Waste Rock Dump Design Criteria

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1. Introduction

The dump configuration discussed in this report is the AMEC 2010 design, Figure 1.1. Information and recommendations described herein were derived with additional information from previous Mary River specific waste rock dump design documentation and other technical documents.

For permitting and planning purposes Hatch calculated and produced figures (Figures 5.1-5.4) to schematically show the waste rock dump construction sequence based on:

- The 2010 configuration provided by AMEC; and
- The mine production sequence proposed in the 2009 Resource and Mine Planning Report prepared by Wahl and Gharapetian.

The current AMEC design consolidates all waste rock, including non-PAG, PAG and overburden, to the north of the open pit totalling a volume of 310 LCM (loose cubic meters) to accommodate a total tonnage in the order of 640 million tonnes of waste.

2. Objectives

This document identifies waste rock dump design criteria for the Mary River Deposit #1 mine. The waste rock dump performance objectives are as follows:

- Physical stability;
- Maintain permafrost conditions;
- Avoid contaminated run-off; and
- Operationally efficient and cost effective.

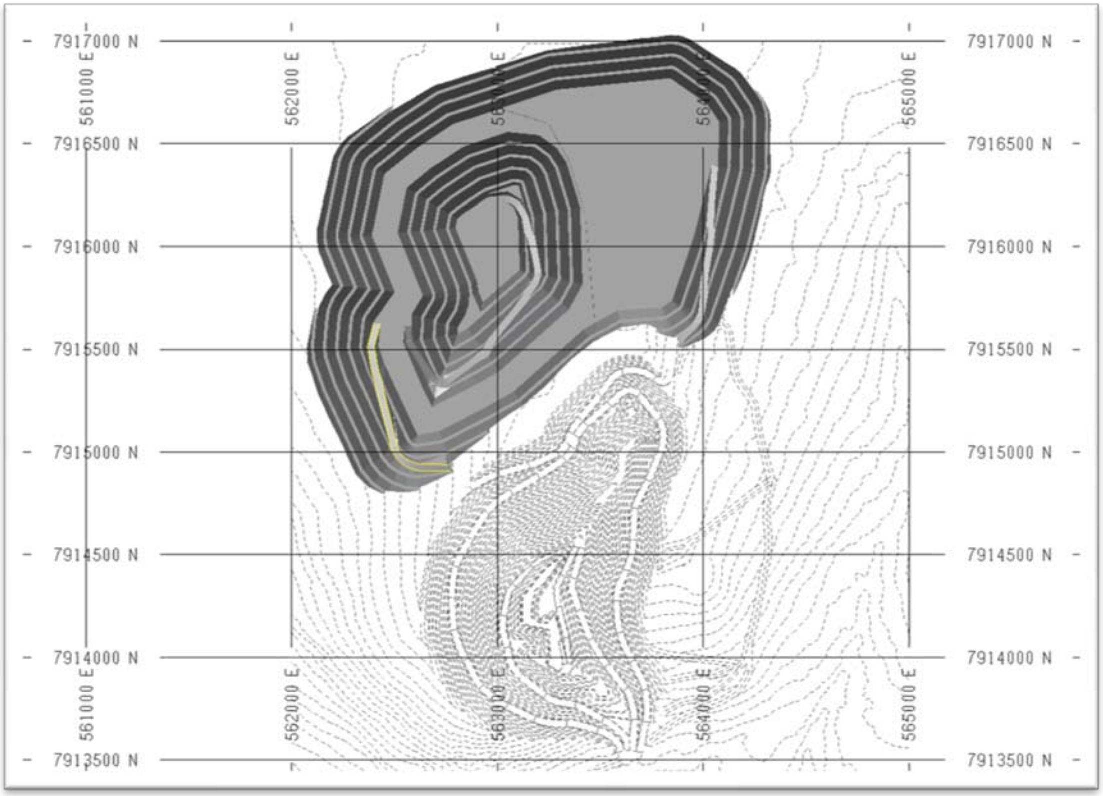

Figure 1: AMEC 2010 Deposit 1 Waste Rock Design

3. Background Information

3.1 Waste Rock Dump Design History

The 2008 Aker Kvaerner definitive feasibility study (DFS) originally located two waste rock dumps NE and SW of the Deposit 1 Pit. Subsequent waste dump design iterations, in 2009 and 2010, have called for a single waste dump to be located progressively further north and at a higher elevation. For example the original Aker dump peaked at an elevation of 660m elevation whereas the current AMEC design peaks at 820m elevation. The upper pit exits are currently designed at 600m and 590m elevations.

The northern migration of the waste rock dump design was done to address potential stability hazard(s) and the associated safety risk to the industrial buildings in the crushed ore stockpile area. A review of possible waste rock dump locations accompanied by thorough geotechnical assessment will be carried out in the next project phase.

Although not directly addressed in this document it has been acknowledged, and Hatch agrees, that an opportunity for some in-pit waste dumping exists.

3.2 Potential Acid Generating (PAG) Material Placement

Approximately 14% of waste rock samples to date have been identified as PAG material using the limited samples of waste rock available. PAG has been defined by previous studies as material whose neutralising potential to acid generation potential ratio is <2. The recommendations (AMEC and Knight Piesold) incorporated the construction of a single cell, located in the north section of the main waste rock dump pile, for containment of PAG material which is subsequently encapsulated within non-PAG rock waste. In addition, PAG material is expected to freeze in place and thus eliminate significant acid drainage and metal leaching.

Given the uncertainty in the amount of PAG material because of the limited sampling of the waste rock in the pit, a plan for further characterisation of footwall waste material is being developed by Baffinland.

The dump construction plan will be altered to accommodate the cell construction methods confirmed by the ongoing waste rock characterization and PAG management plan. The same non-PAG barrier thickness requirements listed in the Design Basis Criteria will be utilized around any PAG cell.

3.3 Waste Rock Placement Alternatives

The waste rock contains both potentially acid generating (PAG) material and non-acid generating material (non-PAG). Preliminary characterization efforts indicate that the amount of PAG rock could be up to 20% of the waste rock generated. A waste rock characterization program is underway to gain a better understanding of the waste rock Acid Rock Drainage (ARD) characteristics. This program will be ongoing for the life of the Project.

Three scenarios have been considered for the placement of waste rock:

1. Placement of the waste rock in a single stockpile without any segregation of the PAG and non-PAG material;
2. Placement of the waste rock in a single stockpile with segregation of the PAG and non-PAG material. The PAG material would be encapsulated within the confine of the non-PAG material;
3. Separate stockpiles for both PAG and non-PAG material.

The major factors that influence the selection of an appropriate site for the disposal of waste rock include economic, safety, and, environmental considerations. From an economic perspective, the waste rock stockpile should be as close to the mine pit as possible in order to minimize trucking distance. From a safety perspective, the stockpile must be located sufficiently far from the mine pit to prevent any slope stability concerns both for the mine pit walls and the stockpile itself. Finally, from an environmental perspective, it is desirable to limit the footprint of the stockpile and contain the stockpile within the same watershed so that runoff can easily be contained and monitored for quality over the life of the Project.

The topography of the site is not easily amenable to the construction of two separate waste rock stockpiles. In addition, sampling and sorting of PAG and non-PAG rock is not a precise operation. Despite best management efforts, over the life of the mine, some PAG material will inevitably be mixed with non-PAG material. For this reason, it is preferable to have a single stockpile and focus on placement of the PAG material within the core of the stockpile. Scenario # 3 was thus rejected.

In terms of Scenarios #1 and 2, a suitable stockpile location was identified north of the mine pit (refer to drawing H337697-7000-10-014-1002 attached in Appendix 3C). This site will enable Baffinland to contain and collect all runoff from the waste rock pile and channel this runoff to sedimentation ponds where the quality can be monitored prior to discharge to the receiving environment. On the basis of waste rock characterization work performed to date, Baffinland believes it is prudent to adopt an approach where to the extent possible, the PAG rock will be segregated from the non-PAG rock. Therefore, the waste rock stockpile design retained for the Project is based on scenario #2. This decision will be reconsidered and re-evaluated as more information becomes available on the characteristics of the waste rock.

3.4 Design Guidelines

3.4.1 Dump Construction Parameters

Incorporating previous reviews of waste rock dump design criteria the design guidelines are as follows:

- Offset/setback for subsequent dump tier from pit crest: 100m, to be re-assessed following geotechnical drilling in 2012;
- 2H:1V overall effective slopes;
- 1.5H:1V individual bench slopes;
- 15m berms between benches;
- 30m bench height;
- 150m segments (5 benches);
- For the upper segment (above 680m elev.), the toe will be moved back 120m from crest of the bottom segment at below 680m elevation);
- No overburden or PAG rock in in-pit dump; and
- Up to minimum 50m thickness of non-PAG material placed on outside of waste rock dump face.

3.4.2 Haul Roads and Ramps

Haul ramps for the waste stockpile are similar in design to those within the pit at 33m wide and 10% grades. Final accesses are from the east and west sides of the pit, tying into the pit design.

3.4.3 Mine Equipment

Dumps will be constructed utilizing 290 tonne capacity class haul trucks in conjunction with 580 hp class tracked dozers.

3.4.4 Pit Crest Setback

The setback distance of 100m is based on preliminary geotechnical review by AMEC and is further discussed in the Knight Piesold Memo NB10-00317 dated June 28, 2010.

3.4.5 Thermal Barrier

In previous dump design criteria documentation a 2m to 3m thick layer, thermal barrier, of waste is recommended to be placed in winter over the footprint for areas where waste dumping will be necessary during the following summer/fall. Given that much of the waste dump area is on sloped ground this may not always be practical given the size and type of mining equipment envisioned for the Mary River Project A practical approach would be to plan for the utilization of high dumps (15 - 30m benches) wherein dumping onto original ground only takes place during the subzero winter months. During the warm months waste dump lifts will be restricted to construction on top of already established waste dump surfaces. This is consistent with the thermal barrier objectives of avoiding the possibility of trapping in heat in unfrozen surface soils. If heat were inadvertently trapped in the ground, ice rich soils could thaw and thus reduce the stability of the dump foundation. The intention is that the permafrost level will rise progressively in the waste dump by conduction. This is discussed in detail in the Thurber memo on permafrost aggradation in the waste dump (Refer to Waste Rock Management Plan, Annex 2).

3.5 Dump Footprint

Only surface ice and snow should be removed prior to waste dumping on original ground. Existing frozen topsoil is to be left in place for protection of the thermal regime below the waste dump(s).

3.6 Overburden Management

Overburden, above bedrock material, contains ice rich soils, organic material and rock. This material will be encountered in varying amounts annually for approximately the first 12 years of the mine life. Following excavation, this material will be subject to potential thawing. Seepage from the melt could contain significant volumes of sediment. A number of strategically located encapsulation cells will be incorporated into the waste dump(s) as the dump and pits develop. The implementation of numerous overburden containment cells facilitates practical dump construction methods and efficient waste haulage. The location and scheduling of these cells is to be incorporated in the mid range mining operation plans utilizing appropriate geotechnical parameters.

3.7 Runoff Water Management

Surface collection systems consisting of collection channels, diversion channels and settlement ponds will be implemented as part of the waste dump water management system. In addition to sediment control, water management practices will minimize the introduction of water into the waste dump foundations wherein standing water may adversely affect the thermal regime and therefore dump stability (Refer to Waste Rock Management Plan, Annex 1).

3.8 Geotechnical Monitoring

As is standard practice waste dumps are to be monitored for movement, settlement and cracking. Settlement cracks are a normal and common occurrence in hard rock waste and these are to be filled in with rock as they occur in order to avoid water inflow and the possible subsequent formation of ice wedges.

Additional monitoring such as installation of temperature sensors to check the temperature within and below the waste rock will be implemented during the staging of the waste rock dump construction.

4. Mine Waste Rock Production

The expected life of mine waste rock production schedule is summarized in Table 1: Mary River Deposit #1 Mine Rock Movement Schedule. Note the PAG figures consist of 20% of the total rock waste volume plus mineralized rock that does not meet the 55%Fe cut-off grade.

Table 1: Mary River Deposit #1 Mine Rock Movement Schedule

Mary River Deposit #1 Mine Rock Movement Schedule (Life of Mine)					
Period	Non-PAG Waste			PAG*	TOTAL WASTE ROCK
	OverBurden (Mt)	*Waste (Mt)*	Total Non-PAG kt	(Mt)	(Mt)
PPM	*0.00*	*0.0*	0.0	0.5	0.50
Year 1	*0.00*	*7.9*	7.9	3.1	11.00
Year 2	*0.50*	*6.7*	7.2	2.5	9.70
Year 3	*0.30*	*18.1*	18.4	5.2	23.60
Year 4	*1.80*	*17.4*	19.2	6.1	25.30
Year 5	*1.30*	*24.0*	25.3	7.2	32.50
Year 6	*2.10*	*21.4*	23.5	6.2	29.70
Year 7	*2.80*	*26.0*	28.8	7.8	36.60
Year 8	*2.50*	*31.4*	33.9	9.6	43.50
Year 9	*4.70*	*25.8*	30.5	7.6	38.10
Year 10	*2.60*	*27.9*	30.5	8.2	38.70
Year 11 - 15	*13.20*	*132.0*	145.2	41.3	186.50
Year 16 - 21	*0.70*	*126.8*	127.5	39.8	167.30
Total	*32.50*	*465.40*	497.9	145.1	643.00

PPM: Pre-production material
PAG: Potentially acid generating rock
** Includes: mineralized rock below cut-off grade of 55%Fe and inferred material*

5. References

Baffinland Iron Mines Corporation "Mary River Project Environmental Impact Statement", Volume 10 EHS Management, Appendix 10D-5, Waste Rock Management Plan SD-EMMP-005, dated December 2010.

Aker Kvaerner, "Definitive Feasibility Study Report, Mary River Iron Ore Project, Northern Baffin Island, Nunavut", dated February 2008".

Wahl and Gharapetian, "Mary River Deposit No 1 Resources and Mine Planning Report", dated October 2009".

Knight Piesold Consulting, "Memorandum NB07-00495", dated May 31, 2007.

Knight Piesold Consulting, "Memorandum NB10-00317" dated June 28, 2010.