



Water Resources Division
Resource Management Directorate
Nunavut Regional Office
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September 12, 2019

Richard Dwyer
Manager of Licensing
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU, X0B 1J0

Your file - Votre référence
2AM-DOH1335

Our file - Notre référence
CIDM#1261801

sent via email: licensing@nwb-oen.ca

Re: Crown-Indigenous Relations and Northern Affairs Canada Comments on TMAC Resources Inc. Proposed Site Specific Geochemical Criteria for Non-Mineralized Waste Rock Construction for Water Licence 2AM-DOH1335 – Amendment No. 2, Doris-Madrid (Hope Bay) Gold Mine Project.

Dear Mr. Dwyer,

Thank you for your August 15, 2019 invitation to comment on the above referenced Proposed Site Specific Geochemical Criteria for Non-Mineralized Waste Rock Construction. The Water Resources Division of Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) examined the letter of request and the results of our review are provided in the enclosed attachment for the Nunavut Water Board's consideration.

Comments have been provided pursuant to CIRNAC's mandated responsibilities under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and the *Department of Crown-Indigenous Relations and Northern Affairs Act*.

If there are any questions or concerns, please contact me at (867) 975-4282 or by e-mail at bridget.campbell@canada.ca, or David Zhong at (867) 975-4555 or david.zhong@canada.ca.

Sincerely,



Crown-Indigenous Relations
and Northern Affairs Canada

Relations Couronne-Autochtones
et Affaires du Nord Canada

A handwritten signature in blue ink that reads "Bridget Campbell".

Bridget Campbell
Water Resources Coordinator

CC: Derek Donald, Nunavut Water Board
Oliver Curran, TMAC Resources Inc.



Attachment A: Review Comments

A. BACKGROUND

TMAC proposes to use site-specific geochemical criteria to determine the suitability of waste rock produced from Naartok East Crown Pillar Recovery (NE CPR) at the Madrid North site for use in construction. To be suitable, waste rock needs to be non-PAG (not potentially acid generating) and have low metal leaching (ML) risk, particularly for arsenic, cobalt and nickel. This request is fulfilling a requirement under the Type 'A' Water License 2AM-DOH1335, Part F, Item 12.

B. REVIEW COMMENTS

1. Validation of Arsenic Criterion

Reference:

- SRK Consulting, prepared for TMAC Resources Inc. Classification of Waste Rock - Naartok East Crown Pillar Recovery, Madrid North, Hope Bay Project. Licence No. 2AM-DOH1335. August, 2019.

Comment:

TMAC proposes to apply the following two site-specific criteria to determine the suitability of waste rock for construction: (1) total sulfur < 1.0wt%, and (2) total arsenic < 70ppm. These criteria are based on the results of a series of geochemical tests and analyses of 43 weight-averaged composite samples of four rock types (i.e., 18 samples for mafic metavolcanics, 9 for mafic volcanics with sediments, 7 for sedimentary units, and 9 for early gabbro). CIRNAC reviewed the data and considers the < 1.0wt% total sulfur criterion for non-PAG to be justified by the data. However, CIRNAC has concerns regarding the total-arsenic < 70ppm criterion for low arsenic leaching risk.

A statement made by the consultant reads as follows (page 20 of the SRK Report): *"Figure 4-10 indicates that samples classified non-PAG have arsenic content less than 80 ppm. However, when the accounting for rock types other than sedimentary units (5), all samples were classified as non-PAG with arsenic as high as 800 ppm."* CIRNAC agrees with the second statement, but seeks clarification on how SRK came to the interpretation in the first statement that samples classified non-PAG have arsenic content less than 80 ppm.

As arsenic can leach under neutral conditions, non-PAG waste rock that contains arsenic could also result in arsenic leaching. Although kinetic test (i.e., humidity cell) conducted on one early gabbro sample from the NE CPR (i.e., HC-40) indicated slow arsenic leaching rates (i.e., 0.004 – 0.002 mg/kg/week), CIRNAC cannot find evidence that appropriate leaching tests were conducted directly on the 43 composite samples. CIRNAC notes that early gabbro usually has much lower arsenic content than all other



waste rock types from the NE CPR. Therefore, it is not clear how the total arsenic < 70ppm criterion was determined.

Recommendation:

CIRNAC recommends that the criterion for arsenic leaching be validated or justified, particularly for mafic metavolcanics, which is the dominant waste rock type.

2. Rationale for using Portable XRF for In-Situ Analyses

Reference:

- SRK Consulting, prepared for TMAC Resources Inc. Classification of Waste Rock - Naartok East Crown Pillar Recovery, Madrid North, Hope Bay Project. Licence No. 2AM-DOH1335. August, 2019.
- Oliver Curran, on behalf of TMAC Resources Inc. Letter to Derek Donald of the Nunavut Water Board Re: Water License 2AM-DOH1335 – Naartok East Crown Pillar Recovery at Madrid North – Proposed Site-Specific Geochemical Criteria for use of Non-Mineralized Waste Rock for Construction. August 14, 2019.

Comment:

For practical reasons, TMAC proposes to use a portable XRF (pXRF) (Thermo Scientific Niton ZL3t GOKDD+) to conduct in-situ analyses of total sulfur and total arsenic. According to the letter submitted with this request, written by Oliver Curran (page 2):

The characterization program also established the viability of using portable X-ray fluorescence (pXRF) as a practical field tool to expedite the quantification of arsenic content and total sulphur content in waste rock. The field level arsenic pXRF screening is an additional practical mitigation to minimize the risk of neutral-pH ML in waste rock that has been classified as suitable for construction under the project-wide ML/ARD criteria specified in the 'Waste Rock for Construction Flowchart' (TMAC, 2019).

CIRNAC interprets the rationale behind choosing this approach to be due to the strong linear relationships between the results obtained in the lab and by the pXRF (i.e., Figures 4-11 to 4-14, and Equations 1 and 2). CIRNAC notes, however, that the linear relationships exhibited in the Figures are based on a logarithmic scale while the relationships exhibited in the Equations are not based on the same scale.

Recommendation:

CIRNAC recommends that TMAC provide clarification as to why a logarithmic scale is used to demonstrate a linear relationship in Figures 4-11 to 4-14 but not in Equations 1 and 2.