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Memo

To:	Katsky Venter, TMAC Lea-Marie Bowes-Lyon, TMAC	**Client:**	TMAC Resources Inc.
From:	Lisa Barazzuol	**Project No:**	1CT022.001.310
Cc:	Dave King, TMAC Paul Christman, TMAC	**Date:**	April 17, 2014
Subject:	Doris Type A Water License Expansion Application - IR #10: Waste Rock Quantities and Management		

1 Introduction

TMAC Resources Inc. has applied to modify and amend Project Certificate No. 003 and Type A Water License No. 2AM-DOH1323 for their Doris North mine, Nunavut (TMAC 2013). The application proposes the expansion of the underground Doris North mine to include additional areas of the Doris deposit, specifically Doris North deep, Doris Connector and Doris Central. All the Doris deposits areas are hosted within the same lithologies and share the same alteration and mineralization assemblages. Management of waste rock from the Doris expansion would be according to the Doris North waste rock management plan (SRK 2010). However, as described in the application (TMAC 2013), the waste rock storage area has been expanded to accommodate the additional material from these other areas.

An information request (IR), listed as IR #10, related to waste rock quantities and management was put forward to TMAC. Specifically, IR #10 requests the following:

1. Breakdown of the total volumes of waste rock from the project expansion that would be classified as mineralized and non-mineralized and how they will be managed.
2. The total volume of mineralized waste rock from the proposed expansions that will be potentially acid generating (PAG) and non-PAG.
3. The total volume of mineralized waste rock that will end up being stored on-land in the waste rock storage pads and whether there will be any PAG materials in these on-land pads.

This memorandum documents the technical rationale for determining the waste rock volumes requested in IR #10.

2 Background

Table 2 of *Doris North Waste Rock and Ore Management Plan* (SRK 2010) outlines the geochemical classification and management recommendations for waste management units. Also included in this table was an assessment of the acid rock drainage (ARD) risk for each unit: basalt, diabase and buffer zone were considered to have a low risk whereas gabbro and alteration zone were considered to have a moderate risk. SRK (2010) provides the technical rationale for these classifications and related management recommendations.

HBML operated the Doris North mine from November 2010 to December 2011 during which time, waste rock and ore were managed and monitored according to SRK (2010). The results of the geological inspections and the geochemical monitoring program were documented in *2011 Waste Rock and Quarry Monitoring Report* (Appendix B of SRK 2012), which was submitted to the Nunavut Water Board.

One recommendation from SRK (2012) was the revision of segregation criteria for the basalt unit. Specifically, basalt within approximately 15 m of the diabase was hornfelsed, or altered by contact metamorphism (heat). The site geologists have indicated that the hornfelsed basalt may have been misidentified as gabbro in historical geological logs from this area. Geochemically, hornfelsed basalt contains similar amounts of sulphides as basalt (i.e. trace amounts) and lower levels of carbonate than basalt within the deposit area.

For the purpose of IR #10, the “gabbro” waste management unit has been renamed as hornfelsed basalt. This material is defined in the geological model as extending 15 m from the diabase unit, which is consistent with the zone of influence observed in the Doris decline, and it is now possible to quantify the amount of hornfelsed basalt that will be generated in the mine. In terms of the geochemical sample set, the hornfelsed basalt group includes samples that were previously logged as gabbro, and also basalt samples proximal to (within 15 m of) diabase (Table 1).

Table 1 presents the quantity of waste rock that would be produced for each waste management unit, the ARD classifications of the geochemical sample set from Doris North, Connector and Central, and the ARD risk and management approach for each unit. The data indicate that the assessment of risk and management of each waste management unit is consistent with the Doris North waste rock management plan (SRK 2010). SRK (2010) outlines the rationale for the waste rock risk ratings and management.

Table 1: Geochemical Classification and Management Recommendations for Proposed Waste Management Units – Doris Deposits

Unit	Quantity (tonnes)	Classification based on NP/AP (% of Samples)				Classification based on TIC/AP (% of Samples)				ARD Risk	Management
		No. of Samples	non-PAG	Uncertain	PAG	No. of Samples	non-PAG	Uncertain	PAG		
Basalt	855,841	179	95%	4%	1%	167	93%	4%	3%	Low	Non-mineralized pile unless high sulphide material.
Hornfelsed Basalt*	101,650	88	88%	9%	3%	81	51%	15%	35%	Moderate	Mineralized pile
Diabase**	146,089	43	100%	0%	0%	43	21%	53%	26%	Low	Non-mineralized pile
Alteration Zone	781,256	258	75%	20%	5%	240	80%	15%	4%	Moderate	Mineralized pile
Buffer zone	218,404	51	98%	2%	0%	47	98%	2%	0%	Low	Non-mineralized pile unless high sulphide material.
Stope***	n/a**	26	46%	15%	38%	15	60%	20%	20%	n/a	All material from the stopes will be processed

Source: P:\01_SITES\Hope.Bay\1CT022.001_2014 Hope Bay Ongoing Support\310_Response to Information Requests\Geochem IR\Working file\[Hope Bay MASTER Geochemical Spreadsheet_Rev29_2011DorisABA_Rev04_2014WRMP_Rev01.xlsx]Table 1-ARD

Note:

*Hornfelsed basalt replaces the gabbro unit presented in SRK (2010).

**Given the consistently low AP, should be managed as non-PAG.

***All of the rock in the stopes is ore and will be processed.

3 Response to IR #10

The following are responses to IR #10. The numbers correspond to the three questions posed for IR #10.

1. As presented in Table 2, the total volume of waste rock that would be produced from mining of the Doris deposit is 2,103,240 tonnes[1] . This volume includes proposed waste rock from the permitted Doris North mine and also proposed Doris expansion (Doris North deep, Doris Connector and Doris Central). Table 2 presents the total volumes of low and moderate risk waste rock that would be produced by proposed mining activities at all of Doris, and at Doris North and the Doris Expansion project exclusively.

Table 2: Quantities of Low and Moderate Risk Waste Rock from Doris North and Expansion

Deposit Area	Low Risk[1] (tonnes)	Moderate Risk[2] (tonnes)	Total (tonnes)
North	582,777	238,723	821,500
Expansion	637,556	644,184	1,281,740
Doris (All)	1,220,334	882,906	2,103,240

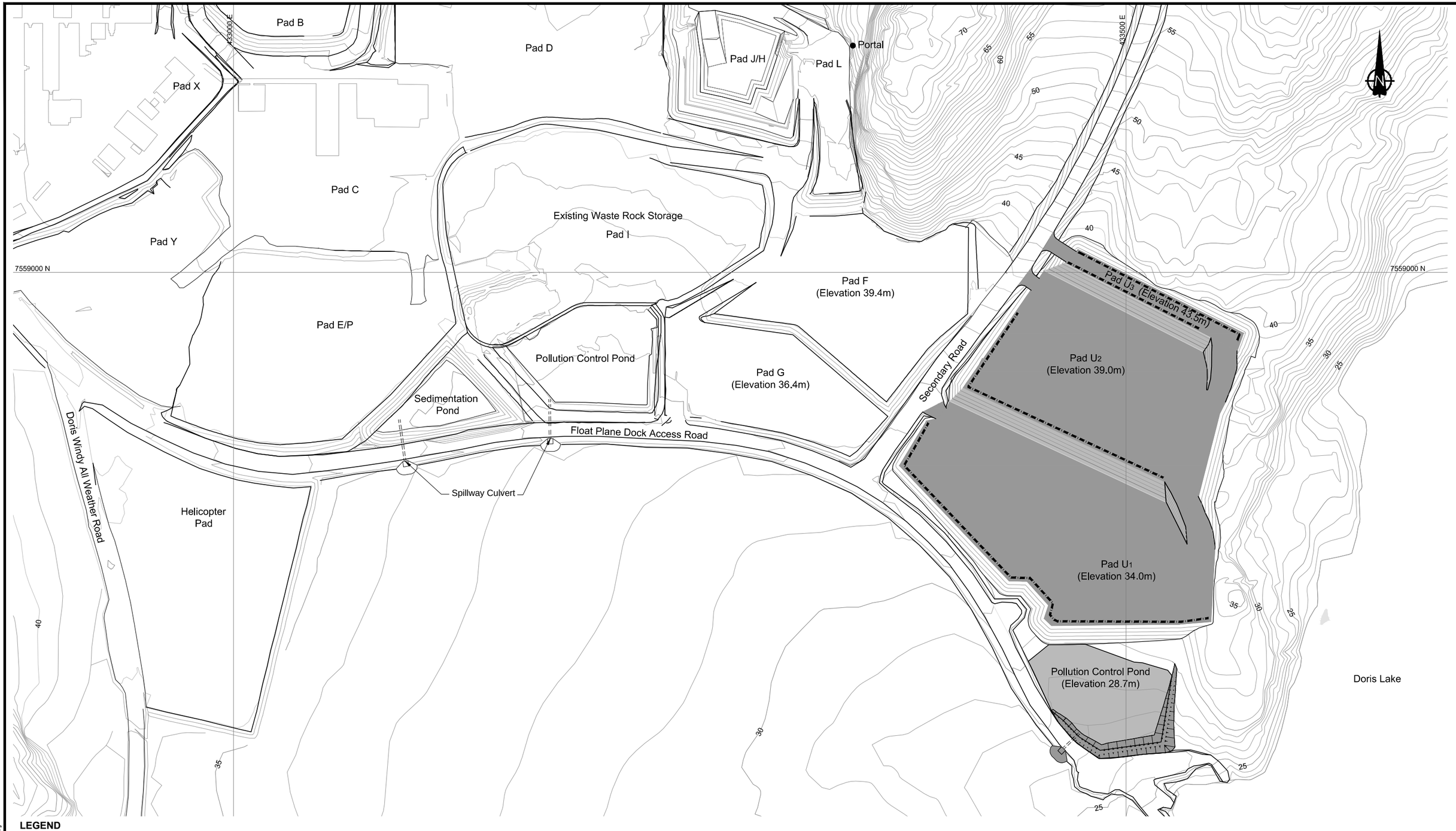
Note:

1. Low risk waste rock units include basalt, diabase and buffer zone. Low risk waste rock containing low sulphides levels is managed as non-mineralized waste rock.
2. Moderate risk waste rock units include hornfelsed basalt and alteration zone. These units would managed as mineralized waste rock. Low risk waste rock containing high sulphides levels would also be managed as mineralized waste.

The quantity of backfill is currently projected at 905,580 tonnes, indicating there is sufficient capacity for the backfill of moderate risk waste rock units. Backfilling moderate risk material would depend on sequencing but it is expected that the majority of the moderate risk waste rock would remain underground, and be directly used as backfill. Approximately 90% of the moderate risk waste rock is from the alteration zone, which is an envelope surrounding the quartz veining and ore zone. Therefore, it is the material that is most likely to be used as backfill during periods when backfill is sourced from within the underground mine. Small amounts of mineralized waste originating from the decline will need to be brought to surface during periods when the amount of waste rock production exceeds the backfill requirements. In the final year of mining, when there is a net deficit of backfill, priority will be given to backfilling the mineralized rock, and it is expected that there will be sufficient capacity to backfill all of this material. As a result, the material that remains in the waste rock pile will be non-mineralized.

Low risk waste rock units would be stockpiled on surface. Storage pads F, I, G and U have been assigned for waste rock stockpiling (Figure 1).

[1] The total volume of waste rock was also stated in the application on page 32 as “(1,095,000 tonnes + 1,010,000 tonnes)”.



LEGEND

- New Infrastructure Pads
- Safety Berms

NOTES

1. The co-ordinate system is UTM NAD 83, Zone 13.
2. All dimensions are in metric units, unless specifically mentioned.

0 10 20 30 40 50
Scale in Metres

srk consulting

SRK JOB NO.: 1CH022.001
FILE NAME: DN–Pad–U–1.dwg

TMAC RESOURCES

HOPE BAY MINING LTD.

Doris North Project

Pad U
General Arrangement

DATE:	APPROVED:	FIGURE:
April 2014		1

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2. Of the 882,906 tonnes of moderate risk waste rock from the proposed expansion, 68,825 tonnes is expected to be potentially acid generated (PAG), 132,450 tonnes has an uncertain classification and 683,650 tonnes is non-PAG. Approximately half of the 68,825 tonnes of PAG waste rock is from Doris North.

3. Current projections indicate that the total volume of the waste rock stockpile on surface at closure is approximately 1,200,000 tonnes, of which approximately 40% (or 506,500 tonnes) is from the Doris North mine with the balance (693,500 tonnes) from the proposed Doris expansion. At closure, all stockpiled waste rock is expected to be non-mineralized waste.

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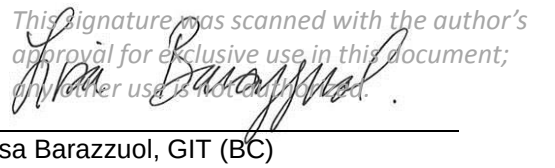

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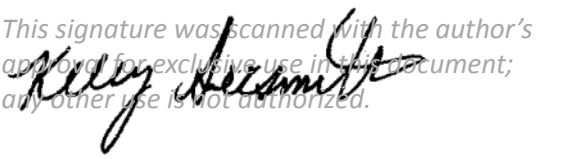
Reviewed by



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4 References

SRK 2010. Hope Bay Project – Doris North Waste Rock and Ore Management Plan. Report prepared for Hope Bay Mining Ltd. by SRK Consulting (Canada) Inc., December 2010.

SRK 2012. 2011 Waste Rock and Quarry Monitoring Report. Report prepared for Hope Bay Mining Ltd. by SRK Consulting (Canada) Ltd., March 2012.

TMAC 2013. Doris North Mine Modifications and Related Amendments to Project Certificate No. 003 and Type A Water Licence No. 2AM-DOH1323. Prepared by TMA Resources Inc.: Toronto Ontario.