Baffinland Iron Mines Corporation
Mary River Project

Borrow Source Management Plan

2013-10-30	0	Approved for Use	J. Keech	T. Mackay	S. Perry	E. Madsen
Date	**Rev.**	**Status**	**Prepared By**	**Checked By**	**Approved By**	**Approved By**

Table Of Contents

List of Appendices

1. Introduction

The following document is intended to supplement the Quarry and Borrow Pit Management Plan, submitted to the QIA March 7th, 2013. The purpose of this addendum is to provide further detail regarding borrow source best management practices and a description of the 2014 borrowing activities for the Mary River Project.

During execution of the 2014 Work Plan borrow material will be required from a source along the Tote Road, P1 and in the future, sources at the Mary River Mine Site and at the Milne Port site. Borrow material is an essential element for numerous construction activities including: grading, laydown areas, backfill, foundations for fuel storage, camp expansion, local roads and administration and maintenance facilities, and heavy equipment storage. The purpose of this addendum is to briefly outline Baffinland's borrow management strategy as well as key borrow source locations and quantities.

2. Operations at Borrow Sites

2.1 Mechanical Removal of Borrow

2.1.1 Procedures

In the summer months (July – October) borrow material will be removed via mechanical methods. This will consist of utilizing dozers with rippers, or excavators to remove loose borrow material including sand and gravel. Borrow material will then be pushed into a pile within the permitted boundaries of the borrow site and removed via haul truck to its designated location. Benching will be minimized where practical and the activities will work to "pushback" existing hills for borrow material. As a result there will be no "pits" created as a result of borrow development. Upon closure of the borrow source only a cliff face or the side of a hill will remain. This step is being taken to ensure that no "ponding" of water will occur and all borrow sources will have natural drainage upon closure. During borrow extraction care will be taken to ensure that all activity remains within the permitted borrow site boundaries.

2.1.2 Environmental Challenges

Mechanical removal of borrow material will pose few environmental challenges. Where necessary borrow areas will be drilled prior to extracting material in order to acquire geochemical and geotechnical test samples. The samples will be tested to ensure that material is not considered acid generating and that the area is considered stable and secure. Baffinland will not utilize any borrow sources that contain acid generating material. As no chemicals or explosives are required for mechanical removal both spills and runoff contamination are expected to pose little risk. Noise and dust will exist but are not expected to pose any problems given the method of extraction and the remote location of the site.

2.1.3 Best Practices and Mitigation Measures

Borrow source best management practices will be implemented and followed by all personnel on site. Site personnel will undergo extensive training in operating a borrow source safely and efficiently. To ensure limited environmental impact the following best practice guidelines will be followed at all times:

- All activities will be confined to the agreed upon site layout and boundaries.
- All borrow sources will have a minimum setback of 31m from fish bearing streams.
- Adequate space will be provided for all borrowing activities.
- Dust and noise will be minimized to the extent that is reasonably practicable.
- Waste on site will be managed adequately and disposed of in an appropriate manner (see: Waste Management Plan for Construction, Operation, and Closure (H3490000-1000-07-126-0006) and Hazardous Material and Hazardous Waste Management Plan (H349000-1000-07-126-0008)).
- Operations will be sequenced in such a way as to minimize unnecessary disturbances to the local environment.
- Proper spill response procedures will be followed with adequate spill response equipment available on site at all times (Please see: Emergency Response and Spill Contingency Plan H349000-1000-07-126-0002).
- No fuel storage will occur at borrow or quarry sites.
- Activities will be undertaken in such a way as to minimize any effects on or damage to permafrost or ground-ice. Thawed layers will be removed sequentially.
- Interaction with local wildlife will be handled in an appropriate manner (Please see: Terrestrial Environmental Management and Monitoring Plan).
- The borrow face will be “pushed back” in a calculated and designed matter to ensure geological stability. Excavations will be minimized by utilizing above grade sources for material (hills and swales), which will minimize water collection and drainage disruption.
- Borrow locations will be regularly inspected and unstable slopes re-graded to eliminate depressions and re-establish natural drainage patterns.
- Proper site drainage plan will be implemented. The drainage plan will ensure positive drainage to prevent water pooling or flooding.
- Areas of unexpected settlement will be filled to re-establish natural contours and eliminate water ponding.

2.2 Blasting at Borrow Locations

2.2.1 Procedures

As a result of the extreme temperatures encountered on Baffin Island and the existence of extensive permafrost the removal of material from borrow sources will at times require the use of blasting. This requirement will be particularly critical during winter months, when the ground will be fully frozen. These frozen conditions will create borrowed material that is too hard for mechanical removal.

Proper blasting procedures, as laid out in Quarry Management Plan Milne Inlet Quarry (Q7) - Appendix C: Blasting Operation Management Plan H349000-3000-07-245-0001, will be followed to ensure that all blasting activities are conducted in a safe and efficient manner avoiding an unnecessary impact to the surrounding environment. The nature of the material will be taken into account and best blasting management practices will be employed. This will include: appropriate grid size and powder factor, the use of hydrophobic high quality emulsion explosives, and a highly trained competent staff.

Potential borrow source areas will be drilled and sampled prior to borrowing when necessary, geochemical and geotechnical tests will be conducted to ensure that no acid generating material is present in the area and that the area is geotechnically stable and secure. Baffinland will not utilize borrow sources containing acid generating material.

2.2.2 Environmental Challenges

The primary challenge related to the removal of material from borrow sources via blasting is the management of explosives, specifically ammonia nitrate (AN). The primary ecological concerns with ammonia are acute end-of-pipe toxicity and chronic toxicity in downstream lakes. Secondary issues relate to ammonia as a nutrient and the fact that ammonia nitrifies to nitrate in the environment. Some forms of nitrogen such as anionic ammonia or free ammonia and nitrite can be detrimental to fish at elevated concentrations.

The risk of ammonia entering the environment is low given the fact that all blasting will be completed using hydrophobic emulsion explosives that has an extremely low solubility in water. In addition to this all blasting of borrow material will be completed in frozen ground. This will ensure that potential “pathways” for AN will be frozen substantially limiting the ability of AN to enter the surrounding environment.

2.2.3 Best Practices and Mitigation Measures

Borrow Source and blasting best management practices will be implemented and followed by all personnel on site. The blasting activities at burrow sites will be completed by trained and qualified personnel. Baffinland is committed to implementing best management practices in its use of explosives. To ensure limited environmental impact the following best practice guidelines will be followed at all times:

- All activities will be confined to the permitted site layout and boundaries.
- All borrow sources will have a minimum setback of 31m from fish bearing streams.

- Adequate space will be provided for all borrowing activities.
- Dust and noise will be minimized to the extent that is reasonably practicable.
- Waste on site will be managed adequately and disposed of in an appropriate manner (see: Waste Management Plan for Construction, Operation, and Closure (H3490000-1000-07-126-0006) and Hazardous Material and Hazardous Waste Management Plan (H349000-1000-07-126-0008)).
- Operations will be sequenced in such a way as to minimizing unnecessary disturbances to the local environment.
- Proper spill response procedures will be followed with adequate spill response equipment available on site at all times (Please see: Emergency Response and Spill Contingency Plan H349000-1000-07-126-0002).
- No fuel will be stored at borrow or quarry sites.
- Activities will be undertaken in such a way as to minimize any effects on or damage to permafrost or ground-ice. Thawed layers will be removed sequentially.
- Interaction with local wildlife will be handled in an appropriate manner (Please see: Terrestrial Environmental Management and Monitoring Plan).
- Whenever possible “benching” will be avoided. Instead hills will be “pushed back” in a calculated and designed matter to ensure geological stability. Where possible, excavations will be minimized by utilizing above grade sources for material (hills and swales), which will minimize water collection and drainage disruption
- Borrow locations will be regularly inspected and unstable slopes re-graded to eliminate depressions and re-establish natural drainage patterns.
- All blasting will be conducted in frozen conditions when contamination of water will not be a problem.
- Blasting will be conducted utilizing pre-packaged emulsion explosives.
- Best blasting practices will be utilized to ensure that all explosives are fully detonated.
- Areas of unexpected settlement will be filled to re-establish natural contours and eliminate water ponding.
- Borrow locations will be regularly inspected and unstable slopes re-graded to eliminate depressions and re-establish natural drainage patterns.
- A performance monitoring program will be implemented to ensure that AN release to receiving waters from explosives is minimized to an acceptable level. Site specific performance targets will be developed and finalized in concert with the site contractors:
  - Blast performance monitoring to optimize blasting efficiency.

- Monitoring and auditing of field operations to ensure acceptable field implementation of procedures and delivery of associated training.
- Based on drainage plan and site conditions, there may be surface flow or runoff from the borrow source to the downstream receiving environment. Discharge and runoff to the aquatic receiving environment (fish habitat), will meet water licence requirements for total suspended solids, and ammonia/nitrate will be at concentrations that are non-acutely toxic.

3. Borrow Source Location and Quantity

Operation will continue as necessary at existing borrow source areas adjacent to the Tote Road at Km 2 (formerly borrow source no. 1), and Km 97 (formerly borrow source no. 3). In addition, borrow source P1 (which is along the Tote Road between Milne Inlet and the Mine Site) will be expanded. Please refer to Drawing H349000-3138-10-015-0003, attached in Appendix A for the exact location of the borrow site P1. Table 3-1 summarises the quantities expected to be extracted from this borrow site.

Table 3-1: Borrow Pit P1 Specifications

Requirement	Description
NTS Map Sheet (1:50,000)	• 37 G/2 Edition 1 ASE Series A 713
Quarry vertices Coordinates (UTM)	• 529 364 E 7 927 133 N (Centre point) • 529 121 E 7 927 153 N (NW Corner) • 529 645 E 7 927 113 N (E extent) • 529 360 E 7 927 007 N (SW Corner) • 529 442 E 7 927 297 N (NE Corner)
Total Area of Borrow Site	• 75,820 m^2 or 7.6 hectares as shown in Appendix A
Volume with Contingency	• 275,000 m^3
Area of Existing Clearing	• 46,300 m^2. Little clearing is required for larger area as site is primarily exposed gravels
Area of Proposed Quarrying	• Appendix A shows the borrow pit extents
Topsoil/Overburden Storage Area	• None is required as site is primarily exposed gravels. If overburden topsoil is removed, it will be stockpiled on site and used for future reclamation
Access Roads/Trails	• The borrow pit will be accessed directly from the Tote Road
Camp Locations	• No camp will be built specifically for the borrow pit operation. Personnel will be housed at the existing Mary River or Milne Inlet camp

3.1 Borrow Source P1

Borrow source P1 is located at approximately kilometre 63 along the Milne Inlet Tote Road. The borrow source consists of proglacial outwash gravels and sands that formed as a result of glacial action and water deposition. The sands and gravels originate from the erosion, transport, and deposition of materials that originate from the varied bedrock underlying the adjacent area and region. This has resulted in a relatively high content of Paleozoic carbonates consisting of dolestone and limestone. A large volume of this borrow source material has been successfully used over the past five years to support Tote Road construction and maintenance. There has been no evidence of the development of ARD or metal leaching processes at or downstream of the existing road embankment. In summary, it is highly unlikely that the materials from this borrow source will generate ARD and leach metals for the following reasons:

- The origin of the materials are unconsolidated waterborne sediments and hence the unlikely presence of high concentrations of metals.
- There is an the absence of sulphide minerals based on visual observations of the material.
- There is a lack of ARD or metal leaching evidence along the Tote Road embankment which contains a large volume of this material.
- There is a high relative abundance of carbonate rock materials which offer significant acid buffering capacity for the material as a whole.

Figure 3-1: Borrow Site P1 along Tote Road showing gravels

Development of the P1 Borrow Site is expected to progress as detailed in the following steps:

3.1.1 *Crusher Pad*

Construct a crusher pad at a suitable distance from blasting areas using locally available fill material. The crusher pad will be sized for crushing and screening operations, stockpiles of finished product, and loading operations to deliver produced borrow materials. If required, storm water drainage will be managed with perimeter ditching and/or berms to divert rainfall or snow melt to natural drainage channels. Rip-Rap rock will be placed at strategic locations along the drainage channel to minimize erosion and to enhance settlement of sediments.

3.1.2 *Access Road*

This borrow site is adjacent to the Tote Road; therefore access to the area where material is extracted will be via a simple graded surface at existing ground elevation. A dedicated embankment is not necessary since the existing soils will support the expected truck and equipment loads. There are no streams at this site, therefore culverts or water crossings are not expected. This access road is used to transport the borrow materials from the material source to the crusher pad for processing and loading the finished product.

3.1.3 *Summer Extraction Operations at Borrow Site*

Summer extraction of borrow can be achieved by simple excavation of thawed gravels at the surface, dozing the thawed materials into a stockpile, loading, and hauling to the crusher or to the construction site for placement.

3.1.4 *Winter Extraction Operations at Borrow Site*

With the use of a track drill, a bench is drilled and blasted at some designated elevation to begin bench development. Bench development can proceed from a higher elevation to a lower elevation or vice versa, depending on the topography of the site. Blasted borrow material is ready for loading into haul trucks and hauled to the crusher pad as crusher feed material to produce finished products or hauled to construction sites if crushing is not required.

3.1.5 *Bench Drilling*

As each drill round is blasted out, the drill either stays at this elevation to expand the bench in a longitudinal direction along the face, or the drill climbs to a higher or lower elevation to drill and blast subsequent benches. These benches are expanded in length as required for subsequent blasting of borrow at that elevation. Benches are created for safety and for efficient drill/blast operations.

3.1.6 *Subsequent Bench Development*

Each bench proceeds toward the main body of borrow rock at that elevation. Lower benches follow behind upper benches and drilled and blasted to move toward the main body of rock. Ramps may be constructed to the upper benches for truck loading near the blasted rock. Whenever practical benching will be minimized during borrow operations, instead utilizing the pushback of hills. When benches are deemed necessary to operate the borrow source safely and effectively, the will be properly regarded upon closure of the borrow source to ensure natural drainage and avoid the pooling of water.

3.1.7 *Drilling Frozen Gravels*

Drilling frozen gravels is completed with the use of one or two drill rigs using small diameter boreholes less than 100 mm. The boreholes are laid out by a surveyor to the engineered spacing and burden for each particular rock type and geologic conditions. The drill is removed from the area for loading explosives and blasting. The drill can proceed along the bench to continue drilling or proceed to a new bench.

3.1.8 *Blasting Operations*

Blasting frozen gravels is completed by installing high explosive detonating boosters at the bottom of each hole with initiation wires extending to the surface for connection to the blasting circuit, followed by dropping in pre-packaged sticks of explosives and pouring from pre-packaged emulsion bags. Detonation and initiation is carried out with the use of delays to time the detonators in a fast millisecond sequence of smaller blasts for efficient rock breakage. Blasting lags behind the drill as more drilling is completed. As each new drill round is completed, the drill moves on and the drilled round is loaded with explosives and blasted.

3.1.9 *Hauling Borrow Gravels*

The blasted material is loaded onto trucks for delivery to the crusher or to construction sites.

3.1.10 *Crushing Operations*

Borrow material is fed to the crusher and/or screening equipment to size and produce the desired rock product, stored in stockpiles and loaded into trucks for delivery to construction sites.

4. Borrow Source Closure

The abandonment of the Project works and site reclamation for the borrow sources will be undertaken at or before the close of the Project. Separate closure plans for each borrow source will be required prior to closing each facility, for more information on site closure please refer to the Project Abandonment and Reclamation Plan H349000-1000-07-126-0012. Closure of the Project will involve removing construction materials, equipment and infrastructure and reclaiming the site to self sustaining productive ecosystem near its original condition.

The general abandonment and reclamation plans include the following:

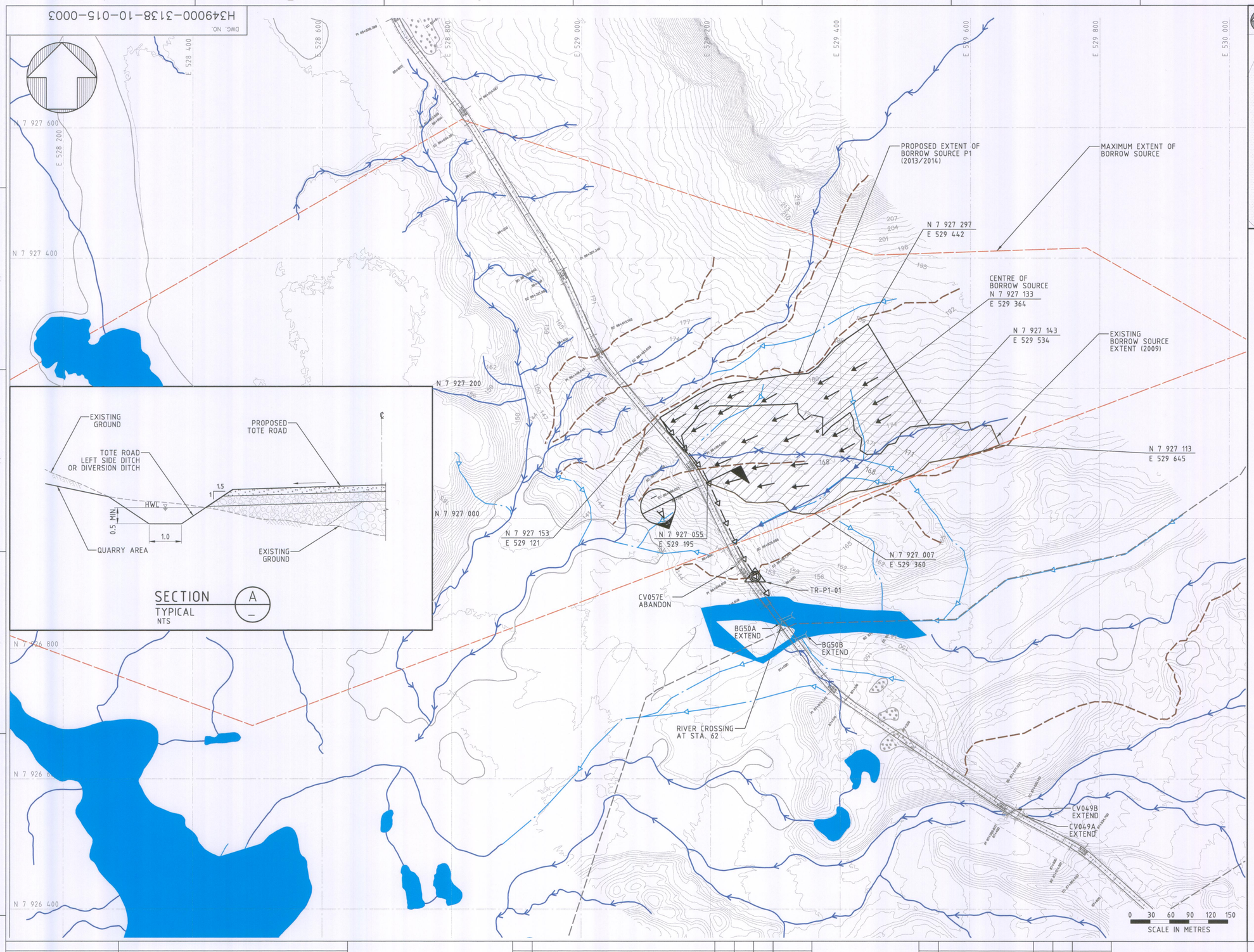
- Dismantle and transport all fuel/chemical storage and handling infrastructure to an approved facility or for reuse where applicable.
- Dismantle and remove all buildings and related infrastructure.
- Remove all hazardous waste and explosives.
- Re-grade as necessary to establish safe slopes and restore the natural drainage to the area.
- If overburden topsoil has been removed and stockpiled, it will be used to re-grade the land.
- Test soils and granular materials for hydrocarbon content; contaminated soils will be remediated.

Appendix A

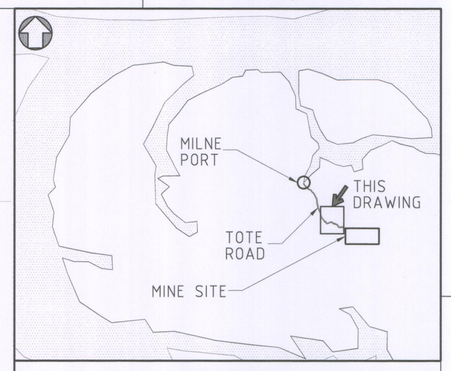
Borrow Source Drawing

(H349000-3138-10-015-0003)

DWG. NO. H349000-3138-10-015-0003



SECTION A
TYPICAL
NTS



KEY PLAN

LEGEND:

- EXISTING WATERBODY
- PROPOSED FOOTPRINT OF BORROW SOURCE AREA
- BAFFINLAND'S COMMERCIAL LEASE ON INUIT OWNED LAND
- MAXIMUM EXTENT OF BORROW SOURCE
- EXISTING STREAM
- OVERLAND FLOW PATH
- EXISTING DRAINAGE TO BE DIVERTED/ABANDONED
- SURFACE DRAINAGE DIVERSION
- INTERNAL SURFACE DRAINAGE
- RIDGE LINE (HIGH POINT)
- PROPOSED CULVERT
- EXISTING CULVERT (LOCATION APPROXIMATE)
- WATER QUALITY MONITORING LOCATION (TR-P1-01)
- HWL — HIGH WATER LEVEL
- TOTE ROAD LEFT SIDE DITCH OR DIVERSION DITCH

NOTES:

1. TOPOGRAPHY PROVIDED BY TERRAPOINT CANADA INC.
2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
3. CONTOURS ARE IN METRES. CONTOUR INTERVAL IS 1.5 METRES.

FOR PERMITTING

DRAWING NO.	DRAWING TITLE
H349000-3000-07-015-0001	MID-WAY BORROW AREA – 2009 EXCAVATION LIMITS
H349000-3000-10-012-0088	TOTE ROAD – STA. 87+500 TO 88+200 – PLAN AND PROFILE
H349000-3000-10-012-0087	TOTE ROAD – STA. 86+800 TO 87+500 – PLAN AND PROFILE
H349000-3000-10-012-0086	TOTE ROAD – STA. 86+100 TO 86+800 – PLAN AND PROFILE
H349000-3000-10-012-0085	TOTE ROAD – STA. 85+410 TO 86+100 – PLAN AND PROFILE

REFERENCE DRAWINGS

PERMIT TO PRACTICE
HATCH LTD.
Signature
Date 30 Oct 13
PERMIT NUMBER: P 512
The Association of Professional Engineers, Geologists and Geophysicists of NWT/NU

NO.	DESCRIPTION	BY	CHK'D	APP'D	DATE
1	UPDATE P1 BOUNDARY, ADD OUTLINES OF 2009 & 2013/2014 BORROW SOURCES	AV	KF	SH	2013-10-30

REVISIONS

REGISTERED PROFESSIONAL ENGINEER
M. M. S. HASSAN
LICENSE# 7024 13
NT/NU

REV.	ISSUE FOR	AUTH. BY		DATE
1	FOR PERMITTING	SH	AV	2013-10-30
0	FOR PERMITTING	SH	IK	2013-10-17

ISSUE AUTHORIZATION

HATCH™

DESIGNED BY: I. KITYNSKA DATE 2013-10-10	DRAWN BY: I. KITYNSKA DATE 2013-10-10
CHECKED BY: K. FALLAHI DATE 2013-10-17	DISCIP. ENGR: S. HASSAN DATE 2013-10-17
PROJ. DES. COORD.: T. THERTELL DATE 2013-10-17	PROJ. ENGR.: J. CLELAND DATE 2013-10-17
PROJ. MGR.: S. PERRY DATE 2013-10-17	

Baffinland

MARY RIVER PROJECT

TOTE ROAD
BORROW SOURCE P1
DRAINAGE PLAN

SCALE	DWG. NO.	REV.
1:3000 OR AS NOTED	H349000-3138-10-015-0003	1

ORIGINAL SHEET SIZE: ISO A1 (841 x 594)

vale69806
31/10/2013 10:39:14 AM
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