Indian and Northern Affairs Canada | Affaires indiennes et du Nord Canada

ROBERTS BAY AND IDA BAY REMEDIATION PROJECT

QUARRY MANAGEMENT PLAN

September 24, 2010 (Revised)

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1 Introduction

This document is a brief summary of the Quarry Management Plan (QMP) for the proposed borrow sources for the Roberts Bay and Ida Bay Remediation Project, Nunavut. Since this is a revised form of the QMP, some details have been updated with what transpired during the 2009 and 2010 construction season, as it relates to quarrying from the borrow areas, at the site.

Roberts Bay and Ida Bay abandoned silver mines are located approximately 68° 10' 45" N by 106° 33' 29" W and about 115 kilometres southwest of Cambridge Bay, Nunavut. The Roberts Bay Lake Area (i.e. the areas covering Roberts Bay and Ida Bay mine sites) was first staked by the Roberts Mining Company Ltd. in 1964. In 1997 the Roberts Mining Lease was surrendered back to INAC.

The Roberts Bay mine site consists of an adit, a shaft, covered vent raise, tailings pond, waste rock piles, mill structure and equipment, assay and garage buildings, fuel storage compound, equipment storage area, barrel storage shed, camp and dump area. The Ida Bay site consists of an open adit, a partially covered vent raise, waste rock piles and scattered debris located around the site. Some waste rocks at the Ida Bay mine site are observed adjacent to the ocean and below the high tide level.

Borrow materials at both Roberts Bay and Ida bay are required to achieve the remediation goals of the site.

2 Existing Environment

The Roberts Lake project area is coastal lowland with numerous lakes and ponds separated by glacial landforms and parallel running geological intrusions of diabase dykes and sills. The drainage basins are generally long and narrow and predominantly oriented along the north-south axis. Low lying areas at the site are saturated and marshy and underlain by clayey silt with permafrost detected at depths of 0.3 to 0.6 m.

The dominant soils are Turbic and Static Cyrosols (Rescan Environmental Services report of 2004). Elevated areas are typically underlain by a silty gravelly sand till, saturated if poorly drained with permafrost at approximately 0.6 m below grade. Occasional granular deposits are found in the vicinity of the site at surface and are typically well graded sands and gravels with 1 to 2% silt/clay.

3 Borrow Sources: Permits, Locations, Material Types, and Volumes

Seven (7) borrow areas (6 at Roberts Bay and 1 at Ida bay) were selected. Permits to quarry from the 7 borrow areas were granted in 2009 by the Land Administration Division of the Department of Indian and Northern Affairs Canada (INAC).

Table 1 below provides the details of the borrow sources including location, material types, quarry permit numbers as well as the amount of borrow material available and proposed to be recovered from the respective borrow pits during the Roberts Bay Remediation Project.

Table 1: Summary of Details of the Borrow Areas

Borrow Areas (BA)		Locations (Coordinates)		Material Type	Quarry Permit #	Volume Available (m^3)
		Northing (m)	Easting (m)			
Roberts Bay	BA - #1	7563730	435605	Sand/gravel	2009QP0059	300
	BA - #2	7563775	435490	Sand/gravel	2009QP0060	2520
	BA - #3	7563645	435390	Sand/gravel	2009QP0061	2250
	BA - #4	7563910	435510	Sand/gravel	2009QP0062	1370
	BA - #5	7563895	435410	Sand/gravel	2009QP0063	215
	BA - #6	7563630	436495	Sand/gravel	2009QP0064	2880
Ida Bay	BA - #7	7569795	436495	Sand/gravel	2009QP0065	1200

Other details about the borrow areas, including the topography of the site and the borrow areas, are contained in attached drawings in the appendix.

4 Quarry Operation

Any and all operations related to the excavation and use of borrow materials shall be in accordance with all applicable territorial, federal and local guidelines recommendations and regulations, more specifically the issued land use and quarry permits and the Nunavut Mining Safety Ordinance.

Access to the quarry locations are overland and the majority of the borrow locations are via road or via a waste/blast rock capping material that was laid down during mining operations when the site was active. Machinery travel and operation on areas off the roads and waste rock capping shall be minimized. Improvements the borrow access roads and waste rock cap shall be made as required to minimize damage to the environment.

Machinery to be used for the excavation, loading, transport and placement include a tracked excavator, loader, rock trucks and a bulldozer. Borrow operations shall be conducted during the day and supervised by the departmental representative and contractor foreman.

5 Noise

There are no notable residences other than the construction camp near the proposed quarry areas at Roberts Bay. Noise disturbances shall be minimized by prohibiting quarry work outside of regular construction hours and ensuring the equipment used is running properly with proper/reasonable muffling.

6 Archaeology

All known archaeology sites have been marked and no borrow activities will occur in or near these areas.

7 Dust/Sediment

Dust during quarry operations will be mitigated by the use of misted or sprayed water to prevent the production of dust and minimizing the required disturbance

of borrow material. No quarry activities shall be carried out near water bodies and during heavy rainfalls to prevent the admission of sediments to fish bearing waters. Sediment screens may be used and put in place as required.

8 Potential Acid Generation and Metal Leaching

The waste rocks, tailings and surrounding surficial soils on the two sites (Robert Bay and Ida Bay) are not net acid generating. This conclusion is based on the information provided in the November 2006 Geochemical Assessment document prepared by AMEC, on behalf of Public Works and Government Services Canada, entitled *Roberts Bay and Ida Bay Abandoned Mine Sites- Geochemical Assessment*. A copy of this report was submitted to Nunavut Water Board (NWB) during the initial application to the Board, for Water Licence and can also be obtained, upon request, from INAC.

As part of the geochemical assessment program, twenty-two samples of waste rock, tailings and surficial soils were procured and analyzed to determine the net acid generating potential of these materials located on site. The location of these samples is distributed across the mine site and as such are considered representative of the borrow conditions.

In addition to the results of the 2006 geochemical assessment, surface water testing carried out in the Roberts Lake area in August 2010 did not identify any water quality issues that would be related to acid drainage issues at the site. A summary of the August 2010 water sampling is available upon request to INAC and will be included in the final annual report on the Water Licence.

The INAC long term monitoring plan will continue to monitor the water at the site for potential indications of acid generation.

9 Surface Water Management

The recovery of waste rock and local surficial soils for use as borrow material entailed the removal of material within the active permafrost layer. The permafrost on site was encountered at less than 500 mm from surface and as such borrow material was recovered by stripping layers of material in lifts not exceeding 300 mm so as to minimize the potential for ice in the aggregate as well as excessive moisture in the borrow material. When significant amounts of aggregate were required the stripped material was placed into stockpiles to allow the ice to melt and the water to drain from the aggregate. At no time during the

site earthworks did this generate a significant volume of water such that a stream or surface water sheet flow was generated.

In all areas where borrow material was recovered the depressions were backfilled with local waste rock to reinstate a positive drainage condition at the respective borrow locations. At no time were borrow pits left exposed for extended periods of time. This protocol was adopted to minimize the thermal impacts of the earthworks on the permafrost underlying the site.

At no time during the borrow source recovery work was active pumping of a borrow area undertaken. Nor were there any significant amounts of surface water run-off generated during the site works. Given the nature of the site stratigraphy there was no major surface water sources other than the melting of the permafrost and precipitation events which were few during the course of the program. Ponding of water in quantities that would warrant management (i.e. discharge) was not observed.

10 Summary of Quarrying Activities to end of 2010

Quarry Permits for the site were issued in conjunction with the Land Use Permit for the site. Quarry Permits 2009 QP0059 to 2009 QP0065 were issued for the seven potential borrow areas identified for use during the remediation project. In general, the recovery of borrow material was done in accordance with the operating conditions of these permits. A total of 2,915 m^3 of sand and gravel was recovered from the local borrow areas for use during the remediation program while approximately 853 m^3 of waste rock was relocated for use as capping material. A summary of the material recovered from the respective borrow areas is provided below. Waste rock was recovered from work areas that were graded adjacent to the former tailings containment structure as part of the remediation works.

During the course of the remediation program, the location, access to and condition of the respective borrow sources were evaluated by the resident engineer. From this evaluation, it was determined that the sand and gravels previously identified for the respective borrow sources were not available due to their saturated condition or shallow depth of the permafrost layer. In the case of borrow areas #1, #3 and #6 these potential borrow sources were only accessible if access roads were constructed across the tundra. Upon evaluation it was determined that there would be less damage done to the tundra surrounding the site if we were to quarry the additional rock required to complete the remediation work on the tailings cover. This additional quarried material, 5544 m^3, was recovered from the bedrock outcrop immediately adjacent to the tailings

containment pond and Solid Waste Management Facility (SWMF) at the Roberts Bay site.

At the conclusion of the use of borrow sources, the areas were re-graded and backfilled to ensure there was no remaining rutting and proper drainage of the area.

Figure 8, attached to this report, outlines the respective borrow pit locations, UTM coordinates and the state of the site grading at the end of the 2009 remediation works. The distance of the borrow pits to the normal high water mark of the nearest water bodies are also shown on this figure. Of note is that all permanent water bodies, located down-gradient of the site, are over 750 m from the cluster of borrow pits which centre on the former mine site.

As stated above, borrow pits, #1, #3 and #6, were not used during the course of the remediation program.

Table 2: Summary of Borrow Material Volumes Used in 2009-2010

Borrow Areas (BA)		Material Type	Quarry Permit #	Volume Available (m^3)	Volume Used in 2009 (m^3)
Roberts Bay	BA - #1	Sand/gravel	2009QP0059	300	0
	BA - #2	Sand/gravel	2009QP0060	2520	1512
	BA - #3	Sand/gravel	2009QP0061	2250	0
	BA - #4	Sand/gravel	2009QP0062	1370	1188
	BA - #5	Sand/gravel	2009QP0063	215	215
	BA - #6	Sand/gravel	2009QP0064	2880	0
Ida Bay	BA - #7	Sand/gravel	2009QP0065	1200	0

The Ida Bay Borrow Pit #1 was not used for this program. This borrow was located approximately 200 m from the ocean. For the same reasons noted above regarding damage to the tundra, in 2010 waste rock was recovered from along the shoreline and used as borrow material for the remediation works at this site.

No fresh water bodies located within a kilometre of the Ida Bay site.

11 Long Term Monitoring

In accordance with Part K of the NWB License for the Roberts Bay and Ida Bay site remediation works, a long term monitoring program was to be developed which incorporated the sampling requirements outlined in the license. In order to comply with this license requirement INAC has developed a long term monitoring program for the site and its implementation will commence in 2010. A copy of the Long Term Monitoring program was submitted to the Nunavut Water Board (NWB) as part of the additional documentation requirement by NWB, during the application processing phase. An electronic copy of the document can be provided upon request from INAC.

The results of water quality testing will be provided to the NWB on an annual basis as per the conditions of the license and monitoring program requirements. The results of the analytical program will be compared to the CCME guidelines and site specific standards developed for the site.

12 Conclusion

At the conclusion of the use of borrow sources, the areas will be re-graded and backfilled to ensure there was no remaining rutting and there is proper drainage of the area.

An as-built drawing outlining the respective borrow pit locations and the state of the site grading at the end of the remediation works will be included in the closure materials for the site.

UTM N 7564000 | UTM E 435300 | UTM E 435400 | UTM E 435500 | UTM E 435600 | UTM E 435700 | UTM E 435800 | UTM N 7564000

UTM N 7563900 | UTM N 7563900

UTM N 7563800 | UTM N 7563800

UTM N 7563700

~220m to unnamed lake

~750m to unnamed creek

~200m to Borrow Area #6 not used

~400m to unnamed lake

~850m to Roberts Lake

~920m to Roberts Lake

Borrow Area #3 not used ~100m from old camp landfill

Borrow Area #1 not used

Borrow Area #4
Area=1505 m²
Average Depth=0.78m
Type 2 Material

Borrow Area #5
Area=940m²
Average Depth=0.22m
Type 2 Material

Borrow Area #2
Area=1704m²
Average Depth=0.89m

Quarried Area #1
Area=2100m²

Solid Waste Management Facility Landfill
Area=3378m²

Capped with Waste Rock Old Camp Landfill
Area=2329m²

Contaminated Soil Removed Capped with Waste Rock Mill & Assay
Area=273m²

Contaminated Soil Removed Capped with Waste Rock Adit#1 Area
Area=225m²

Contaminated Soil Removed Capped with Waste Rock Former Drum Area
Area=61m²

Contaminated Soil Removed Capped with Waste Rock Old Garage Area
Area=360m²

Contaminated Soil Removed Capped with Waste Rock Adit#2 Area
Area=493m²

Fuel Bladders
Area=159m²

2 (101)
PLSPK -GPS CHECK POINT
67.684

5 (102)
5 BM -CP 5
72.570

6 (103)
FDIB
72.070

11 (105)
AMEC -CP-11
55.211

12 (106)
AMEC -CP-12
48.724

14 (108)
AMEC -CP-14
67.377

"A" "B" "C"

GARAGE | ADIT#1 | ASSAY | MILL | Vent Raise | Adit#2

Quarry Location UTM Coordinates		
Roberts Bay Borrow Source	Northing (m)	Easting (m)
Borrow #1	7563730	435605
Borrow #2	7563775	435490
Borrow #3	7563645	435390
Borrow #4	7563910	435510
Borrow #5	7563895	435410
Borrow #6	7563840	435150
Ida Bay Borrow #1	7569795	436495

Point Table				
Point #	Description	Elevation	Northing (m)	Easting (m)
101	PLSPK -GPS CHECK POINT	67.684	7563930.522	435437.047
102	5 BM -CP 5	72.570	7563843.766	435324.383
103	FDIB	72.070	7563868.350	435562.574
105	AMEC -CP-11	55.211	7563708.884	435478.698
106	AMEC -CP-12	48.724	7563648.781	435300.180
108	AMEC -CP-14	67.377	7563979.367	435495.803

LEGEND:

- BEDROCK OUTCROP
- WASTE/BLAST ROCK CAPPING
- EXISTING STRUCTURES
- THERMISTER LOCATIONS
- SURVEY MONUMENT
- LIMITS OF EVCAVATION
- CONTOUR (MAJOR-1.0 INTERVAL)
- CONTOUR (MINOR-0.5 INTERVAL)

0 20 40 60 80m Metres

SCALE 1:1500

Public Works and Government Services Canada | Travaux publics et Services gouvernementaux Canada

Indian and Northern Affairs Canada | Affaires indiennes et du Nord Canada

ROBERTS BAY AND IDA BAY MINE SITES REMEDIATION PROGRAM

ROBERTS BAY SITE GRADING POST 2009 REMEDIATION WORKS

SENES Consultants | Project Number 34807 | Figure 8

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