Appendix 4:
Interim Waste Rock Stockpile Seepage Quality Model Report

INTERIM WASTE ROCK STOCKPILE SEEPAGE QUALITY MODEL
MARY RIVER PROJECT

Submitted to:
Baffinland Iron Mines Corporation
120 Adelaide St. West, Suite 1016
Toronto, Ontario
M5H 1T1

Submitted by:

AMEC Environment & Infrastructure,
a division of AMEC Americas Limited
160 Traders Blvd., Suite 110
Mississauga, Ontario
L4Z 3K7

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1.0 INTRODUCTION

AMEC was retained by Baffinland Iron Mines Corporation (Baffinland) to conduct seepage quality modeling for the waste rock stockpiles to support an environmental impact statement (EIS). The following report summarizes the expected waste rock stockpile seepage quality following closure of the proposed Mary River Iron Ore mine. The estimate is based on available laboratory data, the mine plan and assumptions regarding the physical qualities of the waste rock stockpile.

The proposed Mary River Project will consist of an open pit and adjacent waste rock stockpile, plus supporting buildings and infrastructure. Ore will be mined from the Deposit No. 1 pit and shipped directly offsite for further processing. A waste rock disposal area designed for permanent storage of waste rock will be located northwest of the open pit. Based on the mine plan for Deposit No. 1 (Hatch 2011a), an estimated 571 Mt of waste rock will be generated over a period of 21 years.

2.0 GEOLOGY

Baffinland Iron Mines Corporation (Baffinland) is planning to mine iron ore from Deposit No. 1 at their Mary River project (the Project), located on the northern half of Baffin Island, Nunavut Territory, Canada. The deposit is a high-grade example of Algoma-type iron formation, which is characterized by zones of massive, layered or brecciated hematite (sometimes in the specularite form) and magnetite, variably intermixed with banded oxide to silicate-facies iron formation.

A description of the following regional and local geology of Deposit No. 1, taken from Appendix 6B-1 of the FEIS, is provided below.

2.1 Regional Geology

The northern part of Baffin Island consists of the ca. 3.0-2.5 Ga Committee Fold belt which lies within the Rae domain of the western Churchill Province (Jackson and Berman, 2000). The Committee belt extends north-east for around 2000 km from south-west of Baker Lake, Nunavut Territory to northwestern Greenland. Four major assemblages of Precambrian rocks have been identified within the Committee Belt. The iron ore deposits occur as part of the supra-crustal rocks of the Neoarchean aged (2.76-2.71 Ga) Mary River Group in the region. The Central Borden Fault Zone passes within 1 km to the south-west of the site. This fault separates the highly deformed Precambrian rocks to the north-west from the early Paleozoic relatively flat lying sedimentary rocks to the southwest. The generalized stratigraphic sequence of the Mary River group from top to base according to Young et al. (2004) and Johns and Young (2006) is:

- interbedded ultramafic and intermediate volcanic rocks;
- quartzite;

- Algoma–type oxide and silicate–facies iron formation;
- amphibolite; and
- psammite and sedimentary migmatite.

The thickness of individual units varies considerably across the area. Ultramafic and gabbroic intrusions in the form of small sills and dykes (<10 m in thickness) may occur within the sedimentary rocks, iron formation and amphibolite units (Johns and Young, 2006). Locally these intrusions have been observed to contain thin sulphide veinlets and disseminated sulphides. At the deposit scale, the overall sequence can be complicated by inferred early isoclinal folds and ramp and flat thrust faults (Young *et al.*, 2004) which create complex and variable stratigraphic relationships. The contact between the Mary River group and gneiss basement rock are generally not directly exposed, being obscured by younger granitic intrusions.

Iron formation within the Mary River Group occurs as an oxide- and silicate- facies unit. Oxide facies iron formations vary from lean magnetite-chert to iron-ore quality deposits of magnetite and hematite (Johns and Young, 2006). Genesis of high grade iron ores is the result of the Hudsonian age deformation and metamorphism of enriched Archean Banded Iron Formation. The silicate–facies iron formation is generally thin and found in association with the oxide–facies, although it also occurs on its own. It commonly contains coarse garnet, anthophyllite, cummingtonite, and actinolite porphyroblasts.

2.2 Deposit Geology

Deposit No.1 occurs at the nose of a syncline plunging steeply to the north-east (Aker Kvaerner, 2008). The iron formation occupies the nose and two limbs of this feature with an ~1300 m long northern portion and an ~700 m long southern portion. The footwall to the iron formation mainly consists of gneiss with minor schist, psammitic gneiss (psammite) and amphibolite. The hanging wall is primarily composed of schist and volcanic tuff with lesser amphibolite and metasediment.

The hanging wall primarily encompasses chlorite–actinolite schist and garnetiferous amphibolites. Meta-volcanic tuff is also a significant lithology identified in the hanging wall. The footwall mainly consists of quartz-feldspar-mica gneiss with lesser meta-sediment (greywacke) and quartz-mica schist. Microcline and albite are the predominant feldspars within the gneiss and biotite is generally more abundant than muscovite. Rocks are observed to represent at least amphibolite grade metamorphism.

The iron ore deposits at the Mary River project represent high-grade examples of Algoma-type iron formation and are composed of hematite, magnetite and mixed hematite-magnetite-specular hematite varieties of ore (Aker Kvaerner, 2008). The iron deposits consist of a number of lensoidal bodies that vary in their proportions of the main iron oxide minerals and impurity content of sulphur and silica in the ore. The massive hematite ore is the highest grade ore and also has the fewest impurities, which may indicate it was derived from relatively pure magnetite or that chert, quartzite and sulphides were leached and oxidized during alteration of the iron formation.

Intense deformation and lack of outcrop limit the ability to subdivide by lithology on the basis of future mined tonnages. Rather, the waste material has been subdivided on the basis of zonal relationships around the iron ore as described in Table 1.

Table 1: Summary of Waste Types and Tonnages

Waste Type	In-Pit Tonnage (t)	% of Waste	Lithologies (in approximate order of abundance)
Hanging wall (HW)	114,506,831	20.0	meta-volcanic (tuff); greywacke; amphibolite; chlorite, mica or amphibole schist; ultramafite; and gneiss
Hanging wall schist (HWS)	103,479,188	18.1	chlorite, mica, or amphibole schist; amphibolite; greywacke; and meta-volcanic (tuff)
Internal waste (IW)	2,982,893	0.5	schist; amphibolite; and meta-volcanic (tuff)
Deleterious ore (DO)	13,672,193	2.4	high grade iron formation (elevated Mn, S or P); and banded iron formation
Footwall schist (FWS)	45,917,213	8.0	chlorite, mica, or amphibole schist; gneiss; greywacke; amphibolite; and meta-volcanic (tuff)
Footwall (FW)	291,226,388	50.9	gneiss; metasediments (e.g. greywacke); chlorite, mica or amphibole schist; and amphibolites
Total	571,784,706	100.0	

3.0 WASTE ROCK ML/ARD CHARACTERIZATION

Assessment of the potential for ML/ARD from mine rock has been undertaken primarily by sampling of the Project's archived exploration drill core. Sampling and analysis has been conducted in stages since 2006 (Knight Piésold 2008, Knight Piésold 2009, AMEC 2010) with an additional sampling program conducted in 2011 (AMEC 2012). The highly deformed nature of the deposit and the relatively high metamorphic grade has largely restricted interpretation of waste material tonnages to a spatial (hanging wall and footwall) rather than a lithological basis.

In addition to the archived drill core, three drillholes (318 m in total) were advanced in 2010 to specifically address a lack of representative waste material in the footwall of the deposit.

Work in 2011 included collection of an additional 377 samples of waste rock material on the basis of a revised waste type model that subdivided the hangingwall (HW) and footwall (FW) zones to incorporate more schist dominated regions (HWS and FWS) occurring generally in close proximity to the iron ore. It has been observed that sulphide content in these regions while variable is typically higher than that in the more distal hanging wall and footwall material. The revised waste model also incorporated an internal waste (IW) subdivision (waste fingering within the ore zone) and a deleterious ore (DO) zone that has been identified as probable waste in the footwall.

Static testing has included modified Sobek acid base accounting (ABA) with sulphur speciation and carbon analysis, net acid generation (NAG) testing, total element analyses, and short term leach analyses. A summary of static testing available to 2010 is provided in AMEC (2010), with updated ABA and total element analyses (aqua-regia ICP) data inclusive to 2011 summarized in Appendix A.

Waste rock is characterized by generally low modified Sobek neutralization potentials (NP) and low sulphide contents with resulting low acid potentials (AP) (Figure 1). Carbonate NP typically represents <30% of the modified Sobek NP. Sulphide content in excess of 0.5% is generally predictive of a Neutralization Potential Ratio (NPR=the ratio of NP/AP) less than 2 (Figure 2). Overall, assuming that a NPR ≤2 is representative of Potentially Acid Generating (PAG) material and based on the current understanding of waste distributions in the pit, an estimated 15% of waste rock is expected to be PAG.

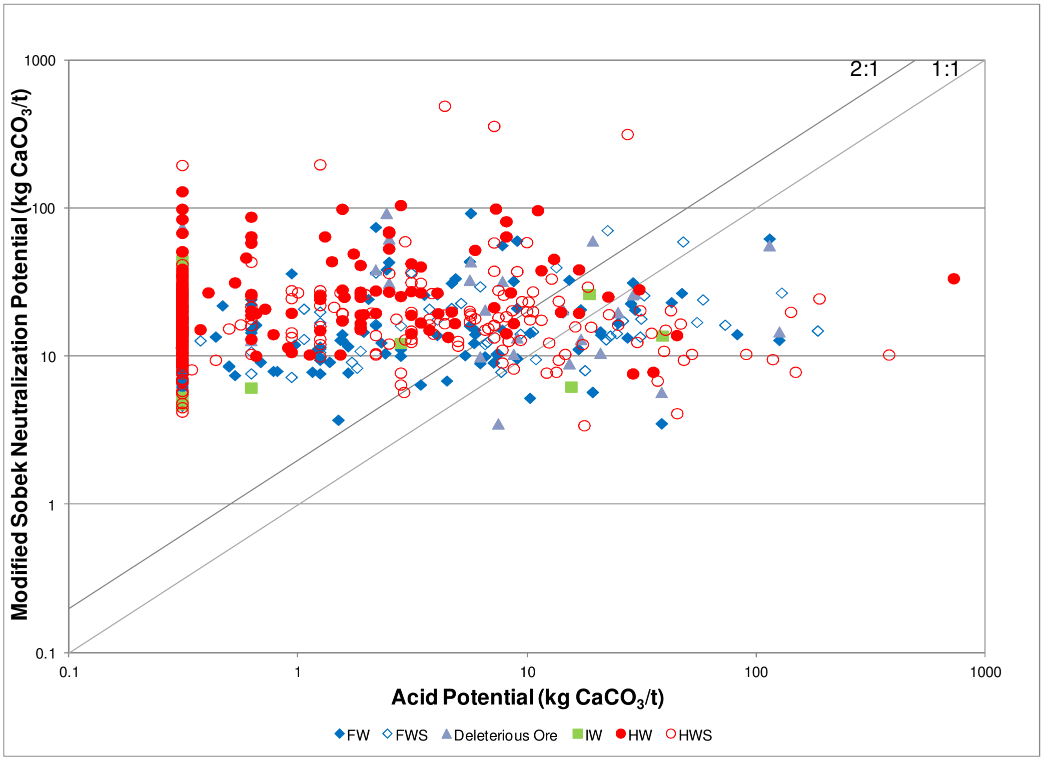

Figure 1: Neutralization Potential (NP) vs. Acid Potential (AP)

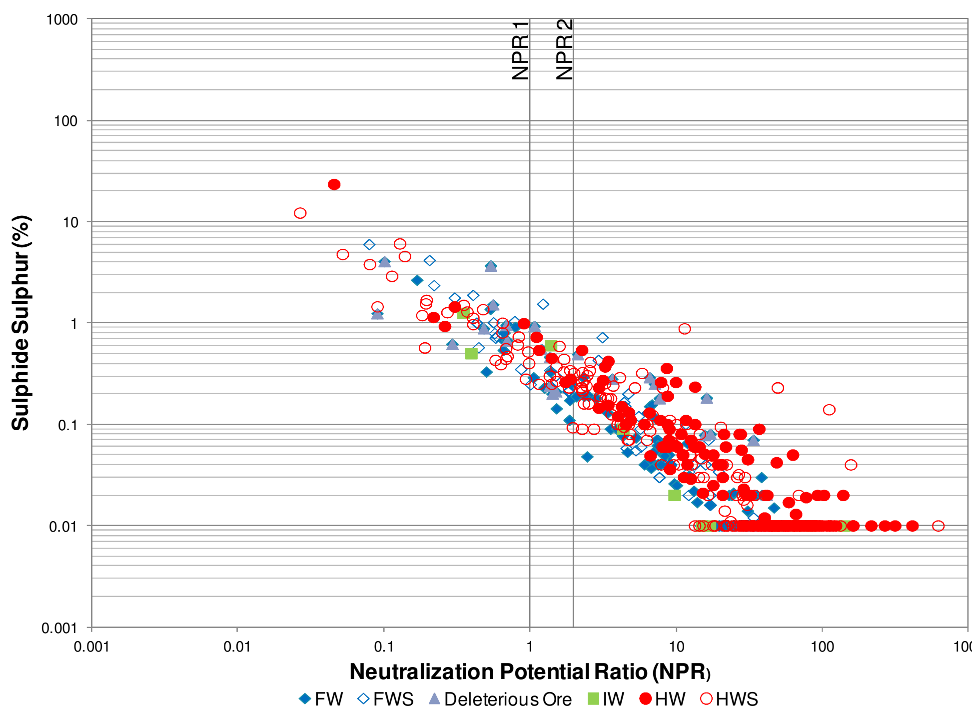

Figure 2: Neutralization Potential Ratio vs. Sulphide Sulphur

The static ABA sampling program completed in 2011 included a component of mineralogical work to improve the overall understanding of the waste rock ML/ARD characteristics and particularly the source of non-carbonate acid neutralizing potential in the waste rock. Selected samples have been characterized by qualitative and Rietveld XRD (R-XRD), optical microscopy and SEM to better understand the waste rock mineralogy in terms of ML/ARD. The work initiated in 2011 is on-going; however, initial results indicate the following:

Sulphides

- The most common sulphide mineral present is pyrite.
- Chalcopyrite is the next most abundant sulphide though usually at trace concentrations.
- Sphalerite (sometimes Cd bearing), pyrrhotite, pentlandite, cobalt-pentlandite and marcasite have also been identified as trace sulphide constituents.

Carbonates

- The most common carbonate minerals observed are dolomite-ankerite and siderite, with the latter more common in proximity to the ore. The siderite and the Fe component of the dolomite-ankerite carbonates are not expected to provide significant neutralization potential.

Silicates

- Quartz, plagioclase, k-feldspar, amphiboles (e.g. cummingtonite and hornblende), biotite, muscovite, and chlorite (Fe-rich and Mg-rich) are the major silicate rock forming minerals present.
- Plagioclase ranged from albite (Na rich) to anorthite (Ca rich) in composition.
- Silicate minerals occurring more typically in minor to trace amounts include garnet, epidote, staurolite, cordierite, and andalusite.

Oxides

- Oxide minerals identified include magnetite, hematite, goethite, ilmenite and chromite with granular magnetite in waste iron formation.

The mineralogical work underway is being directed to better understand the potential non-carbonate NP sources among the different waste rock types.

4.0 MODEL DESCRIPTION

Based on the mine plan, the total tonnage of waste rock is estimated to be 571 Mt (Hatch, 2011a). For waste rock management Baffinland will adopt operational management practices that will enhance permafrost development in the waste rock stockpile and minimize the active zone thickness. Waste rock management will also include the segregation at source of Potentially Acid Generating (PAG) rock from Non-Potentially Acid Generating (non-PAG) rock. Selective placement of PAG and non-PAG wastes will be utilized to encapsulate the PAG material within non-PAG rock prior to the on-set of acidic conditions.

The waste rock seepage quality model described in this report has been developed based on Baffinland's proposed waste management plan, with the following assumptions:

- Construction of the waste rock pile is complete and the mine site is in Closure;
- A thermal steady-state condition has been achieved in the waste pile, with established permafrost conditions occurring in all but the outer active layer of the pile;
- Hydrology of the pile is in a steady-state condition;
    - Seepage only occurs from the active layer;
    - Annual seepage flows equal annual infiltration rates, no infiltration is lost to the permafrost zone;
- Sulphide oxidation occurs within the active layer, but not within the permafrost zone;
- The rate of sulphide oxidation in the active layer is temperature dependent;
- PAG and non-PAG rock will be effectively segregated during mining such that;
    - PAG rock will be placed within the core of the stockpile;
    - Only non-PAG waste rock will be present within the active layer; and
- Waste management practices will be utilized in the waste rock stockpile construction to:
    - Promote permafrost development within the piles, and
    - Minimize the active layer thickness of the waste stockpiles.

In addition, the waste rock management plan includes construction of the waste rock stockpiles such that seepage will be contained and collected within two separate catchments (East and West) adjacent to the pit.

The mass balance seepage quality model utilizes mass loadings from waste rock using source terms derived from laboratory testing of humidity cells. Sulphate and metal loadings were calculated from the concentrations and volumes of leachates measured from the humidity cells. For scaling purposes, loadings of sulphate and metals were normalized to an estimated surface area (mg/m^2/wk) of the waste rock in the humidity cells based on surface areas calculated from grain size analysis. Estimated waste rock tonnages from the mine plan were used to determine the mass of the stockpile. The surface area normalized loading rates from the humidity cells and an estimated waste rock surface area in the stockpile were used to calculate the loadings of the parameters of interest from the stockpile.

Water infiltrating through the stockpile was assumed to flush accumulated loadings from the waste rock surface area within the active layer during the discharge months. The model is based on a monthly schedule to best reflect seasonal changes in the climatic and water flow conditions at the site. The calculated mass loadings were coupled with estimated water flows assumed from available hydrologic information in order to estimate concentrations of sulphate and metals in seepage from the stockpiles.

The mass balance model was used to calculate the load of sulphate and metals that will be released from the waste rock stockpile. However, the concentrations of these parameters in the stockpile effluent will depend on the solubility constraints for those parameters. The concentrations of certain parameters may reach conditions that cause them to exceed saturation with respect to some mineral phase. To address this, the geochemical program, PHREEQC was used to assess the solubility constraints on selected results of the mass balance model by using the calculated effluent quality from the mass balance model (including pH) as inputs. A description of the approach and results of this equilibration step are described in Section 6.

The water quality model included estimation of relevant parameters listed in the MMER effluent regulations (arsenic, copper, lead, nickel, and zinc). In addition, sulphate, trace metals, and major cation concentrations in the waste rock stockpile seepage were also estimated.

5.0 MODEL ASSUMPTIONS AND DATA SOURCES

In addition to the model assumptions discussed in Section 4, this section provides additional details and describes the data sources used in the model. Detailed data is provided in supporting references and Appendix A.

5.1 Physical Framework for the Model

5.1.1 Material Balance

The following bullets summarize the material balance:

- The material balance used for the model was based on the mine plan (Hatch, 2011a).
- Acid Base Accounting (ABA) results from previous geochemical testing (Knight Piésold (2008) and AMEC (2010)) and the recent geochemical testing program conducted by Baffinland (AMEC 2012) were used to define the proportions of non-PAG and PAG rock (Appendix A).
- Overall, assuming that an NPR ≤ 2 is representative of PAG material and based on the current understanding of waste distributions in the pit, an estimated 15% of the waste rock is expected to be PAG. The proportions of non-PAG and PAG rock in the pit are shown in Table 2.

Table 2: Waste Rock Classification in Mary River Deposit No.1

Waste Type	Number of samples	NPR* < 2		Modeled In-Pit Tonnage	Estimated PAG Tonnage
	N	n	%	t	t
HW	142	10	7.0	114,506,831	8,063,861
HWS	207	48	23.2	103,479,188	23,995,174
IW	11	3	27.3	2,982,893	813,516
DO	27	15	55.6	13,672,193	7,595,663
FWS	99	23	23.2	45,917,213	10,667,635
FW	127	14	11.0	291,226,388	32,103,696
Total	613	113	18.4	571,784,706	83,239,546

* NPR = mod. Sobek NP/AP **% PAG normalized to tonnage = 15**

- As discussed, the model assumes that permafrost has aggraded into the stockpiles and has reached a steady-state condition. Therefore, seepage only occurs from the active layer of the pile containing only non-PAG rock and there are no water losses to permafrost.
- The thickness of the active layer is assumed to be 10 meters based on long term monitoring of the Ekati Mine waste stockpiles (EBA, 2011) which indicated the active layer thickness ranges from 1 to 10 m.
- The mass of waste rock in the active layer was estimated assuming a uniform thickness across the surface of the designed waste stockpile (Hatch 2011b).

5.1.2 Hydrology

Water inputs to the waste rock stockpile were based on monthly precipitation values (Appendix A) provided by Knight Piésold (2011) and the following assumptions.

- The only water flow into the stockpiles is from direct precipitation on the stockpile footprint areas, either as rainfall or the melting of accumulated snowpack;
- Approximately 45% of precipitation in September and all precipitation in October through May occurs as snow and are stored on the stockpile. It was assumed that 70% of the stored snow was melted in June and the rest of the stored snow was melted in July (Knight Piésold 2011);
- An infiltration coefficient of 0.7 was assumed for the waste rock pile. The infiltration coefficient was defined as the proportion of the precipitation including the melted snow that percolated into the pile;

- Seepage discharging from the waste rock only occurs during the summer months (June to September inclusive); and
- The monthly infiltrating water will completely flush the accumulated oxidation products from the active layer within the waste rock piles.

5.2 Geochemical Source Terms

- Expected loading rates from the waste rock were derived from humidity cell data. The humidity cell testing program was conducted for 53 weeks on 10 rock samples from the Mary River project in early 2008. In May 2011, humidity cell testing was initiated on an additional 9 rock samples; data for these samples are available at this time for 21 weeks;
  - The samples tested in the humidity cells were mainly waste rock samples with NPR<2, and the sulphide contents of those rock samples were higher than median sulphide content in the waste rock samples that underwent the static testing. Therefore, the resulting source terms may be higher than what will be expected from the waste rock stockpile;
  - Surface areas of humidity cell samples were estimated at 7 to 12 m^2/kg based on grain-size analysis;
  - Leachates from several waste rock samples had somewhat lower pH (5.5 to 6.5), but none of the PAG rock samples produced strongly acidic drainage over the course of the humidity cell testing;
  - Loading rates used for the non-PAG leaching presently being modeled were based on median release rates calculated from selected humidity cells (excluding weak acid cells) (Appendix A);
- Sulphide oxidation rates were assumed to be 50% of laboratory rates during the months with mean monthly temperature above zero (June to August) and 15% during the remainder of the year (months with average below freezing temperatures) due to reduced temperatures (MEND, 1996);
- Detection limit values were handled using the following protocol (EPA, 1991):
  - For elements that reported >50% of their humidity cell leachate concentrations below their respective method detection limit (MDL) (antimony, arsenic, cadmium, chromium, copper, iron, lead, mercury, selenium, silver, thallium and zinc) the <MDL values were set to equal half the applicable detection limit.
  - For the remaining elements, <MDL values were set to equal the applicable MDL value;
- The effective reactive surface area of waste rock in the pile was assumed to be 50 m^2/tonne;

  - Estimates of the surface area for the Project waste rock are not available. Therefore, the estimate (50 m^2/tonne) was based on a review of published and unpublished data including a recent study by AMEC on the grain size / surface area of waste rock at a large open pit copper porphyry project. Data from these sources indicated waste rock surface areas ranging from 13 to 52 m^2/tonne;
- The pH of the waste rock stockpile seepage was estimated based on the median of the pH of the humidity cells selected for determining loading rates;
- An ARD onset time of 5 years was assumed for the PAG mine rock in the stockpiles based on the estimated average carbonate neutralization potential (Carbonate NP) depletion time derived from humidity cell testing of PAG materials;
  - Carbonate NP depletion was calculated based on average release rate of calcium and magnesium during steady-state conditions, assuming carbonate was the only source for NP, The Carbonate NP values from the ABA results were used to estimate the initial NP of the materials; and
  - Water quality at the site will be regulated using MMER values.

6.0 MODELED WASTE ROCK STOCKPILE SEEPAGE QUALITY

The estimated drainage concentrations for the model base case are provided in Table 3. As discussed previously, these mass balance derived values may exceed geochemical solubility limits and therefore, the results were checked through geochemical equilibration in PHREEQC using the Minteq v4 database. The resulting equilibrated values are also provided in Table 3.

The equilibration step assumed the estimated pH of 6.9 and that waters were oxidizing and in equilibrium with atmospheric O_2. In the absence of site specific secondary mineral precipitate information, a set of solid phases were identified that may reasonably be expected to precipitate for the given conditions. For Ca and SO_4 gypsum ($CaSO_4 \cdot 2H_2O$) was assumed to be the most probable geochemical control and for Al, amorphous $Al(OH)_3$ was assumed, although both of these phases are under saturated in the modeled waters. As expected for the circum-neutral oxidizing conditions, the equilibrated Fe and Mn concentrations are also low with solubility effectively limited by ferrihydrite (poorly crystalline Fe oxyhydroxide) and manganite (MnO(OH)) respectively. It should be noted that manganite was selected as a suitable low temperature phase; however, it is possible that higher solubility Mn phases (or a mixed Fe-Mn oxyhydroxide) could be kinetically favoured that would result in somewhat higher equilibrated Mn concentrations. Thermodynamic data is not readily available for such phases.

The PHREEQC modeling identified other possible low temperature phases above saturation that could limit solubility of Al and SO_4 in this system (e.g. basaluminite $Al_4(SO4)(OH)_{10} \cdot 5(H_2O)$ and alunite $KAl_3(SO_4)_2(OH)_6$); however, whether these or other possible solid phase solubility controls are likely to be present would require further investigation.

Seepage concentrations were predicted on a monthly basis (June to September) with the maximum concentrations occurring during June. Estimated seepage concentrations (unequilibrated and equilibrated) by month are presented in Appendix B.

The highest concentrations are predicted by the model to occur during the month of June. This is due to the flushing of reaction products which accumulated over the previous winter season.

Table 3: Estimated Water Quality of Waste Rock Stockpile Seepage

Parameters	MMER values	Maximum (June)			
		West Catchment		East Catchment	
		Unequilibrated	Equilibrated	Unequilibrated	Equilibrated
pH	**6 – 9.5**	6.9	6.9	6.9	6.9
Sulphate (mg/L)		33	33	26	26
Arsenic (mg/L)	0.5	0.0025	0.0025	0.0020	0.0020
Copper (mg/L)	0.3	0.0031	0.0031	0.0025	0.0025
Lead (mg/L)	0.2	0.00020	0.00020	0.00016	0.00016
Nickel (mg/L)	0.5	0.0019	0.0019	0.0015	0.0015
Zinc (mg/L)	0.5	0.013	0.013	0.010	0.010
Aluminum (mg/L)		0.12	0.12	0.095	0.095
Antimony (mg/L)		0.0031	0.0031	0.0025	0.0025
Boron (mg/L)		0.025	0.025	0.020	0.020
Cadmium (mg/L)		0.000020	0.000020	0.000016	0.000016
Chromium (mg/L)		0.0029	0.0029	0.0023	0.0023
Cobalt (mg/L)		0.00079	0.00079	0.00063	0.00063
Iron (mg/L)		0.024	<0.002	0.019	<0.002
Manganese (mg/L)		0.0095	0.00004	0.0076	0.00004
Mercury (mg/L)		0.00057	0.00057	0.00045	0.00045
Molybdenum (mg/L)		0.010	0.010	0.0078	0.0078
Selenium (mg/L)		0.0077	0.0077	0.0051	0.0051
Silver (mg/L)		0.000064	0.000064	0.000051	0.000051
Thallium (mg/L)		0.00029	0.00029	0.00023	0.00023
Vanadium (mg/L)		0.0010	0.0010	0.00083	0.00083
Barium (mg/L)		0.064	0.064	0.051	0.051
Sodium (mg/L)		0.41	0.41	0.32	0.33
Potassium (mg/L)		12.4	12.4	9.9	9.9
Calcium (mg/L)		15.3	15.3	12.2	12.2
Magnesium (mg/L)		8.6	8.6	6.9	6.9

7.0 SENSITIVITY ANALYSIS

Sensitivity analysis was performed on the model to assess the impact of variation of the critical physical parameters on the model estimates. The scenarios for the sensitivity analysis are summarized in Table 4.

Table 4: Sensitivity Analysis on the Model Parameters

Model Parameters	Scenario	Reactive Surface Area (m^2/tonne)	Winter Reaction Factor	Summer Reaction Factor	Infiltration Coefficient	Flushing Ratio	Active Zone Thickness (m)
	Base case	50	0.15	0.5	0.7	1	10
Active layer thickness	Case A1	50	0.15	0.5	0.7	1	20
	Case A2	50	0.15	0.5	0.7	1	40
	Case A3	50	0.15	0.5	0.7	1	80 m from side, 15 m from top
Reactive Surface Area	Case B1	30	0.15	0.5	0.7	1	10
	Case B2	100	0.15	0.5	0.7	1	10
	Case B3	250	0.15	0.5	0.7	1	10
	Case B4	500	0.15	0.5	0.7	1	10
Active layer thickness and surface area	Case B5	500	0.15	0.5	0.7	1	80 m from side, 15 m from top
Infiltration Coefficient	Case C1	50	0.15	0.5	0.4	1	10
	Case C2	50	0.15	0.5	1	1	10
Flushing Ratio	Case D1	50	0.15	0.5	0.7	0.8	10
	Case D2	50	0.15	0.5	0.7	0.6	10
Reaction Rate	Case E1	50	0.5	0.5	0.7	1	10
	Case E2	50	1.0	1.0	0.7	1	10

Results of the sensitivity analysis are presented in Appendix B with a summary as follows:

- The reactive surface area and the infiltration coefficient are the key drivers on model results.
- Lowering the infiltration coefficient (i.e., increasing water losses prior to infiltration) increases concentrations proportional to the volumetric decrease in inflow.
- An increase in the active layer thickness or reactive surface area within the active layer results in an increase in discharge concentrations proportional to the increased surface area.
- In the extreme scenario, Case B5, where both the active zone thickness layer and the reactive surface area were increased to high values, the estimated seepage

concentrations approach MMER limits for copper (detection limit based loading value), and exceed MMER limits for zinc (detection limit based loading value).

- Variation of the winter reaction rates only affected seepage concentrations in June when oxidation products accumulated over the winter months were flushed from the stockpile.
- Reducing the flushing ratio from 1 to 0.6 shifts the maximum discharge concentration from June to September due to the accumulation of oxidation products over that time.

These results confirm that minimizing the reactive surface area within the dump will aid in the reduction of metal loads from the stockpiles. Increased active layer thicknesses and mine rock surface areas will result in increased concentrations of parameters in the stockpile seepage. As described in the model assumptions, surface area data from the Project waste rock are not available. Differences in the actual surface area of the waste rock could lead to notable differences in the expected seepage quality. This has been explored in the sensitivity analysis (Appendix B, Table B3).

Geochemical release rates were not addressed in the sensitivity analysis due to a lack of data. In general, the use of laboratory derived loadings in the model may overestimate actual sulphide oxidation and metal release rates in the field due to the more aggressive nature of laboratory humidity cell tests which are designed to accelerate the weathering process in sample materials. Further, the source terms are largely based on non-acidic PAG humidity cells with higher sulphide contents than may be expected for much of the non-PAG waste rock produced. This suggests that model loading rates might be overly aggressive. However, median humidity cell rates used in the model were at laboratory detection limits for many metals. This, combined with the near neutral pH inferred, suggests that limitations on availability of humidity cell data may be exerting only a limited bias into the loading source terms. However, additional kinetic testing of a wider range of non-PAG materials would provide more robust source terms for the model under current assumptions. Lower detection limits should be applied where possible on the parameters of concern.

8.0 UNCERTAINTIES

Uncertainties with this water quality model include the following:

- The water quality model is based on the mine plan, waste rock stockpile configuration, water balance and geochemical data. Changes to these inputs could significantly alter the results of the model;
- The current model is based on a number of assumptions as discussed in this report (permafrost extent, stockpile hydrology, acid drainage source terms, etc.) and should be updated where more appropriate data becomes available;
- The current model has considered the surface area based on a review of published and unpublished data from other mine projects which could be different from the actual surface area of the Project waste rock; and

- Current model estimates are based upon simplified estimates of the seepage pH. These pH values can have a significant impact on the estimated loadings and concentrations of metals predicted in the model.

9.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions can be made regarding the estimates of seepage quality from the proposed Mary River project waste rock stockpiles:

- Based on the assumptions and data used in the model, the results suggest that arsenic, copper, lead, nickel, and zinc concentrations in the waste rock stockpile seepage will be below MMER values;
- Estimates of the pH are difficult to make due to the sensitivity of pH to numerous factors not considered in this mass balance prediction. However, as a preliminary estimate, seepage from the stockpiles is expected to maintain a circum-neutral pH;
- The following recommendations are made to improve future modeling estimates:
    - Thermal modeling to estimate the permafrost zone and active layer thickness should be undertaken. This modeling should be done to both assess the formation of the permafrost in the stockpile, and the behavior of the stockpile under longer term (including changing) climatic conditions.
    - Additional geochemical sampling and testing to refine estimates of the volumes of non-PAG and PAG rock in the pit volumes;
    - Continuation of the kinetic testing program to refine ARD onset time and mass-release rates, including extended monitoring of those humidity cells which begin to produce acidic conditions; and
    - Investigate possible studies that could lead to a more direct assessment of the surface area of the waste rock.

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We trust the above report, along with enclosures satisfies your current requirements. If additional information is required, please do not hesitate to contact the undersigned.

AMEC Environment & Infrastructure
A Division of AMEC Americas Ltd.

Prepared by: Reviewed by:

Stephen Walker, Ph.D.
Senior Hydrogeochemist

Steve Sibbick, M.Sc., P. Geo.
Senior Associate Geochemist

JA/SW/SS/vc

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APPENDIX A

Table A1. Summary of Acid Base Accounting Results of Rock Samples

	Paste pH	Total Sulphur	Sulphate Sulphur	Sulphide Sulphur*	Total Carbon	AP	NP	Ca-NP	NPR	Ca-NPR
		(wt.%)				(kg $CaCO_3$/tonne)				
All Waste Rock										
No. of sample	613	613	613	613	613	613	613	613	613	613
Minimum	3.8	<0.005	<0.01	<0.01	0.005	0.31	<0.01	0.42	0.0001	0.002
Maximum	10	22	5.5	23	6.7	731	487	558	621	605
Mean	8.8	0.38	0.09	0.30	0.21	9.23	22	17	30	11
Standard Deviation	0.86	1.36	0.27	1.24	0.69	39	32	58	44	38
Median	8.7	0.08	0.03	0.03	0.02	0.94	15	1.67	19	3
10^{th} Percentile	7.9	0.01	0.01	0.01	0.01	0.31	7.80	0.75	0.70	0.11
90^{th} Percentile	9.8	0.73	0.18	0.59	0.40	18	36	34	67	15
Hanging Wall (HW)										
No. of sample	142	142	142	142	142	142	142	142	142	142
Minimum	7.3	<0.005	<0.01	<0.01	0.008	0.31	7.60	0.67	0.046	0.003
Maximum	10	22.2	0.6	23.4	3.8	731	129	320	413	285
Mean	8.9	0.31	0.06	0.26	0.20	8.26	29	17	45	20
Standard Deviation	0.57	1.87	0.08	1.97	0.41	61	23	34	57	43
Median	8.9	0.05	0.03	0.02	0.03	0.63	20	2.67	33	5.38
10^{th} Percentile	8.2	0.01	0.01	0.01	0.01	0.31	11	1.17	3.28	0.40
90^{th} Percentile	9.7	0.44	0.14	0.26	0.65	8	63	54	89	51
Hanging Wall Schist (HWS)										
No. of sample	207	207	207	207	207	207	207	207	207	207
Minimum	6.1	<0.005	<0.01	<0.01	0.005	0.31	<0.01	0.42	0.006	0.005
Maximum	10	17.8	5.5	12.2	6.7	381	487	558	621	605
Mean	8.3	0.49	0.12	0.38	0.17	12	25	15	28	8.70
Standard Deviation	0.57	1.51	0.41	1.15	0.74	36	49	62	52	45
Median	8.3	0.12	0.05	0.06	0.02	1.97	16	1.67	11	1.33
10^{th} Percentile	7.7	0.01	0.01	0.01	0.01	0.31	7.8	0.75	0.54	0.08
90^{th} Percentile	9.0	0.94	0.21	0.73	0.11	23	33	8.8	68	11
Footwall (FW)										
No. of sample	127	127	127	127	127	127	127	127	127	127
Minimum	4.8	<0.005	<0.01	<0.01	0.005	0.31	3.70	0.42	0.1691	0.005
Maximum	10	3.3	0.6	2.7	2.5	82.8	36	208	96	38
Mean	9.4	0.15	0.05	0.10	0.04	3.09	13	3.5	24	4.05
Standard Deviation	0.8	0.38	0.10	0.29	0.22	9.12	5.9	18	19	6.0
Median	9.6	0.03	0.02	0.01	0.02	0.31	11	1.33	25	2.56
10^{th} Percentile	8.8	0.01	0.01	0.01	0.01	0.31	7.5	0.42	1.90	0.19
90^{th} Percentile	10	0.27	0.11	0.19	0.04	5.94	22	3.2	47	7.6

Table A1. Summary of Acid Base Accounting Results of Rock Samples

	Paste pH	Total Sulphur	Sulphate Sulphur	Sulphide Sulphur*	Total Carbon	AP	NP	Ca-NP	NPR	Ca-NPR
		(wt.%)				(kg $CaCO_3$/tonne)				
Footwall (FWS)										
No. of sample	*99*	*99*	*99*	*99*	*99*	*99*	*99*	*99*	*99*	*99*
Minimum	*3.9*	*<0.005*	*<0.01*	*<0.01*	*0.005*	*0.31*	*<0.01*	*0.42*	*0.0001*	*0.002*
Maximum	*10.2*	*6.1*	*1.5*	*6.0*	*3.3*	*186.3*	*71*	*278*	*114*	*387*
Mean	*8.7*	*0.42*	*0.09*	*0.33*	*0.16*	*10.29*	*16*	*13*	*24*	*7.67*
Standard Deviation	*1.1*	*0.99*	*0.20*	*0.85*	*0.52*	*26.59*	*10*	*43*	*23*	*40*
Median	*9.1*	*0.06*	*0.03*	*0.02*	*0.02*	*0.50*	*13*	*1.25*	*19*	*2.40*
10^{th} Percentile	*7.7*	*0.01*	*0.01*	*0.01*	*0.01*	*0.31*	*7.7*	*0.50*	*0.57*	*0.09*
90^{th} Percentile	*9.8*	*1.09*	*0.17*	*0.87*	*0.15*	*27.25*	*26*	*12.8*	*54*	*6*
Deleterious Ore (FW 1300 & 1400)										
No. of sample	*27*	*27*	*27*	*27*	*27*	*27*	*27*	*27*	*27*	*27*
Minimum	*3.8*	*<0.005*	*<0.01*	*<0.01*	*0.010*	*0.31*	*<0.01*	*0.83*	*0.004*	*0.015*
Maximum	*9.7*	*4.4*	*1.1*	*4.1*	*5.3*	*127*	*92*	*439*	*42*	*180*
Mean	*8.2*	*0.89*	*0.21*	*0.67*	*1.51*	*21*	*29*	*126*	*9*	*22*
Standard Deviation	*1.2*	*1.09*	*0.27*	*1.00*	*1.71*	*31*	*23*	*143*	*13*	*42*
Median	*8.4*	*0.58*	*0.11*	*0.28*	*0.98*	*9*	*21*	*81*	*1*	*5.03*
10^{th} Percentile	*7.0*	*0.12*	*0.02*	*0.05*	*0.01*	*1.56*	*7.6*	*1.05*	*0.22*	*0.13*
90^{th} Percentile	*9.2*	*1.85*	*0.52*	*1.35*	*3.98*	*42*	*61*	*332*	*34*	*54*
Internal Wastes (IW)										
No. of sample	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*	*11*
Minimum	*7.9*	*0.008*	*<0.01*	*<0.01*	*0.007*	*0.31*	*4.70*	*0.58*	*0.35*	*0.037*
Maximum	*9.5*	*1.3*	*0.3*	*1.3*	*0.1*	*39.1*	*44*	*8.8*	*141*	*8.0*
Mean	*8.5*	*0.28*	*0.06*	*0.23*	*0.02*	*7.16*	*16*	*2.1*	*35*	*2.9*
Standard Deviation	*0.56*	*0.44*	*0.09*	*0.40*	*0.03*	*13*	*12*	*2.3*	*45*	*2.6*
Median	*8.5*	*0.03*	*0.02*	*0.01*	*0.02*	*0.31*	*14*	*1.4*	*15*	*2.67*
10^{th} Percentile	*8.0*	*0.01*	*0.01*	*0.01*	*0.01*	*0.31*	*5.3*	*0.67*	*0.40*	*0.08*
90^{th} Percentile	*9.3*	*0.88*	*0.16*	*0.60*	*0.03*	*19*	*26*	*2.5*	*83*	*5.3*

Notes:

AP = Acid potential in tonnes $CaCO_3$ equivalent per 1000 tonnes of material. AP is determined from calculated sulphide sulphur content: S(T) - S(SO_4).

NP = Neutralization potential in tonnes $CaCO_3$ equivalent per 1000 tonnes of material.

Ca-NP = Carbonate NP is calculated from TC originating from carbonates and is expressed in kg $CaCO_3$/tonne.

NPR = Net Potential Ratio = NP/AP; Carb-NPR = Carb-NP/AP

*Where NP or AP values are equal to or less than zero, NPR is calculated assuming detection limit (NP = 0.2 kg $CaCO_3$/tonne, AP = 0.03 kg $CaCO_3$/tonne).

Table A2. Summary of Aqua-regia Extracted Metal Content of Rock Samples

	Hg	Au	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo	Na	Ni	P	Pb	Sb	Se	Sn	Sr	Ti	Tl	U	V	Y	Zn
	µg/g	µg/g	µg/g	%	µg/g	µg/g	µg/g	µg/g	%	µg/g	µg/g	µg/g	µg/g	%	%	µg/g	%	µg/g	µg/g	%	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	%	µg/g	µg/g	µg/g	µg/g	µg/g
All Waste Rock																																	
No. of sample	564	376	376	617	617	617	617	617	617	617	617	617	617	617	617	617	617	617	616	564	617	376	617	617	617	617	617	617	617	617	617	376	617
Minimum	0.10	0.020	0.01	0.001	0.50	0.01	0.020	0.01	0.003	0.02	0.25	0.500	0.10	0.003	0.0001	2.00	0.002	2.300	0.10	0.001	0.10	2.00	0.26	0.10	0.70	0.50	0.22	0.00001	0.02	0.002	1.00	0.47	0.70
Maximum	0.20	1.4	11	13	260	3000	19	34	11	30	140	2400	480	70	7	370	15	35000	450	2.20	2410	6900	2174	25	20	12	410	1	20	100	460	26	3280
Mean	0.10	0.03	0.16	4.3	5.64	204	0.98	1.41	0.7	0.4	25	232	51.6	13	0.96	20	3.48	1512	6	0.05	113	561	13	1.87	1.77	1.64	14	0.14	1.13	8.60	78	4.59	61
Standard Deviation	0.004	0.07	0.59	2.7	20	366	1.26	5.81	1.5	1.4	21	310	57	15	1.14	23	3	3196	26	0.11	182	743	91	4.59	3.58	1.82	28	0.14	3.47	23.03	75	3.52	143
Median	0.10	0.02	0.08	3.9	0.70	81.0	0.64	0.09	0.2	0.1	19	110	30	7	0.48	15	2.60	570	2	0.02	64	320	4.20	0.80	0.70	0.90	6.50	0.10	0.20	1.30	58	3.70	42
10th Percentile	0.10	0.02	0.01	0.69	0.50	1.60	0.09	0.09	0.04	0.02	6	28.6	3.76	2.30	0.01	3	0.76	230	0.40	0.01	7.4	22	1.20	0.80	0.70	0.50	2.00	0.01	0.02	0.04	8.60	1.40	13
90th Percentile	0.10	0.02	0.33	8.0	7.50	498	2.40	1.70	2.2	0.5	51	590	120	38	2.60	39	7.60	3080	10	0.12	264	1350	19	1.94	2.54	4.88	24	0.34	2	8	170	9	100
Hanging Wall (HW)																																	
No. of sample	124	89	89	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	142	124	142	89	142	142	142	142	142	142	142	142	142	89	142
Minimum	0.10	0.02	0.01	0.06	0.50	0.22	0.02	0.01	0.03	0.02	1.10	10	1.20	0.87	0.004	2.00	0.30	130	0.10	0.01	6.80	23	0.39	0.10	0.70	0.50	1.50	0.002	0.02	0.002	1.00	0.67	3.80
Maximum	0.20	0.03	0.49	11	159	420	5.1	34	10	4.9	110	2400	240	65	4.7	75	14.0	35000	44.0	2.2	2410	2000	68	25	20	6.0	410	0.7	20	100	380	10	490
Mean	0.10	0.02	0.10	4.59	5.74	102	0.70	0.88	1.64	0.28	31	280	83	7.24	0.64	20	3.89	1681	2.20	0.11	148	357	4.51	2.31	1.91	1.56	27	0.16	0.96	10	115	3.6	56
Standard Deviation	0.01	0.002	0.09	2.71	21	107	1.03	4.06	1.93	0.67	19	335	52	7.71	0.67	14	3.35	3145	4.67	0.22	267	329	6.88	5.61	3.26	1.84	50	0.14	2.76	25	89	1.6	52
Median	0.10	0.02	0.07	3.95	0.70	72	0.20	0.09	1.00	0.08	26	170	92	5.40	0.45	17	2.60	940	0.80	0.05	94	280	2.65	0.80	0.70	0.50	11	0.13	0.10	0.12	97	3.7	43
10th Percentile	0.10	0.02	0.03	1.60	0.50	5.05	0.05	0.09	0.10	0.02	13	68	8.77	1.71	0.05	4.10	0.76	282	0.30	0.01	36	176	0.93	0.80	0.70	0.50	3.32	0.03	0.02	0.02	27	1.8	16
90th Percentile	0.10	0.02	0.20	8.40	6.66	284	2.28	2.00	4.10	0.79	55	620	140	14	1.40	37	9.40	3390	4.29	0.22	207	480	8.91	2.00	6.00	6.00	68	0.29	5.00	70	279	5.2	103
Hanging Wall Schist (HWS)																																	
No. of sample	194	136	136	208	208	208	208	208	208	208	208	208	208	208	208	208	208	208	208	194	208	136	208	208	208	208	208	208	208	208	208	136	208
Minimum	0.10	0.02	0.01	0.001	0.50	0.01	0.02	0.04	0.00	0.02	0.25	0.50	0.10	0.003	0.0001	2.00	0.002	2.30	0.10	0.00	0.10	2.0	0.26	0.10	0.70	0.50	0.22	0.00001	0.02	0.003	1.0	0.47	0.70
Maximum	0.10	0.16	1.3	13	170	1300	5.10	34	11	4.00	140	1500	480	66	4.00	370	11	14000	100	0.27	1040	6900	230	25	20	12	100	0.59	20	100	460	17	460
Mean	0.10	0.02	0.14	4.88	7.87	100	1.14	1.18	0.62	0.24	32	292	51	17	0.47	23	4.46	1276	4.31	0.02	163	429	6.07	1.78	1.61	1.52	10.62	0.08	0.82	6.64	88	3.1	55
Standard Deviation	0	0.015	0.19	2.64	20	197	1.12	5.23	1.75	0.65	24	293	57	14	0.73	32	2.59	1667	11	0.03	160	765	17	4.27	3.23	1.71	15	0.10	3.18	21	80	2.4	55
Median	0.10	0.02	0.08	5.00	1.70	14	0.81	0.12	0.12	0.06	27	210	31	13	0.09	16	4.05	680	1.50	0.01	120	190	2.90	0.80	0.70	0.90	5.80	0.04	0.05	0.91	70	2.7	44
10th Percentile	0.10	0.02	0.01	0.60	0.50	1.07	0.13	0.09	0.02	0.02	6.84	21	3.32	5.04	0.01	2.00	1.10	240	0.40	0.01	15	9.0	1.17	0.80	0.70	0.50	1.50	0.01	0.02	0.04	8	0.91	12
90th Percentile	0.10	0.02	0.30	8.03	16	300	2.73	0.74	0.56	0.28	61	720	120	41	1.60	43	8.16	2930	9.21	0.04	373	1050	10	1.90	2.00	3.72	22	0.19	0.53	3.53	173	5.4	100
Footwall (FW)																																	
No. of sample	112	55	55	127	127	127	127	127	127	127	127	127	127	127	127	127	127	127	126	112	127	55	127	127	127	127	127	127	127	127	127	55	127
Minimum	0.10	0.02	0.01	0.35	0.50	2.60	0.03	0.06	0.01	0.02	1.20	8.00	0.70	0.72	0.01	2.00	0.36	110	0.10	0.00	2.30	71	0.91	0.80	0.70	0.50	1.60	0.01	0.02	0.11	1.00	2.2	6.40
Maximum	0.10	1.40	11.00	9.30	13	3000	5.10	34	1.60	30	79	2200	330	62	6.00	92	15	18000	53	0.18	870	2400	2174	25	20	11	170	0.63	20	100	210	26	3280
Mean	0.10	0.05	0.36	3.53	1.39	362	0.84	2.56	0.32	0.85	14	182	41	4.80	1.97	24	2.36	629	4.20	0.06	52	694	35	1.90	2.34	2.21	12	0.24	2.08	14	54	9.2	106
Standard Deviation	0	0.19	1.5	2.27	2.12	528	0.92	8.22	0.29	2.88	13	363	57	5.67	1.22	16	2.32	1569	8.35	0.04	133	559	194	4.54	4.89	2.21	21	0.14	4.78	28	48	5.3	298
Median	0.10	0.02	0.10	2.80	0.50	180	0.56	0.12	0.22	0.18	9.30	80	20	4.00	1.90	22	1.50	460	2.00	0.05	9.40	590	10	0.80	0.70	1.30	6.60	0.24	0.64	3.00	38	8.9	61
10th Percentile	0.10	0.02	0.02	1.22	0.50	64	0.17	0.09	0.09	0.02	4.60	35	4.02	1.70	0.44	6.60	0.75	260	0.40	0.02	4.96	158	3.40	0.80	0.70	0.50	3.10	0.05	0.20	1.30	11	3.4	22
90th Percentile	0.10	0.02	0.42	7.30	6.00	700	2.14	3.00	0.63	3.06	26	334	104	7.70	3.64	43	5.24	828	8.55	0.11	104	1320	39	2.00	6.00	6.00	21	0.43	5.00	70	140	16	164
Footwall (FWS)																																	
No. of sample	96	63	63	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	96	101	63	101	101	101	101	101	101	101	101	101	63	101
Minimum	0.10	0.02	0.01	0.14	0.50	0.58	0.14	0.09	0.03	0.02	2.10	12	0.60	1.70	0.00	2.00	0.22	70	0.30	0.00	3.50	23	0.76	0.10	0.70	0.50	1.60	0.004	0.02	0.03	1.00	1.1	5.70
Maximum	0.10	0.22	1.30	12	17	2200	5.20	34.00	1.60	4.00	84	1500	380	69	6.50	140	9.30	23000	360	0.23	450	5400	410	25	20	10	42	0.48	20	100	290	14	140
Mean	0.10	0.03	0.13	4.17	1.72	391	1.08	1.58	0.28	0.23	16	136	30	14	1.40	16	2.72	1323	11	0.04	57	1059	15	1.60	1.47	1.56	7.93	0.15	1.13	6.69	55	5.7	34
Standard Deviation	0	0.03	0.22	2.64	2.90	469	0.86	6.36	0.30	0.67	14	196	53	16	1.34	17	1.95	3276	39	0.03	92	994	42	3.99	3.35	1.52	6.83	0.12	3.41	19	51	2.5	26
Median	0.10	0.02	0.06	3.60	0.50	230	0.83	0.10	0.18	0.11	12	75	13	7.70	1.10	11	2.20	380	2.40	0.03	17	820	6.20	0.80	0.70	1.00	5.90	0.12	0.38	2.00	38	5.4	26
10th Percentile	0.10	0.02	0.01	0.86	0.50	3.10	0.38	0.09	0.07	0.02	5.10	29	2.50	2.90	0.01	2.00	0.85	150	0.80	0.01	7.10	150	2.30	0.80	0.70	0.50	2.60	0.02	0.02	0.49	8.00	3.0	9.40
90th Percentile	0.10	0.02	0.41	7.50	4.50	1000	2.00	0.93	0.67	0.20	31	310	65	46	3.30	32	5.20	2300	16	0.08	150	2460	26	0.80	1.30	3.00	16	0.31	1.60	6.50	130	8.8	68
Deleterious Ore (FW 1300 & 1400)																																	
No. of sample	27	25	25	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	25	27	27	27	27	27	27	27	27	27	25	27
Minimum	0.10	0.02	0.02	0.07	0.50	0.08	0.12	0.09	0.00	0.02	2.20	12	2.40	0.69	0.004	2.00	0.05	200	1.00	0.00	8.70	2.0	1.00	0.80	0.70	0.50	0.55	0.002	0.02	0.05	4.00	0.57	6.20
Maximum	0.10	0.14	1.10	6.90	260	1900	6.40	1.50	1.20	0.38	54	920	250	70	3.90	47	7.60	32000	450	0.07	550	2800	32	0.90	3.50	2.50	11.00	0.44	1.60	5.20	120	7.6	61
Mean	0.10	0.03	0.23	1.65	25	169	0.87	0.29	0.26	0.09	19	86	40	44	0.48	6.22	1.77	7607	28	0.01	56	424	8.01	0.80	1.01	0.92	3.50	0.06	0.20	1.07	25	3.8	22
Standard Deviation	0	0.03	0.25	2.34	58	436	1.27	0.34	0.25	0.09	15	181	49	23	1.11	9.28	1.93	8342	86	0.02	102	676	8.45	0.02	0.68	0.57	2.70	0.11	0.39	1.44	25	1.5	14
Median	0.10	0.02	0.16	0.41	2.40	2.20	0.45	0.12	0.19	0.05	17	42	31	51	0.01	2.00	1.10	4200	3.80	0.01	34	93	6.00	0.80	0.70	0.60	2.50	0.02	0.03	0.42	22	3.4	16
10th Percentile	0.10	0.02	0.04	0.12	0.50	0.58	0.18	0.09	0.05	0.02	4.46	14	7.74	9.44	0.01	2.00	0.18	306	1.20	0	10	8.6	1.20	0.80	0.70	0.50	0.99	0.004	0.02	0.13	5.60	2.4	9.96
90th Percentile	0.10	0.07	0.43	6.32	60	478	1.60	0.84	0.48	0.20	43	83	68	68	1.88	13	3.70	19200	55	0.04	83	1172	21	0.80	1.94	1.92	7.22	0.20	0.70	3.26	55	6.2	43
Internal Waste																																	
No. of sample	11	8	8	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	11	12	8	12	12	12	12	12	12	12	12	12	8	12
Minimum	0.10	0.02	0.01	0.12	0.50	0.01	0.04	0.09	0.01	0.02	3.30	32	1.10	3.40	0.01	2.00	0.13	360	0.30	0.01	6.30	2.0	0.87	0.80	0.70	0.50	0.27	0.002	0.02	0.08	1.00	0.57	7.60
Maximum	0.10	0.03	0.21	7.3	6.00	160	19	3.00	0.52	0.50	43	1260	73	63	0.35	47	8.20	1500	4.00	0.02	430	2400	22	25	6.00	6.00	12	0.10	5.00	75	130	6.5	90
Mean	0.10	0.02	0.06	3.3	1.06	17	2.48	0.36	0.17	0.11	19	322	16	28	0.04	10	3.37	853	1.96	0.01	102	677	4.76	2.92	1.21	1.09	4.11	0.03	0.44	7.06	55	2.5	36
Standard Deviation	0	0	0.07	3.1	1.58	45	5.28	0.83	0.19	0.15	14	346	20	21	0.10	14	3.01	351	1.45	0.00	119	930	6.47	6.96	1.52	1.57	3.77	0.03	1.44	21	48	2.0	27
Median	0.10	0.02	0.02	3.3	0.50	2.35	0.84	0.09	0.12	0.03	19	250	10	24	0.01	5.00	4.05	800	1.60	0.01	93	258	2.10	0.80	0.70	0.50	4.05	0.03	0.02	1.20	51	2.0	43
10th Percentile	0.10	0.02	0.01	0.14	0.50	0.76	0.06	0.09	0.01	0.02	3.53	38	1.42	5.69	0.01	2.00	0.16	497	0.33	0.01	6.70	2.7	1.40	0.80	0.70	0.50	0.46	0.002	0.02	0.20	2.10	0.78	7.91
90th Percentile	0.10	0.02	0.13	7.10	1.42	12	2.85	0.31	0.51	0.20	37	569	29	54	0.02	26	7.21	1290	3.97	0.01	159	1980	13	1.88	1.17	1.28	9.34	0.05	0.06	1.78	119	4.7	62

Table A3.
Monthly Precipitation Used for the Model
(Knight Piesold, 2011)

Parameter	Precipitation	Precipitation Derived from Discharge*
	mm	mm
January	7	
February	3.9	
March	9.1	
April	12.4	
May	15.4	
June	20.6	96.3
July	28.4	60.9
August	44.6	44.6
September	30.1	15.0
October	20.9	
November	15.0	
December	9.50	

* Assumes approximately 45% the precipitation in September and all of the precipitation in October through May falls as snow and was melted during June (70%) and July (30%).

Table A4.
Release Rates Used for the Model

Parameter	Release Rates
	$mg/m^2/week$
Sulphate	0.28
Arsenic	2.80E-05
Copper	4.94E-05
Lead	2.40E-06
Nickel	1.37E-05
Zinc	1.68E-04
Aluminum	1.24E-03
Cadmium	4.11E-07
Cobalt	6.67E-06
Chromium	4.94E-05
Iron	3.07E-04
Molybdenum	8.81E-05
Selenium	1.06E-04
Silver	1.06E-06
Antimony	2.62E-05
Barium	8.05E-05
Manganese	5.42E-04
Boron	2.16E-04
Vanadium	1.45E-05
Thallium	8.41E-06
Mercury	9.63E-06
Tin	1.11E-05
Stronsium	3.90E-04
Sodim	3.45E-03
Potassium	1.05E-01
Calcium	1.30E-01
Magnesium	7.28E-02

Note: rates based on median release rates of selected humidity cells

Baffinland Iron Mines Corporation

amec

APPENDIX B

Baffinland Iron Mines Corporation

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Table B-1. Monthly Predicted Water Quality of Waste Rock Stockpile Seepage

Parameters	MMER values	June				July				August				September			
		West Catchment		East Catchment		West Catchment		East Catchment		West Catchment		East Catchment		West Catchment		East Catchment	
		Unequilibrated	Equilibrated	Unequilibrated	Equilibrated	Unequilibrated	Equilibrated	Unequilibrated	Equilibrated	Unequilibrated	Equilibrated	Unequilibrated	Equilibrated	Unequilibrated	Equilibrated	Unequilibrated	Equilibrated
Sulphate (mg/L)		33	33	26	26	15	15	12	12	21	21	17	17	19	19	15	15
Arsenic (mg/L)	0.5	0.0025	0.0025	0.0020	0.0020	0.0012	0.0012	0.0009	0.0009	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001
Copper (mg/L)	0.3	0.0031	0.0031	0.0025	0.0025	0.0015	0.0015	0.0012	0.0012	0.0020	0.0020	0.0016	0.0016	0.0018	0.0018	0.0014	0.0014
Lead (mg/L)	0.2	0.00020	0.00020	0.00016	0.00016	0.00009	0.00009	0.00007	0.00007	0.00013	0.00013	0.00010	0.00010	0.00011	0.00011	0.00009	0.00009
Nickel (mg/L)	0.5	0.0019	0.0019	0.0015	0.0015	0.0009	0.0009	0.0007	0.0007	0.0012	0.0012	0.0010	0.0010	0.0011	0.0011	0.0008	0.0008
Zinc (mg/L)	0.5	0.013	0.013	0.010	0.010	0.006	0.006	0.005	0.005	0.008	0.008	0.007	0.007	0.007	0.007	0.006	0.006
Aluminum (mg/L)		0.12	0.12	0.095	0.095	0.055	0.055	0.044	0.044	0.075	0.075	0.060	0.060	0.067	0.07	0.054	0.054
Antimony (mg/L)		0.0031	0.0031	0.0025	0.0025	0.0014	0.0014	0.0011	0.0011	0.0020	0.0020	0.0016	0.0016	0.0017	0.0017	0.0014	0.0014
Boron (mg/L)		0.025	0.025	0.020	0.020	0.012	0.012	0.009	0.009	0.016	0.016	0.013	0.013	0.014	0.014	0.012	0.012
Cadmium (mg/L)		0.000020	0.000020	0.000016	0.000016	0.000009	0.000009	0.000007	0.000007	0.000012	0.000012	0.000010	0.000010	0.000011	0.000011	0.000009	0.000009
Chromium (mg/L)		0.0029	0.0029	0.0023	0.0023	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.001	0.002	0.002	0.001	0.001
Cobalt (mg/L)		0.00079	0.00079	0.00063	0.00063	0.0004	0.0004	0.0003	0.0003	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004
Iron (mg/L)		0.024	<0.002	0.019	<0.002	0.011	<0.002	0.009	<0.002	0.015	<0.002	0.012	<0.002	0.014	<0.002	0.011	<0.002
Manganese (mg/L)		0.0095	0.00004	0.0076	0.00004	0.004	0.00003	0.004	0.00003	0.006	0.00004	0.005	0.00003	0.005	0.00003	0.004	0.00003
Mercury (mg/L)		0.00057	0.00057	0.00045	0.00045	0.00026	0.00026	0.00021	0.00021	0.00036	0.00036	0.00029	0.00029	0.00032	0.00032	0.00026	0.00026
Molybdenum (mg/L)		0.010	0.010	0.0078	0.0078	0.0046	0.0046	0.0036	0.0036	0.0062	0.0062	0.0050	0.0050	0.0056	0.0056	0.0044	0.0044
Selenium (mg/L)		0.0077	0.0077	0.0051	0.0051	0.0030	0.0030	0.0024	0.0024	0.0041	0.0041	0.0033	0.0033	0.0036	0.0036	0.0029	0.0029
Silver (mg/L)		0.000064	0.000064	0.000051	0.000051	0.000030	0.000030	0.000024	0.000024	0.000041	0.000041	0.000033	0.000033	0.000036	0.000036	0.000029	0.000029
Thallium (mg/L)		0.00029	0.00029	0.00023	0.00023	0.00014	0.00014	0.00011	0.00011	0.00019	0.00019	0.00015	0.00015	0.00017	0.00017	0.00013	0.00013
Vanadium (mg/L)		0.0010	0.0010	0.00083	0.00083	0.00048	0.00048	0.00038	0.00038	0.00066	0.00066	0.00052	0.00052	0.00059	0.00059	0.00047	0.00047
Barium (mg/L)		0.064	0.064	0.051	0.051	0.0297	0.0297	0.0237	0.0237	0.0406	0.0406	0.0324	0.0324	0.0362	0.0362	0.0289	0.0289
Sodium (mg/L)		0.41	0.41	0.32	0.33	0.19	0.19	0.15	0.15	0.26	0.26	0.21	0.21	0.23	0.23	0.18	0.18
Potassium (mg/L)		12.4	12.4	9.9	9.9	5.8	5.8	4.6	4.6	7.9	7.9	6.3	6.3	7.0	7.0	5.6	5.6
Calcium (mg/L)		15.3	15.3	12.2	12.2	7.1	7.1	5.7	5.7	9.7	9.7	7.8	7.8	8.7	8.7	6.9	6.9
Magnesium (mg/L)		8.6	8.6	6.9	6.9	4.0	4.0	3.2	3.2	5.4	5.4	4.4	4.4	4.9	4.9	3.9	3.9

Table B-2. Predicted Water Quality of Waste Rock Stockpile Seepage
Sensitivity Analysis on Active Layer Thickness

Parameters	Case	Base Case		Case A1		Case A2		Case A3	
	Active layer	10 m		20 m		40 m		80 m from the side and 15 m from the top	
	Infiltration Coefficient	0.7		0.7		0.7		0.7	
	Flushing ratio	1		1		1		1	
	Winter reaction ratio	0.15		0.15		0.15		0.15	
	Summer reaction ratio	0.5		0.5		0.5		0.5	
	Reactive surface area	50 m^2/tonne		50 m^2/tonne		50 m^2/tonne		50 m^2/tonne	
		West Catchment	East Catchment	West Catchment	East Catchment	West Catchment	East Catchment	West Catchment	East Catchment
	MMER values	Unequilibrated		Unequilibrated		Unequilibrated		Unequilibrated	
Sulphate (mg/L)		33	26	66	52	131	105	173	98
Arsenic (mg/L)	0.5	0.0025	0.0020	0.0050	0.0040	0.0100	0.0080	0.0132	0.0074
Copper (mg/L)	0.3	0.0031	0.0025	0.0062	0.0050	0.012	0.0100	0.0165	0.0093
Lead (mg/L)	0.2	0.00020	0.00016	0.00040	0.00032	0.00079	0.00063	0.00105	0.00047
Nickel (mg/L)	0.5	0.0019	0.0015	0.0037	0.0030	0.0075	0.0060	0.0099	0.0056
Zinc (mg/L)	0.5	0.013	0.010	0.026	0.021	0.051	0.041	0.068	0.038
Aluminum (mg/L)		0.12	0.095	0.24	0.19	0.47	0.38	0.63	0.35
Antimony (mg/L)		0.0031	0.0025	0.0062	0.0049	0.0123	0.0099	0.0163	0.0092
Boron (mg/L)		0.025	0.020	0.051	0.041	0.102	0.082	0.135	0.076
Cadmium (mg/L)		0.000020	0.000016	0.000039	0.000031	0.000078	0.000062	0.000103	0.000058
Chromium (mg/L)		0.0029	0.0023	0.0058	0.0047	0.0116	0.0093	0.0154	0.0087
Cobalt (mg/L)		0.00079	0.00063	0.0016	0.0013	0.0031	0.0025	0.0042	0.0023
Iron (mg/L)		0.024	0.019	0.048	0.039	0.096	0.077	0.127	0.072
Manganese (mg/L)		0.0095	0.0076	0.019	0.015	0.038	0.030	0.050	0.028
Mercury (mg/L)		0.00057	0.00045	0.0011	0.0009	0.0023	0.0018	0.0030	0.0017
Molybdenum (mg/L)		0.010	0.0078	0.020	0.016	0.039	0.031	0.052	0.029
Selenium (mg/L)		0.0077	0.0051	0.015	0.010	0.031	0.021	0.041	0.019
Silver (mg/L)		0.000064	0.000051	0.00013	0.00010	0.00026	0.00021	0.00034	0.00019
Thallium (mg/L)		0.00029	0.00023	0.00058	0.00047	0.0012	0.0009	0.0015	0.0009
Vanadium (mg/L)		0.0010	0.00083	0.0021	0.0017	0.0041	0.0033	0.0055	0.0031
Barium (mg/L)		0.064	0.051	0.13	0.10	0.26	0.20	0.34	0.19
Sodium (mg/L)		0.41	0.32	0.81	0.65	1.63	1.30	2.15	1.21
Potassium (mg/L)		12.4	9.9	24.8	19.8	49.6	39.6	65.5	37.0
Calcium (mg/L)		15.3	12.2	30.6	24.5	61.2	48.9	80.9	45.7
Magnesium (mg/L)		8.6	6.9	17.2	13.7	34.3	27.4	45.4	25.6

Table B-3. Predicted Water Quality of Waste Rock Stockpile Seepage
Sensitivity Analysis on Reactive Surface Area

Parameters	Case	Base Case		Case B1		Case B2		Case B3		Case B4		Case B5	
	Active layer	10 m		10 m		10 m		10 m		10 m		80 m from the side and 15 m from the top	
	Infiltration Coefficient	0.7		0.7		0.7		0.7		0.7		0.7	
	Flushing ratio	1		1		1		1		1		1	
	Winter reaction ratio	0.15		0.15		0.15		0.15		0.15		0.15	
	Summer reaction ratio	0.5		0.5		0.5		0.5		0.5		0.5	
	Reactive surface area	50 m^2/tonne		30 m^2/tonne		100 m^2/tonne		250 m^2/tonne		500 m^2/tonne		500 m^2/tonne	
		West Catchment	**East Catchment**	**West Catchment**	**East Catchment**	**West Catchment**	**East Catchment**	**West Catchment**	**East Catchment**	**West Catchment**	**East Catchment**	**West Catchment**	**East Catchment**
	MMER values	**Unequilibrated**		**Unequilibrated**		**Unequilibrated**		**Unequilibrated**		**Unequilibrated**		**Unequilibrated**	
Sulphate (mg/L)		33	26	20	16	66	52	164	131	328	262	1,733	980
Arsenic (mg/L)	0.5	0.0025	0.0020	0.0015	0.0012	0.0050	0.0040	0.012	0.010	0.025	0.020	0.132	0.074
Copper (mg/L)	0.3	0.0031	0.0025	0.0019	0.0015	0.0062	0.0050	0.016	0.012	0.031	0.025	0.165	0.093
Lead (mg/L)	0.2	0.00020	0.00016	0.00012	0.00010	0.00040	0.00032	0.00099	0.00079	0.0020	0.0016	0.0105	0.0047
Nickel (mg/L)	0.5	0.0019	0.0015	0.0011	0.0009	0.0037	0.0030	0.0094	0.0075	0.019	0.015	0.099	0.056
Zinc (mg/L)	0.5	0.013	0.010	0.008	0.006	0.026	0.021	0.064	0.051	0.13	0.10	0.68	0.38
Aluminum (mg/L)		0.12	0.095	0.071	0.057	0.237	0.189	0.59	0.47	1.18	0.95	6.26	3.54
Antimony (mg/L)		0.0031	0.0025	0.0018	0.0015	0.0062	0.0049	0.015	0.012	0.031	0.025	0.163	0.092
Boron (mg/L)		0.025	0.020	0.015	0.012	0.051	0.041	0.13	0.10	0.25	0.20	1.35	0.76
Cadmium (mg/L)		0.000020	0.000016	0.000012	0.000009	0.000039	0.000031	0.000098	0.000078	0.00020	0.00016	0.00103	0.00058
Chromium (mg/L)		0.0029	0.0023	0.0017	0.0014	0.0058	0.0047	0.015	0.012	0.029	0.023	0.154	0.087
Cobalt (mg/L)		0.00079	0.00063	0.00047	0.00038	0.0016	0.0013	0.0039	0.0031	0.0079	0.0063	0.042	0.023
Iron (mg/L)		0.024	0.019	0.014	0.012	0.048	0.039	0.12	0.096	0.24	0.19	1.27	0.72
Manganese (mg/L)		0.0095	0.0076	0.0057	0.0046	0.019	0.015	0.047	0.038	0.095	0.076	0.50	0.28
Mercury (mg/L)		0.00057	0.00045	0.00034	0.00027	0.0011	0.0009	0.0028	0.0023	0.0057	0.0045	0.030	0.017
Molybdenum (mg/L)		0.010	0.0078	0.0059	0.0047	0.020	0.016	0.049	0.039	0.098	0.078	0.52	0.29
Selenium (mg/L)		0.0077	0.0051	0.0046	0.0031	0.015	0.010	0.039	0.026	0.077	0.051	0.41	0.19
Silver (mg/L)		0.000064	0.000051	0.000039	0.000031	0.00013	0.00010	0.00032	0.00026	0.00064	0.00051	0.0034	0.0019
Thallium (mg/L)		0.00029	0.00023	0.00018	0.00014	0.00058	0.00047	0.0015	0.0012	0.0029	0.0023	0.0154	0.0087
Vanadium (mg/L)		0.0010	0.00083	0.00062	0.00050	0.0021	0.0017	0.0052	0.0041	0.0103	0.0083	0.055	0.031
Barium (mg/L)		0.064	0.051	0.038	0.031	0.13	0.10	0.32	0.26	0.64	0.51	3.38	1.91
Sodium (mg/L)		0.41	0.32	0.24	0.19	0.81	0.65	2.03	1.62	4.06	3.25	21.5	12.1
Potassium (mg/L)		12.4	9.9	7.44	5.94	24.8	19.8	62.0	49.5	124	99.0	655	370
Calcium (mg/L)		15.3	12.2	9.19	7.34	30.6	24.5	76.6	61.2	153	122	809	457
Magnesium (mg/L)		8.6	6.9	5.15	4.11	17.2	13.7	42.9	34.3	85.8	68.6	454	256

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Table B-4. Predicted Water Quality of Waste Rock Stockpile Seepage
Sensitivity Analysis on Infiltration Coefficient

Parameters	Case	Base Case		Case C1		Case C2	
	Active layer	10 m		10 m		10 m	
	Infiltration Coefficient	0.7		0.4		1	
	Flushing ratio	1		1		1	
	Winter reaction ratio	0.15		0.15		0.15	
	Summer reaction ratio	0.5		0.5		0.5	
	Reactive surface area	50 m^2/tonne		50 m^2/tonne		50 m^2/tonne	
		West Catchment	East Catchment	West Catchment	East Catchment	West Catchment	East Catchment
	MMER values	Unequilibrated		Unequilibrated		Unequilibrated	
Sulphate (mg/L)		33	26	57	46	23	18
Arsenic (mg/L)	0.5	0.0025	0.0020	0.0044	0.0035	0.0017	0.0014
Copper (mg/L)	0.3	0.0031	0.0025	0.0055	0.0044	0.0022	0.0017
Lead (mg/L)	0.2	0.00020	0.00016	0.00035	0.00028	0.00014	0.00011
Nickel (mg/L)	0.5	0.0019	0.0015	0.0033	0.0026	0.0013	0.0010
Zinc (mg/L)	0.5	0.013	0.010	0.022	0.018	0.009	0.007
Aluminum (mg/L)		0.12	0.095	0.207	0.166	0.083	0.066
Antimony (mg/L)		0.0031	0.0025	0.0054	0.0043	0.0022	0.0017
Boron (mg/L)		0.025	0.020	0.045	0.036	0.018	0.014
Cadmium (mg/L)		0.000020	0.000016	0.000034	0.000027	0.000014	0.000011
Chromium (mg/L)		0.0029	0.0023	0.0051	0.0041	0.0006	0.0004
Cobalt (mg/L)		0.00079	0.00063	0.00138	0.00110	0.00204	0.00163
Iron (mg/L)		0.024	0.019	0.042	0.034	0.017	0.013
Manganese (mg/L)		0.0095	0.0076	0.0166	0.0133	0.0066	0.0053
Mercury (mg/L)		0.00057	0.00045	0.00099	0.00079	0.00040	0.00032
Molybdenum (mg/L)		0.010	0.0078	0.017	0.014	0.007	0.005
Selenium (mg/L)		0.0077	0.0051	0.0136	0.0090	0.0054	0.0036
Silver (mg/L)		0.000064	0.000051	0.000112	0.000090	0.000045	0.000036
Thallium (mg/L)		0.00029	0.00023	0.00051	0.00041	0.00072	0.00058
Vanadium (mg/L)		0.0010	0.00083	0.0018	0.0014	0.0002	0.0002
Barium (mg/L)		0.064	0.051	0.112	0.089	0.045	0.036
Sodium (mg/L)		0.41	0.32	0.71	0.57	0.28	0.23
Potassium (mg/L)		12.4	9.9	21.7	17.3	8.68	6.93
Calcium (mg/L)		15.3	12.2	26.8	21.4	10.7	8.57
Magnesium (mg/L)		8.6	6.9	15.0	12.0	6.0	4.8

Table B-5. Predicted Water Quality of Waste Rock Stockpile Seepage
Sensitivity Analysis on Flushing Ratio

Parameters	Case	Base Case				Case D1				Case D2			
	Active layer	10 m				10 m				10 m			
	Infiltration Coefficient	0.7				0.7				0.7			
	Flushing ratio	1				0.8				0.6			
	Winter reaction ratio	0.15				0.15				0.15			
	Summer reaction ratio	0.5				0.5				0.5			
	Reactive surface area	50 m^2/tonne				50 m^2/tonne				50 m^2/tonne			
		June		September		June		September		June		September	
		West Catchment	East Catchment	West Catchment	East Catchment	West Catchment	East Catchment	West Catchment	East Catchment	West Catchment	East Catchment	West Catchment	East Catchment
	MMER values	Unequilibrated		Unequilibrated		Unequilibrated		Unequilibrated		Unequilibrated		Unequilibrated	
Sulphate (mg/L)		33	26	19	15	27	22	28	22	22	18	41	33
Arsenic (mg/L)	0.5	0.0025	0.0020	0.0014	0.0011	0.0021	0.0016	0.0021	0.0017	0.0017	0.0014	0.0031	0.0025
Copper (mg/L)	0.3	0.0031	0.0025	0.0018	0.0014	0.0026	0.0021	0.0027	0.0021	0.0021	0.0017	0.0039	0.0031
Lead (mg/L)	0.2	0.00020	0.00016	0.00011	0.00009	0.00016	0.00013	0.00017	0.00014	0.00013	0.00011	0.00025	0.00020
Nickel (mg/L)	0.5	0.0019	0.0015	0.0011	0.0008	0.0015	0.0012	0.0016	0.0013	0.0013	0.0010	0.0023	0.0019
Zinc (mg/L)	0.5	0.013	0.010	0.007	0.006	0.011	0.008	0.011	0.009	0.009	0.007	0.016	0.013
Aluminum (mg/L)		0.12	0.095	0.067	0.054	0.098	0.078	0.102	0.081	0.080	0.064	0.15	0.12
Antimony (mg/L)		0.0031	0.0025	0.0017	0.0014	0.0025	0.0020	0.0026	0.0021	0.0021	0.0017	0.0039	0.0031
Boron (mg/L)		0.025	0.020	0.014	0.012	0.021	0.017	0.022	0.017	0.017	0.014	0.032	0.026
Cadmium (mg/L)		0.000020	0.000016	0.000011	0.000009	0.000016	0.000013	0.000017	0.000013	0.000013	0.000011	0.000024	0.000020
Chromium (mg/L)		0.0029	0.0023	0.0016	0.0013	0.0006	0.0005	0.0007	0.0005	0.0005	0.0004	0.0010	0.0008
Cobalt (mg/L)		0.00079	0.00063	0.00045	0.00036	0.00241	0.00192	0.00250	0.00200	0.00197	0.00158	0.0036	0.0029
Iron (mg/L)		0.024	0.019	0.014	0.011	0.020	0.016	0.021	0.017	0.016	0.013	0.030	0.024
Manganese (mg/L)		0.0095	0.0076	0.0054	0.0043	0.0078	0.0063	0.0081	0.0065	0.0064	0.0051	0.0119	0.0095
Mercury (mg/L)		0.00057	0.00045	0.00032	0.00026	0.00047	0.00038	0.00049	0.00039	0.00038	0.00031	0.00071	0.00057
Molybdenum (mg/L)		0.010	0.0078	0.0056	0.0044	0.0081	0.0065	0.0084	0.0067	0.0066	0.0053	0.0123	0.0098
Selenium (mg/L)		0.0077	0.0051	0.0036	0.0029	0.0064	0.0042	0.0056	0.0044	0.0052	0.0035	0.0084	0.0064
Silver (mg/L)		0.000064	0.000051	0.000036	0.000029	0.000053	0.000042	0.000055	0.000044	0.000044	0.000035	0.000080	0.000064
Thallium (mg/L)		0.00029	0.00023	0.00017	0.00013	0.00085	0.00068	0.00089	0.00071	0.00070	0.00056	0.0013	0.0010
Vanadium (mg/L)		0.0010	0.00083	0.00059	0.00047	0.00024	0.00019	0.00025	0.00020	0.00020	0.00016	0.00037	0.00029
Barium (mg/L)		0.064	0.051	0.036	0.029	0.053	0.042	0.055	0.044	0.043	0.035	0.080	0.064
Sodium (mg/L)		0.41	0.32	0.23	0.18	0.34	0.27	0.35	0.28	0.28	0.22	0.51	0.41
Potassium (mg/L)		12.4	9.9	7.0	5.6	10.2	8.2	10.6	8.5	8.4	6.7	15.5	12.4
Calcium (mg/L)		15.3	12.2	8.7	6.9	12.7	10.1	13.1	10.5	10.4	8.3	19.2	15.3
Magnesium (mg/L)		8.6	6.9	4.9	3.9	7.1	5.7	7.4	5.9	5.8	4.6	10.8	8.6

Note: Concentrations represent the seepage quality 2 years after mine closure

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Table B-6. Predicted Water Quality of Waste Rock Stockpile Seepage
Sensitivity Analysis on Reaction Rate Factor

Parameters	Case	Base Case		Case E1		Case E2	
	Active layer	10 m		10 m		10 m	
	Infiltration Coefficient	0.7		0.7		0.7	
	Flushing ratio	1		1		1	
	Winter reaction ratio	0.15		0.5		1	
	Summer reaction ratio	0.5		0.5		1	
	Reactive surface area	50 m^2/tonne		50 m^2/tonne		50 m^2/tonne	
		West Catchment	East Catchment	West Catchment	East Catchment	West Catchment	East Catchment
	MMER values	Unequilibrated		Unequilibrated		Unequilibrated	
Sulphate (mg/L)		33	26	87	69	174	139
Arsenic (mg/L)	0.5	0.0025	0.0020	0.0066	0.0053	0.0175	0.0140
Copper (mg/L)	0.3	0.0031	0.0025	0.0083	0.0066	0.0308	0.0246
Lead (mg/L)	0.2	0.00020	0.00016	0.00052	0.00042	0.0015	0.0012
Nickel (mg/L)	0.5	0.0019	0.0015	0.0050	0.0040	0.0085	0.0068
Zinc (mg/L)	0.5	0.013	0.010	0.034	0.027	0.105	0.084
Aluminum (mg/L)		0.12	0.095	0.31	0.25	0.78	0.62
Antimony (mg/L)		0.0031	0.0025	0.0082	0.0065	0.016	0.013
Boron (mg/L)		0.025	0.020	0.067	0.054	0.13	0.11
Cadmium (mg/L)		0.000020	0.000016	0.000052	0.000041	0.00026	0.00020
Chromium (mg/L)		0.0029	0.0023	0.0077	0.0062	0.015	0.012
Cobalt (mg/L)		0.00079	0.00063	0.0021	0.0017	0.0042	0.0033
Iron (mg/L)		0.024	0.019	0.064	0.051	0.19	0.15
Manganese (mg/L)		0.0095	0.0076	0.025	0.020	0.050	0.040
Mercury (mg/L)		0.00057	0.00045	0.0015	0.0012	0.0060	0.0048
Molybdenum (mg/L)		0.010	0.0078	0.026	0.021	0.055	0.044
Selenium (mg/L)		0.0077	0.0051	0.017	0.014	0.066	0.053
Silver (mg/L)		0.000064	0.000051	0.00017	0.00014	0.00066	0.00053
Thallium (mg/L)		0.00029	0.00023	0.00077	0.00062	0.0052	0.0042
Vanadium (mg/L)		0.0010	0.00083	0.0027	0.0022	0.0091	0.0072
Barium (mg/L)		0.064	0.051	0.17	0.14	0.34	0.27
Sodium (mg/L)		0.41	0.32	1.08	0.86	2.2	1.7
Potassium (mg/L)		12.4	9.9	32.8	26.2	65.6	52.4
Calcium (mg/L)		15.3	12.2	40.5	32.4	81.1	64.8
Magnesium (mg/L)		8.6	6.9	22.7	18.2	45.4	36.3

Appendix 5:
Interim Open Pit Water Quality Model Technical Memorandum

Annex 5
Interim Open Pit Water Quality Model Technical Memorandum

TECHNICAL MEMORANDUM

To	**Jim Millard, Baffinland**	Project #	**TC111523**
From	**Judy Andrina, AMEC** **Steve Walker AMEC**	cc	**Steve Sibbick, AMEC** **Richard Cook, Knight Piésold**
Tel	**905-568-2929**		
Email	**steve.walker@amec.com**		
Date	**16 January 2012**		

Subject **Interim Open Pit Water Quality Model, Mary River Project**

1.0 INTRODUCTION

AMEC was retained by Baffinland Iron Mines Corporation (Baffinland) to conduct seepage quality modeling for the proposed Deposit No.1 open pit to support an environmental impact statement (EIS). Ore will be mined from the Deposit No. 1 pit and shipped directly offsite for further processing. Based on the mine plan for Deposit No. 1, the open pit will be mined for a period of 21 years (Hatch 2011). The following memorandum report contains estimates of the preliminary open pit water quality during the 21 years of mine life for the proposed Mary River Project. The estimate is based on available laboratory data, and general assumptions regarding the physical qualities of the future open pit.

2.0 MODEL DESCRIPTION

Based on the mine plan (Hatch 2011), the Deposit No.1 will be mined for 21 years. During the mine operation the drainage within the pit/mined perimeter (hereafter referred to as "pit walls") will be managed by collecting at either perimeter drains (early in mine life) or to pit sump(s). The preliminary water quality model described in this memo has been developed to estimate the expected quality of water draining from the open pit during the mine operation.

The model developed is a mass balance model utilizing mass loadings from the pit wall surface areas. During the operational phase of the mine, some of the pit walls will be exposed long enough that acidic conditions may occur on potentially acid generating (PAG) surfaces. However, kinetic testing (humidity cell) results for the project have yet to produce any acidic conditions. Therefore, source terms derived from laboratory testing of humidity cells were used to derive source terms for the non-potentially acid generating (non-PAG) surfaces and non-acidic PAG surfaces. For acidic conditions on PAG rock surfaces, metals analysis of leachate

AMEC Environment & Infrastructure,
a division of AMEC Americas Limited
160 Traders Blvd. East, Suite 110
Mississauga, Ontario, Canada L4Z 3K7
Tel (905) 568-2929
Fax (905) 568-1686
www.amec.com

from Net Acid Generation (NAG) analyses were scaled and used to develop source terms. The use of NAG leachate analyses for the estimation of acidic sources terms is likely to result in prediction of worse water quality from acidic drainage than may actually occur.

For scaling purposes, loadings of sulphate and metals were normalized to an estimated surface area (mg/m^2/wk) of the waste rock in the humidity cells based on surface areas calculated from grain size analysis. The surface area normalized loading rates from the humidity cells and an estimated surface area for the pit wall were used to calculate the loadings of the parameters of interest from the pit during non-acidic conditions.

Direct precipitation was assumed to completely flush accumulated loadings from pit wall surface areas. The model is based on the site annual water balance derived from available hydrologic information. Calculated mass annual loadings from the pit walls were coupled with these estimated flows to estimate the annual mean concentrations of sulphate and metals in seepage from the pit.

However, the concentrations of these parameters in the pit seepage will depend on the solubility constraints. The concentrations of certain parameters may reach conditions that cause them to exceed saturation with respect to some mineral phase. To address this, preliminary equilibration using the geochemical program, PHREEQC was used to assess the solubility constraints on selected results of the mass balance model by using the calculated effluent quality (including pH) as inputs. A description of the approach and results of this equilibration step are described in Section 4.

The model included estimation of relevant parameters listed in the MMER effluent regulations (arsenic, copper, lead, nickel, and zinc). In addition, sulphate, trace metals, and major cation concentrations in the pit drainage were also estimated. Preliminary pit model results were estimated based on water quality at years 6, 10, 15 and 21.

3.0 MODEL ASSUMPTIONS AND DATA SOURCES

This section provides additional details and describes the data sources used in the model. Detailed data is provided in supporting references and Appendix A.

3.1 Physical Framework for the Model

3.1.1 Surface Area

- The exposed pit surface area used for the model was based on the mine plan and the block model (Hatch, 2011 & Hatch, 2012) for the mine years 6, 10, 15 and 21. The surface area was assigned for each rock type (e.g., hangingwall (HW), footwall (FW) hangingwall schist (HWS), footwall (FW), footwall schist (FWS), internal waste (IW), delerious ore (DO), ore and overburden). The proportion of non-PAG and PAG rock exposed on the pit surface area was assigned based on the current understanding of the percentage PAG for each material type as described in AMEC (2012a) and summarized in Table 1. Source terms were assigned to each of the surface areas on the basis of the proportion of non-PAG and PAG for that material type;

Table 1: Waste Rock Classification in Mary River Deposit No.1

Waste Type	Number of samples	NPR* < 2		Modeled In-Pit Tonnage	Estimated PAG Tonnage
	N	n	%	t	t
HW	142	10	7.0	114,506,831	8,063,861
HWS	207	48	23.2	103,479,188	23,995,174
IW	11	3	27.3	2,982,893	813,516
DO	27	15	55.6	13,672,193	7,595,663
FWS	99	23	23.2	45,917,213	10,667,635
FW	127	14	11.0	291,226,388	32,103,696
Total	613	113	18.4	571,784,706	83,239,546

* NPR = mod. Sobek NP/AP **% PAG normalized to tonnage = 15**

- The surface area that will be exposed longer than ARD on set time (currently estimated to be 5 years) was estimated by Hatch (2012). These exposed surface area estimates included HW, FW, HWS and FWS waste types; and

- The proportion of PAG for ore rock was initially assumed to be 20%; however, based on continuous mining of ore during operations no acidic drainage was incorporated from ore.

3.1.2 Hydrology

Water inputs to the pit were based on monthly precipitation values provided by Knight Piésold (2011) as shown in Appendix A and the following assumptions:

- The only water flow into the pit is from direct precipitation within the pit/mined footprint area, either as rainfall or the melting of accumulated snowpack; no additional natural drainage or catchments flow to the pit (Knight Piésold (2011);
- Approximately 45% of precipitation in September and all precipitation in October through May occurs as snow and are stored within the pit limit. It was assumed that 70% of the stored snow melted in June and the rest of the stored snow melted in July (Knight Piésold 2011);
- Runoff within the pit/mined footprint perimeter collects at either perimeter drains (early time) or to pit sump(s) for management during operations; and
- The infiltrating water will completely flush the accumulated oxidation products from the pit surfaces.

3.2 Geochemical Source Terms

- Expected loading rates from the pit surface area that contained non-PAG and PAG materials during non-acidic conditions were derived from humidity cell data (AMEC 2012b). The humidity cell testing program was conducted for 53 weeks on 10 representative rock samples collected from the Project area in early 2008. In May 2011, humidity cell testing was initiated on an additional 9 rock samples; data for these samples are available at this time for 21 weeks and summarized as follows:
    - The samples tested in the humidity cells were mainly waste rock samples with NPR<2, and the sulphide contents of those rock samples were higher than median sulphide content in the waste rock samples that underwent the static testing. Therefore, the resulting source terms could be higher than what would be expected from the non-PAG mine rock drainage;
    - Surface areas of humidity cell samples were estimated at 7 to 12 m^2/kg based on grain-size analysis;
    - Leachates from several waste rock samples had somewhat lower pH (5.5 to 6.5), but none of the PAG rock samples produced strongly acidic drainage over the course of the humidity cell testing;
- Loading rates used for the leaching of non-PAG and PAG rock during non-acidic conditions were based on median release rates calculated from selected humidity cells (excluding weak acid cells) (Appendix A);
- Loading rates from the pit rock surface area for PAG material under acidic conditions were derived from available weak acid humidity cell and NAG leachate results.
- The sulphate and metal loadings of ore materials were assumed to be the same as loadings from the waste rock materials;
- Overburden material was assumed to have no load contribution;
- Yearly average loadings were calculated based on the sum of summer month and freezing month loadings. Sulphide oxidation rates were assumed to be 50% of laboratory rates during the months with mean monthly temperature above zero (June to August) and 15% during the remainder of the year (months with freezing temperatures) due to reduced temperatures (MEND, 1996);
- Detection limit values were handled using the following protocol (EPA, 1991):
    - For elements that reported >50% of their humidity cell leachate concentrations below their respective method detection limit (MDL) (antimony, arsenic, cadmium, chromium, copper, iron, lead, mercury, selenium, silver, thallium and zinc) the <MDL values were set to equal half the applicable detection limit; and,
    - For the remaining elements, <MDL values were set to equal the applicable MDL value.

- The effective reactive surface area of the pit walls was assumed to be 50 times the calculated pit wall surface (calculated from pit dimensions) to allow for surface roughness and fracture influences (Morin and Hutt, 2004);
- Based on limited data, a simple estimate of pH for the pit water drainage was made based on mixing of the seepage generated from the non-PAG and PAG materials at the pit wall, in proportion to the surface area of those materials present (hydrogen ion concentration basis);
    - A median pH of the humidity cells (pH of 6.9) during non-acidic condition was selected to represent the non-PAG rock and non-acidic conditions for PAG rock.
    - A median pH of 2.7 from NAG testing of 49 rock samples with NPR<2 was used to represent the leachate pH from PAG rock under acidic conditions.
- An ARD onset time of 5 years was assumed for the PAG mine rock based on the estimated average carbonate neutralization potential (Carbonate NP) depletion time derived from humidity cell testing of PAG materials; and,
    - Carbonate NP depletion was calculated based on average release rate of calcium and magnesium during steady-state conditions, assuming carbonate was the only source for NP. The Carbonate NP values from the ABA results were used to estimate the initial NP of the materials.
- Water quality at the site will be regulated using MMER values.

4.0 MODELED PIT SEEPAGE QUALITY

The modeled seepage quality from the pit for years 6, 10, 15 and 21 are presented in Table 2. For the first ten years of operation, the predicted water quality meets MMER average values for pH and the metals indicated. Based on pit progress estimates provided by Hatch (2012) PAG rock exposed at year 6 that has the potential to remain undisturbed for the 5 year lag time required to begin generating acidic drainage. Therefore in the model, potential acidic drainage from portions of the pit walls are expected to occur after year 11 and impacts on the pit water quality are expected. For years 15 and 21 modeled metal concentrations are predicted to be less than MMER limits, but pH may be lower than the MMER limit of 6.

The equilibration step assumed the estimated pH and that waters were oxidizing and in equilibrium with atmospheric O_2. In the absence of site specific secondary mineral precipitate information, a set of solid phases were identified that may reasonably be expected to precipitate for the given conditions. For Ca and SO_4 gypsum ($CaSO_4{\bullet}2H_2O$) was assumed to be the most probable geochemical control, although it is under saturated in the modeled waters. For Al, $Al(OH)_3$ (amorphous) is saturated in all but the most acidic waters and precipitation of this phase would result in a small attenuation in Al concentration for these results. As expected for the circum-neutral oxidizing conditions, the equilibrated Fe and Mn concentrations are also low with solubility effectively limited by ferrihydrite (poorly crystalline Fe oxyhydroxide) and manganite (MnO(OH)) respectively. With increasingly acid conditions at later time, less attenuation of Fe and Mn is observed. It should be noted that manganite was selected as a suitable low temperature phase; however, it is possible that higher solubility Mn phases (or a mixed Fe-Mn oxyhydroxide) could be kinetically favoured that would result in somewhat higher equilibrated Mn concentrations. Thermodynamic data is not readily available for such phases.

5.0 UNCERTAINTIES

Uncertainties with this water quality model include the following:

- The water quality model is based on the currently available mine plan which includes estimates of the pit configuration and progress over time, as well as the site water balance and available geochemical data. Changes to these inputs could significantly alter the results of the model;
- The current model estimates are based upon limited geochemical data for acidic leachates. Results of the NP depleted cells that are currently in operation will be used to refine the source terms used for acidic drainage in the model; and,
- Estimates of the pit wall surface area are based on a review of published and unpublished data from the other mine projects which could be different from the actual surface of the pit walls. Significant changes in surface area could lead to significant changes in the estimated water quality.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions can be made regarding the estimates of pit seepage quality from the proposed Mary River project:

- Based on the assumptions and data used in the model, the results suggest that arsenic, copper, lead, nickel, and zinc concentrations in the pit seepage will be below MMER values during mine life.
- Estimates of pH are difficult to make due to the sensitivity of pH to numerous factors not considered in this mass balance prediction. As a preliminary estimate, seepage from the pit is expected to maintain a circum-neutral pH until year 10. Sometime after year 11 the on-set of some acidic drainage is predicted to lead to impacts on the pit water that may lead to pH values below the MMER minimum of pH 6.
- The following recommendations are made to improve future modeling estimates:
    - Continuation of the kinetic testing program to refine ARD onset time and mass-release rates during non-acidic as well as acidic conditions for waste rock, including extended monitoring of those humidity cells which begin to produce acidic conditions;
    - Additional geochemical sampling and testing to refine the volumes of non-PAG and PAG waste and ore at the projected pit limits; and

- Kinetic testing of a limited number of PAG and non-PAG ore materials representative of ore to be exposed at pit limits in order to improve prediction of future drainage quality from these exposures in the pit.

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TABLE

Baffinland Iron Mines Corporation

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Table 2. Preliminary Predicted Water Quality of Pit Seepage

Parameters	MMER values	Year 6		Year 10		Year 15		Year 21	
		Unequilibrated	Equilibrated	Unequilibrated	Equilibrated	Unequilibrated	Equilibrated	Unequilibrated	Equilibrated
pH	6 - 9.5	6.9	6.5	6.9	6.5	5.2	5.1	4.3	4.2
Sulphate (mg/L)		77	77	80	80	88	88	158	158
Arsenic (mg/L)	0.5	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.007
Copper (mg/L)	0.3	0.007	0.007	0.008	0.008	0.016	0.016	0.074	0.074
Lead (mg/L)	0.2	0.0005	0.0005	0.0005	0.0005	0.0007	0.0007	0.0022	0.0022
Nickel (mg/L)	0.5	0.004	0.004	0.005	0.005	0.018	0.018	0.11	0.11
Zinc (mg/L)	0.5	0.030	0.030	0.031	0.031	0.035	0.035	0.062	0.062
Aluminum (mg/L)		0.28	0.24	0.29	0.24	0.77	0.77	4.2	4.2
Antimony (mg/L)		0.007	0.007	0.007	0.007	0.007	0.007	0.008	0.008
Boron (mg/L)		0.060	0.060	0.062	0.062	0.067	0.067	0.11	0.11
Cadmium (mg/L)		0.00005	0.00005	0.00005	0.00005	0.00006	0.00006	0.00016	0.00016
Chromium (mg/L)		0.007	0.007	0.007	0.007	0.008	0.008	0.019	0.019
Cobalt (mg/L)		0.002	0.002	0.002	0.002	0.008	0.008	0.053	0.053
Iron (mg/L)		0.057	<0.002	0.059	<0.002	0.12	0.031	0.59	0.22
Manganese (mg/L)		0.15	0.0001	0.16	0.0001	0.20	0.10	0.57	0.57
Mercury (mg/L)		0.0013	0.0013	0.0014	0.0014	0.0014	0.0014	0.0016	0.0016
Molybdenum (mg/L)		0.023	0.023	0.024	0.024	0.024	0.024	0.027	0.027
Selenium (mg/L)		0.015	0.015	0.016	0.016	0.016	0.016	0.022	0.022
Silver (mg/L)		0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0008	0.0008
Thallium (mg/L)		0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0009	0.0009
Vanadium (mg/L)		0.0024	0.0024	0.0025	0.0025	0.0025	0.0025	0.0029	0.0029
Barium (mg/L)		0.022	0.022	0.023	0.023	0.024	0.024	0.034	0.034
Sodium (mg/L)		1.0	1.0	1.0	1.0	1.1	1.1	1.8	1.8
Potassium (mg/L)		29.2	29.2	30.1	30.1	30.2	30.2	34.9	34.9
Calcium (mg/L)		36.0	36.0	37.2	37.2	37.4	37.4	43.4	43.4
Magnesium (mg/L)		20.2	20.2	20.8	20.8	22.9	22.9	39.9	40.0

Note: Equilibrated concentrations assume equilibrium with amorphous $Al(OH)_3$, ferrihydrite and manganite where estimated concentrations exceed saturation indices for those phases.

APPENDIX A

Table A1.
Precipitation Data Used for the Model
(Knight Piésold, 2011)

Parameter	Precipitation	Precipitation Derives for Discharge
	mm	mm
January	7	
February	3.9	
March	9.1	
April	12.4	
May	15.4	
June	20.6	96.3
July	28.4	60.9
August	44.6	44.6
September	30.1	15.0
October	20.9	
November	15.0	
December	9.50	

Note: Approximately 45% the precipitation in September and all of the precipitation in October through May fell as snow and was melted during June (70%) and July (30%).

Table A2.
Release Rates Used for the Model

Parameter	Average Yearly Release Rates for Non Acidic Condition* mg/m^2/year	Average Yearly Release Rates for Non Acidic Condition** mg/m^2/year
Sulphate	5.97	164
Arsenic	0.0005	0.001
Copper	0.001	0.15
Lead	0.00004	0.004
Nickel	0.0003	0.26
Zinc	0.002	0.065
Aluminum	0.022	9.2
Cadmium	0.000004	0.0003
Cobalt	0.0001	0.12
Chromium	0.001	0.026
Iron	0.004	1.23
Molybdenum	0.002	0.0004
Selenium	0.001	0.011
Silver	0.00001	0.001
Antimony	0.001	0.000
Barium	0.002	0.019
Manganese	0.012	0.93
Boron	0.005	0.090
Vanadium	0.0002	0.0002
Thallium	0.0001	0.0004
Mercury	0.0001	0.0002
Tin	0.0002	0.00004
Strontium	0.008	0.033
Sodium	0.074	1.7
Potassium	2.3	3.6
Calcium	2.8	5.1
Magnesium	1.6	39

Notes:*Rates based on median release rates of selected humidity cells
**Scaled from NAG testing results

Appendix 6:
Phase 1 Waste Rock Management Plan
(BAF-PH1-830-P16-0029)

Baffinland Iron Mines Corporation

PHASE 1 WASTE ROCK MANAGEMENT PLAN

BAF-PH1-830-P16-0029

Rev 0

Prepared By: Francisco Albor Consuegra
Department: Mine Operations
Title: Mine Operations Superintendent
Date: April 30, 2014
Signature:

Approved By: Tony Woodfine
Department: Mine Operations
Title: Mine Operations Manager
Date: April 30, 2014
Signature:

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Appendix C : Mine Site Waste Rock Drainage - Diversion Ditch Plan and Profile

1 PURPOSE

A waste rock disposal area designed for storage of waste rock in perpetuity will be located north and west of the open pit.

A modification of the mining plan has resulted in a smaller tonnage of waste rock being produced in earlier years 1-4 of operations from 2015-2018 when ore will be mined and shipped through Milne Port at a rate of up to 3.5 Mtpa. During this Phase 1, it is estimated that about 2.5 Mt will be placed in the stockpile.

This is reflected in a smaller waste rock storage area footprint and a new run-off collection pond to be constructed. As additional geological, geotechnical and geochemical data is collected, the waste rock management plan will be updated based on the application of best management practices.

Following the planned construction of the rail line and Steensby Port, production of ore and waste rock will increase quickly with a Life of Mine total of about 600 Mt of waste rock and 30 Mt of overburden produced over the mine life of Deposit No. 1. The existing "Waste Rock Management Plan" document number H349000-1000-07-126-0009, approved under NIRB Project Certificate #005 remains in effect as the approved Life of Mine waste rock management plan.

2 SCOPE

This plan has been developed for Phase 1 of the waste rock stockpile (dump) development for Deposit 1 at the Mary River Mine Site and describes the geochemical characterization of the waste rock and how this influences the way waste rock is deposited and how the stockpile is constructed.

Closure considerations are included as well as environmental monitoring and reporting.

Updates to this plan will be developed as new information is available and is included in ongoing optimization of the waste rock storage area (dump) design.

2.1 Relationship with Standard Operating Procedures

This Phase 1 Waste Rock Management Plan should be reviewed with other Baffinland Standard Operating Procedures:

- BAF-PH1-340-PRO-0006 r0 - Haul Truck Operation Procedure
- BAF-PH1-340-PRO-0012 r0 - Dozer Operation Procedure.

3 RESPONSIBILITES

3.1 Mine Operations Supervisor Responsibilities

The Mine Operations supervisor is responsible for the following:

- The safety and health of all persons while managing and directing activities associated with the hauling and placement of waste rock. Nothing relieves the mine operations supervisor for ensuring a safe work place and compliance with federal and provincial regulations and those of Baffinland.
- Preparation and execution of the waste rock stockpile deposition plan.

3.2 Haul Truck Operator Responsibilities

Haul truck operators are responsible for the safe operation of their haul truck as follows:

- Carry out all pre-start up and shut down inspections as specified in the Baffinland regulations.
- Observe all speed limits and adjust driving for the conditions during bad weather.
- Follow closely all directional signs when proceeding loaded to the waste rock stockpile.
- When approaching, dumping and leaving the stockpile area follow closely the instructions of the spotter.

3.3 Dozer Operator and Spotter Responsibility

The dozer operator and spotter have the following responsibilities:

- Maintain safe conditions for haul truck dumping at the edges of the stockpile lift and at the dumping location.
- Give clear communication and signals to the haul truck operator.
- On bottom lift, avoid pushing large boulders down at the edge of the stockpile footprint to prevent damage to run off pond liner at the north end of the stockpile.

3.4 Safety

- PPE is essential and is required to be worn at all times.
- Appropriate speed limit and direction signs will be posted.
- A daily safety huddle and review of Job Safety Assessments will be made.

3.5 ENVIRONMENT

Haul truck, Dozer Operators and the Spotter must take every precaution to protect the environment and wildlife as follows:

- Haul truck, Dozer Operators and the Spotter must have completed WHMIS training.
- Haul truck, Dozer Operators and the Spotter must have completed training in oil spill reporting, containment and cleanup.
- Return all waste and empty containers to the Mary River Waste Management facility for appropriate disposal.

The Environmental Department will be responsible for:

- Regular inspections of the waste rock stockpile and run off pond and dam.
- Monitoring of the water quality of the run off pond before controlled release into the environment.
- All required reporting to the regulators.

4 REGULATORY REQUIREMENTS

All mining operations are carried out under the Mines Act and the requirements will be reflected in Baffinland procedures which must be followed.

The Mary River Operation is permitted under Nunavut Impact Review Board Project Certificate #005 and Nunavut Water Board Type A Water Licence, 2AM-MRY1325. The specific environmental requirement related to the waste rock stockpile is for run-off to be collected in a downstream pond with capacity sized to reduce suspended solids in the discharge to meet discharge requirements of <30 mg/L (Maximum concentration of any grab sample) and 15 mg/L maximum average concentration.

In addition, the discharge from the pond is established as a monitoring and discharge point under the Metal Mining Effluent Regulations (MMER) SOR/2002-222.

5 WASTE ROCK CHARACTERIZATION

5.1 DEPOSIT GEOLOGY

Deposit No.1 occurs at the nose of a syncline plunging steeply to the north-east (Aker Kvaerner, 2008). The iron formation occupies the nose and two limbs of this feature with a ~1,300 m long northern portion and a ~700 m long southern portion. The footwall to the iron formation mainly consists of gneiss with minor schist, psammitic gneiss (psammite) and amphibolite. The hanging wall is primarily composed of schist and volcanic tuff with lesser amphibolite and metasediment.

The hanging wall primarily encompasses chlorite–actinolite schist and garnetiferous amphibolites. Meta-volcanic tuff is also a significant lithology identified in the hanging wall. The footwall mainly consists of quartz-feldspar-mica gneiss with lesser meta-sediment (greywacke) and quartz-mica schist. Microcline and albite are the predominant feldspars within the gneiss and biotite is generally more abundant than muscovite.

The iron ore deposits at the Mary River project represent high-grade examples of Algoma-type iron formation and are composed of hematite, magnetite and mixed hematite-magnetite-specular hematite varieties of ore (Aker Kvaerner, 2008). The iron deposits consist of a number of lensoidal bodies that vary in their proportions of the main iron oxide minerals and impurity content of sulphur and silica in the ore. The massive hematite ore is the highest grade ore and also has the fewest impurities, which may indicate it was derived from relatively pure magnetite or that chert, quartzite and sulphides were leached and oxidized during alteration of the iron formation.

Intense deformation and lack of outcrop limit the ability to subdivide by lithology on the basis of future mined tonnages.

5.2 SUMMARY OF GEOTECHNICAL CONSIDERATIONS

The existence of the ridge north of Deposit No. 1 and outcrop appearing along the ridge support existing evidence from geotechnical drilling of the geotechnical stability of the area and make it a suitable location to start construction of the waste rock stockpile. Ongoing geotechnical drilling to complement existing data will be used to optimize the stockpile design.

5.3 SUMMARY OF GEOCHEMICAL SAMPLING AND TEST WORK

Metal leaching and acid rock drainage (ML/ARD) characterization studies in support of the Life of Mine pit waste rock are provided in the report entitled “Mine Rock ML/ARD Characterization Report Deposit 1, Mary River Project”, March 2014 as appended to the Life-of-Mine Waste Rock Management Plan. A further analysis of the available ML/ARD results related to the five year pit is provided in Appendix A.

The waste rock was subdivided based on broad geo-structural categories about the iron ore zone, mainly by hanging wall and footwall zones. A total of 776 waste rock samples were selected as representing the waste rock categories and broad spatial coverage of non-ore mine rock in the vicinity of the Life of Mine open pit development. All 776 waste rock samples were analyzed for modified Sobek acid base accounting (ABA), NAG pH and elemental content. Subsets of drillcore samples were also analyzed for downhole variability, NAG leachate, short-term metal leaching, whole rock elemental content, detailed mineralogical analysis, and long-term kinetic testing.

Results of ABA testing determined that waste rock is generally characterized as having low neutralization potentials (NP) and low acid potentials (AP). Data suggests that the waste rock is dominated by non-carbonate sources of NP (e.g. silicates) with lesser NP derived from carbonate sources. Sulphide was the primary form of sulphur. Approximately 85% of waste rock samples had neutralization potential ratios (NPR) greater than 2 and are classified as non potentially acid generating (Non-PAG) and are unlikely to generate acidic drainage. Approximately 10% of the samples had NPR values of less than 1, and 5% of the samples were classified as having uncertain acid generating potential (1<NPR<2). Extrapolating these results to the project waste rock model, indicates that approximately 11% of the Life of Mine in-pit waste rock is expected to have NPR <2 and is considered potentially acid generating (PAG). Proximity to ore appears to correlate to increased PAG quantities (defined as NPR <2) with the hanging wall schist (HWS) and footwall schist (FWS) zones identified with the greatest proportion of PAG of the major waste units.

Analysis of a set of samples proximal to the proposed five year pit indicates a lower sulphur and sulphide content is likely to be encountered in the shallower HWS and FWS rock of early development than at depth during later production. This lower sulphide content is expected to result in a lower percentage of PAG rock being encountered during early operations than would be predicted by extrapolating the overall (including deeper) HWS and FWS waste rock data to near surface.

For planning related to the Phase 1 Waste Rock Management Plan, 10% PAG rock plus allowances for expansion due to field screening limitations and dilution has been assumed.

Ten waste rock samples were run in humidity cells for 53 weeks in 2008 and 2009. A further 17 waste rock samples were initiated in humidity cell tests in May 2011 for between 109 and 120 weeks of reported data. Nine of these samples were standard humidity cells and eight were NP depleted humidity cells designed to assess drainage quality in the absence of carbonate NP. The pH of most cells was in the range of 5.5 to 7 throughout testing. Of the 17 cells in operation since 2011, three cells exhibited slowly declining pH throughout testing reaching a minimum measured weakly acidic pH between 4.5 and 5 after approximately two (2) years of operation (under laboratory conditions). Metal release rates from humidity cells were generally low.

Kinetic testing results and cold climate conditions at site suggest the lag time to acid on-set in PAG rock with potentially increased metal release rates would be on the order of five years or longer.

Work is continuing to confirm the feasibility of developing field test pads at the site using selected waste rock material generated during early mine development. Operation and monitoring of such test piles (if feasible) would better inform the project about projected drainage quality and water quality modeling assumptions under site-specific cold climate conditions.

6 CONSTRUCTION OF THE WASTE ROCK STOCKPILE

6.1 DEPOSITION STRATEGY

Waste rock will be deposited in lifts using the guidelines presented in Section 6.4. The primary objective is safety of personnel and stability of the waste rock stockpile. However, these deposition methods will also enhance permafrost aggradations into the Waste Rock Stockpile

The design of the waste rock storage area is based on the conservative results from drilling and laboratory test work.

Phase 1 of the WRD will be built oriented along the ridge extending Northwards from the top of Deposit 1 as shown in Figure 6.1. Stockpile construction will start at the northern perimeter of the stockpile footprint. The stockpile will be bounded on the east and west by WRD roads which join to form the downstream wall of the run off pond. Berms constructed along the upstream edge of the WRD roads will divert run off towards the run off pond. A plan of the northern section of the WRD, the WRD roads and the run off pond is included in Appendix B.

It is important that the bottom layer of the waste rock is placed while the ground is frozen allowing the freezing level to rise in elevation by conduction. In addition, the first lift of material to be placed will be non-PAG material. It expected that a permanently frozen impermeable core will form in the waste rock storage area within the first few years after placement. A technical memorandum with recommendations on the development of permafrost in waste rock stockpiles has been completed by Thurber (refer to Appendix B, Life-of-Mine Waste Rock Management Plan) Temperature modeling of the waste rock regime including climate change included in the technical memorandum will be carried out as part of the ongoing waste rock characterization program.

It is expected that the interior of the waste rock stockpile material will become permanently frozen, and that only the outer layer of material will be subject to seasonal freezing and thawing. The frozen condition will increase both the physical and chemical stability of the structure. The final surficial "active" layer, which will be subject to seasonal freeze-thaw, will be constructed of non acid generating rock as the waste rock stockpile develops.

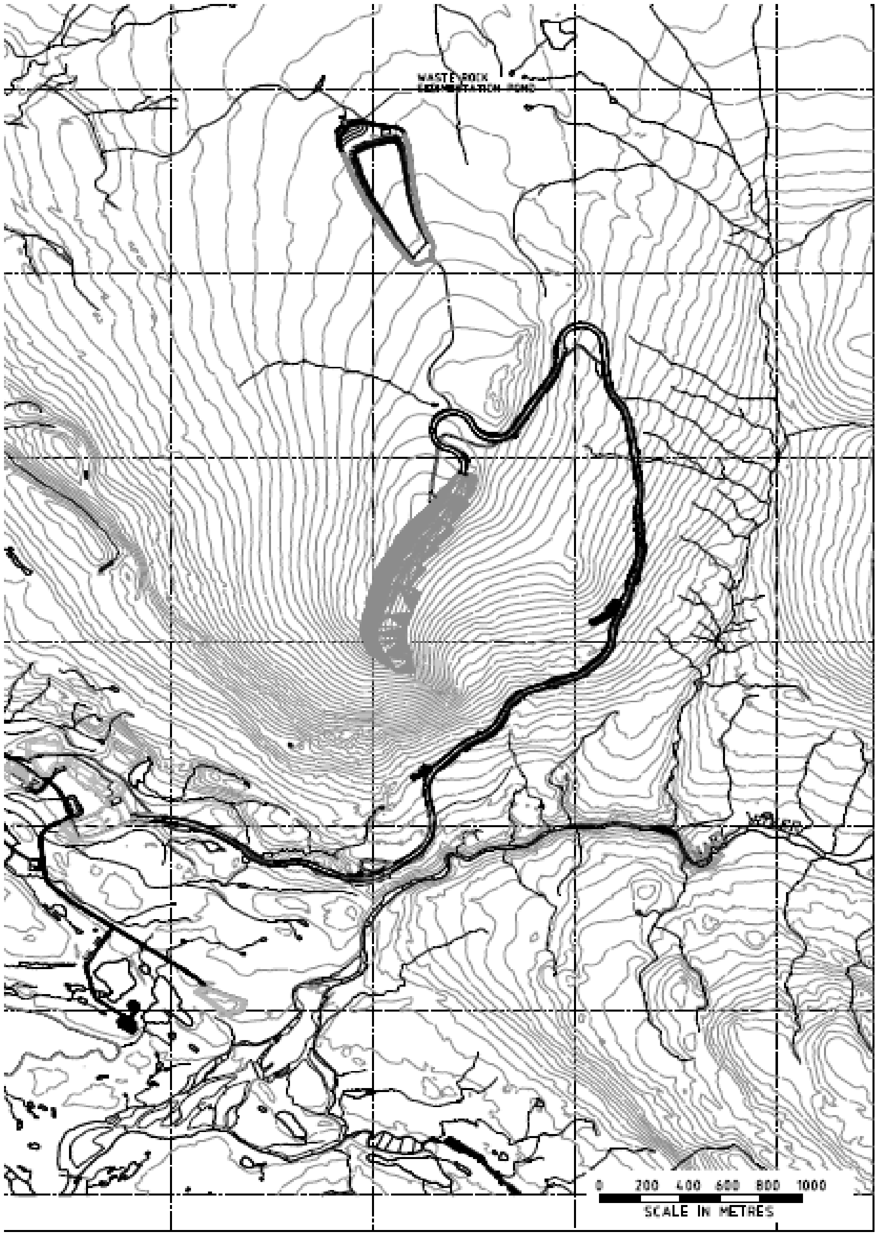

FIGURE 6-1: PHASE 1 OF THE WASTE ROCK STOCKPILE AND RUN OFF POND

6.2 Phasing of Waste Rock Deposition over Time

A modification of the mining plan has resulted in a smaller tonnage of waste rock being produced in the earlier years of operation.

The initial, Phase 1, waste rock storage layout for the first five years of mining is illustrated in Figure 6-1. As additional geological, geotechnical and geochemical data is collected, the waste rock deposition plan will be updated based on the application of best management practices. A geotechnical investigation will be carried out in areas where there are potential instabilities. These results will be incorporated into the ongoing waste rock stockpile design. Specifically a stability analysis of the waste rock stockpile and the open pit will be carried out to show that the combined structures are stable.

Following the planned construction of the rail line and Steensby Port, production of ore and waste rock will increase quickly with a Life of Mine for Deposit 1 total of about 600 Mt of waste rock and 30 Mt of overburden produced over the mine life.

The volume of waste rock delivered to the waste rock storage area will be recorded and will be reported as required by the NWB Type A Water Licence, 2AM-MRY1325 and the Commercial Lease, Q13C301.

6.3 Management of Potentially Acid Generating (PAG) waste rock

The low percentage of PAG material identified in waste rock and an estimated lag time of more than five years support the management of PAG by encapsulation of the PAG material in the ultimately frozen core of the waste rock stockpile.

PAG waste rock will be identified by processing on-site analytical data from blast hole drill cuttings samples. Laboratory determination of PAG waste materials will be completed using total sulphur analysis by Leco sulphur analyser and guidance provided in Appendix A. Materials identified with a total sulphur content greater than 0.20% will be considered PAG rock or subjected to standard ABA testing for confirmation as either PAG or non-PAG rock. NAG pH testing may also be used as a screening tool for this purpose. The on-site processing of blast hole samples in the environmental laboratory will allow timely development of the waste rock deposition plan.

All material within a specified 3D radius from a sample determined to be PAG will be assigned as PAG and incorporated into the mine scheduling. When that material is loaded into the haul truck it will be directed according to the mine scheduling plan to a specific section of the waste stockpile where all the PAG rock will be encapsulated together within non-PAG waste rock.

The permanently frozen core of the stockpile will limit sulphide oxidation and prevent seepage of PAG drainage to the environment.

The outer “active” layer of the WRD which freezes and thaws seasonally will be constructed of non-PAG rock.

6.4 General Guidelines Used to Develop the Waste Rock Stockpile

The design of the waste rock storage area is based on the conservative results from laboratory test work. The design guidelines which follow will develop over time as the results of the ongoing studies and field piles become available:

- The stockpile will be constructed in lifts from the bottom up with lift and bench characteristics appropriate for the geotechnical conditions and waste handling equipment. These characteristics will be approved by the Mine Manager
- A 2-3 m thermal barrier of non-PAG waste rock will be placed during the winter months to protect the permafrost layer during the summer months and allow development of the permafrost through conduction.
- PAG waste rock should be segregated from non-PAG rock and encapsulated within the pile.
- At closure, the active layer of the waste rock stockpile should consist of non-PAG rock.
- PAG rock should all be placed in the section of the WRD which drains to the Mary River watershed.
- The perimeter of the WRD will be a minimum of 31 m from any water body.

7 WASTE ROCK RUNOFF MANAGEMENT

The first phase of runoff management for years 1-4 for the waste rock stockpile area will consist of channels formed by berms around the stockpile perimeter produced by two roads, one on each side of the waste rock stockpile. These will channel the run off downstream of the waste rock stockpile where a sedimentation pond is formed by construction of a berm about 3 m high. The watershed, including the waste rock stockpile, contributing to this pond has an area of 20ha. The sedimentation pond will be lined and is sized to contain the 1:10 year 24 hr storm event falling on the waste rock stockpile area. The sedimentation pond will have an overflow weir capable of passing the 1:200 year storm event. Clean, non contact water from upstream of the waste rock stockpile will be diverted around the waste rock stockpile by upstream diversion berms.

Further phased drainage management berms and ponds will be designed as mining progresses. All phases of the run off management system are designed such that the discharge from sedimentation ponds flows directly into existing water courses such that surface erosion is minimized and no additional impacts are created.

Figure 6-1 shows that the initial footprint of the waste rock storage area is partially in the western watershed of the two watersheds that drain the area to the north of the open pit and which drain into Camp Lake. In order to divert the discharge from the run off pond to the Mary River watershed a berm/channel will be constructed to convey the water to an existing water course draining into a tributary of Mary River. A drawing of the waste rock drainage diversion ditch plan and profile is included as Appendix C.

Snow will accumulate on the waste rock stockpile during the winter and during the summer the melted snow along with any rainfall will seep through the active zone and run off the sides of the stockpile or drain from the foot of the perimeter of the stockpile.

Stockpile drainage water quality is expected to meet MMER discharge limits. Specifically, the existing water quality model developed in support of the larger Life-of-Mine Waste Rock Management Plan predicts that after sedimentation, drainage water quality from the non-acidic mine rock exposed during operations will meet MMER discharge requirements. Kinetic testing results and cold climate conditions at site suggest the lag time to acid on-set in PAG rock would be on the order of five years or longer providing adequate time to isolate PAG materials within the waste rock stockpile. This supports the key modeling assumption of non-acidic drainage from PAG rock during waste rock stockpile construction.

7.1 ORE STORAGE

Ore mined in the pit will be dumped on a small run-of-mine (ROM) stockpile located near the mobile crusher in the Crushing and Screening area located on the South side of the pit east of the Site Services Pad.

Following crushing, the ore is loaded directly into ore transport trucks for transportation to Milne Port. Since ore will be stored in these locations only temporarily and the drainage during operations is controlled, there is no concern about long-term potential effects of PAG material stored at these locations.

7.2 Runoff Water Treatment Alternatives

As identified above, existing water quality modeling and kinetic testing data indicate that runoff water quality in the Phase 1 period is not expected to contain concentrations of metals in excess of discharge requirements based upon the Metal Mining Effluent Regulations. In addition, ammonia and nitrate in the runoff are not expected to cause receiving water impacts or regulatory exceedances.

However, in the event that ongoing investigations or field monitoring of the runoff pond shows a trend toward exceedance of discharge requirements, then water treatment facilities as described in the (Life of Mine) Waste Rock Management Plan will be constructed and operated for as long as required.

8 CLOSURE

At closure the principal objectives are the safety of the public and maintaining the physical and chemical stability of the permanent structures to ensure that there is no long-term safety or environmental impact.

Mine planning will ensure that at closure the exterior of the final stockpile consists of an active layer of non-PAG material up to 50 m thick so that the interior of the stockpile remains frozen year round in the long term. The thickness of this active layer will be determined after some years of mining experience and taking climate change into account. To minimize active layer thickness a stockpile of overburden will be retained to spread a layer of less porous material over the top of the waste rock stockpile.

When monitoring shows that runoff meets water quality objectives for closure the runoff ponds will be decommissioned and runoff will be discharged directly to the environment.

8.1 CLIMATE CHANGE CONSIDERATIONS

Studies of waste rock in permafrost demonstrate that permafrost forms an effective long-term barrier to water and oxygen, thereby preventing significant oxidation of sulphidic waste rock located below the surficial active zone. The surficial "active" zone, which will be subject to seasonal freeze-thaw, will not reach the 50 m thickness of non-PAG material in the long-term (within 200 years) under the influence of current climate change criteria (Intergovernmental Panel on Climate Change, 2007).

Therefore, over the long term, runoff water quality which is influenced by contact water that flows through the active layer in the waste rock stockpile will not be affected.

9 ENVIRONMENTAL PERFORMANCE INDICATORS AND THRESHOLDS

Runoff quality from the waste rock and ore storage runoff management ponds is the most relevant environmental performance indicator. Discharge from these ponds shall not exceed the effluent quality limits of Part F, Item 25 in Type A Water Licence 2AM-MRY1325 and site-specific indicators shown in Table 9-1.

TABLE 9-1: DISCHARGE PERFORMANCE INDICATORS AND THRESHOLDS

Indicator	Units	Maximum Concentration of Any Grab Sample
pH		6.0 < pH < 9.5
Ammonia	mg/L	Monitored but not regulated
Nitrate	mg/L	Monitored but not regulated
Sulphate	mg/L	To be established
Arsenic	mg/L	0.5
Copper	mg/L	0.30
Lead	mg/L	0.20
Nickel	mg/L	0.50
Zinc	mg/L	0.5
TSS	mg/L	15
Oil and Grease		No visible sheen
Toxicity		Non-Acutely Toxic

In addition, Environmental Effects Monitoring or biological monitoring will be carried out as required by MMER.

Conductivity, pH and sulphate will be used as early-warning indicators to identify potential acid generation in the waste rock storage area. Ammonia and Nitrate will be monitored in run-off to ensure that no explosive material remaining on the blasted waste rock has been dissolved by water infiltrating the active layer.

Any contaminants of potential concern identified from on-going testing will be measured to provide temporal data on effluent quality that could potentially affect the receiving water quality.

The Aquatic Effects Monitoring Plan (AEMP) will be implemented to monitor environmental effects of effluent discharge from the SWM ponds at Mary River. Results of the AEMP can trigger additional adaptive management actions such as further treatment of pond effluent, if required.

10 MONITORING AND REPORTING REQUIREMENTS

All monitoring and reporting of runoff water quality will be carried out by the Environmental Department.

This includes the annual reporting to NIRB, NWB, QIA and others.

10.1 GROUND TEMPERATURE MONITORING

Following consultation with experts from NRCan, the appropriate instrumentation will be installed in the waste rock stockpile to monitor ground temperatures and confirm the aggradation of permafrost within the waste rock stockpile and the thickness of the active layer.

Data from temperature sensors installed to monitor the ground temperatures will be collected on a regular basis and used to ensure that frozen conditions are maintained below the waste rock stockpile. In addition, the data will be used to calibrate the waste rock stockpile thermal model.

Baffinland will carry out thermal modeling of the waste rock stockpile when suitable data is available to demonstrate the robustness of the proposed waste rock stockpile deposition design and confirm that frozen conditions are maintained in the waste rock stockpile. This will take long-term climate change into account (200 years).

11 REFERENCES

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Appendix A:
AMEC ML/ARD Characterization for Five Year Pit

TECHNICAL MEMORANDUM

To	**Jim Millard, Baffinland**	File no	**TC123908**
From	**Steve Walker, AMEC**	cc	**Steve Sibbick, AMEC**
Tel	**(905) 568-2929**		
Date	**April 28, 2014**		

Subject **Mary River Deposit 1, 5-Year Pit ML/ARD Characterization**
Rev. 1 – Issued for Phase 1, WRMP

1.0 INTRODUCTION

AMEC was retained by Baffinland Iron Mines Corporation to investigate the metal leaching and acid rock drainage (ML/ARD) potential of mine rock from the Mary River project. The current Deposit 1 mine plan includes a reduced production schedule in the first five years of operation in comparison to that originally envisioned for the project. This memo provides an updated evaluation of the available geochemical characterization results related to this revised five year mine plan. The basis for this evaluation is the data-base and report developed for the Mary River life of mine plan (AMEC 2014). This evaluation also includes recommended guidance to assist in developing appropriate waste rock management planning for the proposed five year mine plan.

1.1 Background

ML/ARD characterization of Mary River Deposit 1 waste rock within the life of mine pit has been reported (AMEC 2014). In summary, the waste rock was subdivided based on broad geo-structural categories about the iron ore zone, mainly by hanging wall and footwall zones. A total of 776 waste rock samples were selected as representing the waste rock categories and broad spatial coverage of non-ore mine rock in the vicinity of the life of mine open pit development. All 776 waste rock samples were analyzed for modified Sobek acid base accounting (ABA), NAG pH and elemental content. Subsets of drillcore samples were also analyzed for downhole variability, NAG leachate, short-term metal leaching, whole rock elemental content, detailed mineralogical analysis, and long-term kinetic testing.

Results of ABA testing determined that waste rock is generally characterized as having low neutralization potentials (NP) and low acid potentials (AP). Data suggests that the waste rock is dominated by non-carbonate sources of NP (e.g. silicates) with lesser NP derived from carbonate sources. Sulphide was the primary form of sulphur. Approximately 85% of waste rock samples had neutralization potential ratios (NPR) greater than 2 and are classified as non potentially acid generating (Non-PAG) and are unlikely to generate acidic drainage. Approximately 10% of the samples had NPR values of less than 1, and 5% of the samples were classified as having uncertain acid generating potential (1<NPR<2). Extrapolating these results to the project waste rock model, indicates that approximately 11% of the life of mine in-pit waste rock is expected to have NPR <2 and is considered potentially acid generating (PAG). Proximity to ore appears to correlate to increased PAG quantities (defined as NPR <2) with the hanging wall schist (HWS) and footwall schist (FWS) zones identified with the greatest proportion of PAG of the major waste units.

The revised five year mine plan is projected to produce approximately 2.5 Mt of waste rock primarily from the HWS and FWS defined waste rock regions.

AMEC Environment & Infrastructure
A Division of AMEC Americas Limited
160 Traders Blvd. East, Suite 110
Mississauga, Ontario
Canada L4Z 3K7
Tel (905) 568-2929
Fax (905) 568-1686
www.amec.com

1.2 Objective and Scope of Work

The objective of this analysis is to support development of the Phase 1 waste rock management plan for the project. The content of this analysis includes:

- reinterpretation of the available geochemical data to develop an understanding of early mine life waste rock in terms of ML/ARD, and
- identification of analytical options that will be effective for determination of PAG rock during mining to support the planned segregation of PAG rock during operations.

2.0 SAMPLE SELECTION RELATIVE TO FIVE YEAR PIT

Analysis of geochemical data across the life of mine pit provides reduced resolution of the much more localized waste rock units adjacent to ore within the five year pit (Figures 1 to 3). Therefore, to aid in planning for rock encountered during early mine development, a subgrouping of samples were selected from within and adjacent to the five year pit limit. Essentially only the HWS and FWS waste rock units are intersected within the volume of the five year pit. Small regions of FW material are identified along the upper-most regions on the west side of the five year pit; however, for the purposes of this analysis treating this limited region as FWS is reasonable and conservative (FWS contains proportionally more PAG rock than FW). Therefore, the subsample list was populated by extracting all HWS and FWS samples from within approximately 150m adjacent to and below the five year pit (Figures 4 and 5). The extension of the sample area laterally and below the pit was necessary due to the paucity of samples within the actual five year pit envelope which is located at high elevations above the majority of existing exploratory drilling.

3.0 COMPARISON OF FIVE YEAR AND LIFE OF MINE DATA SETS

The following sections describe the ABA and elemental content results of HWS and FWS samples within and just below the five year pit limit as described in Section 2 and compare these results to overall results for the life of mine data (AMEC 2014).

3.1 ABA

The subset of ABA data extracted from the life of mine data set in support of the five year pit development is provided in Appendix A, Tables A-1 and A-2. A statistical summary of this data in comparison to the life of mine data is provided in Table A-3 with selected parameters provided as side by side comparison in Table 1. Analysis and discussion of this comparative analysis for both the HWS and FWS zones is provided in the following sections.

3.1.1 Hanging Wall Schist

ABA results for the HWS five year data set are generally comparable to the life of mine data with the exception of distinctly lower overall sulphide content leading to a lower proportion of PAG samples in the five year data. Results for the five year data are summarized as follows.

- Paste pH values for footwall schist samples were circum-neutral to alkaline with values that ranged from 7.4 to 9.7 and a median of 8.5.
- Total sulphur contents ranged from the minimum detection limit (MDL) of 0.005 to 1.2% with a median and average of 0.11 and 0.14% respectively.
- The majority of the sulphur is in the form of sulphide (Figure 6) with concentrations that ranged from the MDL of 0.01 to 0.97% with a median and average of 0.02 and 0.08% respectively.

- The sulphide content for the five year data is distinctly less than the life of mine data with a median sulphide content of 0.02% in comparison to 0.06% and a 90th percentile sulphide content of 0.15% in comparison to 0.72%.
- The NP ranged from 7.0 to 104 kg $CaCO_3$/t with median and mean values of 16 and 23 kg $CaCO_3$/t respectively.
- In general the carbonate NP (CarbNP) was lower than the NP (Figure 7) indicating a predominance of non-carbonate NP (silicates).
- One of 53 samples had CarbNP higher than the corresponding NP, which was interpreted to be due to the presence of iron or manganese carbonates that do not provide effective neutralization potential.
- NPR ranged from 0.41 to 268 with median and mean values of 26 and 9.5 respectively.
- Based on the NPR distribution where values less than 2 are considered PAG, one of 53 samples (2%) would be classified as PAG (Table 2; Figure 8).

3.1.2 Footwall Schist

ABA results for the FWS five year data set are generally comparable to the life of mine data with the exception of slightly lower sulphide content resulting in a lower proportion of PAG samples in the five year data. Results for the five year data are summarized as follows.

- Paste pH values for footwall schist samples were circum-neutral to alkaline with values that ranged from 6.4 to 10 and a median of 9.1.
- Total sulphur contents ranged from the MDL of 0.005 to 5.6% with a median and average of 0.01 and 0.32% respectively.
- The majority of the sulphur is in the form of sulphide (Figure 9) with concentrations that ranged from the MDL of 0.01 to 4.2% with a median and average of 0.01 and 0.23% respectively.
- At the 90th percentile, the sulphide content for the five year data is less than half that of the life of mine data (0.31% in comparison to 0.72%).
- The NP ranged from 5.3 to 59 kg $CaCO_3$/t with median and mean values of 13 and 17 kg $CaCO_3$/t respectively.
- The NP at the 90th percentile for the five year data was slightly higher than that of the life of mine data (29 kg $CaCO_3$/t in comparison to 26 kg $CaCO_3$/t).
- In general the CarbNP was lower than the NP (Figure 10) indicating a predominance of non-carbonate NP (silicates).
- Five of 40 samples had CarbNP higher than the corresponding NP, which was interpreted to be due to the presence of iron or manganese carbonates that do not provide effective neutralization potential.
- NPR ranged from 0.21 to 176 with median and mean values of 36 and 2.4 respectively.
- Based on the NPR distribution where values less than 2 are considered PAG, 5 of 40 samples (8%) would be classified as PAG (Table 2; Figure 11).

3.1.3 Analysis of Decreased PAG Proportion in Five Year Pit

From the analysis above it is observed that the proportion of PAG on the basis of NPR <2 is lower in the HWS and FWS units projected to surface in the vicinity of the five year pit than the overall life of mine pit. In order to further support this observation, the life of mine ABA data was evaluated in comparison to elevation.

Plots of total sulphur, sulphide, NP and NPR variation by elevation are provided in Figures 12 through 15. A distinct decrease in total sulphur and sulphide is observed in both the HWS and FWS sample sets above an elevation of 420 masl. The majority of HWS and FWS samples above the lowest elevation of the five year pit (~570 masl) are less than 0.5% total sulphur and less than 0.3% sulphide (Figures 12 and 13). The variation of NP with depth (Figure 14) is observed to decrease in the highest range and increase in lowest range with little change in average NP. The net result of the sulphide (and AP) and NP responses with decreasing depth are an overall shift toward higher NPR at shallower depths (Figure 15) and especially for those samples above the base of the five year pit.

3.2 Elemental Content

The subset of elemental content data extracted from the life of mine data set in support of the five year pit development is provided in Appendix A, Table A-4. A statistical summary of this data in comparison to the life of mine data is provided in Table 3. For screening purposes, elemental content of the mine rock samples were compared to 10 times average continental crust values (Price, 1997). The number of enriched samples are summarized in Table 4 and compared to results for the life of mine data set.

The list of elements exceeding the 10 times screening criteria are similar between the five year data set and the life of mine data set. Some infrequently observed enriched elements in the larger life of mine data set are not observed in the five year data set.

Concentrations of Bi exceeded the screening value of 0.25 µg/g for 14% of the samples (13 of 93 samples). Bi exceedances of the 10 times criteria for the various waste types on a percentage basis are lowest in the hanging wall schist.

A total of 8 of the 93 samples were greater than the MDL for selenium which also exceeded the screening value. It is noted that the MDL for selenium (0.7 µg/g) is greater than the 10 times crustal abundance value of 0.5 µg/g.

Three elements (arsenic, silver and molybdenum) had 3-8% of their concentrations above their respective screening values. Chromium, gold, iron, lithium, manganese and antimony had 1-2% of their samples concentrations above the applicable screening values.

4.0 GUIDANCE ON PAG ROCK MANAGEMENT

Total sulphur, sulphide and NAG pH can be interpreted as predictors of PAG materials on the basis of NPR <2 (Figures 16 through 18). Specifically, a total sulphur content of >0.2% and NAG pH of <4.5 are predictors of PAG material (NPR <2).

An analysis of the effectiveness and errors associated with the use of the above thresholds for categorization of PAG and Non-PAG samples in relation to the life of mine ABA data set is provided in Table 5 and Figures 19 through 21. Use of sulphur content in excess of 0.2% results in a small percent of PAG samples (0.1%) being incorrectly categorized as Non-PAG. A higher percentage (10%) of Non-PAG samples were incorrectly categorized as PAG. The use of NAG pH <4.5 resulted in 3% of PAG samples incorrectly categorized as Non-PAG and 2% of Non-PAG samples incorrectly categorized as PAG.

For the critical segregation factor which is to prevent PAG being identified as Non-PAG the sulphur cut-off of >0.2% is the most effective approach. PAG quantity estimates using the sulphur cut-off (>0.2%) in comparison to the original ABA data (NPR <2) are provided in Table 6. Using the sulphur cut-off results in an increase in the life of mine projected PAG quantity (without considering increased volumes due to dilution effects) from 63 Mt to 110 Mt.

Applying the sulphur cut-off followed by NAG pH check increased the reliability of PAG classification with the combined analyses resulting in a decrease in misclassification of Non-PAG as PAG from 10% to 1% (Table 5, Figure 21). However, there is a subset of 23 PAG samples (3%) that are misclassified as Non-PAG using NAG pH <4.5 . The reason for the misclassifications is presently unknown; however, it was noted that a high proportion of these samples (12) are iron formation samples. For comparison, the misclassified samples that aren't iron formation represent 1.6% of all non-iron formation samples.

5.0 SUMMARY AND CONCLUSIONS

Analysis of a set of samples proximal to the proposed five year pit has been completed that indicates a lower sulphur and sulphide content is likely to be encountered in the shallower rock of early development than at depth during later production. This lower sulphide content is expected to result in a lower percentage of PAG rock being encountered during early operations than would be predicted by extrapolating waste rock data in similar proximity to the ore to near surface. A comparison of the overall percentages and quantities of PAG materials for the HWS and FWS for the life of mine pit as well as the five year pit are provided in Table 7.

A sulphur content of >0.2% has been determined to be indicative of PAG material (NPR <2) and would be a suitable screening test to segregate PAG and Non-PAG using sulphur by Leco S analyser. The addition of the NAG pH test to those PAG samples identified by sulphur >0.2% can substantially reduce the potential for incorrect classification of Non-PAG samples as PAG. However, the data presently suggests use of the NAG pH test could result in a misclassification of PAG samples as Non-PAG in 1 to 3% of samples (for available data).

The NAG pH test should be explored further as a potential means of refining PAG and Non-PAG segregation through the Phase 1 development. The additional test if proven in the operational setting may provide a relatively efficient means to allow a significant reduction in the amount of Non-PAG material managed as PAG for the Life of Mine project.

It is noted that due to ore body geometry and availability of exploration drilling intersects there is an inherent limitation in sample coverage of the waste rock within the five year pit envelope. Therefore, for planning purposes and the Phase 1 waste rock management plan, AMEC recommends that a minimum of 10% PAG rock be assumed for HWS and FWS waste rock (Table 7). The above 10% PAG allowance excludes any increases due to field screening and dilution.

6.0 REFERENCES

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TABLES

Table 1: Summary and Comparison of ABA Results (Five Year and End of Mine Sample Sets)

		Total Sulphur %		Sulphide* %		AP kg $CaCO_3$/t		NP kg $CaCO_3$/t		CarbNP kg $CaCO_3$/t		NPR		CarbNPR	
		5 Year Pit	LOM Pit	5 Year Pit	LOM Pit	5 Year Pit	LOM Pit	5 Year Pit	LOM Pit	5 Year Pit	LOM Pit	5 Year Pit	LOM Pit	5 Year Pit	LOM Pit
Footwall Schist	Count	40	143	40	143	40	143	40	143	40	143	40	143	40	143
	Min	0.0050	0.0050	0.010	0.010	0.31	0.31	5.3	4.6	0.083	0.083	0.21	0.21	0.019	0.0034
	Max	5.6	5.6	4.2	4.2	130	130	59	71	129	178	176	176	345	345
	Median	0.011	0.044	0.010	0.010	0.31	0.31	13	13	0.54	0.50	36	23	1.6	1.0
	Average	0.32	0.29	0.23	0.23	7.1	7.0	17	16	11	8.5	2.4	2.3	1.5	1.2
	Standard Deviation	1.00	0.70	0.74	0.58	23	18	12	11	30	27	35	27	55	30
	10th Percentile	0.0050	0.0050	0.010	0.010	0.31	0.31	7.2	7.4	0.083	0.083	1.4	0.90	0.19	0.039
	90th Percentile	0.53	0.74	0.31	0.72	9.5	22	29	26	17	14	78	62	17	6.8
Hanging Wall Schist	Count	53	270	53	270	53	270	53	270	53	270	53	270	53	270
	Min	0.0050	0.0050	0.010	0.010	0.31	0.31	7.0	-6.5	0.083	0.083	0.41	0.000033	0.019	0.00035
	Max	1.2	22	0.97	22	30	693	104	487	79	514	268	621	232	571
	Median	0.11	0.12	0.019	0.057	0.59	1.8	16	18	1.0	0.62	26	13	1.3	0.37
	Average	0.14	0.60	0.076	0.48	2.4	15	23	26	8.0	17	9.5	1.7	3.4	1.1
	Standard Deviation	0.19	2.0	0.14	1.8	4.5	56	20	46	19	56	42	50	39	41
	10th Percentile	0.0050	0.0080	0.010	0.010	0.31	0.31	11	7.7	0.090	0.083	4.1	0.41	0.069	0.0095
	90th Percentile	0.26	0.91	0.15	0.72	4.7	22	31	33	18	21	55	73	20	19

*As total sulphur - sulphate

Table 2: Five Year Pit NPR Distribution

Waste Classification	Number of Samples	NPR Distribution				
		NPR < 1	1 < NPR < 2	2 < NPR < 3	3 < NPR < 4	NPR > 4
All	93	3	3	3	2	82
Footwall Schist	40	2	3	0	1	34
Hanging Wall Schist	53	1	0	3	1	48
Waste Classification	**Number of Samples**	**Carbonate NPR Distribution**				
		NPR < 1	**1 < NPR < 2**	**2 < NPR < 3**	**3 < NPR < 4**	**NPR > 4**
All	93	42	12	7	7	25
Footwall Schist	40	16	8	4	4	8
Hanging Wall Schist	53	26	4	3	3	17

Table 3: Summary of Elemental Content for the 5 Year Pit

		Hg	Au	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	K	Li	Mg
		µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
Footwall Schist	Count	40	13	13	40	40	40	40	40	40	40	40	40	40	40	40	40	40
	Min	0.10	0.020	0.010	1,700	0.50	0.90	0.21	0.090	110	0.020	4.4	12	1.8	20,000	40	2.0	8,600
	Max	0.10	0.15	1.3	100,000	147	1,600	5.0	2.3	19,000	0.38	52	600	380	470,000	39,000	244	91,000
	Median	0.10	0.020	0.060	34,000	0.60	180	0.71	0.095	1,500	0.040	12	72	10	70,000	9,050	17	21,500
	Average	0.10	0.030	0.22	42,860	7.0	234	1.0	0.26	3,157	0.096	15	114	33	118,125	10,414	24	31,970
	Standard Deviation	4.2E-17	0.036	0.36	24,634	26	307	0.88	0.40	4,519	0.096	10	119	68	114,764	10,130	38	23,918
	10th Percentile	0.10	0.020	0.014	17,700	0.50	3.1	0.37	0.090	368	0.020	6.3	27	3.1	29,000	177	3.8	10,840
	90th Percentile	0.10	0.020	0.47	80,100	4.7	534	2.0	0.52	8,290	0.20	25	240	70	234,000	20,800	36	70,000
Hanging Wall Schist	Count	53	33	33	53	53	53	53	53	53	53	53	53	53	53	53	53	53
	Min	0.10	0.020	0.010	10	0.50	0.010	0.020	0.090	25	0.020	0.25	0.50	0.10	33	1.0	2.0	19
	Max	0.10	0.040	1.3	116,000	59	660	3.5	28	43,000	0.60	67	1,260	180	600,000	31,000	370	110,000
	Median	0.10	0.020	0.05	39,000	0.50	31	0.32	0.090	1,700	0.080	26	150	73	63,000	2,500	19	25,000
	Average	0.10	0.021	0.12	40,885	2.6	123	0.62	0.65	7,233	0.12	27	215	71	82,548	7,239	32	30,238
	Standard Deviation	5.6E-17	0.0035	0.29	22,623	8.4	185	0.78	3.8	9,994	0.11	15	213	53	89,986	8,500	51	21,715
	10th Percentile	0.10	0.020	0.010	16,200	0.50	2.2	0.070	0.090	312	0.020	9.9	61	5.1	15,000	114	7.2	7,920
	90th Percentile	0.10	0.020	0.12	71,000	3.5	472	1.6	0.22	24,000	0.20	48	500	140	159,000	20,000	56	54,800

		Mn	Mo	Na	Ni	P	Pb	S	Sb	Se	Sn	Sr	Ti	Tl	U	V	Y	Zn
		µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
Footwall Schist	Count	40	40	40	40	13	40	20	40	40	40	40	40	40	40	40	13	40
	Min	83	0.30	28	5.3	32	1.3	41	0.80	0.70	0.50	0.8	72	0.020	0.42	2.0	1.1	3.9
	Max	11,000	360	1,100	260	5,400	32	1,200	1.4	6.2	4.6	28	3,100	1.6	8.4	170	14	110
	Median	530	2.1	275	27	390	4.1	89	0.80	0.70	0.80	3.4	745	0.23	1.8	32	3.7	32
	Average	1,430	18	306	46	1,030	5.9	260	0.82	0.95	1.2	5.5	1,000	0.31	2.2	45	5.7	40
	Standard Deviation	2,770	62	248	51	1,587	5.8	362	0.09	0.95	1.02	5.3	803	0.34	1.7	41	4.3	26
	10th Percentile	170	0.30	55	8.1	56	1.8	54	0.80	0.70	0.50	1.8	238	0.030	0.68	7.9	1.6	14
	90th Percentile	2,210	13	570	101	2,960	13	911	0.80	0.76	2.9	12	2,310	0.64	4.1	101	12	77
Hanging Wall Schist	Count	53	53	53	53	33	53	0	53	53	53	53	53	53	53	53	33	53
	Min	2.3	0.30	9.0	0.10	7.0	0.40	-	0.80	0.70	0.50	0.22	0.10	0.020	0.0080	1.0	0.63	0.70
	Max	2,600	39	2,000	430	2,200	113	-	14	1.4	4.6	35	3,000	1.6	7.3	210	6.5	145
	Median	370	0.90	350	93	280	2.2	-	0.80	0.70	0.50	9.7	1,000	0.10	0.22	65	2.7	37
	Average	502	2.3	527	109	348	5.2	-	1.1	0.74	0.90	11	1,060	0.23	0.83	87	2.8	41
	Standard Deviation	440	5.7	522	93	402	15	-	1.8	0.14	0.79	7.5	789	0.33	1.3	58	1.4	29
	10th Percentile	152	0.42	86	30	42	0.85	-	0.80	0.70	0.50	2.8	180	0.020	0.012	22	1.2	14
	90th Percentile	850	3.0	1,378	200	612	6.0	-	0.80	0.70	1.7	21	2,000	0.49	1.8	170	4.5	71

Table 4: Summary of Enriched Elements (> 10x Crustal Abundance)

5 Year Pit	Waste Classification	Au	Ag	As	Bi	Cd	Cr	Fe	Li	Mn	Mo	Ni	S	Sb	Se*	Zn
		µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
	Number of Samples	46	46	93	93	93	93	93	93	93	93	93	93	93	93	93
	Avg Crustal	0.004	0.075	1.8	0.025	0.15	102	56300	20	950	1.2	84	350	0.2	0.05	70
	10x Avg Crustal	0.04	0.75	18	0.25	1.5	1020	563000	200	9500	12	840	3500	2	0.5	700
	All	1	3	3	13	-	1	1	2	2	7	-	-	1	8	-
	Footwall Schist	1	1	2	9	-	-	-	1	2	5	-	-	-	4	-
	Hanging Wall Schist	-	2	1	4	-	1	1	1	-	2	-	-	1	4	-

LOM Pit	Waste Classification	Au	Ag	As	Bi	Cd	Cr	Fe	Li	Mn	Mo	Ni	S	Sb	Se*	Zn
		µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
	Number of Samples	261	261	413	413	413	413	413	413	413	413	413	413	413	413	413
	Avg Crustal	0.004	0.075	1.8	0.025	0.15	102	56300	20	950	1.2	84	350	0.2	0.05	70
	10x Avg Crustal	0.04	0.75	18	0.25	1.5	1020	563000	200	9500	12	840	3500	2	0.5	700
	All	11	4	28	81	2	5	18	3	9	32	3	10	3	62	1
	Footwall Schist	5	2	4	32	1	-	10	3	5	15	1	2	2	18	1
	Hanging Wall Schist	6	2	24	49	1	5	8	-	4	17	2	8	1	44	-

*Only values above detection are included

Table 5: Assessment of Sulphur and NAG pH to Define PAG Material

Description		Correctly Categorized		Incorrectly Categorized	
		Non-PAG as Non-PAG	PAG as PAG	Non-PAG as PAG	PAG as Non-PAG
		776	**776**	**776**	**776**
Sulphur >0.2% as PAG	**Number of Samples**	584	114	77	1
	Percent	75%	15%	10%	0.1%
NAG pH <4.5 as PAG	**Number of Samples**	648	92	13	23**
	Percent	84%	12%	2%	3%
Sulphur >0.2% followed by NAG pH check*	**Number of Samples**	652	92	9	23**
	Percent	84%	12%	1%	3%

* NAG pH check on apparent PAG samples from sulphur >0.2%.

**Includes 12 iron formation samples which is proportionally high for the data set (see text).

Table 6: Tonnage Distribution for Life of Mine Pit (Comparison of PAG by NPR <2 and S >0.2%)

Waste Rock Domain	Tonnage (Mt)	No. Samples	Mean Sulphur %	Mean NPR*	% Samples NPR <2	PAG tonnage (Mt)	% Samples Sulphur >0.2%	PAG tonnage (Mt)
Footwall Schist	74.1	143	0.29	2.3	20%	15.0	28%	20.7
Footwall Waste	263	271	0.070	12	4%	9.7	8%	21.4
Hanging Wall Schist	139.6	270	0.60	1.7	24%	33.1	40%	56.4
Hanging Wall Waste	77.5	62	0.074	20	0%	0	5%	3.8
Internal Waste	2.1	12	0.61	1.0	42%	0.9	42%	0.9
Mineralized Waste	9.7	18	0.81	1.7	41%	4.0	67%	6.5
Total	566	776				62.7		109.5

Table 7: HWS and FWS PAG Tonnage Estimates

Waste Classification	Number of Samples		Tonnage (Mt)		% PAG*		Tonnage (Mt) PAG*		For Planning (5 year pit)	
	LOM Pit	5 Year Pit	LOM Pit	5 Year Pit	LOM Pit	5 Year Pit	LOM Pit	5 Year Pit	% PAG	Tonnage (Mt) PAG
Footwall Schist	143	40	74.1	0.81	20%	8%	14.8	0.07	10%	0.08
Hanging Wall Schist	270	53	140	1.70	24%	2%	33.5	0.03	10%	0.17

*Based on NPR<2

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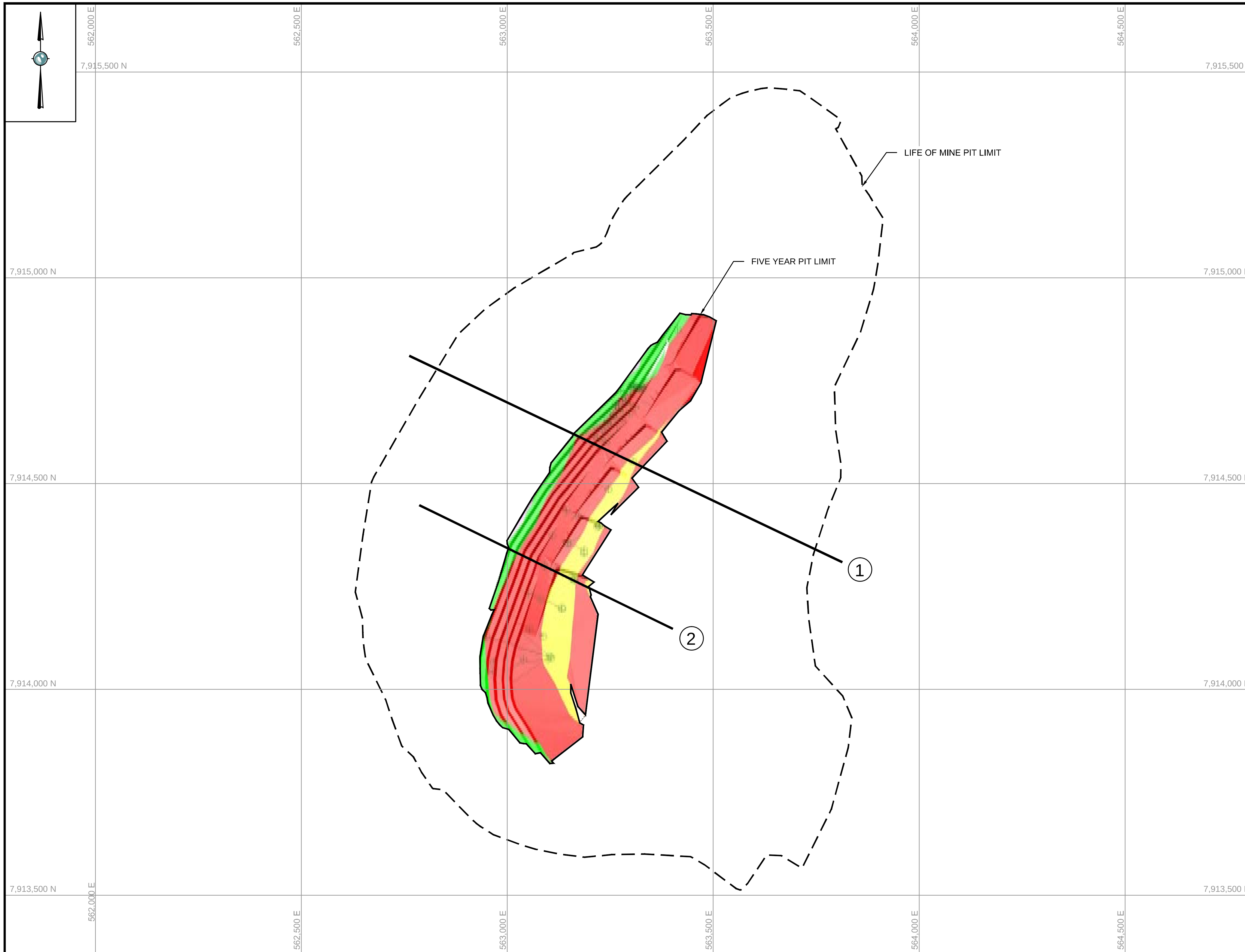
FIGURES



NOTES:

1. THE GRID COORDINATES SHOWN ON THIS DRAWING ARE IN METRES. THE COORDINATES ARE REFERENCED TO UTM NAD 83 ZONE 17N DATUM.
2. DRAWING PRODUCED FROM DIGITAL FILES PROVIDED BY BAFFINLAND IRON MINES CORPORATION.
3. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

LEGEND:

- HIGH GRADE IRON ORE
- FOOTWALL SCHIST
- HANGING WALL SCHIST
- FOOTWALL WASTE
- CROSS SECTION

0 100 200 500m

1:10 000 SCALE

CLIENT LOGO

Baffinland Iron Mines Corporation

CLIENT:

BAFFINLAND IRON MINES CORPORATION

AMEC Environment & Infrastructure

160 Traders Boulevard East
Mississauga, Ontario, Canada L4Z 3K7

amec

DWN BY:	NR
CHK'D BY:	SW
DATUM:	NAD 83
PROJECTION:	UTM ZONE 17N
SCALE:	AS SHOWN

PROJECT

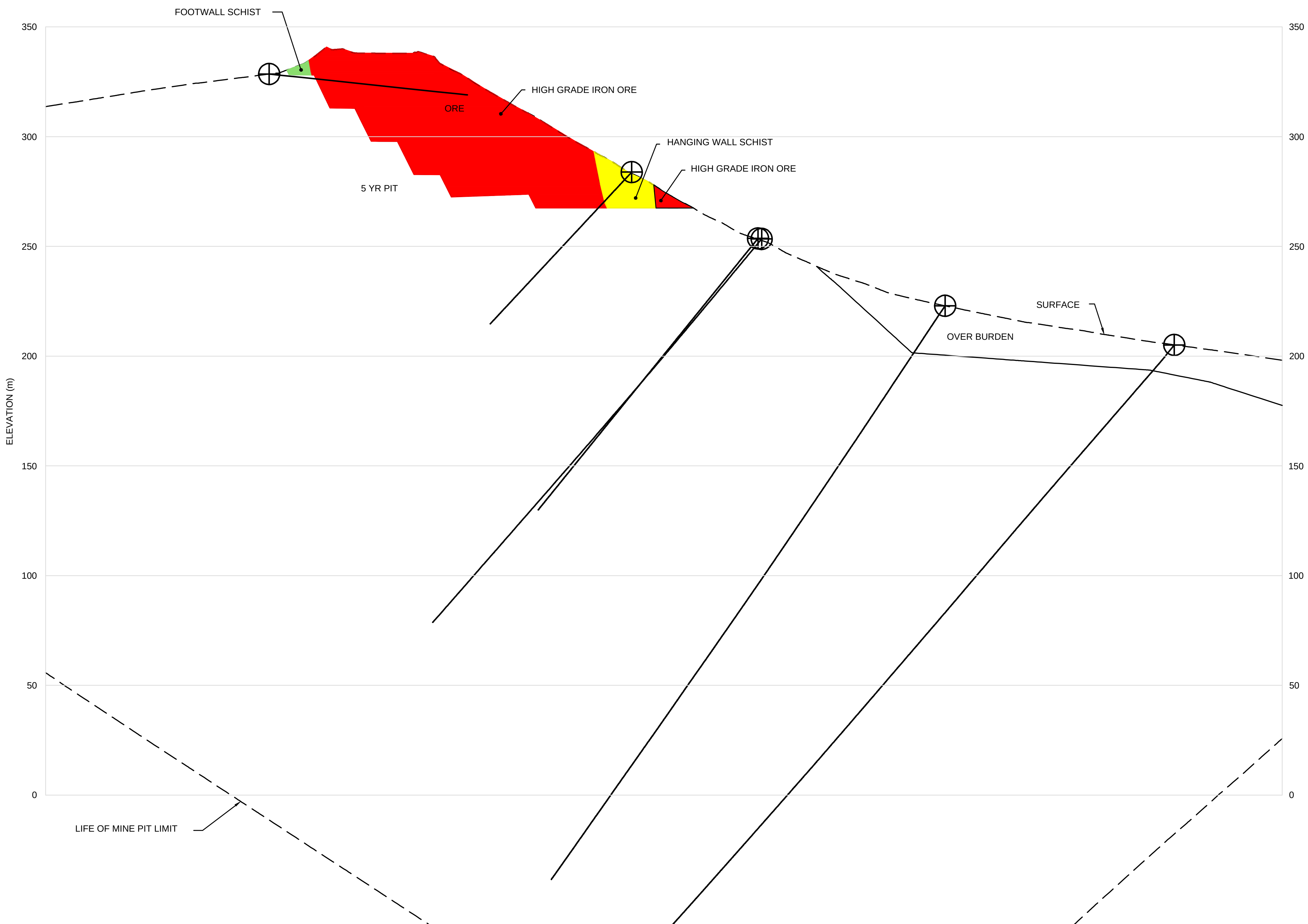
MARY RIVER PROJECT
DEPOSIT 1

TITLE

FIVE YEAR PIT LIMIT
PLAN VIEW

DATE:	APRIL 2014
PROJECT NO:	TC123908
REV. NO.:	A
FIGURE No.	1

P:\Geo\1 - PROJECTS\2012\TC123908-Baffinland Iron Mines Corp\08. CAD\WRK\FIGURE 1a.DWG - 1 - Apr. 23, 2014 11:35am - nadine.rondon



NOTES:

1. DRAWING PRODUCED FROM DIGITAL FILES PROVIDED BY BAFFINLAND IRON MINES CORPORATION.
2. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

LEGEND:

- HIGH GRADE IRON ORE
- FOOTWALL SCHIST
- HANGING WALL SCHIST
- FOOTWALL WASTE
- EXISTING BOREHOLE

0 50 100m

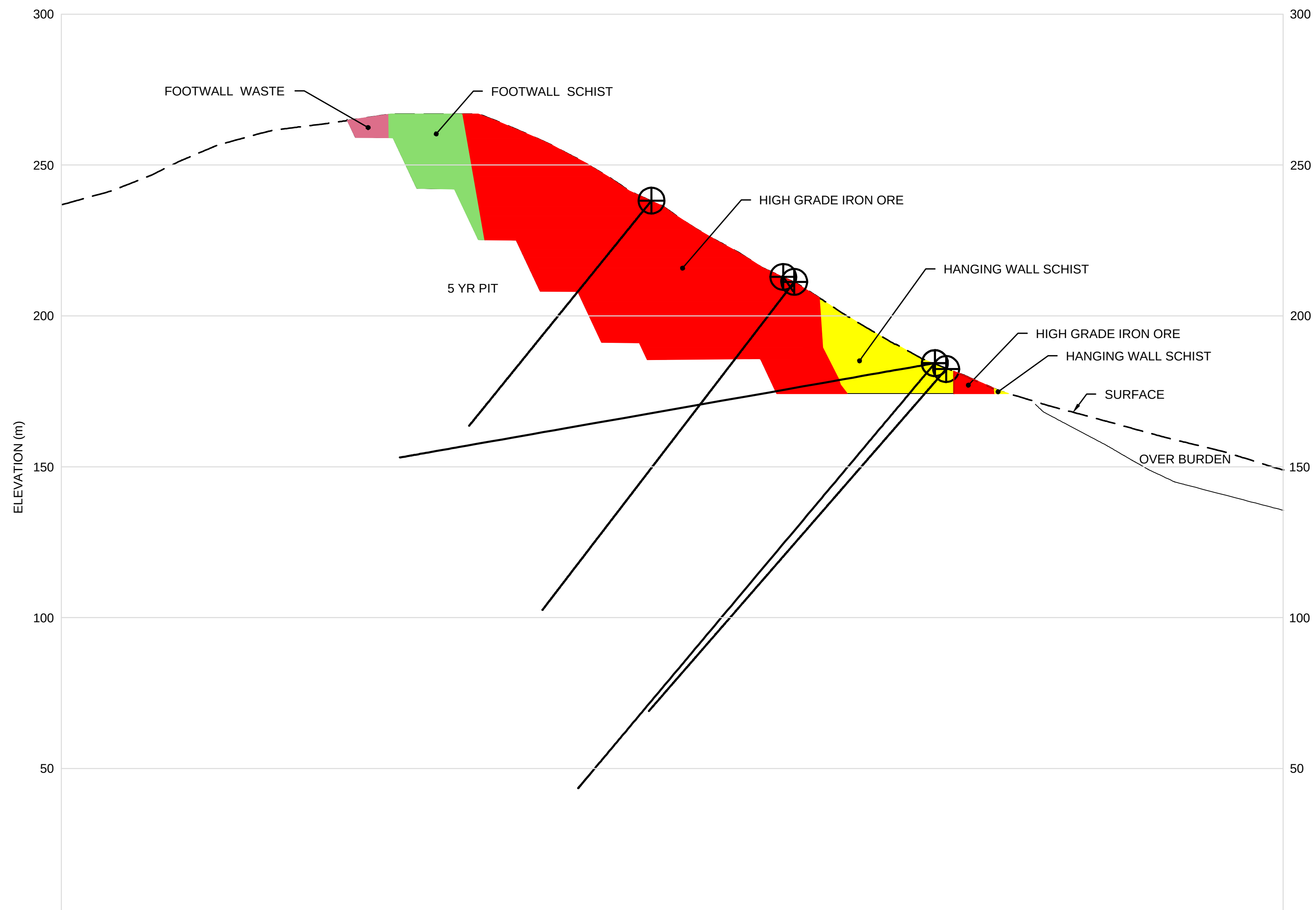
1:2000 SCALE

CLIENT LOGO	Baffinland Iron Mines Corporation
CLIENT:	BAFFINLAND IRON MINES CORPORATION
	AMEC Environment & Infrastructure 160 Traders Boulevard East Mississauga, Ontario, Canada L4Z 3K7
DWN BY:	NR
CHK'D BY:	SW
DATUM:	NAD 83
PROJECTION:	UTM ZONE 17N
SCALE:	AS SHOWN
PROJECT	MARY RIVER PROJECT DEPOSIT 1
TITLE	FIVE YEAR PIT CROSS SECTION #1
DATE:	APRIL 2014
PROJECT NO:	TC123908
REV. NO.:	A
FIGURE No.	2

P:\Geo\1 - PROJECTS\2012\TC123908-Baffinland Iron Mines Corp\08. CAD\WRK\FIGURE 1a.DWG - 2 - Apr. 23, 2014 11:33am - nadine.rondon

NOTES:

1. DRAWING PRODUCED FROM DIGITAL FILES PROVIDED BY BAFFINLAND IRON MINES CORPORATION.
2. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.



LEGEND:

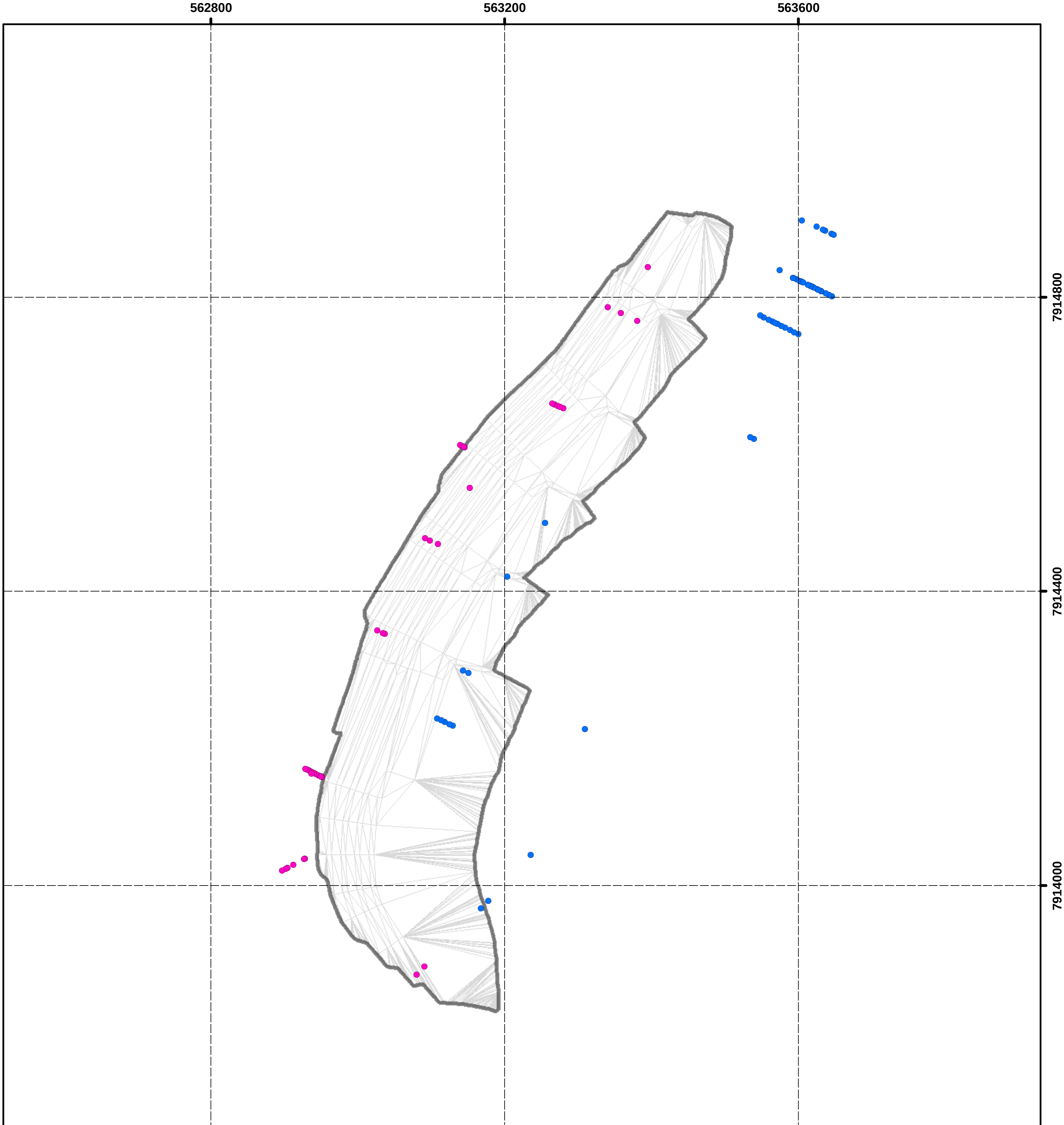
- HIGH GRADE IRON ORE
- FOOTWALL SCHIST
- HANGING WALL SCHIST
- FOOTWALL WASTE
- EXISTING BOREHOLE

0 50 100m

1:2000 SCALE

CLIENT LOGO	Baffinland Iron Mines Corporation
CLIENT:	BAFFINLAND IRON MINES CORPORATION
	AMEC Environment & Infrastructure 160 Traders Boulevard East Mississauga, Ontario, Canada L4Z 3K7
DWN BY:	NR
CHK'D BY:	SW
DATUM:	NAD 83
PROJECTION:	UTM ZONE 17N
SCALE:	AS SHOWN
PROJECT	MARY RIVER PROJECT DEPOSIT 1
TITLE	FIVE YEAR PIT CROSS SECTION #2
DATE:	APRIL 2014
PROJECT NO:	TC123908
REV. NO.:	A
FIGURE No.	3

P:\Geo\1 - PROJECTS\2012\TC123908-Baffinland Iron Mines Corp\08. CAD\WRK\FIGURE 1a.DWG - 3 - Apr. 23, 2014 11:56am - nadine.rondon



P:\Geo\1 - PROJECTS\2012\TC123908-Baffinland Iron Mines Corp\07. GIS\3D_PitSamples_March2014\MXD_Maps\5yr_Pit_2D_ABA_Samples_4.mxd

LEGEND

- Proposed 5 Year Open Pit Boundary
- Footwall Schist ARD Sample Locations
- Hanging Wall Schist ARD Sample Locations

NOTES:
-

Datum: NAD83
Projection: UTM Zone 17N

0 75 150 300 450 600 Metres

N W E S

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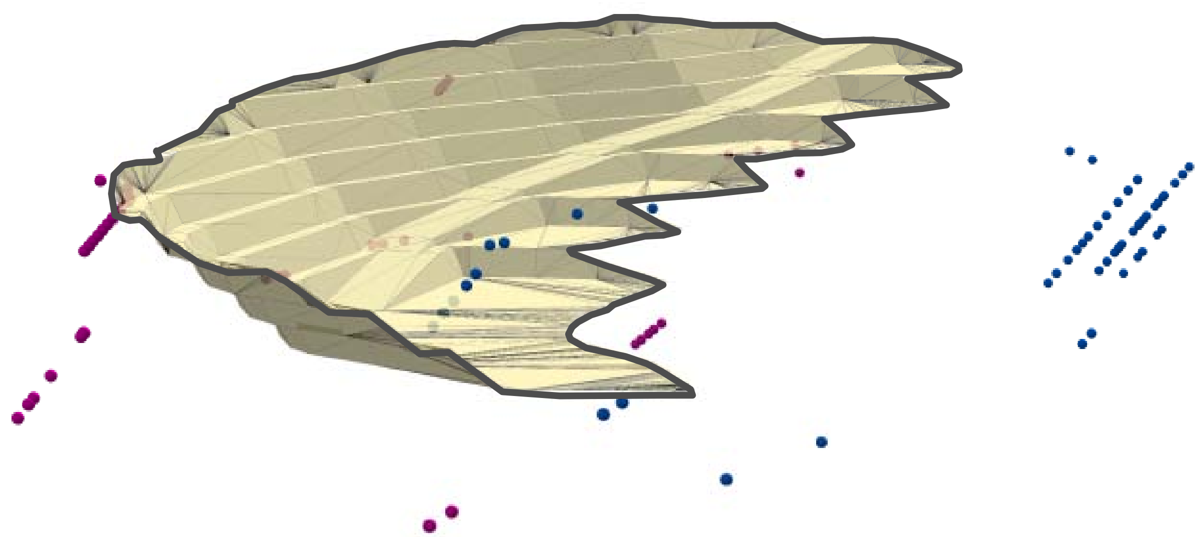
MARY RIVER PROJECT

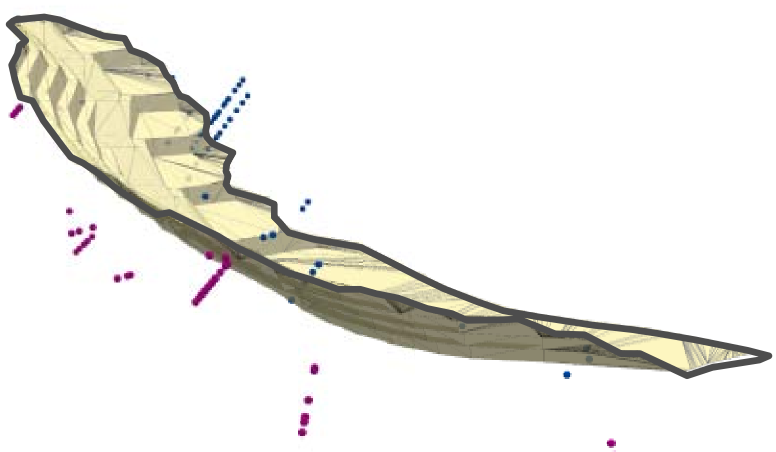
Plan View of ARD Sample Distribution Adjacent to the 5 Year Deposit 1 Pit Shell

PROJECT N°: TC123908	**FIGURE: 4**
SCALE: 1:7,000	DATE: April 2014

Three-Dimensional Looking North
(linear scale varies in this perspective)



Three-Dimensional Looking Northeast
(linear scale varies in this perspective)



LEGEND

- Proposed 5 Year Open Pit Boundary
- Footwall Schist ARD Sample Locations
- Hanging Wall Schist ARD Sample Locations

NOTES:
-

Datum: NAD83
Projection: UTM Zone 17N

N / W / E / S

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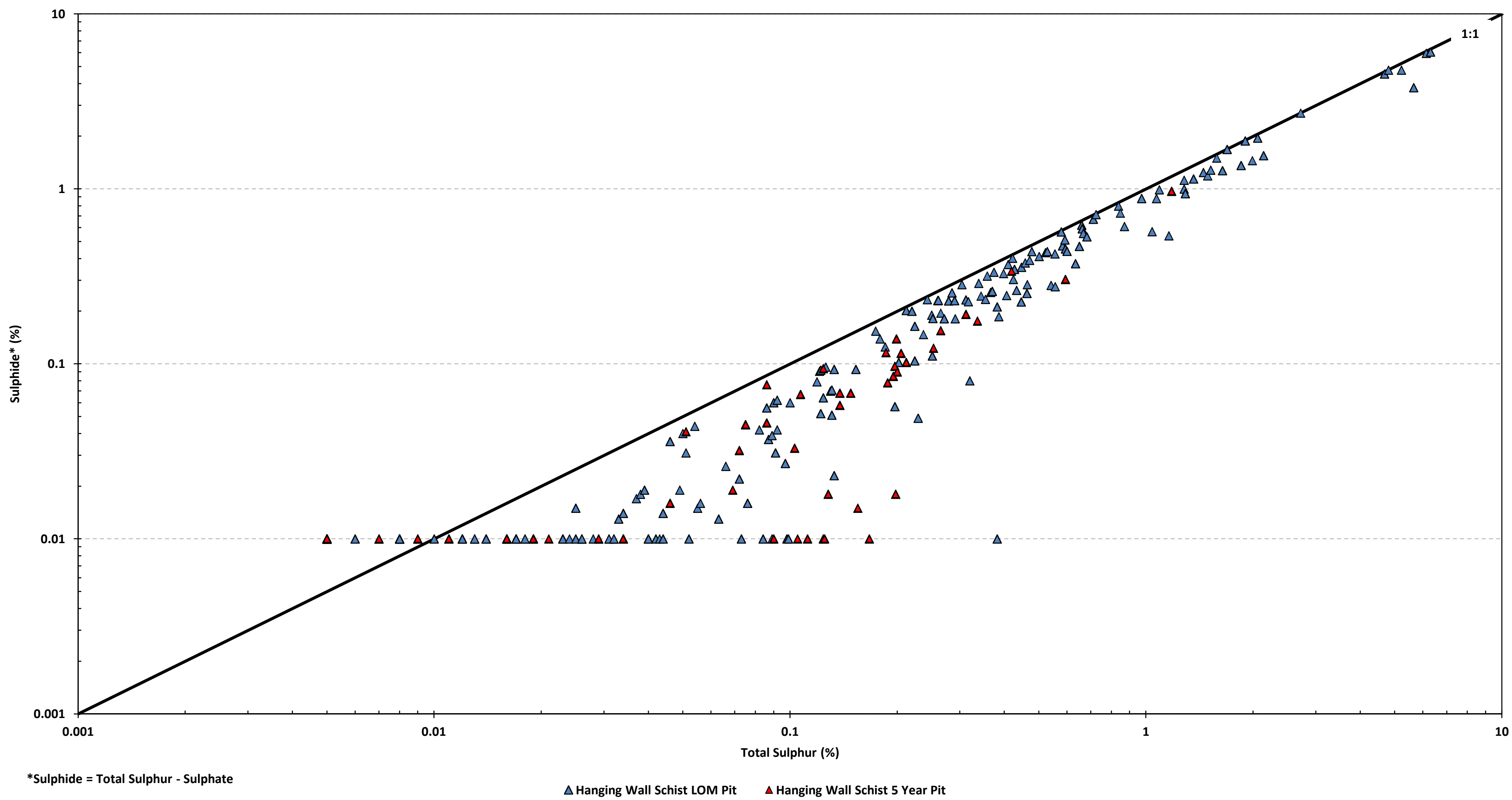
MARY RIVER PROJECT

Oblique View of ARD Sample Distribution Adjacent to the 5 Year Deposit 1 Pit Shell

PROJECT N°: TC123908	**FIGURE: 5**
SCALE:	DATE: April 2014

P:\Geo\1 - PROJECTS\2012\TC123908-Baffinland Iron Mines Corp\07. GIS\3D_PitSamples_March2014\MXD_Maps\5yr_Pit_3D_ABA_Samples_4.mxd



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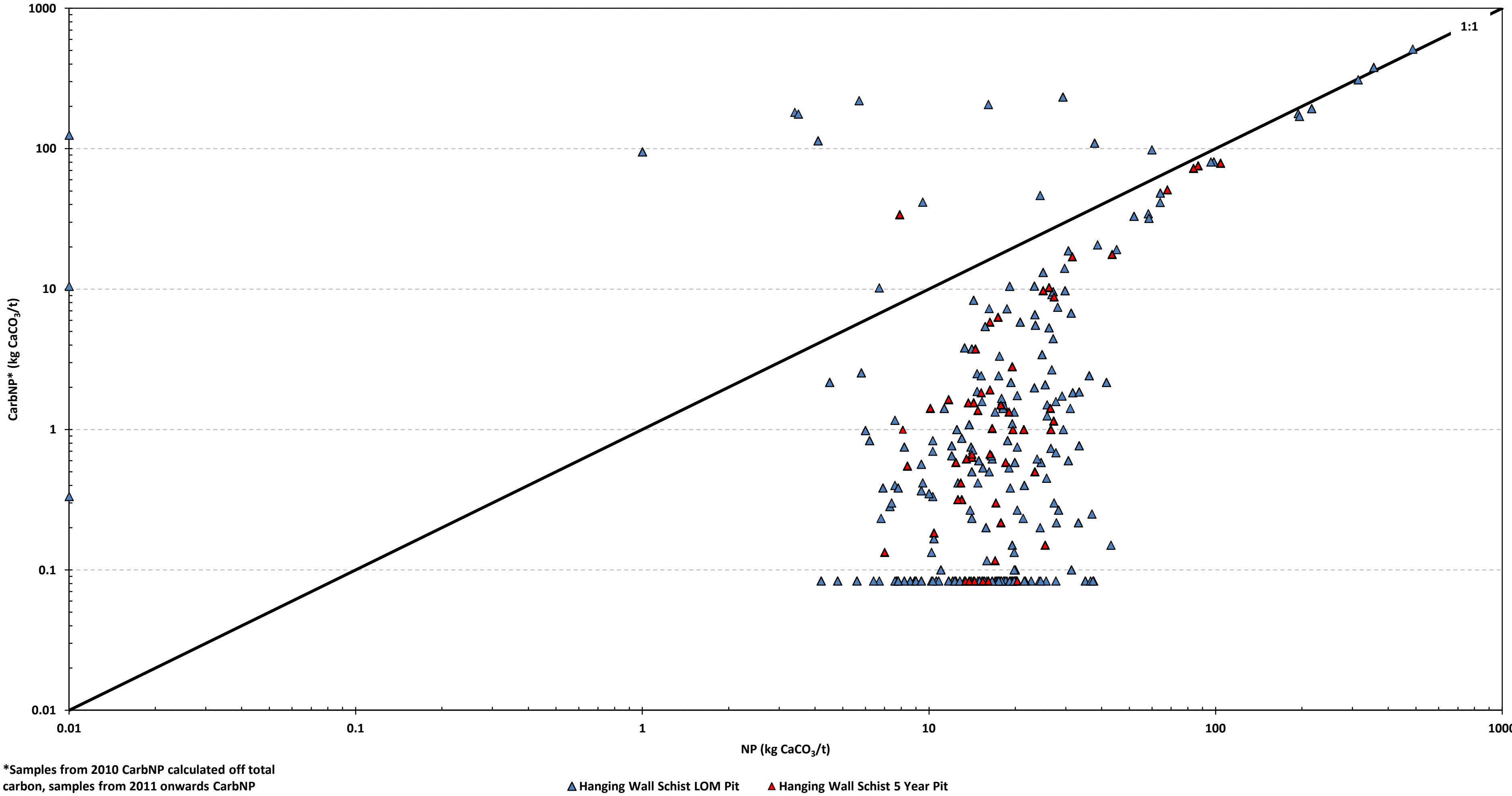
Mary River Project

Total Sulphur vs Sulphide for Hanging Wall Schist

Drawn by: LC	Checked by: SW	Date: April 2014
Project: TC123908		FIGURE 6



*Samples from 2010 CarbNP calculated off total carbon, samples from 2011 onwards CarbNP calculated off carbonate carbon

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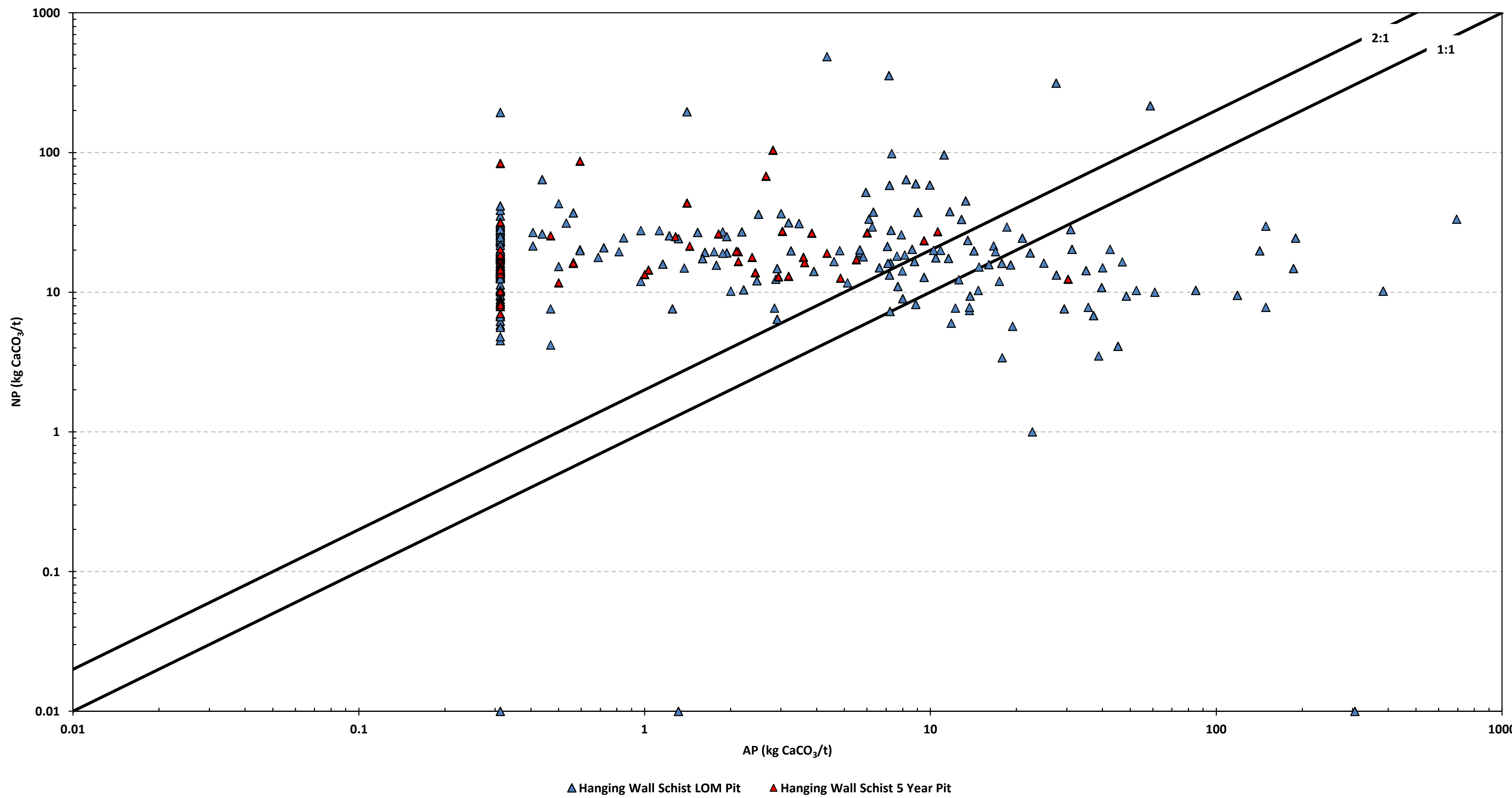
Mary River Project

NP vs. CarbNP for Hanging Wall Schist

Drawn by: LC	Checked by: SW	Date: April 2014
Project: TC123908		FIGURE 7



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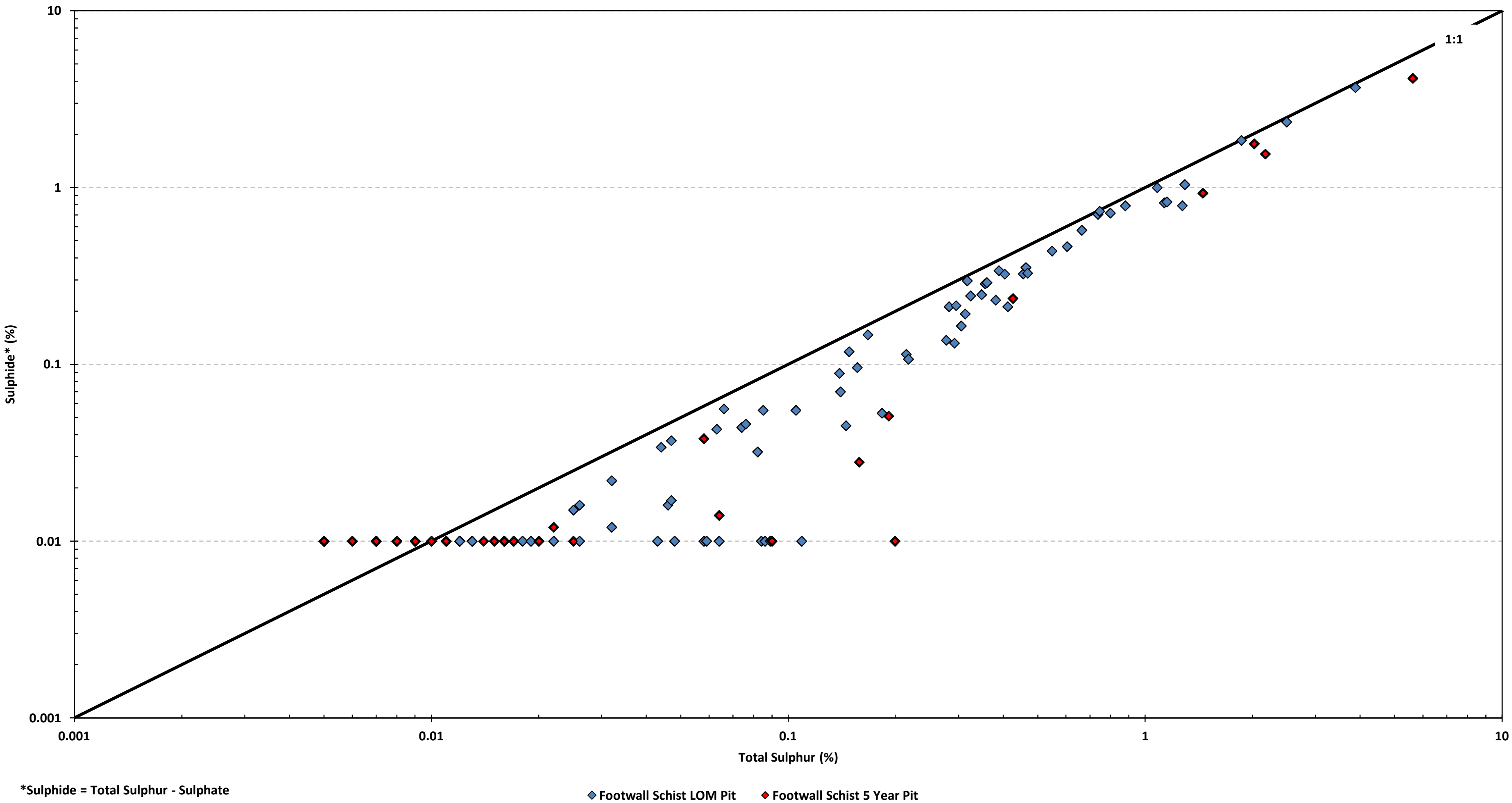
Mary River Project

NP vs. AP for Hanging Wall Schist

Drawn by: LC	Checked by: SW	Date: April 2014
Project: TC123908		FIGURE 8



*Sulphide = Total Sulphur - Sulphate

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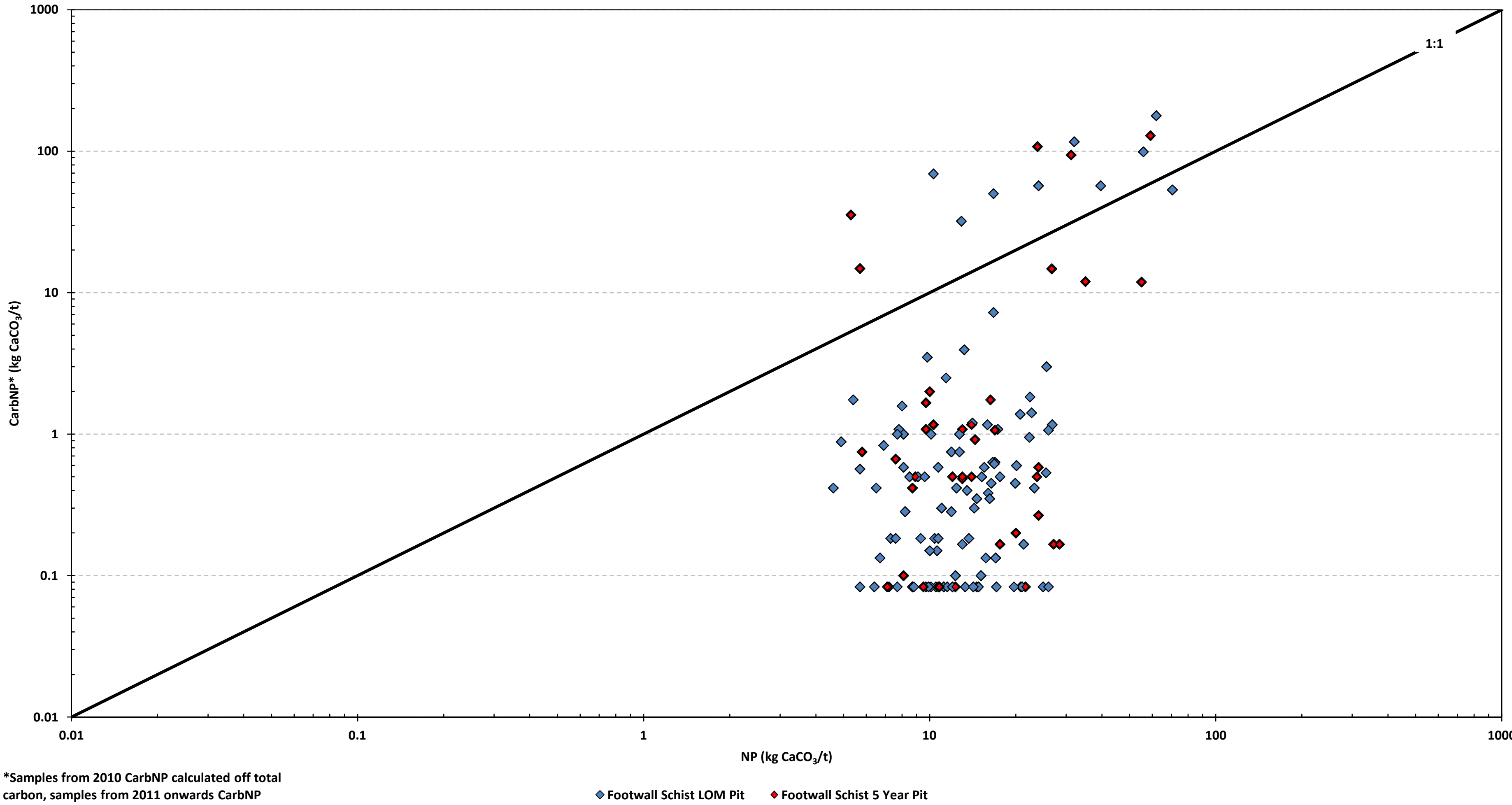
Mary River Project

Total Sulphur vs Sulphide for Footwall Schist

Drawn by: LC	Checked by: SW	Date: April 2014
Project: TC123908		FIGURE 9



*Samples from 2010 CarbNP calculated off total carbon, samples from 2011 onwards CarbNP calculated off carbonate carbon

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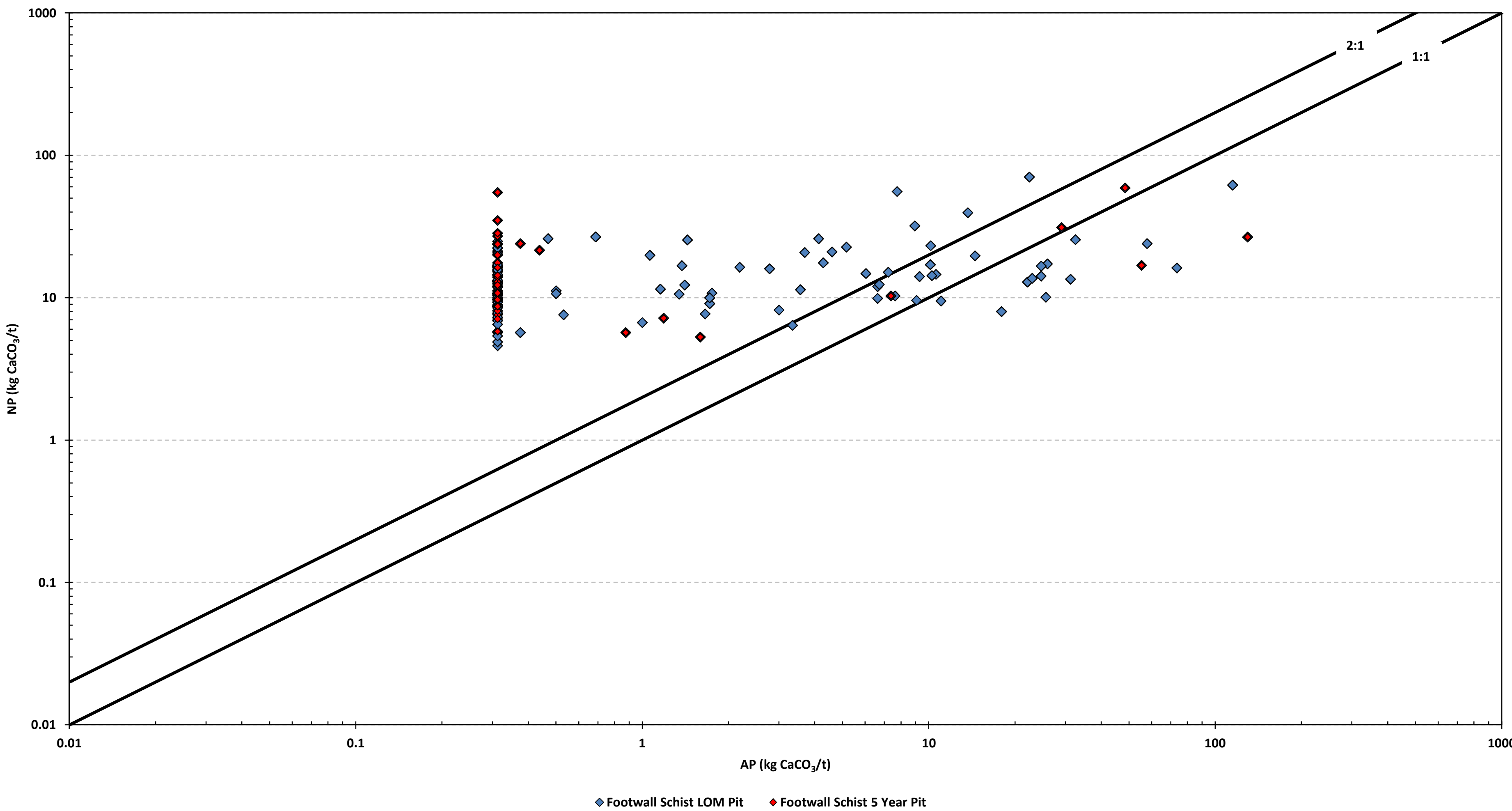
Mary River Project	
NP vs. CarbNP for Footwall Schist	
Drawn by: LC / Checked by: SW	Date: April 2014
Project: TC123908	FIGURE 10



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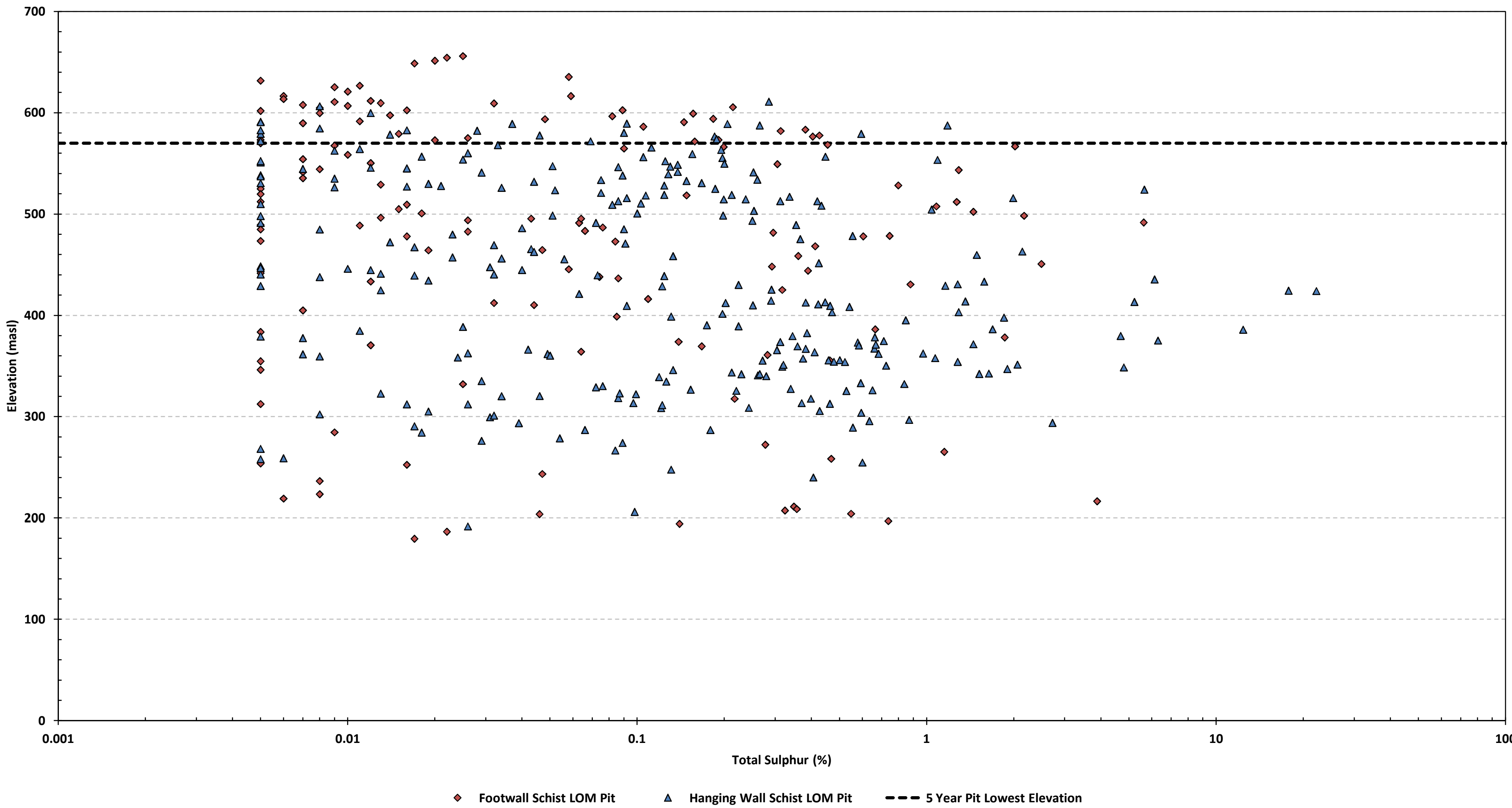
Mary River Project

NP vs. AP for Footwall Schist

Drawn by: LC	Checked by: SW	Date: April 2014
Project: TC123908		FIGURE 11



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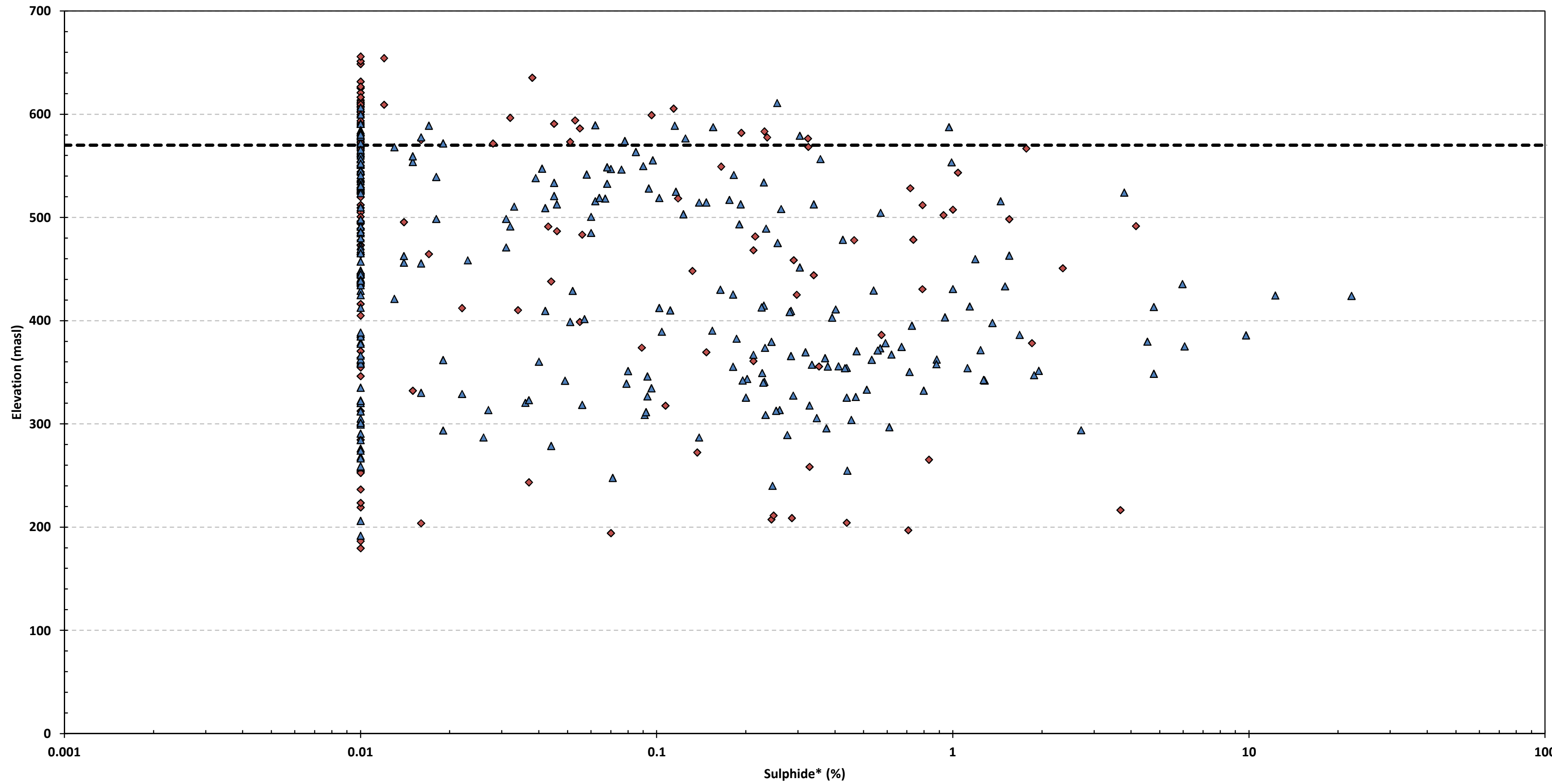
Mary River Project

Total Sulphur vs. Elevation for Footwall Schist and Hanging Wall Schist

Drawn by: LC	Checked by: SW	Date: April 2014
Project: TC123908		FIGURE 12



*Sulphide = Total Sulphur - Sulphate

Footwall Schist LOM Pit | Hanging Wall Schist LOM Pit | 5 Year Pit Lowest Elevation

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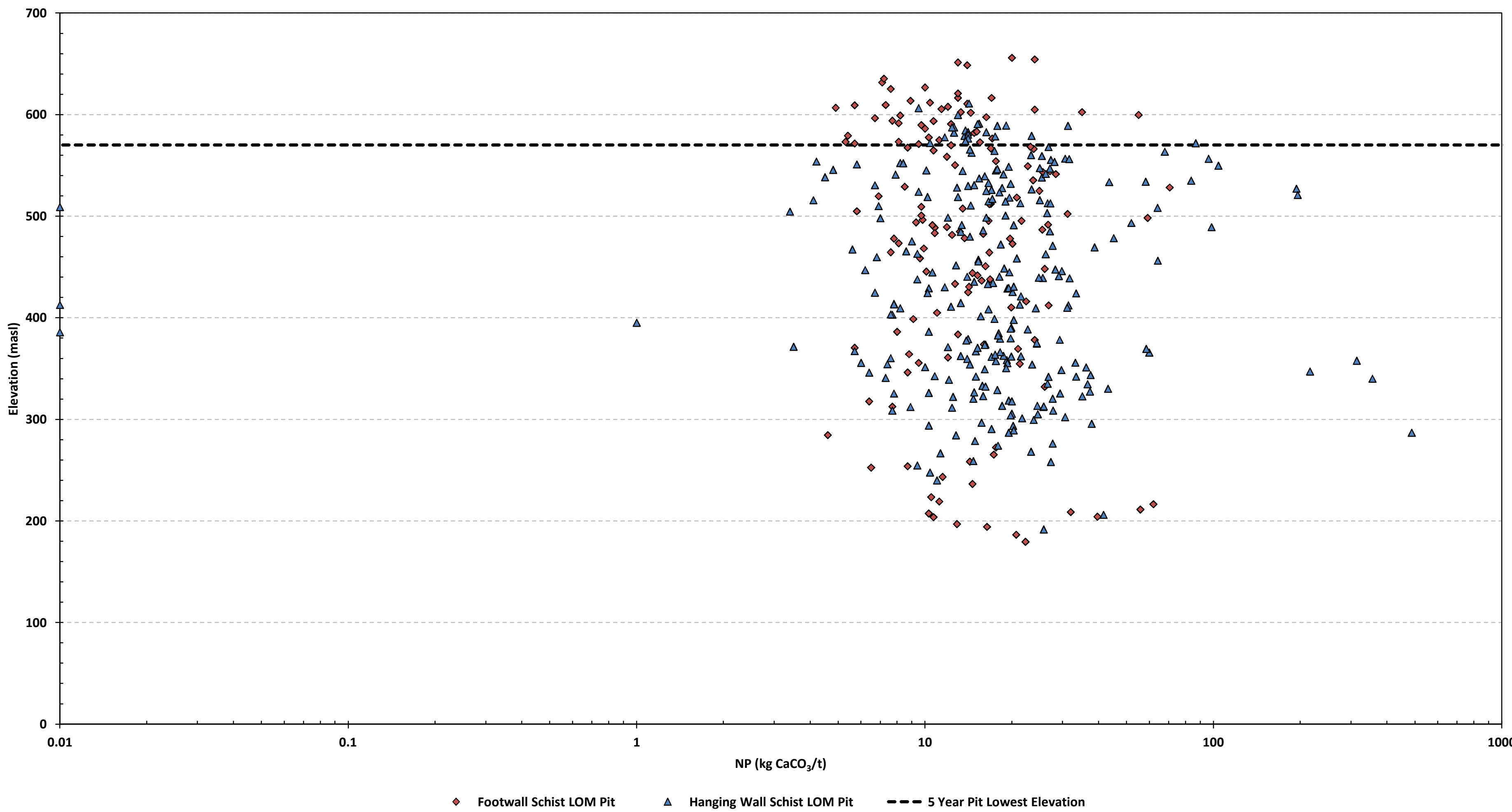
Mary River Project

Sulphide vs. Elevation for Footwall Schist and Hanging Wall Schist

Drawn by: LC	Checked by: SW	Date: April 2014
Project: TC123908		FIGURE 13



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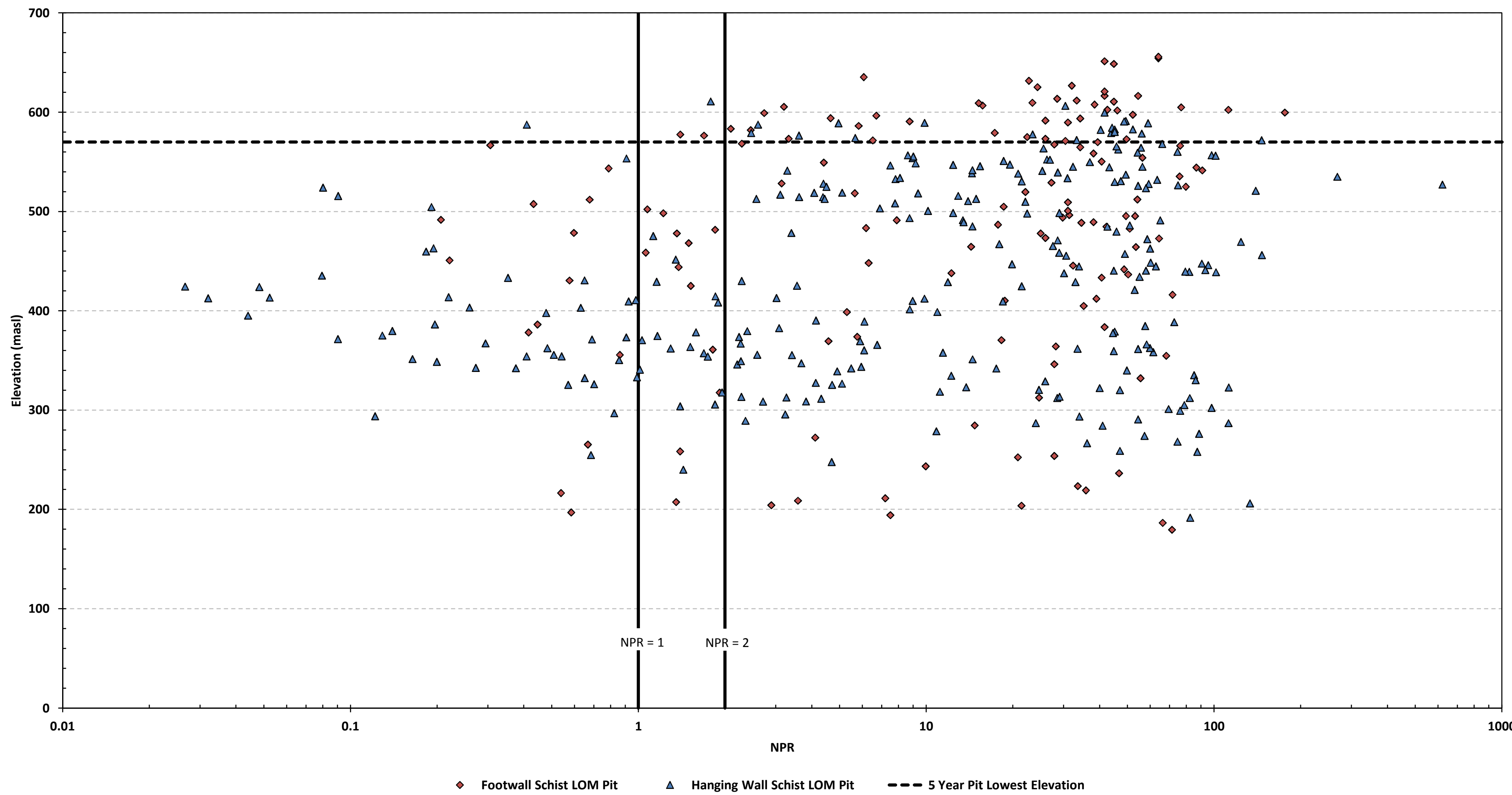
Mary River Project

NP vs. Elevation for Footwall Schist and Hanging Wall Schist

Drawn by: LC	Checked by: SW	Date: April 2014
Project: TC123908		FIGURE 14



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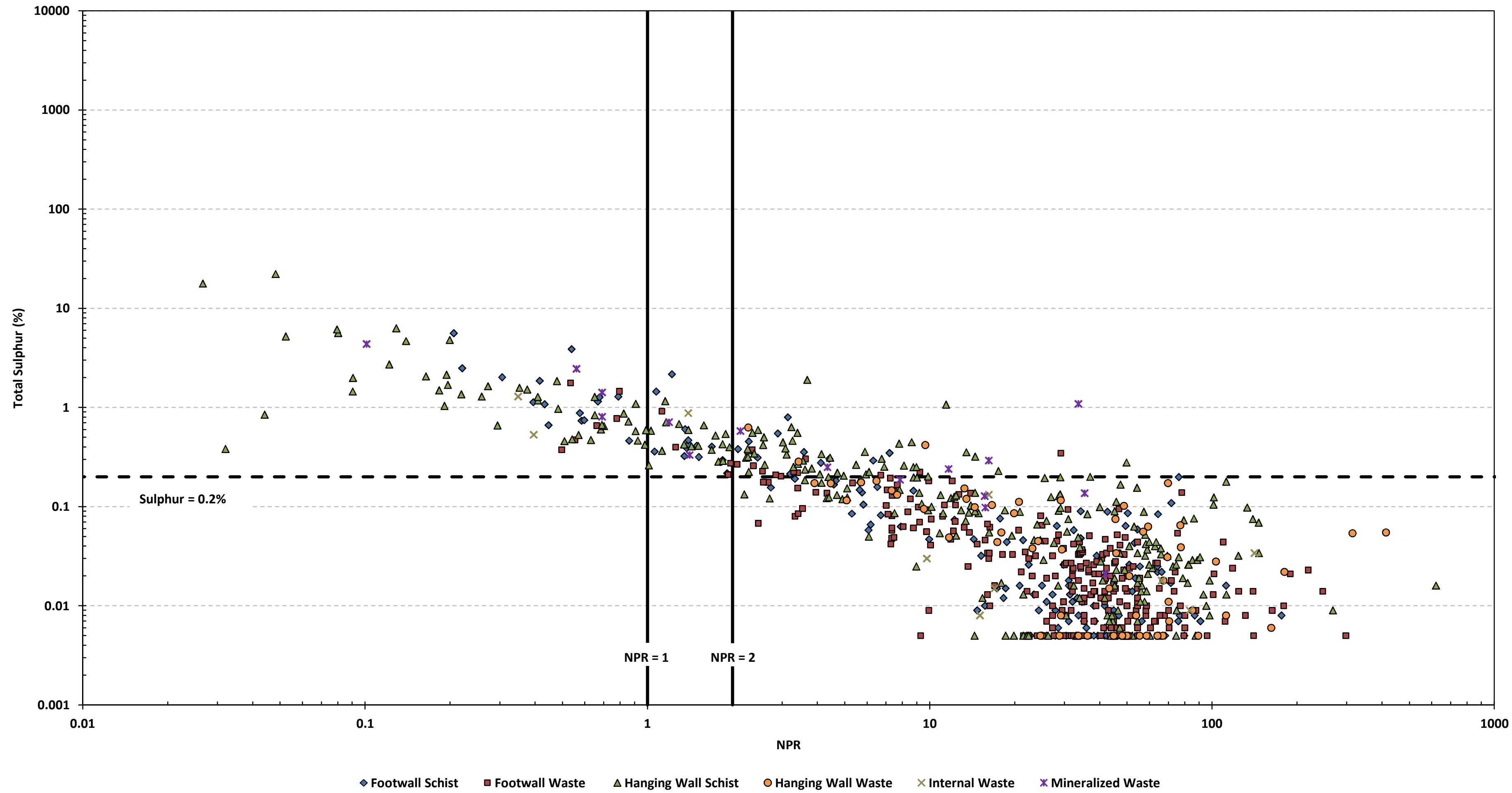
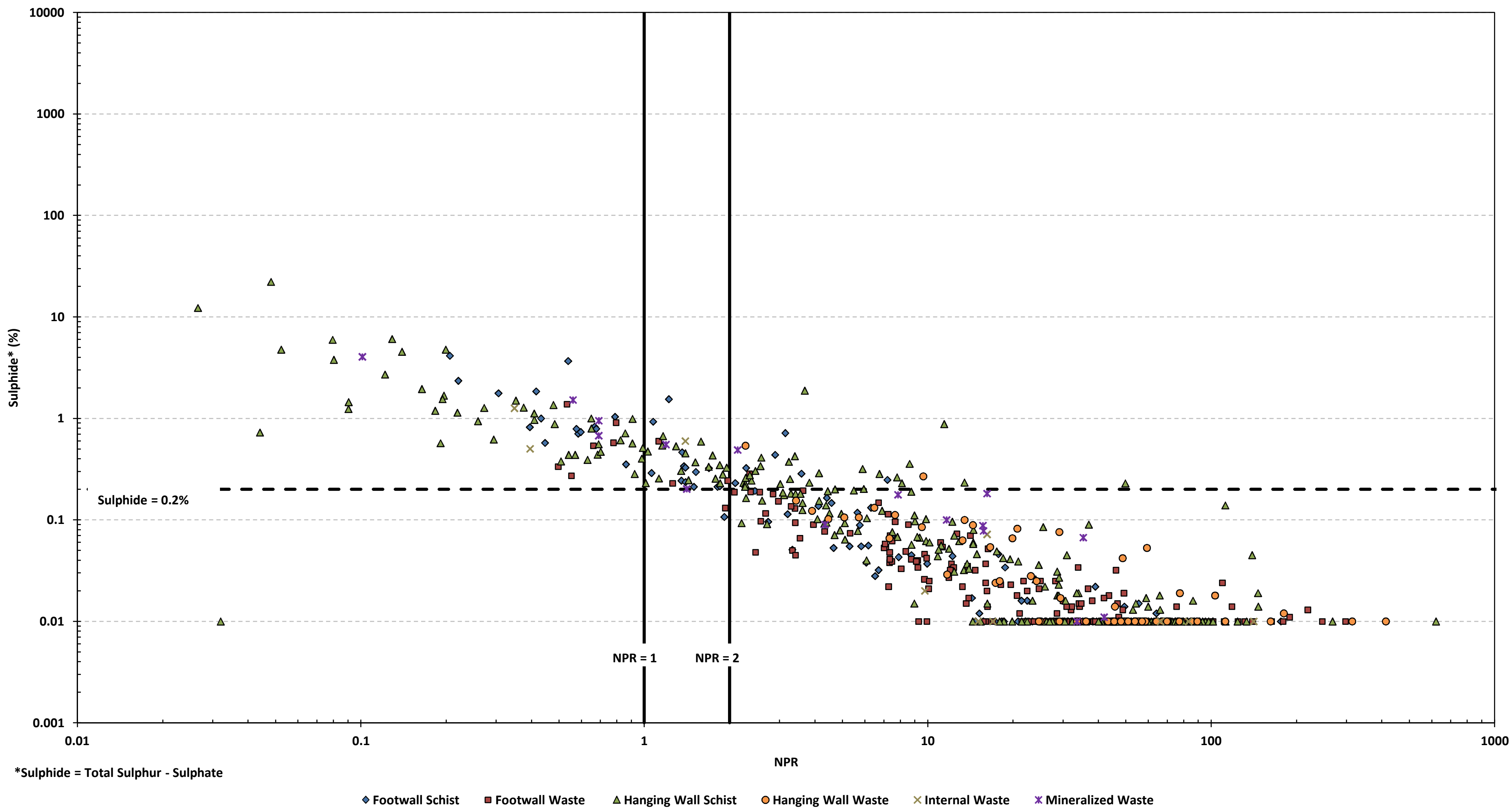
Mary River Project	
NPR vs. Elevation for Footwall Schist and Hanging Wall Schist	
Drawn by: LC / Checked by: SW	Date: April 2014
Project: TC123908	FIGURE 15



Mary River Project

Total Sulphur vs. NPR for the LOM Pit

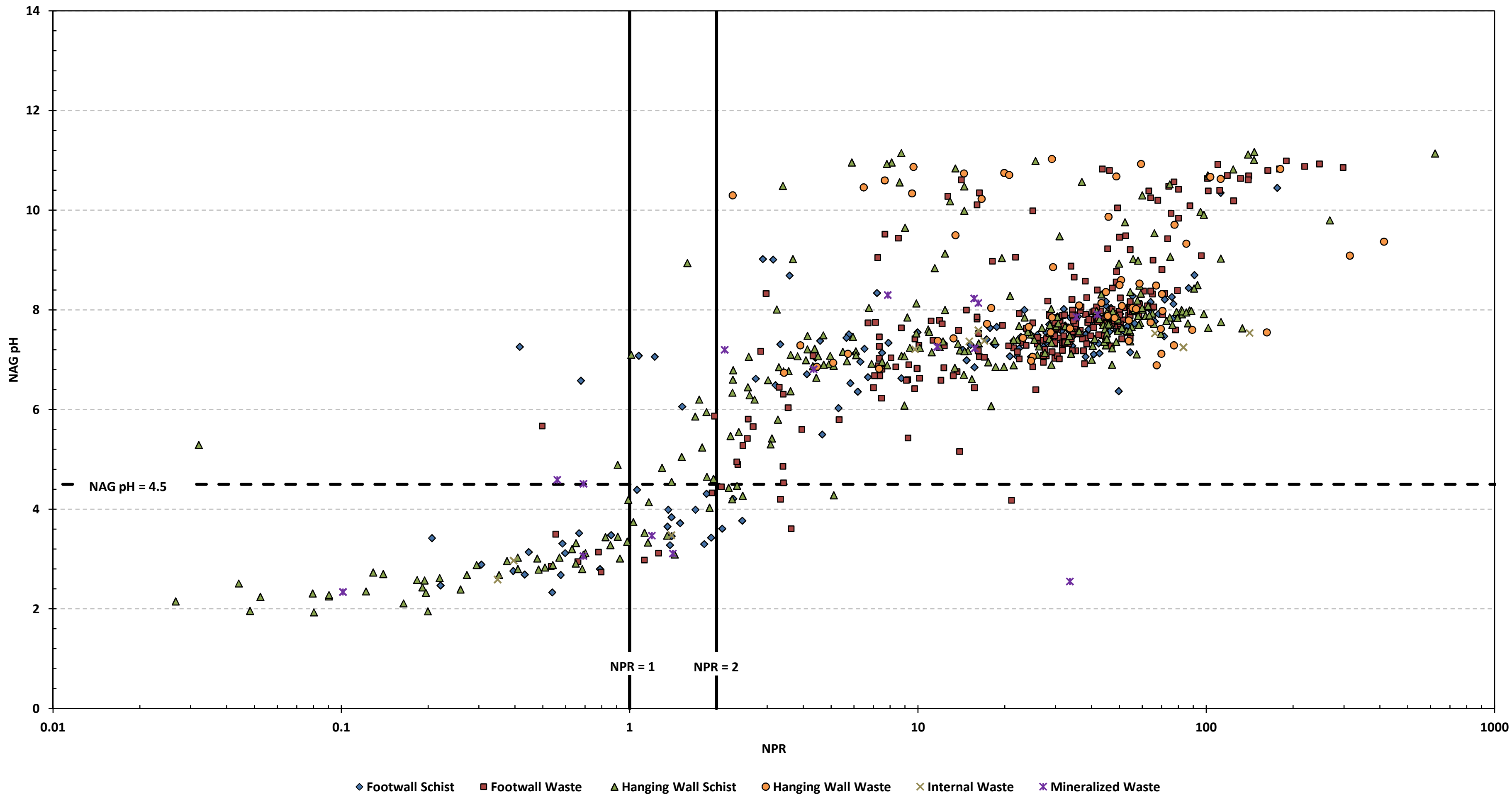
Drawn by: LC	Checked by: SW	Date: April 2014
Project: TC123908		FIGURE 16



Mary River Project

Sulphide vs. NPR for the LOM Pit

Drawn by: LC	Checked by: SW
Date: April 2014	
Project: TC123908	FIGURE 17



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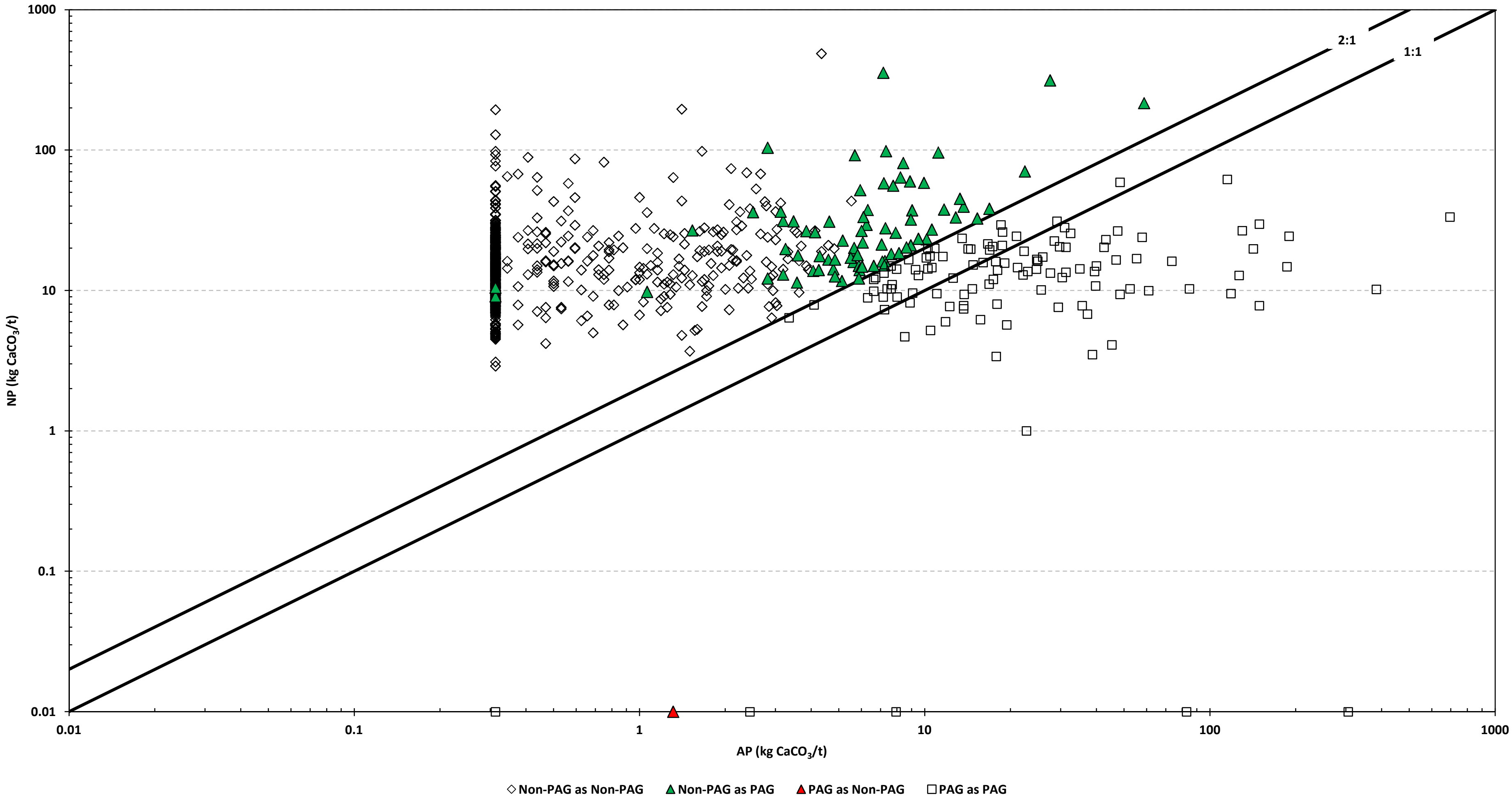
Mary River Project

NAG pH vs. NPR for the LOM Pit

Drawn by: LC	Checked by: SW	Date: April 2014
Project: TC123908		FIGURE 18



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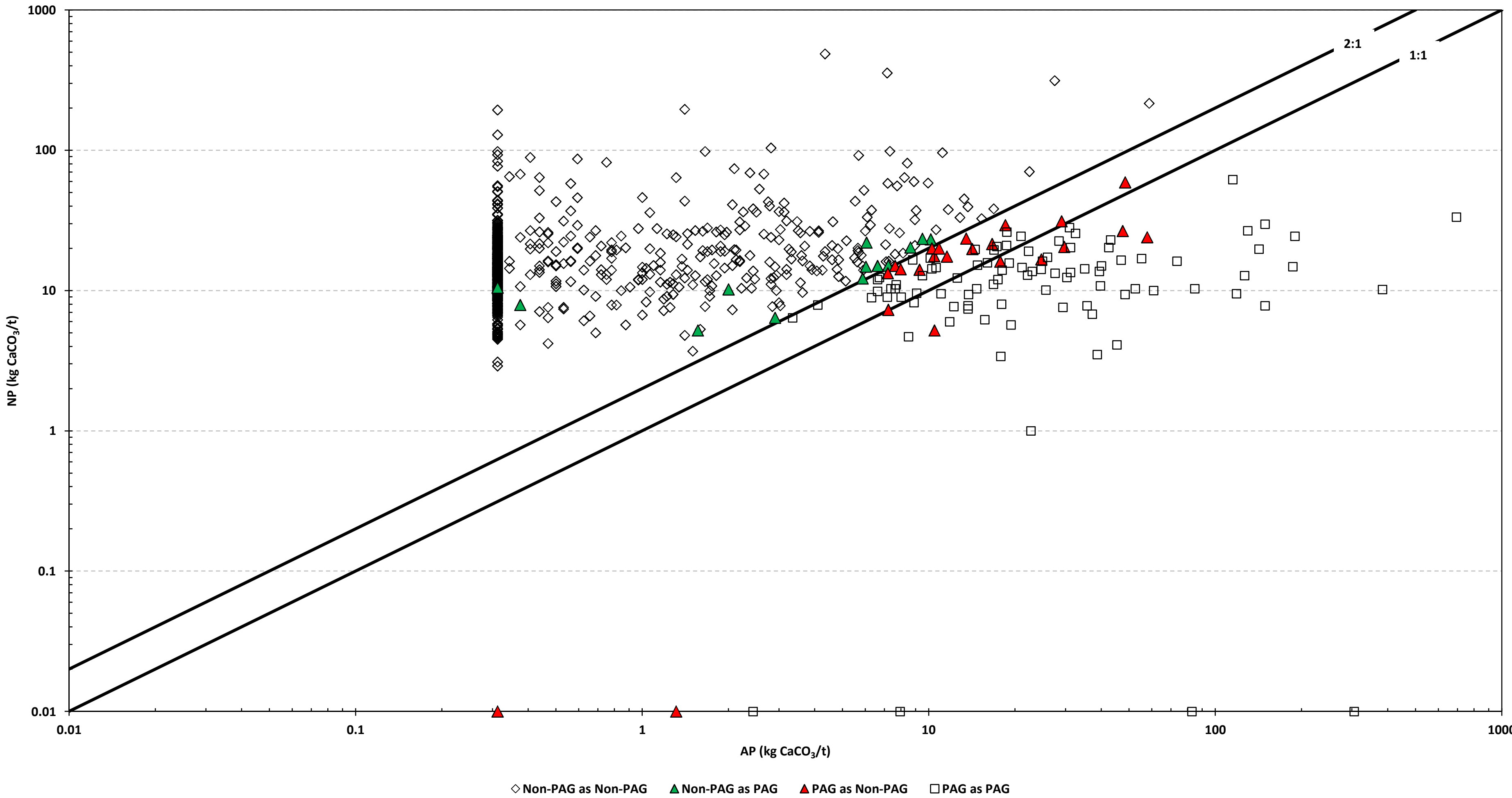
Mary River Project

Misclassification Using a Total Sulphur Content >0.2% to Determine PAG

Drawn by: LC	Checked by: SW	Date: April 2014
Project: TC123908		FIGURE 19



Baffinland Iron Mines Corporation

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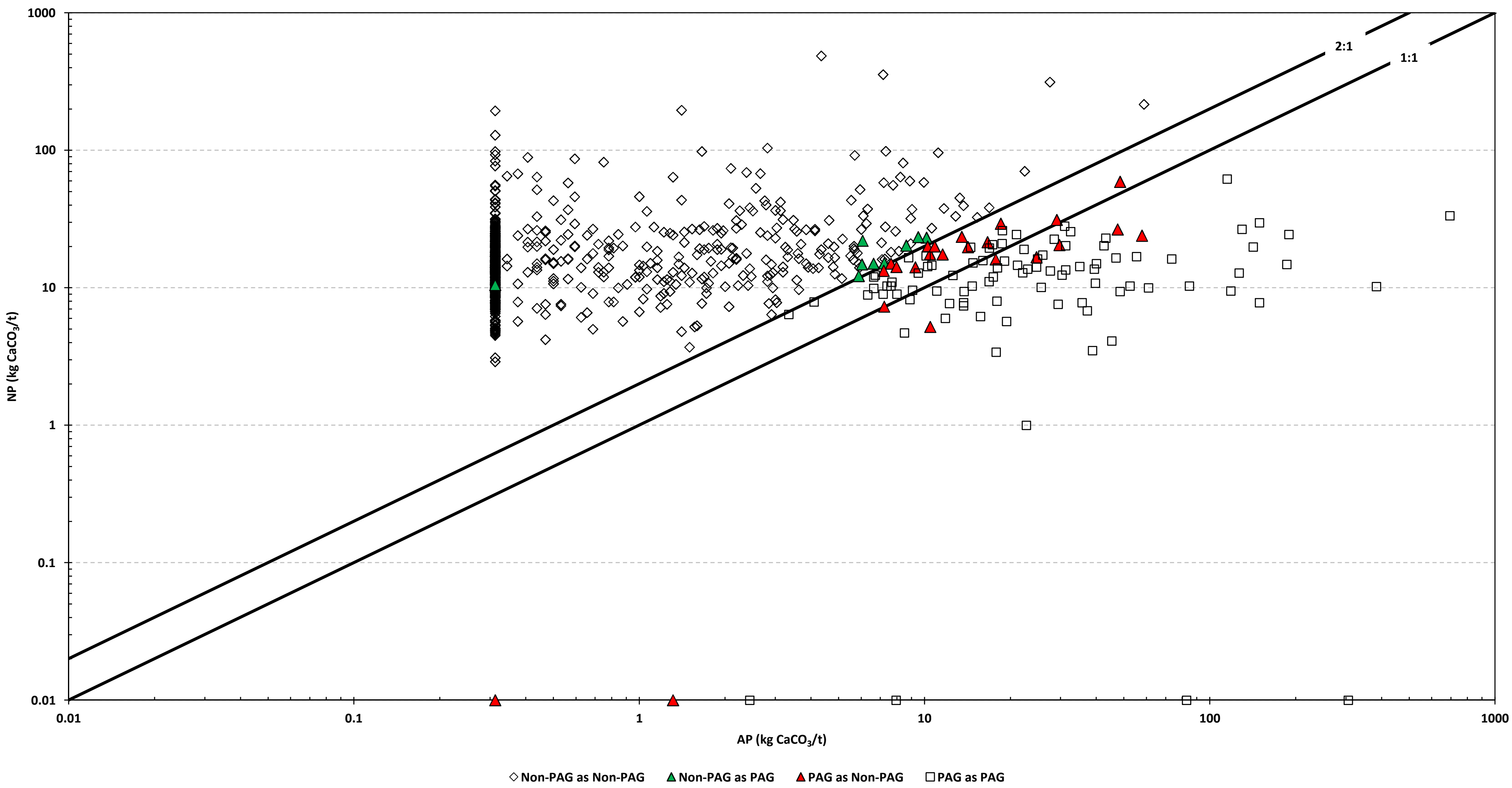
Mary River Project

Misclassification Using a NAG pH < 4.5 to Determine PAG

Drawn by: LC	Checked by: SW	Date: April 2014
Project: TC123908		FIGURE 20



Note: NAGpH test applied to samples identified as PAG by sulphur >0.2%.

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Mary River Project

Misclassification Using a Total Sulphur Content >0.2% and NAG pH < 4.5

Drawn by: LC	Checked by: SW	Date: April 2014
Project: TC123908		FIGURE 21

APPENDIX A

Table A-1: ABA Results for the 5 Year Pit

Easting	Northing	Elevation	Hole ID	Sample ID	Program	From	To	Waste Classification	Lithology	Paste pH	Fizz Rate	Total Sulphur	Sulphate	Sulphide*	Total Carbon	Carbonate	AP**	NP	CarbNP	NPR	CarbNPR
												%					kg $CaCO_3$/t				
7914597.909	563141.566	651.436	MR1-12-224	15482	Baff2012	27.5	29.5	Footwall Schist	Gniess	9.16	1	0.02	0.01	0.01	0.027	0.029	0.3	13	0.5	41.6	1.5
7914599.171	563139.381	648.73	MR1-12-224	15484	Baff2012	31.3	33.1	Footwall Schist	Gniess	10	1	0.017	0.01	0.01	0.019	0.07	0.3	14	1.2	44.8	3.7
7914147.995	562951.331	626.809	MR1-12-225	15702	Baff2012	14	16	Footwall Schist	Gniess	9.09	1	0.011	0.01	0.01	0.063	0.12	0.3	10	2.0	32.0	6.4
7914148.592	562950.105	625.346	MR1-12-225	15703	Baff2012	16	18	Footwall Schist	Gniess	9.46	1	0.009	0.01	0.01	0.024	0.04	0.3	7.6	0.7	24.3	2.1
7914150.386	562946.428	620.958	MR1-12-225	15706	Baff2012	22	24	Footwall Schist	Gniess	9.15	1	0.01	0.01	0.01	0.018	0.065	0.3	13	1.1	41.6	3.5
7914152.18	562942.75	616.57	MR1-12-225	15709	Baff2012	28	30	Footwall Schist	Gniess	9.46	1	0.006	0.01	0.01	0.013	0.03	0.3	13	0.5	41.6	1.6
7914153.376	562940.298	613.644	MR1-12-225	15711	Baff2012	32	34	Footwall Schist	Gniess	9.51	1	0.006	0.01	0.01	0.013	0.03	0.3	8.9	0.5	28.5	1.6
7914154.572	562937.846	610.719	MR1-12-225	15713	Baff2012	36	38	Footwall Schist	Gniess	9.57	1	0.009	0.01	0.01	0.013	0.03	0.3	14	0.5	44.8	1.6
7914155.768	562935.394	607.793	MR1-12-225	15715	Baff2012	40	42	Footwall Schist	Gniess	9.78	1	0.007	0.01	0.01	0.016	0.03	0.3	12	0.5	38.4	1.6
7914156.919	562933.034	604.978	MR1-12-225	15717	Baff2012	44	45.7	Footwall Schist	Gniess	9.37	1	0.008	0.01	0.01	0.019	0.035	0.3	24	0.6	76.8	1.9
7914464.386	563109.225	573.328	MR1-08-145	16310	Baff2011	132.5	133.65	Footwall Schist	Gniess	8.53	1	0.005	0.01	0.01	0.023	0.006	0.3	8.1	0.1	25.9	0.3
7914469.619	563098.002	571.144	MR1-08-145	16312	Baff2011	145.2	146.1	Footwall Schist	Gniess	8.63	1	0.005	0.01	0.01	0.034	0.005	0.3	9.5	0.1	30.4	0.3
7914472.537	563091.745	569.927	MR1-08-145	16314	Baff2011	152.16	153.16	Footwall Schist	Gniess	9.3	1	0.005	0.01	0.01	0.016	0.005	0.3	12.3	0.1	39.4	0.3
7914152.497	562936.858	635.446	MR1-07-118	16518	Baff2011	14.61	15.56	Footwall Schist	Gniess	9.15	1	0.058	0.02	0.038	0.024	0.005	1.2	7.2	0.1	6.1	0.1
7914148.235	562949.976	631.75	MR1-07-118	16520	Baff2011	28.9	29.83	Footwall Schist	Gniess	9.39	1	0.005	0.01	0.01	0.012	0.005	0.3	7.1	0.1	22.7	0.3
7914347.059	563026.427	564.832	MR1-06-90	16726	Baff2011	153.4	154.38	Footwall Schist	Gniess	9.05	1	0.09	0.09	0.01	0.015	0.005	0.3	10.7	0.1	34.2	0.3
7913890.018	563090.826	509.355	MR1-09-179	MRARD10 004	AMEC_2010	160	161	Footwall Schist	Gniess	9.5	1	0.016	0.02	0.01	0.013	0.026	0.3	9.7	1.1	31.0	3.5
7913878.955	563080.142	504.945	MR1-09-179	MRARD10 005	AMEC_2010	176	177	Footwall Schist	Gniess	9.4	1	0.015	0.02	0.01	0.009	0.011	0.3	5.8	0.8	18.6	2.4
7914840.815	563394.858	577.665	MR1-08-161	MRARD10 057	AMEC_2010	160	161	Footwall Schist	Gniess	9.49	1	0.426	0.19	0.236	0.014	0.042	7.4	10.3	1.2	1.4	0.2
7914540.881	563152.285	567.574	MR1-08-140	MRARD10 104	AMEC_2010	165	166	Footwall Schist	Gniess	8.41	1	0.009	0.01	0.01	0.005	0.005	0.3	8.7	0.4	27.8	1.3
7914654.151	563267.972	491.753	MR1-06-105	16076	Baff2011	182.01	182.96	Footwall Schist	High Grade Iron Formation	7.66	1	5.62	1.47	4.15	1.25	0.885	129.7	26.7	14.8	0.2	0.1
7914649.263	563279.902	502.306	MR1-06-105	16070	Baff2011	165.6	166.05	Footwall Schist	High Grade Iron Formation	7.2	1	1.45	0.52	0.93	3.29	5.65	29.1	31.2	94.2	1.1	3.2
7914651.088	563275.469	498.382	MR1-06-105	16072	Baff2011	171.52	172.52	Footwall Schist	High Grade Iron Formation	7.92	2	2.17	0.62	1.55	3.34	7.73	48.4	59.1	128.9	1.2	2.7
7914595.8	563145.219	655.96	MR1-12-224	15479	Baff2012	21.23	23.4	Footwall Schist	Schist	8.06	4	0.025	0.02	0.01	0.026	0.012	0.3	20	0.2	64.0	0.6
7914596.528	563143.958	654.398	MR1-12-224	15480	Baff2012	23.4	25.5	Footwall Schist	Schist	8.34	1	0.022	0.01	0.012	0.021	0.016	0.4	24	0.3	64.0	0.7
7914037.25	562928.144	573.304	MR1-12-226	15631	Baff2012	75.27	77.37	Footwall Schist	Schist	6.44	1	0.191	0.14	0.051	0.427	2.13	1.6	5.3	35.5	3.3	22.3
7914036.549	562926.826	571.702	MR1-12-226	15632	Baff2012	77.37	79.65	Footwall Schist	Schist	6.4	1	0.158	0.13	0.028	0.202	0.889	0.9	5.7	14.8	6.5	16.9
7914028.919	562912.476	554.274	MR1-12-226	15644	Baff2012	101.34	103.34	Footwall Schist	Schist	8.21	1	0.007	0.01	0.01	0.027	0.01	0.3	17.6	0.2	56.3	0.5
7914024.568	562904.293	544.335	MR1-12-226	15651	Baff2012	114.93	116.93	Footwall Schist	Schist	8.4	1	0.008	0.01	0.01	0.022	0.01	0.3	27.1	0.2	86.7	0.5
7914023.321	562901.947	541.487	MR1-12-226	15653	Baff2012	118.93	120.72	Footwall Schist	Schist	8.64	1	0.007	0.01	0.01	0.02	0.01	0.3	28.4	0.2	90.9	0.5
7914157.935	562930.95	602.491	MR1-12-225	15719	Baff2012	47.4	49.1	Footwall Schist	Schist	9.66	1	0.016	0.01	0.01	0.194	0.719	0.3	35	12.0	112.0	38.4
7914159.056	562928.651	599.749	MR1-12-225	15721	Baff2012	51	53	Footwall Schist	Schist	9.9	4	0.008	0.01	0.01	0.222	0.714	0.3	55	11.9	176.0	38.1
7914020.687	562896.994	535.471	MR1-12-226	15658	Baff2012	127.05	129.05	Footwall Schist	Schist	9.62	1	0.007	0.01	0.01	0.022	0.03	0.3	23.7	0.5	75.8	1.6
7914655.524	563264.597	488.761	MR1-06-105	16078	Baff2011	186.7	187.7	Footwall Schist	Schist	9.05	1	0.011	0.01	0.01	0.009	0.005	0.3	10.8	0.1	34.6	0.3
7914342.277	563036.682	566.827	MR1-06-90	16722	Baff2011	141.9	142.9	Footwall Schist	Schist	7.62	1	2.02	0.25	1.77	0.014	0.064	55.3	16.9	1.1	0.3	0.02
7914343.44	563034.188	566.342	MR1-06-90	16724	Baff2011	144.7	145.69	Footwall Schist	Schist	8.07	1	0.199	0.2	0.01	1.45	6.47	0.3	23.8	107.9	76.2	345.3
7914786.719	563340.21	594.098	MR1-08-163	MRARD10 035	AMEC_2010	155	156	Footwall Schist	Schist	7.89	1	0.007	0.01	0.01	0.02	0.207	0.3	9.7	1.7	31.0	5.3
7914767.99	563380.374	601.912	MR1-08-163	MRARD10 047	AMEC_2010	110	111	Footwall Schist	Schist	8.5	1	0.005	0.01	0.01	0.011	0.005	0.3	14.4	0.9	46.1	2.9
7914778.395	563358.061	597.571	MR1-08-163	MRARD10 049	AMEC_2010	135	136	Footwall Schist	Schist	8.15	1	0.014	0.01	0.01	0.021	0.005	0.3	16.3	1.8	52.2	5.6
7914652.408	563272.251	495.535	MR1-06-105	16074	Baff2011	176	177.03	Footwall Schist	Ultramafic	8.31	1	0.064	0.05	0.014	0.028	0.005	0.4	21.6	0.1	49.4	0.2
7914607.255	563539.17	498.078	MR1-05-72	16022	Baff2011	92.7	93.65	Hanging Wall Schist	Amphibolite	7.77	1	0.005	0.01	0.01	0.014	0.008	0.3	7	0.1	22.4	0.4
7914609.72	563534.114	491.375	MR1-05-72	16024	Baff2011	101.4	102.45	Hanging Wall Schist	Amphibolite	8.16	1	0.072	0.04	0.032	0.008	0.005	1.0	13.4	0.1	13.4	0.1
7914755.246	563588.198	564.313	MR1-05-77	16590	Baff2011	41.13	42.1	Hanging Wall Schist	Amphibolite	9.27	2	0.011	0.01	0.01	0.114	0.378	0.3	17.4	6.3	55.7	20.2
7914758.512	563581.502	555.435	MR1-05-77	16592	Baff2011	52.71	53.7	Hanging Wall Schist	Amphibolite	9.45	2	0.197	0.1	0.097	0.158	0.529	3.0	27.3	8.8	9.0	2.9
7914760.988	563576.426	548.705	MR1-05-77	16594	Baff2011	61.5	62.48	Hanging Wall Schist	Amphibolite	9.26	1	0.138	0.07	0.068	0.07	0.168	2.1	19.5	2.8	9.2	1.3
7914763.569	563571.134	541.688	MR1-05-77	16596	Baff2011	70.65	71.65	Hanging Wall Schist	Amphibolite	9.2	2	0.138	0.08	0.058	0.184	0.616	1.8	26.2	10.3	14.5	5.7
7914772.622	563552.572	517.075	MR1-05-77	16604	Baff2011	102.8	103.76	Hanging Wall Schist	Amphibolite	8.86	1	0.336	0.16	0.176	0.018	0.018	5.5	17.1	0.3	3.1	0.1
7914775.024	563547.646	510.544	MR1-05-77	16606	Baff2011	111.32	112.29	Hanging Wall Schist	Amphibolite	8.84	1	0.103	0.07	0.033	0.023	0.005	1.0	14.4	0.1	14.0	0.1
7914766.867	563564.372	532.721	MR1-05-77	16600	Baff2011	82.35	83.36	Hanging Wall Schist	Gniess	9.01	1	0.148	0.08	0.068	0.031	0.061	2.1	16.6	1.0	7.8	0.5
7914769.349	563559.282	525.973	MR1-05-77	16602	Baff2011	91.15	92.18	Hanging Wall Schist	Gniess	9.65	1	0.034	0.03	0.01	0.013	0.007	0.3	17	0.1	54.4	0.4
7914749.753	563599.461	579.247	MR1-05-77	16586	Baff2011	21.62	22.62	Hanging Wall Schist	Metasediment	9.22	1	0.005	0.01	0.01	0.061	0.093	0.3	13.7	1.6	43.8	5.0
7914752.385	563594.064	572.092	MR1-05-77	16588	Baff2011	30.96	31.96	Hanging Wall Schist	Metasediment	9.16	1	0.005	0.01	0.01	0.018	0.011	0.3	10.4	0.2	33.3	0.6
7914801.516	563645.605	582.739	MR1-08-156	16694	Baff2011	8.73	9.79	Hanging Wall Schist	Metasediment	8.93	2	0.005	0.01	0.01	0.107	0.35	0.3	16.3	5.8	52.2	18.7
7914803.299	563641.781	577.71	MR1-08-156	16696	Baff2011	15.34	16.31	Hanging Wall Schist	Metasediment	9.46	1	0.046	0.03	0.016	0.035	0.098	0.5	11.7	1.6	23.4	3.3
7914765.211	563567.766	537.222	MR1-05-77	16598	Baff2011	76.5	77.46	Hanging Wall Schist	Schist	9.33	1	0.005	0.01	0.01	0.015	0.005	0.3	15.4	0.1	49.3	0.3
7914821.987	563601.703	525.01	MR1-08-156	16712	Baff2011	84.07	85.17	Hanging Wall Schist	Schist	8.64	1	0.186	0.07	0.116	0.013	0.04	3.6	16.3	0.7	4.5	0.2
7914824.14	563597.087	518.939	MR1-08-156	16714	Baff2011	92.03	93.06	Hanging Wall Schist	Schist	7.96	1	0.212	0.11	0.102	0.015	0.019	3.2	13	0.3	4.1	0.1
7914826.342	563592.365	512.731	MR1-08-156	16716	Baff2011	100.18	101.12	Hanging Wall Schist	Schist	8.29	1	0.419	0.08	0.339	0.022	0.069	10.6	27.2	1.2	2.6	0.1
7914217.513	563129.414	580.306	MR1-06-84	16740	Baff2011	16.55	17.63	Hanging Wall Schist	Schist	8.42	1	0.09	0.09	0.01	0.023	0.038	0.3	14.1	0.6	45.1	2.0
7914219.703	563124.716	574.128	MR1-06-84	16742	Baff2011	24.68	25.63	Hanging Wall Schist	Schist	8.38	1	0.188	0.11	0.078	0.019	0.005	2.4	13.8	0.1	5.7	0.03
7914222.7	563118.29	565.679	MR1-06-84	16744	Baff2011	35.7	36.67	Hanging Wall Schist	Schist	8.25	1	0.112	0.11	0.01	0.027	0.093	0.3	14.3	1.6	45.8	5.0
7914227.474	563108.051	552.215	MR1-06-84	16748	Baff2011	53.21	54.31	Hanging Wall Schist	Schist	7.83	1	0.125	0.13	0.01	0.02	0.033	0.3	8.4	0.6	26.9	1.8
7913979.772	563177.5	545.133	MR1-09-179	MRARD10 002	AMEC_2010	30.2	31.2	Hanging Wall Schist	Schist	8.37	1	0.016	0.02	0.01	0.017	0.037	0.3	10.1	1.4	32.3	4.5
7913969.538	563167.617	541.054	MR1-09-179	MRARD10 003	AMEC_2010	45	46	Hanging Wall Schist	Schist	7.74	1	0.029	0.03	0.01	0.407	1.57	0.3	7.9	33.9	25.3	108.5
7914042.297	563235.419	498.607	MR1-09-177	MRARD10 007	AMEC_2010	55	56	Hanging Wall Schist	Schist	8.5	1	0.198	0.18	0.018	0.023	0.053	0.6	16.3	1.9	29.0	3.4
7914493.018	563254.927	587.544	MR1-08-140	MRARD10 068	AMEC_2010	50	51	Hanging Wall Schist	Schist	7.58	1	1.18	0.21	0.97	0.007	0.144	30.3	12.4	0.6	0.4	0.0
7914820.868	563604.104	528.166	MR1-08-153	MRARD10 078	AMEC_2010	80	81	Hanging Wall Schist	Schist	8.33	1	0.124	0.03	0.094	0.005	0.005	2.9	12.9	0.4	4.4	0.1
7914890.585	563636.278	518.342	MR1-08-147	MRARD10 086	AMEC_2010	90	91	Hanging Wall Schist	Schist	8.43	1	0.107	0.04	0.067	0.012	0.005	2.1	19.6	1.0	9.4	0.5
7914904.285	563604.232	579.229	MR1-08-142	MRARD10 092	AMEC_2010	30	31	Hanging Wall Schist	Schist	7.67	1	0.594	0.29	0.304	0.006	0.005	9.5	23.4	0.5	2.5	0.1
7914895.95	563624.772	503.213	MR1-08-147	MRARD10 094	AMEC_2010	110	110.5	Hanging Wall Schist	Schist	8.17	1	0.253	0.13	0.123	0.017	0.012	3.8	26.5	1.4	6.9	0.4
7914826.301	563592.452	512.846	MR1-08-153	MRARD10 101	AMEC_2010	100	101	Hanging Wall Schist	Schist	8.16	1	0.086	0.04	0.046	0.012	0.005	1.4	21.4	1.0	14.9	0.7
7914815.435	563615.755	543.487	MR1-08-156	MRARD10 117	AMEC_2010	60	61	Hanging Wall Schist	Schist	8.86	1	0.086	0.01	0.076	0.018	0.033	2.4	17.8	1.5	7.5	0.6
7914820.977	563603.871	527.86	MR1-08-156	MRARD10 119	AMEC_2010	80.8	81	Hanging Wall Schist	Schist	8.04	1	0.021	0.02	0.01	0.007	0.005	0.3	18.5	0.6	59.2	1.9
7914826.301	563592.452	512.846	MR1-08-156	MRARD10 122	AMEC_2010	100	101	Hanging Wall Schist	Schist	8.46	1	0.312	0.12	0.192	0.012	0.005	6.0	26.6	1.0	4.4	0.2
7914420.445	563203.455	591.661	MR1-08-145	MRARD10 126	AMEC_2010	27	28	Hanging Wall Schist	Schist	7.44	1	0.011	0.01	0.01	0.012	0.005	0.3	8.1	1.0	25.9	3.2
7914836.569	563574.057	590.725	MR1-08-143	MRARD10 127	AMEC_2010	20	21	Hanging Wall Schist	Schist	8.1	1	0.005	0.01	0.01	0.022	0.005	0.3	15.2	1.8	48.6	5.9
7914814.05	563618.726	547.394	MR1-08-153	MRARD10 130	AMEC_2010	54.9	55.9	Hanging Wall Schist	Schist	8.74	1	0.051	0.01	0.041	0.117	0.381	1.3	25	9.8	19.5	7.6
7914212.854	563309.016	491.231	MR1-05-46	16470	Baff2011	55.72	56.72	Hanging Wall Schist	Volcanic Tuff	8.32	1	0.005	0.01	0.01	0.043	0.005	0.3	20.3	0.1	65.0	0.3
7914805.377	563637.324	571.85	MR1-08-156	16698	Baff2011	23	23.95	Hanging Wall Schist	Volcanic Tuff	9.25	3	0.069	0.05	0.019	0.998	4.54	0.6	86.8	75.7	146.2	127.5
7914808.323	563631.006	563.542	MR1-08-156	16700	Baff2011	33.82	34.82	Hanging Wall Schist	Volcanic Tuff	9.17	3	0.195	0.11	0.085	0.724	3.06	2.7	67.8	51.0	25.5	19.2
7914810.885	563625.513	556.319	MR1-08-156	16702	Baff2011	43.25	44.25	Hanging Wall Schist	Volcanic Tuff	9.48	3	0.105	0.1	0.01	0.223	1.02	0.3	31.6	17.0	101.1	54.4
7914813.19	563620.57	549.819	MR1-08-156	16704	Baff2011	51.73	52.74	Hanging Wall Schist	Volcanic Tuff	8.96	3	0.2	0.11	0.09	1.09	4.74	2.8	104	79.1	37.0	28.1
7914815.036	563616.611	544.613	MR1-08-156	16706	Baff2011	58.53	59.53	Hanging Wall Schist	Volcanic Tuff	9.64	1	0.007	0.01	0.01	0.014	0.037	0.3	13.5	0.6	43.2	2.0
7914816.895	563612.624	539.37	MR1-08-156	16708	Baff2011	65.37	66.38	Hanging Wall Schist	Volcanic Tuff	9.49	1	0.128	0.11	0.018	0.023	0.005	0.6	16.1	0.1	28.6	0.1
7914819.97	563606.029	530.698	MR1-08-156	16710	Baff2011	76.7	77.69	Hanging Wall Schist	Volcanic Tuff	8.48	1	0.167	0.17	0.01	0.025	0.082	0.3	14.8	1.4	47.4	4.4
7914289.124	563150.669	589.004	MR1-06-90	16718	Baff2011	14.21	15.17	Hanging Wall Schist	Volcanic Tuff	8.41	1	0.205	0.09	0.115	0.017	0.013	3.6	17.8	0.2	5.0	0.1
7914292.595	563143.225	587.556	MR1-06-90	16720	Baff2011	22.5	23.56	Hanging Wall Schist	Volcanic Tuff	8.31	1	0.265	0.11	0.155	0.013	0.019	4.8	12.6	0.3	2.6	0.1
7914224.949	563113.466	559.336	MR1-06-84	16746	Baff2011	44	44.93	Hanging Wall Schist	Volcanic Tuff	8.32	1	0.155	0.14	0.015	0.021	0.009	0.5	25.4	0.2	54.2	0.3
7914891.943	563633.365	514.512	MR1-08-150	MRARD10 066	AMEC_2010	95	96	Hanging Wall Schist	Volcanic Tuff	8.31	1	0.199	0.06	0.139	0.016	0.026	4.3	19	1.3	4.4	0.3
7914886.496	563645.046	529.871	MR1-08-150	MRARD10 067	AMEC_2010	75	75.9	Hanging Wall Schist	Volcanic Tuff	8.63	1	0.019	0.02	0.01	0.008	0.181	0.3	14.1	0.7	45.1	2.1
7914885.152	563647.929	533.663	MR1-08-147	MRARD10 089	AMEC_2010	70	71	Hanging Wall Schist	Volcanic Tuff	8.72	1	0.075	0.03	0.045	0.212	0.78	1.4	43.5	17.7	30.9	12.6
7914808.644	563630.319	562.638	MR1-08-153	MRARD10 098	AMEC_2010	35	36	Hanging Wall Schist	Volcanic Tuff	9.53	1	0.009	0.01	0.01	0.045	0.086	0.3	14.5	3.8	46.4	12.0
7914810.083	563627.231	558.578	MR1-08-156	MRARD10 112	AMEC_2010	40.3	41.3	Hanging Wall Schist	Volcanic Tuff	9.02	3	0.009	0.01	0.01	0.871	4.03	0.3	83.7	72.6	267.8	232.3

Table A-2: NAG pH Results for the 5 Year Pit

Easting	Northing	Elevation	Hole ID	Sample ID	Program	From	To	Waste Classification	Lithology	NAG pH after Reaction	Volume of 0.1 N NaOH (mL)		NAG (kg H_2SO_4/tonne)	
											to pH 4.5	to pH 7	to pH 4.5	to pH 7
7914597.909	563141.566	651.436	MR1-12-224	15482	Baff2012	27.5	29.5	Footwall Schist	Gniess	7.89	0	0	0	0
7914599.171	563139.381	648.73	MR1-12-224	15484	Baff2012	31.3	33.1	Footwall Schist	Gniess	8.17	0	0	0	0
7914147.995	562951.331	626.809	MR1-12-225	15702	Baff2012	14	16	Footwall Schist	Gniess	8.02	0	0	0	0
7914148.592	562950.105	625.346	MR1-12-225	15703	Baff2012	16	18	Footwall Schist	Gniess	7.67	0	0	0	0
7914150.386	562946.428	620.958	MR1-12-225	15706	Baff2012	22	24	Footwall Schist	Gniess	7.97	0	0	0	0
7914152.18	562942.75	616.57	MR1-12-225	15709	Baff2012	28	30	Footwall Schist	Gniess	7.83	0	0	0	0
7914153.376	562940.298	613.644	MR1-12-225	15711	Baff2012	32	34	Footwall Schist	Gniess	7.71	0	0	0	0
7914154.572	562937.846	610.719	MR1-12-225	15713	Baff2012	36	38	Footwall Schist	Gniess	8.09	0	0	0	0
7914155.768	562935.394	607.793	MR1-12-225	15715	Baff2012	40	42	Footwall Schist	Gniess	7.9	0	0	0	0
7914156.919	562933.034	604.978	MR1-12-225	15717	Baff2012	44	45.7	Footwall Schist	Gniess	8.12	0	0	0	0
7914464.386	563109.225	573.328	MR1-08-145	16310	Baff2011	132.5	133.65	Footwall Schist	Gniess	7.49	0	0	0	0
7914469.619	563098.002	571.144	MR1-08-145	16312	Baff2011	145.2	146.1	Footwall Schist	Gniess	7.87	0	0	0	0
7914472.537	563091.745	569.927	MR1-08-145	16314	Baff2011	152.16	153.16	Footwall Schist	Gniess	7.75	0	0	0	0
7914152.497	562936.858	635.446	MR1-07-118	16518	Baff2011	14.61	15.56	Footwall Schist	Gniess	7.13	0	0	0	0
7914148.235	562949.976	631.75	MR1-07-118	16520	Baff2011	28.9	29.83	Footwall Schist	Gniess	7.46	0	0	0	0
7914347.059	563026.427	564.832	MR1-06-90	16726	Baff2011	153.4	154.38	Footwall Schist	Gniess	7.46	0	0	0	0
7913890.018	563090.826	509.355	MR1-09-179	MRARD10 004	AMEC_2010	160	161	Footwall Schist	Gniess	7.72	0	0	0	0
7913878.955	563080.142	504.945	MR1-09-179	MRARD10 005	AMEC_2010	176	177	Footwall Schist	Gniess	7.3	0	0	0	0
7914840.815	563394.858	577.665	MR1-08-161	MRARD10 057	AMEC_2010	160	161	Footwall Schist	Gniess	3.46	0.7	1.6	2.3	5.2
7914540.881	563152.285	567.574	MR1-08-140	MRARD10 104	AMEC_2010	165	166	Footwall Schist	Gniess	7.35	0	0	0	0
7914654.151	563267.972	491.753	MR1-06-105	16076	Baff2011	182.01	182.96	Footwall Schist	High Grade Iron Formation	3.42	1.24	10.76	4	35
7914649.263	563279.902	502.306	MR1-06-105	16070	Baff2011	165.6	166.05	Footwall Schist	High Grade Iron Formation	7.08	0	0	0	0
7914651.088	563275.469	498.382	MR1-06-105	16072	Baff2011	171.52	172.52	Footwall Schist	High Grade Iron Formation	7.06	0	0	0	0
7914595.8	563145.219	655.96	MR1-12-224	15479	Baff2012	21.23	23.4	Footwall Schist	Schist	7.88	0	0	0	0
7914596.528	563143.958	654.398	MR1-12-224	15480	Baff2012	23.4	25.5	Footwall Schist	Schist	8.16	0	0	0	0
7914037.25	562928.144	573.304	MR1-12-226	15631	Baff2012	75.27	77.37	Footwall Schist	Schist	7.31	0	0	0	0
7914036.549	562926.826	571.702	MR1-12-226	15632	Baff2012	77.37	79.65	Footwall Schist	Schist	7.22	0	0	0	0
7914028.919	562912.476	554.274	MR1-12-226	15644	Baff2012	101.34	103.34	Footwall Schist	Schist	7.73	0	0	0	0
7914024.568	562904.293	544.335	MR1-12-226	15651	Baff2012	114.93	116.93	Footwall Schist	Schist	8.44	0	0	0	0
7914023.321	562901.947	541.487	MR1-12-226	15653	Baff2012	118.93	120.72	Footwall Schist	Schist	8.7	0	0	0	0
7914157.935	562930.95	602.491	MR1-12-225	15719	Baff2012	47.4	49.1	Footwall Schist	Schist	10.35	0	0	0	0
7914159.056	562928.651	599.749	MR1-12-225	15721	Baff2012	51	53	Footwall Schist	Schist	10.45	0	0	0	0
7914020.687	562896.994	535.471	MR1-12-226	15658	Baff2012	127.05	129.05	Footwall Schist	Schist	8.26	0	0	0	0
7914655.524	563264.597	488.761	MR1-06-105	16078	Baff2011	186.7	187.7	Footwall Schist	Schist	7.62	0	0	0	0
7914342.277	563036.682	566.827	MR1-06-90	16722	Baff2011	141.9	142.9	Footwall Schist	Schist	2.89	5.21	9.28	17.1	30
7914343.44	563034.188	566.342	MR1-06-90	16724	Baff2011	144.7	145.69	Footwall Schist	Schist	7.82	0	0	0	0
7914786.719	563340.21	594.098	MR1-08-163	MRARD10 035	AMEC_2010	155	156	Footwall Schist	Schist	7.64	0	0	0	0
7914767.99	563380.374	601.912	MR1-08-163	MRARD10 047	AMEC_2010	110	111	Footwall Schist	Schist	7.56	0	0	0	0
7914778.395	563358.061	597.571	MR1-08-163	MRARD10 049	AMEC_2010	135	136	Footwall Schist	Schist	7.55	0	0	0	0
7914652.408	563272.251	495.535	MR1-06-105	16074	Baff2011	176	177.03	Footwall Schist	Ultramafic	7.58	0	0	0	0
7914607.255	563539.17	498.078	MR1-05-72	16022	Baff2011	92.7	93.65	Hanging Wall Schist	Amphibolite	7.68	0	0	0	0
7914609.72	563534.114	491.375	MR1-05-72	16024	Baff2011	101.4	102.45	Hanging Wall Schist	Amphibolite	6.84	0	0.05	0	0.2
7914755.246	563588.198	564.313	MR1-05-77	16590	Baff2011	41.13	42.1	Hanging Wall Schist	Amphibolite	9.02	0	0	0	0
7914758.512	563581.502	555.435	MR1-05-77	16592	Baff2011	52.71	53.7	Hanging Wall Schist	Amphibolite	9.65	0	0	0	0
7914760.988	563576.426	548.705	MR1-05-77	16594	Baff2011	61.5	62.48	Hanging Wall Schist	Amphibolite	7.85	0	0	0	0
7914763.569	563571.134	541.688	MR1-05-77	16596	Baff2011	70.65	71.65	Hanging Wall Schist	Amphibolite	9.99	0	0	0	0
7914772.622	563552.572	517.075	MR1-05-77	16604	Baff2011	102.8	103.76	Hanging Wall Schist	Amphibolite	5.42	0	0.36	0	1.2
7914775.024	563547.646	510.544	MR1-05-77	16606	Baff2011	111.32	112.29	Hanging Wall Schist	Amphibolite	7.19	0	0	0	0
7914766.867	563564.372	532.721	MR1-05-77	16600	Baff2011	82.35	83.36	Hanging Wall Schist	Gniess	6.89	0	0.6	0	1.9
7914769.349	563559.282	525.973	MR1-05-77	16602	Baff2011	91.15	92.18	Hanging Wall Schist	Gniess	7.56	0	0	0	0
7914749.753	563599.461	579.247	MR1-05-77	16586	Baff2011	21.62	22.62	Hanging Wall Schist	Metasediment	7.7	0	0	0	0
7914752.385	563594.064	572.092	MR1-05-77	16588	Baff2011	30.96	31.96	Hanging Wall Schist	Metasediment	7.65	0	0	0	0
7914801.516	563645.605	582.739	MR1-08-156	16694	Baff2011	8.73	9.79	Hanging Wall Schist	Metasediment	9.76	0	0	0	0
7914803.299	563641.781	577.71	MR1-08-156	16696	Baff2011	15.34	16.31	Hanging Wall Schist	Metasediment	7.85	0	0	0	0
7914765.211	563567.766	537.222	MR1-05-77	16598	Baff2011	76.5	77.46	Hanging Wall Schist	Schist	7.58	0	0	0	0
7914821.987	563601.703	525.01	MR1-08-156	16712	Baff2011	84.07	85.17	Hanging Wall Schist	Schist	7.07	0	0	0	0
7914824.14	563597.087	518.939	MR1-08-156	16714	Baff2011	92.03	93.06	Hanging Wall Schist	Schist	6.99	0	0.07	0	0.2
7914826.342	563592.365	512.731	MR1-08-156	16716	Baff2011	100.18	101.12	Hanging Wall Schist	Schist	6.45	0	0.11	0	0.4
7914217.513	563129.414	580.306	MR1-06-84	16740	Baff2011	16.55	17.63	Hanging Wall Schist	Schist	7.42	0	0	0	0
7914219.703	563124.716	574.128	MR1-06-84	16742	Baff2011	24.68	25.63	Hanging Wall Schist	Schist	6.97	0	0.05	0	0.2
7914222.7	563118.29	565.679	MR1-06-84	16744	Baff2011	35.7	36.67	Hanging Wall Schist	Schist	7.71	0	0	0	0
7914227.474	563108.051	552.215	MR1-06-84	16748	Baff2011	53.21	54.31	Hanging Wall Schist	Schist	7.64	0	0	0	0
7913979.772	563177.5	545.133	MR1-09-179	MRARD10 002	AMEC_2010	30.2	31.2	Hanging Wall Schist	Schist	7.67	0	0	0	0
7913969.538	563167.617	541.054	MR1-09-179	MRARD10 003	AMEC_2010	45	46	Hanging Wall Schist	Schist	7.4	0	0	0	0
7914042.297	563235.419	498.607	MR1-09-177	MRARD10 007	AMEC_2010	55	56	Hanging Wall Schist	Schist	6.9	0	0.1	0	0.3
7914493.018	563254.927	587.544	MR1-08-140	MRARD10 068	AMEC_2010	50	51	Hanging Wall Schist	Schist	2.8	4.5	7.3	15	24
7914820.868	563604.104	528.166	MR1-08-153	MRARD10 078	AMEC_2010	80	81	Hanging Wall Schist	Schist	6.86	0	0.1	0	0.3
7914890.585	563636.278	518.342	MR1-08-147	MRARD10 086	AMEC_2010	90	91	Hanging Wall Schist	Schist	7.24	0	0	0	0
7914904.285	563604.232	579.229	MR1-08-142	MRARD10 092	AMEC_2010	30	31	Hanging Wall Schist	Schist	4.27	0.1	1	0.3	3.3
7914895.95	563624.772	503.213	MR1-08-147	MRARD10 094	AMEC_2010	110	110.5	Hanging Wall Schist	Schist	6.92	0	0.1	0	0.3
7914826.301	563592.452	512.846	MR1-08-153	MRARD10 101	AMEC_2010	100	101	Hanging Wall Schist	Schist	7.18	0	0	0	0
7914815.435	563615.755	543.487	MR1-08-156	MRARD10 117	AMEC_2010	60	61	Hanging Wall Schist	Schist	6.96	0	0.1	0	0.3
7914820.977	563603.871	527.86	MR1-08-156	MRARD10 119	AMEC_2010	80.8	81	Hanging Wall Schist	Schist	8.33	0	0	0	0
7914826.301	563592.452	512.846	MR1-08-156	MRARD10 122	AMEC_2010	100	101	Hanging Wall Schist	Schist	6.64	0	0.4	0	1.3
7914420.445	563203.455	591.661	MR1-08-145	MRARD10 126	AMEC_2010	27	28	Hanging Wall Schist	Schist	7.5	0	0	0	0
7914836.569	563574.057	590.725	MR1-08-143	MRARD10 127	AMEC_2010	20	21	Hanging Wall Schist	Schist	7.36	0	0	0	0
7914814.05	563618.726	547.394	MR1-08-153	MRARD10 130	AMEC_2010	54.9	55.9	Hanging Wall Schist	Schist	9.04	0	0	0	0
7914212.854	563309.016	491.231	MR1-05-46	16470	Baff2011	55.72	56.72	Hanging Wall Schist	Volcanic Tuff	7.93	0	0	0	0
7914805.377	563637.324	571.85	MR1-08-156	16698	Baff2011	23	23.95	Hanging Wall Schist	Volcanic Tuff	11.01	0	0	0	0
7914808.323	563631.006	563.542	MR1-08-156	16700	Baff2011	33.82	34.82	Hanging Wall Schist	Volcanic Tuff	10.99	0	0	0	0
7914810.885	563625.513	556.319	MR1-08-156	16702	Baff2011	43.25	44.25	Hanging Wall Schist	Volcanic Tuff	10.7	0	0	0	0
7914813.19	563620.57	549.819	MR1-08-156	16704	Baff2011	51.73	52.74	Hanging Wall Schist	Volcanic Tuff	10.57	0	0	0	0
7914815.036	563616.611	544.613	MR1-08-156	16706	Baff2011	58.53	59.53	Hanging Wall Schist	Volcanic Tuff	8.31	0	0	0	0
7914816.895	563612.624	539.37	MR1-08-156	16708	Baff2011	65.37	66.38	Hanging Wall Schist	Volcanic Tuff	7.7	0	0	0	0
7914819.97	563606.029	530.698	MR1-08-156	16710	Baff2011	76.7	77.69	Hanging Wall Schist	Volcanic Tuff	7.97	0	0	0	0
7914289.124	563150.669	589.004	MR1-06-90	16718	Baff2011	14.21	15.17	Hanging Wall Schist	Volcanic Tuff	7.08	0	0	0	0
7914292.595	563143.225	587.556	MR1-06-90	16720	Baff2011	22.5	23.56	Hanging Wall Schist	Volcanic Tuff	6.29	0	0.13	0	0.4
7914224.949	563113.466	559.336	MR1-06-84	16746	Baff2011	44	44.93	Hanging Wall Schist	Volcanic Tuff	7.59	0	0	0	0
7914891.943	563633.365	514.512	MR1-08-150	MRARD10 066	AMEC_2010	95	96	Hanging Wall Schist	Volcanic Tuff	7.22	0	0	0	0
7914886.496	563645.046	529.871	MR1-08-150	MRARD10 067	AMEC_2010	75	75.9	Hanging Wall Schist	Volcanic Tuff	7.71	0	0	0	0
7914885.152	563647.929	533.663	MR1-08-147	MRARD10 089	AMEC_2010	70	71	Hanging Wall Schist	Volcanic Tuff	9.48	0	0	0	0
7914808.644	563630.319	562.638	MR1-08-153	MRARD10 098	AMEC_2010	35	36	Hanging Wall Schist	Volcanic Tuff	7.7	0	0	0	0
7914810.083	563627.231	558.578	MR1-08-156	MRARD10 112	AMEC_2010	40.3	41.3	Hanging Wall Schist	Volcanic Tuff	9.8	0	0	0	0

Table A-3: Summary of ABA Results

		Paste pH	Total Sulphur	Sulphate	Sulphide*	Total Carbon	Carbonate	AP	NP	CarbNP	NPR	CarbNPR
			%					kg CaCO3/t				
Footwall Schist (5 Year Pit)	Count	40	40	40	40	40	40	40	40	40	40	40
	Min	6.4	0.005	0.010	0.010	0.0050	0.0050	0.31	5.3	0.083	0.21	0.019
	Max	10	5.6	1.5	4.2	3.3	7.7	130	59	129	176	345
	Median	9.1	0.011	0.010	0.010	0.021	0.030	0.31	13	0.54	36	1.6
	Average		0.32	0.100	0.23	0.28	0.65	7.1	17	11.0	2.4	1.5
	Standard Deviation	0.89	1.0	0.26	0.74	0.77	1.8	23	12.0	30	35	55
	10th Percentile	7.7	0.005	0.010	0.010	0.012	0.0050	0.31	7.2	0.083	1.4	0.19
	90th Percentile	9.6	0.53	0.21	0.31	0.51	1.01	9.5	29	17	78	17
Footwall Schist (LOM Pit)	Count	143	143	143	143	143	143	143	143	143	143	143
	Min	4.8	0.005	0.010	0.010	0.005	0.0050	0.3125	4.6000	0.08	0.2	0.003
	Max	10	5.6	1.5	4.15	3.3	10.7	129.7	70.5	178	176	345
	Median	8.9	0.044	0.020	0.010	0.015	0.011	0.313	13.000	0.50	23	0.99
	Average		0.29	0.07	0.225	0.20	0.50	7.04	15.94	8.5	2	1.2
	Standard Deviation	0.86	0.70	0.15	0.58	0.62	1.61	18.0	10.86	27	27	30
	10th Percentile	7.7	0.005	0.010	0.010	0.006	0.005	0.313	7.3600	0.08	1	0.04
	90th Percentile	10	0.74	0.14	0.716	0.218	0.85	22.4	25.92	14.2	62	7
Hanging Wall Schist (5 Year Pit)	Count	53	53	53	53	53	53	53	53	53	53	53
	Min	7.4	0.005	0.010	0.010	0.0050	0.0050	0.31	7.0	0.083	0.41	0.019
	Max	9.7	1.2	0.29	0.97	1.1	4.7	30	104	79	268	232
	Median	8.5	0.11	0.060	0.019	0.021	0.037	0.59	16	1.0	26	1.3
	Average		0.14	0.070	0.076	0.11	0.44	2.4	23	8.0	9.5	3.4
	Standard Deviation	0.58	0.19	0.061	0.14	0.25	1.1	4.5	20	19	42	39
	10th Percentile	7.9	0.005	0.010	0.010	0.0088	0.0050	0.31	11	0.090	4.1	0.069
	90th Percentile	9.5	0.26	0.14	0.15	0.22	0.97	4.7	31	18	55	20
Hanging Wall Schist (LOM Pit)	Count	270	270	270	270	270	270	270	270	270	270	270
	Min	4.3	0.005	0.010	0.010	0.005	0.0050	0.3125	-6.5000	0.08	0.0	0.000
	Max	9.8	22.2	5.5	22.19	6.69	30.8	693.4	487.00	514	621	571
	Median	8.4	0.12	0.04	0.057	0.022	0.022	1.766	17.5500	0.62	13	0.4
	Average		0.60	0.12	0.485	0.259	0.97	15.14	26.450	16.7	2	1.1
	Standard Deviation	0.68	2.04	0.39	1.807	0.83	3.35	56.5	45.84	56.1	50	41
	10th Percentile	7.7	0.008	0.010	0.010	0.010	0.0050	0.3125	7.7000	0.08	0	0.009
	90th Percentile	9.6	0.90	0.18	0.72	0.37	1.26	22.43	33.40	21.0	73	19

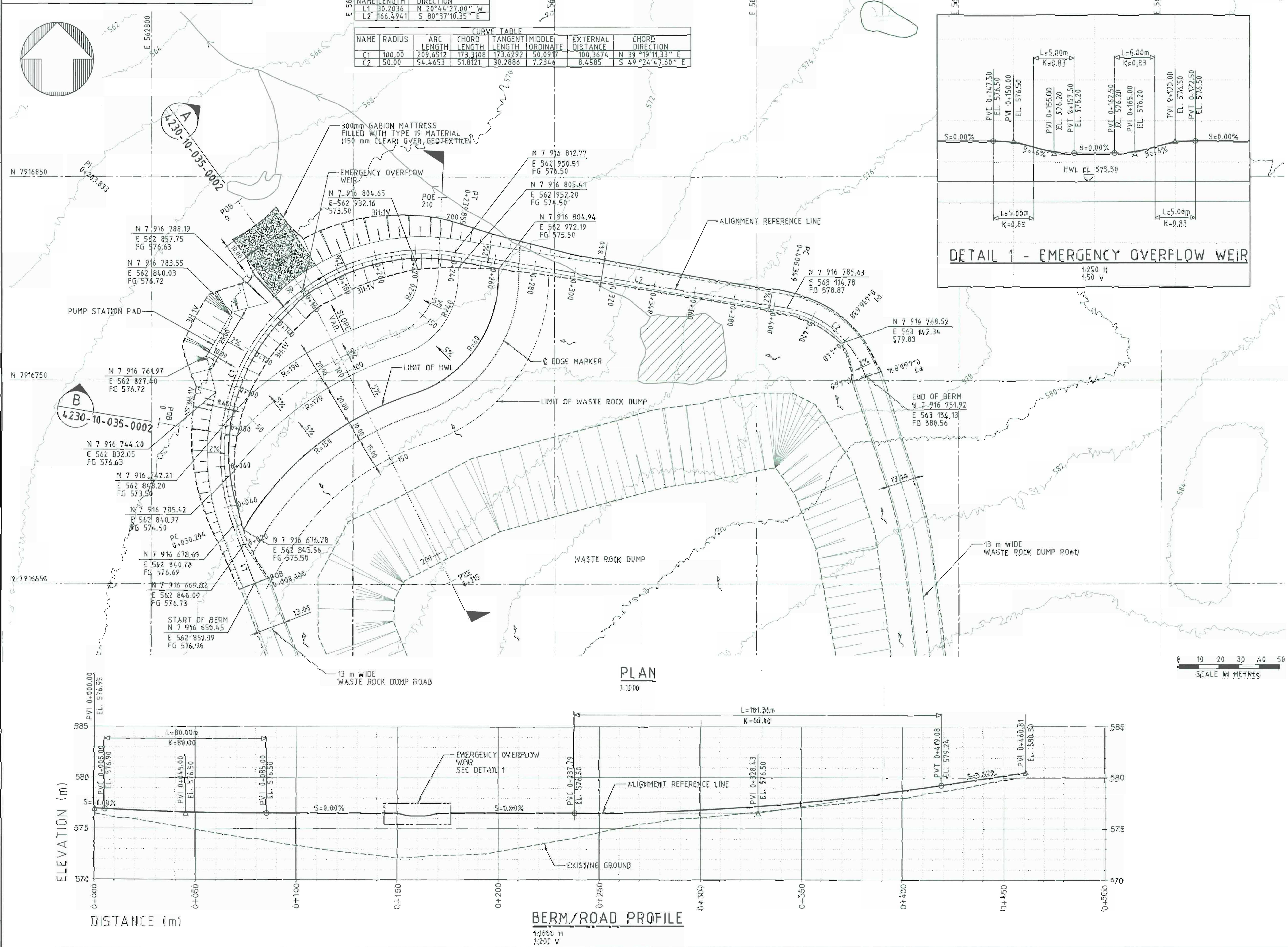
*As total sulphur - sulphate

Table A-4: Elemental Content Results for the 5 Year Pit

Easting	Northing	Elevation	Hole ID	Sample ID	Program	From	To	Waste Classification	Lithology	Hg	Au	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	K	Li	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Se	Sn	Sr	Ti	Tl	U	V	Y	Zn
										µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g	µg/g
									Avg Crustal	**0.085**	**0.004**	**0.075**	**82300**	**1.8**	**425**	**3**	**0.025**	**41500**	**0.15**	**25**	**102**	**60**	**56300**	**20850**	**20**	**23300**	**950**	**1.2**	**23550**	**84**	**1050**	**14**	**350**	**0.2**	**0.05**	**2.3**	**370**	**5650**	**0.85**	**2.7**	**120**	**33**	**70**
									10x Avg Crustal	**0.85**	**0.04**	**0.75**	**823000**	**18**	**4250**	**30**	**0.25**	**415000**	**1.5**	**250**	**1020**	**600**	**563000**	**208500**	**200**	**233000**	**9500**	**12**	**235500**	**840**	**10500**	**140**	**3500**	**2**	**0.5**	**23**	**3700**	**56500**	**8.5**	**27**	**1200**	**330**	**700**
7914597.909	563141.566	651.436	MR1-12-224	15482	Baff2012	27.5	29.5	Footwall Schist	Gniess	0.1			33000	0.7	530	0.63	0.16	250	0.03	16	210	33	52000	19000	20	16000	240	8.2	440	68		10	170	0.8	0.7	1.3	2.6	1200	0.55	4.9	23		26
7914599.171	563139.381	648.73	MR1-12-224	15484	Baff2012	31.3	33.1	Footwall Schist	Gniess	0.1			30000	0.5	300	0.37	0.09	500	0.02	6.7	100	12	42000	20000	11	14000	120	6.6	550	14		5.1	160	0.8	0.7	1.2	2.6	980	0.39	6.8	12		3.9
7914147.995	562951.331	626.809	MR1-12-225	15702	Baff2012	14	16	Footwall Schist	Gniess	0.1			25000	4	200	0.78	0.13	1700	0.04	23	73	25	44000	7900	32	14000	320	0.5	240	29		3.2	69	0.8	0.7	0.5	3.8	670	0.25	2.4	8		27
7914148.592	562950.105	625.346	MR1-12-225	15703	Baff2012	16	18	Footwall Schist	Gniess	0.1			18000	1.8	190	0.46	0.09	1200	0.05	9.5	71	17	29000	6100	11	9100	220	0.4	300	11		4.8	60	0.8	0.7	0.5	3.3	520	0.18	1.3	7		22
7914150.386	562946.428	620.958	MR1-12-225	15706	Baff2012	22	24	Footwall Schist	Gniess	0.1			33000	0.5	210	0.56	0.09	1600	0.04	11	190	2.8	42000	11000	19	21000	530	0.3	310	48		2.9	61	0.8	0.7	0.5	3.2	810	0.29	1.5	26		38
7914152.18	562942.75	616.57	MR1-12-225	15709	Baff2012	28	30	Footwall Schist	Gniess	0.1			36000	0.5	320	0.69	0.09	1100	0.02	7.2	72	4.5	43000	17000	19	20000	550	0.3	390	8.1		3.3	52	0.8	0.7	0.5	2.6	1100	0.45	1.8	10		26
7914153.376	562940.298	613.644	MR1-12-225	15711	Baff2012	32	34	Footwall Schist	Gniess	0.1			18000	0.5	200	0.38	0.09	370	0.02	6.4	110	4.5	20000	9200	9	8700	200	0.3	350	19		2.1	41	0.8	0.7	0.5	3	490	0.22	1.6	10		14
7914154.572	562937.846	610.719	MR1-12-225	15713	Baff2012	36	38	Footwall Schist	Gniess	0.1			32000	0.5	190	0.52	0.09	1400	0.02	12	59	2.8	48000	15000	16	18000	530	0.3	400	25		2.1	61	0.8	0.7	0.5	2.6	1200	0.49	1.3	34		18
7914155.768	562935.394	607.793	MR1-12-225	15715	Baff2012	40	42	Footwall Schist	Gniess	0.1			24000	0.8	250	0.59	0.09	870	0.02	4.9	62	4.1	32000	13000	13	12000	370	0.3	370	5.9		2.2	54	0.8	0.7	0.5	2.8	860	0.37	1.9	6		23
7914156.919	562933.034	604.978	MR1-12-225	15717	Baff2012	44	45.7	Footwall Schist	Gniess	0.1			34000	0.5	390	0.64	0.38	6500	0.27	5.2	63	17	41000	18000	42	27000	1100	0.3	320	5.4		4.8	160	0.8	0.7	1.6	9.8	1500	0.51	2.5	12		74
7914464.386	563109.225	573.328	MR1-08-145	16310	Baff2011	132.5	133.65	Footwall Schist	Gniess	0.1	0.02	0.03	20000	0.7	85	0.76	0.09	1400	0.02	7.1	110	3.7	35000	6900	12	11000	170	2.2	140	9	570	1.7		0.8	0.7	0.5	4	640	0.13	2.1	14	5.4	12
7914469.619	563098.002	571.144	MR1-08-145	16312	Baff2011	145.2	146.1	Footwall Schist	Gniess	0.1	0.02	0.07	29000	0.6	86	0.69	0.09	860	0.02	13	88	8.7	49000	11000	19	19000	560	1.7	240	34	210	1.6		0.8	0.7	0.5	3.9	550	0.23	2	20	2.2	27
7914472.537	563091.745	569.927	MR1-08-145	16314	Baff2011	152.16	153.16	Footwall Schist	Gniess	0.1	0.02	0.06	26000	0.5	260	0.42	0.21	3000	0.03	12	130	32	41000	18000	22	17000	580	1.7	470	30	1200	1.9		0.8	0.7	0.6	5.4	2400	0.33	2.6	31	12	47
7914152.497	562936.858	635.446	MR1-07-118	16518	Baff2011	14.61	15.56	Footwall Schist	Gniess	0.1	0.02	0.03	19000	1.4	140	0.31	0.09	1000	0.03	4.4	120	31	38000	8900	13	8600	230	2.8	220	5.3	320	4.3		0.8	0.7	0.5	1.7	1000	0.28	1.5	2	2.3	36
7914148.235	562949.976	631.75	MR1-07-118	16520	Baff2011	28.9	29.83	Footwall Schist	Gniess	0.1	0.02	0.04	15000	1.2	180	0.29	0.09	1200	0.03	7.9	76	4.5	24000	4200	8	9400	180	0.8	240	17	530	2.8		0.8	0.7	0.5	2.8	370	0.09	1.8	7	3.4	23
7914347.059	563026.427	564.832	MR1-06-90	16726	Baff2011	153.4	154.38	Footwall Schist	Gniess	0.1	0.02	0.01	34000	0.5	360	1.2	0.1	830	0.02	10	91	28	46000	17000	20	22000	170	3.8	430	12	390	3.5		0.8	0.7	1.4	5.7	2300	0.33	2.2	32	3.7	26
7913890.018	563090.826	509.355	MR1-09-179	MRARD10 004	AMEC_2010	160	161	Footwall Schist	Gniess	0.1			83000	0.6	230	2.5	0.09	1800	0.2	18	28	1.8	130000	10000	36	82000	310	15	280	85		2.3		0.8	0.7	3.3	6.3	1100	0.21	1.8	46		22
7913878.955	563080.142	504.945	MR1-09-179	MRARD10 005	AMEC_2010	176	177	Footwall Schist	Gniess	0.1			77000	0.6	39	2.8	0.09	1700	0.2	14	91	15	130000	4800	38	70000	1800	8	160	55		4.6		0.8	0.7	4.6	6.8	420	0.12	1.3	53		53
7914840.815	563394.858	577.665	MR1-08-161	MRARD10 057	AMEC_2010	160	161	Footwall Schist	Gniess	0.1			59000	0.5	0.9	2.2	0.19	4900	0.2	24	390	6.4	150000	180	29	59000	490	0.3	97	140		4		1.4	0.7	2.9	6.4	650	0.05	3.4	78		36
7914540.881	563152.285	567.574	MR1-08-140	MRARD10 104	AMEC_2010	165	166	Footwall Schist	Gniess	0.1			47000	0.5	960	0.35	0.11	1900	0.2	18	59	70	63000	29000	5	21000	170	1	750	17		32		0.8	0.7	3	8.4	2600	0.71	1.4	140		9.3
7914654.151	563267.972	491.753	MR1-06-105	16076	Baff2011	182.01	182.96	Footwall Schist	High Grade Iron Formation	0.1	0.15	1.3	11000	0.5	0.98	0.79	0.93	15000	0.1	19	36	380	400000	41	2	15000	9300	3.2	28	56	5400	4.7		0.8	2.6	0.5	16	300	0.02	0.69	42	14	18
7914649.263	563279.902	502.306	MR1-06-105	16070	Baff2011	165.6	166.05	Footwall Schist	High Grade Iron Formation	0.1	0.02	0.36	3700	2.2	3.1	0.21	0.25	3600	0.38	17	21	31	470000	150	2	17000	11000	13	31	43	32	8.8		0.8	0.7	1	0.82	220	0.02	0.42	22	3	33
7914651.088	563275.469	498.382	MR1-06-105	16072	Baff2011	171.52	172.52	Footwall Schist	High Grade Iron Formation	0.1	0.02	0.41	1700	14	1.4	0.43	0.24	10000	0.14	23	29	72	470000	40	2	13000	11000	2.7	56	40	99	4.6		0.8	1.3	0.7	2.6	72	0.07	0.66	15	6.1	21
7914595.8	563145.219	655.96	MR1-12-224	15479	Baff2012	21.23	23.4	Footwall Schist	Schist	0.1			67000	1	45	2	0.97	350	0.06	31	64	16	220000	1100	244	39000	1600	8.9	110	100		2.5	140	0.8	0.7	0.6	3	380	0.03	5.8	62		110
7914596.528	563143.958	654.398	MR1-12-224	15480	Baff2012	23.4	25.5	Footwall Schist	Schist	0.1			68000	0.5	570	1.3	0.32	1100	0.04	24	230	5.1	160000	20000	32	43000	660	3	360	97		8.8	180	0.8	0.7	1.4	3.6	1800	0.63	4	70		41
7914037.25	562928.144	573.304	MR1-12-226	15631	Baff2012	75.27	77.37	Footwall Schist	Schist	0.1			45000	77	34	0.81	2.3	130	0.17	12	100	180	230000	340	5	27000	1300	158	56	34		6	1100	0.8	6.2	2.1	1.2	210	0.04	0.84	110		100
7914036.549	562926.826	571.702	MR1-12-226	15632	Baff2012	77.37	79.65	Footwall Schist	Schist	0.1			48000	147	9.5	0.64	0.84	110	0.13	11	150	170	170000	180	7	29000	1300	89	71	44		7.2	1200	0.8	2.6	0.8	1.8	190	0.03	0.89	130		78
7914028.919	562912.476	554.274	MR1-12-226	15644	Baff2012	101.34	103.34	Footwall Schist	Schist	0.1			80000	2.2	2.9	0.93	0.09	801	0.02	40	600	7.9	180000	130	2	68000	360	3	50	260		1.8	79	0.8	0.7	0.6	1.3	270	0.02	1.2	100		71
7914024.568	562904.293	544.335	MR1-12-226	15651	Baff2012	114.93	116.93	Footwall Schist	Schist	0.1			81000	0.6	140	0.84	0.1	2100	0.04	13	22	6.5	130000	4200	9	66000	420	2.7	120	15		2.7	79	0.8	0.7	0.7	6.5	680	0.11	3	48		81
7914023.321	562901.947	541.487	MR1-12-226	15653	Baff2012	118.93	120.72	Footwall Schist	Schist	0.1			84000	0.6	290	1.2	0.09	2700	0.03	18	16	6.6	110000	11000	23	70000	560	0.3	270	17		4.1	70	0.8	0.7	1.8	8.2	960	0.23	3.4	48		71
7914157.935	562930.95	602.491	MR1-12-225	15719	Baff2012	47.4	49.1	Footwall Schist	Schist	0.1			28000	0.5	160	0.71	0.36	17000	0.07	6.6	51	9.6	29000	14000	28	19000	1200	1.4	520	13		7.9	890	0.8	0.7	0.8	16	1400	0.45	1.7	23		41
7914159.056	562928.651	599.749	MR1-12-225	15721	Baff2012	51	53	Footwall Schist	Schist	0.1			29000	0.5	180	0.72	0.09	19000	0.05	5.5	56	7.1	29000	15000	24	14000	1000	0.9	820	7.8		6.6	470	0.8	0.7	0.7	28	1500	0.43	2.2	16		31
7914020.687	562896.994	535.471	MR1-12-226	15658	Baff2012	127.05	129.05	Footwall Schist	Schist	0.1			63000	0.5	1600	1.1	0.12	2700	0.02	12	68	6.2	91000	39000	35	36000	83	1	1100	20		13	99	0.8	0.7	3.8	12	3100	1.1	2.1	59		13
7914655.524	563264.597	488.761	MR1-06-105	16078	Baff2011	186.7	187.7	Footwall Schist	Schist	0.1	0.02	0.03	50000	0.5	700	0.91	0.09	2100	0.04	11	12	15	92000	28000	19	23000	630	1.4	430	17	950	15		0.8	0.7	1.3	3.1	2900	1.1	8.4	40	9	18
7914342.277	563036.682	566.827	MR1-06-90	16722	Baff2011	141.9	142.9	Footwall Schist	Schist	0.1	0.02	0.48	71000	0.8	6.3	1.5	0.48	390	0.33	52	35	13	180000	880	66	91000	410	360	360	140	45	16		0.8	0.7	1.3	1.9	380	0.08	0.68	60	1.1	77
7914343.44	563034.188	566.342	MR1-06-90	16724	Baff2011	144.7	145.69	Footwall Schist	Schist	0.1	0.02	0.08	31000	2	3.1	0.41	0.39	1400	0.03	7	63	6.2	270000	330	7	28000	540	7.7	86	19	250	1.3		0.8	0.7	0.9	1.8	270	0.06	0.49	14	1.4	55
7914786.719	563340.21	594.098	MR1-08-163	MRARD10 035	AMEC_2010	155	156	Footwall Schist	Schist	0.1			61000	11	28	0.69	0.09	2700	0.2	29	350	33	130000	350	9	47000	580	2	93	110		3.7		0.8	0.7	1.2	7.8	240	0.03	0.5	170		51
7914767.99	563380.374	601.912	MR1-08-163	MRARD10 047	AMEC_2010	110	111	Footwall Schist	Schist	0.1			59000	0.5	450	0.71	0.09	1000	0.2	8.6	55	11	77000	34000	17	25000	320	4.4	860	18		16		0.8	0.7	1.1	2.9	2100	1.6	2.5	21		15
7914778.395	563358.061	597.571	MR1-08-163	MRARD10 049	AMEC_2010	135	136	Footwall Schist	Schist	0.1			100000	0.7	15	5	0.09	1900	0.2	15	68	1.9	130000	1200	13	89000	5900	2.5	110	49		1.7		0.8	0.7	2.5	3.4	1400	0.04	1.5	77		72
7914652.408	563272.251	495.535	MR1-06-105	16074	Baff2011	176	177.03	Footwall Schist	Ultramafic	0.1	0.02	0.01	41000	0.5	15	1	0.1	8100	0.11	17	330	3.1	58000	450	4	41000	200	1.7	31	95	3400	2.7		0.8	0.7	0.5	12	250	0.03	2.7	92	10	49
7914607.255	563539.17	498.078	MR1-05-72	16022	Baff2011	92.7	93.65	Hanging Wall Schist	Amphibolite	0.1	0.02	0.01	44000	0.5	320	1.2	0.09	410	0.03	26	110	34	60000	20000	98	21000	230	0.6	350	100	34	6.1		0.8	0.7	1.3	9.7	1800	0.78	1.2	110	2.2	14
7914609.72	563534.114	491.375	MR1-05-72	16024	Baff2011	101.4	102.45	Hanging Wall Schist	Amphibolite	0.1	0.02	0.03	47000	0.5	180	0.39	0.09	310	0.02	27	160	82	82000	14000	40	30000	300	0.4	230	120	7	2.3		0.8	0.7	0.5	5.1	1400	0.41	0.066	150	0.9244	
7914755.246	563588.198	564.313	MR1-05-77	16590	Baff2011	41.13	42.1	Hanging Wall Schist	Amphibolite	0.1	0.02	0.07	21000	0.5	15	0.07	0.09	17000	0.06	11	59	110	19000	1700	15	11000	310	0.5	1100	30	220	1.4		0.8	0.7	0.5	13	930	0.02	0.02	41	3.5	32
7914758.512	563581.502	555.435	MR1-05-77	16592	Baff2011	52.71	53.7	Hanging Wall Schist	Amphibolite	0.1	0.02	0.06	26000	0.5	53	0.06	0.09	22000	0.03	27	130	130	22000	5800	22	10000	300	0.5	1900	110	300	1.8		0.8	0.7	0.5	23	2200	0.21	0.021	91	3.832	
7914760.988	563576.426	548.705	MR1-05-77	16594	Baff2011	61.5	62.48	Hanging Wall Schist	Amphibolite	0.1	0.02	0.04	31000	0.5	31	0.08	0.09	24000	0.05	25	89	92	25000	2300	23	12000	430	0.4	1400	84	440	2.2		0.8	0.7	0.5	25	1300	0.08	0.043	72	5.3	38
7914763.569	563571.134	541.688	MR1-05-77	16596	Baff2011	70.65	71.65	Hanging Wall Schist	Amphibolite	0.1	0.02	0.09	23000	0.5	33	0.07	0.09	25000	0.08	19	65	110	21000	2400	10	7900	550	0.5	1400	69	240	2		0.8	0.7	0.5	18	1400	0.07	0.024	52	3.6	38
7914772.622	563552.572	517.075	MR1-05-77	16604	Baff2011	102.8	103.76	Hanging Wall Schist	Amphibolite	0.1	0.02	0.08	42000	1.3	260	0.16	0.09	1200	0.05	41	210	150	58000	17000	28	27000	230	0.5	460	110	440	3.3		0.8	0.7	0.5	8.4	2000	0.27	0.012	180	1.1	46
7914775.024	563547.646	510.544	MR1-05-77	16606	Baff2011	111.32	112.29	Hanging Wall Schist	Amphibolite	0.1	0.02	0.12	50000	1.1	640	0.12	0.09	320	0.22	50	250	120	69000	25000	56	32000	330	1.5	650	140	43	18		0.8	0.7	0.5	10	2800	0.26	0.012	170	0.63	59
7914766.867	563564.372	532.721	MR1-05-77	16600	Baff2011	82.35	83.36	Hanging Wall Schist	Gniess	0.1	0.02	0.03	43000	0.5	200	0.02	0.09	1200	0.02	45	150	120	63000	13000	19	29000	260	0.8	570	100	280	0.84		0.8	0.7	0.5	6	2000	0.2	0.01	190	1.4	52
7914769.349	563559.282	525.973	MR1-05-77	16602	Baff2011	91.15	92.18	Hanging Wall Schist	Gniess	0.1	0.02	0.03	38000	0.5	240	0.24	0.09	2600	0.02	45	150	73	54000	21000	9	21000	390	1.5	640	120	1100	1.3		0.8	0.7	0.7	18	2900	0.44	0.018	190	2.7	42
7914749.753	563599.461	579.247	MR1-05-77	16586	Baff2011	21.62	22.62	Hanging Wall Schist	Metasediment	0.1	0.02	0.05	18000	0.5	17	0.07	0.09	14000	0.04	11	78	110	11000	1500	16	7000	190	0.6	1700	31	300	0.64		0.8	0.7	0.5	18	980	0.03	0.06	49	2.6	16
7914752.385	563594.064	572.092	MR1-05-77	16588	Baff2011	30.96	31.96	Hanging Wall Schist	Metasediment	0.1	0.02	0.05	23000	0.5	16	0.07	0.09	11000	0.06	13	80	110	20000	1300	22	13000	190	0.3	1200	36	160	1.4		0.8	0.7	0.5	12	620	0.02	0.016	67	2.1	36
7914801.516	563645.605	582.739	MR1-08-156	16694	Baff2011	8.73	9.79	Hanging Wall Schist	Metasediment	0.1	0.02	0.07	20000	0.5	34	0.07	0.09	13000	0.02	25	170	100	13000	3300	39	11000	240	0.7	2000	68	340	0.62		0.8	0.7	0.5	21	1420	0.06	0.022	120	2.7	31
7914803.299	563641.781	577.71	MR1-08-156	16696	Baff2011	15.34	16.31	Hanging Wall Schist	Metasediment	0.1	0.02	0.08	14000	0.5	10	0.07	0.09	10000	0.04	12	77	94	13000	1700	24	7600	240	0.6	1600	38	280	2.2		0.8	0.7	0.5	15	1050	0.04	0.038	43	2.4	20
7914765.211	563567.766	537.222	MR1-05-77	16598	Baff2011	76.5	77.46	Hanging Wall Schist	Schist	0.1	0.02	0.03	26000	0.5	17	0.07	0.09	24000	0.06	13	60	72	14000	1700	8	6400	370	0.5	950	37	290	0.93		0.8	0.7	0.5	21	1300	0.03	0.02	55	3.2	23
7914821.987	563601.703	525.01	MR1-08-156	16712	Baff2011	84.07	85.17	Hanging Wall Schist	Schist	0.1	0.02	0.01	58000	0.5	600	0.44	0.09	1000	0.02	48	240	91	88000	26000	48	40000	330	1.4	510	150	240	4.5		0.8	1.3	0.5	7.9	2260	0.32	0.011	170	2.2	40
7914824.14	563597.087	518.939	MR1-08-156	16714	Baff2011	92.03	93.06	Hanging Wall Schist	Schist	0.1	0.02	0.02	53000	0.5	190	0.54	0.09	1100	0.02	53	230	60	98000	16000	55	37000	390	0.9	280	140	320	3.1		0.8	0.7	0.5	5.6	1430	0.17	0.008	160	2.8	25
7914826.342	563592.365	512.731	MR1-08-156	16716	Baff2011	100.18	101.12	Hanging Wall Schist	Schist	0.1	0.04	0.03	46000	0.5	2.1	0.38	0.09	5000	0.07	28	290	50	86000	160	9	54000	550	1	76	78	2200	2.2		0.8	0.7	0.5	10	410	0.02	1.6	60	2.8	47
7914217.513	563129.414	580.306	MR1-06-84	16740	Baff2011	16.55	17.63	Hanging Wall Schist	Schist	0.1	0.02	0.01	39000	2.1	2.6	0.23	0.09	710	0.14	12	230	9.2	82000	130	12	31000	150	2.6	86	110	340	5.3		0.8	0.7	0.5	7.2	180	0.02	1	35	2.8	145
7914219.703	563124.716	574.128	MR1-06-84	16742	Baff2011	24.68	25.63	Hanging Wall Schist	Schist	0.1	0.02	0.04	35000	1.5	13	0.12	0.09	110	0.12	13	250	22	68000	200	8	25000	77	1.9	86	110	58	4.5		0.8	0.7	0.5	0.85	310	0.02	1.4	40	2.1	42
7914222.7	563118.29	565.679	MR1-06-84	16744	Baff2011	35.7	36.67	Hanging Wall Schist	Schist	0.1	0.02	0.01	58000	0.6	1	0.3	0.09	250	0.02	29	640	6.2	120000	82	10	55000	750	1.6	97	290	57	0.63		0.8	0.7	0.7	1.2	200	0.02	0.77	57	1.8	46
7914227.474	563108.051	552.215	MR1-06-84	16748	Baff2011	53.21	54.31	Hanging Wall Schist	Schist	0.1	0.02	0.02	37000	3.8	6.1	0.91	0.09	140	0.04	49	380	11	140000	2400	14	31000	160	1.9	120	390	53	0.93		0.8	0.7	0.5	1.5	250	0.02	1	64	1.5	65
7913979.772	563177.5	545.133	MR1-09-179	MRARD10 002	AMEC_2010	30.2	31.2	Hanging Wall Schist	Schist	0.1			34000	0.6	520	0.32	0.09	1700	0.2	7.7	100	9.3	53000	18000	8	17000	130	4.4	430	14		3.7		0.8	0.7	3.7	7.5	2000	0.6	1.5	32		5.7
7913969.538	563167.617	541.054	MR1-09-179	MRARD10 003	AMEC_2010	45	46	Hanging Wall Schist	Schist	0.1			17000	0.7	99	0.62	0.09	480	0.2	5.3	120	79	23000	8600	7	8300	100	2.4	240	8.4		4.9		0.8	0.7	0.6	3.2	440	0.36	7.3	5		7.5
7914042.297	563235.419	498.607	MR1-09-177	MRARD10 007	AMEC_2010	55	56	Hanging Wall Schist	Schist	0.1			7900	16	3	0.58	0.09	1600	0.2	6.8	19	3.9	600000	130	3	8000	2600	1.7	120	18		1.9		0.8	0.7	0.7	3	180	0.02	0.35	11		7
7914493.018	563254.927	587.544	MR1-08-140	MRARD10 068	AMEC_2010	50	51	Hanging Wall Schist	Schist	0.1			60000	1.1	160	2.5	28	1700	0.2	48	150	169	160000	11000	36	33000	530	1.9	270	92		113		1.2	0.7	1.2	2.8	930	0.89	0.88	130		26
7914820.868	563604.104	528.166	MR1-08-153	MRARD10 078	AMEC_2010	80	81	Hanging Wall Schist	Schist	0.1			28000	0.5	160	1.2	0.09	640	0.2	9.9	74	1.6	35000	11000	11	15000	320	2	300	14		2.8		0.8	0.7	0.8	3.7	700	0.42	1.7	21		22
7914890.585	563636.278	518.342	MR1-08-147	MRARD10 086	AMEC_2010	90	91	Hanging Wall Schist	Schist	0.1			71000	0.5	0.01	2.4	0.09	1400	0.2	37	1260	15	170000	82	47	82000	1500	1	150	430		1.4		0.8	0.7	1.3	4.7	68	0.02	1.8	64		50
7914904.285	563604.232	579.229	MR1-08-142	MRARD10 092	AMEC_2010	30	31	Hanging Wall Schist	Schist	0.1			87000	0.7	2.9	0.69	0.11	6500	0.2	25	530	4.8	135000	47	6	58000	570	0.3	71	93		2.4		0.8	0.7	0.5	15	200	0.08	1.2	140		37
7914895.95	563624.772	503.213	MR1-08-147	MRARD10 094	AMEC_2010	110	110.5	Hanging Wall Schist	Schist	0.1			78000	0.5	5.8	1.2	0.24	1500	0.2	31	170	7.4	150000	490	39	63000	310	3.8	87	130		2.1		0.8	0.7	1.4	15	76	1.5	1	62		99
7914826.301	563592.452	512.846	MR1-08-153	MRARD10 101	AMEC_2010	100	101	Hanging Wall Schist	Schist	0.1			18000	0.5	25	0.06	0.12	10000	0.4	27	110	92	31000	1600	13	8800	960	0.9	1290	88		3.3		0.8	0.7	1	11	870	0.27	0.29	79		80
7914815.435	563615.755	543.487	MR1-08-156	MRARD10 117	AMEC_2010	60	61	Hanging Wall Schist	Schist	0.1			73000	0.5	510	1.1	0.19	12000	0.2	55	74	33	155000	31000	17	19000	140	18	550	70		15		0.8	0.7	1.9	35	1700	1.6	2.6	28		26
7914820.977	563603.871	527.86	MR1-08-156	MRARD10 119	AMEC_2010	80.8	81	Hanging Wall Schist	Schist	0.1			10	1.7	0.51	0.08	0.13	25	0.2	0.25	0.5	0.1	33	1	2	19	2.3	0.5	9	0.1		0.4		0.8	0.7	0.5	0.22	0.1	0.27	0.22	1		0.7
7914826.301	563592.452	512.846	MR1-08-156	MRARD10 122	AMEC_2010	100	101	Hanging Wall Schist	Schist	0.1			45000	0.5	100	0.12	0.09	1200	0.2	40	230	141	56000	15000	35	25000	220	0.6	390	120		0.91		0.8	0.7	0.7	11	1200	0.2	0.047	210		23
7914420.445	563203.455	591.661	MR1-08-145	MRARD10 126	AMEC_2010	27	28	Hanging Wall Schist	Schist	0.1			84000	6.9	31	3.5	0.17	810	0.2	44	130	29	216000	600	370	46000	630	0.8	170	200		5.7		0.8	0.7	1.5	7.9	750	0.04	3.9	55		143
7914836.569	563574.057	590.725	MR1-08-143	MRARD10 127	AMEC_2010	20	21	Hanging Wall Schist	Schist	0.1			116000	0.5	560	1.3	0.09	2500	0.2	67	580	94	145000	10000	32	110000	850	0.8	350	310		3.6		0.8	0.7	1	3.6	1000	0.19	0.89	150		73
7914814.05	563618.726	547.394	MR1-08-153	MRARD10 130	AMEC_2010	54.9	55.9	Hanging Wall Schist	Schist	0.1			25000	1.2	56	0.12	0.09	7400	0.2	21	120	165	33000	5000	39	24000	590	1.7	250	59		1		0.8	0.7	2	12	1200	0.09	0.031	140		16
7914212.854	563309.016	491.231	MR1-05-46	16470	Baff2011	55.72	56.72	Hanging Wall Schist	Volcanic Tuff	0.1	0.02	1.3	48000	0.6	7.5	2.7	0.09	750	0.08	6.9	170	3.9	78000	3800	20	69000	1100	0.6	190	48	42	2.1		0.8	0.7	2.1	9.4	350	0.1	3.4	1	6.4	46
7914805.377	563637.324	571.85	MR1-08-156	16698	Baff2011	23	23.95	Hanging Wall Schist	Volcanic Tuff	0.1	0.02	0.08	13000	0.5	6.1	0.05	0.09	43000	0.06	10	51	130	12000	2000	16	7600	600	2.7	1200	38	280	1.4		0.8	0.7	0.5	27	1030	0.05	0.013	31	4.3	15
7914808.323	563631.006	563.542	MR1-08-156	16700	Baff2011	33.82	34.82	Hanging Wall Schist	Volcanic Tuff	0.1	0.02	0.07	16000	0.5	21	0.08	0.09	33000	0.16	13	68	42	23000	2500	24	12000	730	0.7	1000	35	280	6.5		0.8	0.7	0.5	20	1070	0.03	0.024	57	4.5	45
7914810.885	563625.513	556.319	MR1-08-156	16702	Baff2011	43.25	44.25	Hanging Wall Schist	Volcanic Tuff	0.1	0.02	0.11	25000	0.5	45	0.07	0.09	27000	0.09	18	73	140	22000	4100	35	14000	770	0.5	390	47	330	0.84		0.8	0.7	0.5	17	1640	0.06	0.019	71	3.7	40
7914813.19	563620.57	549.819	MR1-08-156	16704	Baff2011	51.73	52.74	Hanging Wall Schist	Volcanic Tuff	0.1	0.02	0.06	21000	0.5	64	0.08	0.09	25000	0.02	18	80	120	30000	3100	61	40000	1600	0.4	270	52	240	1.6		0.8	0.7	0.5	17	870	0.03	0.014	78	6.5	17
7914815.036	563616.611	544.613	MR1-08-156	16706	Baff2011	58.53	59.53	Hanging Wall Schist	Volcanic Tuff	0.1	0.02	1.2	41000	0.5	240	0.17	0.09	1100	0.02	39	210	180	54000	25000	17	25000	420	1.2	520	120	370	1.2		0.8	0.9	0.7	15	3000	0.22	0.011	170	1.4	17
7914816.895	563612.624	539.37	MR1-08-156	16708	Baff2011	65.37	66.38	Hanging Wall Schist	Volcanic Tuff	0.1	0.02	0.17	37000	0.5	140	0.17	0.09	790	0.03	35	370	140	54000	15000	17	24000	250	2.2	380	190	240	0.9		0.8	0.7	0.5	6.4	1840	0.17	0.041	160	1.2	30
7914819.97	563606.029	530.698	MR1-08-156	16710	Baff2011	76.7	77.69	Hanging Wall Schist	Volcanic Tuff	0.1	0.02	0.01	51000	0.5	660	0.37	0.09	2200	0.03	47	260	93	68000	20000	70	31000	360	0.8	390	150	740	1.9		0.8	1.1	0.6	14	1550	0.24	0.012	170	2.9	35
7914289.124	563150.669	589.004	MR1-06-90	16718	Baff2011	14.21	15.17	Hanging Wall Schist	Volcanic Tuff	0.1	0.02	0.03	50000	12	2.9	0.33	0.23	1500	0.02	30	630	14	95000	160	10	44000	220	1	90	320	630	3.3		0.8	0.7	0.5	4.3	200	0.02	0.58	65	1.7	49
7914292.595	563143.225	587.556	MR1-06-90	16720	Baff2011	22.5	23.56	Hanging Wall Schist	Volcanic Tuff	0.1	0.02	0.05	37000	2.5	120	1.7	0.37	1200	0.06	13	150	27	61000	8600	15	27000	850	3.1	260	51	540	10		0.8	0.7	0.7	5.3	1560	0.27	1.6	45	3.9	31
7914224.949	563113.466	559.336	MR1-06-84	16746	Baff2011	44	44.93	Hanging Wall Schist	Volcanic Tuff	0.1	0.02	0.06	40000	7.4	1.6	0.68	0.09	200	0.02	22	570	54	96000	110	20	43000	540	1.7	87	200	42	1.2		0.8	0.7	0.5	1.1	190	0.02	0.89	36	2.7	25
7914891.943	563633.365	514.512	MR1-08-150	MRARD10 066	AMEC_2010	95	96	Hanging Wall Schist	Volcanic Tuff	0.1			62000	0.5	4.1	0.78	0.09	3100	0.2	27	320	54	71000	450	15	52000	710	0.3	120	94		2.7		0.8	0.7	1.2	3.5	110	0.02	1.8	98		53
7914886.496	563645.046	529.871	MR1-08-150	MRARD10 067	AMEC_2010	75	75.9	Hanging Wall Schist	Volcanic Tuff	0.1			13000	59	2.8	0.48	0.49	3400	0.2	12	19	8.8	210000	410	6	24000	170	39	160	46		3.3		0.9	0.7	1.1	8.4	53	0.15	0.63	13		12
7914885.152	563647.929	533.663	MR1-08-147	MRARD10 089	AMEC_2010	70	71	Hanging Wall Schist	Volcanic Tuff	0.1			56000	0.5	73	1.1	0.09	7800	0.6	31	190	70	85000	8900	54	51000	800	0.6	420	110		5.2		0.8	0.7	0.5	7.2	1500	0.13	0.099	150		88
7914808.644	563630.319	562.638	MR1-08-153	MRARD10 098	AMEC_2010	35	36	Hanging Wall Schist	Volcanic Tuff	0.1			71000	0.5	3.7	1.8	0.09	4500	0.2	30	280	1.5	160000	270	67	54000	550	0.5	300	120		2.6		0.8	0.7	1.8	11	490	0.02	1.6	92		58
7914810.083	563627.231	558.578	MR1-08-156	MRARD10 112	AMEC_2010	40.3	41.3	Hanging Wall Schist	Volcanic Tuff	0.1			50000	0.6	0.64	0.57	0.57	5000	0.2	25	200	80	68000	65	5	49000	540	4.5	70	55		2.5		14	1.4	4.6	12	270	0.5	2.2	58		44

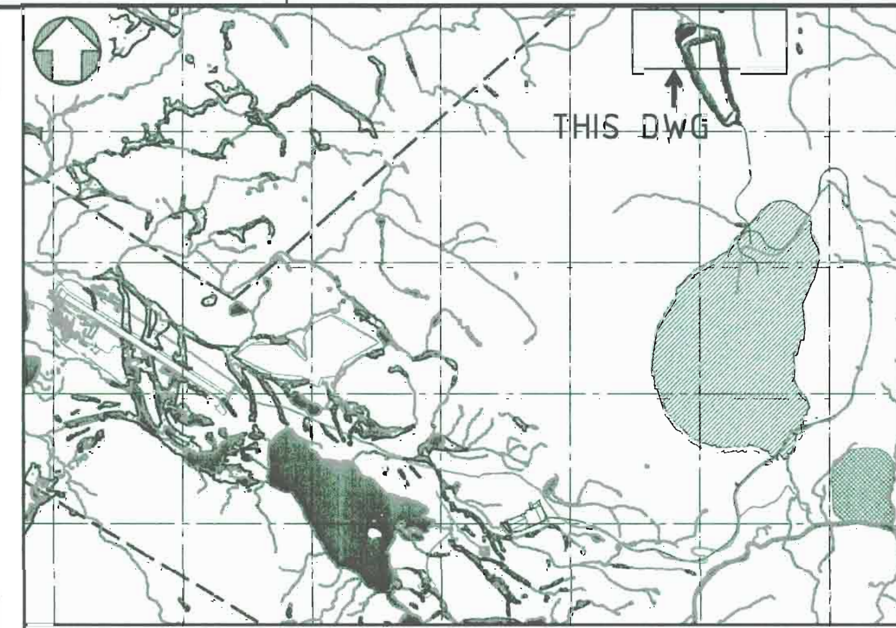
Appendix B:
Mine Site Waste Rock Sedimentation Pond Earthworks & Drainage Plan

H349000-4230-10-035-0001



LINE TABLE		
NAME	LENGTH	DIRECTION
L1	30.2036	N 20°44'27.00" W
L2	166.4941	S 80°37'10.35" E

CURVE TABLE							
NAME	RADIUS	ARC LENGTH	CHORD LENGTH	TANGENT LENGTH	MIDDLE ORDINATE	EXTERNAL DISTANCE	CHORD DIRECTION
C1	100.00	209.6512	173.3108	173.6292	50.0917	100.3674	N 39°19'11.33" E
C2	50.00	54.4653	51.8121	30.2886	7.2346	8.4585	S 49°24'47.60" E



KEY PLAN

LEGEND:

	EXISTING WATER BODY
	EXISTING DEPRESSION
186.5	EXISTING GROUND CONTOUR
	FILL SLOPE
	TOE OF SLOPE
%	GRADING SLOPE
	FLOW DIRECTION
	RIP RAP
	CROSS SECTION DISTANCE
PT	POINT OF TANGENT
PC	POINT OF CURVE
PI	POINT OF INTERSECTION
POB	POINT OF BEGINNING
POE	POINT OF END
PVC	POINT OF VERTICAL CURVE
PVI	POINT OF VERTICAL INTERSECTION
PVT	POINT OF VERTICAL TANGENT
K	RATE OF VERTICAL CURVATURE
HWL	HIGH WATER LEVEL
FB	FREEBOARD

NOTES:

1. TOPOGRAPHY PROVIDED BY TERRAPOINT CANADA INC.
2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
3. CONTOUR INTERVAL IS 2.0 METRES.
4. ALL DIMENSIONS AND ELEVATIONS SHOWN ARE IN METRES UNLESS NOTED OTHERWISE.
5. EXISTING MARSH WITHIN THE EARTHWORKS LIMIT SHALL BE DEWATERED AND CLENAED FROM VEGETATION AND UNSUITABLE MATERIAL PRIOR TO BACKFILLING AND LINER INSTALLATION.
6. TO BE READ IN CONJUCTION WITH DOCUMENT No. H349000-4230-10-144-0001 "WASTE ROCK SEDIMENTATION POND BERM STAKEOUT REPORT".
7. EXISTING DEPRESSION TO BE DEWATERED AND BACKFILLED.

FOR CONSTRUCTION

DRAWING NO.	DRAWING TITLE
H349000-4230-00-041-0001	MINE SITE - SITE LAYOUT

REFERENCE DRAWINGS

PERMIT TO PRACTICE
HATCH LTD
PERMIT NUMBER: P 512
The Association of Professional Engineers, Geologists and Geophysicists of NWT/NU

REVISIONS

REV.	ISSUE FOR	BY	APP'D	DATE
0	CONSTRUCTION	SH	RM	2013-08-30

ISSUE AUTHORIZATION

HATCH

DESIGNED BY R. MANOOCHEHRI DATE 2013-08-26	DRAWN BY R. MANOOCHEHRI DATE 2013-08-26
CHECKED BY A. SAHELI DATE 2013-08-30	DISCIP. ENGR. S. HASSAN DATE 2013-08-30
PROJ. DES. COORD. T. THERTELL DATE 2013-08-30	PROJ. ENGR. J. CLELAND DATE 2013-08-30
PROJ. MGR. S. PERRY DATE 2013-08-30	

Baffinland

MARY RIVER PROJECT

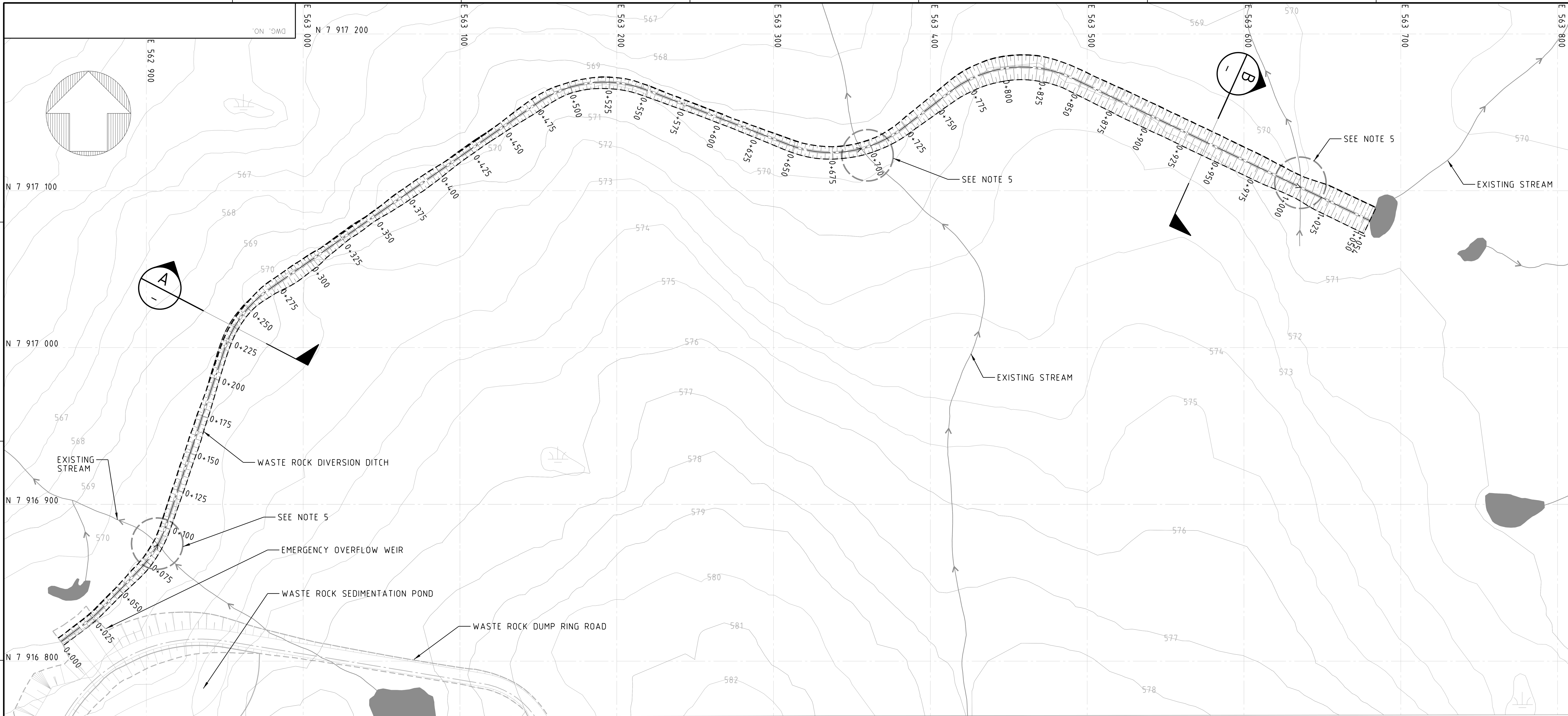
MINE SITE
WASTE ROCK SEDIMENTATION POND
EARTHWORKS & DRAINAGE - PLAN

SCALE	DWG. NO.	REV.
1:1000 OR AS NOTED	H349000-4230-10-035-0001	0

ORIGINAL SHEET SIZE: ISO A1 (841 x 594)

mcdo64322 30/08/2013 5:42:00 PM
c:\prj\projectwise\mcdo64322\dms74793\H349000-4230-10-035-0001.dgn

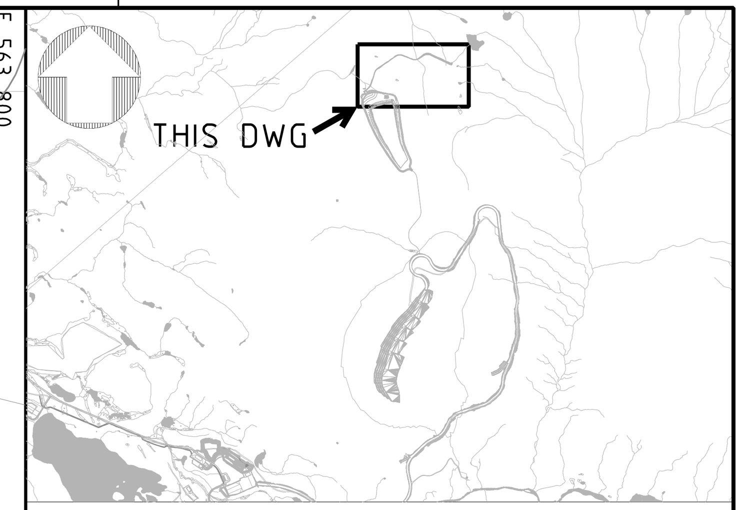
Appendix C:
Mine Site Waste Rock Drainage - Diversion Ditch Plan and Profile



DIVERSION DITCH-PLAN

1:1500 H

0 15 30 45 60 75
SCALE IN METRES



KEY PLAN

LEGEND:

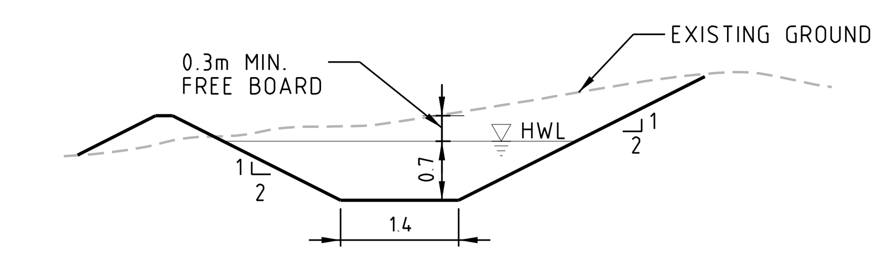
- CENTERLINE OF DITCH
- EXISTING WATER BODIES
- EXISTING GROUND CONTOURS
- EXISTING STREAM
- OVERLAND FLOW PATH
- FILL SLOPE
- CUT SLOPE

NOTES:

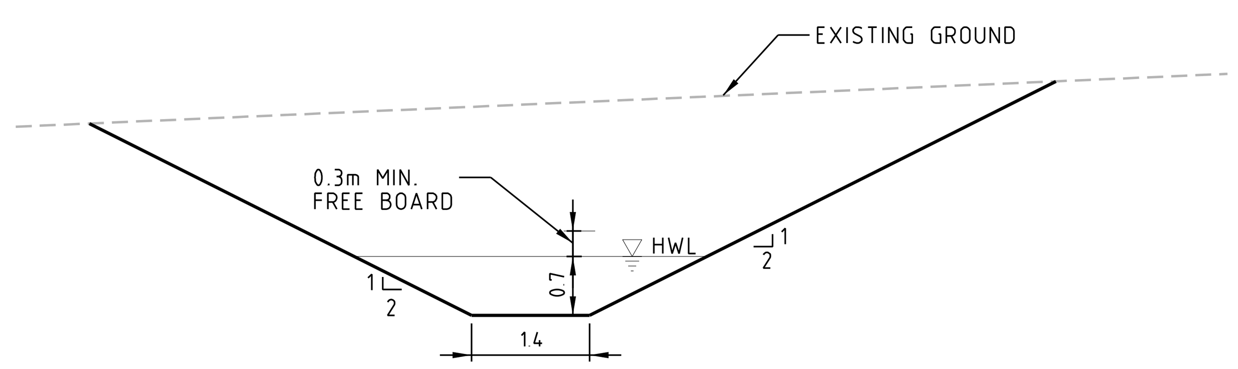
1. TOPOGRAPHY PROVIDED BY TERRAPOINT CANADA INC.
2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.
3. CONTOURS ARE IN METRES. CONTOUR INTERVAL IS 1 METRE.
4. ALL DIMENSIONS AND ELEVATIONS ARE IN METRES UNLESS NOTED OTHERWISE.
5. THE DIVERSION DITCH HAS BEEN DESIGNED TO INTERCEPT AND CONVEY DISCHARGE FROM THE EXISTING STREAMS SOUTH OF THE DITCH.

NOT FOR CONSTRUCTION

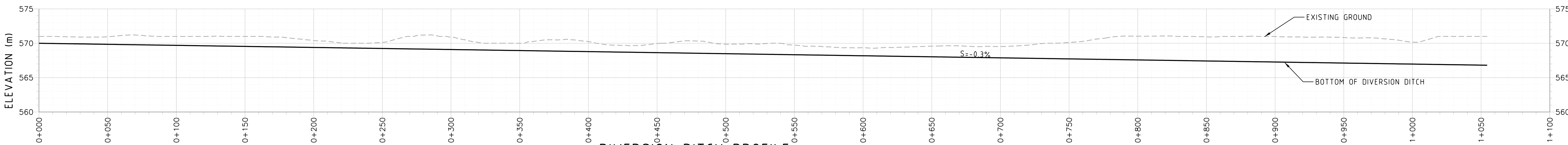
PRELIMINARY



TYPICAL DITCH CROSS-SECTION A



TYPICAL DITCH CROSS-SECTION B



DIVERSION DITCH-PROFILE

1:1500 H
1:300 V

DRAWING NO.	DRAWING TITLE
H349000-4230-10-035-0002	WASTE ROCK SEDIMENTATION POND-EARTHWORKS & DRAINAGE PLAN

REFERENCE DRAWINGS

NO.	DESCRIPTION	BY	CHK'D	APP'D	DATE

REVISIONS

REV.	ISSUE FOR	AUTH. BY	DATE
A	INTERNAL/CLIENT REVIEW	SH	GJ 2014-03-19

ISSUE AUTHORIZATION

HATCH

DESIGNED BY G. JUBINVILLE DATE 2014-03-19	DRAWN BY G. JUBINVILLE DATE 2014-03-19
CHECKED BY A. MOHEBKHANI DATE 2014-03-19	DISCIP. ENGR. S. HASSAN DATE 2014-03-19
PROJ. DES. COORD. T. THERTELL DATE 2014-03-19	PROJ. ENGR. J. CLELAND DATE 2014-03-19
PROJ. MGR. S. PERRY DATE 2014-03-19	

Baffinland

MARY RIVER PROJECT

MINE SITE
WASTE ROCK DRAINAGE – DIVERSION DITCH
PLAN AND PROFILE

SCALE 1:1500 OR AS NOTED

DWG. NO. H349000-4230-10-035-0003 REV. A

ORIGINAL SHEET SIZE: ISO A1 (841 x 594)