORCZYK DATE 2014-10-21
PROJ. DES. COORD. T. THERTELL DATE 2014-10-21
PROJ. ENGR. J. CLELAND DATE 2014-10-21
PROJ. MGR. J. CLELAND DATE 2014-10-21

Baffinland

MARY RIVER PROJECT

MINE SITE
INFRASTRUCTURE FOOTPRINT
WORK PLAN 2016

SCALE 1:15000 OR AS NOTED
DWG. NO. H349000-4000-00-015-0021
REV C

ORIGINAL SHEET SIZE: ISO A1 (841 x 594)

H349000-4000-00-015-0021

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10/15/2015 9:49:01 AM
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