Environment and Climate Change Canada
Environnement et Changement climatique Canada

ENVIRONMENT AND CLIMATE CHANGE CANADA'S FINAL WRITTEN SUBMISSION TO THE NUNAVUT WATER BOARD

REGARDING AMENDMENT NO. 1 TO TYPE A WATER LICENCE 2AM-DOH1323 TMAC RESOURCES INC.

August, 2016

Canada

1.0 Table of Contents

2.0 List of Acronyms

AEMP - Aquatic Effects Monitoring Program
AMF - Aquatic Monitoring Framework
CCME - Canadian Council of Ministers of the Environment
EC - Environment Canada (when referencing previously submitted documents)
ECCC - Environment and Climate Change Canada
Km - Kilometre
m - Metre
mg/l - Milligram per litre
MMER - Metal Mining Effluent Regulations
NWB - Nunavut Water Board
TIA - Tailings Impoundment Area
TMAC - TMAC Resources Ltd.
tpd - Tonnes per day

3.0 Executive Summary

TMAC Resources Ltd. (TMAC) owns the existing Doris North Gold Mine which was granted a water licence in 2007. The Doris North project (the Project) is located approximately 125 km south of Cambridge Bay on the Canadian mainland in the Kitikmeot Region of Nunavut. The approved project included underground mining of the Doris North Zone over a two year mine life. TMAC has applied to amend the Project to facilitate more efficient and extensive mining. The major changes proposed include extending the mine life to six years by modifying the mine plan to include: accessing additional mineral deposits through the Doris North portal, discharging saline mine water to Roberts Bay, changing the way tailings are managed, and increasing the size of the camp and the tailings impoundment area.

Environment and Climate Change Canada (ECCC) participated in the review of the original water licence and has been an active participant in the review of the amendment proposal. ECCC has provided specialist expertise, information and knowledge to the Nunavut Water Board (NWB) pursuant to the *Nunavut Land Claims Agreement* and the *Nunavut Planning and Project Assessment Act*. ECCC's input to the water licensing process has been designed to address issues related to our mandate, in the context of the *Canadian Environmental Protection Act* and the pollution prevention provisions of the *Fisheries Act*. During the review of the water licence amendment proposal ECCC identified concerns regarding planned modelling of effluent quality and monitoring in Roberts Bay. All of the issues ECCC identified during the review have been addressed either through the provision of additional information and/or through commitments on the part of TMAC. In this intervention ECCC provides a summary of the issues identified and the path forward.

Ataniuyunut Nainaqhimayuq

TMAC Resources Ltd. (TMAC) nanminiriyangit aulapkaiyuq Doris Nuat Kulu Uyaraqtarviuyuq aittuqtauhimayuq imaup laisiata uvani 2007 mi. Una Doris Nuat havaangit (Havaariyauyukhaq) nayugaat huqpaniittuq 125 km ungahingnia hivuraanit Iqaluktuuttiarmit uvani Kaniitian ahiangani iluani Qitirmiut Nunangani Nunavunmi. Una angiqtauhimayuq havaangit ilaliutigiyangit nunaup iluani uyaraqtarviuyuq Doris Nuat Kiglingani qaangiqhimalugu malrurnik ukiungani uyaraqtarviuyukhaq. TMAC tukhiriiqhimayut aallannguqtiqtakhaanit Havaariyauyukhanut ilitturigiami nakuutqiyaanik akturluarnaqtumiglu uyaraqtarviuyukhamut. Hamna aalannguqtiryuaqhimayut tukhiutauhimaningit ilaliutauyuq tahitiqhimalugit uyaraqtarviuyukhat inuuhia arvinilik ukiukhamut nainaarnahuarlugillu uyaraqtarviup upalungaiyautinga ilagilugulu: angmaffaarmilugu ilagiyauhimayut uyaraqtarvikhamut ukunanngat Doris Nuat ikaarvia, unguvaiyaraluarlugit taryulingnit uyaraqtarviuhimayut imaq uvunga Roberts Bay mut, aallannguqtiqhimalugillu atuqhimayangit kuvvingat amiriyauyukhat, angikliktiqtaulugillu havaktut hiniktarvingat kuvvingalu kiiliqhimayut inikhainit.

Nunaup avatingit Hilaup Aallannguqtiqpallianingillu Kanata (ECCC) ilauqatauhimagaluaqtut ukunanngat qimilruqhutik nanminiriyangit imaup laisiata atuinnaqhugulu ilaunahualiraangat qimilruqtakhainit nutaannguqtiqtauhimaningit tukhiutaanit. ECCC ikayuqhimayangit ayuittumik ilihimattiaqtumik, ilittuqhait qauyimayangillu Nunavunmi Imaliqiyit (NWB) maligautilik ukunanngat *Nunavut Nunataarutaata Angirutaa* unalu *Nunavut Parnaiyaiyit Havaariyakhaanit Ihivriuqtangit Maligaq.* ECCC'p ihumagiyangit ukunanngat imaup laisikhaat piliriyingat tiliuqtauhimayuq turaarnahuarlugit akihautingit ilagihimayangit maliktakhait, hivuniriyakhaanit haffumani *Kaniitian Nunamut Avatikhait Hapumminahuarnikkut Maligaq* unalu halumaittunik pittailinahuarlutik ilaliutigiyangit haffumani *Iqalukhiurniqmut Maligaq.* Kinguani qimilrurnigut haffumani imaup laisiata aallannguqtirningagut tukhiutauhimayuq ECCC nalunaiqhihimayangit ihumaaluutigiyait hapkunanngat upalungaiqtaaqhimayumik pivalliahimaningit imaq nakuuyuq nakuunngittuniluuniit makhuqtuq hilamut uuktuutingit aallannguqtirninganingit iluani Roberts Baymi. Tamaat akihautingit ECCC nit naunaiyaqhimayut qimilrurnigut turaaqtauhimayut ukunanngat ilaliutigivlugu ilaaqtauhimayaat ilittuqhainiq unalu/ukuninngalluuniit malittiaqhimayangit ilagiyaanit uumani TMAC. Uvani pittailinahuaqtangit ECCC nit ikayuqhimayait nainaaqhimayait ihumaaluutigiyait ilittuqhimayangit iniliurvikhangillu hivumut.

ᓇᐃᓈᕐᓯᒪᔪᖅ ᐅᖃᐅᓯᒃᓴᐃᑦ

ᐅᔭᕋᒃᓯᐅᕐᑐᑦ TMAC Resources Ltd. (TMAC) ᐱᖁᑎᖃᕐᑐᑦ ᒫᓐᓇ ᐅᔭᕋᒃᓯᐅᕐᕕᐅᔪᖅ ᑐᐊᕆᔅ ᓄᐊᑦ ᒍᓗᓯᐅᕐᕕᒃ Doris North Gold Mine ᐊᖏᕐᑕᐅᓚᐅᕐᓯᒪᔪᑦ ᐃᒥᕐᒧᑦ ᐱᔪᓐᓇᐅᑎᒥᒃ 2007. ᑐᐊᕆᔅ ᓄᐊᑦ ᐅᔭᕋᒃᓯᐅᕐᕕᒃ (ᐅᔭᕋᒃᓯᐅᕐᕕᒃ) ᓄᓇᖃᕐᑐᖅ 125 ᑭᓛᒥᑕ ᐅᖓᓯᒃᓂᖃᕐᑐᖅ ᓂᒋᐊᓂ ᐃᖃᓗᒃᑐᑦᑎᐊᕐᒥᑦ ᑲᓇᑕᐅᑦ ᓄᓇᖓᓂ ᕿᑎᕐᒥᐅᓂ ᓄᓇᕘᒻᒥ. ᐊᖏᕐᑕᐅᓯᒪᔪᖅ ᐅᔭᕋᒃᑕᕐᕕᐅᔪᖅ ᐱᖃᓯᐅᑎᓯᒪᔪᖅ ᓄᓇᐅᑦ ᐃᓗᐊᓂ ᐅᔭᕋᒃᑕᕐᕕᐅᓪᓗᓂ ᑐᐊᕆᔅ ᓄᐊᑦ ᐊᕋᒎᒃᓄᑦ ᒪᕉᒃᓄᑦ ᐅᔭᕋᒃᑕᕐᑕᐅᓂᐊᕐᑐᖅ. ᐅᔭᕋᒃᓯᐅᕐᑎᑦ TMAC ᐱᓇᓱᑎᖃᕐᒪᑕ ᐋᕿᒋᐊᕐᓯᔪᒪᓪᓗᑎᒃ ᐅᔭᕋᒃᑕᕐᕕᐅᔪᒥᒃ ᐊᐅᓚᓂᖃᑦᑎᐊᕐᓂᕐᓴᐅᖁᓪᓗᒍ ᐅᔭᕋᒃᑕᕐᓂᕐᓴᐅᓗᑎᒃᓗ. ᐊᓯᓪᓕᕐᓂᐅᔪᑦ ᐱᓇᓱᑕᐅᔪᑦ ᐃᓚᔭᐅᓪᓗᓂ ᐊᑯᓂᐅᓂᖓ ᐅᔭᕋᒃᑕᕐᑕᐅᓂᖓ ᐊᕋᒍᓄᑦ 6-ᓄᑦ ᐋᕿᒋᐊᕐᑕᐅᓪᓗᑎᒃ ᐅᔭᕋᒃᑕᕐᓂᐅᑦ ᐸᕐᓇᐅᑎᖏᑦ ᐱᖃᓯᐅᑎᓪᓗᒋᑦ ᐅᑯᐊᐳ ᐱᔭᐅᒃᑲᓐᓂᕐᑐᑎᒃ ᐅᔭᕋᒃᑕᕐᑕᐅᔪᓐᓇᕐᑐᑦ ᑐᐊᕆᔅ ᓄᐊᑦ ᐅᐊᖕᓇᖓᓂ ᐳᓚᑕᕐᕕᐅᔪᖅ, ᑯᕕᔭᐅᓗᓂ ᑕᕆᐅᖑᓂᖓ ᐃᒥᖅ ᑲᖏᕐᖢᒃᒧᑦ ᕿᐳᑦ, ᐊᓯᓪᓕᕐᑕᐅᓗᓂ ᑯᕕᕿᑦᑕᕐᕕᐅᔪᖅ ᑕᓯᓕᐊᓇᓯᒪᔪᖅ ᐊᐅᓚᑕᐅᓂᖓ, ᐊᒻᒪᓗ ᐊᖏᓕᒋᐊᕐᑐᒍ ᑕᒃᒫᕐᕕᐅᓯᒪᔪᖅ ᐊᒻᒪᓗ ᑯᕕᕿᑦᑕᕐᕕᐅᔪᖅ.

ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᐊᒻᒪᓗ ᓯᓚᐅᑦ ᐊᓯᓪᓕᕐᐸᓪᓕᐊᓂᖓᓄᑦ ᑲᓇᑕᒥ ᐃᓚᐅᖃᑕᐅᓚᐅᕐᑐᑦ ᕿᒥᕈᔭᐅᑎᓪᓗᒍ ᐃᒥᕐᒧᑦ ᐱᓇᓱᑎᖓ ᓯᕗᓪᓕᕐᒥ ᐃᓚᒋᔭᐅᖏᓐᓇᕐᖢᑎᒃᓗ ᕿᒥᕈᔭᐅᑎᓪᓗᒍ ᐋᕿᒋᐊᕐᑕᐅᓇᓱᒃᑐᑦ ᐱᓇᓱᑎᖓ. ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᓇᑕᒥ ᖃᐅᔨᒪᔨᖏᓐᓂᒃ ᐅᖃᐅᓯᒃᓴᖃᕐᕕᐅᓯᒪᔪᖅ, ᑐᓴᐅᒪᔭᐅᔭᕆᐊᓕᒃᓂᒃᓗ ᐊᒻᒪᓗ ᖃᐅᔨᒪᔭᐅᔪᓂᒃ ᓄᓇᕗᑦ ᐱᒥᓕᕆᓂᕐᒧᑦ ᑲᑎᒪᔩᖏᓐᓄᑦ ᒪᓕᒃᑐᒍ *ᓄᓇᕗᑦ ᓄᓇᖓ ᐱᒋᔭᐅᓕᕐᓂᖓᓄᑦ ᐊᖏᖃᑎᒋᒍᑎᑦ* ᐊᒻᒪᓗ *ᓄᓇᕗᑦ ᐸᕐᓇᒃᑕᐅᓂᖓᓄᑦ ᐊᒻᒪᓗ ᐱᓕᕆᐊᖑᔪᒧᑦ ᕿᒥᕈᔭᐅᓂᖓᓄᑦ ᐱᖁᔭᐃᕐ.* ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᓇᑕᒥ ᐅᖃᐅᓯᒃᓴᖏᑦ ᐃᒥᕐᒧᑦ ᐱᔪᓐᓇᐅᑎᒧᑦ ᐊᐅᓚᓂᖓᓄᑦ ᐋᕿᒃᓯᒪᓪᓗᓂ ᐃᓱᒪᒌᑕᐅᒐᔭᕐᑐᑦ ᐱᓕᕆᐊᒃᓴᖏᑕ ᒥᒃᓴᓄᐊᖓᔪᑦ ᑲᒪᒋᔭᐅᓪᓗᑎᒃ, ᒪᓕᒃᑐᒋᑦ *ᑲᓇᑕᒥ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ ᓴᐳᔾᔨᓂᕐᒧᑦ ᐱᖁᔭᐃᑦ* ᐊᒻᒪᓗ ᓱᕈᕐᓇᕐᑐᑦ ᐱᑕᖃᕐᑕᐃᓕᒪᑎᑕᐅᓂᖏᓐᓄᑦ *ᐃᖃᓗᓕᕆᓂᐅᑦ ᐱᖁᔭᐃᕐ.* ᕿᒥᕈᔭᐅᑎᓪᓗᒍ ᑭᖑᓪᓕᕐᐸᒥᒃ ᐃᒥᕐᒧᑦ ᐱᔪᓐᓇᐅᑎᖓᓄᑦ ᐋᕿᒋᐊᕈᑕᐅᓇᓱᒃᑐᑦ ᐱᓇᓱᑕᐅᔪᒧᑦ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᓇᑕᒥ ᓇᓗᓇᐃᕐᓯᓚᐅᕐᑐᑦ ᐃᓱᒫᓗᑕᐅᓂᖓᓂᒃ ᑯᕕᔭᐅᖃᑦᑕᕐᓂᐊᕐᑐᖅ ᖃᐅᔅᓴᕐᑕᐅᖃᑦᑕᕆᐊᖃᕐᓂᖓᓂᒃ ᑲᖏᕐᖢᒃᒧᑦ ᑕᕆᐅᖑᓂᖓᓄᑦ ᕿᐳᑦ ᑲᖏᕐᖢᒃ. ᑕᒪᕐᒥᒃ ᐃᓱᒫᓗᑕᐅᔪᑦ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᓇᑕᒥ ᓇᓗᓇᐃᕐᓯᒪᔭᖏᑦ ᕿᒥᕈᔭᐅᑎᓪᓗᒍ ᑭᐅᔭᐅᓯᒪᔪᑦ ᐋᕿᒋᐊᕐᑕᐅᓪᓗᓂ ᑐᓴᒐᓴᐅᒃᑲᓐᓂᕐᑐᑦᓗ ᐅᖃᐅᓯᐅᓪᓗᑎᒃ ᐊᒻᒪᓗ ᐅᕙᑰᓐᓃᑦ ᐊᖏᕐᓯᒪᓂᕐᒥᓂᒃ ᐱᓂᐊᕐᓂᓴᕐᑐᑎᒃ ᐅᔭᕋᒃᑕᕐᑐᑦ TMAC. ᑕᕙᓂ ᐅᖃᐅᓯᒃᓴᖏᓐᓂ ᐊᕙᑎᓕᕆᔨᒃᑯᑦ ᑲᓇᑕᒥ ᓇᐃᓈᕐᓯᒪᔪᓂᒃ ᐅᓂᒃᑳᒃᓴᖃᕐᑐᑦ ᐃᓱᒫᓗᑕᐅᔪᓂᒃ ᓇᓗᓇᐃᕐᑕᐅᓯᒪᔪᓂᒃ ᐊᑐᕐᑕᐅᔭᕆᐊᓕᒃᓂᒃᓗ.

4.0 ECCC's Mandate, Roles and Responsibilities

The mandate of ECCC is determined by the statutes and regulations under the responsibility of the assigned Minister of Environment and Climate Change. In delivering this mandate, ECCC is responsible for the development and implementation of policies, guidelines, codes of practice, inter-jurisdictional and international agreements, and related programs. ECCC's specialist advice is provided based on our mandate, in the context of the *Canadian Environmental Protection Act*, and the pollution prevention provisions of the *Fisheries Act*.

ECCC is participating in the review of TMAC's application to amend their Type A Water Licence in order to provide specialist expertise, information, and knowledge to support the NWB and regulators.

5.0 ECCC's Technical Review Comments

ECCC's review encompassed TMAC's application to amend NWB Type A Water Licence 2AM-DOH1323 and the information submitted to support it.

The scope of the amendment application includes:

- The discharge of mine water directly to Roberts Bay via a two km pipeline to a diffuser located on the ocean floor at the 40 m bathymetric contour. Process water may be mixed with the saline groundwater and treated, if needed, prior to discharge;
- An additional 550 m of road, and riprap over the pipe entering the sea;
- Removal of the laboratory from the mine plan;
- Creation of a non-hazardous waste landfill located in Quarry 3;
- Increasing the milling rate to 2,000 tpd;
- Increasing the capacity of Doris Camp from 180 to 280 personnel;
- Expansion of laydown and temporary ore storage areas;
- The inclusion of additional ore bodies (Doris Central and Doris Connector);
- The deposition of waste rock and cyanide tailings underground as backfill following destruction of residual cyanide; and,
- The disposal of uncontaminated tailings through subaerial deposition in the Tailings Impoundment Area (TIA), behind a newly constructed dike designed to retain solids.

During the course of the review ECCC provided comments on TMAC's application and management plans for the Doris North Project technical review. ECCC reviewers identified issues related to four general themes: monitoring site locations in the receiving environment; predicting and understanding effluent composition; parameters to be monitored in the effluent and the receiving environment; and management of minewater.

1. Monitoring site locations in the marine receiving environment:
   During the review of the amendment application ECCC noted that the monitoring stations in the receiving environment were sparsely distributed and were not located sufficiently close to the effluent diffuser to detect effects. ECCC also noted that oceanographic conditions did not appear to have been considered in monitoring station placement. TMAC responded they had held workshops with the Aquatic Monitoring Framework (AMF) Working Group, and an appropriate program is being developed for the marine waters receiving effluent discharge. TMAC indicated that oceanographic conditions are unlikely to affect plume mixing, given that tides are small, Roberts Bay circulation is largely wind-driven, and the deep waters of Robert's Bay mix with the waters of Melville Sound. TMAC also noted that it has committed to work with appropriate regulators and stakeholders to develop an overarching aquatic monitoring framework so monitoring will be adjusted should data conflict with impact predictions. Based on TMAC's responses and the ongoing work of the AMF Working Group ECCC is satisfied that potential effects in the receiving environment can be effectively detected and managed.

2. Predicting and understanding effluent composition:
   The effluent discharged from the diffuser originates from several different sources including groundwater and the TIA. Understanding and effective management of effluent quality

requires knowledge of the composition of the water coming from each source. ECCC recommended that TMAC model the quality of the TIA effluent and the quality of the minewater as well as monitor each input and the final discharge to inform adaptive management. TMAC has committed to improving accuracy of effluent quality modeling by refining inputs; this was completed in January 2016. In addition, hydrodynamic dispersion modeling was done, and a technical memorandum was provided on near-field mixing of the effluent plume. With respect to the monitoring of source water quality, discussions have been held (and will continue) within the AMF Working Group regarding parameters and frequency of monitoring of site water quality. ECCC is satisfied with the progress to date and looks forward to ongoing discussions in the AMF Working Group.

3. Parameters to be monitored in the effluent and the receiving environment:
   TMAC originally proposed to limit the assessment of parameters of concern to those with existing marine water quality guidelines under the Canadian Council of Ministers of the Environment (CCME). ECCC noted that the effluent may contain parameters for which there are no CCME marine water quality guidelines and that these parameters should be assessed as they have the potential to impact the Roberts Bay receiving environment. After discussions with ECCC at the technical meetings TMAC committed to monitor an expanded list of parameters to meet ECCC's request. ECCC considers this issue resolved, noting that the NWB may change the requirements as warranted by monitoring results.

4. Management of minewater:
   The Doris North Gold Mine will be subject to the Metal Mining Effluent Regulations (MMER). TMAC has applied to amend the project to include marine discharge of project effluent containing saline mine water. The MMER require that effluent to be released to the receiving environment undergo toxicity testing prior to release; however, the application indicates that the salinity of the minewater portion of the effluent may exceed the tolerance of the existing MMER bioassay test species. At ECCC's request TMAC has developed an alternative minewater management strategy to ensure that project discharges remain in compliance with the MMER. TMAC has committed to discharging saline mine water to the TIA until such time as the minewater salinity declines to the point where it can be tested using the current MMER test method or until a new test method is developed. In the meantime ECCC is working to develop a test method which utilizes a saline-tolerant species that would be appropriate for testing saline effluents to be released to the marine environment, and to amend the MMER to reflect this new testing option.

ECCC's concerns were addressed in large part prior to the Technical Meeting held in January 2016 and were verified as resolved during the meeting itself. Ongoing work to address issues related to the marine receiving environment is being done through the AMF Working Group that has been established to facilitate monitoring and mitigation efforts.

The comments outlined in this intervention are in no way to be interpreted as any type of acknowledgement, compliance, permission, approval, authorization, or release of liability related to any requirements to comply with federal or territorial statutes and regulations. Responsibility for achieving regulatory compliance and cost-effective risk and liability reduction lies solely with the Proponent.

6.0 Conclusions

ECCC acknowledges and appreciates the effort that TMAC has taken to address technical concerns and issues raised by Interveners. ECCC looks forward to participating in ongoing discussions through the working group established to support monitoring and management of this project and thanks the NWB for the opportunity to participate in this water licence amendment process.