ᓄᓇᕗᑦ ᐊᕐᕌᒍᑕᓕᕆᔨᒃᑯᑦ ᑲᑎᒪᔨᖏᑦ
NUNAVUMI AVATILIKIYIN KATIMAYIN

Nunavut Impact Review Board
Final Hearing Report
Phase 2 Hope Bay Belt Project

TMAC Resources Inc.

NIRB File No. 12MN001

June 2018

INSIDE COVER PAGE

The Nunavut Impact Review Board's Primary Objectives as established under the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada*, Article 12, Section 12.2.5 are stated as follows:

> In carrying out its functions, the primary objectives of NIRB shall be at all times to protect and promote the existing and future well-being of the residents and communities of the Nunavut Settlement Area, and to protect the ecosystemic integrity of the Nunavut Settlement Area. NIRB shall take into account the well-being of residents of Canada outside the Nunavut Settlement Area.

Contact Information:
Nunavut Impact Review Board
PO Box 1360
29 Mitik Street
Cambridge Bay, NU X0B 0C0
Telephone: (867) 983-4600
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Cover Photo Credits: Board staff

SIGNATURE PAGE

Photo 1: TMAC Phase 2 Panel Members: Philip (Omingmakyok) Kadlun, Allen Maghagak, and Henry Ohokannoak

THIS REPORT IS SUBMITTED TO THE HONOURABLE CAROLYN BENNETT, MINISTER OF CROWN-INDIGENOUS RELATIONS AND NORTHERN AFFAIRS BY THE NUNAVUT IMPACT REVIEW BOARD ON THIS 26TH DAY OF JUNE 2018.

Allen Maghagak, Board Member Chairperson of the NIRB's TMAC Phase 2 Panel	Henry Ohokannoak, Board Member
Philip (Omingmakyok) Kadlun, Board Member	

COVER LETTER

NIRB File No.: 12MN001

June 26, 2018

The Honourable Carolyn Bennett, P.C.
Minister of Crown-Indigenous Relations and Northern Affairs
Government of Canada
10 Wellington, 21st Floor
Gatineau, QC K1A 0H4

Sent via email and courier: minister@aadnc-aandc.gc.ca; carolyn.bennett@canada.ca; and infopubs@aadnc.gc.ca

Re: Final Hearing Report for the Nunavut Impact Review Board's Review of TMAC Resources Inc.'s Phase 2 Hope Bay Belt Project Proposal

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Dear Honourable Carolyn Bennett:

In accordance with the mandate and objectives of the Nunavut Impact Review Board (NIRB) established under Article 12 of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada* (*Nunavut Agreement*), the NIRB is pleased to provide you with the enclosed Final Hearing Report summarizing the NIRB's Review of the potential ecosystemic and socio-economic effects of TMAC Resources Inc.'s (the Proponent) "Phase 2 Hope Bay Belt Proposal", NIRB File No. 12MN001 (the Project).

After due consideration of all information provided to the NIRB in respect of the Project, and in accordance with the objectives and requirements of the *Nunavut Agreement*, the NIRB has determined that with appropriate mitigation, management and monitoring measures (as set out in detail in the attached Final Hearing Report), the Project can be conducted in a manner that protects and promotes the existing and future well-being of the residents and communities of the Nunavut Settlement Area while also adequately protecting the ecosystemic integrity of the Nunavut Settlement Area. On this basis, it is the NIRB's recommendation that the Project should now be allowed to proceed to the regulatory stage.

Should you have questions or require clarification regarding this matter, please contact the NIRB's Executive Director, Ryan Barry at (867) 983-4608 or rbarry@nirb.ca.

Sincerely,

Allen Maghagak
Chairperson of the TMAC Phase 2 Hope Bay Belt Panel
Nunavut Impact Review Board

cc: The Honourable Catherine McKenna, Minister of Environment and Climate Change
The Honourable Dominic LeBlanc, Minister of Fisheries and Oceans and the Canadian Coast Guard
The Honourable Jim Carr, Minister of Natural Resources
The Honourable Marc Garneau, Minister of Transport
The Honourable Hunter Tootoo, MP for Nunavut
The Honourable Dennis Patterson, Senator for Nunavut
The Honourable Joe Savikataaq, Premier of Nunavut
Aluki Kotierk, President, Nunavut Tunngavik Incorporated
Stanley Anablak, President, Kitikmeot Inuit Association
Lootie Toomasie, Chairperson, Nunavut Water Board
Oliver Curran, VP Environmental Affairs, TMAC Resources Inc.
Phase 2 Hope Bay Belt Distribution List

CHAIRPERSON'S FOREWORD

As required under Article 12, Section 12.5.6 of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada* (the *Nunavut Agreement*) the Nunavut Impact Review Board (NIRB or Board) provides the following Final Hearing Report to the Ministers responsible for the Phase 2 Hope Bay Belt Project (the Project) as proposed by TMAC Resources Inc. (the Proponent or TMAC). This Final Hearing Report summarizes the Board's Review of the Project to assess the potential ecosystemic and socio-economic effects of the Project as conducted by the Board under Article 12, Part 5 of the *Nunavut Agreement*.

The Project proposes to expand gold mining (underground and limited surface/crown pillar mining) along the Hope Bay Greenstone Belt at three sites, known as the Madrid North, Madrid South and Boston deposits, as well as to upgrade an existing single-lane private haul road connecting these deposits with the existing gold processing, waste management, shipping and accommodation facilities at the Doris North Gold Mine and Roberts Bay sites.

As detailed later in this Report, although the Board's assessment of the Project commenced in December 2011, due to several suspensions of the Project by the original proponent, Hope Bay Mining Ltd. and the subsequent transfer of the Project to the current Proponent, TMAC, in 2013, the timeline for the Board's Review of the Project has been more extended than is usually the case. The Project has advanced more steadily through the Review since December 2016 when TMAC submitted its Draft Environmental Impact Statement, and the Board's Review concluded with the Board holding a five-day Final Hearing in Cambridge Bay on May 8-12, 2018.

This Report summarizes the information received throughout the assessment from the Proponent and formal Intervenors, including the Kitikmeot Inuit Association, various Federal Government Departments and the Government of Nunavut. The Report also reflects the important contributions of Elders and other Community Representatives from five nearby Kitikmeot communities, Cambridge Bay, Kugluktuk, Gjoa Haven, Taloyoak and Kugaaruk, and the two seasonally occupied communities of Kingaok (Bathurst Inlet) and Omingmaktok (Bay Chimo) during the Board's Pre-Hearing Conference in 2017 and Final Hearing in 2018. The Board is grateful for all participants who shared their experiences and expertise, offered their opinions, shared their personal stories and views and asked important questions of the Proponent and Intervenors who have given the Board much to consider, and supported the Board's completion of this thorough assessment.

The Board is also grateful for the commitment and hard work of all participants to identify and resolve issues arising throughout the Board's Review. The Board was pleased to see that this assessment was informed by the practical experience and monitoring of effects from the operations at the existing Doris North Project. This information was central to ensuring this assessment was based on updated predictions from the original Doris North Project and helped to shape improvements to the Project to reduce the potential for negative effects and to maximize the positive effects of the Project for the Kitikmeot Region, Nunavut and Canada in general. The Board also recognizes that TMAC's proposed use of the existing gold processing and waste management infrastructure at the Doris North site to support the further development of the Hope

Bay Belt will enable TMAC to limit the surface footprint of the Project, addressing guidance given by the NIRB in 2016 during the Board's reconsideration of the Doris North Gold Project.

Although the Board noted widespread support for the Project, with communities eager to see increasing benefits to employment, training and business opportunities throughout the Kitikmeot Region, the Board also heard concerns expressed by both Community Representatives and Intervenors about the potential for the Project to:

- Increase effects on terrestrial wildlife, and caribou in particular;
- Contribute to the cumulative effects of marine shipping;
- Have effects on the marine environment due to the discharge of saline groundwater from the new mines via an already-approved pipeline and into Roberts Bay; and
- Result in fuel spills due to accidents during marine shipping or transportation along the road.

The Board is confident that by building on the experience and knowledge gained by the Proponent, regulators and community members during operation of the Doris North Gold Mine, the Phase 2 Hope Bay Belt Project can be developed in a way that limits the potential for adverse effects, including the potential for adverse effects on caribou and all wildlife, as well as fish, freshwater and the marine environment. The Board's recommended terms and conditions are the result of considerable advice and direction shared by the participants in the Review, often in collaboration with each other and the Proponent, and with demonstrated integration of Inuit Qaujimaningit throughout. The Board notes the importance and continued role of Inuit Qaujimaningit in the development, implementation and on-going adaptive management of mitigation and monitoring for the Project. The terms and conditions recommended by the Board as outlined in the Report also exhibit a high standard of the precautionary principle for those issues where data gaps exist (such as the nature and extent of future effects on caribou when the truck traffic increases significantly on the private haul road between the Boston site and Doris North Gold Mine during construction and mining at the Boston site).

Throughout the Review the Board was encouraged by the commitment and willingness of TMAC and all parties to long-term collaboration and ensuring the potential for the effects of this Project, when combined with the effects of previously approved activities in this area is minimized. In closing, I would like to extend my thanks to the Proponent, Intervenors, Community Representatives and the Board and Board staff for their essential contributions to this assessment.

Sincerely,

Allen Maghagak
Chairperson of the Phase 2 Hope Bay Belt Panel
Nunavut Impact Review Board

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ᐊᑐᖏᓕᕆᓯᒪᓂᖅᓱᓄᑦ ᐊᑕᐅᓂ ᑎᑎᕎᖅᓯᒪᓂᖅᓱ 12, ᐊᐃᖅᓯᒪᓂᖅᓱ 12.5.6 *ᐊᖅᑎᑭᑎᑦ ᐃᓄᐃᑦ ᓄᓇᑦᑐᖅ ᓄᓇᕈᕆᓯᓕᕆᓂ ᐊᓘᒪ ᑯᐃᐅ ᑭᒡᓕᖏᑐᖅᓱᓕ ᑲᑎᕐᓂᖅ (ᓄᓇᑦᑐᖅ ᐊᖅᑎᑭᑎᑦ)* ᓄᓇᑦᑐᒥ ᐊᐅᑎᓪᓗᓂᓄᑦ ᑲᑎᒪᔨᖅ (NIRB ᐅᖅᐳᔪᓐᓂᑦ ᑲᑎᒪᓂᕐᓂᖅ) ᑐᓂᓯᓯᒪᓕᒡᓗ ᑭᖑᑦᓂᖅᑎᑦ ᑐᓴᖅᑭᑎᓂᑦ ᐅᓂᒃᑑᐅᔪᓄᑦ ᒥᓂᕆᐊᖃᖅᑐᑦ ᐱᓕᕆᔨᖅᑐᑦ ᐱᓕᕆᔨᑦ ᑐᖑᓪᓗᐊᓂᑦ Hᐅᑦ ᐸᐃᒥᒃ ᐱᓕᕆᔨᖅ ᑐᖑᓪᓗᐊᓂᑦ ᑕᐃᒪᐃᓐᓇᖅᑐᑦ TMAC ᐅᓴᖅᓂᒋᐊᖅᑎᖅᑎᑦ ᐃᓐᓇᐋᓐᓇᑎᑦ (ᐱᓕᕆᓂᒋᐊᖅᑐᖅ ᐅᖅᐳᔪᓐᓂᑦ TMAC). ᑕᒪᓐᓇ ᑭᖑᓪᓕᖅ ᑐᓴᖅᑐᓕᒃ ᐅᓂᒃᑑᐅᔪᓄᑦ ᑎᑎᕎᖅᑕᐅᓯᒪᔪᖅᑐᑦ ᓄᓇᕗᒻᒥ ᐊᖏᑎᓕᕆᓂᖅ ᑲᑎᒪᔨᖅᑎᑦ ᓴᐅᐅᔨᓴᓂᖅᑐᑦ ᐱᓕᕆᐊᖃᓕᒫᑦ ᓴᐅᐅᓂᑐᓴᓕᑎᖅ ᐊᑐᐃᐃᓂᖅᑐᑦ ᐱᓕᕆᐊᖃᓕᒫᑦ ᐊᖏᑎᑎᖅ ᐃᓄᓐᓂᖅᑐᑦ ᐱᓕᕆᐊᖃᓕᒫᑦ ᓴᐅᐅᓂᑐᓴᓕᑎᖅ ᐊᓄᓇᕗᒻᒥ ᐊᖏᑎᓕᕆᓂᖅ ᑲᑎᒪᔨᖅᑐᖅᓱᓂᑦ ᐊᑕᐅᓂ 12, ᐃᓕᓴᐃᓚ 5 *ᓄᓇᕗᒻᒥ ᐊᖅᑎᑭᑎᑦ*.

ᐱᓕᕆᐊᖅᐳᓯᐊᖅᑐᖅ ᑐᓴᕐᓂᒪᑦ ᐊᖅᑎᓕᑕᐊᖅᑎᕐᔪᓂᕐᓗᖅ ᔪᑐᔪᐅᖅᓂᕐᓗᖅ (ᓄᓇᕗᑦ ᐊᑕᖅᓂ ᐃᓕᖅᓯᓐᓂᑐ ᓄᓇᕗᑦ ᖃᖅᓯᓂ) Hᐅᑦ ᐸᐃᒥᒃ ᓄᓇᑦᑯᑎᓯᓂ ᔪᑐᖃᐅᑎᓯᖅᓯᒪᒥ, ᐱᖅᓯᓴᐃᓕᓴᔪᔨᑦ ᑕᐃᔨᐅᔨᖅ ᒪᑐᐃᑦ ᓄᓇᕗᑦ, ᒪᑐᐃᑦ ᐳᓴᒃ ᐊᒥᓱᓄ ᐊᐃᒪᓕᐊᓯᔪᑦ ᓴᐅᐅᓂᑐᓴᓕᑎᖅ ᐱᓕᕆᐊᖃᓕᒫᑦ ᐊᖏᑎᑎᖅ ᐃᓄᓐᓂᖅᑐᑦ ᐱᓕᕆᐊᖃᓕᒫᑦ ᓴᐅᐅᓂᑐᓴᓕᑎᖅ ᐊᓄᓇᕗᒻᒥ ᐊᖏᑎᓕᕆᓂᖅ ᑲᑎᒪᔨᖅᑐᖅᓱᓂᑦ ᐊᑕᐅᓂ 12, ᐃᓕᓴᐃᓚ 5 *ᓄᓇᕗᒻᒥ ᐊᖅᑎᑭᑎᑦ*.

ᐊᓪᓚᑲᓇᑕᒥ ᐃᓕᓴᕐᕕᐊᓂᖅ ᐊᑐᖅᑐᑎᒃ ᐃᓚᖃᖅᑎᑦ ᐊᑐᖅᑐᑎᒃ ᐊᑐᖅᑐᑎᒃ ᐊᑐᖅᑐᑎᒃ

ᔪᓕᓯᐅᕐᖓᖏᓚᓂ ᐃᑲᔪᖅᓂᐊᖏᓪᓕᒃᓗᑦ ᐱᓕᕆᓕᐊᓂᕐᒥᓄᑦ ᐄᐅᐸ ᐸᐃ ᐱᓕᕆᓚᖏᓄᑦ ᐊᔪᖓᑎᓯᓕᓂᓕ TMAC ᐅᓴᖅᖃᓂᐊᖅᑎᖓ ᑭᒡᓕᖅᖢᖅᑎᓯᓕᓂᓂ ᐊᐅᑐᐃᓂᖅᓕᐊᖓᓂᕐᒥᒃ, ᐅᖅᑲᐅᓯᖅᓴᓕᓂ ᒪᓕᖅᑯᕆᐅᔪᓂᒃ ᓄᓇᕗᑦ ᐊᖓᑎᓕᕆᓚᓕᓂ ᑲᑎᒪᓕᕐᕕᒃᓴᖓᓂ 2016 ᓄᓇᕗᑦ ᐊᖓᑎᓕᕆᓚᓕᓂ ᑲᑎᒪᓕᖅᖓ ᐃᓗᒪᓕᐅᖅᓯᒪᓕ ᑐᐊᓚᐅᖅ ᓄᐊᑦ ᔪᓕᓯᐅᕐᖓᖏᓚᓂᒃ.

ᓄᓇᕗᑦ ᐊᖓᑎᓕᕆᓚᓕᓂ ᑲᑎᒪᓕᖅᖓ ᐃᑲᔪᖅᑐᑦᑎᐅᖅᓯᒪᓕᒃ ᐱᓕᕆᓚᐊᖅᑭᑦ, ᓄᓇᕗᓂ ᓂᓚᐅᖅᓯᒪᓕᒐᓗ ᐱᖓᓱᖏᓪᓕᖏᓪᓕᖅᒃ, ᐃᖅᑲᐅᐱᖅᓯᖅᑕᐅᓂᖅᒃ ᖃᑎᖅᑎᐅᖅ ᓄᓇᖅᑯᓂᖅᓄᑦ, ᓄᓇᕗᑦ ᐊᖓᑎᓕᕆᓚᓕᓂ ᑲᑎᒪᓕᖅᖓ ᑐᓴᕐᕕᖏᓐᓇᓕᒃᑐᓂ ᐊᖓᑎᓕᕆᓚᓕᓂ ᑲᑎᒪᓕᖅᖓ ᐃᓗᒪᓕᐅᖅᓯᒪᓕ ᑐᐊᓚᐅᖅ ᐱᖓᓱᖏᓪᓕᖏᓪᓕᖅᒃ ᓄᓇᕗᓂᖅ ᑲᑎᒪᓕᖅᖓ ᐅᓪᓗᒥᐅᑦᑎᐊᖅᑐᓂ ᐊᒻᒪ ᐅᖅᑲᖅᑎᑕᐅᔪᓂᒃ ᐱᓕᕆᓚᐊᖅᑭᑦ ᐱᓇᓱᐊᖅᑐᖅᑐᑦ.

- ᐊᒃᑐᐃᓂᐅᓇᖅᑐᑦ ᓄᓇᕗᑦ ᓂᕆᔨᑎᓄᑦ, ᐱᓗᐊᖅᑐᒥᑦ ᑐᓴᕐᕕᖏᓐᓇᓕᒃᑐᓂ ᐅᓪᓗᒥᐅᑦᑎᐊᖅᑐᑦ;
- ᐃᑲᔪᑕᐅᓂᐊᖅᑐᑦ ᐊᓯᖏᓐᓂᒃ ᐊᒃᑐᐃᓂᕐᒧᑦ ᑕᕆᐅᔨᑦ ᐅᓯᑲᑕᕐᓂᕐᒥᒃ;
- ᐊᒃᑐᐃᓂᖅᑲᖅᑕᑎᒃ ᑕᕆᐅᒪᒥ ᐊᐅᑎᒪᒧᑦ ᐱᔨᑎᖅᑲᖅᑐᓂ ᑕᕆᐅᒪᒥᑦ ᓄᓇᕐᓂᖓᓂᒃ ᐅᓴᖏᓂᐅᐊᖏᖅᓱᓄᑦ ᓯᔨᓂᑲᓂᔨᑦ ᐊᒪᓪᑎᓂ ᕿᓂᕋ; ᐊᒪᓪᑎ
- ᐅᖅᓯᐊᓂᖅᒥᒃ ᔨᕕᔨᖅᑲᓴᖏᓂᖅᓱᓂᒃ ᐱᖏᓂᐊᕐᕿᓂᔨᑦ ᑕᕆᐅᔨᑦ ᐅᓯᑲᑕᕐᓂᕐᒥ ᐅᓕᓂᓂ ᐊᔪᖏᑎᔨᑦ ᐃᖅᑲᐅᖅᓯᒪᓕᖅᑐᑦ.

ᓄᓇᕗᑦ ᐊᖓᑎᓕᕆᓚᓕᓂ ᑲᑎᒪᓕᖅᖓ ᐅᖃᐱᓯᔭᖅᓂᒃ ᐱᐅᖅᓴᐃᓂᕐᒥᒃ ᖃᐅᐅᓴᖅᑐᑎᔨᑦ ᐱᓕᕆᓚᓯᐊᖅᑐᓪᓚᑦ, ᒪᓕᑎᓕᕆᓚᓕᓂ, ᓄᓇᕗᓂᒥᐅᓪᓚᑦ ᐃᖓᑕᖅᓱᓂᒃᓴᓂ ᑐᐊᓚᐅᖅ ᓄᓇᕗᑦ ᔪᓕᓯᐅᕐᖓᖏᓚᓂᒃ, ᐱᓕᕆᓚᐸᑦ ᑐᓵᓕᐊ ᐄᐅᐸ ᐸᐃᒥᒥ ᓄᓇᕗᓵᖅᓯᒪᓕᓂ ᔪᓕᓯᐅᕐᖓᖏᓚᓂᒃ ᐱᓕᕆᓚᐊᖅᑭᑦ, ᖃᖓᑦᑑᑎᓂᐊᖅᑐᓂᕐᒥᒃ ᐅᖅᑲᖅᑎᑕᐅᓂᐊᖏᓪᓕᖏᓪᓕᖅᒃ ᐃᓕᓴᐃᓂᖅ ᐊᒃᑐᐃᓂᐅᓇᖅᑐᑦ ᑐᐊᓚᐅᖅ ᓄᓇᕗᓂ ᐊᔪᖏᑎᔨᑦ ᐃᓗᒪᓕᐅᖅᓯᒪᓕᓂ ᐅᓯᑲᑕᕐᓂᕐᒥᒃ ᐃᓕᓴᐃᓂᖅ ᐊᒃᑐᐃᓂᐅᓇᖅᑐ

IGHIVAOTALIOP ANGMAKTIKUTAIT

Piyagiakakmat uvani Nakatak 12-mi, Oigoani 12.5.6 tatvani *Angekutatni ukkua Inuit tahamani Nunavut Nunatakutaita Angekutatni tatvalu Aknaup Ihumagiyautiaktok Kuin kivgaktoiyok Kanatamik* (Una *Nunavumi Angekutaoyok*) ukkua Nunavumi Avatilikinikut Katimayiit (NIRB-kut uvalunin ukkua Katimayiit) hatkighihimaliktot haffuminga Kingolikpamik Nalaktaotitlogit Katimatjutaita Onipkamik tohaktaghanik ukkua Ministat monagiyakaktot haffuminga Havagiyaoyok 2 Kapihiliktomi Uyagaghiokviatni Havagiyaoyok (una Havagiyaoyok) toghiktotat ukkua TMAC Resources Inc. (ukkua Toghiktoiyot uvalunin TMAC-kut). Una Kingolikpak Nalaktaotitlogit Katimatjutaita Onipkangit nainaghimayok ukkua Katimayiit Ihivgiokutat haffuminga Havagiyaoyok kimilgogahoakhugit immakak pivaliatjutaoniaknikat tatvalu inulikinikut- maniliokutaoniaktitlugo hamna Havagiyaoyok monagiyaotitlugo Katimayiitnin malikavlugo una Nakatak 12, Ilanga 5 tatvani *Nunavut Angekutatni*.

Una Havagiyaoyoktoghiotaoyok angeklilagomavlugo hamna uyagaghiokvioyok (nunap iloagot tatvalo ilanga kangani/kavamatkut nunaotani uyagaghiokvigilugo? Tatvalo haffumani Kapihiliktomi Attayok hamna Uyagaghiokvighak pingahuni nalvakviohimayoni ukkua attiktaohimayot Madrid North, Madrid South tatvalo Aimaokatalokmi, tatvalo ilingaiyaklugo hamna ataohikamik uhitjutaoyonik aghalotitokvighak apkohioktaohimayok avatinot akyaktakvighak hapkununga uyagaktaktot gold-nik hannaviitnot, ekakokviitnot, omitjat tolaktakviitnot tatvalo iglokpakakviitnot tatvani Kapihiliktomi Uyagaghiokviatni tatvalo kangikhokmi Roberts Bay-mi havakviatni.

Naonaiyatiaklugo onipkagiyaoniaktok uvani Onipkangatni, taimaititlugo ukkua Katimayiit naonaiyaotat haffuminga Havagiyaoyomik tatvani Desaipa 2011-mi, kihianionmingmat tatva notkaktitaohimangmat kaffiktakhutjuk haffuminga Havagiyaoyomik ukkunanga uyagaghiokhimayogaloitnit, Hope Bay Mining Ltd. Tatvalo nioviktaongmat totighimangmiyat hamna Havagiyaoyok tatvunga tatja Uyagaghioktonot, TMAC-kunot tatvani 2013-mi, taimatovalak hamna kiglighaat ukkua Katimayiit Ihivgiokutighaat haffuminga Havagiyaoyomik kingoffavyaghimayok taimaininganin. Una Havagiyaoyok hivomuffaliagalitok tatvanganin Ihivgioktaotaktitlugo Desaipa 2016-min ukkua TMAC-kut tonihihimalikmata Eneghimaitomik Avatilikinikut Kanogiliyokakhimanikat Ihivgiokutighaatnik, tatvalo ukkua Katimayiit Ihivgiokutaat enektaohimalikmat tatva Katimayiit nalaktaovlotik talimanik ublunik katimapkaitjuakhimayok Ekaluktutiami May 8-min 12-mut 2018-mi.

Una Onipkaak nainaghimayok tohaktitjutighanik tatvanga kimilgoktaotitlugo naonaiyaktaohimangmat hapkunangat Toghiktotikaktonit tatvalo Akkihaktoktonit ilaliotivlugit hapkua Kitikmeot Inuit Katuyikatigit, amihuyok Kavamatokatkut Havakvigiyait tatvalo Nunavut Kavamatkut. Una Onipkak naonaipkutaongmiyok okaotigihimayaitnik hapkua Enekniit tatvalo Nunaliitnit Kivgaktoiyot talimanit Kitikmeoni nunaliitningaktonit Ekaluktutiamit, Kugluktumit, Uqhuktumit, Talokyoamit, Kugaarukmitlo, hapkunangalo malgokningaktoniit nayoktaokataktoniit tamagalungitkaloaktok nunaliitnin Kingaok Omingmaktoklo tatvuna ukkua Katimayiit Nalaktaoniahaktitlugit Katimahimangmata 2017-mi tatvalo Kingolikpaakmi Nalaktaotitlugit Katimakjuaktitingmata 2018-mi. Ukkua Katimayiit koyagikpiaktait pikataohimayot onipkaghimangmata atokpaktamingnik tatvalo okaotjivangmata nalungitamingnik, apighokpangmata hapkuninga Toghiktoktonik tatvalo Akkihaktoktonik

ihomakhotighaitnik ukkua Katimayiit, ekayokpiakmatalo enektigotighaitnik haffuminga naonaiyaotaitnik.

Ukkua Katimayiit koyagikpiaktait tamaita pikataohimayot tonighihimavlotik havakpiakhimangmata ehoaghaikataohimangmatalo ukkua Katimayiit Ihivgiokhititlogit. Ukkua Katimayiit koviahoktot hamna naonaiyaktaotitlugo tohaktitaotiaktot ayogaokataktonik kimilgokutaoyoniklo aolatjutaitnik tatvani Kapihiliktomi Havakviatni. Hamna tohaktitjutat naonaiyaotaotloaktok notanik itkoniakutigiyaitnik tatvanganin kingolikmi Kapihiliktomi Havagiyaohimatitlugo ikkayotaongmingmat ehoaghaotighaitnik tatvani Havakvioyomi piikpaliatjutighaitniklo ihoangitonik tatvalo ekayokpaliotighaitnik Inuit Kitikmeoni,Nunavumi tatvalo Kanatamiotakniklo. Ukkua Katimayiit eliitagiyaitaok ukkua TMAC-kut toghiotat atoghimagomavlogit hapkua gold-nik hannavigiyait tatvalo ekkakokvigiyait ehoakutaitlo tatvani Kapihiliktomi uyagaghiokviatni ekkayotiginiakmatjuk tahamani Kapihiliktomi Attayomi Uyagaghiokvigihimaakniaktatni taimatot ukkua TMAC-kut havakpalaknaktomi ajikohiongitangita havangitnik tatvani Havakvioyomi, okaotaotaktonik tatvani ukkua NIRB-kut 2016-mi ukkua Katimayiit ihomaghotigihimaakmatjuk hamna Kapihiliktomi Gold-nik Uyagaghiokvighak Havakvioyok.

Kihianitaok ukkua Katimayiit elihimaligaloaktat tatva hamna ekayoktaoloaktok Havakvighak, hapkua nunaliit piyomavlotik takuyomangmata ekayotighanik havaghanik, elihaotighanik tatvalo nanminikaktot oktotighaitnik eloani Kitikmeotni Aviktoghimayomi, ukkua Katimayiit tohaktitaovakmiyot ihomalotaovaktonik Nunaliit Kivaktiitnit tatvalo Akkihaktoiyonit immakak hamna Havagiyaoyok pitjutaoniaknikat hapkununga:

- kanok ikpigiyakakniakat hapkua nunamiotat angotighat, tuktut ihomagiloaghugit;
- ikayotaoniaknikat angektivalianinganik ihoilotaoyonik tagiokmi omiaktoknikut;
- ihoilotaoniaknikat tagiokmi avatilikinikut hamna koviogaktaokatalikat tagioknitok immak tatvanga notamiit uyagaghiokvioniktomit tatvuna angektaohimaliktokut toghoakakvianit koviogaktaotitlugo kangighokmut Roberts Bay-mut; tatvalo
- okhokyoanik koviyokaghimanikat pihoktitlugo tagiokmi omiaktoktitlugit uvalunin ingilgaktitlugit aghalotit apkutmi.

Ukkua Katimayiit nalungitat tatva tungavikaklogit ayungitaitnik uvalu kaoyimayaitnik ukkua Toghiktoiyot, maligaknik tigomiaktot tatvalo nunaliitningaktotnit hamna aolayaotitlugot Kapihiliktomi Gold-nik uyagaghioktitlugit, hamna Havaak 2 Kapihiliktomi Attayok Uyagaghiokvighak havagiyaoyungnaktok pitailinahoaklogit hapkua ihoilotaoniaktot, ilaliotilogit ihoilotiginiaktait hapkua tuktuit tatvalo tamaita angotighat, ekaluitlo, emmagiktomiotatlo tagiokmiotatlo pikahiotitlugit. Ukkua Katimayiit pitkoihimayot atogaoyughanik maligoakutighaitniklo ihomaghotaohimayonik okaotjaohimangmata hivunighitjutaitniklo hapkua pikataohimayot Nalaktaotitlogit Katimapkaihimangmata, havakatigitiakpaghutik tatvalo ukkua toghiktotikaktot, tatvalo ilaliotitliaghogit hapkua Inuit Qaujimaningit atogiakagangata. Ukkua Katimayiit ihomagitiaktat hamna Inuit Qaujimaningit ilaliotiyagiakakmat ehoaghaotighaitnot aolahimaaktitlugit kimilgokataotighait haffuming Havagiyaoyomi. Hapkua atokoyangit tatvalo maligoakutighat pitkohimayat ukkua Katimayiit tatvani Onipkangitni naonaitiaghimayot kayagitiagiakaktat hapkua nalunaktitlugit naonaiyaghimaitmata huli (hapkua hilap kanoginginga tatvalu hivunighami kanoginingit tuktut aghalotit hangovalialikata nanminigiyaitni

apkuhioghimayaitnik akungnani Aimaokatalokmi tatvalu Kapihiliktomi Uyagaghiokviitni iglukpiokpalialikata uyagaghiokpalialikatalo tatvani Aimaokatalokmi).

Tatva Ihivgiokhimaktitlugit ukkua Katimayiit namagikpiaktat tonnighimatjutaitnik tatvalu piyomayaitnik ukkua TMAC-kut tatvalo taimaitni pikataoyuniit tatva hivunighami havakatigitiakutighanik tatvalo pitailiitjutighanik ihoilotaoniaktonik tatvani Havakvioyomi, tatva havagihimaklogitlo hapkua angektaohimayagekhimayot havaghat ihoilotaongitangita taimaktikutigilugo, okalagomayunga koyagikpiakhogit hapkua Toghiktoihimayot, Akkiyaktoiyotm Nunaliitni Kivgaktoiyot tatvalo Katmayiit havaktigiyaitlo ikkayokpiakmata tamaita hapkuninga naonaiyaotinik kimilgogititlota.

Uvanga

Allen Maghagak
Ihivaotaliop tatvani Havak 2 Kapihiliktomi Attayomi Uyagaghioktiit Katimayiitni
Nunavut Avatilikiyiit Katimayiit

AVANT-PROPOS DE LA PRÉSIDENTE

Tel que stipulé à l'article 12, paragraphe 12.5.6, de l'*Accord entre les Inuits de la région du Nunavut et Sa Majesté la Reine en Chef du Canada (*l'*Accord du Nunavut,*) la Commission du Nunavut chargée de l'examen des répercussions (CNER ou la Commission) soumet aux ministres compétents le rapport ci-joint de l'audience finale de la phase 2 du projet Hope Bay Belt (le projet), proposé par TMAC Resources Inc. (le promoteur ou TMAC) Ce rapport résume l'examen approfondi du projet entrepris par la Commission en vertu de *l'article 12, partie 5 de l'Accord du Nunavut*, pour en évaluer les possibles incidences écosystémiques et socioéconomiques.

Ce projet a pour but d'étendre l'exploitation aurifère (souterraine et extraction limitée en surface/pilier de couronne) aux trois sites connus sous le nom de gîtes minéraux de Madrid Nord, Madrid Sud et Boston le long de la ceinture de roches vertes de Hope Bay ainsi que de rénover une route de transport privée à une seule file, reliant ces gisements aux installations existantes de traitement du minerai aurifère, de gestion des déchets, d'expédition et de logements sur les sites de la mine d'or Doris North et de Roberts Bay.

Tel que détaillé ultérieurement dans ce rapport, la Commission a commencé son examen approfondi en décembre 2011. À cause de plusieurs interruptions du projet effectuées par le promoteur initial, Hope Bay Mining Ltd. et du transfert consécutif du projet à l'actuel promoteur, TMAC en 2013, le calendrier des activités de l'examen approfondi de la CNER a été prolongé plus que de coutume. Depuis décembre 2016, après que TMAC ait soumis son Énoncé provisoire des incidences environnementales, l'examen approfondi du projet a progressé plus régulièrement et s'est terminé par une audience finale de cinq jours, organisée par la Commission du 8 au 12 mai 2018 à Cambridge Bay.

Les informations recueillies tout au long de l'évaluation par le promoteur et les intervenants officiels, notamment la Kitikmeot Inuit Association, divers ministères fédéraux et le gouvernement du Nunavut, sont résumées dans ce rapport. De plus, les importantes observations des Aînés et des autres représentants des cinq collectivités voisines de la région de Kitikmeot, à savoir Cambridge Bay, Kugluktuk, Gjoa Haven, Taloyoak et Kugaaruk, ainsi que des deux communautés occupées en saison, Kingaok (Bathurst Inlet) et Omingmaktok (Bay Chimo), recueillies lors de la conférence pré-audience de 2017 et de l'audience finale de 2018 ont instruit la rédaction de ce rapport. La Commission remercie tous les participants qui ont échangé leurs expériences et leur expertise, formulé leurs points de vue, raconté leur propre vécu, posé d'importantes questions au promoteur et aux intervenants. Ils ont intensément alimenté la réflexion de la Commission et l'ont guidé dans la réalisation de cet examen rigoureux.

La Commission remercie sincèrement tous les participants de leur engagement et de leur travail acharné pour identifier et résoudre les questions qui se sont dégagées tout au long de cet examen approfondi. La Commission se réjouit de constater que l'examen a été nourri par l'expérience pratique et par la surveillance des effets de l'exploitation du projet Doris North. Cette information a été essentielle pour pouvoir bien baser l'examen sur les prévisions actualisées du projet Doris North initial et pour façonner les améliorations au projet afin d'en réduire les

éventuels effets négatifs et d'en optimiser les effets positifs pour la région de Kitikmeot, pour le Nunavut et pour le Canada en général. La Commission reconnaît en outre que l'utilisation de l'actuelle infrastructure de traitement aurifère et de gestion des déchets du site de Doris North, proposée par TMAC afin de faciliter l'expansion de la mine de Hope Bay, permettra au promoteur de limiter l'empreinte de surface et d'aborder l'orientation donnée par la CNER en 2016, lors de son réexamen du projet de mine d'or Doris North.

Bien qu'ayant constaté le vaste soutien manifesté à l'égard du projet par des collectivités avides de profiter d'avantages supplémentaires tirés des possibilités d'emploi, de formation et commerciales dans la région de Kitikmeot, la Commission a également entendu les préoccupations des représentants communautaires et des intervenants quant à de possibles :

- effets accrus sur les espèces sauvages terrestres et les caribous en particulier;
- contributions aux effets cumulatifs de la navigation maritime;
- répercussions sur le milieu marin à cause de rejet dans Roberts Bay d'eau souterraine saline provenant des nouvelles mines via un pipeline préalablement approuvé;
- résultats de déversements d'hydrocarbures dus à des accidents pendant le transport maritime ou routier.

La Commission est persuadée qu'en se basant sur l'expérience et les connaissances acquises par le promoteur les organes de règlementation et les membres de la collectivité lors de l'exploitation de la mine d'or Doris North, le projet de Phase 2 de Hope Bay Belt peut être développé en limitant ses éventuels effets négatifs, y compris ses éventuels effets négatifs sur les caribous et toutes les espèces sauvages ainsi que sur les poissons, l'environnement d'eau douce et le milieu marin. Les modalités et conditions recommandées par la Commission sont le fruit des remarquables conseils et orientations prodigués par les participants lors de l'examen approfondi, souvent en inter-collaboration les uns, les autres et le promoteur, et prouvant l'intégration des principes du Qaujimajatuqangit inuit. La Commission a constaté le rôle important et soutenu de ces principes dans le développement, la mise en vigueur et la gestion adaptative continue des mesures d'atténuation et de surveillance du projet. Les modalités et conditions, telles qu'énoncées dans le rapport, prévoient une norme élevée quant à l'application du principe de précaution aux questions connaissant des lacunes en matière de données ((comme la nature et l'ampleur des futures répercussions sur les caribous lorsque la circulation des camions s'intensifiera sur la route de transport privée entre le site de Boston et la mine d'or Doris North pendant la construction et l'extraction aurifère sur le site Boston).

L'engagement de TMAC et de toutes les parties concernées pour une collaboration de longue durée et leur détermination à minimiser les éventuels effets de ce projet, combinés aux effets des activités préalablement approuvées dans cette région, ont encouragé la Commission tout au long de cet examen approfondi. En terminant, j'aimerais remercier le promoteur, les intervenants, les représentants des collectivités ainsi que la Commission et son personnel de leurs inestimables contributions à cet examen.

Veuillez agréer l’expression de mes sentiments les meilleurs.

Allen Maghagak
Président du Groupe d’experts de la Phase 2 du projet Hope Bay Belt
Commission du Nunavut chargée de l’examen des répercussions

EXECUTIVE SUMMARY

This Final Hearing Report has been issued by the Nunavut Impact Review Board (NIRB or Board) to summarize the Board's review of TMAC Resources Inc.'s (TMAC or the Proponent) Phase 2 Hope Belt project proposal NIRB File No.: 12MN001 (the Project). The scope of the Phase 2 Hope Bay Belt project proposal as reviewed by the Board and summarized in this Final Hearing Report involves the proposed mobilization, construction, operation, closure, reclamation, and post-closure monitoring of gold mining operations at three deposits along the Hope Bay Greenstone Belt, a contiguous 1,600 square-kilometre mineral property.

The Hope Bay Greenstone Belt is located in the Kitikmeot Region of Nunavut, approximately 150 kilometres (km) southwest of Cambridge Bay, 60 km east of Umingmaktok (Bay Chimo), 130 km northeast of Kingaok (Bathurst Inlet), and 700 km northeast of Yellowknife, Northwest Territories (see Figure 1). The scope of the Project would involve TMAC mining three new gold deposits within the Hope Bay Greenstone Belt, referred to as the Madrid North, Madrid South and Boston mineral deposits. TMAC estimates that the three deposits contain approximately 4.8 million ounces of gold in total. TMAC proposes to mine the ore from these deposits using underground mining methods; however, some portions of the ore near the surface would be recovered by surface mining methods (Crown Pillar Recovery). As part of the Project, TMAC proposes to use and expand existing gold processing, waste management and project shipping infrastructure at the already-approved Doris North Gold Mine and Roberts Bay sites, as well as establishing new infrastructure at the Madrid and Boston sites (including an additional camp/accommodation facility at the Boston site), and constructing a private all-weather road connecting the sites in support of the belt-wide mining and exploration activities.

In terms of employment for the Project, as with the operations at the existing Doris North Gold Mine, TMAC will continue to conduct operations as fly-in/fly-out operations for the mine site personnel. The maximum TMAC workforce for the Project would be 870 employees, with 400 personnel housed at the existing Doris North camp and 300 personnel housed at the Boston site. The proposed life of the Project, from mobilization and construction through to operations, closure and post-closure, would be 19 years, with considerable overlap between the construction, operation and decommissioning phases at the three sites. TMAC proposes to develop the Project in overlapping phases, starting in 2019, with a five-year construction phase (Year 1 to Year 5), a 14-year operations phase (Year 1 to Year 14), a six-year closure phase (Year 12 to Year 17), and a six-year post-closure phase (Year 14 to Year 19). This phased development approach is intended to provide more stable and on-going employment than would be the case if the individual deposits were developed separately, and the extended use of ore processing and waste management infrastructure at the Doris North site would limit the surface footprint of the three additional mine sites.

Processing of the ore mined at the three deposits would take place at the existing mill at the Doris North site, although some ore processing (to yield an ore concentrate) is proposed to take place at the Boston site. Ore from the North and South Madrid sites and ore concentrate from the Boston site would be trucked to the mill at the Doris North site via improvements to the existing all-weather road (already constructed to support advanced exploration) between the Madrid sites and Doris North site and the construction of a 55-kilometre extension of the existing

Doris North-Madrid all weather haul road linking the Boston site to the Doris North-Madrid haul road. TMAC proposes to use the existing marine infrastructure in Roberts Bay to support shipment of materials required for construction of the Project as well as annual resupply of fuel, with all shipping taking place during the open water season. The Project would also include the addition of up to six (6) wind turbines, generators and associated power transmission lines to power the Project, as well as additional fuel storage infrastructure at the mine sites. Recognizing that some ore processing will take place at the Boston site, TMAC has proposed to include additional tailings management infrastructure (dry stack method) at the Boston site.

As detailed in the Procedural History section of this Report, although the Board received the original Phase 2 Hope Bay Belt project proposal in 2011 from the owner of the Project at that time, Hope Bay Mining Ltd. (HBML), the Board's assessment of the Project under Article 12 of the *Nunavut Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada* (the *Nunavut Agreement*) was suspended at various times by the Proponent. In 2013, the Project was assigned by HBML to the current Proponent, TMAC, and the Board's Review entered the most active stage of the assessment when TMAC filed the Draft Environmental Impact Statement in December 2016.

The Board's Review involved the assessment of the potential environmental and socio-economic effects of the proposed Project to determine if the Project should be allowed to proceed, and if so, under what terms and conditions. At the request of the Proponent, and as provided for under the *Nunavut Agreement*, throughout the NIRB's Review of the Project, the NIRB worked closely with the Nunavut Water Board (NWB) to coordinate, to the extent possible, the NIRB's review with the NWB's consideration of the water licensing components of the Project. Reflecting this approach, the NWB's processing of the water licence applications for the Project commenced in December 2017 when TMAC filed the Final Environmental Impact Statement with the NIRB and the water licence applications with the NWB. The coordination with the NWB continues, with the NWB conducting a Technical Meeting to consider the water licence applications in the week immediately following the NIRB's conclusion of the Final Hearing.

In addition, throughout the Board's Review of the Project, the Board has provided numerous opportunities to participants from the Kitikmeot Inuit Association, federal, territorial and local governments and Community Representatives from each of the five (5) affected Kitikmeot communities, Cambridge Bay, Kugluktuk, Gjoa Haven, Taloyoak and Kugaaruk, and the two seasonally occupied communities of Kingaok (Bathurst Inlet) and Omingmaktok (Bay Chimo) to ask questions and to highlight their concerns about the potential ecosystemic and socio-economic effects (both positive and negative) of the Project on the Nunavut Settlement Area and adjacent jurisdictions. Elders, students and members of the general public in Cambridge Bay were also invited to share their perspectives about the Project during the Final Hearing (including having specific time set aside during the Community Roundtable portion of the Final Hearing during the day and evening sessions on May 11 and the day session of May 12).

The Board heard that there is widespread support for the Project throughout the Kitikmeot Region, noting that the additional mining along the Hope Bay Greenstone Belt will allow for more training, sustained employment and additional educational and economic opportunities.

This common view was summarized at the Public Hearing by Canute Krejunark, a Community Representative from Kugaaruk as follows:

> *We are in support of the mine. We would like to see the company given the green light. The way I see it, it's going to help our economy and Canada as a whole. I am thankful to the Government of Nunavut and the Government of Canada and the Kitikmeot Inuit Association as well. I see it as a benefit to everyone, ensuring that they have protection plans in place and to implement the protection plan of the environment.*[1]

In addition to support for the Project in general, the Board heard that since acquiring the Project and the Doris North Mine, TMAC has developed positive relationships with the Kitikmeot Inuit Association, the federal, territorial and local governments and residents in the Kitikmeot Region. This positive and collaborative approach to the development of the Project was evident at the Final Hearing, as TMAC and Intervenors were able to resolve the vast majority of technical issues. Community Representatives also noted their support of TMAC, as expressed by Simon Qingnaqtuq, a Community Representative from Taloyoak:

> *For those of us in this region, we are also in support of the mining company, TMAC. We would like to see them continue. We are in support of TMAC. We were able to ask questions. We were given clear and concise responses from the company. We would like to see the Hope Bay project go ahead in the communities in our region. They have really contributed to the Kitikmeot communities a great deal, and they are very supportive of the students completing their education, and they've also recognized the students trying to finish their education*.[2]

However, despite support for the Proponent and the potential positive socio-economic effects of the Project, during the NIRB's Review participants raised many questions about how TMAC would prevent the Project from having adverse effects on caribou and other terrestrial wildlife, fish, and the freshwater and marine environments. As noted by Uriash Puqiqnak, a Community Representative from Gjoa Haven, the residents of the Kitikmeot are proud of the area's pristine environment and do not want to sacrifice the long-term integrity of the environment:

> *…I am very proud of our pristine lands, our wildlife, the abundance of wildlife… We're trying to ensure that we go the direction with thoughts of let's not just think about the past and not think about only today. We will not always be here. We have to think about the children that we will leave behind. It's very difficult to say that, you know, we won't be here. We have to ensure that our children and grandchildren have a better future.*[3]

[1] C. Krejunark, Kugaaruk, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, pp. 1001-1002, lines 23-26 and lines 1-5.
[2] S. Qingnaqtuq, Taloyoak, NIRB Final Hearing File No. 12MN001 Transcript, May 12, p. 1003, lines 7-16.
[3] U. Puqiqnak, Gjoa Haven, NIRB Final Hearing File No. 12MN001 Transcript, May 12, p. 1003, lines 8-11 and 17-21.

Having reviewed and considered all the information provided to the Board during this Review, including TMAC's incorporation of Inuit Qaujimajatuqangit to improve the Project and the mitigation and management of Project effects and noting that TMAC is expected to learn from their experience operating the existing Doris North Gold Mine, the Board is confident that with proper adaptive management, adequate monitoring and appropriate mitigation, the Project can be developed in a way that preserves the ecosystemic integrity of the area. Having recommended that the Project be allowed to proceed, as required under Article 12, Section 12.5.6(c) of the *Nunavut Agreement* the Board has recommended some 54 terms and conditions that should govern the Project going forward, including in key areas such as mitigation, management, monitoring and reporting in relation to specified ecosystemic and socio-economic effects. The recommended terms and conditions were developed by the Board taking into account the substantial work undertaken by the Proponent and Intervenors to jointly develop appropriate mitigation, management and monitoring measures.

As summarized in greater detail in this Report, the Board's Review was based on the Draft and Final Environment Impact Statements, all written comment submissions provided to the Board by formal Intervenors and members of the public, formal and informal presentations, questions and comments provided by more than 60 speakers who presented during the Final Hearing. The Board thanks all who participated in such a collaborative and respectful manner throughout the Board's Review of the Project. The Board's assessment benefitted from the active engagement and productive participation of all parties; as always, your insightful questions and perspective played an essential role in the Board's decision-making for the Project. The Board looks forward to the continued involvement of parties and the Kitikmeot communities to ensure that the Project is carried out as proposed by TMAC and delivers the predicted socio-economic benefits while minimizing the potential for adverse ecosystemic effects.

ᓇᐃᓕᒧᐊᖅᓯᒪᔪᓕ ᐅᓂᐸᑲᖅᓯᒪᔪᓕ ᐱᓕᕆᐊᖃᓂᐊᖅᑐᒥᑲ

ᑕᒪᓇ ᑭᖓᔪᓕᓪᖅ ᑐᐱᓂᐅᐸ ᐅᓂᐸᑲᖓ ᓴᖅᑭᑎᑕᐅᔪᖅ ᓄᓇᕗᒥ ᐊᐢᑏᑎᓕᕆᔨᓕᓂ ᑲᑎᒪᔨᖓᒥᓄᓂ (NIRB ᐅᕐᐢᑕᓗᕐᓂᓕ ᑲᑎᒪᔨᓂ) ᓇᓗᓇᐃᖅᓯᕗᖅ ᓄᓇᕗᒥ ᐊᐢᑏᑎᓕᕆᔨᓕᓂ ᑲᑎᒪᔨᖓᒥᑕ ᖃᐅᔨᓴᓂᖓᓚᐅᓂᑲᑦ TMAC ᐅᓴᖅᖃᓂᐊᖅᑎᖓᒥ ᐃᐢᑯᐊᐳᓱᓴᐢ (TMAC ᐅᓴᖅᖃᓂᐊᖅᑎᖓᒥ) ᐱᓕᕆᐊᑦ ᑐᓴᒋᓕᐅᑦ Hᐅᑦ ᐸᐃᓪᒥ ᐱᓕᕆᐊᑦ ᑐᓵᓯᕕᑎᖓᓚᐅ ᓄᓇᕗᒥ ᐊᐢᑏᑎᓕᕆᔨᓕᓂ ᑲᑎᒪᔨᖓᒥᑕ ᑎᑎᖃᐅᑎᖓᒥᓐᓂᑦ: 12MN001 (ᐱᓕᕆᐊᖓᔪᖅ). ᑐᖅᑕᓱᖓᓚᐅ ᐱᓕᕆᐊᖓᔪᑦ ᖃᐅᔨᓴᓱᐅᓕᐅᖅᑐᖅᑐᖅ ᓄᓇᕗᒥ ᐊᐢᑏᑎᓕᕆᔨᓕᓂ ᑲᑎᒪᔨᖓᒥᓐᓄᓂ ᐊᐢᒪ ᓇᓗᓇᐃᖅᑕᐅᐳᓗᓐᓂᑦ ᑕᐢᑎᓂ ᑭᖓᔪᓕᓪᖅᑐᑦ ᑐᓂᐸᑲᖓᓂ ᐅᓂᐸᑲᖓᓚᐅ ᔨᕐᒉᒧᐸᓕᐊᓂᖓᓚᐅᓂᑦ, ᐃᓕᖓᑎᑕᐅᓂᖓᓚᐅᓂᑦ, ᐅᑎᖅᑎᑕᐅᓂᖓᓚᐅᓂᑦ ᖃᐅᔨᓴᓱᐅᓕᐅᖅᑐᖅᑐᖅᓗᓐᓂ ᔨᓗᔨᐅᑦᓴᐃᓐᓇᖅᑐᑦ ᐊᐢᒪ ᕿᐳᑦ ᐸᐃᓪᒥ ᐅᓂᐸᑲᖓᓚᐅᓂᑦ, ᐅᑕᐅᓂᖓᓚᐅᓂᑦ ᐊᐢᑏᑎᓕᕆᔨᓕᓂ ᑲᑎᒪᔨᖓᒥᑕ ᐊᐢᑏᑎᓕᕆᔨᓕᓂ ᑲᑎᒪᔨᖓᒥᓐᓄᓂ ᐊᐢᒪ ᐊᐢᖃᓂᐅᑦ ᐸᐃᓪᒥ ᐅᓂᐸᑲᖓᓚᐅᓂᑦ,

ᓯᕐᒃᑕᑎᑕᐅᓂᖅ ᓴᖇᒃᓴᐃᓕᑦ ᐱᖓᓱᓂ ᐅᓴᖏᖅᑐᐊᕐᕕᖅᓂ ᓯᕐᒃᑕᑎᓇᖅᑎᑦ ᑐᐊᓇᓴ ᓄᐊᑦ ᐱᕐᔨᑎᖓᓚᓂ ᐊᓇᓴᖅᓴᑦ ᑭᓯᐊᓂ ᓯᕗᒃᖁᓂᖅ ᓄᐃᑎᓇᓂᖅ (ᐊᑐᖏᑐᑦ ᐱᖅᑕᐅᓗᑎᒃ) ᕿᓵᓐ ᓄᓇᕐᔨᑎᖓᓚᓂ ᐱᑕᓇᐊᓇᕆᐅᓗᑎᒃ. ᓴᕗᒃᖁᑦ ᓄᐊᑦ ᐊᓯᒪ ᓴᐅᓵ ᒪᑐᓇᒥ ᐊᒃᓴᑐᐊᑕᔨᑦ ᐊᓱᖅᑕᐅᓄᖅᓴᖅᑦ ᕿᓵᓐᓂᑦ ᐊᕐᕌᕐᔨᑎᖓᓚᓂ (ᓴᓇᐅᑉᑕᐊᓂᖅᑐᑎᖅ ᐊᕐᕌᕐᔨᑦ) ᐊᔨᓂᖖᓚᓂ ᒪᑐᓵᓂ ᓄᓇᕐᔨᑎᖓᑎᑕ ᐊᓯᒪ ᑐᐊᓇᓴ ᓄᐊᑦ ᓄᓇᖖᓚᓂ ᓴᓇᔨᒃᖃᑐᓗᓗ 55-ᑭᓕᒥᑐᓴ ᐃᓕᒋᐊᑭᑎᖖᓂᖅ ᑐᐊᓇᓴ ᓄᐊᑦ-ᒪᑐᓵᓂ ᐊᕐᕌᕐᔨᑎᖓᓚᓂ ᐊᑕᐅᔨᖓᔪᑐᑎᒃ ᑐᐊᓇᓴ ᓄᐊᑦ ᐊᓯᒪ ᒪᑐᓵᓂ ᐊᕐᕌᕐᔨᑎᖓ. TMAC ᐅᓴᖏᖅᑐᐊᖏᖅᑎᑦ ᐱᓕᓇᓂᐊᖏᖅᓂᖅ ᒪᓂᓇ ᐊᑐᖏᑕᐅᔪᒥᒃ ᐅᒥᐊᖏᔪᐃᓂ ᐱᖓᔪᑎᑦᓂᖅ ᕿᑐᐃᓂ <ᐃᓕᒥ ᐅᔨᔭᖏᓇᓂ ᐊᑐᖏᖅᑐᐊᖏᖅᑐᑎᖅ ᓇᓇᐅᓕᖅᕿᑦ ᐅᓴᖏᖅᑐᐊᖏᖅᑎᖅ ᐊᓯᒪ ᐊᖏᔪᑦᓯᐊᓂᖅ ᐊᑐᖏᖅᑐᐊᖏᖅᑐᑎᖅ ᐅᓂᒃᑳᖅ ᐅᓴᖏᖅᑐᐊᖏᖅᑎᖅ ᐊᓯᒪ ᐊᖏᔪᒪᓕᒃᑕ ᐅᒥᐊᖏᔪᐊᓕᒃᑕ ᐱᖓᓱᓂᖅ ᐅᖃᐅᔾᔨᒃᑯᓂᖅ ᐱᖓᓱᓂᖅ ᐅᖃᐅᔾᔨᐊᒃᑯᓂᖅ ᐊᓯᒪ ᐊᖏᔪᒪᓕᒃᑕ ᐱᖓᓱᓂᖅ ᐅᖃᐅᔾᔨᐊᒃᑯᓂᖅ ᐅᓴᖏᖅᑐᐊᖏᖅᑎ

ᓄᓇᕗᑦᑐᑐᓂ ᐊᓱᖏᓪᓗᓂ ᓄᓇᕗᑦᑎᑕᐅᔨᓄᓂ. ᐃᓄᑐᕆᐃᓂ, ᐃᓕᓴᐅᔪᖅᑐᑦ ᐃᓄᒥᐊᓕᒃᑲ ᓄᓇᕗᒻᒥ ᐃᑦᑳᓴᑐᑎᒥ ᐃᓕᐅᕐᔪᐊᓕᐅᕙᓪᓚᑦ ᐃᓱᒪᒋᔭᖏᑦᓴᓗᒃ ᑐᖓᔪᓕᕆᔨᒪᔪᑲᑎᒃ ᑭᖑᓪᓕᖅ ᑐᓴᵒᓂᕐᒥ (ᐊᕿᑭᓱᒪᔨᖅᑎᑦᑐᓂ ᓄᓇᕗᒻᓂ ᐅᖅᑮᖓᓇᖅᑎᑦᑐᒃ ᑭᖑᓪᓕᖅᒥ ᑐᓴᵒᓂᕐᒥ).

ᓄᓇᕗᒥ ᐊᐅᑎᓕᓗᓴᑦ ᑲᑎᒪᔨᖏᑦ ᑐᓴᒪᔪᓕᒡ ᐊᖏᑦᔪᒥᒃ ᐃᑲᔨᖅᑐᐃᔨᓂᒃ ᐱᓕᓗᐊᖅᑎᒃ ᕿᑎᕐᒥᐅᓂ, ᐅᓴᕐᓂᐊᕐᕕᑲᑎᓂᖅ ᓴᕿᑦᑉ ᐃᓕᓴᐅᑲᒃᓂᕐᑕᕐᓗᑎᒃ ᐃᖅᑲᓇᐃᑲᑲᑎᒃᓗ ᐱᓇᔭᕐᒪᖓ ᐅᓪᓗᕈᓘᑦ ᑐᓴᵒᓂᕐᒥ ᑐᓴᵒᓂᕐᒥ ᑐᓴᵒᓂᕐᒥ

...ᓴᓗᒪᓕᓚᐅᖅᓯᒪ ᐱᐅᓂᖅᓯᓂᒃ ᓄᓇᕐᓂ, ᓂᕆᐊᑎᓂ, ᐊᒥᑕᐃᑐᓂᒃ ᓂᕆᐊᑎᖏᓂᖅᓂᒃ... ᑐᑭᓯᐊᑎᐊᕆᓂᓗᒃᑲᓂ ᑭᖑᓂᖅᓂᒃ ᐃᓕᓴᓂᓗᖏᓪᓗᑐᓂ ᐊᓯᒪ ᐅᕙᒥᑐᐊᖅ ᐃᓕᓴᖏᓂᓂᓗᒃᑐᓂ. ᑕᒪᓂᖏᓐᓄᓇᕐᖏᓇᕐᓂ. ᐃᓕᓴᕆᓚᐊᖅᖃᓐᓇᓕᓂ ᓄᓇᕐᑕᕆᑎᖅᓂᒃ ᖃᖅᖏᑦᒥᐊᖅ ᖃᑭᒧᒪᓕᕆᓕᑎᒍ. ᐊᓯᖏᓐᓄᑦᑐᐊᖅ ᐅᖃᖅᓂᒍ, ᖃᖅᐅᓚᒪᙵᑎᓗᒃ, ᑕᒪᓂᖏᓐᓄᓇᕐᖏᓇᕐᓂ. ᐅᓴᖅᑐᓚᐊᖅᖃᓐᓇᓕᓂ ᓄᓇᕐᑕᕆᑎᖅᓂᒃ ᑲᖅᓯᒪᓕᕆᓕᑎᒍ.[6]

ᖃᐅᓴᕐᓴᑦᑐᓚᓕᖅᓯᒪᓂ ᐃᓚᒪᑎᑦᑐᓚᓕᖅᓯᒪᔪᓗᓂᓗ ᑐᕐᓴᑦᓴᐅᑎᓂ ᑐᓂᖅᐅᓚᐅᖅᑐᓂ ᓄᓇᕗᒻ ᐊᐃᑎᓪᓚᕆᐊᖃᓂ ᑲᑎᒪᔨᓕᕆᔨᒃᑲᓂ, ᐃᓚᐅᔪᓂᒃᑐᓗ TMAC ᐅᓴᖏᖅᓯᐊᖅᑎᖅᑎᓂ ᐃᓚᐅᓚᖅᑎᓂᖅᓂᒃ ᐃᓄᐃᑦ ᑲᑎᒪᔨᓕᖅᑐᓂᓗᒃᑲᓂ ᐊᖏᖅᑎᓂᓕᕆᔨᓗᒍ ᐱᓕᕆᔨᒃᑲᓂ ᐊᐃᑦᑐᓚᐅᖅᑐᓂ TMAC ᐅᓴᖏᖅᓯᐊᖅᑎᖅᑎᓂ ᓂᓪᓕᐅᑎᓴᐅᓂᖅᓴᓂᒃ ᑐᐊᓪᓴ ᓄᐊᑦ ᐅᓴᖏᖅᓯᐊᖏᕐᕕᖅᓱᒃ, ᓄᓇᕗᒻ ᐊᐅᑎᓚᓪᓕᑦ ᑲᑎᒪᔨᖅᑎᓂ ᐅᐸᐱᓂᐳᓂ ᓇᓴᒪᑎᐊᖅᑐᓂ ᐊᑐᓚᖅᑎᑕᐅᓂᖏᓐᓄᑦᑐᓚᓕᖅᓯᒪᓂ ᒥᐊᑐᓴᐅᑎᓯᓂᓗᓂ, ᐃᓖᓂᕆᓂᖅᓯᒪᓂ ᖃᐅᓴᕐᓴᑦᑐᓚᐅᖅᓯᓚᓄᑦᑐᓂᒃᓗ, ᐱᓚᓪᓚᐊᖅ ᑲᔪᓯᓇᕐᓕᑦ ᒥᐊᑐᓴᐅᑎᓯᓂᓗᒃᑲᓂ ᐊᐊᑦᑐᓂᖅᑐᖅ. ᐊᑐᓚᓂᒋᔭᐅᓯᒪᓕᕆᓕᑎᒍ ᐱᓚᓪᓚᐊᖅᑎᓂᓕᕆᔨᒃᑲᓂ ᑲᑎᒪᔨᓕᖅᑐᓂᓗᒃᑲᓂ ᐊᐊᑦᑐᓂᖅᑐᖅ, ᒥᐊᑐᓴᐅᑎᓯᓂᓗᒃᑲᓂ ᐊᐊᑦᑐᓂᖅᑐᖅ ᐊᐃᑦᑐᓚᐅᖅᑐ

ATANGUYT ONIPKANGIT

Una Kingolikpanguyok Nalaktaovlotik Katimakjuaktitingmata Onipkalighimayat ukkua Nunavut Avatilikiyiit Katimayiit (NIRB-kut uvalunin Katimayiit) nainaghimayok ukkua Katimayiit Ihivgiokutat haffuminga TMAC Resources Inc. (TMAC-kut uvalunin Toghiktotikaktot) Havaak 2 Kapihiliktomi Gold-nik Attayok uyagaghiokvighak havagiyaoyok toghiktotat NIRB Titigak No.: 12MN001 (una Havagiyaoyok). Hamna angininga haffuma Havagiyaoyup ihivgiokhimayat ukkua Katimayiit onipkaliokhugo uvani Kingolikpamik Nalaktaovlotik Katimakjuaktitingmata Onipkangat ilaliotihimayot hapkua toghiktotaoyot hannatjutighait, igluliokutighait, angmaktikutighat, omiktitkutighat,haligaotighat tatvalu omiktaohimaliktitlugo kimilgokataotighat hapkunani gold-nik pingayuni uyagaghiokviginiaktaitni tahamani Kapihiliktomi Gold-nik Attayok, tavunga 1,600 square-kilometre nalvakviohimayok nanminiktangovluni.

Hamna Kapihiliktomi Gold-nik Attayok nalvakviohimayok tahamani Kitikmeoni Aviktoghimayomi eloani Nunavut, ungahiktigiyok 150 kilometres (km) hivogata oatani Ekaluktutiap, 60 km kivatani Umingmaktok, 130 km tunnuata kivatani Kingaok, tatvalo 700 km tunnuata kivatani Yellowknife, Nunatiami (takulugu Naonaipkut 1). Una havagiyaoyok tatvani Havakvioyomi ilaliotihimayot ukkua TMAC-kut pingahut uyagaghiokvigiyomayait iloani haffuma Kapihiliktomi Gold-nik Attayok, naonaipkutait attikaktot imatot Madrid North, Madrid South unalo Aimaokatalokmi uyagaghiokvighat nalvakviohimayot. TMAC-kut itkuniakutat tatva pingahuni nalvakviohimayoni pitakaktot 4.8 million ounces gold-nik kititlugit. TMAC-kut toghiktoktot uyagaghiokvigiyomavlogit hapkua nalvakviohimayot iloagot nunnap uyagaghioklotik; kihianitaok, ilanga hamna uyagak natkaniitok kangata nunnap uyagaktakvioniaktok kanganiit. Ilaliotilugo hamna Havagiyaoyok, TMAC-kut toghiktoktot atoghimaagomavlugo tatvalo angeklilagomavlugo una gold-nik uyagaghiokvigiyatik, ekakokvigiyaitnik tatvalo havagiyaitnik omiakut akyaktaokataktot ihoakutighaitnik angektaoyagekhimaliktot tatvani Kapihiliktomi Gold-nik uyagaghiokvigiyaitni tatvanilo Kangighokmi Roberts Bay-mi uyagaghiokviatni, tatvalo hannavalialotik notanik ihoakutighanik tatvani Madrid-mi Aimaokatalokmilo (ilaliotilugit hapkua hinniktakvighaitnik havaktot tatvani Aimaokatalokmi), tatvalo hannalotik illikoaktomik okiogalok atoktaokataktoghamik apkohioklotik avatingnokataotighamik tahamani nalvakviohimayop Attayok- uyagaghiokvigak tatvalo nalvakhiokhimakvighaitnot.

Okaotaovakmiyok tatva havaghat hatkikpalianiaktot tatvani Havakvioyomi, taimataok havagiyaohimaaktitlugo uyagaghiokvik tatvani Kapihiliktomi Gold-nik Uyagaghiokviatni, TMAC-kut huli aolahimakniaktat havaktigiyatik tingmiakut agyakataklogit avatinot uyagaghiokvikmut angilgagiyaitnutlo. Kiglikakniaktot TMAC-kuni havaktot 870-nik tatvani Havakviatni, hapkua 400-guyut havaktot hinniktakvikaklotik tatvani havakviohimaaktomik Kapihiliktomi tatvalo 300-guyut hinniktakvikakniaktot tatvani Aimaokatalokmi uyagagiokviatni. Hamna toghiktotaoyok kighigha tatvani Havakvioniaktomi, hannaovalialoni, iglukpioklotik, tatvalo havagivalialugo uyagaghiokvigilugo, omiktikpalialugo tatvalo omiktaohimalikat kimilgokataklugo tatva 19-nik okionik kititlugo havagiyaoniaktok, akkunigalok havagivalialugo tatva igluliokpalialotik, uyagaghiokvigilgaklugo kiklighanot omiktigivalianighanot hapkua pingahuni uyagaghiokvighaitni. TMAC-kut toghiktoktot hannavaliayomayat una Uyagaghiokvighak akkuni okioni havagivalialugo, aolakutilutjuk 2019-mi, tatva talimanik

okionik iglukpiokpalialotik (Okiok 1 tavunga Okiok 5-mut), tatvataok 14-nik okionik aolavalialugo uyagaghiokvigivalialugo (Okiok 1 tatvunga Okiok 14-mut), 6-sinik okionik omiktikpalialugo (Okiok 12 tavunga Okiok 17-mut), tatvalo 6-sinik okionik omikhimaliktitlugo kimilgokataklotjuk (Okiok 14 tavunga Okiok 19-mut). Hamna akkuni havagihimagomayat eloatkiyaoniaknahogigamitko havaghakhioktonot havagiyaohimaakniakmata elikot ataohiktakninganit uyagagakvigilogit, tatvalo atoghimaaklutjuk hapkua uyagaghioktot hannalgotait, hikoptigotait tatvalo ekakokviita ihoakutait tatvani Kapihiliktomi taimatot ajikuhiongitangita hapkua titigaoyaliokutait uyagaghiokvighaitnik hapkunani pingahuni uyagaghiokvigaitni.

Hamna hikoptiginik uyagaktaktaitnik hapkunanga pingahunit uyagaghiokvitnit havagiyaoniaktok tatvani atogaohimaktatni uyakat hikoptigikviat tatvani Kapihiliktomi, kihiani elanga uyagaktaktat hikoptiktaoniaktok angektaohimalikat tatvani Aimaokatalokmi uyagaktakviatni. Uyagaktatait tatvanga Tunnuanit tatvalu Hivuganit Madrid-mi tatvangalu Aimaokatalokmin agyaktaoniaktot aghalotikut tatvunga Kapihiliktomi uyagaktakviatnun una ilingaiyaktaohaktok apkohioktaohimayok atoklugo (hannayaotaghimaliktok atogaohimaktat nalvakhiokhimaktonit) akkungani ukkua Madrid-mi Kapihiliktomilo uyagaktakviitni tatvalu hannavalialugo hamna 55-kilometre taghivaliklugo hamna atogaoyok Kapihiliktomin-Madrid-mut okiogalok atogaoyoghak apkuhioktaohimayok agyaktaktot aghalotinot tatvangalo Aimaokatalokmin Kapihiliktomut-Madrid-mutlo. TMAC-kut toghiktokmiyot atoghimagomavlotjuk una tagiokmi omitjat ehoakutat tolaktakvik tatvani Kangighokmi Roberts Bay-mi ohiyakviat omitjat igluliokutighanik tatvani Havakvioyomi tatvalo aipagotoagangat okhokyoaniklo agyaktakviat, tamaita hapkua omitjat tikkikatakniaktot tagiok hikokagoigaikpat. Una Havagiyaoyok ilaliotihimaniaktok 6-sinik annugitotinik, kulliktotinik tatvalu hapkuninga algoyaktotighaitnik ukkua Havakvioyomi, tatvalu ilavalikmiyogit hapkua okhokyoakakvighaitnik hapkunani uyagaghiokvioniaktoni. Ilihimalighogit tatva ilanga hapkua uyagaktaktaitnik hikoptiginiakmatjuk tatvani Aimaokatalokmi uyagaghiokviatni, TMAC-kut toghiktokmiyot ilaliotiyomavlutjuk uyakat totkomavighaitnik (paniomayonik kaligekataklogit totkomayaoniaktot) tatvani Aimaokatalokmi uyagaghiokvikmi.

Naonaiyaghimayok tatvani Aolatjutaita Eliitkohiktotaitni uma Onipkagiyaitni, Ukkua Katimayiit pihimaligaloaghutjuk una hivolikpak Havak 2 Kapihiliktomi Attayok Uyagaghiokvighak toghiktotaoimayok 2011-mi tatvuna nanminikaktonit, Kapihiliktomi Uyagaghioktit Nanminikaktot. (HBML), ukkua Katimayiit naonaiyaotat haffuminga Havagiyaoyomik atughugo una Nakatak 12 uvani *Nunavut Angekutatni Atuni ukkua Inuit Nunavumi Nunatakutani tatvalu Una Ihumagiyaotiaktok Koin Kivaktoiyok Kanatami* (una *Nunavumi Angekutaohimayok*) notkaktihimayat kaffiktaghugo ukkua Nanminikakhimayot. Tatvani 2013-mi, una Havagiyaoyok niovgotaohimayok ukkunanga HBML-kunit tatvunga Nanminikaliktonot TMAC-kunot, tatvalo ukkua Katimayiit Ihivgiokutat pitjutaohimayok havagiyaoloaliktitlugo una naonaiyaotat ukkua TMAC-kut toghiktotikakmata haffuminga Eneghimaitomik Avatilikinikut Kanogiliyokaghimanikat Naonaiyaotaitnik Desaipa 2016-mi.

Ukkua Katimayiit Ihivgiokutat ilaliotihimayot naonaiyaotait avatilikinikut tatvalu inolikinikut pivalialikinikutlo ikpigiyaoniaknikat hamna toghiktotaohimayok Havagiyaoniaknikat angektaonigomi, taimainiaknikat, kanok malikayagiakakat tatvalu kanogitungmangatlo. Tatva toghiktotikakmiyot ukkua Nanminikaktot, hatkighimatitlugo tatvani *Nunavut Angekutatni*,

havagiyaohimaktitlugo ukkunanga NIRB-kunin Ihivgioktaokataktitlugo hamna Havagiyaoyok, ukkua NIRB-kut havakatigitiagiakaktat ukkua Nunavumi Immalikiyiita Katimayiit (NWB-kut) ehoaghaikatigilugit, havakatigihimaaklogit, ukkua NIRB-kut ihivgiokhititlugit ukkua NWB-kut ihomaghotigiyatnik immap laisikhaktakutighaitnik haffuma Havagiyaoyop. Taimaititlugo, ukkua NWB-kut havagiyait immap laisighaktakutighaitnik tatvani Havagiyaoyomi aolagotihimayot tatvani Desaipa 2017-mi ukkua TMAC-kuy tonihihimangmata Kingolikpakmik Avatilikinikut Kanogiliyokakniaknikat tatvunga NIRB-kunot tatvalo immap laisighaktakutighat toghiktotaitnik tatvanga NWB-kunit. Havakatigihimaktat ukkua NWB-kut huli, ukkua NWB-kut ehoaghainiakmingmata Avatilikinikut Katimatjutikaklotik ihomaghutigilugit immap laisighaktakutighaita toghiktotaitnik enegiakata ukkua NIRB-kut Kingolikpakmik Nalaktaotitlugit Katimakjuakutat.

Ilaliotivlugo, ukkua Katimayiit ehivgioghihimaktitlugit haffuminga Havagiyaoyomik, ukua Katimayiit hatkighikataghimayot kaffiktaklotik oktotighaitnik hapkua pikataoyot hapkunanga Kitikmeot Inuit Katuyikatigit, Kavamatokatkunit, aviktoghimayoni tatvalu nunaliitnit kavamaoyot tatvalu Nunaliitnit Kivgaktoiyot tamaitnin talimanit ikpigiyakaktonit Kitikmeoni nunaliitni, Ekaluktutiak, Kugluktuk, Ukhoktok, Taloyoak unalo Kugaaruk, tatvalo ukkua malgok nayoktaokataktok nunaliit Kingaok unalo Omingmaktok appikutighakagomik appigikatakoyaovlotik tatvalo okaotigilugit ihomalotigiyatik avatilikinikut tatvalu inolikinikut pivalialialikinikutlo ikpigiyakakniakata (nakoatot ihoitokutlo) tatvani Havakvioyomi Nunavut Nunatakviatni tatvalo kanigiyani aviktokhimayoni. Eneknigit, ilihaktot tatvalo kitot inuit Ekaluktutiamiotat pikataotkoyaohimayot okalakatakuyaovlotik tatvani Kingolikpakmik Nalaktaotitlogit Katimakjuaktitingmata (ilaliotivlugo ukkua Nunaliit Katimapkaktitaohimangmata Kingolikpakmik Nalaktaotitlogit Katimakjuaktitingmata).

Ukkua Katimayiit tuhaktitaohimayot tatva amegaitot tamatkiomavyaktot ikkayoghiotihimayot haffuminga havagiyaoyomik nakilikak Kitikmeoni Aviktoghimayomi, ihomagivlotjuk tatva ilavalighimalikat hamna uyagaghiokvigiyat tahamani Kapihiliktomi Uyagaghiokviat Attayok pivaliatiginiakmatjuk ilihakpalikutighanik, havaghanik tatvalo huli ilihaotighanik pivaliatjutighaniklo. Hamna ihomagiyaoyok onipkagihimaya tatvani Nalaktaotitlogit Katimakjuaktitingmata uma Canute Krejunark, Nunaliitni Kivgaktoiyok tatvani Kugaarukmiotak okalaktok:

> *Uvagot ikkayoghioktiyavut hamna uyagaghiokvik. Takuyomayavut ukkua nanminikaktot uyagaghioktit angektaokuvlogit. Uvanga taotoktaga, hamna ikkayotaoniakmat maniliokutaoniakmat tatvalo Kanatamionik ikkayotaoniakmat. Koanakpiaktot ukkua Nunavut Kavamatkut tatvalu ukkua Kavamatokatkut ukkualo Kitikmeot Inuit Katuyikatigitkut. Tautoktaga hamna ikkayotaoniakmat inuknik tamaitnik, kihianiongmiyok paknaiyaotikatiakata monagitjutighanik tatvalo ehoaghaitjutikakniakata monagitjutighaitnik avatilikitjutinik.*[7]

Ilaliotilogit hapkua ikkayoghiotihimayot haffuminga Havagiyaoyomik kitoniit, ukkua Katimayiit tohaghimaliktot tatva niovighimaligamitko hamna Havakvioyok tatvalu una Kapihiliktomi Uyagaghiokvik, TMAC-kut nakoatot havakatigitiaktat ukkua Kitikmeot Inuit Katuyikatigit-kut,

[7] C. Krejunark, Kugaaruk, NIRB-kut Kingolikpakmik Nalaktaotitlugit Katimakjuaktitingmata Naonaipkutat No. 12MN001 Titigaghimayok, May 12, 2018, pp. 1001-1002, titikat 23-26 tatvalo titikat 1-5.

ukkualo kavamatokatkut, aviktoghimayoni tatvalo nunaliitni kavamaoyot tatvalo nunakatigit iloani Kitikmeoni Aviktoghimayomi. Hamna nakoatot ikkayokatigitiaknik ihomagivlugo hamna Havagiyaoyok naonaitpiaktok taotoghugo tatvani Kingolikpamik Nalaktaovlotik Katimakjuaktitingmata, TMAC-kut hapkualo Akkiyaktoktot ihoaghaihimalikmatjuk amihuyot ayungnaktot ihomalotaoyot. Nunaliitni Kivgaktoiyot okakhimayot ikkayokhiotivlotik TMAC-kunik, okalaghimayok una Simon Qingnaqtuq, Nunaliitni Kivgaktoiyok Taloyoak-mit:

> *Uvagot Kitikmeotaovlota,ikkayoghiotihimayavut ukkua uyagaghioktit, TMAC-kut. Takuyomayavut huli havaghimaakovlogit. Ikkayoghiotiyavut ukkua TMAC-kut. Appikhokuyaogapta appikutikakpaktugot. Naonaitiaghimayonik kioyaotiakataktugot uyagaghioktiniit.. Takuyomayavut hamna uyagaghiokvik tatvani Kapihiliktomi angektaokutlugo nunaliitni Kitikmeoni. Ukkua ikkayoloakatakmata hamani Kitikmeot nunaliitni aghutak, tatvalotaok ikkayoghiotikpiakmata ilihaktotiptingnik innikhitkoivlotik sikokutimingnik, ilihimavlotik hapkua ilihaktotivut aghoktot innighinahoaktot sikokutimingnik.*[8]

Kihianitaok, ikkayoghiotigaloakhutik Uyagaghiogomayonik tatvalo atkunaotaoniaktomik haffuminga Havagiyaoyomik, ukkua NIRB-kut Ihivgioghititlugit katimakataoyot apikhutikakpaktot kanok ukkua TMAC-kut ameginiakatjuk hamna Havagiyaoyok ihoilotaongitangani tuktunot allanutlo nunamiotanik angotighanik, ekalukniklo tatvalo tatinik tagiokmi halomaiyaktailinahoaklogit. Okalaktok una Uriash Puqiqnak, Nunaliitni Kivgaktoiyok Ukhoktokmiotak, hapkua nunakatigit Kitikmeoni hagimagiyaat hamna halumakpiaktok nunaotivut avativutlo taimatot ihoiyakungitavut hivunighaptini haimanaktok nunagiyavut:

> *…Uvanga hagimagiloaktaga hamna nunaotigiyavut,hapkualo angotighavut, hugatjat amegaitpiaktot… ihomagiyagiakaktavut hamna hivunighavut ihomaginaghimaitomik hamna kingolivut ubluminaongitomiklo. Uvagut hamaninginalaitnapta. Ihomagiyagiakaktavut nutakavut kimaniaktavut. Ayoknakyogaloak taima okaotigilugo, kaoyimayugot, hamaninginalaitugot. Ihoaghitihimayagiakaktavut hapkua nutakavut ingotavutlo nakuyomik hivunikhakatiakuvlogit.*[9]

Tatva ihivgiokhimalikutjuk tatvalo ihomaghotigitiakhutjuk tamaita hapkua tohaktitjutaohimayot ukkununga Katimayiitnun tatvunga Ihivgiokhititlogit, ilaliotivlugit ukkua TMAC-kut ilaliotihimayait Inuit Quajimajatuqangit ikkayotighat tatvunga Havagiyaoyomut tatvalo ihoaghaitjutighait uvalu monagitjutighait tatvani Havakvioyomi nakoatot tatvalo ihomagivlugit ukkua TMAC-kut nigiogiyat iliitpalikniakmata havagiyamingnik uyagaghiokvigiyamingni Kapihiliktomi, ukkua Katimayiit naonaikhimaliktat nakoatot monagiyaotiakat, kimilgoktaokatakat, tatvalo ehoaktomik ehoaghaotighait paknaiyaghimakpatjuk, hamna Havagiyaoyok havagiyaoyungnaktok ilipkatiagahoaklugo hamna pinniktok avatta nunami tagiokmilo. Tatva ihomagivlugo hamna Havagiyaoyok angektaotkovlugo uyagaghiokvikhak, piyunaotitik malikhugo tatvani Nakatak 12-mi, Oigoani 12.5.6(c) uvani *Nunavut Angekutani*,

[8] S. Qingnaqtuq, Taloyoak NIRB-kut Kingolikpakmik Nalaktaotitlugit Katimakjuaktitingmata Titigak No. 12MN001 Titigagimayok, May 12, p. 1003, titigakmi 7-16.

[9] U. Puqiqnak, Ukhoktok, NIRB-kut Kingolikpakmik Nalaktaotitlugit Katimakjuaktitingmata Naonaipkutat Titigak No. 12MN001 Titigakhimayok, May 12, p. 1003, titikani 8-11 tatvalo 17-21.

ukkua Katimayiit pitkoihimayot avatkutugit 54-guyot malikayaghanik tatvalu havagiyaghaitnik ataniktotigilugit hamna Havagiyaoyok hivumovaliayangani, ilaliotilugit hapkua ihomagiyaoloaktot ehoaghaotighait, monagitjutighait,kimilgokutighait tatvalo onipkaliokutigait pitjutigivlugit hapkua naonaitiaghimayonik avatilikitjutinik tatvalo inulikinikut pivalialikinikutlo ikpiknaotaitnik. Hapkua ihomagiyaoyot malikayaghanik tatvalu havagiyaghaitnik ukkua toghiktotikaktot ehoaghaktait ukkua Katimayiit ihomagivlutjuk havagiloaghimayait ukkua Toghiktotikaktot hapkualo Akkihaktoiyot havakatigikhotik ehoaghaikatigikhimangmata ihoaktunik ehoaghaotighanik, monagitjutighanik tatvalu kimilgokutighaitnik.

Taima naonaiyatiagimayot uvani Onipkalioktatni, hamna Katimayiit Ihivgiokutait naonaiyaghimayat hapkunanga Enekhimaitonit tatvalu Kingolikpakmik Avatilikinikut Kanogiliyokakniaknikat Naonaipkutatni, tamaita titigaghimayot okaotaoyot kiotjutaohimayot Katimayiitnun hapkunanga Akkihaktoiyonit tatvalu kitonit inuknit, kaitkoyaohimayonit nalagiaktokhimayonitlo apikutaohimayot okaotaohimayotlo avatkohimayot 60-nit okalaktokakhimayonit tatvani Kingolikpamik Nalaktaotitlugit Katimakjuaktitingmata. Ukkua Katimayiit koyagikpiaktait tamaita hapkua pikataohimayot ikkayokategitiakhotik pitiakategitiakhotik ukkua Katimayiit Ihivgioghihimangmata haffuminga Havagiyaoyomik. Ukkua Katimayiit kimilgokutait ikkayoktigivlugit hapkua aolatiaghotik katimakatigitiakmata tatvalu nakoatot ikkayokatigitiakmata tamaita katimakataohimayot; taimainginaktitlugo, hapkua ihomatokpiaktotlo tatvalu nakoatot appikutikatiakpangmata ikkayotigitiaktait ukkua Katimayiit ihomaliokutaitnik haffuminga Havagiyaoyomik. Ukkua Katimayiit nigioktot huli pikataonginakovlugit tamaita hapkua pikataohimayot tatvalu hapkua Kitikmeoni nunaliit hamna Havagiyaoyok nakoatot havagiyaotkovlugo toghiktotigiyatik malikatiakovlugo ukkua TMAC-kut hatkitpaliayangita hapkua ikkayotighat inulikinikut pivalialikinikut tatvalo ikkilivaligahoaklugo hamna kayangnaktok avatilikinikut ihoilotaovaktot.

SOMMAIRE EXÉCUTIF

La Commission du Nunavut chargée de l'examen des répercussions (CNER ou la Commission) publie ce rapport d'audience finale résumant l'examen approfondi de la proposition de Phase 2 du projet Hope Bay Belt, no. de dossier 12MN001 de la CNER (le projet) de la TMAC Resources Inc. (TMAC ou le promoteur). La portée de ce projet, examinée par la Commission et résumée dans ce rapport, englobe la mobilisation, la construction, l'exploitation, la fermeture, la remise en état et la surveillance post-fermeture des activités d'exploitation de minerai aurifère dans trois gisements le long de la ceinture de roches vertes de Hope Bay, une propriété minière contiguë de 1 600 kilomètres carrés.

Le projet Hope Bay Greenstone Belt (ceinture de roches vertes de Hope Bay) est situé dans la région de Kitikmeot, Nunavut, à environ 150 kilomètres (km) au sud-ouest de Cambridge Bay, à 60 km à l'est de Umingmaktok (Bay Chimo), à 130 km au nord-est de Kingaok (Bathurst Inlet) et à 700 km au nord-est de Yellowknife, Territoires du Nord-Ouest (voir Figure 1). Ce projet vise l'exploitation de trois nouveaux gisements aurifères dans la ceinture de roches vertes de Hope Bay, référés comme les gîtes minéraux Madrid Nord, Madrid Sud et Boston. Selon TMAC, les trois gisements contiennent environ 4,8 millions d'onces d'or au total. La TMAC propose d'extraire le minerai de ces gisements par des techniques minières souterraines; toutefois, certaines parties du minerai près de la surface seront extraites par des techniques minières à ciel ouvert. Dans le cadre du projet, TMAC propose d'utiliser et d'agrandir l'infrastructure des sites approuvés de Roberts Bay et de la mine d'or Doris North, infrastructure déjà installée pour le traitement de l'or, la gestion des déchets et le transport des minerais. La compagnie envisage en outre de bâtir de nouvelles installations sur les sites Madrid et Boston (y compris un camp/logements supplémentaires au site Boston) ainsi que de construire une route privée toutes saisons, reliant les sites aux fins d'exploration et d'exploitation minière sur toute la ceinture de roches vertes).

En matière d'emploi, la TMAC continuera à réaliser ses travaux en mettant un service de navette aérienne à la disposition du personnel, comme elle l'a fait pour exploitation à la mine d'or existante de Doris North. L'équipe du projet sera composée au maximum de 870 employés dont 400 seront logés au camp existant à Doris North et 300 sur le site Boston. La durée proposée du projet sera de 19 ans, de la mobilisation et construction à la fermeture et post-fermeture en passant par l'exploitation minière. D'intenses chevauchements sont prévus sur les trois sites au cours des phases de construction, d'exploitation et de déclassement. La TMAC propose de développer le projet par phases chevauchantes, commençant en 2019 par la phase de construction de cinq ans (années 1 à 5), suivie de la phase d'exploitation de 14 ans (années 1 à 14), et phase de clôture de six ans (années 12 à 17) et enfin phase post-clôture de six ans (années 14 à 19). Cette stratégie de développement progressif permettra d'optimiser la stabilité et la continuité des emplois ce qui n'aurait pas été le cas avec une exploitation distincte des trois sites. D'autre part, l'utilisation accrue de l'infrastructure du site de Doris North pour la concentration du du minerai d'or et de la gestion des déchets, limitera l'empreinte de surface des trois sites miniers supplémentaires.

Le traitement du minerai aux trois gîtes minéraux s'effectuera au concentrateur installé sur le site Doris North. Mais une partie du traitement (récupérer le concentré) pourrait avoir

lieu au site Boston. Le minerai des sites Madrid Nord et Sud sera transporté par camion jusqu'à l'usine de concentration du site Doris North, grâce à des améliorations apportées à la route de transport toutes saisons (déjà construite pour l'exploration avancée) entre les sites Madrid et Doris North et la construction d'un prolongement de 55 kilomètres reliant la route Doris North -Madrid jusqu'au site Boston. TMAC propose d'utiliser l'infrastructure maritime de Roberts Bay pour transporter, pendant la saison des eaux libres, les matériaux requis pour la construction du projet ainsi que pour le réapprovisionnement annuel de combustible. Jusqu'à six (6) éoliennes, des générateurs et les lignes d'électricité connexes requises pour alimenter le projet ainsi qu'une installation supplémentaire pour le stockage du carburant, seront également livrés pour le projet. Sachant qu'une partie de la concentration (traitement du minerai) aura lieu au site Boston, TMAC a proposé d'inclure une installation de gestion des résidus (empilage des résidus secs) sur ce site.

Tel que détaillé à la partie *Historique des procédures* de ce rapport, le propriétaire de l'époque – Hope Bay Mining Ltd. (HBML) -, a soumis à la Commission, en 2011, la proposition initiale de la Phase 2 du projet Hope Bay Belt. Mais l'examen approfondi entrepris par la CNER en vertu de l'article 12 de *l'Accord entre les Inuits de la région du Nunavut et Sa Majesté la Reine en Chef du Canada (l'Accord du Nunavut*) a été interrompu à plusieurs reprises par le promoteur. En 2013, HBML a confié le projet à l'actuel promoteur, TMAC. En décembre 2016, TMAC a soumis l'Énoncé provisoire des incidences environnementales à la Commission, et l'examen a repris son élan, entrant dans la phase la plus active de l'évaluation.

Cet examen de la Commission consiste à évaluer les éventuels effets environnementaux et socioéconomiques du projet proposé afin de déterminer s'il devrait être autorisé à aller de l'avant et, le cas échéant, selon quelles modalités et conditions. À la demande du promoteur, et tel que requis au titre de *l'Accord du Nunavut*, la CNER a étroitement collaboré avec l'Office des eaux du Nunavut (OEN) pendant toute la durée de l'examen approfondi afin de coordonner, dans la mesure du possible, son évaluation avec les considérations de l'OEN relatives aux composantes des permis d'eau du projet. Suite à cette approche, l'OEN a commencé à traiter les questions de délivrance des permis en décembre 2017, après que le promoteur ait soumis l'Énoncé définitif des incidences environnementales à la CNER et les demandes de permis d'eau à l'OEN. La coordination se poursuit avec l'OEN qui, dans la semaine suivant la conclusion de l'audience finale de la CNER, a organisé une réunion technique pour évaluer les demandes de permis d'eau.

De plus, tout au long de l'examen approfondi du projet, la Commission a fortement multiplié les possibilités de participation pour les membres de la Kitikmeot Inuit Association, les gouvernements fédéral, territorial et locaux et les représentants de chacune des cinq (5) collectivités visées de la région de Kitikmeot, - Cambridge Bay, Kugluktuk, Gjoa Haven, Taloyoak and Kugaaruk -, ainsi que des deux communautés occupées en saison, Kingaok (Bathurst Inlet) et Omingmaktok (Bay Chimo), afin de leur permettre de poser des questions et de formuler leurs préoccupations quant aux effets (positifs et négatifs) écosystémiques et socioéconomiques du projet sur le Nunavut et sur les territoires adjacents. D'autre part, des Aînés, des étudiants et des membres de la population de Cambridge Bay ont également été invités à exposer leurs points de vue sur le projet lors de l'audience finale (de plus, une période particulière leur a été consacrée lors de la Table ronde communautaire de l'audience finale).

Dans toute la région de Kitikmeot, la Commission a constaté et entendu un vaste soutien pour le projet, notant que l'exploitation minière supplémentaire le long de la ceinture de roches vertes de Hope Bay intensifierait la formation et les emplois continus et dégagerait d'autres possibilités éducatives et économiques. Ce point de vue commun a été résumé lors de l'audience finale par Canute Krejunark, un représentant de la collectivité de Kugaaruk :

> *« Nous appuyons la construction de la mine. Nous aimerions que la compagnie ait le feu vert. À mon avis, cela va aider notre économie et le Canada dans son ensemble. Je suis reconnaissant envers le gouvernement du Nunavut et le gouvernement du Canada et la Kitikmeot Inuit Association également. Nous y gagnerons tous. Il faut des plans de protection et s'assurer qu'il y ait un plan de protection pour l'environnement ».* [10]

Outre l'appui général, la Commission a également entendu que depuis l'acquisition du projet et de la mine d'or Doris North, TMAC avait établi des relations positives avec la Kitikmeot Inuit Association, les gouvernements fédéral, territorial et locaux et les résidents de la région de Kitikmeot. Ce positivisme et cette démarche collaborative pour le développement du projet ont porté fruits lors de l'audience finale car la TMAC et les intervenants ont pu résoudre la vaste majorité des questions techniques. Les représentants communautaires ont également manifesté leur appui à la TMAC, comme l'a déclaré Simon Qingnaqtuq, un représentant de la collectivité de Taloyoak:

> *« Nous, dans cette région, nous soutenons la compagnie minière TMAC. Nous aimerions qu'elle continue. Nous appuyons TMAC. Nous avons pu poser des questions. La compagnie nous a répondu de manière claire et concise. Nous aimerions que le projet Hope Bay aille de l'avant dans les communautés de notre région. Ils ont énormément contribué aux collectivités du Kitikmeot. Ils ont aidé les étudiants à terminer leurs études et ils ont également reconnu les étudiants qui essayaient de les finir. »*[11]

Toutefois, malgré l'appui pour le promoteur et les éventuels effets socioéconomiques positifs du projet, des participants à l'examen de la CNER ont interrogé la TMAC sur les mesures qu'elle comptait prendre pour prévenir les répercussions négatives du projet sur les caribous et autres espèces sauvages terrestres, sur les poissons, sur l'environnement d'eau douce et sur le milieu marin. Comme l'a souligné Uriash Puqiqnak, un représentant de la collectivité de Gjoa Haven, les résidents du Kitikmeot sont fiers de l'environnement vierge de la région et ne veulent pas sacrifier son intégrité à long terme:

> *« …Je suis très fier de nos terres vierges, de nos espèces sauvages, de leur abondance. Nous voulons nous assurer qu'en nous dirigeant vers l'avenir, nous ne nous concentrerons pas uniquement sur le passé, ni sur le temps présent. Nous ne serons pas toujours là. Nous devons penser à nos enfants et à ce que nous leur*

[10] C. Krejunark, Kugaaruk, Transcription de l'audience finale de la CNER, dossier no.12MN001, 12 mai 2018, pages 1001 à 1002, lignes 23 à 26 et 1 à 5.
[11] S. Qingnaqtuq, Taloyoak, Transcription de l'audience finale de la CNER, dossier no.12MN001, 12 mai 2018, page 1003, lignes 7 à 16.

laisserons. Il est très difficile, vous savez, de dire que nous ne serons pas là. Nous devons garantir un meilleur avenir à nos enfants et à nos petits-enfants. »[12]

Après avoir revu et analysé tous les renseignements qui lui ont été fournis pendant cet examen approfondi , y compris l'intégration par TMAC des principes de Quajimajatuqangit inuit afin d'améliorer le projet et l'atténuation et la gestion de ses répercussions, et constatant que TMAC s'apprête à tirer des leçons de l'expérience vécue avec l'exploitation de la mine d'or Doris North, la Commission est convaincue qu'avec une gestion adaptative appropriée et d'adéquates mesures d'atténuation et de surveillance, le projet pourra être réalisé selon une approche préservant l'intégrité écosystémique de la région. Ayant recommandé que le projet soit autorisé à aller de l'avant et tel que requis à l'article 12, alinéa 12.5.6 c) de l'Accord du Nunavut, la Commission a recommandé plus de 54 modalités et conditions qui régiront l'évolution du projet, notamment dans des secteurs clés comme l'atténuation, la gestion, la surveillance et la soumission de rapports sur les effets écosystémiques et socioéconomiques spécifiques. La Commission a établi ces modalités et conditions en tenant compte du travail considérable accompli par le promoteur et les intervenants en élaborant conjointement de pertinentes mesures d'atténuation, de gestion et de surveillance.

Tel que détaillé dans ce rapport, l'examen approfondi de la Commission a été basé sur les Énoncés provisoire et final des incidences environnementales, sur les commentaires écrits soumis par les intervenants officiels et les membres de la population, sur les exposés/présentations officiels et officieux et sur les commentaires énoncés par plus de soixante (60) conférenciers lors de l'audience finale. La Commission remercie toutes les personnes qui ont participé d'une manière aussi collaborative que respectueuse à l'examen approfondi du projet. L'évaluation de la Commission a bénéficié de cet engagement actif et de cette participation productive de toutes les parties intéressées. Comme à l'accoutumé, vos judicieuses questions et vos pertinents points de vue ont instruit la prise de décision de la CNER vis-à-vis du projet. La Commission compte sur cet engagement soutenu des parties concernées et des collectivités du Kitikmeot pour s'assurer que le projet sera réalisé tel que proposé par TMAC et dégagera les avantages socioéconomiques prévus tout en minimisant d'éventuels et néfastes effets écosystémiques.

[12] U. Puqiqnak, Transcription de l'audience finale de la CNER, dossier no.12MN001, 12 mai 2018, page 1003, lignes 8 à 11 et 17 à 21.

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1. INTRODUCTION

1.1. PROJECT OVERVIEW

The Phase 2 Hope Bay Belt Project (the Project), as proposed by TMAC Resources Inc. (TMAC or the Proponent), is a mine project located in the Kitikmeot region, Nunavut, approximately 150 kilometres (km) southwest of Cambridge Bay, 60 km east of Umingmaktok (Bay Chimo), 130 km northeast of Kingaok (Bathurst Inlet), and 700 km northeast of Yellowknife, Northwest Territories (see Figure 1). The Project would include mining for gold at the Madrid North, Madrid South and Boston mineral deposits in a contiguous 1,600 square-kilometre property within the Hope Bay Greenstone Belt. It is estimated that the Madrid North, Madrid South, and Boston deposits contain approximately 4.8 million ounces of gold. Most of the ore would be mined by underground mining methods; however, portions of the ore near the surface would be recovered by surface mining methods (Crown Pillar Recovery). As part of the Project, TMAC proposes to use and expand specific infrastructure at the existing Doris North Gold Mine and Roberts Bay sites, establish new infrastructure at the Madrid and Boston sites, and construct an all-weather road connecting the sites in support of the belt-wide mining activities.

The Project will involve a fly-in/fly-out operation for the mine site personnel. The maximum workforce at the Project site at any time would be 870, with 400 personnel to be housed at the existing Doris North camp and 300 to be accommodated at the Boston site. The proposed life of the Project, from mobilization and construction to operations, closure and post-closure, would be 19 years.

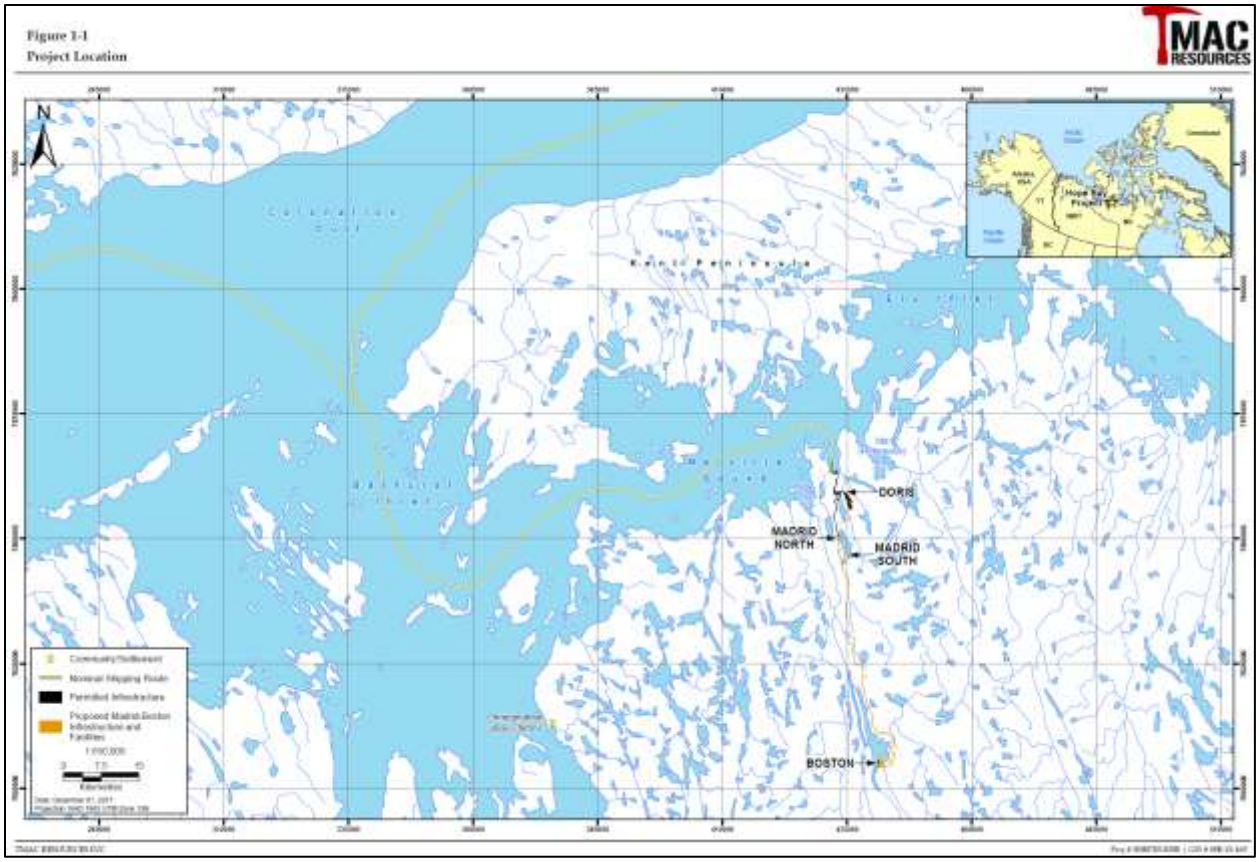

Figure 1: Proposed Location of the Phase 2 Hope Bay Belt Project (*adapted from the Phase 2 Hope Bay Belt Project Final Environmental Impact Statement, Volume 3*)

1.2. NIRB/NWB COORDINATED PROCESS

In 2011-2012, the NIRB and the Nunavut Water Board (NWB) developed a Detailed Coordinated Process Framework to meet legislative requirements for coordination, and to address project specific requests from proponents to better integrate the NWB's licensing phase with the NIRB's impact assessment phase. The Detailed Coordinated Process Framework was introduced to provide clarity, transparency, and timelines for a coordinated approach to impact assessment and water licensing for the NIRB, the NWB, proponents and other parties participating in these processes. By allowing for the initial steps in the NWB's water licencing process to run concurrently with the NIRB's Review process for major developments, the Detailed Coordinated Process Framework was designed to reduce the overall timeline for impact assessment and water licensing and also limit duplication and overlap, resulting in more timely, coordinated and efficient assessment and licensing.

Since its introduction, the NIRB and NWB have updated the Framework to reflect an increased emphasis on coordination and the ability of the Boards to consider the conduct of joint hearings in accordance with the amended Article 13, Section 13.5.2 of the *Nunavut Agreement* that states:

> Where the project proposal is referred for review under Article 12, the NWB and the review body shall coordinate their efforts to avoid unnecessary duplication in

> the review and processing of the proposal. Legislation may provide for joint hearings or authorize the NWB to forego public hearings on any water application where it has participated in a public review of the relevant proposal pursuant to Article 12.

When Hope Bay Mining Ltd. (HBML; the original Proponent) filed the initial proposal for the Phase 2 Hope Bay Belt Project (the Project) with the NIRB in 2012, the proposal included a draft Type "A" Water Licence application to initiate the regulatory process. Following the May 30, 2012 referral of the Project by then Minister of Aboriginal Affairs and Northern Development[13] to the NIRB for a Review pursuant to Part 5, Article 12 of the *Nunavut Agreement*, HBML noted in correspondence to the NIRB (June 8, 2012) that it did *not* wish to continue with a NIRB/NWB coordinated process in the assessment of the Project. The NIRB subsequently conducted the Project Scoping and Environmental Impact Statement (EIS) Guidelines development stages of the Review independent of the NWB and outside of the coordinated process, culminating in the NIRB's issuance of the EIS Guidelines to HBML on December 14, 2012.

In 2013, TMAC Resources Inc. (TMAC or the Proponent) acquired the Doris North Gold Mine Project and associated infrastructure from HBML and became the Proponent of the Phase 2 Hope Bay Belt Project. On December 28, 2016 TMAC Resources Inc. submitted a Draft Environmental Impact Statement (DEIS) and a Draft Type "A" Water Licence Application for the Project to the NIRB and NWB and indicated that it wished to proceed with a NIRB/NWB coordinated process. On February 16, 2017 TMAC submitted correspondence to the NIRB and the NWB clarifying the level of NIRB/NWB coordination TMAC was seeking; and upon initiating the technical review period on March 24, 2017, the NIRB and the NWB jointly released direction regarding the project-specific coordinated process for the impact assessment and water licencing processes for the Project.

The NWB reviewed the Draft Water Licence Application (Application) accompanying the DEIS and determined that the Application was deficient. The Application and supporting information contained in the DEIS covered many of the issues that are critical to the water licensing process; however, as identified in the NWB's review and in the comments provided by interested parties, major deficiencies remained in terms of the level of information required to complete and support the technical review of the water licence Application. The NWB noted that these deficiencies were substantive and must be addressed by TMAC through a resubmission of the Water Licence Application(s) as a "stand-alone" appendix to the Final Environmental Impact Statement (FEIS) in order for the water licensing process to proceed.

Following the 2017 Pre-Hearing Conference (PHC) hosted by the NIRB and with participation by the NWB, the NWB determined that, having considered the information received, the circumstances of the Project, and the regulatory approach the NWB had taken in respect of a similar application by Agnico Eagle Mines Limited for a water licence to authorize the water uses and waste deposit activities associated with the Whale Tail Pit Project Proposal (NIRB File No. 16MN056), TMAC should provide two (2) water licence applications for the Project as follows:

[13] As the Ministry was known in 2012; subsequently, the Ministry was renamed to Indigenous and Northern Affairs Canada, and the Minister is known as the Minister of Crown-Indigenous Relations and Northern Affairs.

1. An application to amend the current scope of the existing Doris North Type "A" Water Licence to include the additional water use and waste disposal activities at the Doris site associated with the Madrid North and Madrid South components of the Project and the processing at the Doris site of the additional volumes of ore originating from the Madrid North, Madrid South, and Boston components of the Project; AND
2. An application for a new and separate Type "A" Water Licence to govern the water use and waste deposit activities associated with the construction, operation and reclamation of the mining undertaking at the Boston site.

The NWB noted that this approach was in tandem with the approach taken by the NIRB, reviewing the Phase 2 Hope Bay Belt Project Proposal as a related but separate project proposal from the existing Doris North Project (NIRB File No. 05MN047). The proposed NIRB/NWB coordinated process to be implemented following TMAC's submission of an FEIS and revised Water Licence Applications for the Phase 2 Hope Bay Belt Project was included in the NIRB's PHC Decision for the Project.[14] Updates to the coordinated review process were communicated to the Proponent and parties by the NIRB and NWB throughout the Review of the Project, including after TMAC's submission of the FEIS and the Water Licence Applications. Reflecting the NWB's continued coordination with the NIRB, on May 14 and 15, immediately following the conclusion of the NIRB's Final Hearing for the file, the NWB held a Technical Meeting for the Applications in Cambridge Bay. The purpose of the NWB's Technical Meeting was to discuss technical review comments provided to the NWB by the interveners and also to solicit questions and comments from members of the public in relation to TMAC's water licence applications for the Project.

1.3. MANDATE OF THE BOARD

As with all Nunavut Impact Review Board (NIRB) functions, in carrying out the Board's review of the Phase 2 Hope Bay Belt Project proposal, the Board is bound by Article 12, Part 2, Section 12.2.5 of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada* (*Nunavut Agreement*), which states:

> In carrying out its functions, the primary objectives of NIRB shall be at all times to protect and promote the existing and future well-being of the residents and communities of the Nunavut Settlement Area, and to protect the ecosystemic integrity of the Nunavut Settlement Area. NIRB shall take into account the well-being of residents of Canada outside the Nunavut Settlement Area.

In the present context, the function of the Board is to gauge and define the extent of the potential impacts of the proposed Phase 2 Hope Bay Belt Project (the Project) by conducting a thorough review of the predicted ecosystemic and socio-economic impacts of the Project. On the basis of this review, the Board is then required to determine if the Project should be allowed to proceed, and if so, whether terms and conditions are required to mitigate, manage and/or monitor the anticipated impacts. Reflecting the provisions of the *Nunavut Agreement*, in carrying out this function, the NIRB's primary objective is at all times the protection and promotion of the

[14] NIRB Pre-hearing Conference Decision for the Phase 2 Hope Bay Belt Project, NIRB File No. 12MN001, July 21, 2017.

existing and future well-being of the residents and communities of the Nunavut Settlement Area, and the protection of the ecosystemic integrity of the Nunavut Settlement Area.

1.4. JURISDICTION OF THE BOARD TO CONDUCT A REVIEW

The Board has jurisdiction over the review of this Project pursuant to Article 12, Parts 5 (Review of Project Proposals by NIRB) and 12 (Application) of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada* (*Nunavut Agreement*). Reflecting the integrated regulatory system established under the *Nunavut Agreement*, when a Review of a project proposal is required under Article 12, Part 5 of the *Nunavut Agreement*, Article 12, Section 12.10.1 of the *Nunavut Agreement* prohibits the issuance of any licences or approvals that would be required in order to allow the project to proceed until after the required Review has been completed and a NIRB project certificate is issued. Consequently, other than the limited exceptions of exploration and development activities,[15] no permits, licences or authorizations for activities within the scope of the Phase 2 Hope Bay Belt Project as assessed have been granted to date.

It should be noted that although the *Nunavut Planning and Project Assessment Act*, S.C. 2013, c. 14, s. 2 (*NuPPAA*) came into force on July 9, 2015, while this Review was underway, as provided for under the *NuPPAA* transition provisions,[16] because the NIRB's Review of the Project had already commenced under the *Nunavut Agreement*, the NIRB's Review of the Project continued pursuant solely to the requirements of the *Nunavut Agreement*.

1.5. PURPOSE OF THIS REPORT

The reporting parameters for the Board's Review of the Project are found in Article 12, Section 12.5.6 of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada* (*Nunavut Agreement*):

> **Article 12, Section 12.5.6:**
> After reviewing the project proposal, NIRB shall issue a report to the Minister and the Proponent containing:
>
> (a) its assessment of the project and its impacts;
>
> (b) its determination as to whether or not the project should proceed based on its assessment under (a); and
>
> (c) in the event the project were to proceed, terms and conditions reflecting the primary objectives set out in Section 12.2.5.

Reflecting these requirements and the Board's authority, this Final Hearing Report presents the results of the NIRB's Review of the proposed Phase 2 Hope Bay Belt Project (the Project). The

[15] See the discussion in this Final Hearing Report in Section 3.3 "Applications for Activities Excepted from the Review" for more detail regarding activities that were originally within the scope of the Phase 2 Hope Bay Belt Project proposal but that were subsequently excepted from further assessment under this Review by the NIRB.

[16] Section 235 (1) of *NuPPAA* provides that: This Act does not apply in respect of (a) a project that is being assessed under the [Nunavut] Agreement or is being, or has been, lawfully carried out on the day on which this section comes into force.

Report includes the NIRB's conclusions and recommendations to the Minister of Crown-Indigenous Relations and Northern Affairs (the Minister) on behalf of the Ministers responsible for issuing project approvals. The Board is satisfied that it has complied with its obligations under the *Nunavut Agreement* and that it has sufficient information to draw conclusions and make recommendations regarding the potential effects of the Project.

1.6. EVIDENTIARY ISSUES

1.6.1 The Burden and Standard of Proof

The Proponent bears the onus of proof and must demonstrate, on a balance of probabilities, that the Phase 2 Hope Bay Belt Project is consistent with the Board's mandate and requirements of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada* (*Nunavut Agreement*).

In the context of this Review specifically, it is the responsibility of the Proponent to provide the Board with an Environmental Impact Statement (EIS) that fully reflects all applicable NIRB issued guidelines and directions, the minimum EIS requirements set out under Article 12, Section 12.5.2 of the *Nunavut Agreement* and the Minister's direction. In addition, the EIS must also provide the Board with the information necessary to assess the potential ecosystemic and socio-economic impacts of the Phase 2 Hope Bay Belt Project.

In addition to the overall onus on the Proponent during the Board's assessment, individual participants throughout the assessment process must also meet the burden of proof for specific information or assertions offered to the Board. As stated in the NIRB *Rules of Procedure*,[17] any party offering evidence has the burden of ensuring that they have provided the Board with sufficient information to support that participant's position. Further, where there is conflicting information, the Board has the authority to decide which information will be accepted by the NIRB in whole or in part. The standard of proof in this Review required a careful balancing of all information received by the Board throughout this Review, including all information filed with the Board prior to the Final Hearing and the information, comments and questions presented by all participants in person at the Final Hearing. The sections of this Report discussing the Board's Views address how the Board balanced information provided on key topics. However, the onus remained on the Proponent throughout the Review to demonstrate that the Phase 2 Hope Bay Belt Project is consistent with the Board's mandate and requirements of the *Nunavut Agreement*.

1.6.2 The Precautionary Principle and Adaptive Management

With respect to areas where there are substantial gaps in data or uncertainty regarding predicted effects, the Board was guided, as always, by the "precautionary principle". The concept as cited in previous EIS Guidelines and as followed by TMAC Resources Inc. (TMAC or the Proponent) during the preparation of the EIS for the Project, and that guided the Review is stated as follows:

[17] *NIRB Rules of Procedure*, September 3, 2009, Rule 32.1 at p. 18.

> Where there are threats of serious or irreversible damage, lack of full scientific certainty must not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

When the precautionary principle applies, as is the case with respect to some of the effects identified during the course of this Review, it is the Proponent who bears the burden of proof to show that despite this uncertainty, the potential for adverse environmental impacts can be mitigated or reversed. The onus on the Proponent created by the precautionary principle in the case of the Phase 2 Hope Bay Belt Project proposal has been highlighted by the Board in the specific sections of this Report applicable to particular Valued Ecosystem Components and Valued Socio-Economic Components. Where the Proponent, parties or the NIRB have identified that the precautionary principle is applicable, TMAC has been required to:

- Demonstrate that the proposed actions are examined in a precautionary manner in order to ensure that they do not cause serious or irreversible damage to the environment;
- Outline the assumptions made about the effects of the proposed actions and the approaches to minimize these effects;
- Identify any follow-up and monitoring activities planned, particularly in areas where scientific uncertainty exists in the prediction of effects; and
- Present public views on the acceptability of these effects.

This application of the precautionary principle in environmental decision-making enables the Board to make recommendations that reflect the potential for adverse environmental impacts, even though the risk of such impacts cannot be definitively proven, based on the data available at the time of this assessment. As demonstrated in the submissions of many of the participants in this Review and as evident throughout this Final Hearing Report, implementing the precautionary approach in the context of this Review has resulted in the adoption of several "adaptive management" tools to address the potential for adverse impacts that may not be fully understood at the time of the assessment.

Adaptive management is essentially an ongoing process of decision-making that involves making initial decisions based on the existing data, subsequently monitoring for potential effects, assessing the effectiveness of the initial decisions (including assessing the effectiveness of mitigation measures), and then adjusting actions going forward to reflect the monitoring data and the effectiveness of measures taken to minimize adverse effects. Recognizing that the Phase 2 Hope Bay Belt Project proposal involves both modifications to existing infrastructure at the Doris North Gold Mine, where considerable monitoring has been conducted by TMAC on an annual basis, as well as new infrastructure and mining operations at the Madrid North, Madrid South, and Boston sites, where less monitoring has been undertaken to date, the Board expects that TMAC's proposed adaptive management measures have been informed by, and reflect, existing monitoring data and/or experience with the implementation of such measures at the Doris North Gold Mine site.

The feedback loop created by the precautionary approach and responsive adaptive management is reliant on, and emphasizes the importance of the NIRB's project monitoring jurisdiction as set out in Article 12, Part 7 of the *Nunavut Agreement*. The Board also notes that Article 12, Part 8 of the *Nunavut Agreement*, recognizes the need for flexibility in relation to how project

certificates developed by the NIRB may need to be modified to ensure project effects can continue to be effectively managed by mechanisms adapted over time, and provides the NIRB with the jurisdictional basis to revisit and modify the terms and conditions of a project certificate, as required to meet the Board's objectives.

During the course of this Review although the precautionary principle and adaptive management were foundational to the entire assessment, these concepts figured most prominently in discussions regarding caribou protection measures,[18] impacts to marine mammals from project-related shipping,[19] waste rock management,[20] loss to fish habitat,[21] saline groundwater management,[22] and tailings storage.[23]

Section 5: Ecosystemic Effects, Section 6: Socio-Economic Effects and Section 7.6: Cumulative Effects in this Report contain detailed discussions in relation to the manner in which the precautionary principle and adaptive management have factored into the Board's assessment of specific potential effects and also, where applicable, the Board's monitoring and mitigation recommendations in relation to these effects.

1.6.3 Inuit Qaujimaningit and Inuit Qaujimajatuqangit

As indicated in previous Environmental Impact Statement (EIS) Guidelines, the Board's previous decisions, and as reflected in the minimum EIS requirements set out under Section 12.5.2 of the *Nunavut Agreement*, in the Board's view, Inuit Qaujimaningit encompasses Inuit traditional knowledge (and variations thereof or Inuit Qaujimajatuqangit), local and community-based knowledge, as well as Inuit epistemology as it relates to Inuit Societal Values and Inuit Knowledge (both traditional and contemporary). Inuit Qaujimaningit is rooted in the daily life of Inuit people and represents experience acquired over thousands of years of direct human contact with the environment. Inuit Qaujimajatuqangit refers to traditional values, beliefs, principles and experience regarding the environment.[24,25,26] With its emphasis on personal observation, collective experience and oral transmission over many generations, Inuit Qaujimaningit provides factual information on such matters as ecosystem function, social and economic well-being, and explanations of these facts and causal relations among them. In this regard, Inuit Qaujimaningit

[18] See for example discussions on this topic in the NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2018, pp. 151-154.
[19] See for example discussions on this topic in the NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, pp. 311-316.
[20] See for example discussions on this topic in the NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2018, pp. 74-92.
[21] See for example discussions on this topic in the NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, pp. 532-537.
[22] See for example discussions on this topic in the NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, pp. 614-618.
[23] See for example discussions on this topic in the NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, pp. 668-669.
[24] Ellis, S.C. 2005. "Meaningful Consideration? A Review of Traditional Knowledge in Environmental Decision Making." Arctic 58, 1: 66–77.
[25] QIA (Qikiqtani Inuit Association). 2009. Letter to the NIRB Re: *Draft* Guidelines for the Preparation of an Environmental Impact Statement – Baffinland Iron Mines Corporation, Mary River Project. July 31, 2009.
[26] Berkes, F. 1993. Traditional ecological knowledge in perspective. In: Inglis, J. (ed.), Traditional Ecological Knowledge: Concepts and Cases. Ottawa: Canadian Museum of Nature, pp. 1-9.

has played a significant role in this assessment by contributing to the development of accurate baseline information; comparing predictions of effects with past experience; and assisting in the assessment of the magnitude of predicted effects.

The Proponent was required to incorporate Inuit Qaujimaningit into its Final Environmental Impact Statement (FEIS), to the extent that the Proponent had access to such information and in keeping with the expectation that the Proponent would undertake appropriate due diligence to gain access to the information. However, the Board understands that the availability of such information for TMAC's use in the FEIS may be limited by obligations of confidentiality and other ethical obligations that may attach to such information, and respects where such limits have been noted. In addition to Inuit Qaujimaningit provided as part of the FEIS, Inuit Qaujimaningit was also freely shared with the Board during the Community Roundtable portion of the Final Hearing in questions or responses provided by the intervenors, Elders, Inuit harvesters and other community members. The NIRB has benefitted from the Inuit Qaujimaningit provided in the FEIS and shared by the participants at the Final Hearing and considers Inuit Qaujimaningit to play a central role in the Board's Review of the Project.

1.7. SCOPE OF THE NIRB'S ASSESSMENT

The NIRB first became engaged in the assessment of the "Phase 2 Hope Bay Belt Project" proposal (the Project) on January 12, 2012 when the NIRB received a referral to screen Hope Bay Mining Ltd.'s (HBML; *original* Proponent) Project from the Kitikmeot Inuit Association (KIA). As the Project was outside an area with an approved regional land use plan, a conformity determination from the Nunavut Planning Commission was not required pursuant to Article 12, Section 12.3.5 of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada (Nunavut Agreement)*.

The project proposal outlined the proposed project lifecycle for the development of the Phase 2 Hope Bay Belt Project. The scope of the proposed Project included the expansion of existing infrastructure at the Doris North and Roberts Bay sites as well as the development of new infrastructure at the Madrid/Patch and Boston sites to support belt-wide mining operations.

On February 24, 2012 the Board issued a Screening Decision Report with the determination that the proposed Project required further assessment that would be best facilitated through a full environmental review under Article 12, Part 5 or 6 of the *Nunavut Agreement*. The NIRB based its determination on the following concerns identified by interested parties:

- The project may have significant adverse effects on the ecosystem, wildlife habitat or Inuit harvesting activities;
- The project may have significant adverse socio-economic effects on Northerners; and
- The project will cause significant public concern.

In addition to the potential ecosystemic and socio-economic impacts identified by parties, the NIRB also identified several other important issues, which a Review of the Phase 2 Hope Bay Belt Project should take into consideration:

- Geochemical characterization of waste rock and mitigation measures for potential acid rock drainage and metal leaching;

- Proposed tailings management strategies;
- Potential cumulative effects of increasing mineral development in the Kitikmeot region;
- Availability of participant funding; and
- Announcement regarding care and maintenance at the Doris North Gold Mine.

The responsible Minister responded to the NIRB's Screening Decision Report in a letter received by the NIRB on May 30, 2012 directing the Board to undertake a review of the Project proposal pursuant to Article 12, Part 5 of the *Nunavut Agreement*.[27] In the referral to the NIRB, the responsible Minister provided specific responses to two (2) of the five (5) issues that were set out in the NIRB's Screening Decision Report as follows:

1. *Availability of participant funding* – The Minister stated that, while funding has been provided for a number of complex projects on a case-by-case basis in the past, Aboriginal Affairs and Northern Development Canada (AANDC) does not have an established participant funding program in place for environmental assessments in Nunavut. As such, he was unable to provide participant funding for the Review of the Phase 2 Hope Bay Belt project proposal. Further, the Minister agreed that effective participation is important, and expressed confidence in the ability of the NIRB's Review process to provide sufficient and meaningful opportunities for potentially affected groups to participate in the Review.

2. *Recent announcement regarding care and maintenance at Doris North* – The Minister noted that while the establishment of certainty with respect to start-up timelines of resource development projects may be difficult, he expected the review to continue as long as HBML is actively engaged in the review process and information requirements can be met.

The Minister further agreed with the NIRB's recommendation that the issues related to acid rock drainage and metal leaching, tailings management, and cumulative impacts are important and directed the Board to consider these effects in the Review of the Project.

On June 8, 2012 the NIRB distributed a preliminary scoping list for the proposed Project with these issues in mind, and from October 9 to October 23, 2012 the Board conducted public scoping information sessions in the five (5) communities of the Kitikmeot region identified by the NIRB as potentially affected by the Project. As indicated in the Board's Public Scoping Meeting Summary Report, the scoping process assisted the Board in identifying those components of the biophysical and/or socio-economic environment that may be impacted by the Project and/or for which there is public concern. Following incorporation of the comments from parties and the scoping information session, on November 9, 2012, the NIRB released the *Final* Scope guiding the Board's assessment of the Project. Although there were periods of delays during the NIRB's conduct of the Review while the Board awaited the Proponent's advancement of the Project (originally HBML and subsequently TMAC), the scope of the assessment remained as set out in the *Final* Scope in November 2012.

[27] The Honourable J. Duncan, Minister, Aboriginal Affairs and Northern Development, Decision Re: Hope Bay Mining Ltd.'s Phase 2 Hope Bay Belt Project proposal, NIRB File No. 12MN001, May 29, 2012.

1.8. NIRB'S ENVIRONMENTAL IMPACT STATEMENT GUIDELINES

On August 27, 2012 the NIRB invited parties to provide comments on the revised *Draft* Environmental Impact Statement (EIS) Guidelines for the Project. Although the Board notes that it is the sole responsibility of a Proponent of a Project under Board review to prepare an EIS that includes sufficient baseline data and analysis for a complete assessment of the anticipated impacts of the Project, the EIS Guidelines are provided by the NIRB to assist the Proponent and participants in the Review to understand the Board's information requirements and expectations for the EIS. If an EIS conforms to the EIS Guidelines, the Board and interested parties are better able to understand and assess the potential positive and negative ecosystemic and socio-economic effects likely to be associated with development of a project.

Following receipt of parties' comments on the *Draft* EIS Guidelines, the Board, on December 14, 2012, provided the Proponent with the *Final* EIS Guidelines for the Project, in accordance with Article 12, Section 12.5.2 of the *Nunavut Agreement* and after due consideration of the issues identified during the Board's Screening, the issues identified by the Minister, and the comments received during the scoping process.[28]

1.9. KEY ISSUES

Technical review comments on the Draft Environmental Impact Statement (DEIS) were filed with the NIRB during several technical comment periods and comments were also provided during associated technical meetings. The Board received additional input from parties and comments from Community Representatives during the Community Roundtable Sessions at the Pre-Hearing Conference (PHC) [29] for the Phase 2 Hope Bay Belt Project (the Project) held in June 2017. The Board identified the following key issues within its PHC Report, issued on July 21, 2017, to be addressed by TMAC (the Proponent) in the preparation of the FEIS:

- Revisions to grizzly bear and carnivore denning habitat models;
- Consideration of project infrastructure in terms of waste management, water management, and relevant mitigation and monitoring measures;
- Updates to draft management, mitigation, and monitoring plans for the proposed development;
- Further discussion and assessment of potential project impacts to caribou and caribou harvesting, mitigation, adaptive management and monitoring measures, including caribou-focused workshops with interested parties and groups in the Kitikmeot regions;
- Conduct additional studies, including encounter rate analysis and zone of influence prediction, to support cumulative effects assessment for the Dolphin and Union, Beverly and Ahiak caribou subpopulations;
- Conduct additional sampling and analysis in support of a human and ecological health risk assessment; and

[28] NIRB Guidelines for the Preparation of an Environmental Impact Statement for Hope Bay Mining Ltd.'s Phase 2 Hope Bay Belt Project, NIRB File No. 12MN001, December 14, 2012.
[29] NIRB Pre-hearing Conference Decision for the Phase 2 Hope Bay Belt Project, NIRB File No. 12MN001, July 21, 2017.

- Address areas of uncertainty in impact predictions for valued ecosystemic and socio-economic components.

At the Final Hearing, following the technical review period and TMAC's response to interested parties' final written submissions, it was noted that the following additional key issues remained the subject of discussion and resolution by parties, Intervenors and Community Representatives:

- Caribou protection measures for project road traffic and heavy equipment use;
- Impacts to marine mammals from project-related shipping;
- Predicted exceedances of nitrogen dioxide concentrations at the project site;
- Monitoring of Inuit employment at the Project; and
- Adequacy of information on the design of the proposed aboveground power transmission line.

2. PROJECT SETTING[30]

2.1. DESCRIPTION OF PROJECT LOCATION

The proposed Phase 2 Hope Bay Belt Project (the Project) as described by TMAC Resources Inc. (TMAC or the Proponent) is located at the Hope Bay Property (the Property), which is located approximately 150 kilometres (km) southwest of the Hamlet of Cambridge Bay, within the Kitikmeot region of Nunavut, and approximately 700 km northeast of Yellowknife in the Northwest Territories. The nearest settlements are Omingmaktok (Bay Chimo), located approximately 60 km to the west, and Kingaok (Bathurst Inlet), located 130 km southwest of the project site. Both Omingmaktok and Kingaok are historical settlements; the former full-time residents of these communities have moved to Cambridge Bay or other communities, although the settlements continue to be used seasonally. Along with additional infrastructure specific to the development and operation of the Phase 2 Hope Bay Belt, the proposed Project would also utilize existing infrastructure associated with the Doris North Gold Mine. The northern portion of the Property consists of several watersheds that drain into Roberts Bay, and the Koignuk River, which flows into Hope Bay, west of the Property. Watersheds in the southern portion of the Property drain into the upper Koignuk River. The entire area lies within the Bathurst Inlet-Burnside Watershed.

2.1.1 Biophysical Conditions

The proposed Phase 2 Hope Bay Belt Project area is located on the Canadian Shield, in the Slave Geological Province and extends over the Hope Bay volcanic belt surrounded by mostly granitic and sedimentary rocks. The bedrock in the local study area (LSA) is mostly composed of Precambrian mafic volcanic rocks with minor components of felsic volcanics, volcaniclastic rocks, metasedimentary rocks, and iron formations. These rocks were reported to have metamorphosed from greenschist to amphibolite-facies and intruded by granite, granodiorite, and gneiss and have predominantly volcanic lithology.

[30] Unless otherwise stated, information in this section is based on the information provided by the Proponent in the Final Environmental Impact Statement, received by the NIRB on December 21, 2018.

The soils in the area are known to have developed from morainal, organic, and glaciomarine materials which dominate the LSA and in general, coarse morainal soils occupy higher elevations. Finer glaciomarine soils and peaty organic soils are known to accumulate in valley bottoms and on plains. The topography is gently rolling with long and narrow drainage basins oriented in a north-south direction with similarly oriented rock outcroppings. The north end of the LSA (comprising the area from Roberts Bay to Wolverine Lake) is typical of coastal lowlands in the Arctic, with lakes and ponds occurring in low relief areas and ridges, cliffs, and rock outcroppings occurring in higher relief areas. The south end of the LSA, adjacent to Aimaokatalok Lake, has low to moderate surface relief and is characterized by lowlands occurring as plains and terraces, interspersed with numerous small thaw lakes. Bedrock is close to the surface with several boulder fields and areas of shattered rock. The topography of the central section of the LSA is generally subtle with large, level terraces and plains. There are numerous round thaw lakes and many wetlands in this area.

More than 870 plant species grow in the Project area, including many species of lichens, mosses, and algae. Terrestrial animals in the region include barren-ground caribou (Dolphin/Union, and Beverly herds), muskox, grizzly bear, wolverine, and grey wolves, as well as several species of raptor, waterfowl, and upland breeding birds. Four species of cliff-nesting raptors (peregrine falcon, gyrfalcon, rough-legged hawk, and golden eagle) and three ground-nesting raptor species (snowy owl, short-eared owl, and northern harrier) may live in the area. The local study area and the proposed project development area do not overlap with protected or conservation areas; however, a Territorial Park and a large bird sanctuary are located in the vicinity of the Hope Bay Project area. Known traditional burial sites and sources of carving stone and copper are located approximately 40 to 100 km west of the proposed project area.

Waterbird species occurring in the Phase 2 Hope Bay Belt Project area include geese, tundra swan, several species of ducks, gulls, Arctic tern, four species of loons, and sandhill crane. A total of fourteen fish species are found in lakes, ponds, and streams throughout the project area. The most common fish species is the ninespine stickleback, followed by lake trout, Arctic char, Arctic grayling, slimy sculpin, lake whitefish, cisco, least cisco, burbot, broad whitefish, Arctic flounder, fourhorn sculpin, Greenland cod, and starry flounder. Marine fish include saffron cod, capelin, Arctic flounder, Pacific herring, fourhorn sculpin, Arctic char, Bering wolffish, Inconnu and Greenland cod. Ringed seals are occasionally sighted in Roberts Bay.

2.1.2 Socio-economic Conditions

The Kitikmeot region is the smallest of Nunavut's three regional areas and represents 18.2% of Nunavut's population. There has been an increase in regional population of about 10% between each census period from 2001 to 2016. Overall, the Kitikmeot region has grown by 35.9% over the 15-year period. From 2001 to 2016, the Inuit population has increased by 36.9% while the non-Inuit population increased by 31.3%. The largest population increases in the Kitikmeot region were in Kugaaruk (54.2%) and Taloyoak (42.9%), while the populations in Cambridge Bay, Kugluktuk and Gjoa Haven increased by 35.9%, 34.9%, and 23.0%, respectively. In 2016, Cambridge Bay was the largest community (1,766) and Kugaaruk was smallest (933).

Each Kitikmeot community has kindergarten, elementary, and secondary schools. The larger communities have separate secondary and elementary schools (i.e., Cambridge Bay, Kugluktuk,

and Gjoa Haven), while the smaller communities (i.e., Taloyoak and Kugaaruk) have a single school for all grade levels. Increases in educational attainment in the Kitikmeot region was evident in 2016 as the regional rate of individuals aged 25 to 64 without high school or other credentials declined from 62% in 2011 to 45% in 2016. Cambridge Bay has continued to have higher levels of educational attainment, as only 36% of its residents (aged 25 to 64) were without high school or other certificates/diplomas (an improvement from 38% in 2011). Kugluktuk was slightly higher at 45%, while Gjoa Haven and Taloyoak continued to have a higher proportion of residents without high school or other credentials at 64% and 54%, respectively. School attendance rates are generally low across the territory (i.e., about 70% in 2014), and have been reported to have declined to about 58% in the Kitikmeot region. For the 2016/17 school year, the number of high school graduates varied by community: four (4) in Taloyoak, seven (7) in Gjoa Haven, eight (8) in both Kugluktuk and Kugaaruk, and eleven (11) in Cambridge Bay.

The Kitikmeot region has a mixed economy, focused on public sector services, private sector, and traditional activities. The service sector is the base of the Kitikmeot economy, providing employment to around 84% of the employed labour force. Traditional economic activities are of great importance in the Kitikmeot communities, particularly among Inuit residents. The traditional (or subsistence) economy includes non-commercial hunting, fishing, trapping, and gathering. It also includes the transformation of harvested products into useful products such as clothing, tools, or arts and crafts. The Government of Nunavut (GN) is a prominent employer in the Kitikmeot region, dominates the service sector, and is a major economic driver. Cambridge Bay is the largest and most diversified economy and is the business and employment hub for the Kitikmeot region. Other communities have relatively few private sector businesses and more limited employment opportunities. The employment opportunities available in the Region are centered on providing the essential services required by the community.

2.2. PROJECT DESCRIPTION

The Phase 2 Hope Bay Belt Project (the Project) involves the proposed underground and above ground mining of three gold deposits located at the Hope Bay property, approximately 150 kilometres (km) southwest of Cambridge Bay in the Western Kitikmeot, Nunavut, and approximately 700 km northeast of Yellowknife. TMAC Resources Inc. (TMAC or the Proponent) proposes the development of the Phase 2 Hope Bay Belt Project to mine three gold deposits in the Hope Bay property as part of a proposed long-term mining operation in the Canadian Arctic that provides sustained economic stability and benefits to the Kitikmeot region. The Project would include mining for gold at the Madrid North, Madrid South and Boston mineral deposits in the approximately 1,600 square-kilometre Hope Bay Greenstone Belt. The total mineral reserves at the Madrid North, Madrid South, and Boston sites, based on a cut-off grade of 4.5 grams per tonne, is estimated to be approximately 4.8 million ounces of gold.

Most of the ore would be mined by underground mining methods; however, portions of the ore near the surface would be recovered by surface mining methods (Crown Pillar Recovery). As part of the mining activities for the Project, the Proponent would use and expand specific infrastructure at the Doris North site and the Roberts Bay site in addition to the construction and operation of new infrastructure at the Madrid and Boston sites. Development of the Project would require the following facilities and activities:

- Underground mine workings;
- Surface mining (Crown Pillar Recovery);
- Ore, waste rock pads and laydown areas;
- Ore processing facilities;
- Quarries;
- Tailings management facilities;
- Site water management infrastructure;
- Infrastructure to support land, air and marine transport;
- On-site accommodations;
- Shipping to and from site of supplies via barge, and personnel, and gold bars by aircraft;
- Shipping of fuel to the Project site via tanker vessels;
- Sealifting or airlifting of all hazardous waste generated at the Project site;
- Bulk fuel storage;
- Explosives storage;
- Other mine support facilities; and
- Decommissioning and closure.

The project workforce would work at the mines on a fly-in/fly-out rotation. The maximum workforce at the project site would be 870, with 400 personnel housed at an expanded camp at the existing Doris North site and 300 personnel housed at the camp that would be developed at the Boston site. The proposed life of the Project, from mobilization and construction to operation, closure and post-closure, would be 19 years.

2.2.1 Need for the Project

The proposed Phase 2 Hope Bay Belt Project would focus on mining of the Madrid North, Madrid South, and Boston deposits by utilizing and expanding upon some of the existing Doris North Gold Mine Project infrastructure for the integrated development of the Hope Bay Belt. The proposed Project would provide a unique opportunity to develop the well-established Hope Bay gold deposits into a long-term mining operation in the Canadian Arctic in order to provide sustained economic stability and benefits to the Kitikmeot region. The Proponent proposes to enhance the socio-economic benefits of the Project through efforts to hire (and train, where necessary) residents of the Kitikmeot region. Employment and business benefits would be established in an Inuit Impact and Benefit Agreement (IIBA) between TMAC and the Kitikmeot Inuit Association (KIA). Over the total life-of-mine, the Project would generate an estimated 11,764 person-years of direct employment across Canada, including direct employment associated with construction activities and direct employment associated with mine operations. Direct employment will begin with an estimated 175 full-time equivalent workers in Year 1, increasing to a maximum of 1,287 by Year 10, then decreasing to a low of 281 during the final year of operations.

TMAC believes that the Project is a viable project and should provide benefits to a variety of stakeholders, including the KIA and the Nunavut Tunngavik Inc. (NTI). The Hope Bay Property represents significant mineral exploration potential, and the Hope Bay Project assets are well

advanced. TMAC indicated that, in its view, the potential risks have been significantly diminished through the use of existing on-site infrastructure. The Proponent noted that the development plan has been designed to minimize capital investment and build on the existing assets to generate cash flow that can sustain expansion and exploration. TMAC stated that the predicted benefits of the Project to local communities would include employment and economic benefits that support both the lifestyles and pursuits of Inuit, while providing the opportunity of continuing the integration of wage-based employment into the communities of the Kitikmeot.

2.2.2 Project Components and Activities

The scope of the project proposal includes all physical works, activities, and/or undertakings as scoped by the Nunavut Impact Review Board (NIRB) on November 9, 2012 for the Phase 2 Hope Bay Belt Project (the Project) and as updated within the Final Environmental Impact Statement, and encompasses the entire project life.

a) Doris North Site

Facilities and activities proposed include (see Figure 2 for Doris North Site Layout):

- expansion of accommodations (400-person capacity);
- increasing the capacity for sub-aerial deposition at the existing Doris Tailings Impoundment Area to 18 million tonnes by raising the existing south dam by eight (8) metres (m) and constructing a five (5) m high west dam to support belt-wide activities associated with the Project;
- increases to the volume of water used for domestic and industrial purposes from Windy Lake and Doris Lake, respectively;
- construction of a Windy Lake North freshwater intake;
- construction of two (2) wind turbines;
- upgrading the existing all-weather road between Doris North and Madrid North sites; and
- use of other existing facilities at the Doris North site, including the 7.5 million litre (ML) fuel storage facility and explosives magazines; waste rock and ore storage facilities and laydown area, solid waste management facilities and water management infrastructure (including contact water ponds and water treatment facilities), site roads and airstrip, and explosives storage facilities.

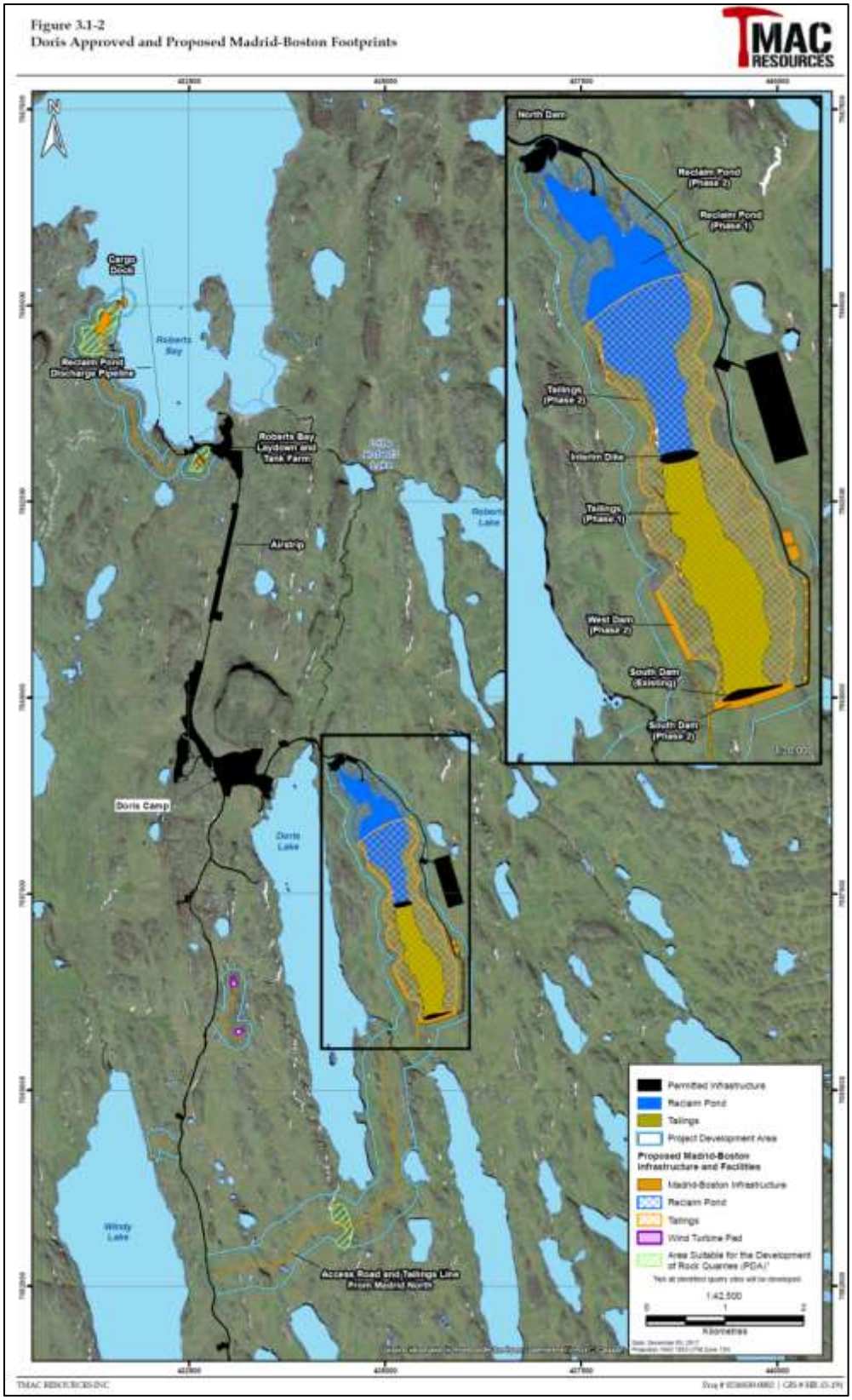

Figure 2: Doris North Site Layout (*adapted from the Phase 2 Hope Bay Belt Project Final Environmental Impact Statement, Volume 3*)

b) Madrid North Site

Facilities and activities proposed for Madrid North include (see Figure 3 for Madrid North Site Layout):

- underground mining and surface mining (crown pillar recovery) to access the ore deposits at Madrid North;
- construction of a 1,200 tonne-per-day (tpd) concentrator;
- incremental expansion of surface infrastructure at Madrid North to accommodate production mining, including laydown areas;
- construction of two (2) wind turbines;
- hauling of concentrate and excess mined ore to the existing processing plant at Doris North for gold extraction;
- storage of ore and waste rock on dedicated pads;
- construction and operation of site roads and an all-weather access road and tailings pipeline from Madrid North to the south end of the Doris North Tailings Impoundment Area;
- establishment of quarries for construction and for use as backfill material;
- trucking of domestic waste to existing waste management facilities at the Doris North site;
- construction and operation of site water management infrastructure (including contact water ponds);
- construction of maintenance facilities and other buildings necessary to support mining activities;
- construction of a bulk fuel storage facility (4.5 ML capacity);
- construction of other infrastructure necessary to support ongoing exploration activities, including helipads;
- water use for domestic and industrial purposes from Windy Lake and Doris Lake, respectively; and
- installation and operation of three (3) 1.2 megawatt (MW) power plants and a standby/emergency plant.

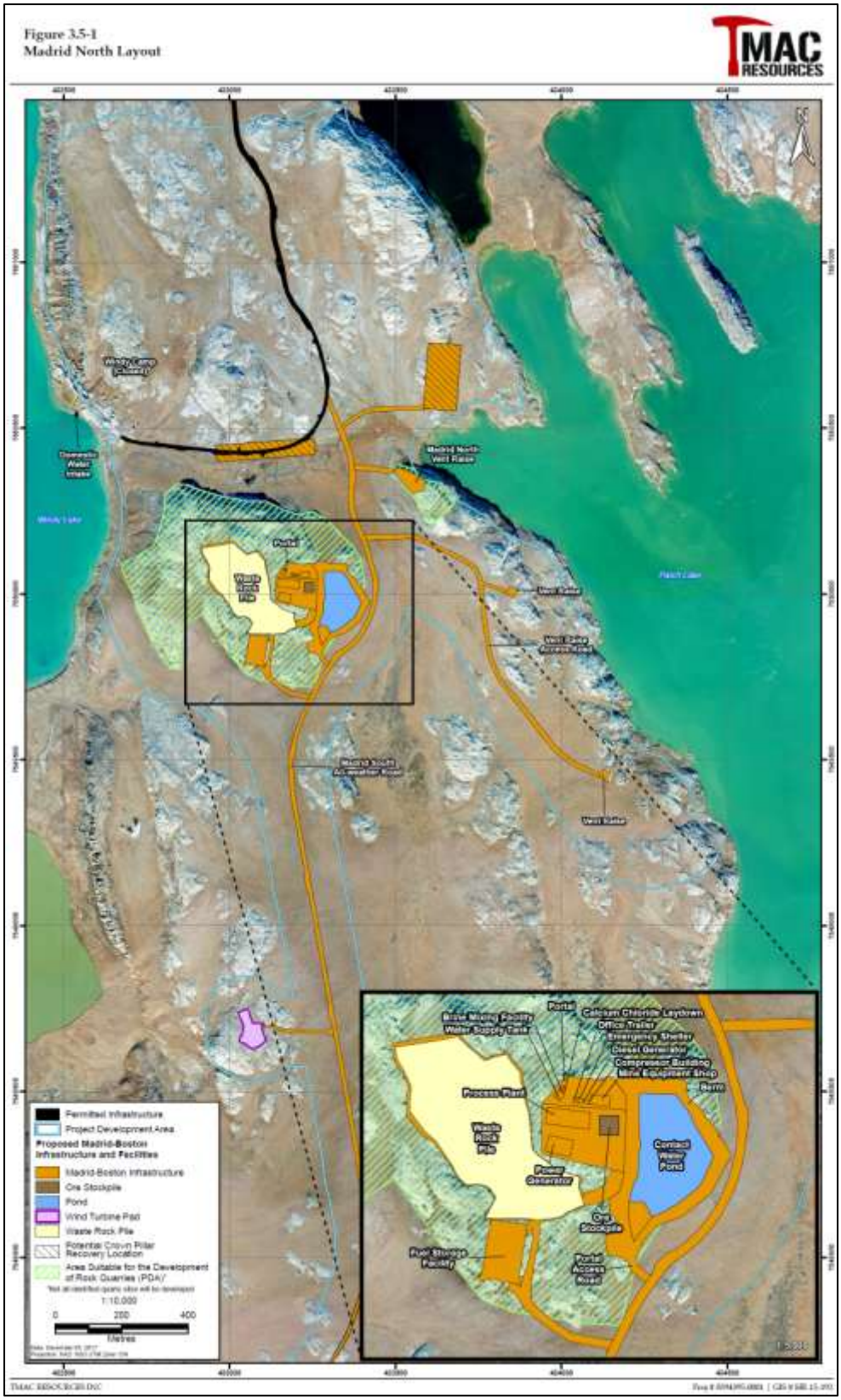

Figure 3: Madrid North Site Layout (*adapted from the Phase 2 Hope Bay Belt Project Final Environmental Impact Statement, Volume 3*)

(c) Madrid South Site

Facilities and activities proposed for Madrid South include (see Figure 4 for Madrid South Site Layout):

- underground mining and surface mining (crown pillar recovery) to access ore deposits at Madrid South;
- construction and operation of site roads and a 4.7 km extension of the Doris-Windy all-weather road to the Madrid South site;
- haulage of mined ore for processing at the Madrid North plant and the existing Doris North processing plant;
- establishment of quarries for construction and for use as backfill material;
- incremental expansion of surface infrastructure, including laydown areas, at Madrid South to accommodate production mining;
- storage of ore and waste rock on dedicated pads;
- construction of maintenance facilities and other buildings necessary to support mining activities;
- construction and operation of site water management infrastructure, including contact water ponds;
- water use for domestic and industrial purposes from Windy Lake and Doris Lake, respectively;
- trucking of domestic waste to existing waste management facilities at the Doris North site; and
- installation and operation of two (2) 725 kilowatt power plants and a standby/emergency plant.

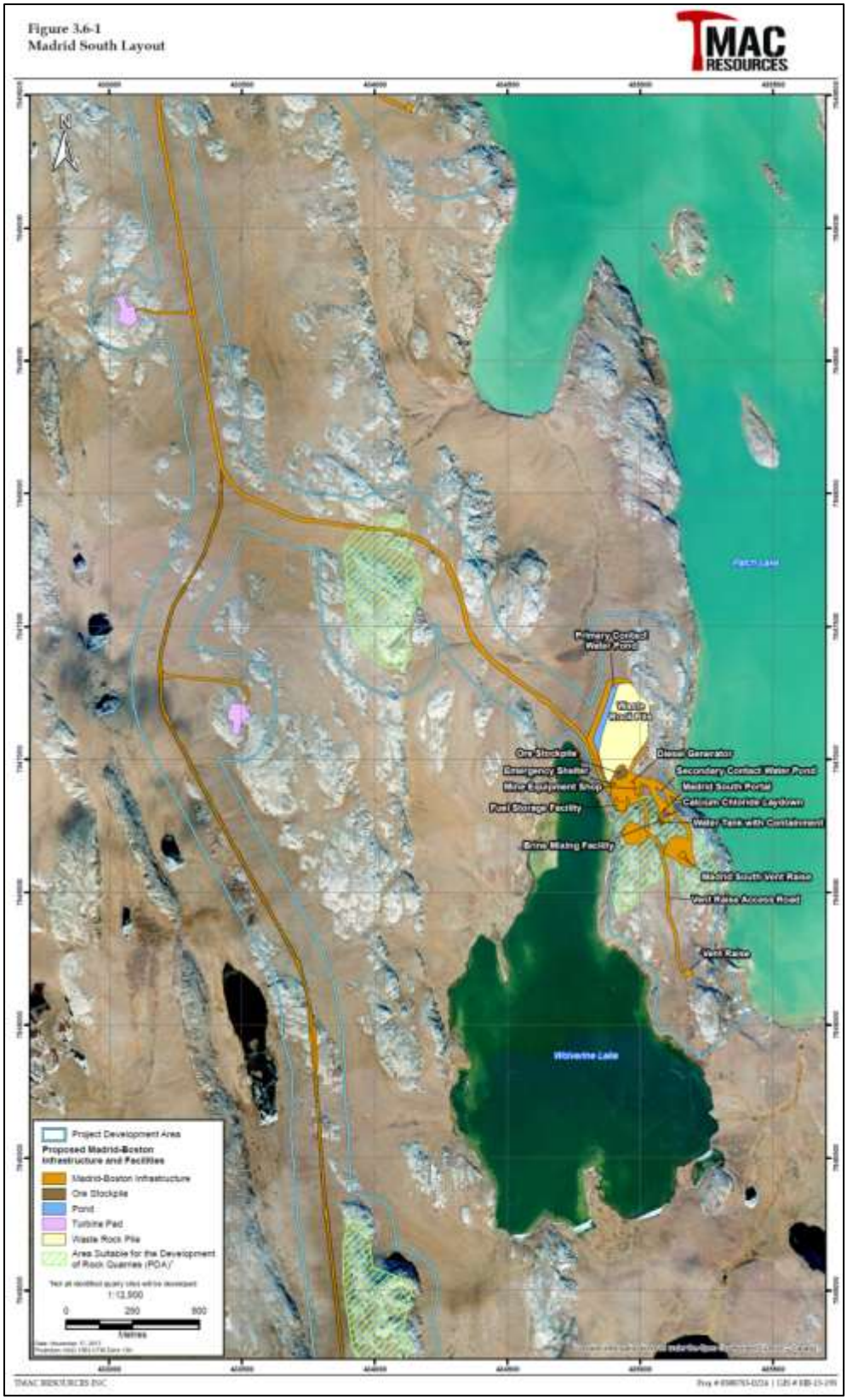

Figure 4: Madrid South Site Layout (*adapted from the Phase 2 Hope Bay Belt Project Final Environmental Impact Statement, Volume 3*)

(d) Boston Site

Facilities and activities proposed for Boston include (see Figure 5 for Boston Site Layout):

- underground mining and surface mining (crown pillar recovery) to access ore deposits at Boston;
- storage of ore and waste rock on dedicated pads;
- construction and operation of site access and haul roads and quarry sites;
- haulage of mined ore to a new 2,400 tpd processing plant at the Boston site;
- haulage of some ore and concentrate to the existing plant at Doris North for processing and gold extraction;
- construction and operation of a dry-stack Tailings Management Area (storage capacity of 5.1 million tonnes);
- construction of all infrastructure necessary to support mining and processing activities at Boston, including construction of a new accommodation (300 person-capacity) facility and associated support facilities (sewage treatment, incinerator, water supply), ore and waste rock pads, explosives storage facility, reagent pad, laydown area, and maintenance facilities;
- construction and operation of site water management infrastructure, including contact water ponds;
- construction of two (2) wind turbines;
- construction and operation of a power plant and a 7.5 ML fuel tank farm;
- construction and operation of a two (2) km all-weather airstrip;
- water use for domestic and industrial purposes from Aimaokatalok Lake;
- establishment and operation of a wastewater treatment plant with a discharge outfall to Aimaokatalok Lake;
- construction and operation of solid waste management facilities;
- construction of other infrastructure necessary to support ongoing exploration activities, including helipads; and
- installation and operation of eight (8) 1.2 MW power plants and a standby/emergency plant.

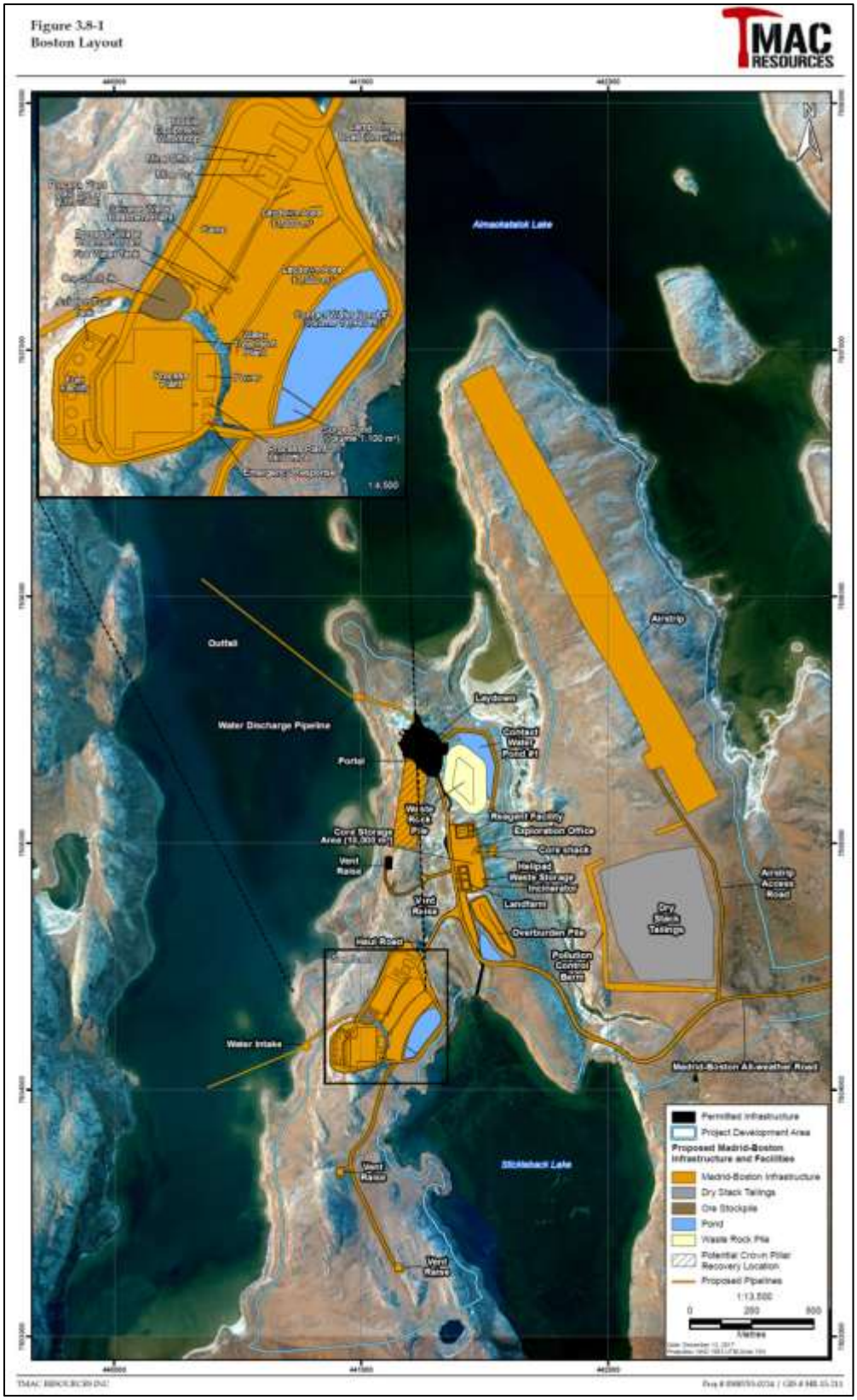

Figure 5: Boston Site Layout (*adapted from the Phase 2 Hope Bay Belt Project Final Environmental Impact Statement, Volume 3*)

(e) Madrid-Boston All-Weather Road

Facilities and activities proposed include: construction and operation of a new 55 km single lane Madrid-Boston all-weather road, including turnouts, and stream and wildlife crossings; and establishment of quarries in proximity to the road alignment to support road construction and maintenance (see Figure 6 for Madrid-Boston All-Weather Road Alignment).

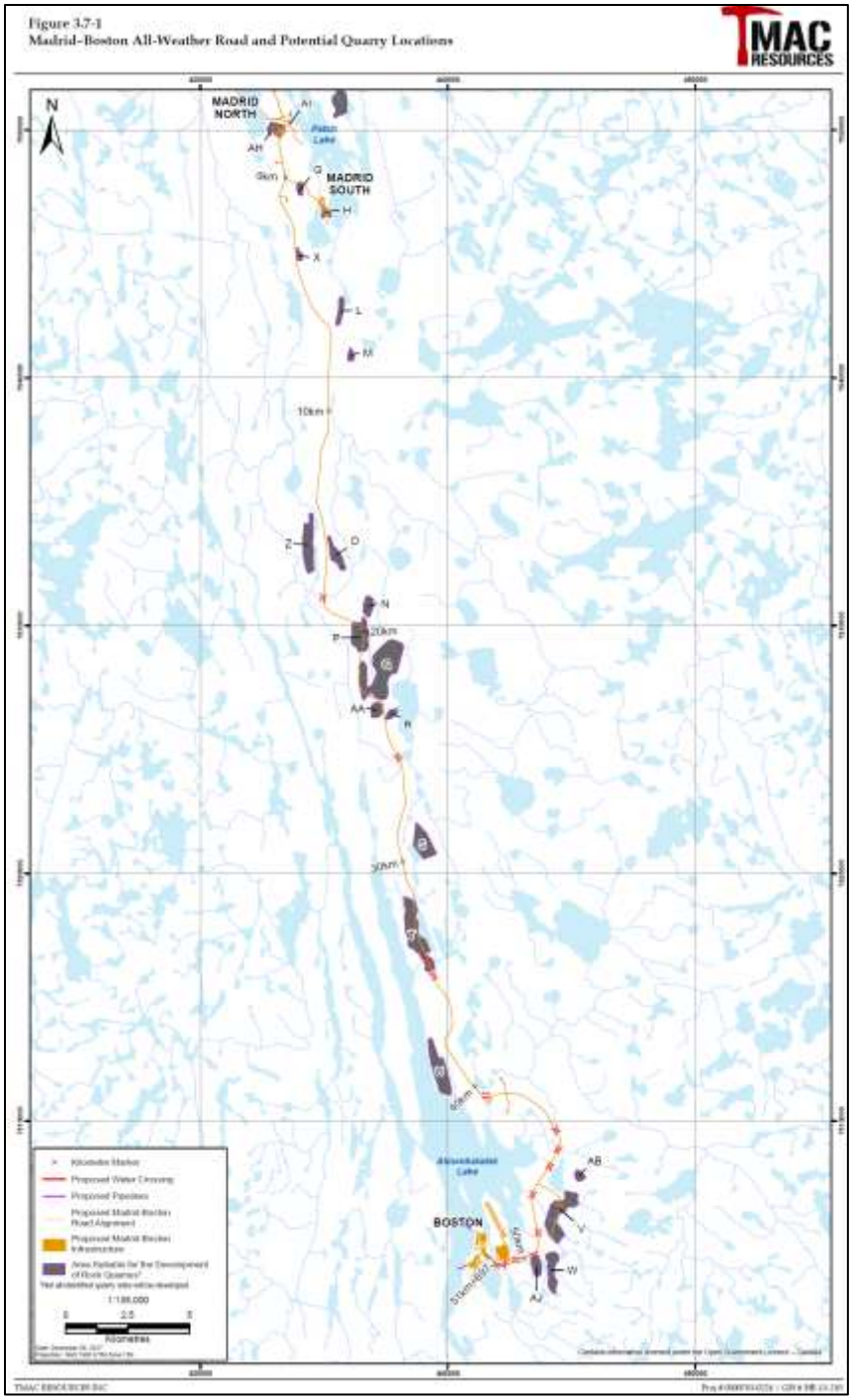

Figure 6: Madrid-Boston All-Weather Road Alignment (*adapted from the Phase 2 Hope Bay Belt Project Final Environmental Impact Statement, Volume 3*)

(f) Roberts Bay Site

Facilities and activities proposed include: construction and operation of an off-loading cargo dock, laydown area, and a twenty (20) ML diesel tank farm; use of existing marine infrastructure in Roberts Bay; extension of service and access roads to the new cargo dock; and annual marine shipment of fuel and other project supplies to Roberts Bay during open water season only (see Figure 7 for Roberts Bay Site Layout).

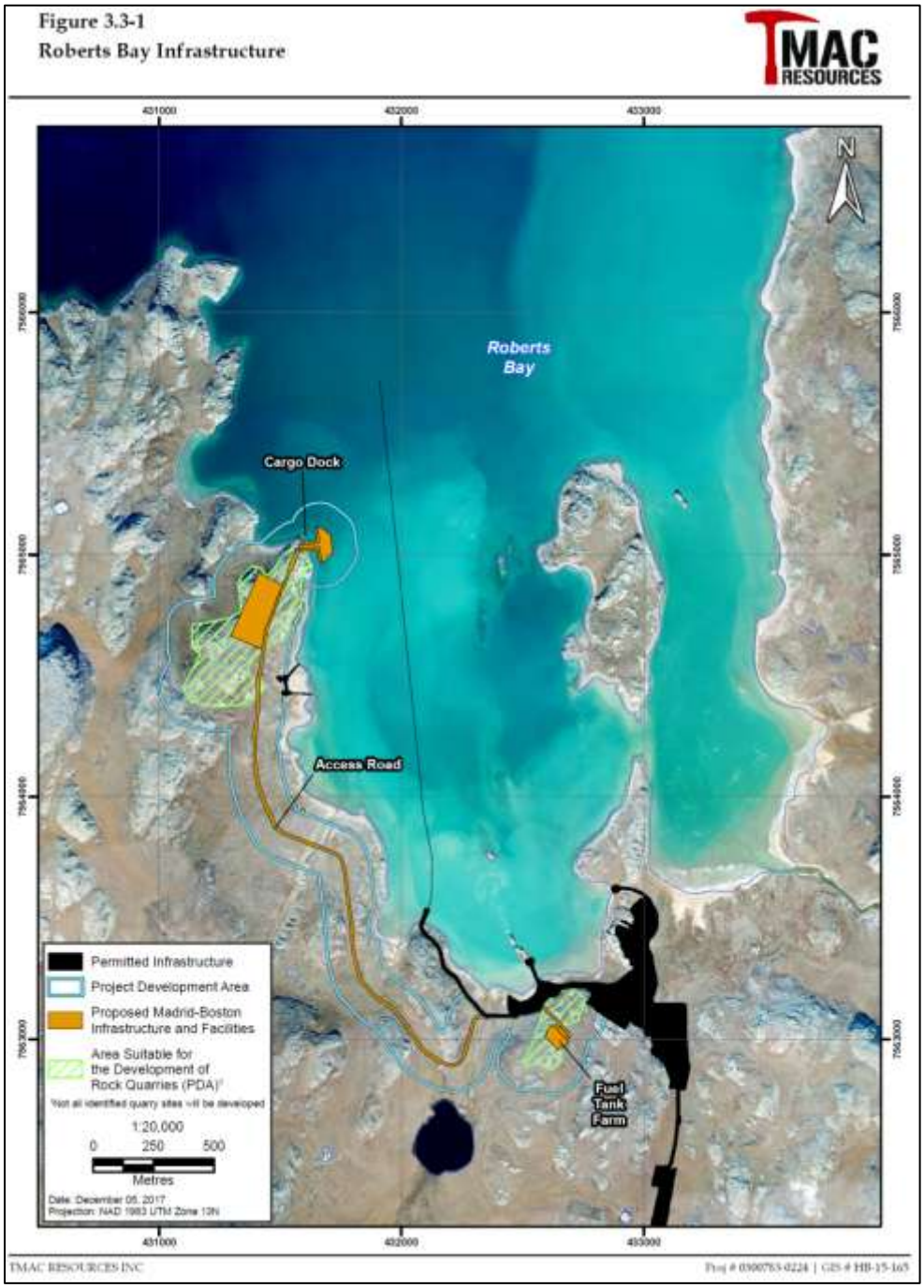

Figure 7: Roberts Bay Site Layout (*adapted from the Phase 2 Hope Bay Belt Project Final Environmental Impact Statement, Volume 3*)

(g) Closure

The Proponent intends to progressively reclaim areas within the project footprint that are no longer required for mining-related activities during the construction or operations phases. The proposed Project includes three (3) closure scenarios: short-term temporary closure (less than 1 year); long-term temporary closure (more than 1 year); and final closure.

Final closure activities proposed include: backfilling of underground workings and crown pillar recovery trenches, and sealing mine portals; dismantling or demolition of buildings on site; measures to ensure physical stability of the project site, including closure of tailings management facilities, and reclamation of any remaining surface structures such as roads, pads, and stream crossings; measures to ensure the chemical stability of the mine and other disturbed areas within the project footprint; and monitoring the environmental performance of the Project post-closure.

2.2.3 Linkage between the Project Proposal and Previously Assessed Project Proposals

TMAC plans to achieve continuous mine operation at the Hope Bay Property through mining at Doris (the approved and existing Phase 1 project at the Hope Bay Property), followed by the commercial mining of the Madrid North, Madrid South and Boston deposits. This staged approach will apply across construction, operations, reclamation and closure, and post-closure phases. The Phase 1 (Doris North Gold Mine) Project has already established infrastructure at Roberts Bay and the Doris North sites including accommodations (with capacity for up to 280 people); an operating underground mine with ore and waste rock storage areas, an all-weather airstrip, a tailings impoundment area (TIA), fuel storage facilities at Roberts Bay and Doris North, a process plant, and all associated infrastructure required for the mining operation. The proposed Phase 2 Hope Bay Belt Project (the Project) construction and operation activities would overlap with the Phase 1 operation activities at the Doris North Gold Mine site. The proximity of the Madrid area to the Doris North site, including the existing process plant and TIA would create the opportunity for the Project to utilize existing infrastructure at Doris North, and will reduce costs, minimize the footprint, and reduce the time required to develop the Madrid deposits, and support development of the Boston site. The already-permitted or approved infrastructure and facilities at Roberts Bay and the Doris North sites have sufficient capacity to support the proposed construction of the Phase 2 Hope Bay Belt Project.

2.2.4 Project Phases

The Phase 2 Hope Bay Belt Project (the Project) would integrate components and activities of the four (4) sites (Doris North and Roberts Bay; Madrid North; Madrid South; and Boston) over the life of the mine. TMAC proposes to develop the Project in overlapping phases from 2019, with a five-year construction phase (Year 1 to Year 5), a 14-year operations phase (Year 1 to Year 14), a six-year closure phase (Year 12 to Year 17), and a six-year post-closure phase (Year 14 to Year 19).

The planned sequence of mineral production activities for the Madrid North, Madrid South, and Boston sites are:

- Commence mining at Madrid North in Year 1 (2019) and continue to Year 13 (2031), with ore processing at the Doris North and Madrid North process plants;

- Commence mining at Boston in Year 4 (2022) and continue to Year 11 (2029), with ore processing at the Doris North site in Years 4, 5 and 6, and at the Boston process plant from Year 5 to Year 11; and
- Commence mining at Madrid South in Year 11 (2029) and continue to Year 14 (2032), with ore processing at the Doris North and Madrid North sites.

The proposed life of the Project, from mobilization and construction to operations, closure and post-closure, would be 19 years.

3. PROCEDURAL HISTORY OF THE PROJECT PROPOSAL

Table 1 below provides a brief summary of the key procedural steps associated with the Nunavut Impact Review Board's (NIRB or Board) assessment of the Phase 2 Hope Bay Belt Project (the Project) under Article 12, Part 5 of the *Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada* (*Nunavut Agreement*), and the Nunavut Water Board's (NWB) consideration of the associated Type "A" water licence applications in a NIRB/NWB coordinated process. The procedural steps commenced with a referral to screen the Project from the Kitikmeot Inuit Association (KIA) received by the NIRB on January 12, 2012, advanced to the NIRB Pre-hearing Conference (PHC) held in Cambridge Bay on June 16, 2017 and continuing through to the completion of the NIRB's Final Hearing held in Cambridge Bay on May 8-12, 2018.

Table 1 also identifies key milestones, opportunities for public participation, and involvement of parties throughout the NIRB/NWB coordinated processes and associated timelines. Please refer to Appendix A for a record of proceedings for the Final Hearing, Appendix B for a list commitments provided during the Final Hearing, Appendix C for a list of exhibits presented at the Final Hearing and Appendix D for a list of Acronyms and Abbreviations.

3.1. LAND USE PLANNING REQUIREMENTS

As the proposed Phase 2 Hope Bay Belt Project was outside an area with an approved regional land use plan, a conformity determination from the Nunavut Planning Commission was not required for the Project pursuant to Article 12, Section 12.3.5 of the *Nunavut Agreement*.

3.2. PROCEDURAL HISTORY OF THE NIRB ASSESSMENT OF THE PROJECT PROPOSAL

The key procedural steps that have been taken by the NIRB during the consideration of the Draft and Final Environmental Impact Statement are set out in Table 1 that follows. In particular, the NIRB wishes to highlight and provide more detail regarding important procedural developments leading up to the Final Hearing.

On December 8, 2011 the NIRB received the Phase 2 Hope Bay Belt Project (the Project) from Hope Bay Mining Ltd., and on January 12, 2012 the Board received a referral to screen the Project from the Kitikmeot Inuit Association (KIA). The Board subsequently conducted a screening of the Project pursuant to the *Nunavut Agreement*, Article 12, Part 4, and

recommended to then-Minister of Aboriginal Affairs and Northern Development (*now* referred to as the Minister of Crown-Indigenous Relations and Northern Affairs (CIRNA) for the Department of Indigenous and Northern Affairs Canada (INAC) that the Project undergo a Review pursuant to the *Nunavut Agreement*, Article 12, Part 5 or 6. The NIRB's recommendation to undertake further assessment via a Review under Article 12 of the Nunavut Agreement was accepted by the Minister on May 30, 2012. In 2013, the ownership of the existing Doris North Project and associated assets, including the mineral deposits and infrastructure included within the scope of the proposed Phase 2 Hope Bay Belt Project, was transferred from Hope Bay Mining Ltd. to TMAC Resources Inc. (TMAC or the Proponent). Subsequently, on December 28, 2016 the NIRB received a Draft Environmental Impact Statement (DEIS) for the Project from TMAC and, after confirming conformity of the DEIS to the project-specific Environmental Impact Statement (EIS) Guidelines issued by the Board, commenced the Technical Review of the Project. As part of the Review of the Project, the NIRB conducted consultation sessions in potentially impacted communities in the Kitikmeot region in February and March 2017, and hosted a Technical Meeting and Pre-hearing Conference (PHC) in Cambridge Bay in June 2017.

On December 21, 2017 the NIRB received TMAC's Final Environmental Impact Statement (FEIS) for the Project, and on January 17, 2018 the Board confirmed that the FEIS was in compliance with the NIRB's EIS Guidelines and PHC Decision for the Project, and commenced the 60-day technical review period. On March 19, 2018 the NIRB received final written submissions from parties, and on April 4, 2018 TMAC provided its response to parties' final written submissions to the Board. From May 8 to May 12, 2018 the NIRB hosted a Final Hearing, including a Community Roundtable, in Cambridge Bay with participation of intervenors, community representatives from all seven (7) communities in the Kitikmeot region, Cambridge Bay, Kugluktuk, Gjoa Haven, Taloyoak, Kugaaruk, including the two (2) seasonal communities in the region, Omingmaktok (Bay Chimo) and Kingaok (Bathurst Inlet), and the general public.

Unfortunately, due to flight cancellations and other travel issues, the Board's Chairperson and a second Board Member travelling from the Qikiqtani Region were unable to reach Cambridge Bay in time for the start of the Final Hearing. As only three members of the Board were able to attend the Final Hearing, the Board would not have had quorum to conduct the Final Hearing as a full Board (quorum requires a minimum of five members). Consequently, the full Board met by teleconference in advance of the Final Hearing to delegate decision-making for the file to the three member TMAC Phase 2 Hope Bay Belt Panel (the Panel). As required under Article 12, Section 12.2.14, the Panel consisted of a Chairperson for the Panel, Allen Maghagak and Philip (Omingmakyok) Kadlun, the government-nominated Panel Member and Henry Ohokannoak, the nominee of the Designated Inuit Organization. As the full Board delegated the power to the Panel to complete the decision-making for the file, the Panel Members conducted the Final Hearing and were responsible for issuing this decision and providing the recommendations included in this Final Hearing Report on behalf of the full Board.

As this summary is not exhaustive, parties wishing to develop a more complete understanding of the activities associated with the NIRB's' assessment for this project proposal are encouraged to

consult the complete listing of all associated documentation available from the NIRB's online public registry at www.nirb.ca/project/124148.

Table 1: Procedural History

Assessment Step	Party	Timeline	Process Step	Notes[a]
	Hope Bay Mining Ltd. (HBML)	**December 8, 2011**	The NIRB receives the "Phase 2 Hope Bay Belt" project proposal (the Project) directly from HBML	On December 12, 2011 the NIRB (or Board) noted that the application was pending a referral from an authorizing agency. HBML's also included an application for a Type "A" Water Licence.
SCREENING	**Kitikmeot Inuit Association (KIA)**	**January 12, 2012**	The NIRB receives a referral to screen the project proposal from the KIA.	The Proposed Project was outside the area of an applicable regional land use plan; hence, a Conformity Determination by the Nunavut Planning Commission was not required.
	NIRB	**January 19, 2012**	The NIRB issues correspondence on public engagement and comment request on assessment process	Correspondence requested that parties provide comments regarding the project proposal.
	Public/Parties	**February 9, 2012**	Comments received by the NIRB on assessment process	Comments received from: KIA, Government of Nunavut – Executive and Intergovernmental Affairs, Transport Canada (TC), Fisheries and Oceans Canada (DFO), and Environment Canada (EC).
	NIRB	**February 22, 2012**	Ministerial extension request	NIRB requested for an extension of the timeline for the screening of the Project due to limited Board Member availability.
	NIRB	**February 24, 2012**	Screening Decision Report to the responsible Minister	Project recommended for Review under Article 12, Part 5 or 6 of the *Nunavut Agreement*
	NIRB	**March 28, 2012**	Addendum to Screening Decision Report to the Responsible Minister	The NIRB issued a summary of comments on the Project submitted by Aboriginal Affairs and Northern Development Canada (AANDC) as comments from AANDC were not included in the February 24, 2012 Screening Decision Report due to an internal server error.

Assessment Step	Party	Timeline	Process Step	Notes[a]
	HBML	**May 7, 2012**	NIRB's assessment of the Project	HBML noted in correspondence to the NIRB that although it had made a decision to place the Doris North Project into care and maintenance and to suspend development of the Phase 2 Hope Bay Belt Project (correspondence to the NIRB on January 31, 2012), it was requesting that the NIRB continue to process the Project Proposal up to the issuance of Environmental Impact Statement (EIS) Guidelines.
	Responsible Minister of Aboriginal Affairs and Northern Development	**May 30, 2012**	Responsible Minister issues decision in support of the NIRB's recommendation	Project referred to the NIRB for a Review under Part 5, Article 12 of the *Nunavut Agreement*. The Minister of Aboriginal Affairs and Northern Development also provided direction on some issues to be considered in the Review.
REVIEW	**NIRB**	**May 31, 2012**	Minister's decision distributed and Review commences	
	HBML	**June 8, 2012**	NIRB/Nunavut Water Board (NWB) Coordinated Process	HBML noted in correspondence to the NIRB that it did not wish to proceed with a NIRB/NWB coordinated process in the assessment of the Project.
Scoping and EIS Guidelines	**NIRB**	**June 8, 2012**	*Draft* Scope for the Project released for comments	
	Public/Parties	**August 17, 2012**	Comments received on *Draft* Scope of assessment for the NIRB's Review of the Project	Comments received from: KIA, DFO, EC, Natural Resources Canada (NRCan), TC, Aboriginal Affairs and Northern Development Canada, and Government of Nunavut (GN)
	NIRB	**August 27, 2012**	*Revised Draft* Scope and *Draft* EIS Guidelines released for comments	
	Public/Parties	**October 4, 2012**	Comments received on *Revised Draft* Scope and *Draft* EIS Guidelines	Comments received from: KIA, GN, AANDC, DFO, EC, NRCan, and TC.
	NIRB	**October 9-23, 2012**	Public Scoping Meetings	Public scoping meetings held in the five Kitikmeot communities (i.e. Kugluktuk, Cambridge Bay, Gjoa Haven, Taloyoak, and Kugaaruk), with participation of seasonal residents of Bay Chimo and Bathurst Inlet.

Assessment Step	Party	Timeline	Process Step	Notes[a]
	NIRB	**November 9, 2012**	*Final* Scope and *Revised Draft* EIS Guidelines distributed to interested parties	
	NIRB	**November 16, 2012**	Release of Scoping Summary Report	
	Public/Parties	**November 30, 2012**	Comments received on the *Revised* EIS Guidelines	Comments received from: KIA, GN, AANDC, DFO, EC, NRCan, and TC.
	NIRB	**December 14, 2012**	*Final* EIS Guidelines for the Project issued to HBML and suspension of the Review of the Project.	NIRB subsequently distributed the *Final* EIS Guidelines for the Project to other parties on December 17, 2012. The NIRB suspended its Review of the Project, as requested by HBML in correspondence to the Board on May 7, 2012.
	HBML	**March 18, 2013**	Notification of Change in Project Ownership	HBML informed the Board about change of ownership of the Hope Bay Gold Project, including the Phase 2 Hope Bay Belt Project, to TMAC Resources Inc.
Exception from the Review	**TMAC Resources Inc. (TMAC; Proponent)**	**December 31, 2014**	Application pursuant to Section 12.10.2(b) of the *Nunavut Agreement*	TMAC submitted its "Madrid Advanced Exploration Program" project proposal to the NIRB for consideration of an exception from the Board's ongoing Review of the Project to allow specific exploration and/or development activities to proceed.
	NIRB	**June 24, 2016**	Release of NIRB's Determination Report regarding the "Madrid Advanced Exploration Program" project proposal	The NIRB approved the "Madrid Advanced Exploration Program" project proposal to proceed prior to completion of the Review pursuant to Section 12.10.2(b) of the *Nunavut Agreement*. The Board also noted that the approval of the proposal was subject to the implementation of the Board's recommendations as set out in the Determination Report
	TMAC	**August 26, 2016**	Expected date for submission of the Draft EIS (DEIS) for the Project	TMAC confirmed to the Board that it plans to submit the DEIS for the Project in December 2016. This correspondence was preceded by periodic updates to the NIRB on timing for submission of a DEIS for the Project.
Submission of DEIS	**NIRB & NWB**	**December 28, 2016**	Receipt of TMAC's DEIS and Draft Type "A" Water Licence Application for the Project	NIRB issued correspondence that noted TMAC's submission of DEIS and intention to continue the assessment as coordinated between the NIRB and NWB.

Assessment Step	Party	Timeline	Process Step	Notes[a]
Conformity and Information Requests	**NIRB**	**January 18, 2017**	Commencement of NIRB's technical review period	NIRB issued correspondence accepting TMAC's submission as a DEIS and commenced the technical review with a 30-day information request (IR) period related to the DEIS and Draft Water Licence Application. Correspondence further requested clarification from TMAC on the level of coordination it was seeking in the Review of the Project.
	NWB	**February 10, 2017**	Phase 2 Hope Bay Belt Project File Status Request	NWB issued correspondence requesting TMAC provide clarification on the level of coordination for the assessment of the Project and clarified that as the water licence application was a draft only, any IRs received related to the water licence application would be considered preliminary IRs.
	TMAC	**February 16, 2017**	Clarification on level of NIRB/NWB Coordination Request	Correspondence to the NIRB and NWB provided clarification on the level of coordination TMAC was seeking for the Review of the Project.
	Public/Parties	**February 24, 2017**	Submission of IRs by parties to the NIRB	IRs received from: KIA, GN, Environment and Climate Change Canada (ECCC), DFO, Health Canada (HC), Indigenous and Northern Affairs Canada (INAC), NRCan, and TC.
	NIRB	**February 27, 2017**	IRs distributed to appropriate parties	IRs sent to TMAC.
Community Consultation	**NIRB**	**February 27 – March 22, 2017**	Community Information Sessions	Meetings held in the Kitikmeot communities of Kugluktuk, Cambridge Bay, Gjoa Haven, Taloyoak, and Kugaaruk. Seasonal residents of Bay Chimo and Bathurst Inlet were provided an opportunity to participate in the community information sessions in either Cambridge Bay or Kugluktuk.
	TMAC	**March 20, 2017**	Responses to IRs submitted to the NIRB	
Technical Review	**NIRB**	**March 24, 2017**	Commencement of 60-day technical review	NIRB issued correspondence requesting parties submit technical review comments on the DEIS, and provided the anticipated process for the coordinated assessment, tentative schedule for a Technical Meeting and Pre-hearing Conference (PHC) and the Community Roundtable.

Assessment Step	Party	Timeline	Process Step	Notes[a]
	NIRB	**March 31, 2017**	Confirmation of dates for the Technical Meeting and PHC	
	NIRB	**April 12, 2017**	Public information meeting summary report released	NIRB issues report that summarized community information meeting sessions.
	NIRB	**May 18, 2017**	Circulation of *draft* agenda and request for comments	Correspondence provided information on the Technical Meeting and PHC protocols.
	Public/Parties	**May 23, 2017**	Technical review comments on the DEIS submitted to the NIRB	Comments received from: KIA, GN, ECCC, DFO, HC, INAC, NRCan, and TC.
	NIRB	**May 24, 2017**	Technical comments distributed to the Proponent for response	
	NIRB	**June 2, 2017**	Circulation of *final* agenda	Agenda revised based on comments received by May 31 from: KIA, Canadian Northern Economic Development Agency (*on behalf of participating federal departments*), and TMAC.
	TMAC	**June 7, 2017**	Responses to technical review comments submitted to the NIRB	TMAC's response to technical comments included draft List of Commitments.
Technical Meeting	**NIRB**	**June 12-14, 2017**	Technical Meeting in Cambridge Bay	Parties in attendance included: TMAC, NWB, KIA, GN, ECCC, DFO, HC, INAC, NPMO, NRCan, TC, and the general public.
Pre-hearing Conference	**NIRB**	**June 15-16, 2017**	Community Roundtable and PHC in Cambridge Bay	Parties in attendance included: TMAC, NWB, KIA, GN, ECCC, DFO, HC, INAC, NPMO, NRCan, TC, as well as community representatives from seven (7) Nunavut communities in the Kitikmeot region and the general public.
	NIRB	**July 21, 2017**	PHC Decision Report issued	The NIRB's PHC Decision Report included instructions to TMAC for the preparation of an FEIS; Appendix E of the PHC Decision Report included NWB's directives regarding Water Licence submission requirements for the Project.

Assessment Step	Party	Timeline	Process Step	Notes[a]
Submission of FEIS	**NIRB & NWB**	**December 21, 2017**	Receipt of TMAC's FEIS and Draft Type "A" Water Licence Applications for the Project and commencement of compliance review and completeness check by the NIRB and NWB, respectively	NIRB issued correspondence that noted TMAC's submission of FEIS and intention to continue the assessment as coordinated between the NIRB and NWB. The NIRB commenced an internal check of the FEIS submission for compliance with the NIRB's EIS Guidelines and PHC Decision for the Project. The NWB acknowledged receipt of the associated Water Licence Applications and supporting information in the FEIS on December 22, 2018 and commenced a completeness check of the applications and supporting documents as per the NIRB/NWB coordinated process for the Project.
Technical Review	**NIRB**	**January 17, 2018**	The NIRB accepted TMAC's submission as a FEIS, following the compliance review, and initiated the 60-day public technical review and preparation of final written submissions	The NWB requested that intervening parties and the public comment on the completeness of the Water Licence Applications and submit information requests by February 14, 2018 prior to the possible issuance of Notice of Applications for the Water Licence Applications. The NWB issued the Notice of Applications to parties on February 23, 2018 and requested submission of technical review comments by March 23, 2018.
	NIRB	**February 21, 2018**	Confirmation of dates for the Final Hearing	Public Notice of the Final Hearing was issued to interested parties and the public by correspondence and the print media. The NIRB also provided direction to parties wishing to apply for formal intervenor status at the Final Hearing and noted that under the NIRB *Rules of Procedure* (September 2009), regulatory agencies have full standing throughout the Review and are not required to file a request to be granted intervenor status.
	Public/Parties	**March 19, 2018**	Technical review comments/final written submissions on the FEIS submitted to the NIRB	Technical review comments/final written submissions received from: KIA, GN, ECCC, HC, INAC, NRCan, and TC. DFO provided their submissions to the NIRB on March 20, 2018.
	NIRB	**March 20, 2018**	Technical review comments/final written submissions distributed to the Proponent for response	

Assessment Step	Party	Timeline	Process Step	Notes[a]
	TMAC	**April 4, 2018**	Responses to technical review comments/final written submissions received by the NIRB	TMAC's response to technical review comments/final written submissions received by the NIRB as part of its Review of the Project. TMAC also provided its response to parties' technical review comments as part of the NWB's processing of the Water Licence Applications for the Project.
	NIRB	**April 6, 2018**	Circulation of *draft* agenda and request for comments	Correspondence included information on the Final Hearing protocols.
	NIRB	**April 20, 2018**	Circulation of *final* agenda	Agenda revised based on comments received by April 16, 2018 from: Government of Canada and TMAC.
Final Hearing	**NIRB**	**May 8-12, 2018**	Final Hearing, including Community Roundtable, in Cambridge Bay	Parties in attendance included: TMAC, NWB, KIA, GN, ECCC, DFO, HC, INAC, NPMO, NRCan, TC, as well as community representatives from seven (7) Nunavut communities in the Kitikmeot region and the general public.

NOTES: Draft Environmental Impact Statement (DEIS), Environment and Climate Change Canada (ECCC; *previously* Environment Canada, EC), Fisheries and Oceans Canada (DFO), Government of Nunavut (GN), Health Canada (HC), Hope Bay Mining Ltd. (HBML), Indigenous and Northern Affairs Canada (INAC; *previously* Aboriginal and Northern Affairs Canada, AANDC), Information Request (IR), Kitikmeot Inuit Association (KIA), Natural Resources Canada (NRCan), Northern Projects Management Office (NPMO), Nunavut Impact Review Board (NIRB), Nunavut Water Board (NWB), Pre-hearing Conference (PHC), TMAC Resources Inc. (TMAC), Transport Canada (TC).

3.3. APPLICATIONS FOR ACTIVITIES EXCEPTED FROM THE REVIEW

On December 31, 2014 the Nunavut Impact Review Board (NIRB or Board) received an application from TMAC Resources Inc. (TMAC) pursuant to Article 12, Section 12.10.2(b) of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada* (*Nunavut Agreement*), for an exception from the NIRB's ongoing Review of TMAC's Phase 2 Hope Bay Belt Project (NIRB File No.: 12MN001) for specific exploration and/or development activities referred to as "the Madrid Advanced Exploration Program project proposal" (the Exception Application).

The scope of TMAC's Madrid Advanced Exploration Program project proposal included components related to undertaking continued exploration and a bulk sampling program located on Inuit Owned Land over a 10-year period. At the Madrid deposit, TMAC proposed to move up to 50,000 tonnes of ore for bulk sampling at the Madrid North site, and later the same amount from the Madrid South deposit. The Madrid North bulk sample would provide increased understanding of two (2) additional sub-deposits, "Naartok" and "Suluk", while bulk sampling at Madrid South would do the same for the "Patch 14" and "Wolverine" sub-deposits. Exploration activities at each site would consist of four (4) components – diamond drilling, underground development, test stoping, and bulk sampling of the ore and would encompass the following activities:

- Utilization of existing infrastructure associated with the Doris North Gold Mine project:
    - Camp facilities to support up to 70 personnel required to undertake the advanced exploration activities;
    - Mill to process the ore samples;
    - Tailings Impoundment Area to store wastewater trucked from Madrid North and South;
    - Landfill and hazardous waste areas, particularly if closure and remediation becomes required for the Madrid Advanced Exploration Program infrastructure;
    - Fuel tank farms; and
    - Airstrip and Roberts Bay dock facility for transport of personnel and supplies.
- Utilization of existing infrastructure at the Madrid/Boston exploration areas:
    - Borrow and rock quarry facilities: existing quarries A, B and D along the Doris-Windy all-weather road;
    - All-weather access road previously constructed between Doris North and Windy Lake for transportation of personnel, ore, waste, fuel, and supplies; and
    - Future mobilization of existing exploration camp infrastructure should it become necessary.
- Construction of additional facilities at North and South Madrid:
    - Two (2) access portals and ramps for underground operations – one at Madrid North, and one at Madrid South;

- 4.7-kilometre extension of the existing all-weather access road originating from the Doris North Gold Mine to the Windy exploration area (Madrid North) to the Madrid South deposit, with associated access road turn-offs;
    - Development of a winter road from Madrid North to access Madrid South until all-weather access road has been constructed;
- Borrow and rock quarry facilities, two (2) quarries referenced as G and H;
- Waste and ore stockpiles; and
- Water and waste management structures.

- Undertaking of advanced exploration access to aforementioned deposits through:
    - Continue field mapping and sampling, as well as airborne/ground/downhole geophysics;
    - Diamond drilling from the surface and underground; and
    - Bulk sampling through underground mining methods.

The NIRB's jurisdiction to except exploration and development activities from further review is set out in Article 12, Sections 12.10.1 and 12.10.2 of the *Nunavut Agreement* that state:

> **Article 12, Section 12.10.1**:
> No licence or approval that would be required in order to allow a proposed project to proceed shall be issued in respect of a project that is to be screened by NIRB until the screening has been completed and, if a review pursuant to Part 5 or 6 is to be conducted, until after that review has been completed and a NIRB project certificate has been issued by NIRB pursuant to these provisions.
>
> **Article 12, Section 12.10.2**:
> Notwithstanding Section 12.10.1, where a project proposal has been referred for review pursuant to Part 5 or 6, approvals or licences for exploration or development activities related to that project may be issued if:
>
> (a) the activity falls within Schedule 12-1; or
>
> (b) the activity can, in the judgement of NIRB, proceed without such a review.

Essentially, these provisions allow the NIRB to except specified low impact exploration or development activities from further assessment in an on-going Review. The net effect of the NIRB excepting specified activities from further review is that regulatory authorities can grant the approvals or licences for these activities without awaiting completion of the NIRB's Review process for the entire project.

It should be noted that the NIRB's determination in relation to the Exception Application in no way limited the Board's recommendations to the Minister as expressed in this Final Hearing Report in respect of whether the Phase 2 Hope Bay Belt Project proposal, in its entirety, should be allowed to proceed, nor does the NIRB's determination in respect of the Exception Application affect the decision-making of the Responsible Minister(s) in respect of the entire Phase 2 Hope Bay Belt Project and/or the potential issuance of a NIRB Project Certificate under

Article 12, Section 12.5.12 of the *Nunavut Agreement* if the Minister of Crown-Indigenous Relations and Northern Affairs determines that the Project, in its entirety be allowed to proceed.

Reflecting the Board's jurisdiction under Article 12, Section 12.10.2(b) of the *Nunavut Agreement*, upon receipt of the Exception Application the NIRB conducted a thorough review of the technical matters pertaining to the Exception Application, including inviting written comments from interested parties. On this basis, the Board determined that:

> After a thorough assessment of all materials provided to the Board, in accordance with the primary objectives as described above, the determination of the Board pursuant to Section 12.10.2(b) of the NLCA is to approve the exception of the activities included in TMAC's Exception Application from the NIRB's ongoing Review of TMAC's "Phase 2 Hope Bay Belt" project proposal (NIRB File No. 12MN001). This determination applies only to the exploration and/or development activities as described within the Madrid Advanced Exploration Program project proposal and is subject to the implementation of the Board's recommendations as set out in more detail in this Report.[31]

4. INVOLVEMENT OF INTERESTED PARTIES

4.1. ENGAGEMENT OPPORTUNITIES

4.1.1 Public Consultation

Public participation is a central objective of the Nunavut Impact Review Board (NIRB)'s assessment processes. Meaningful public participation within a NIRB Review requires that the assessment process address concerns of the general public regarding the anticipated or potential environmental effects of the Phase 2 Hope Bay Belt Project proposal (the Project). The NIRB's Review must also involve potentially affected Nunavummiut (defined as the people inhabiting the territory of Nunavut) to address concerns regarding any changes that the Project may cause to the environment and the resulting effects of any such changes on the traditional and current use of land/ice and resources.

The Board's public consultation process included community consultations. For this assessment, the NIRB held public information meetings in the five (5) communities of the Kitikmeot region of Nunavut deemed to be the most affected by the proposed Project i.e., Cambridge Bay, Kugluktuk, Gjoa Haven, Taloyoak and Kugaaruk, with the participation of residents of the two (2) seasonal communities in the Kitikmeot region i.e., Kingaok (Bathurst Inlet) and Omingmaktok (Bay Chimo).

The Final Hearing was held in Cambridge Bay, Nunavut, the nearest community to the proposed Project, and the Board sat extended hours so that members of the public had the opportunity to attend and ask questions during the day or evening to accommodate their work schedules. Elders and other community members who were present at the Final Hearing were encouraged to make

[31] NIRB 12.10.2(b) Determination for TMAC Resources Inc.'s "Madrid Advanced Exploration Program" Project Proposal, June 24, 2016 at p. 3.

statements, ask questions and identify their concerns with the Project proposal. The NIRB further supported public participation by making arrangements (including providing support for travel, meals and accommodation) to ensure the seven (7) communities in the Kitikmeot region were able to participate in the Final Hearing by each selecting and sending up to five (5) Community Representatives to attend the Final Hearing, ask questions and make submissions on behalf of the Elders, Youth, Women, the Hamlet, local harvesters and other interested members in their community.

Attendance at any of the NIRB's public meetings associated with this Project, including the Final Hearing, was tracked via the sign in sheets associated with these meetings. It is the NIRB's practice to ask all participants to sign in at the beginning of each day of proceedings; a full listing of sign-in sheets from the Final Hearing is available online from the NIRB's public registry at www.nirb.ca/project/124148.

The consultation efforts and opportunities for Nunavummiut and residents of Canada to provide their comments to the NIRB during the review process are outlined in Table 1. Table 2 provided in Section 4.2.10 of this Report also provides a brief summary of the key issues, concerns, comments and perspectives offered by the Community Representatives and members of the public during the Community Roundtable sessions of the Final Hearing.

TMAC Resources Inc. (TMAC or the Proponent) was also required by the Board to document its efforts regarding consultation to ensure that Nunavummiut had the information they required regarding the Phase 2 Hope Bay Belt Project proposal and its potential impacts. In addition, the Proponent was required to demonstrate how Inuit Qaujimaningit collected through consultation informed the development of the Final Environmental Impact Statement (FEIS). TMAC's specific consultation efforts are summarized in Section 3 of Volume 2 of the FEIS.

In addition to the consultation activities of the NIRB and the Proponent, increasingly over the past decade and with better public access to the internet and Northern-based media outlets, the media has assumed an important role in support of the NIRB's goals of enhanced public awareness and participation. Media outlets have assisted by providing notice of meetings and hearings, disseminating information and reporting on the Final Hearing.

4.2. THE PARTICIPANTS

4.2.1 Nunavut Tunngavik Inc.

Nunavut Tunngavik Incorporated (NTI) is the successor to the Tungavik Federation of Nunavut, which was the signatory to *the Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada* (*Nunavut Agreement*) and coordinates and manages Inuit responsibilities as set out in the *Nunavut Agreement*. NTI is responsible for representing the Inuit of all the regions and communities of Nunavut to safeguard, administer and advance the rights and benefits that belong to the Inuit of Nunavut and to promote their economic, social, and cultural well-being through succeeding generations. This responsibility includes the administration and management of subsurface Inuit Owned Lands, and collection of the Inuit share of royalties on both Inuit Owned Lands and Crown land. NTI is responsible for

determining which Inuit organization discharges implementation responsibilities under Article 39 of the *Nunavut Agreement*.

NTI generally deferred to the Kitikmeot Inuit Association throughout the Review of the Project and neither attended the NIRB's Technical Meeting, Community Roundtable and Pre-hearing Conference, nor the NIRB's Final Hearing.

4.2.2 Kitikmeot Inuit Association

The Kitikmeot Inuit Association (KIA) is a Designated Inuit Organization under the *Nunavut Agreement*, representing interests, rights and values of Inuit in the Kitikmeot region at the territorial and regional levels. The KIA supports sustainable economic development opportunities for Nunavut Inuit. As a Designated Inuit Organization, the KIA is mandated to deal with Inuit Owned Land management issues within the Kitikmeot region. Through its Lands Department, the KIA administers the use of Inuit-owned surface lands, including those associated with the Phase 2 Hope Bay Belt Project, in order to meet legal obligations respecting surface land management. The KIA negotiates Inuit Impact Benefit Agreements in accordance with Article 26 of the *Nunavut Agreement*.

The KIA has participated in the NIRB and the NWB's assessment of the proposed Project since the initiation of the Review of the proposal and the Application, and has provided comments, concerns and advice to the NIRB for consideration regarding the scope of the Project and assessment, throughout the information request period. The KIA has also provided comments to both the NIRB and the NWB through the technical review period, and provided final written submissions to the NIRB.[32] The KIA participated at the Technical Meeting, Community Roundtable and PHC, and participated at the NIRB's Final Hearing.

4.2.3 Government of Nunavut

The Government of Nunavut (GN) has jurisdictional responsibility and permitting authority over activities that affect wildlife and wildlife habitat, Commissioner's lands, municipalities, education, health, social services, public safety, culture, community development, property rights and the administrations of the laws in Nunavut.

The GN reviewed the FEIS in consideration of the following:

- The requirements and principles (including the principles of conservation) found in the *Nunavut Agreement*;
- The requirements of the laws and regulations of Nunavut;
- The priorities of the Government of Nunavut and Nunavummiut; and
- The NIRB's guiding principles – the "Precautionary Principle" in particular.

The GN has participated in the NIRB and the NWB's assessment of the proposed Project since the initiation of the Review of the proposal and the Application, and has provided comments, concerns and advice to the NIRB for consideration regarding the scope of the Project and assessment, throughout the information request period. The GN has also provided comments to

[32] Kitikmeot Inuit Association Final Written Submission, March 19, 2018

both the NIRB and the NWB through the technical review period, and provided final written submissions to the NIRB.[33] The GN participated at the Technical Meeting, Community Roundtable and PHC, and participated at the NIRB's Final Hearing.

4.2.4 Environment and Climate Change Canada

Environment and Climate Change Canada (ECCC, previously Environment Canada) is responsible for leading implementation of the Government of Canada's environmental agenda, and is committed to contributing to the realization of sustainable development in Canada's North. ECCC's mandate covers the preservation and enhancement of the quality of the natural environment, including water, air, soil, flora and fauna, as well as species at risk and migratory birds. In addition, ECCC administers s. 36(3) of the *Fisheries Act*,[34] which prohibits the deposit of a deleterious substance into fish-bearing waters. ECCC also administers the permitting of disposal at sea and participates in the regulation of toxic chemicals pursuant to the pollution provisions of the *Fisheries Act*, and oversees the development and implementation of environmental quality guidelines pursuant to the *Canadian Environmental Protection Act, 1999*.[35] ECCC is responsible for protecting and conserving migratory bird populations and individuals, under the *Migratory Birds Convention Act, 1994*,[36] and administers the *Species at Risk Act*[37] in cooperation with Fisheries and Oceans Canada and the Parks Canada Agency.

ECCC has participated in the NIRB and the NWB's assessment of the proposed Project since the initiation of the Review of the proposal and the Application, and has provided comments, concerns and advice to the NIRB for consideration regarding the scope of the Project and assessment, throughout the information request period. ECCC has also provided comments to both the NIRB and the NWB through the technical review period, and provided final written submissions to the NIRB.[38] ECCC participated at the Technical Meeting, Community Roundtable and PHC, and participated at the NIRB's Final Hearing.

4.2.5 Fisheries and Oceans Canada

Fisheries and Oceans Canada (DFO) is the federal government department that exercises authority over sea, coastal and inland fisheries within Canada's territorial boundaries. Under the *Fisheries Act*,[39] DFO is responsible for the management, protection and conservation of fish (which include marine mammals as defined by the *Fisheries Act*) and their habitats. The mandate of the Fisheries Protection Program of DFO is to maintain the sustainability and ongoing productivity of commercial, recreational and Aboriginal fisheries. Subsection 35 (1) of the fisheries protection provisions of the *Fisheries Act* states that "No person shall carry on any work, undertaking or activity that results in *serious harm to fish* that are part of a commercial, recreational, or Aboriginal fishery or to fish that support such a fishery."

[33] Government of Nunavut Final Written Submission, March 19, 2018
[34] R.S.C. 1985, c. F-14.
[35] S.C. 1999, c. 33.
[36] S.C. 1994, c. 22.
[37] S.C. 2002, c. 29.
[38] Environment and Climate Change Canada Final Written Submission, March 19, 2018
[39] R.S.C. 1985, c. F-14.

The *Species at Risk Act*[40] is intended to prevent Canadian indigenous species, subspecies and distinct populations of wildlife from being extirpated or becoming extinct; to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity; and to manage species of special concern to prevent them from becoming endangered or threatened. The Minister of Fisheries and Oceans is the competent minister for listed aquatic species that are fish (as defined in section 2 of the *Fisheries Act*) or marine plants (as defined in section 47 of the *Fisheries Act*).

The purpose of technical review undertaken by DFO of the FEIS was to ensure that works, undertakings and activities proposed in and around fisheries are conducted in such a way that the Proponent would be in compliance with the applicable provisions of the *Fisheries Act*.

DFO has participated in the NIRB and the NWB's assessment of the proposed Project since the initiation of the Review of the proposal and the Application, and has provided comments, concerns and advice to the NIRB for consideration regarding the scope of the Project and assessment, throughout the information request period. DFO has also provided comments to both the NIRB and the NWB through the technical review period, and provided final written submissions to the NIRB.[41] DFO participated at the Technical Meeting, Community Roundtable and PHC, and participated at the NIRB's Final Hearing.

4.2.6 Health Canada

Health Canada (HC) is responsible for maintaining and improving the health of Canadians. HC has no regulations or permits related to the Project, but provided the Board with technical advice relevant to HC's mandate for the NIRB's environmental assessment of this project.

HC has participated in the NIRB and the NWB's assessment of the proposed Project since the initiation of the Review of the proposal and the Application, and has provided comments, concerns and advice to the NIRB for consideration regarding the scope of the Project and assessment, throughout the information request period. HC has also provided comments to both the NIRB and the NWB through the technical review period, and provided final written submissions to the NIRB.[42] HC participated at the Technical Meeting, Community Roundtable and PHC, and participated at the NIRB's Final Hearing.

4.2.7 Indigenous and Northern Affairs Canada

Indigenous and Northern Affairs Canada (INAC, previously Aboriginal Affairs and Northern Development Canada) is the federal government department responsible for meeting the Government's obligations and commitments to First Nations, Inuit and Métis, and for fulfilling the federal government's constitutional responsibilities in the North. In Nunavut, INAC has responsibilities for land and water resource management. In the NIRB Review process, INAC provided technical advice relative to its mandate and made recommendations to the NIRB to assist with the review of the Phase 2 Hope Bay Belt Project.

[40] S.C. 2002, c. 29.
[41] Fisheries and Oceans Canada Final Written Submission, March 20, 2018
[42] Health Canada Final Written Submission, March 19, 2018

INAC's Minister (now referred to as the Minister of Crown-Indigenous Relations and Northern Affairs), in concurrence with other responsible Ministers, will have a decision-making role in response to the Board's recommendations. If the proposed Project is approved to proceed, INAC will be responsible for inspecting and enforcing those conditions contained within any Crown land authorizations and water licences associated with the Phase 2 Hope Bay Belt Project.

INAC has participated in the NIRB and the NWB's assessment of the proposed Project since the initiation of the Review of the proposal and the Application, and has provided comments, concerns and advice to the NIRB for consideration regarding the scope of the Project and assessment, throughout the information request period. INAC has also provided comments to both the NIRB and the NWB through the technical review period, and provided final written submissions to the NIRB.[43] INAC participated at the Technical Meeting, Community Roundtable and PHC, and participated at the NIRB's Final Hearing.

4.2.8 Natural Resources Canada

The mandate of Natural Resources Canada (NRCan) is to develop, implement and deliver policies, programs, science and technology for the sustainable development and responsible use of Canada's mineral, energy and forestry resources. NRCan has the jurisdiction to issue a licence governing the manufacturing and storage of explosives through the federal *Explosives Act*.[44] NRCan provided scientific and technical expertise to the NIRB Review in the areas of hydrogeology, permafrost and terrain conditions.

NRCan has participated in the NIRB and the NWB's assessment of the proposed Project since the initiation of the Review of the proposal and the Application, and has provided comments, concerns and advice to the NIRB for consideration regarding the scope of the Project and assessment, throughout the information request period. NRCan has also provided comments to both the NIRB and the NWB through the technical review period, and provided final written submissions to the NIRB.[45] NRCan participated at the Technical Meeting, Community Roundtable and PHC, and participated at the NIRB's Final Hearing.

4.2.9 Transport Canada

Transport Canada (TC) is responsible for development and administration of transportation policies and programs for Canada. TC also has a responsibility to regulate associated transportation infrastructure, equipment, and personnel in accordance with key relevant pieces of legislation, including the *Navigation Protection Act*,[46] *Aeronautics Act*,[47] *Canada Shipping Act, 2001*,[48] *Arctic Waters Pollution Prevention Act*,[49] *Marine Liability Act*,[50] *Marine Transportation Security Act*,[51] and the *Transportation of Dangerous Goods Act*.[52] TC provided scientific and

[43] Indigenous and Northern Affairs Canada Final Written Submission, March 19, 2018
[44] R.S.C. 1985, c. E-17.
[45] Natural Resources Canada Final Written Submission, March 19, 2018
[46] R.S.C. 1985, c. N-22.
[47] R.S.C. 1985, c. A-2.
[48] S.C. 2001, c. 26.
[49] R.S.C. 1985, c. A-12.
[50] S.C. 2001, c. 6.
[51] S.C. 1994, c. 40.

technical expertise to the NIRB Review in the areas of marine operations and navigation in Canadian waters.

TC has participated in the NIRB and the NWB's assessment of the proposed Project since the initiation of the Review of the proposal and the Application, and has provided comments, concerns and advice to the NIRB for consideration regarding the scope of the Project and assessment, throughout the information request period. TC has also provided comments to both the NIRB and the NWB through the technical review period, and provided final written submissions to the NIRB.[53] TC participated at the Technical Meeting, Community Roundtable and PHC, and participated at the NIRB's Final Hearing.

4.2.10 Local Community Representatives

The NIRB invited five (5) community representatives from each of the seven (7) communities of the Kitikmeot region of Nunavut deemed to be the most affected by the proposed Project to attend the Final Hearing in Cambridge Bay: Kugluktuk, Kingaok (Bathurst Inlet), Omingmaktok (Bay Chimo), Gjoa Haven, Taloyoak and Kugaaruk, and the host community. Community organizations were contacted in order to solicit representatives from broad demographic groups to participate, including local women's groups, Hunters and Trappers Organizations, Elders' societies, Hamlet Councils, and youth groups. Where no local group existed, the NIRB sought advice from regional associations and organizations to confirm participants for the Final Hearing. A total of 23 community representatives from the seven (7) communities in the Kitikmeot region attended the technical sessions of the Final Hearing and participated directly in the Community Roundtable portion of the Hearing.

The format of the five (5)-day Final Hearing allowed the community representatives to observe the technical presentations provided by TMAC and the Intervenors during the first three (3) days of the proceedings, after which they participated directly through the Community Roundtable portion of the Final Hearing. During the Community Roundtable, representatives from the communities replaced the registered Intervenors at the table to hear summary presentations by TMAC regarding each component of the project proposal and by Intervenors regarding their respective mandates, jurisdictions and the conclusions associated with their review of the Proponent's Final Environmental Impact Statement (FEIS). Community representatives were given time during the Community Roundtable to pose questions directly to TMAC and/or Intervenors and to provide their comments and concerns directly to the Board for consideration.

Sections 5, 6, and 7 of this Report include specific reference to relevant comments, issues, and concerns expressed by community representatives at the Final Hearing; Table 2 below provides a brief summary of the key issues, concerns and perspectives offered by the community representatives and members of the public during the Community Roundtable sessions of the Final Hearing.

[52] S.C. 1992, c. 34.
[53] Transport Canada Final Written Submission, March 19, 2018

Table 2: Key Issues as Raised by Community Representatives regarding the Phase 2 Hope Bay Belt Project Proposal

SUBJECT	ISSUES/CONCERNS/COMMENTS
ECOSYSTEMIC EFFECTS	
Air Quality	How often do regulators get air quality monitoring reports from TMAC Resources Inc. that would show, for example how much in terms of contaminants are going into the air from the mill?
Air Quality	Wildlife do not like smoke and I want to know what type of incinerator(s) will be used and where will the incinerator(s) be built at the camp; also
Air Quality	What can TMAC Resources Inc. burn in the on-site incinerator(s); and will there be big smoke stacks on the incinerator?
Air Quality	When Newmont was operating the site, incinerator suppliers used to do training of the operators to ensure that the wastes being burned were managed properly; does TMAC Resources Inc. intend to continue this training?
Birds	Awhile back there were a significant number of dead birds found along the shore; has anyone looked into what happened there?
Caribou	How high and wide will the bridge structures be along the road? Will there be room for the caribou to pass under/over the bridges?
Caribou	Will TMAC Resources Inc. continue to support the on-going GN/GNWT caribou radio collaring studies?
Caribou	The shipping season needs to be restricted to open water season so that there is no interference with ice formation (because that could interfere with caribou migration across the sea ice).
Caribou	Will the caribou collaring studies (that TMAC Resources Inc. is providing support for) be on-going or is it just this year?
Caribou	What is the purpose behind putting collars on caribou; what does that research involve and why is the collar data needed by TMAC Resources Inc.?
Caribou	The local Hunters and Trappers Organizations in Nunavut do not have funding for research and to participate fully in the transboundary management of the three herds in our area. We would like to see more industry funding of this research.
Caribou	A lot of people don't like to see caribou collared (find the meat has a changed flavour and when collared caribou are found they often have their fur rubbed off their neck around the collars); we would like to see this data collected using some smaller, newer and less intrusive technology to collect the same data.
Caribou	I have some concerns that we all need to ensure wildlife (and fish too) remain healthy; I have noticed that recently some caribou have abscesses and are starving; I am very concerned that this is demonstrating that they have ingested contaminants and/or are experiencing cumulative impacts from this and other mines
Caribou	The numbers of caribou have really declined; are there any ways that TMAC Resources Inc. can support the communities in their caribou harvesting efforts (e.g. supporting hunters who have to travel farther to

Table 2: Key Issues as Raised by Community Representatives regarding the Phase 2 Hope Bay Belt Project Proposal

SUBJECT	ISSUES/CONCERNS/COMMENTS
	harvest)
Climate Change	Due to climate change, the communities have seen streams drying up recently; is TMAC Resources Inc. required to have a plan in place for how to maintain flows in water courses around the mine if TMAC also starts to notice that streams nearby are drying up?
Climate Change	Will TMAC Resources Inc. be required to keep track of their waste rock piles, their tailings and other facilities that are planned to sit on the permafrost in case they need to be changed if climate change causes melting at the site? (We are already seeing lots of melting and small streams forming as the permafrost melts)
Dock	How far off the land will the cargo dock be, and how long with the road be that gets out to the dock?
Dust	There will be dust coming from the road and deposited on the vegetation—will there be any studies done regarding monitoring the dustfall along the road and/or monitoring of the health of the vegetation, especially berries and vegetation people eat?
Fish	The Community of Kugluktuk has participated in effective fisheries offsetting plans with other mines and looks forward to TMAC Resources Inc. also participating in similar offsetting plans in nearby communities
Fish	Have the fish been taken out of any lakes for this project yet?
Fish	Will TMAC Resources Inc. have to develop an offsetting plan and will communities be consulted about that?
Fish	Will there be a time when the lakes that have the fish taken out of them will have the fish put back into them (e.g. can tailings ponds and other waterways affected by the mine sites be returned
Fish	Communities are concerned about fish, especially Arctic char, having trouble navigating/passing through the water courses affected by TMAC bridges and culverts—this is important so that fish can pass into their wintering habitat unimpeded by obstructions;
Fish	Does TMAC Resources Inc. have an obligation to maintain safe fish passage from the streams and into the lakes?
Fish	Did TMAC Resources Inc. also have to study the zooplankton that the fish feed on to make sure that there are no negative effects on the fishes' food sources?
Life of Mine	How many years is TMAC Resources Inc. planning to mine in that area?
Marine Pipeline	We are concerned about the pipeline that will be extended into the Roberts Bay--what is the pipeline going to be used for, and how far is it going to be extended;
Marine Pipeline	Why is that pipe extending into the ocean and not on land going into freshwater?
Marine Pipeline	What goes into that pipeline and what is it used to dispose of?
Marine Pipeline	Will the pipeline into Roberts Bay be left in place; or will it be removed

Table 2: Key Issues as Raised by Community Representatives regarding the Phase 2 Hope Bay Belt Project Proposal

SUBJECT	ISSUES/CONCERNS/COMMENTS
	when the mines are no longer operating?
Marine Pipeline	There may be species in Roberts Bay that you have not yet identified; and we would prefer that the marine environment is kept pristine and does not receive wastes; it is a big concern to the Kitikmeot communities that any water discharged into the marine environment be as clean as possible before it goes into the marine environment;
Marine Pipeline	Will there be a filter over the discharge outlet on the pipeline that goes into Roberts Bay?
Marine Wildlife and Marine Habitat	There are concerns with the effects on marine mammals during shipping, such as the impacts on seals from the sound of ships;
Noise and Vibration	Encourage TMAC to consider noise effects on wildlife in the area; although the speaker has been on-site and has noticed that the noise pollution from the mine is very low because most of the mining is taking place below the ground
Noise and Vibration	How far away from the blast will the noise from blasting be heard?
Power Line (Construction)	Will the on-site power lines be above ground or below ground?
Power Line (Operation)	How much voltage will the power line carry?
Reclamation	When the mines close, does TMAC Resources Inc. have money set aside to support the reclamation of the sites?
Reclamation	When the mine ceases operations are there agreements/arrangements that would require revegetation of the site?
Road Construction	How high/wide will the bridge constructions?
Road Construction	Appreciate that TMAC Resources Inc. has taken hunters and elders out to the area where the road construction is proposed to identify where there should be caribou crossings and how high the bridges and water crossings will be.
Shipping	TMAC Resources Inc. needs to be very careful when coming into Roberts Bay, as there are many shallow areas and it is easy to get stranded or hit shallow areas in the shallow channels
Shipping	The shipping season needs to be restricted to open waters, with no interference with ice formation (because that could interfere with caribou migration).
Shipping	How many ships per year will there be carrying supplies for TMAC Resources Inc.'s mines?
Shipping	How many ships per year will there be carrying fuel into Roberts Bay for TMAC Resources Inc.'s mines?
Shipping	Will the ships TMAC Resources Inc. will use for project-shipping have the capability to carry emergency supplies sufficient for them to respond in the event there is a spill or an incident such as running aground during project-shipping?

Table 2: Key Issues as Raised by Community Representatives regarding the Phase 2 Hope Bay Belt Project Proposal

SUBJECT	ISSUES/CONCERNS/COMMENTS
Shipping	Will the existing dock facilities at Roberts Bay be sufficient for the cargo offloading that will take place as the development of the Boston site takes place? Will TMAC Resources Inc. develop additional docking facilities in Roberts Bay as the shipping expands?
Shipping	Recognizing that this project and others when combined will increase the shipping in the region, is Transport Canada going to do a revamp of the Arctic Shipping route and also reinstating the repeater stations along the route (many communities do not have these stations anymore)?
Shipping	Has Transport Canada updated the mapping data for the current Arctic shipping routes in this area so that communities can have confidence that ships are not running aground?
Shipping	Have concerns about how well mapped out the shipping routes will be in these areas; in recent years, residents of Gjoa Haven and Kugluktuk have seen three ships run aground, as it appears these routes are getting shallower and the shipping companies do not seem to be aware of this; am particularly concerned about making sure that tankers shipping fuel must be aware of these shallower navigable waters
Shipping	Is there going to be a more extensive review of the arctic shipping routes/northern marine transportation corridors in this area?
Shipping	When will be the additional shipping begins for this Project? Are there better ships to be built?
Tailings	Will there be a fence around the tailings ponds to prevent animals from drinking water from those structures?
	Communities are concerned that with the tailings it appears that they are being put into lakes that have to be fished out…is there any way that these can be just put behind berms and stacked on lined areas rather than having to fish out a lake to put tailings into it?
Terrestrial Wildlife and Habitat	I have some concerns that ensuring wildlife and fish remain healthy; I have noticed that recently some caribou have abscesses and are starving; I am very concerned that this is demonstrating that they have ingested contaminants and/or are experiencing cumulative impacts
Vegetation	Are tailings facilities monitored for air emissions (releases) of the particulate into the air and then settling onto the vegetation (that are eaten by lemmings)
Waste Management	Where will TMAC Resources Inc. store/dispose of wastes and hazardous chemicals from your operations?
Waste Management	Back when the site was run by Newmont, once a year in the spring time Newmont would have a concerted clean-up effort to ensure that contractors and Newmont staff work together to clean up; this is something I would recommend TMAC Resources Inc. continue
Water Management	If you are going to withdraw water and then deposit tailings into water at the Boston site, how are you going to ensure that you do not contaminate the freshwater and the land around the water?

Table 2: Key Issues as Raised by Community Representatives regarding the Phase 2 Hope Bay Belt Project Proposal

SUBJECT	ISSUES/CONCERNS/COMMENTS
Water Management	Where does the water that is being sprayed on the rock during the processing of the ore come from and then where does that water get disposed of?
Water Management	Why are there no regional water monitoring initiatives in the Kitikmeot communities?
SOCIO-ECONOMIC EFFECTS	
Benefits, Royalties and Taxation	How much in royalties and taxes would be payable, especially to the Kitikmeot Inuit Association and Nunavut Tunngavik Inc.?
Community Infrastructure and Public Services	Although Hamlets have lost staff to mine sites; in the Hamlet of Cambridge Bay, this competition for labour is not considered to be a negative, as it mostly presents an opportunity for staff and not a negative in terms of losing staff
Contracting and Business Opportunities	Similarly, when contractors started up businesses to service the mine and then the mine went into care and maintenance, those businesses retooled themselves to serve our community better
Culture, Resources and Land Use	TMAC Resources Inc. needs to be mindful of our cultural values, including our respect for the ecosystem
Culture, Resources and Land Use	TMAC Resources Inc. should ensure that there is an Inuk supervisor onsite to ensure that Inuit employees have a voice
Culture, Resources and Land Use	Our communities like the idea of sending Elders to go see your mine site and also sending hunters and trappers to go to your mine site and give you information so you can make your mine better
Education and Training	Is TMAC Resources Inc. willing to conduct on-the-job training for youth in the area who may not already have the training and experience to start working at the mine site?
Education and Training	When it comes to training of our youth, it happens often that if they have to go out of town in order to get training, often when they return home for things like holidays, they are unwilling/unable (i.e. can't afford return travel) to return to complete their training programs away from the community.
Human Health and Safety	Does the camp/mine shut down when the winds are high and/or the weather is not good? It is dangerous for workers to have to remain working on site when the weather turns bad
Human Health and Safety	Does TMAC Resources Inc. have Health and Safety Committees at the site?
Human Health and Safety	Our communities like the idea of sending Elders to go see your mine site and also sending hunters and trappers to go to your mine site and give you information so you can make your mine better
Human Health and Safety	What is TMAC Resources Inc.'s policy with respect to legalized cannabis?
Human Health and Safety	What is TMAC Resources Inc.'s policy with respect to alcohol on the mine site?

Table 2: Key Issues as Raised by Community Representatives regarding the Phase 2 Hope Bay Belt Project Proposal

SUBJECT	ISSUES/CONCERNS/COMMENTS
Human Health and Safety	What happens when a worker is injured on the job; would they be compensated?
Livelihood and Employment	Does TMAC Resources Inc. offer northern allowance benefits to workers from the south and not the workers that are resident in the Kitikmeot? And if so, why?
Livelihood and Employment	Would like to see a significant commitment to employing Inuit youth in the Kitikmeot Region—want to ensure that TMAC Resources Inc. is being true to the commitments they are making at this Public Hearing (that they are not just saying one thing and then acting differently once the mines start up)
Livelihood and Employment	Would like to have our youth employed at these sites, and would like to see our youth get training on the job.
Livelihood and Employment	Support the KIA's emphasis on TMAC maximizing Inuit employment
Livelihood and Employment	How many jobs will be created during the various phases of the proposed project?
Misc. Socio-Economic	How widespread over the world is TMAC Resources Inc.?
Misc. Socio-Economic	Does TMAC Resources Inc. have investors in the company?
OTHER ISSUES	
Accidents and Malfunctions	Additional Coast Guard auxiliary teams should be added to the Kitikmeot Communities (currently only two communities have them) to add to communities' emergency response capability
Cumulative Effects	Will there be effects on marine mammals when the shipping for this project is combined with the increasing numbers of cruise ships and shipping for other projects?
Cumulative Effects	Have noticed in recent years that around Gjoa Haven some of the caribou and fish I have gotten are unhealthy. I am concerned that this means that the terrestrial wildlife and fish may be experiencing cumulative impacts from this and other mines.
Monitoring	How does TMAC Resources Inc. intend to monitor the discharge of the water via the pipeline into Roberts Bay to make sure you are not contaminating the marine environment?
Monitoring	How does monitoring for the effluent work; does ECCC do monitoring, or does ECCC receive discharge and monitoring reports from TMAC Resources Inc.?
Monitoring/Inspections	Are there any Inuit Inspectors on the staff of regulatory agencies? Members of HTOs should accompany the regulatory inspectors because they know the land and they know this area and can spot changes that Inspectors that are not from the area may not
Regulatory System	Who gives approval for this proposal to proceed? Is it the Government of Nunavut, is it the Federal Government, or is it the Kitikmeot Inuit Association?

4.3. LIMITS ON PARTICIPATION AT THE FINAL HEARING

Participation of intervenors and the public is important in the NIRB's process, especially for responsible authorities who would be exercising on-going jurisdiction over several key aspects of the environment that may be affected by the Phase 2 Hope Bay Belt Project (Project) and specific proposed components associated with the development of the Project. Attendance at Final Hearings by responsible authorities with jurisdiction for the project proposal is important and the Board's expectation is that if the assessment of the Project ultimately results in the issuance of a Project Certificate, then the regulatory authorities would be responsible for implementing the terms and conditions within the Project Certificate in accordance with their authorities and jurisdictional responsibilities as required under Article 12, Section 12.9.1 of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada (Nunavut Agreement).*

Although the NIRB is mindful of the fact that travel is both time consuming and expensive, particularly for those government agencies without offices physically located in Nunavut, the NIRB emphasizes that regulatory participants routinely find considerable value in attending Final Hearings in person. The Final Hearing provides an opportunity for active engagement between the parties that can take place during face-to-face discussions that is not at all the same when a participant attends by teleconference only. It has been the NIRB's experience in past Final Hearings that teleconference participation is not an effective substitute for the kind of engagement that arises when a department representative is available in person to ask questions, and just as importantly, to be questioned by the Proponent, public, Community Representatives and Board Members at the Hearing.

Further, the NIRB reminds all parties that even when a responsible authority reaches agreement with the Proponent on the technical issues raised in that agency's submissions, this does not mean that the Board and other participants in the process will necessarily agree that the issue has been resolved to their satisfaction. Consequently, there may still be considerable discussion required at the Final Hearing with respect to issues considered by the responsible authority to be "resolved". Conducting these types of open discussions in a Final Hearing via teleconference is less than ideal and poses a significant obstacle to the Board's full and fair consideration of issues that remained unresolved or for issues that require the agreement and advice of several intervenors and communities.

Finally, the NIRB notes that it is very difficult for community members to establish an effective and on-going working relationship with responsible authorities that do not make the effort to travel to their community. Responsible authorities who fail to appear in person at the Final Hearing have difficulty establishing the kind of on-going working relationship with affected communities that supports effective regulation of projects in the territory. This is particularly the case where there is no, or only limited agency presence in the region generally.

5. ECOSYSTEMIC EFFECTS

TMAC Resources Inc. (TMAC or the Proponent) described its approach to analyzing potential effects, identifying mitigation measures for potential effects, and classifying and determining the significance of impacts from the Phase 2 Hope Bay Belt Project (the Project) on the biophysical and socio-economic environments, in Volume 3 of the Final Environmental Impact Statement (FEIS). The assessment focused on valued components (VCs) of the biophysical and socio-economic environment that may be impacted by the Project, and environmental best practice. Key elements of the assessment methods and approach considered by TMAC included:

- VC Identification/Selection;
- Spatial and Temporal Study Boundaries;
- Environmental and Socio-economic Baseline Description;
- Project-VC Interaction and Effects Analysis;
- Effects Mitigation Development;
- Residual Impact Characterization and Significance Determination;
- Evaluation of Prediction Confidence and Uncertainty;
- Assessment of Cumulative and Transboundary Effects on VCs; and
- Monitoring and Follow-up.

TMAC presented the following rationale for the selection of VCs to support its assessment of potential impacts of the Project on the biophysical and socio-economic environment: (1) requirements of the NIRB's Environmental Impact Statement (EIS) Guidelines for the Project; (2) potential for the VC to be affected by the Project; and (3) importance of the VC to interested parties, including potentially affected communities.

In support of its assessment of potential ecosystemic effects from the Project, TMAC assessed the following valued ecosystemic components (VECs):

- Air Quality
- Noise and Vibration
- Vegetation and Special Landscape Features
- Caribou
- Raptors
- Hydrology
- Groundwater
- Water Quality
- Sediment Quality
- Freshwater Fish/Aquatic Habitat
- Freshwater Fish Community
- Grizzly Bear
- Muskox
- Wolverine/Furbearers
- Migratory Birds
- Marine Water Quality
- Marine Sediment Quality
- Marine Fish/Aquatic Habitat
- Marine Fish Community
- Seabirds/Seaducks
- Ringed Seals

In addition, selected components of the biophysical environment not considered by TMAC as VCs, such as meteorology and climate; geology and geochemistry; permafrost and ground stability; and landforms and soils, were discussed as Subjects of Note in the FEIS.

5.1. AIR QUALITY

5.1.1 Views of the Proponent

TMAC Resources Inc. (TMAC, or the Proponent) presented an assessment of potential impacts to air quality in Volume 4, Section 2 of the Final Environmental Impact Statement (FEIS) for the Phase 2 Hope Bay Belt Project (the Project). TMAC used results of this air quality assessment to inform its assessments of potential impacts to soil, freshwater sediment, vegetation, wildlife, marine sediment, and human health (see Sections 5.5, 5.8, 5.11, 5.12, 5.14 and 7.2 of this Report). Supporting baseline information from 2009 through 2014 collected for the Doris North Gold Mine Project was provided in Volume 4, Appendices V4-2A through V4-2H. TMAC indicated that air quality data were collected prior to 2009 (provided in Appendices in Volume 5 of the FEIS); however, these data were not used in the FEIS because six (6) years of data were deemed sufficient. Volume 4, Appendix V4-2I consisted of TMAC's Air Quality Modeling Study, and Volume 8, Annex V8-2 was TMAC's Air Quality Management Plan. The Proponent noted within the FEIS that it does not expect any significant changes to ambient air quality as a result of the Project.

TMAC defined the following spatial boundaries for its assessment of air quality:

- Project Development Area (PDA): the Project footprint plus engineering buffers;
- Property Boundary (PB): extends two (2) kilometres (km) out from the PDA and represents an area where public exposure would be minimal as it is a hunting exclusion zone as per the *Consolidation of the Mine Health and Safety Regulations*;
- Northern Local Study Area (Northern LSA): a square area approximately 30 km x 30 km centred approximately half way between Doris North and Madrid North, including a portion of the AWR and of the proposed shipping route;
- Southern Local Study Area (Southern LSA): a square area approximately 30 km x 30 km centred approximately on the proposed Boston Mill, including a southern portion of the AWR; and
- Regional Study Area (RSA): extends 30 km out from all proposed Phase 2 infrastructure and approximately 70 km along the marine shipping route extending west from Roberts Bay.

Temporally, TMAC's effects assessment of air quality focused on the construction and operations phases of the project, with air quality modeling conducted for project Years 1, 4, 10, and 12.

The Proponent noted in the FEIS that local Inuit have expressed concerns about the impacts of dust on humans, wildlife, water, and vegetation. The Proponent also highlighted Inuit Traditional Knowledge identified from the Inuit Traditional Knowledge from the *Naonaiyaotit*

Traditional Knowledge Project (NTKP)[54] report as well as from NIRB scoping sessions indicating that snowfall and snowpack consistency are different today than in the past, with snow now finer and less sticky, and darkened by particulate matter.

TMAC indicated that data collected in the years 2013 and 2014 were used to represent the baseline ambient air quality conditions as the Doris North Gold Mine Project was in care and maintenance at the time. The results indicated that the median total suspended particulate (TSP) concentration was 5.8 microgram/cubic metre ($\mu g/m^3$), the medium particulate matter with a diameter less than 10 micrometre (PM_{10}) concentration was 5.4 $\mu g/m^3$, and the particulate matter with a diameter less than 2.5 micrometers ($PM_{2.5}$) concentration was 3.1 $\mu g/m^3$. Further, the median of monthly sulphur dioxide (SO_2) concentrations was 0.3 $\mu g/m^3$, the median of monthly nitrogen dioxide (NO_2) concentrations was 1.1 $\mu g/m3$, and the median of monthly ozone (O_3) concentrations was 52.6 $\mu g/m^3$. TMAC demonstrated that measured median and mean baseline concentrations of these *criteria air contaminants* were below relevant guidelines or standards air quality. There were no project site-specific background concentrations available for carbon monoxide (CO) or volatile organic compounds (VOCs).

The Proponent used an air dispersion model to predict ambient air quality conditions from the existing permitted Hope Bay project activities together with the proposed Hope Bay Belt Phase 2 Project activities including all blasting, crushing, processing, incineration, shipping, and road usage. Predicted air contaminant concentrations were compared against relevant guidelines, standards, or objectives; noting that none exist in Nunavut for some of the contaminants, and that the new Canadian Ambient Air Quality Standards (CAAQS) are more stringent than Nunavut guidelines, the Proponent used the CAAQS for SO_2, NO_2, O_3, and $PM_{2.5}$, the British Columbia Ambient Air Quality Objectives for CO and PM_{10}, and the Alberta Ambient Air Quality Objectives and Guidelines for dust deposition.

TMAC noted the following modelling results:

- Predicted ambient SO_2 concentrations from the Project as well as cumulatively from the Project and the approved Doris North Gold Mine Project would be below the relevant standards for 1-hour, 24-hour, and annual average outside of the PB.
- Predicted ambient NO_2 concentrations from the Project as well as cumulatively from the Project and the approved Doris North Gold Mine Project would be below the Nunavut guidelines for 24-hour and annual average outside of the PB, but would intermittingly exceed the new CAAQS hourly guidelines in portions of the LSA, for the Project as well as cumulatively from the Project and the approved Doris North Gold Mine Project.
- Emissions from the Project and cumulatively from the Project and the approved Doris North Gold Mine Project are predicted to change ambient O_3 concentrations by a negligible amount.
- Predicted ambient CO concentrations from the Project as well as cumulatively from the Project and the approved Doris North Gold Mine Project are predicted to be below the hourly guideline outside of the PB.

[54] Banci, V. and R. Spicker, (Compilers, Editors & GIS). 2016. *Inuit Traditional Knowledge for TMAC Resources Inc. Proposed Hope Bay Project, Naonaiyaotit Traditional Knowledge Project (NTKP)*. Prepared for TMAC Resources Inc. Kitikmeot Inuit Association: Kugluktuk, NU.

- The Project and the cumulative effect of the Project and the approved Doris North Gold Mine Project are predicted to change ambient VOC concentrations by a negligible amount.
- Predicted ambient TSP concentrations from the Project as well as cumulatively from the Project and the approved Doris North Gold Mine Project are predicted to be below the 24-hour and annual guidelines outside of the PB.
- Predicted ambient $PM_{2.5}$ concentrations from the Project as well as cumulatively from the Project and the approved Doris North Gold Mine Project would not exceed the 24-hour or annual guidelines outside of the PB.
- Predicted ambient PM_{10} concentrations from the Project as well as cumulatively from the Project and the approved Doris North Gold Mine Project would intermittingly exceed the relevant 24-hour guidelines within portions of the LSA.

Within the PB (e.g., at the worker camps), the Proponent's air quality modelling predicted that concentrations of NO_2 as well as suspended particulate matter (PM_{10}, $PM_{2.5}$) from dust would exceed the applicable 1-hour, 24-hour and/or annual guidelines for Nunavut, British Columbia, and Canada at certain times and locations during the construction and operations phases. These contaminants were thus carried forward by the Proponent as a Contaminant of Potential Concern (COPC) in the Human Health and Environmental Risk Assessment (Volume 6, Section 5 of the FEIS). During the Final Hearing, TMAC noted that air quality within the PB is managed through occupational health and safety and other mitigation measures applicable to workers.[55] See Section 7.2 of this Final Hearing Report for a summary of the Human Health and Environmental Risk Assessment (HHERA).

In a supplemental submission[56], TMAC provided the results of its updated air quality dispersion modelling that utilized a refined, less conservative, emissions inventory to provide a more representative assessment of potential compliance with the NO_2 CAAQS (should it be adopted as a regulatory criteria in Nunavut). Specific refinements were as follows:

- Madrid North and Boston power plant emissions now assumed to meet the more stringent Tier 4 emissions requirement; and
- Equipment utilization factors for primary and secondary equipment were updated based on actual fuel consumption data at the Doris North site.

The supplemental submission included the following conclusions:

- The refined model predictions show significant reductions in the maximum frequency of exceedance of the NO_2 hourly CAAQS for all scenarios (-26% to -59%);
- The distances outside the modelled property boundary exceeding the hourly NO_2 CAAQS reduced by about 50% for all scenarios and are within the local study area (LSA) in all cases;

[55] M. Rykaart, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2018, p. 129, lines 19-25.
[56] Letter from Nunami Stantec to TMAC Resources Inc. April 26, 2018, *Refined Dispersion Modelling Assessment – Madrid Boston Project*.

- The maximum predicted hourly NO_2 concentrations in the Northern Domain for each scenario have only small reductions in magnitude, suggesting that a NO_x emission source (or sources) not included in the model refinements is the dominant contributor to the maximum predicted concentrations. Refinement of the emissions/model parameters for these source(s) or addition of mitigation measures would further reduce the model predictions;
- Even with the model refinements presented in this analysis, the dispersion model predictions are still expected to be conservative. Further refinement of dispersion model and atmospheric chemistry parameters (e.g. ozone concentrations used in the assessment) would likely further reduce the maximum predicted NO_2 concentrations and
- The refined model predictions for ambient PM_{10} levels for operations for all scenarios are below the applicable objective with the refined modelling. Infrequent exceedances of the PM_{10} objective (1-day per year) were predicted in the FEIS modelling.

TMAC listed a variety of mitigative actions for air quality in the FEIS, including:

- Use of fuel efficient and low emission equipment and vehicles, and regularly servicing vehicles and equipment to maintain efficiency;
- Maintain speed limits at 50 kilometres/hour to minimize fugitive dust along roads;
- Use water, packed snow, coarse material, and/or suitable chemical suppressants to control dust from roads and the Doris North Tailings Impoundment Area and the Boston Tailings Management Area;
- Implement waste segregation and recycling to reduce emissions of dioxins and furans; and
- Consideration of additional mitigation measures as needed / as project design advances.

TMAC identified negative residual effects for all of the air quality contaminants, and noted they would be limited to the construction and operations phases of the Project and reversible once emissions cease at the end of project life. TMAC concluded that all residual effects on air quality would be not significant, including where exceedances were predicted, because such exceedances would be temporary, infrequent, and would occur within areas where human exposure is unlikely. TMAC also concluded that there would be no cumulative effects on air quality because air contaminant concentrations and deposition rates decrease with distance from the source, and the Project is far from any other sources of air quality contaminants.

As detailed in the Air Quality Management Plan, TMAC proposed monitoring dust deposition and levels of suspended particulate matter and NO_2 at a variety of sampling locations, in addition to emissions testing of dioxins, furans and mercury through incinerator stack testing at the Doris North incinerators. TMAC noted that should monitoring indicate that dust emissions exceed guidelines or FEIS predictions, it would consider additional mitigation such as contouring or covering of stockpiles to minimize wind erosion, and installing wind fences.

5.1.2 Views and Concerns of Interested Parties

Emissions inventory and standards

In its final written submission[57], Environment and Climate Change Canada (ECCC) noted that the Air Quality Modelling Study presented in the Draft Environmental Impact Statement (DEIS) had predicted exceedances of nitrogen dioxide (NO_2) and that TMAC had updated the study for the FEIS to incorporate revised estimates of air emissions. ECCC recommended that TMAC provide a table comparing emission estimates and modelling inputs between the DEIS and FEIS along with detailed explanations in order to validate changes resulting from project modifications. In its response to final written submissions, TMAC provided the requested comparison and explanations, listing a variety of changes to the model inputs and parameterization.[58] During the Final Hearing, ECCC indicated it considered this issue resolved.[59]

In its final written submission, ECCC also highlighted that its proposed regulations for air pollutant emissions from stationary diesel engines are to be published in 2018 and would align with the United States' federal emission standards. ECCC noted that the Proponent's Air Quality Modelling Study showed that three (3) of the generators would only meet Tier 2 emission standards while all other gensets would meet Tier 4 standards. ECCC recommended that the Proponent consider using engines that meet Tier 4 emission standards for all construction and operations phases. In response to ECCC's final written submission, TMAC indicated that power at Madrid South, the Quarry D construction camp, and the Boston construction camp may utilize existing generators rather than acquiring new equipment, as the gensets at those locations account for only 8.2% of the total generation capacity of the Project. TMAC noted that the air quality assessment conservatively assumed those gensets would meet Tier 2 emission standards. During the Final Hearing, ECCC indicated it was satisfied with the information provided.[60]

ECCC also noted within its final written submission that the Proponent's model used Tier 3 emission standards for haul trucks at the existing Doris North Gold Mine site and Tier 4 emission standards for haul trucks at the proposed project. ECCC recommended that the Proponent provide confirmation that the Tier 3 equipment used at Doris North would be used for development of the Project and if so whether the equipment would be retrofitted to meet Tier 4 standards, since the Proponent's air quality modelling assumed all equipment would meet Tier 4 standards. ECCC also recommended that the Proponent confirm any new equipment purchased for the project would meet Tier 4 standards. ECCC further recommended that the Proponent not remove emission control technologies from off-road equipment, implement an emission control technology maintenance program, and provide employee training on minimizing off-road equipment idling.

In its response to ECCC's final written submission, TMAC clarified that the FEIS assumed that existing non-road equipment at Doris North Gold Mine meets Tier 3 emission standards. TMAC

[57] Environment and Climate Change Canada Final Written Submission, March 19, 2018
[58] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[59] K. Wells, Environment and Climate Change Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 500, lines 7-8.
[60] K. Wells, Environment and Climate Change Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 502, lines 4-5.

confirmed that it anticipates that most of the equipment required for Phase 2 would be new equipment, which would meet Tier 4 standards, and any existing equipment to be used would meet emission guidelines applicable at the time of manufacture. TMAC noted that the air quality modelling study conservatively assumed that emissions from the Madrid North and Boston generators had the same emissions as the Doris North generators. TMAC further added that new power plants would be used for the Project, and these would meet Tier 4 standards, while the modelling study conservatively assumed they would meet lower (Tier 1) emission standards. TMAC emphasized that based on these two (2) key conservatisms, the air quality modelling study presented in the FEIS overestimated NO_x emissions and ambient air quality from the Project. As noted in Section 5.1.1 of this Report, TMAC provided updated air quality modelling results in a supplemental submission that were based on revised emission estimates[61].

The Proponent's response to ECCC also presented the following proposed air quality mitigation measures identified in the Air Quality Management Plan:

- Vehicle and equipment idling is minimized when not in use and able to do so;
- All mobile and stationary engines are regularly serviced to maintain efficiency;
- A preventive maintenance program is in place for all machinery and equipment; and
- On-site staff are provided training and instruction relating to process control and air emissions (e.g., the required measures to be implemented during start-up, shut down and abnormal conditions).

TMAC further noted it does not anticipate any need to remove emission control technologies from off-road equipment unless the equipment could not be operated with the control in place. TMAC further noted that emissions from underground mining equipment are exempted from ECCC's regulations but will meet the applicable Nunavut regulations. During the Final Hearing, ECCC indicated it was satisfied with TMAC's responses.[62]

Within its final written submission, ECCC also recommended that the Proponent quantify the emission estimates of Volatile Organic Compounds (VOCs) from all sources during all phases of the project, or provide supporting evidence demonstrating that the VOC emissions would be negligible, rather than only stating that the ambient emissions are negligible. TMAC's response to ECCC's final written submission included a table with a summary of estimated daily average total VOC emission rates for construction and operations for existing conditions (Doris North Gold Mine), and for the Phase 2 Hope Bay Belt Project alone. TMAC demonstrated that the Phase 2 Project would be expected to increase total VOC emissions by 0.36 to 0.38 tonnes per day, which TMAC noted is approximately 5.6% to 8.6% of total estimated total NOx emissions, and, based on experience from other mines, well below ambient objectives. During the Final Hearing, ECCC indicated it considered this issue resolved.[63]

[61] Letter from Nunami Stantec to TMAC Resources Inc. April 26, 2018, *Refined Dispersion Modelling Assessment – Madrid Boston Project*.
[62] K. Wells, Environment and Climate Change Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 503, lines 3-4.
[63] K. Wells, Environment and Climate Change Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 501, lines 12-14.

Predicted NO_2 exceedances

In its final written submission[64], the Government of Nunavut (GN) noted that TMAC had predicted that hourly concentrations of NO_2 would exceed the newly introduced Canadian Ambient Air Quality Standards (CAAQS) outside of the Project Development Area (PDA) and Property Boundary (PB) by a substantial amount and should be considered a significant effect. The GN added that TMAC's Human Health and Environmental Risk Assessment (HHERA) was based on current rather than updated CAAQS (effective in 2020 and 2025), and recommended that the impacts on human health be assessed on the latter. Health Canada made the same recommendation in its final written submission.[65] See Section 7.2 for additional discussion of the HHERA. The GN also commented within its final written submission that TMAC's proposed passive monitoring program for NO_2 involves monthly averaging and would not be directly applicable to hourly average NO_2. The GN recommended that the Proponent propose an hourly average air sampling program for NO_2 to ensure adequate follow-up. Noting the Proponent had not provided any details for additional mitigative actions regarding NO_2, the GN further recommended that the Proponent propose a feasible technical solution and make a clear commitment to mitigate the exceedance of hourly average CAAQS for NO_2 if its potential is confirmed by follow-up monitoring. During the Final Hearing, the GN noted the likelihood that it would move towards adopting national standards for air quality.[66]

In its response to the GN's final written submission,[67] TMAC highlighted that it has predicted the Project will be in compliance with the Ambient Air Quality Guidelines for Nunavut, and noted the CAAQS are more appropriate to regional, rather than industrial reporting.[68] As noted in Section 5.1.1 of this Report, TMAC concluded in a supplemental submission[69] that based on its updated air quality dispersion modelling, and in reference to the CAAQS, the frequency and geographic extent of hourly NO_2 exceedances are now expected to be considerably less than originally predicted by the more conservative model, and furthermore that no exceedances of particulate matter with a diameter less than 10 micrometre (PM_{10}) are predicted.

TMAC's response to the final written submissions of both the GN and Health Canada regarding NO_2 exceedances also listed the following mitigative measures that could be applied:

- Wind power generation, which would reduce emissions due to reduced power plant operation;
- Taller stacks at Madrid North and Boston power plants to promote greater dispersion; and
- Project design measures such as energy efficiency methodologies, allowances in design for inclusion of future control technologies in power plant design, etc.

In its final written submission, Health Canada noted that NO_2 and PM_{10} are non-threshold contaminants and even short-term exposures can adversely impact health, therefore additional

[64] Government of Nunavut Final Written Submission, March 19, 2018
[65] Health Canada Final Written Submission, March 19, 2018
[66] S. Pinksen, Government of Nunavut, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 829, lines 6-8.
[67] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[68] TMAC referenced the Canadian Council of the Minister of Environment's *Guidance Document on Achievement Determination: Canadian Ambient Air Quality Standards for fine Particulate and Ozone.*
[69] Letter from Nunami Stantec to TMAC Resources Inc. April 26, 2018, *Refined Dispersion Modelling Assessment – Madrid Boston Project*.

mitigation to reduce these contaminants should be provided and implemented, including using Tier 3/4 emission standards for vehicles. Health Canada recommended that TMAC provide additional specific mitigation measures to reduce the 1-hour NO_2 concentrations below CAAQS guidelines, and additional specific mitigation measures to reduce PM_{10}. Health Canada also recommended the Proponent commit to the CAAQS principles of "Keeping Clean Areas Clean and Continuous Improvement" to ensure the Project contributes minimally to the degradation of air quality. Health Canada also identified two (2) tables within the FEIS showing different values for the existing (including baseline) levels of criteria air contaminants, and asked TMAC to provide rationale for this discrepancy. Health Canada also made a recommendation similar to the Government of Nunavut that the Proponent revise the HHERA to use updated CAAQS for NO_2 to match the criteria used in the air quality assessment. See Section 7.2 of this Report for further discussion on the HHERA.

In response to Health Canada's submission regarding the discrepancy in TMAC's reported levels of existing air contaminants in the FEIS, TMAC clarified that existing conditions refer to the operations at the existing Doris North Gold Mine site during construction and operations for 2019 and 2030 and the changes expected between those two dates. Regarding the issue of exceedances, as noted above in Section 5.1.1 of this Report, TMAC concluded in a supplemental submission[70] that based on its updated air quality dispersion modelling, the frequency and geographic extent of hourly NO_2 exceedances are now expected to be considerably less than originally predicted by the more conservative model, and furthermore that no PM_{10} exceedances are predicted. TMAC also committed to conduct continuous NO_2 monitoring during peak construction and leading up to and during peak operations, and to compare results to the CAAQS; with results used to adjust the monitoring plan as needed.[71] During the Final Hearing, Health Canada acknowledged TMAC's new modelling results and monitoring commitments, however, Health Canada recommended that the NO_2 monitoring continue until the Proponent demonstrates that NO_2 levels are below the 1-hour CAAQS standard.[72] In response to follow-up questions from TMAC,[73] Health Canada acknowledged that while territories and provinces can decide whether to not to implemented the CAAQS, as a federal department, Health Canada will advise the use of federal standards across the country.[74]

At the close of the Final Hearing, Health Canada reiterated its recommendation that TMAC continue NO_2 monitoring until it can demonstrate that concentrations are below the 1-hour NO_2 CAAQS.[75] TMAC emphasized during its closing remarks that the GN will determine whether the federal CAAQS, which are to become effective in 2020 and 2025, will become effective in

[70] Letter from Nunami Stantec to TMAC Resources Inc. April 26, 2018, Refined Dispersion Modelling Assessment – Madrid Boston Project.
[71] TMAC Resources Inc., List of Commitments Generated in the Proponent's Response to Technical Comments on the Madrid-Boston Final Environmental Impact Statement. Exhibit 84, NIRB Final Hearing File No. 12MN001, May 12, 2018.
[72] G. Irvine, Health Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 597, lines 4-9.
[73] B. Armstrong, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, pp. 631-632, lines 25-26 and 1-7.
[74] G. Irvine, Health Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 632, lines 10-14.
[75] M. Gale, Health Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 1023, lines 4-9.

Nunavut. TMAC stressed that it will comply with any requirements of the GN as they become effective.[76]

NO_2 monitoring

ECCC also commented within its final written submission that the Proponent had opted for passive rather than continuous monitoring for NO_2 with no adequate justification provided. ECCC noted that there are currently several stations continuously monitoring NO_2 in the north and also noted that passive samplers can become saturated before the end of the 30 day period resulting in an under measurement of NO_2. ECCC recommended that the Proponent implement continuous NO_2 monitoring in the absence of justification that passive sampling is more reliable. ECCC also noted the most recent version of the Proponent's Air Quality Management Plan did not include adaptive management measures for NO_2, and recommended that specific adaptive measures and strategies for NO_2 be provided.

In response to ECCC's final written submission regarding NO_2 monitoring, TMAC noted that continuous monitoring is challenging in remote areas with extreme temperature levels, as power is needed to maintain the instrumentation within the required temperature range, adding that a power line is unlikely to be available where the monitors would need to be situated, and that portable generators are unreliable and can lead to data losses. TMAC also noted that passive sampling has previously been conducted in the vicinity of the existing Doris North Gold Mine Project, and highlighted that the samplers can be varied to ensure that saturation does not occur. However, during the Final Hearing TMAC subsequently committed to implement continuous NO_2 monitoring during construction and operations.[77, 78] TMAC also committed to compare monitoring results to the CAAQS, to include results in its Annual Report to the NIRB, and to adjust the monitoring plan and implement adaptive management if required, with consideration given to the CAAQS. TMAC further committed to conduct additional NO_2 monitoring in the event that emissions increase due to a change in operations. In response to a request for monitoring details from Health Canada during the Final Hearing,[79] TMAC added that the details of where continuous NO_2 monitoring would be done have not yet been decided, but that the monitoring would likely be done 365 days per year.[80] During the Final Hearing, ECCC indicated it considered this issue resolved with the commitments made by TMAC.[81]

Incineration and Stack Testing

In its final written submission, ECCC noted that the Proponent's Air Quality Management Plan did not include adaptive management measures specifically related to incineration, and

[76] O. Curran, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 1028, lines 1-6.
[77] TMAC Resources Inc. List of Commitments Generated in the Proponent's Response to Technical Comments on the Madrid-Boston Final Environmental Impact Statement. Exhibit 84 NIRB Final Hearing File No. 12MN001, May 12, 2018.
[78] M. Rykaart, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2018, p. 132, lines 9-19.
[79] G. Irvine, Health Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2018, pp. 139-140, lines 7-10 and 5-7.
[80] O. Curran, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2018, p. 139-140, lines 15-26 and 9-10.
[81] K. Wells, Environment and Climate Change Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 500, lines 9-26.

recommended that TMAC provide adaptive management measures that would be implemented should stack testing indicate exceedance of the Canada Wide Standards. ECCC also recommended that the Proponent confirm the frequency of stack testing, noting that the Canada Wide Standard for annual stack testing would apply given amount of wastes estimated to be incinerated. In response, TMAC committed to conduct stack testing at any new incinerator within six (6) months of its installation, and to conduct a representative stack test on existing incinerators after a significant change to site activities with the potential to change the waste stream or every three (3) years, whichever is more frequent.[82] In the event of emission exceedances related to incineration, TMAC committed to investigate the possible source(s) and potential impacts of the exceedances, and to assess and apply adaptive management options based on the identified contributing factors. TMAC's responses to ECCC identified the following adaptive management measures that could be applied in the event of emission exceedances:

- Additional waste diversion (i.e., waste reduction, material reuse) to minimize wastes;
- Waste segregation to divert materials with greater potential to generate dioxins, furans, and mercury to recycling or other non-incineration disposal options;
- Combustion control strategies to optimize incinerator performance; and
- Use of alternative disposal or treatment technologies such as off-site shipment of wastes.

ECCC indicated during the Final Hearing that it considered this issue resolved.[83]

During the Final Hearing, a Community Representative from Gjoa Haven asked the Proponent whether it plans to have an incinerator, and if so, what type, would there be smoke stacks, and what would be burned - in particular, what would happen to used oil. The Representative further asked how frequently inspections would be conducted by ECCC.[84] ECCC responded that the department had reviewed the modelling for emissions to ensure they would be at safe levels, and had received a commitment from TMAC that it would monitor the emissions to verify its predictions, or take actions to ensure they are.[85] TMAC confirmed that it has incinerators on site currently and that the proposed project would involve the addition of an incinerator at the Boston site. TMAC noted that the incinerators are the best technology available and specified that they are dual chamber incinerators to ensure very hot temperatures for proper burn of materials and to allow for gases to react and minimize emissions. TMAC added that waste is segregated so that food waste from the kitchen is incinerated while wood and plastics are not, and that oil can be reused to heat smaller buildings. TMAC confirmed that it will test emissions from the

[82] TMAC Resources Inc. List of Commitments Generated in the Proponent's Response to Technical Comments on the Madrid-Boston Final Environmental Impact Statement. Exhibit 84 NIRB Final Hearing File No. 12MN001, May 12, 2018.
[83] K. Wells, Environment and Climate Change Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 500, lines 1-2.
[84] U. Puqiqnak, Gjoa Haven, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 926, lines 4-16.
[85] B. Summerfield, Environment and Climate Change Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 927, lines 1-8.

incinerator six months after the incinerator is purchased, and then every three (3) years to ensure it is meeting ECCC standards.[86]

A public member from Cambridge Bay later shared that as a former employee at the Doris North Gold Mine under Newmont Mining Corp., he had received waste management training, and noted that "*[w]e'd burn a lot of plastic, and sometimes there was black smoke. To avoid that black showing and how they used to train us is we used to put a little bit of snow on top of the waste inside the incinerator avoiding the black smoke going all over the place.*" The public member further noted that they "*… had a burner to burn used oil. So I did a lot of training on waste management and how to deal with all kinds of waste. You know, when we don't understand about the product, we go through the computer and we go to the product and how to deal with it in the proper way*."[87]

Dust management

In its final written submission, the Kitikmeot Inuit Association (KIA) expressed concerns regarding the potential impacts of fugitive dust on vegetation.[88] The KIA noted that while the Proponent acknowledged in the FEIS that dust may extend beyond the 100 m Project Development Area (PDA), later in the same section of the FEIS the Proponent concluded that effects on vegetation and special landscape features would be limited to the PDA. The KIA referred to both scientific literature and local traditional knowledge, indicating that dust from roads and other sources can affect vegetation at distances well beyond 100 m. The KIA requested that the Proponent ensure dustfall and vegetation monitoring capture potential impacts beyond the PDA to allow for adequate compensation and offsetting to be calculated and to better inform future planning and best practices. The KIA also requested that TMAC limit the amount of fine particles (<0.075 mm in size) in materials used in road construction and upgrades to less than 20% whenever possible. In its response to the KIA's final written submission,[89] TMAC reiterated that its dustfall monitoring program includes monitoring both within and outside of the PDA. TMAC committed to conduct vegetation monitoring should the results of dustfall monitoring indicate a potential for effects to vegetation beyond that predicted in the PDA. TMAC also confirmed that it would limit the amount of fine particles in materials for road construction and upgrades to below 20% whenever possible, noting that existing technical specifications specify the use of coarse rock and surfacing material with no more than 15% composed of particles finer than 0.08 mm. See Section 5.11 of this Report for further discussion on vegetation. During the Final Hearing, the KIA confirmed it considered the issue resolved.[90]

In its final written submission, ECCC recommended that justification and supporting documentation for the assumption of 75% road dust control efficiency in the Air Quality Modelling Study should be provided. In its response, TMAC referenced reports from the United States Environmental Protection Agency (US EPA) and from Golder Associates showing that

[86] O. Curran, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, pp. 927-928, lines 13-26 and 1-20.
[87] J. Avalak, Public Member from Cambridge Bay, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018 pp. 930-931, lines 23-26 and 1-12.
[88] Kitikmeot Inuit Association Final Written Submission, March 19, 2018.
[89] TMAC Resources Inc. Response to final written submissions, April 5, 2018.
[90] J. Roesch, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 435, lines 12-23.

75% efficiency in dust control on unpaved roads can be achieved in the summertime provided sufficient water is applied at regular intervals. TMAC acknowledged that alternative methods for dust control would be required when temperatures fall below freezing, and these could include the application of coarse stone and the implementation of speed limits. TMAC further noted that its planned dustfall monitoring along the Doris-Windy All Weather Road would inform the adequacy of its road dust control measures and the need for adaptive management methods. During the Final Hearing, TMAC subsequently committed to update its Air Quality Management Plan to provide a description of the process undertaken to achieve 75% dust management efficiency.[91] Based on the information provided and TMAC's commitments, ECCC indicated during the Final Hearing that it considered this issue resolved.[92]

In its final written submission, Health Canada noted that the Proponent had proposed to upgrade to continuous monitoring for Total Suspended Particulate Matter (TSP), particulate matter with diameter less than ten (10) micrometers (PM_{10}), and particulate matter with diameter less than 2.5 micrometers ($PM_{2.5}$), and to implement additional dust suppression activities if deemed necessary. Health Canada expressed concern that these contaminants should be monitored over the life of the project and recommended that TMAC provide the criteria for upgrading to continuous monitoring of criteria air contaminants. Health Canada further noted that TMAC did not provide the thresholds that would trigger the need for improved dust suppression activities. Health Canada recommended that the criteria or thresholds for determining when dust suppression activities would be increased should be provided. In its submission, TMAC responded to Health Canada's concern with respect to monitoring and dust suppression noting that continuous monitoring of TSP, PM_{10} or $PM_{2.5}$ would be considered if frequent exceedances of their relevant air quality guidelines or standards are measured by the non-continuous monitors. TMAC also clarified that results of the dustfall monitoring described in its Air Quality Management Plan would be used to confirm or refine the adequacy of road dust control measures. During the Final Hearing, Health Canada stated it had no outstanding concerns related to this issue.[93]

Wind turbines

ECCC's final written submission noted that air pollution emissions would be reduced through the use of wind turbines by an amount that would depend on when the wind power was implemented and their cumulative magnitude. ECCC recommended that TMAC provide timelines for integrating the wind turbines into the power distribution grid. In response, the Proponent explained that the wind turbines would be constructed from 2021 to 2022 and be operational by 2023. During the Final Hearing, ECCC indicated it was satisfied with the information provided.[94]

[91] TMAC Resources Inc. *List of Commitments Generated in the Proponent's Response to Technical Comments on the Madrid-Boston Final Environmental Impact Statement*. Exhibit 84 NIRB Final Hearing File No. 12MN001, May 12, 2018.
[92] K. Wells, Environment and Climate Change Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 501, line 8.
[93] G. Irvine, Health Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 595, lines 23-24.
[94] K. Wells, Environment and Climate Change Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 501, lines 20-21.

Non-Threshold Contaminants

In its final written submission, Health Canada noted that while TMAC described various criteria air contaminants as harmful to humans at high concentrations, scientific analysis has found no evidence of a threshold for population-level health effects associated with non-threshold contaminants, meaning that health effects may occur at any level of exposure. Health Canada emphasized that guideline values should not be construed as limits up to which polluting is allowed. Health Canada recommended that TMAC acknowledge that NO_2, PM_{10}, $PM_{2.5}$, and ozone (O_3) are non-threshold contaminants, and that health effects may occur at any level of exposure, not just at high concentrations. In response, TMAC acknowledged that NO_2, $PM_{2.5}$, and O_3 are non-threshold air contaminants, that health risks exist below the ambient air quality guidelines at any level of exposure, and that ambient air quality guidelines should not be construed as pollution limits. During the Final Hearing, Health Canada stated it had no outstanding concerns related to this issue.[95]

General mitigation measures

Within its final written submission Health Canada recommended for the inclusion of three (3) additional mitigation measures to reduce air pollutant emissions from the project to reduce the potential risk to human health:

- Covered transport trucks and conveyors to reduce dust generation;
- Dust collectors and other pollution control devices at the crushing and processing plants; and
- Stringent (Tier 3/4) vehicle and fuel standards for on-road and off-road equipment.

TMAC's response to Health Canada reiterated the proposed mitigation measures contained within the Hope Bay Project Air Quality Management Plan, which would include:

- Minimizing discharge heights from the crushers onto conveyors and from conveyors onto stockpiles;
- Enclosing the discharge from crushers onto conveyors or into other equipment where practicable;
- Conducting crushing and ore processing in enclosed buildings;
- Possible use of dust collectors or other pollution control devices where required; and
- Ensuring all new on and off-road equipment meets the applicable standard in effect at the time of their purchase and/or manufacture.

During the Final Hearing, Health Canada stated it had no outstanding concerns related to this issue.[96]

Reporting

During the Final Hearing, a Community Representative from Taloyoak asked ECCC how often the department receives a report from TMAC on the air pollution released by the mine.[97] ECCC

[95] G. Irvine, Health Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, pp. 594-595, lines 26 and 1.
[96] G. Irvine, Health Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 595, lines 12-13.
[97] S. Qingnaqtuq, Taloyoak, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 919, lines 14-20.

responded that as part of the Air Quality Monitoring Plan, TMAC submits an annual report to the NIRB, and ECCC reviews this report extensively and provides comments.[98] TMAC subsequently added during the Final Hearing that it measures dust and smaller particulates throughout the year in both summer and winter and this data is reported to the NIRB on an annual basis, although ECCC can review the data at any point in time and provide feedback.[99]

5.1.3 Views of the Board

The Board acknowledges the Proponent's air quality effects assessment including supplemental air dispersion modelling, and the significant commentary that took place throughout the Review process and during the Final Hearing between the Proponent and parties regarding project-related effects on air quality – in particular related to incineration, nitrogen dioxide (NO_2), dust and particulate matter – which helped to develop and refine appropriate mitigation and monitoring measures. The Board agrees that mitigation, monitoring, thoughtful application of appropriate guidelines and standards, and adaptive management are required to ensure minimal impacts to air quality from the proposed project.

The Board takes note of the Proponent's commitments to conduct stack testing of incinerators every three (3) years at a minimum, to continuous NO_2 monitoring, and to consider additional ways in which to minimize NO_2 emissions including through possible wind power generation, through the use of taller stacks at the Madrid North and Boston power plants, and by ensuring the new power plants and all new equipment would meet Tier 4 emission standards. The Board also recognizes the potential adverse impacts of fugitive dust on vegetation, soils, and water, and has given special consideration for the Proponent's commitments to manage fugitive dust from project activities, including its commitment to minimize the amount of fine materials used in road construction and upgrades. Committing to ongoing consultation and collaboration with parties to ensure dust suppression is adequate throughout the life of the Project will be critical; the Board stresses the importance of continual assessment, refinement, and improvement in mitigation, monitoring, and adaptive management measures for project developments in Nunavut.

5.1.4 Conclusions and Recommendations of the Board

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board believes that the Project's potential effects to air quality could be appropriately managed through the commitments provided by the Proponent and the application of key mitigation and monitoring measures. The Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- Maintaining an Air Quality Management Plan that includes the following:

[98] B. Summerfield, Environment and Climate Change Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, pp. 919-920, lines 24-26 and 1-6.
[99] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, pp. 920-921, lines 12-26 and 1-4.

- Consideration for the recommendations provided in Environment and Climate Change Canada's Technical Document for Batch Waste Incineration (2010).[100]
- Commitment to conduct stack testing of any new incinerators within six (6) months of installation, and of all incinerators at least once every three (3) years, whichever is more frequent.
- Description of continuous NO_2 monitoring and demonstration that NO_2 emissions do not exceed levels predicted during the NIRB's Review nor relevant guidelines.
- Description of dustfall monitoring program, including utilization of snow cores during winter.
- Providing methods to achieve 75% dust management efficiency.
- Commitment to conduct vegetation monitoring if the results of dustfall monitoring indicate that there is the potential for effects on tundra vegetation beyond that predicted in the property development area.
- Establishment of specific triggers and thresholds of emissions that will trigger adaptive management responses and actions, with reference to levels predicted or committed to, and within levels or limits established by applicable guidelines and regulations.

5.2. CLIMATE AND METEOROLOGY

5.2.1 Views of the Proponent

TMAC Resources Inc. (TMAC, or the Proponent) addressed Climate and Meteorology as a "Subject of Note" in its Final Environmental Impact Statement (FEIS) for the Phase 2 Hope Bay Belt Project (the Project). TMAC described potential effects of the project on the climate in Volume 4, Section 1 of the FEIS through an assessment of greenhouse gas (GHG) emissions. As the Proponent considered climate and meteorology as a subject of note, it did not present a significance determination specific to these environmental components. TMAC assessed interactions between climate and various valued ecosystemic components (VECs) in those individual sections of the FEIS. Supporting baseline information related to climate and meteorology from 2009 through 2014 was provided in Volume 4, Appendices V4-1A through V4-1H. TMAC indicated that meteorological data were collected prior to 2009 (provided in Appendices in Volume 5 of the FEIS); however, these data were not used in the FEIS because they did not confirm to Environment and Climate Change Canada's – Meteorological Service of Canada standard.

Recognizing that GHG emissions are globally unbounded, TMAC's assessment considered all project-related emissions, including aircraft take-off and landing and local marine shipping lanes, up to 0.75 hours (1 way) away from the Project. TMAC assessed GHG emissions from the Project for the expected peak period of emissions, which would occur during the operations phase in Year 12.

TMAC summarized the results of its meteorological baseline data collection at the project site from 2009 to 2014, noting that the daily average maximum temperatures at the Doris North and

[100] Environment Canada, 2010. Technical Document for Batch Waste Incineration.

Boston meteorological stations over this period were 29.4 degrees Celsius (ºC) and 28.1ºC, respectively, and the daily minimum temperatures were -43.5ºC and -45.2ºC, respectively. TMAC also observed that summer monthly rainfall ranged from 1.3 millimetres (mm) (June 2010) to 41.7 mm (July 2014) for the Doris North station.[101] TMAC added that climate normal data (1981 to 2010) for nearby Environment and Climate Change Canada meteorological stations indicate that the majority (62%) of the total precipitation fell as rain in the summers during this period. TMAC also summarized that winds were observed to blow mainly from westerly directions at the Roberts Bay, Doris North, and Boston sites. TMAC calculated average total monthly lake evaporation to be 139.4 to 143.6 mm.

The Proponent highlighted Inuit Traditional Knowledge from the *Naonaiyaotit Traditional Knowledge Project* (NTKP)[102] report indicating that in recent years there has been thinner ice, less snow, less good quality snow for building igloos, and less freshwater due to altered snowpacks. The Proponent also noted that studies of historical climate data over the past 50 years show increases in temperature and precipitation across much of Canada, including in Nunavut, resulting in changes in other variables including sea ice, snow cover, permafrost, evaporation, and sea level. TMAC reported that the Intergovernmental Panel on Climate Change (IPCC) predict a 5 to 6°C increase in temperature for the year 2100 relative to 1980-1999 temperatures for northern Canada, and relative to the 1961 to 1990 baseline, a 5 to 8% increase in total annual precipitation for 2010 to 2030 and a 15 to 30% increase for the period 2070 to 2100.

TMAC noted that the primary GHGs from anthropogenic sources are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_20), and assessed potential impacts of the Project on climate in the standardized unit of carbon dioxide equivalent (CO_{2eq}). In considering the expected rates of fuel consumption, waste incineration, explosives use, fuel tank venting, and aircraft and shipping traffic for the peak year of project activities, TMAC calculated that total annual project-related GHG emissions would be up to 133.5 kilotonnes (kt) CO_{2eq}. TMAC compared this value to GHG emissions from other mines in Nunavut and the Northwest Territories, demonstrating that projected emissions from the Project would be in line with the Diavik, Ekati, and Snap Lake mines in the Northwest Territories, and substantially lower than the Mary River Mine in Nunavut.

TMAC summarized that the emissions of GHG would be partly mitigated through project design features and best management practices, including the use of wind turbines to supplement the Doris North Gold Mine power plant, minimizing vehicle and equipment idling, and using larger trucks and roads optimized to minimize travel distance and the number of trips required.

TMAC noted that it is subject to Environment and Climate Change Canada's GHG Reporting Program, which requires all facilities that emit 50,000 tonnes or more of CO_{2eq} per year to submit an annual report.

[101] TMAC noted technical difficulties with the precipitation gauge at the Boston station for this time period and as a result only reported data from the Doris North station.

[102] Banci, V. and R. Spicker, (Compilers, Editors & GIS). 2016. *Inuit Traditional Knowledge for TMAC Resources Inc. Proposed Hope Bay Project, Naonaiyaotit Traditional Knowledge Project (NTKP)*. Prepared for TMAC Resources Inc. Kitikmeot Inuit Association: Kugluktuk, NU.

See Section 5.5 of this Report for a summary of TMAC's discussion of the potential impacts of climate change on permafrost conditions in the Project area. See Section 7.4 for a summary of TMAC's discussion of potential impacts of climate change on project components and TMAC's project design considerations.

5.2.2 Views and Concerns of Interested Parties

Within its final written submission, the Kitikmeot Inuit Association (KIA) indicated that climate change can potentially exacerbate the risk of invasive plant establishment, as warming temperatures permit species to grow that might not otherwise be adapted to tolerate cold conditions.[103] The KIA indicated that climate change should therefore be considered as part of a long-term management strategy. Refer to Section 5.11 for further discussion on invasive plant species.

Within its final written submission, Environment and Climate Change Canada (ECCC) expressed concern about the impacts of climate change on seepage at the Boston dry-stack tailings, and recommended that TMAC develop a contingency plan for the potential increase in seepage as a result of changes to permafrost from climate change.[104] See Section 5.7.2 for more details on this topic.

Within its final written submission, Indigenous and Northern Affairs Canada (INAC) expressed concern with TMAC's calculation of lake evaporation rates.[105] INAC specified that contrary to TMAC's conclusions, lake evaporation should not occur during lake ice cover conditions, including during May and June. INAC indicated it had first raised the issue during its review of the Proponent's *Draft* Environmental Impact Statement (DEIS). Noting that TMAC's concordance response to technical comments on the DEIS referenced a 2017 report from SRK Consultants submitted as Annex V1-7 Package P5-9 with the FEIS, and INAC clarified in its submission that the correct reference should be to Annex V1-7, Package P5-2. INAC requested that TMAC confirm the correct report to be referenced in the concordance information and include this in an errata summary for the FEIS as applicable. INAC also noted that this report from SRK referenced a study by Rouse et al. (2008), which INAC could not find, however a study by Rouse et al. (2005) was located and did not support TMAC's conclusions. INAC requested that the Proponent revise this report from SRK and provide it for review to parties, with revisions to include confirmation of the typical period of ice-cover conditions for the Project site based on actual observations, and the modification or removal of references to Rouse et al. (2008). INAC acknowledged that although the water and load balance model may have used questionable lake evaporation amounts, predictions would be insensitive so long as the inputs were consistently applied, and thus INAC did not request TMAC to re-calibrate and re-run the water and load balance model.

In its response to INAC's final written submission, TMAC acknowledged the reference error in the concordance table and confirmed that the correct reference was to the November 2017 Climate and Hydrological Parameters Summary Report, provided as FEIS Annex V1-7 Package

[103] Kitikmeot Inuit Association Final Written Submission, March 19, 2018.
[104] Environment and Climate Change Canada Final Written Submission, March 19, 2018.
[105] Indigenous and Northern Affairs Canada Final Written Submission, March 19, 2018.

P5-2.[106] TMAC also noted that the information found within Rouse et al. (2008) and Rouse et al. (2005) is consistent, but that it is misleading and does not add value to the discussion regarding lake water evaporation in the context of the Hope Bay Project. As a result, TMAC indicated it would remove reference to that study from FEIS Annex V1-7 Package P5-2. TMAC also provided a summary of site-specific baseline data from 1995 to 2014 demonstrating that the open water season is at least 120 days long and occurs approximately June through September. On this basis, and in consideration of reported values from other mining projects in Nunavut, TMAC concluded that its lake evaporation estimates for the month of June was appropriate, however TMAC noted it would update Annex V1-7 Package P5-2 to remove lake evaporation for May. Further, TMAC reran the Water and Load Balance model (presented in FEIS Annex V1-7, Package P5-4) using the updated lake evaporation numbers, and found insignificant differences; TMAC concluded that the effects assessment as presented remains valid.

INAC provided a response to TMAC's conclusions expressing its disagreement with TMAC's conclusion that ice effects on lake evaporation would cease to occur at the end of May, and recommended that TMAC include an adjustment for June when lakes may still be partially ice-covered, or provide a convincing argument for not doing so.[107]

In a supplemental submission, TMAC reiterated the lack of precise, site-specific information on the open water season and open water evaporation data, and as such noted it followed the common practice of calculating potential open water evaporation rates using empirical energy balance equations with more readily obtained primary climate variables.[108] TMAC noted these calculations do not apply for ice covered lakes and thus must be corrected. TMAC described its method that allowed for partial ice cover (i.e., reduced open water area) within the melting period, and provided its revised open water evaporation rates for the Doris-Madrid and Boston sites. TMAC reran the Water and Load Balance model using these updated evaporation rates, demonstrating that the differences in lake levels, water flows, and water quality in all cases was insignificant. TMAC concluded that therefore the effects assessment as presented remains valid. During the Final Hearing, INAC indicated that it was satisfied with this updated response, and considered the issue resolved.[109] See Section 5.7.1 this report for a summary of the Proponent's assessment of surface water hydrology and water quality including a discussion on the water and load balance model.

During the Final Hearing, a Community Representative from Gjoa Haven shared his knowledge with respect to the weather and its predictability: "*We knew just by looking outside what the weather today was going to be… During the day, it would be nice and then they would see a few clouds… they knew that the winds were going to become stronger the following day.*"[110] The Representative added that they used to travel by dog team regardless of the weather.

[106] TMAC Resources Inc. Response to final written submissions, April 5, 2018.
[107] Tetra Tech, Memo to Indigenous and Northern Affairs Canada. Preparation for Final Hearings for TMAC's Phase 2 Hope Bay Belt Gold Mine Project INAC Responses to Proponent, April 11, 2018.
[108] TMAC Resources Inc., Memo from SRK Consulting to TMAC Resources Re: TMAC Response to INAC-FC-2, May 2, 2018.
[109] F. Ngwa, Indigenous and Northern Affairs Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 581, lines 7-13.
[110] J. Qirqqut, Gjoa Haven. NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, pp. 914-915, lines 25-26, 1-8.

Another Community Representative from Gjoa Haven commented that the community is affected by climate change and noted that smoke from forest fires in the south reaches the community and surrounding areas. The Representative stated that:

> *…Whenever that time comes and we go out camping to harvest food that we're going to save for the winter season, and once there's a forest fire, we get impacted in that way because sometimes the wildlife that we want to hunt, they tend to go – sometimes they don't come to our area because they're running from the forest fire and the smoke.*[111]

Following ECCC's presentation, a Community Representative from Taloyoak asked in the context of climate change and waste rock piles, if the mining company will be required to report on ground thaw.[112] ECCC responded that TMAC has done a lot of modelling and has designed its tailings impoundment area and dry-stack storage tailings area to account for future climate change to ensure that even with worst-case scenario effects of climate change that there is no seepage at closure. ECCC noted that seepage throughout the Project is collected and monitored so it is not released into a stream or the receiving environment. ECCC further commented that there will be inspections and reports at closure to ensure future safety.[113] TMAC added that the waste rock storage will be temporary, as waste rock will be used to backfill in the underground mind. TMAC also confirmed that it has estimated future climate change impacts such as how much the active layer thickness will change over time, and TMAC has designed its water management based on estimated seepage quantities and volumes accordingly. TMAC also noted that the project site is inspected annually by a licensed and experienced geotechnical engineer to ensure that all facilities on site are structurally sound and providing all the necessary environmental containment. TMAC noted that this inspection includes an analysis of thermal data from the site going back to the early 2000's to look at permafrost conditions and change.[114]

A Community Representative from Cambridge Bay also expressed concerns about climate change and the presence of mining companies, noting that wildlife such as caribou are less abundant in the area now, and that many hunters return without finding any wildlife to hunt.[115]

5.2.3 Views of the Board

Recognizing that the effects of climate change are generally understood to be more pronounced in Arctic environments and are of direct concern to Nunavummiut who actively harvest and otherwise use the land, the Board appreciates the Proponent's consideration of potential effects of the Project on the climate, and of the potential effects of climate change on project infrastructure and activities. The Board also appreciates the Proponent's incorporation of Inuit

[111] U. Puqiqnak, Gjoa Haven, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, pp. 925-926, lines 23-26 and 1-3.
[112] S. Qingnaqtuq, Taloyoak, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 922, lines 3-25.
[113] B. Summerfield, Environment and Climate Change Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 923, lines 5-25.
[114] M. Rykaart, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, pp. 924-925, lines 5-26 and 1-11.
[115] J. Evalik, Cambridge Bay, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, pp. 936-937, lines 23-26 and 1-16.

Qaujimaningit related to climate change into its assessment and associated management plans. The Board stresses the uncertainty associated with predicting the rates and consequences of future climate change, and the importance of adopting a precautionary approach and conservative measures for mitigation, monitoring, and adaptive management. The Board expects that TMAC will continually monitor, analyze, and reports on its emissions, and acknowledges the Proponent's commitment to report to Environment and Climate Change Canada's Greenhouse Gas Emissions Reporting Program.

5.2.4 Conclusions and Recommendations of the Board

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board believes that the Project's potential effects to climate change could be appropriately managed through the commitments provided by the Proponent and the application of key mitigation and monitoring measures. The Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- Maintaining a Greenhouse Gas Emissions (GHG) Reduction Plan to track emissions and demonstrate mitigation is appropriately managing effects of the Project; and
- Maintaining a Mine Closure and Reclamation Plan or equivalent to: identify the processes that may act upon the mine components after closure and reclamation so that they can be factored within the design and operation of the mine; ensure physical and chemical stability of mine components that remain after closure; ensure mine components that remain after closure will not require long-term active care; and consider future use and aesthetics of the area with the surrounding lands. The Plan shall include monitoring protocols and alternative mitigation options with reference to specific triggers.

5.3. NOISE AND VIBRATION

5.3.1 Views of the Proponent

TMAC Resources Inc. (TMAC, or the Proponent) presented an assessment of potential impacts related to noise and vibration in Volume 4, Section 3 of the Final Environmental Impact Statement (FEIS) for the Phase 2 Hope Bay Belt Project (the Project). Specifically, Volume 4, Section 3 includes TMAC's assessment of expected project-related noise and vibration on humans. Further discussion of the residual effects of noise and vibration on humans was provided in the Human Health and Environmental Risk Assessment (Volume 6, Section 5 of the FEIS). The impacts of project noise on wildlife were provided in Volume 4, Section 9. Supporting baseline information from 2007, 2008, and 2010 collected for the Doris North Gold Mine Project, along with details on the modelling used by TMAC in its effects assessment were provided in Volume 4, Appendix V4-3A. TMAC also provided an analysis of noise and other impacts related to the proposed wind farm in Volume 4, Appendix V4-9E. TMAC's Noise Abatement Plan was presented in Volume 8, Annex V8-8. The Proponent noted within the FEIS that it does not expect any significant effects on humans or wildlife from noise and vibration.

TMAC defined the following spatial boundaries for its assessment of noise and vibration:

- Project Development Area (PDA): the Project footprint plus engineering buffers;
- Local Study Area (LSA): extends 1.5 kilometres (km) from the boundaries of the PDA, and encompasses an area of 299 square kilometres (km^2); and
- Regional Study Area (RSA): extends five (5) km from the boundaries of the PDA, and encompasses an area of 860 km^2.

TMAC identified eight (8) human receptor locations within the RSA corresponding to six (6) known hiking, hunting and fishing locations and two (2) cabins.

Temporally, TMAC considered the production of noise from project activities during the construction, operations, reclamation and closure, and possible temporary closure phases of the project, and noted the potential effects of sleep disturbance, complaints, and high annoyance.

The Proponent reviewed the *Naonaiyaotit Traditional Knowledge Project* (NTKP)[116] report and noted that there were no direct references relevant to noise and vibration. TMAC reported baseline sound levels in terms of the 24-hour logarithmic average of hourly L_{eq} [*continuous equivalent of A-weighted sound pressure level in decibels (dBA) over a specified time period*]. L_{eq} is the continuous equivalent of A-weighted sound pressure level in decibels (dBA) over a time period; the A-weighting is designed to match the average frequency response of the human ear. TMAC observed that mean ambient L_{eq} noise levels across its monitoring stations ranged from 22.9 to 53.3 dBA.

The Proponent used the following indicators and thresholds to assess the effects from construction and operations activities:

- L_{dn}: The 24-hour L_{eq}, with a 10 dBA weighting applied to the nighttime hours to account for increased sensitivity to noise at night. Health Canada's threshold is 62 dBA.
- L_{AMAX}: The maximum equivalent sound level within a 24-hour period. Health Canada's threshold is 56 dBA.
- %HA: Percent of population that would be Highly Annoyed, based on a statistical analysis of population behaviour regarding project-related noise. Health Canada's threshold is 6.5%.
- NEF: Noise Exposure Forecast contours to assess aircraft noise. Transport Canada's threshold is NEF25.
- L_{peak}: Peak blast overpressure sound level used to assess annoyance due to blasting. Health Canada's threshold is 120 unweighted decibels (dBZ); and
- PPV: Peak Particle Velocity, measured in millimetres per second (mm/s), representing the maximum instantaneous peak of the vibration velocity signal resulting from blasting. TMAC referenced to standards from the German Standard DIN 4150 and the United States Office of Surface Mining potential effects. The Proponent`s noise modelling also determined a zone of influence around the source where the PPV would be greater than or equal to 12.5 mm/s and the noise would be greater than or equal to 120 dBZ, values corresponding to the relevant regulation/guideline.

[116] Banci, V. and R. Spicker, (Compilers, Editors & GIS). 2016. *Inuit Traditional Knowledge for TMAC Resources Inc. Proposed Hope Bay Project, Naonaiyaotit Traditional Knowledge Project (NTKP)*. Prepared for TMAC Resources Inc. Kitikmeot Inuit Association: Kugluktuk, NU.

The Proponent noted the following modelling results in the FEIS:

- Sound pressure levels during construction would be below the Health Canada thresholds for annoyance and for sleep disturbance for the human receptors identified within the RSA;
- Sound pressure levels during operations would be below the Health Canada thresholds for annoyance and for sleep disturbance for the human receptors identified within the RSA;
- Noise Exposure Forecast contours from aircraft at the Doris and Boston airstrips would be in compliance with Transport Canada thresholds at all human receptors within the RSA;
- Sound pressure levels from helicopters would be in compliance with the Heath Canada Criteria at all human receptors within the RSA;
- Blasting noise from mines and quarries would not extend beyond the LSA and would not reach the modelled human receptors (zones of influence of 320 metres [m]); and
- Blasting vibration from mines and quarries would not extend beyond the LSA and would not reach the modelled human receptors (zones of influence of 540 m).

TMAC's proposed mitigation for noise and vibration would include designing walls and roofs of the ore processing and power generation buildings to reduce noise transmission; fitting equipment with mufflers and silencers; ensuring equipment is well maintained; posting speed limits for vehicles; and optimizing flight paths and schedules to avoid human and wildlife receptors. Wildlife species-specific abatement procedures are detailed in TMAC's Noise Abatement Plan. While TMAC noted this plan would be revised and finalized prior to operations, in the plan presented TMAC committed to conduct noise monitoring at least once during the operations phase and at least once during the reclamation phase.

During the Final Hearing, TMAC presented the distances at which noise from various sources at the operational Doris North Gold Mine Project could be heard on site, noting that noise is very localized, and that these practical results help reinforce the results of the noise modelling for the Hope Bay Belt Phase 2 Project.[117]

TMAC concluded that the residual effects related to noise and vibration from project-related activities would be not significant as effects are anticipated to be below the applicable criteria. TMAC concluded there would be no cumulative effects because noise and vibration are typically restricted to five (5) km from the source, and there are no other current or foreseeable projects within this distance.

5.3.2 Views and Concerns of Interested Parties

In its final written submission, the Kitikmeot Inuit Association (KIA) stressed the importance of ensuring that human health risks for workers due to excessive noise are appropriately mitigated and noted that TMAC's effects assessment predicted numerous exceedances of Health Canada's

[117] M. Rykaart, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2018, pp. 135-137, lines 21-26, 1-26, and 1-5.

noise thresholds even after the application of best practices and mitigation measures.[118] The KIA requested that TMAC describe additional mitigation that would be used to reduce impacts of noise on workers to below Health Canada thresholds, or if none available, to discuss impacts to human health due to those exceedances. In its response to the KIA's final written submission[119], TMAC noted that it would abide by occupational health and safety regulations, and provide workers with a safe work environment, including work camp accommodation areas.

In its final written submission, the Government of Nunavut (GN) acknowledged that TMAC proposed to cease blasting when caribou are within 2.8 kilometres (km) (all seasons) or four (4) km (calving season if calving range overlaps), but noted a discrepancy between the Wildlife Mitigation and Monitoring Plan (WMMP) and the Noise Abatement and Monitoring Plan, and limited rationale for the buffer / setback distances.[120] In particular, the GN noted it is not clear if TMAC's threshold of 96 unweighted decibels (dBZ) would be met at the distances of 2.8 km and 4 km, and moreover, that no rationale is provided for why a noise level of 96 dBZ is an appropriate threshold. The GN recommended that TMAC:

- Present the predicted overpressure value at 2.8 km and four (4) km from the blasting point;
- Verify that the predicted overpressure value will not affect caribou outside the 2.8 km zone and four (4) km zone in a calving period;
- Monitor the predicted overpressure value (less than 96 dBZ) and provide the effectiveness of the proposed setbacks;
- Amend the Noise Abatement and Monitoring Plan to include monitoring of the overpressure value at 2.8 km and four (4) km from the blasting point;
- Present setbacks for caribou mitigation consistently through relevant management plans; and
- Amend the WMMP to include a procedure on how to determine if the calving range overlaps the project site.

In response to the GN's concern with respect to setback values, TMAC committed to the following which was provided as an exhibit during the Final Hearing[121]:

- Conduct and report on noise measurements during quarry blasts at 2.8 and four (4) km to confirm predictions in the FEIS;
- Confirm that the overpressure value of 96 L_{peak} dBZ will not be exceeded at 2800 metres from the location of the blast;
- Monitor behaviour of caribou during blasts if caribou are observed beyond 2.8 km; and
- Provide methods used to determine calving ground overlap with the Project in the Wildlife Mitigation and Monitoring Plan.

[118] Kitikmeot Inuit Association Final Written Submission, March 19, 2018
[119] TMAC Resources Inc. Response to final written submissions, April 5, 2018.
[120] Government of Nunavut Final Written Submission, March 19, 2018
[121] TMAC Resources Inc. *List of Commitments Generated in the Proponent's Response to Technical Comments on the Madrid-Boston Final Environmental Impact Statement*. Exhibit 84 NIRB Final Hearing File No. 12MN001, May 12, 2018.

In response to GN's final written submission TMAC added that the FEIS over-estimated the size of quarry blasts and indicated that it was conducting supplementary noise modelling. TMAC also clarified that it used setback distances of 2.8 and four (4) km in consideration of noise modelling at other projects, viewscape modelling, and to be conservative in case caribou move to overlap the project site when calving. TMAC added that a noise level of 96 dBZ was predicted at 2.8 km, and this threshold was chosen in consultation with the GN and the KIA. TMAC further added that Inuit participants of its caribou workshops had a distance of 2.8 km from a quarry site pointed out to them, and had agreed that the distance would keep caribou safe. See Section 5.12 of this Report for a summary of the Proponent`s effects assessment related to terrestrial wildlife. During the Final Hearing, the GN noted that the issue had been resolved.[122]

During the Final Hearing, Fisheries and Oceans Canada (DFO) raised concerns about the validity of the Proponent's conclusions in the FEIS as regards the potential effects of underwater noise on marine mammals and noted a general lack of data regarding effects of shipping on marine mammals.[123,124] DFO recommended that the Proponent minimize underwater noise to the degree practicable, and undertake modelling with respect to noise levels and direction from ships and other sources to inform potential adaptive management measures regarding impacts of noise to marine mammals.[125] See Section 5.15 of this Report for additional details with respect to marine mammals.

In its final written submission, Health Canada observed that crown pillar recovery had not been included in the noise assessment as TMAC considered it to be of short duration.[126] Health Canada added that crown pillar recovery is similar to blasting and may cause significant increases in noise levels over several months and recommended that the Proponent include crown pillar recovery in the assessment of noise, or alternatively provide additional justification for its exclusion from the assessment. In response to Health Canada's concern, TMAC noted that noise and vibration effects from crown pillar recovery are expected to be similar or less in magnitude than from blasting for the portal entrance and the quarries, and that these blasting activities would not occur concurrently. TMAC further noted that the results of the blasting assessment are applicable to crown pillar recovery, as the noise and vibration from crown pillar recovery would be within the same zones of influence created around each portal location for blasting (see Volume 4, Appendix V4-3A of the FEIS). During the Final Hearing, Health Canada noted it accepted the Proponent's rationale and agreed that community members are unlikely to be affected from the crown pillar recovery.[127]

Health Canada also noted in its final written submission that the Proponent's noise assessment incorrectly used a daytime noise threshold of 62 dBA L_{dn} (the 24-hour sound pressure level

[122] S. Pinksen, Government of Nunavut, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 829, lines 18-19.
[123] B. Ross, Fisheries and Oceans Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 10 2018, p. 550, lines 12-19.
[124] M. Marcoux, Fisheries and Oceans Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 10 2018, p. 566, lines 18-26.
[125] Fisheries and Oceans Canada. *Phase 2 Hope Bay Belt Project Presentation*. Exhibit 43 NIRB Final Hearing File No. 12MN001, May 10, 2018.
[126] Health Canada Final Written Submission, March 19, 2018
[127] G. Irvine, Health Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 600, lines 2-13.

measured in A-weighted decibels, with a 10 dBA weighting applied to the nighttime hours to account for increased sensitivity to noise at night). Health Canada indicated that this threshold is a complaint-based limit for short-term (less than 12 months) construction noise. Health Canada advised that the noise assessment should be based on a 6.5% change in % Highly Annoyed since the construction would be long-term. Health Canada recommended that TMAC provide % Highly Annoyed results (or the more stringent 59 dBA criteria[128]) for comparing to Health Canada thresholds for annoyance for daytime use receptors from construction noise. Health Canada further recommended that TMAC describe all adjustments made in estimating the change in % Highly Annoyed including the source, time, and other adjustments. In a subsequent meeting with the Proponent, Health Canada indicated that the Proponent could alternatively use the more stringent 59 dBA criteria.

In response to Health Canada's concern regarding the threshold used, TMAC clarified that the % Highly Annoyed criterion was used for the two (2) human receptor locations with potential sleeping quarters, while the 62 dBA L_{dn} threshold was used for the six (6) "non-habitation" human receptors without sleeping quarters. TMAC added that according to Health Canada's latest guidance document,[129] the 62 dBA is used as a threshold for "widespread complaints." TMAC also indicated that the methods for calculating % Highly Annoyed were provided in the Environmental Noise and Vibration Study Report (Volume 4, Appendix V4-3A of the FEIS). In a subsequent meeting with Health Canada[130], TMAC emphasized that the 62 dBA L_{dn} used by Health Canada uses the "widespread complaints" criterion, which assumes that noise sensitive locations are residents and not occasional users of an area during daytime. TMAC noted that there are no residents within 160 km of the Project, and thus the expectation of widespread complaints occurring above 62 dBA is expected to be conservative. However, TMAC provided the results of an analysis demonstrating to Health Canada that predicted noise levels at the six (6) points of reception would meet the proposed 59 dBA L_{dn} criterion, with the exception of a predicted exceedance at one (1) receptor when a low-frequency penalty is applied. TMAC expressed its view that the 59 dBA L_{dn} is overly conservative because the receptors are not permanently occupied locations, are expected to have daytime impact only, and would only be occupied for short-term durations. TMAC concluded that its use of the 62 dBA L_{dn} criterion is acceptable for the Project. During the Final Hearing, Health Canada clarified that while it does not believe there will be a large project related noise impact on the chosen receptors, the department does not support the use of 62 dBA as a threshold for annoyance.[131] However, Health Canada concluded that as long as the Proponent is committed to resolving noise complaints, the department has no outstanding concerns.[132]

Health Canada also commented in its final written submission that TMAC's baseline noise data may have been contaminated by wind, adding that TMAC's assessment may underestimate the potential risk to human health. Health Canada requested that TMAC provide additional

[128] TMAC Resources Inc. Meeting Minutes: TMAC and Health Canada Meeting to Review Outstanding Air Quality and Noise Comments, April 25, 2018
[129] Health Canada, 2017. Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise.
[130] TMAC Resources Inc. Meeting Minutes: TMAC and Health Canada Meeting to Review Outstanding Air Quality and Noise Comments, April 25, 2018.
[131] G. Irvine, Health Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018 pp. 600-304, lines 24-26 and 1-4.
[132] M. Gale, Health Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018 p. 932, lines 2-6.

information of the noise sources making up the baseline and explain if wind contamination was controlled for in the baseline measurements. Health Canada also requested that TMAC provide rationale for using 50 dBA as the baseline to assess % Highly Annoyed. In response to Health Canada's submission regarding baseline noise, TMAC commented that wind is a legitimate source of naturally occurring noise and not a "contaminant" of the baseline conditions. TMAC noted that baseline noise was measured using a sound level meter with a microphone protected by a windscreen to help reduce the effects of the wind hitting the microphone and generating noise from the microphone itself. TMAC listed other sources of natural noise that would have been included in the baseline and noted that noise from the actual baseline study itself such as helicopter noise during deploying of noise monitoring equipment had been removed from the dataset. TMAC added that future noise monitoring would continue to incorporate wind-generated noise, and noted that future monitoring reports would include a discussion of wind. TMAC also replied that 50 dBA L_{dn} was used as the baseline noise level for assessing % Highly Annoyed as the baseline data indicated appropriate measures were taken to control for anthropogenic sources and meteorological conditions. In a supplemental submission[133], TMAC provided results of a new analysis to calculate % Highly Annoyed, which utilized baseline noise values for rural areas from Health Canada's 2017 Guidance Document[134] rather than using TMAC's measured background values. TMAC concluded that even if these more conservative baseline levels are used (which would discount wind effects), the change in % Highly Annoyed would still be acceptable (less than 6.5%). During the Final Hearing, Health Canada stated it does not agree with this method for estimating noise but agreed with the Proponent that there are unlikely to be project-related effects from noise to land users.[135]

Health Canada also noted in the final written submission that TMAC's noise assessment incorrectly used 57 dBA (corresponding to the 25 Noise Exposure Forecast or NEF contour) as a threshold of annoyance for aircraft and as demonstrated in recent literature receptors outside of the 25 Noise Exposure Forecast (NEF) can be disturbed by aircraft noise. Health Canada acknowledged the difficulty in estimating annoyance, complaints and sleep disturbance from aircraft noise and suggested that the Proponent include a strong commitment to resolve any project-related noise complains related to aircrafts and other sources. TMAC responded that it used the 25 NEF contour because Transport Canada suggests its exceedance would likely produce some level of annoyance and recommends against residential development within the 25 NEF contour. TMAC acknowledged that meeting this threshold limit does not mean there will be no annoyance or complaints beyond the 25 NEF contour. During the Final Hearing, Health Canada stated it had no outstanding concerns regarding this issue.[136]

Health Canada noted in its final written submission that TMAC had stated that follow-up monitoring and adaptive management would be used to determine any correction actions to on-site noise and vibration management or additional control measures. Health Canada recommended that the Proponent provide what determinants would be used to decide if there would be need for corrective action, describe what corrective actions would be used, and indicate

[133] TMAC Resources Inc., April 25, 2018. Supporting Information for Technical Comment HC-4.3.3.
[134] Health Canada, 2017. Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise.
[135] M. Gale, Health Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 962, lines 6-13.
[136] G. Irvine, Health Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, pp. 601-602, lines 18-26 and 1-3.

how noise complaints would be addressed. In its response, TMAC noted that conservative assumptions were applied in the assessment of potential effects, and that based on the proposed activities and identified mitigation, it does not anticipate a need for additional corrective actions. TMAC added that its Community Involvement Plan (Volume 8, Appendix V8-7 of the FEIS) includes a community complaints procedure that could be used for noise complaints. During the Final Hearing, Health Canada stated it had no outstanding concerns regarding this issue.[137]

Health Canada's final written submission also noted that TMAC incorrectly used the 120 dBZ peak limit as the blasting noise standard in its impact assessment instead of the 70 dBZ threshold to cause annoyance, which may have underestimated the potential risk. Health Canada explained that the 120 dBZ peak limit is a hearing loss limit to protect children from blasting noise, but that 70 dBZ is recommended to assess annoyance from sounds with strong low-frequency content. Health Canada recommended that the Proponent reassess blasting noise using recommendations in ISO 1996-1:2003.[138] Health Canada added that rattling from the emission of low-frequency noise should be included in the assessment or a rationale provided for its exclusion. TMAC responded that 120 dBZ is a criterion for hearing loss in children and also for limiting damage to nearby structures, and that its use together with the NEF contours to assess noise from aircraft, was appropriate and reasonable. During the Final Hearing, Health Canada stated it had no outstanding concerns regarding this issue, as long as the Proponent is committed to resolving project-related noise complaints.[139]

Finally, Health Canada noted within its final written submission that the noise assessment did not combine noise from the operations phase, blasting, aircraft, and helicopter together to evaluate the total effect on the noise environment from the project. Health Canada recommended that TMAC provide an assessment that combines noise from all these sources to determine the overall noise impacts, or to provide a rationale as to why this is not necessary. In response to Health Canada, TMAC indicated that different activities associated with the project (e.g., aircraft use, blasting, vehicle traffic) have different noise characteristics and so are typically assessed using different criteria. TMAC emphasized that existing regulatory guidance in Canada suggests that one overall noise criterion is insufficient to address the different types of noise sources that can occur. TMAC noted that it used several criteria, and that the assessment was structured such that an exceedance of any one of those criteria would be a significance adverse effect. TMAC concluded that it assessed all project activities based on their applicable criteria and determined that there would be no significant effects. During the Final Hearing, Health Canada stated it had no outstanding concerns regarding this issue as long as the Proponent is committed to resolving project-related noise complaints.[140]

[137] M. Gale, Health Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 962, lines 14-23.
[138] International Organization for Standardization (ISO). 2003. ISO 1996-1:2003 Acoustics – Description, measurement and assessment of environmental noise – Part 1: Basic quantities and assessment procedures.
[139] M. Gale, Health Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 962-963, lines 24-26 and 1-5.
[140] M. Gale, Health Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p.963, lines 6-11.

During the Final Hearing, an Elder from Cambridge Bay commented that he had visited the mine site, and wanted to make it clear that the noise pollution created at the mine site is very low and that noise effects on wildlife have been considered.[141]

A Community Representative from Taloyoak asked Health Canada how far noise from blasting travels.[142] Health Canada deferred to TMAC, which noted that its calculations show that noise from quarry blasting would be reduced to 96 decibels within 2.8 km.[143]

5.3.3 Views of the Board

The Board acknowledges the Proponent's noise and vibration effects assessment, supplemental analyses, and the significant commentary that took place throughout the Review process and during the Final Hearing between the Proponent and parties regarding project-related noise and vibration. The Board recognizes that noise and vibration has the potential to adversely impact people, terrestrial and marine wildlife, birds and fish, and appreciates the thoughtful input of parties to ensure project-related noise is monitored appropriately and assessed against appropriate guidelines and thresholds.

The Final Hearing was an important opportunity for the Board to receive clarification regarding the Proponent's assessment of noise and its plans for noise mitigation and monitoring. During the Final Hearing, the Board asked whether noise and vibration from aircraft associated with TMAC's nearby exploration activities were taken into account within the assessment.[144] In response, TMAC confirmed that its noise model incorporated flights between Doris North and Boston as well as flights to potential drill targets, and added that due to the linear nature of the gold deposit in the Hope Bay Belt, there are not a lot of east-west drill targets of interest.[145]

During the Final Hearing the Board also asked the Proponent to clarify the method of construction for the proposed cargo dock in Roberts Bay noting that pile driving generates a lot of noise that can affect marine mammals and fish.[146] In response, TMAC confirmed that construction of the dock would not use pile driving, but rather sheet piles that are vibrated into the sediments. TMAC added that the vibratory method produces much less sound.[147] See Section 5.15 for additional discussion about underwater noise and potential effects on marine wildlife.

[141] J. Hanilak, Public Member from Cambridge Bay, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018 pp. 781-783, lines 10-26, 1-26, and 1-4.
[142] A. Paniloo, Taloyoak, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018 p. 969, lines 12-13.
[143] A. Buchan, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018 pp. 969-970, lines 26, and 1-10.
[144] P. Kadlun, Board Member, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018 p. 772, lines 8-21.
[145] G. Sharam, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018 pp. 772-773, lines 26 and 1-9.
[146] P. Kadlun, Board Member, NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2018 p. 141, lines 10-25.
[147] O. Curran, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2018, p. 142, lines 4-18

The Board also asked TMAC how noise and effects on humans and wildlife from the proposed wind turbines would be monitored.[148] In response, TMAC noted that the wind turbines would be several kilometres away from the accommodation complexes, but added that noise is monitored inside the mill buildings, and also in the accommodations complex.[149] In a deferred response, TMAC noted that its noise modelling showed no disturbance effects on wildlife from the wind turbines beyond approximately 500 m. TMAC further noted it had committed to additional baseline bird surveys for some of the wind tower locations, and to long-term monitoring of the wind towers for bird [mortality] and would finalize details of the monitoring program with the Canadian Wildlife Service.[150] See Section 5.13 of this Report for additional details regarding TMAC's assessment of potential effects from wind turbines on birds.

The Board acknowledges the Proponent's Noise Abatement and Monitoring Plan and the mitigative measures therein. A safe work environment is critical and the Board stresses the importance of ensuring workers can occupy project accommodations without being disturbed by project-related noise and vibration; the Board expects that the Proponent will demonstrate its consideration for noise reduction through siting and design of all project buildings and infrastructure. The Board further acknowledges the Proponent's commitment to abide by occupational health and safety regulations related to acoustic and vibration impacts on workers, and also the Proponent's commitment to conduct noise monitoring at least once per phase of the project to verify the predictions of its noise model, and to take steps to resolve any exceedances.

5.3.4 Conclusions and Recommendations of the Board

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board believes that the Project's potential effects from noise and vibration could be appropriately managed through the commitments provided by the Proponent and the application of key mitigation and monitoring measures. The Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- Updating and maintaining a Noise Abatement and Monitoring Plan requiring:
    - Measures to protect people, fish, and wildlife, from mine activity noise and vibration, including blasting, drilling, equipment, vehicles and aircraft, including consideration for Fisheries and Oceans Canada's *Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters;*
    - Conducting noise and vibration monitoring at least once during each phase of the Project to demonstrate that noise levels remain within predicted levels and below applicable guidelines and standards;

[148] P. Kadlun, Board Member, NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2018 pp. 142-143, lines 21-26, 1-7.
[149] O. Curran, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2018, pp. 143-144, lines 11-26 and 1-10.
[150] G. Sharam, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, pp. 212-213, lines 15-26 and 1-21.

- Conducting noise measurements during quarry blasts at 2.8 and 4 kilometre (km) to confirm predictions and confirm that overpressure value of 96 L_{peak} unweighted decibels (dBZ) will not be exceeded at 2.8 km from the blast;
- Actions for adaptive management and follow-up monitoring should exceedances be observed; and
- Identification of a procedure for employees to make noise complaints should they have any.

5.4. TERRESTRIAL ENVIRONMENT (GEOLOGY AND GEOCHEMISTRY)

5.4.1 Views of the Proponent

TMAC Resources Inc. (TMAC, or the Proponent) discussed geological and geochemical conditions of the project study area and its assessment of project effects related to geology and geochemistry in Volume 4, Sections 4 and 5 of the Final Environmental Impact Statement (FEIS). Additional discussions of geochemical conditions in the project area and methods of data collection are presented in Volume 1, Annex V1-7, Packages P5-6, P5-7, P5-20, P5-21, and P5-25 of the FEIS. As the Proponent considered geology and geochemistry as subjects of note with linkages to other valued components, it did not present a significance determination specific to these environmental components. The Proponent assessed the potential for acid rock drainage and metal leaching at the project site and proposed mitigation measures to address these potential impacts to environmental components such as water resources.

The Proponent set the spatial boundaries for the assessment of geology and geochemistry as the Hope Bay Volcanic Belt, a large area encompassing the Doris North, Madrid, and Boston deposits. TMAC set the temporal study boundaries to include the construction, operations, closure, and post-closure phases of the Project.

The Proponent reviewed the *Naonaiyaotit Traditional Knowledge Project* (NTKP)[151] report and noted that there were no direct references relevant to geology and geochemistry.

The Proponent noted that the Hope Bay Volcanic Belt is within the Slave Structural Province. This bedrock is overlain by remnants of past glaciations and periods of submergence under sea including glacial till, fine sediment, and marine clays and silts, as well as other surficial deposits such as sand, gravel, cobbles and boulders. TMAC noted that gold mineralization varies among the three (3) deposits – the Boston deposit, located near the south end of the belt, consists of a steeply dipping quartz vein system, and has gold mineralization associated with proximal ankerite, quartz and sericite, with a distal collection of chlorite and calcite; the Madrid North and Madrid South deposits, located in the northern third of the belt, consist of a number of styles of veining and brecciation with deep and some near surface occurrences, and have a style of gold mineralization associated with an assemblage of sericite and carbonate (magnesite and ankerite) with veinlets of quartz-carbonate, which differs from the style of gold mineralization of the Boston deposit. TMAC indicated that the gold mineralization of the Madrid North and Madrid

[151] Banci, V. and R. Spicker, (Compilers, Editors & GIS). 2016. *Inuit Traditional Knowledge for TMAC Resources Inc. Proposed Hope Bay Project, Naonaiyaotit Traditional Knowledge Project (NTKP)*. Prepared for TMAC Resources Inc. Kitikmeot Inuit Association: Kugluktuk, NU.

South deposits also differ from that of the Doris deposit associated with the existing Doris North Gold Mine Project. The Proponent also presented information on a number of site investigations and studies conducted to improve understanding of the geophysical conditions in the project area, including geological mapping, geochemical sampling, underground sampling, mineralogical studies, and geotechnical studies.

In addition, the FEIS presented results of TMAC's geochemical characterization program to assess the metal leaching (ML) and acid rock drainage (ARD) potential of waste rock, ore, and tailings associated with the Madrid North, Madrid South, and Boston deposits, as well as project areas between Roberts Bay and Boston sites proposed for quarry development in support of the Project. The Proponent noted that, with the exception of some potential quarry locations, rocks from all quarries present a low risk of ARD and ML under neutral pH conditions and are, therefore, suitable for use as material for the construction of project infrastructure. Further, TMAC indicated that waste rock and ore from Madrid South, Madrid North, and Boston sites would have a low risk of ARD. The Proponent noted that there is potential for ML of arsenic from the waste rock, ore, and associated tailings under neutral pH conditions, which may be due to the trace occurrence of the sulphide mineral gersdorffite in the deposits. TMAC, however, acknowledged that that it was unable to confirm the presence of gersdorffite in the deposits and that there are no practical field techniques for segregation of waste rock that contains gersdorffite. The Proponent also predicted that, in the event of localized ARD, the high carbonate content in the overall waste rock stockpiles would provide sufficient buffering capacity, and that the overall drainage from the stockpile would remain neutral to alkaline.

Further, TMAC discussed the ARD and ML potential of the two (2) distinct types of tailings to be generated from the mining of the Madrid North, Madrid South, and Boston deposits. Specifically, the Proponent indicated that the first type, flotation tailings, are classified as non-potentially acid generating (non-PAG) and the second type, detoxified tailings, are classified as potentially acid generating (PAG).

TMAC identified a number of measures to mitigate potential effects to the environment as a result of the geology and geochemistry of mined materials at the project site, including the following:

- Impoundment of mine-contact water in lined ponds for treatment before release to the receiving environment;
- Co-disposal of PAG detoxified tailings with waste rock as backfill in the underground mine;
- Placement of any remaining waste rock stockpiled at surface as backfill underground at closure; and
- Flooding of all material backfilled in the underground mines at closure to prevent any further oxidation of sulphides and resulting onset of ARD and ML.

The Proponent presented a number of mitigation and monitoring plans to manage potential effects to the environment due to the geology and geochemistry of mined materials at the project site, including the following:

- Hope Bay Project Doris-Madrid Water Management Plan

- Hope Bay Project Boston Water Management Plan
- Management Plans for the Doris Tailings Impoundment Area and the Boston Tailings Management Area
- Hope Bay Project Waste Rock, Ore and Mine Backfill Management Plan
- Hope Bay Project Quarry Management and Monitoring Plan
- Conceptual Closure Plans for Doris-Madrid and Boston sites

The Proponent considered geology and geochemistry associated with the Project as subjects of note with linkages to other valued components such as water quality (see Section 5.6 and Section 5.7 of this Report for further discussion on hydrogeology, groundwater and surface water quality); therefore, TMAC did not present a significance determination specific to these environmental components.

5.4.2 Views and Concerns of Interested Parties

Within its final written submission, the Kitikmeot Inuit Association (KIA) noted that contingency measures proposed by the Proponent for surface waste rock at closure at the Boston, Madrid North and Madrid South sites and the contingency measures proposed for the Tailings Impoundment Area (TIA) at Doris at closure did not include comparisons of costs of the contingency measures against total contingency sums in the FEIS. Hence, the KIA requested that TMAC provide conceptual cost estimates for covering the proposed waste rock piles at the Boston, Madrid North, and Madrid South sites in place with a liner and an armour rock layer. The KIA also requested that the Proponent provide a conceptual cost estimate for transporting the waste rock pile to the Tailings Management Area at the Boston site or to the underground mine workings at the Boston, Madrid North, and Madrid South sites. In addition, the KIA requested that TMAC provide conceptual cost estimates for including a suitable liner in the tailings cover for the Doris TIA.

In response to the KIA's comments about costs of contingency measures at closure for surface waste rock piles at the Boston, Madrid North, and Madrid South sites, and the TIA at Doris site, TMAC noted that contingency amounts estimated for each of these sites in the FEIS were to account for uncertainties attributed to the conceptual stage of closure plans for the sites, and were not to capture all possible contingency measures that may be adopted for the Project. TMAC also indicated that the closure plans and associated cost estimates for these sites will be routinely updated to reflect any changes to preferred closure alternatives, as the Project develops, in accordance with stipulated water licence conditions. In addition, the Proponent noted the closure cost estimates for each of these sites included the cost of covering the waste rock piles and the TIA with an impermeable cover incorporating a High Density Polyethylene (HDPE) liner, and the cost of hauling the waste rock underground at the Boston, Madrid North, Madrid South sites.[152]

[152] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.

As part of its technical presentation during the Final Hearing, the KIA noted that it was satisfied with TMAC's response to the comments within the KIA's final written submission specific to mine closure cost estimation, and that it considered the issue resolved.[153]

Within its final written submission, Environment and Climate Change Canada (ECCC) noted the Proponent intends to cover the surface of the TIA at the Doris site with waste rock to the minimum thickness practicable (0.3 metres) at closure, and recommended that TMAC demonstrate that the proposed tailings cover design would provide long term protective cover to ensure that there are no adverse impacts on downstream water quality. ECCC also expressed concerns about the Proponent's plans to monitor for signs of onset of acid rock drainage (ARD) in waste rock and ore stockpiles in 10-year intervals, and recommended that the Proponent implement a shorter monitoring interval as a more effective way to detect any environmental issues that could occur and to allow more time for adaptive management responses. In response to ECCC's comments about the proposed tailings cover design, TMAC indicated that its detailed water and load balance modeling developed for the Project confirmed that long term water quality from the Doris TIA will have no negative impacts on the downstream environment and, that a tailings cover thickness greater than 0.3 metres would not be required to prevent infiltration of water or to reduce oxygen presence within the tailings at the Doris site. Also, in response to ECCC's concerns about the adequacy of the proposed 10-year monitoring interval for waste rock and ore stock piles for signs of onset of ARD, the Proponent stated that, in its opinion, the proposed frequency of monitoring was suitable given the availability of buffering capacity within the overall stockpiles and slower rates of mineral weathering in arctic climates. Further, TMAC indicated that its proposed annual seepage and ephemeral stream monitoring programs would be of sufficient frequency to effectively detect any environmental issues that could occur and allow for adaptive management responses.[154]

As part of its technical presentation during the Final Hearing, ECCC noted that TMAC had clarified the protectiveness of the proposed Doris TIA cover to water quality in the downstream environment, that it was satisfied with the Proponent's additional information on tailings cover thickness, and that it considered this issue resolved.[155]

On a related subject, Indigenous and Northern Affairs Canada (INAC), in its final written submission, noted that TMAC's plan (Waste Rock and Ore Management Plan) to conduct seep surveys for waste rock and ore piles once per year at freshet and conduct visual surveys of the piles for seepage twice per year may not provide adequate data on seasonal variability of potential metal leaching concentrations. To address this issue, INAC requested that the Proponent clarify the difference between the proposed twice annual visual survey for seepage and the annual seep survey. Also, INAC requested that TMAC revise the surface water management component of its Waste Rock and Ore Management Plan to include biannual sampling events, once at freshet and once in late fall prior to freeze up. In response to INAC's comments, TMAC clarified that its proposed annual and bi-annual seepage surveys are in

[153] J. Roesch, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 800, lines 13-20.
[154] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[155] M. Tobin, Environment and Climate Change Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 506, lines 7-17.

reference to the waste rock stockpile on surface and the underground backfill. TMAC also noted that all seepage and run-off from the waste rock and ore pile pads would be directed to lined collection ponds and managed according to the Hope Bay Project Doris-Madrid Water Management Plan and the Hope Bay Project Boston Water Management Plan. The Proponent also stated that drainage from the waste rock pile would be monitored more than twice a year; therefore, it did not agree with INAC's opinion that a seepage monitoring program in late fall is warranted.[156]

As part of its technical presentation during the Final Hearing, INAC reiterated its initial concerns about the frequency of waste rock seepage surveys proposed by TMAC, but noted that it now considers this issue resolved as the Proponent has committed to collection of all seepage and runoff from all waste rock and ore stockpile pads into lined collection ponds downstream that will be managed and monitored according to project-specific water management plans.[157]

During the Final Hearing, Nunavut Impact Review Board (NIRB) staff noted that TMAC proposes to co-dispose detoxified tailings and waste rock in the underground mine workings, and requested that the Proponent explain its approach to managing cyanide degradation products in ground water.[158] In response, TMAC noted that the detoxified tailings and waste rock would be co-disposed underground within the permafrost zone of the mine, and that the material is expected to remain frozen and was not likely to interact with groundwater in the long term.[159]

5.4.3 Views of the Board

The proposed environmental design features, mitigation measures and monitoring programs, and closure plans identified by TMAC for minimizing the impacts to the environment from site-specific geological and geochemical conditions are, in the Board's view, satisfactory for this stage of project development. The Board believes that commitments by TMAC to establish and operate contact water ponds to collect all seepage and runoff from the dry-stack tailings facility and the waste rock and ore stockpiles, to conduct an ARD/ML monitoring program for these structures, and to implement adaptive management measures based on results of the monitoring program, would be critical in ensuring that mitigation measures achieve the desired objectives and adequately address concerns related to the surficial and bedrock geology and geochemistry of the project area and the receiving environment. The Board also expects TMAC to have measures in place to address the potential for metal leaching under neutral pH conditions from the storage of mined waste rock and processed ore at surface due to the unique geological and geochemical characteristics of the ore bodies and surrounding waste rock associated with the Madrid North, Madrid South, and Boston deposits.

[156] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[157] F. Ngwa, Indigenous and Northern Affairs Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, pp. 582-583, lines 7-26 and 1-4.
[158] K. Boa-Antwi, Nunavut Impact Review Board, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 295, lines 7-11.
[159] M. Rykaart, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, pp. 295-296, lines 13-26 and 1-3.

5.4.4 Conclusions and Recommendations of the Board

Following a review of the material presented by TMAC in the FEIS and a consideration of views of Parties, the Board believes that the Project's potential effects related to geology and geochemistry could be appropriately managed through the adherence to commitments provided by the Proponent and the implementation of proposed mitigation measures. The Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- Implementing a stand-alone Acid Rock Drainage (ARD) and Metal Leaching (ML) Management Plan that addresses all proposed mine structures of concern within the project site, including tailings storage facilities, waste rock and ore stockpiles, and quarry sites; and
- Developing contingency measures that may be implemented if required for ML and ARD, including measures to address the potential for leaching of arsenic from waste rock and ore stockpiles, and tailings under neutral pH conditions.

5.5. GEOLOGICAL FEATURES, SOILS AND PERMAFROST

5.5.1 Views of the Proponent

TMAC Resources Inc. (TMAC, or the Proponent) provided its effects assessment for permafrost, landforms and soils in the project area, including its characterization of existing conditions, in Volume 4, Sections 6 and 7 of the Final Environmental Impact Statement (FEIS). Additional discussions on existing terrain and soils in the project area are presented in Volume 4, Appendices V4-7A and V4-7B of the FEIS. The Proponent considered geological features, soils, and permafrost conditions associated with the Project as subjects of note with linkages to other valued components of the environments and did not present a significance determination specific to these environmental components. The Proponent predicted that the project area would remain within the zone of continuous permafrost beyond the life the Project.

The Proponent set the spatial boundaries for the assessment of project effects on terrain, permafrost, and soils to include:

- The Project Development Area (PDA): approximately 2,500 hectares (ha), encompasses the project footprint and buffers around the footprint;
- The Local Study Area (LSA): (includes the PDA and a 1 kilometre radius buffer and encompasses 56,340 ha; and
- The Regional Study Area (RSA): the broader spatial area representing the maximum limit where potential effects may occur, encompassing 491,823 ha.

TMAC set the temporal study boundaries for landforms and soils to include the construction, operations, closure, and post-closure phases of the Project.

The Proponent reviewed the *Naonaiyaotit Traditional Knowledge Project* (NTKP)[160] report and noted direct references relevant to geological features or landforms and soils in the project study area:

- Eskers, cliffs, rocky ridges, wetlands, ocean shores, and riverbanks provide habitat for terrestrial wildlife including caribou, grizzly bears, and birds and are considered prime traditional hunting grounds.
- Pools under cliffs are important sources of water during travel on the land.
- Areas with well-drained soil are important as habitat for blueberries, a traditional food source.
- Areas where soil is slightly saline provide habitat for wild peas, a traditional food source.

The Proponent indicated that the project area is above the treeline within the zone of continuous permafrost, and noted that the average permafrost temperature in the project area is -7.6 degrees Celsius (°C) and the average thickness of the active layer (the soil depth to which the permafrost melts each summer) is 1 metre (m). The Proponent stated that taliks, layers or bodies of unfrozen ground in permafrost areas, have been identified underneath lakes in proximity to the Madrid North, Madrid South, and Boston deposits, and noted that it conducted site-specific talik modeling to better understand the configurations of the taliks near the deposits. TMAC predicted that the Boston Mine, including underground workings, would be encapsulated by permafrost and would not intercept taliks or sub-permafrost areas. The Proponent also predicted that the Madrid North and Madrid South mines, including underground workings, would intercept unfrozen ground or taliks under Patch Lake and Wolverine and Patch lakes, respectively.

TMAC indicated that the LSA is gently rolling with low to moderate elevation (158 m at the highest point); rock outcrops, small cliffs and ridges are interspersed with plains and level terraces scattered with lakes and wetlands. The occurrence of bedrock near the surface in the south end of the LSA has resulted in the presence of several boulder fields and areas of shattered rock. The Proponent noted that several large eskers occur in the RSA, and highlighted their importance as denning habitat for terrestrial wildlife and for contributing to the moisture and nutrient regimes of soils. TMAC also observed that other typical landscape features of the Arctic are also present in this region, including kames, frost boils, and thermokarsts.

TMAC noted that as the project area is within the zone of continuous permafrost, soil development generally occurs only close to the ground surface during the short frost-free period of each year. TMAC further noted that the active layer can vary from 0.2 m in thick organic layers to over 3 m in well-drained eskers or bedrock outcrops. TMAC observed that soils formed from morianal, organic, and glaciomarine materials are common in the project area. The dominant soil types in the project area are classified as Static, Turbic, or Organic Cryosols and Dystric Brunisols, and that soils in the project area are mildly alkaline to strongly acidic with median organic carbon content of 1.6 percent. The Proponent stated that most metal concentrations in soils in the project area were below the industrial limits of the Canadian

[160] Banci, V. and R. Spicker, (Compilers, Editors & GIS). 2016. *Inuit Traditional Knowledge for TMAC Resources Inc. Proposed Hope Bay Project, Naonaiyaotit Traditional Knowledge Project (NTKP)*. Prepared for TMAC Resources Inc. Kitikmeot Inuit Association: Kugluktuk, NU.

Council of Ministers of the Environment (CCME) Soil Quality Guidelines for the Protection of Environmental Health; however, the limits of CCME guidelines for the protection of agricultural uses were exceeded for chromium, copper and nickel at some sites in the project area. The Proponent noted that its understanding of baseline conditions with respect to geological features or landforms and soils in the project area was informed by terrain and permafrost mapping, soil inspections, ground temperature measurements using thermistors, and other scientific field studies and desktop research.

TMAC discussed the potential impacts of climate change on permafrost conditions in the project area. Specifically, the Proponent indicated that the mean annual air temperature for the region is projected to increase by 5.5 °C to 6.8 °C by the year 2100, and that this increase is likely to cause natural permafrost degradation and result in negative effects to terrain stability in local thaw-sensitive areas where ice-rich and massive ground ice are present. Also, TMAC indicated that the extent of the lake taliks would likely increase by year 2100, and the active layer thickness in the project site is expected to increase by up to 93 centimetres over the same period, especially in project areas with natural overburden clay. However, the Proponent predicted that the project site would stay within the zone of continuous permafrost beyond the life the Project (see Section 5.2 and Section 7.4 of this Report for further discussions about potential impacts of climate change on conditions in the general project area and on project components, respectively).

The Proponent indicated that changes to soils and the terrain in the project area would be confined to the PDA, and predicted the following potential effects to soils and terrain from the Project:

- Soil erosion – there is potential of soil erosion during land disturbance activities such as land clearing and material stockpiling associated with the construction and operations phases of the Project. In addition, sections of roads built on slopes, in wetlands, and in areas with erodible surficial materials are expected to contribute to soil erosion.
- Soil compaction – there is potential for impacts to soil quality as a result of soil compaction within the PDA from construction activities, soil handling, and wheel traffic.
- Soil acidification and nitrification – there is potential for impacts to soil quality from emission of sulphur and nitrogen containing compounds from the use of diesel engines such as for power generation and for the transportation of materials.

TMAC's proposed mitigation measures to address potential impacts of soil erosion, soil compaction, and soil acidification and nitrification on valued components such as freshwater resources, air quality, fish and fish habitat, and vegetation are discussed in Section 5.1, 5.7, 5.9, and 5.11 of this Report.

During the Final Hearing, TMAC discussed its commitment to conducting additional site investigations to improve its knowledge of the geotechnical and permafrost conditions in the project area prior to detailed engineering design and construction of proposed project site infrastructure, including tailings storage facilities and associated components.[161]

[161] M. Rykaart, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2018, p. 89, lines 14-23.

As the Proponent considered geological features, soils, and permafrost conditions associated with the Project as subjects of note with linkages to other valued components such as Vegetation and Special Landscape Features (see Section 5.11 of this Report), and the Human Health and Environmental Risk Assessment (see Section 7.2 of this Report), it did not present a significance determination specific to these environmental components.

5.5.2 Views and Concerns of Interested Parties

Within its final written submission, the Kitikmeot Inuit Association (KIA) indicated that there were uncertainties regarding the effectiveness of TMAC's plan to rely on the sections of the proposed Madrid-Boston all-weather road, to be built with run of quarry material, as a sedimentation berm for the overburden pile at the Boston site. Specifically, the KIA expressed concerns about the ability of the run of quarry material to filter out fine-grained sediments in surface run-off from the overburden pile, and requested that the Proponent discuss whether the use of filter materials including geotextiles and or natural materials in sections of the Boston-Madrid all-weather road may be more effective in filtering out sediments from run-off from the overburden pile area. The KIA also requested that the Proponent address its concerns about the potential for periodic erosion of the exposed slopes of the Tailings Management Area (TMA) at the Boston site, particularly during the spring melt when snow deposited at the base of the inter-bench slopes melts and results in run-off. Further, the KIA requested that TMAC discuss proposed mitigation measures for any eroded tailings that may be within the footprint of the contact water pond at the Boston site at closure.

In response to the KIA's concerns regarding the potential for sediment-laden run-off from the overburden pile at the Boston site to impact the receiving environment, TMAC indicated that a run of quarry shell would not be required because the areas of concern to the KIA are flat or gently sloping, and do not require armouring. Also, in response to the KIA's concerns about the potential for erosion of slopes of the TMA, the Proponent indicated that every effort would be made to prevent concentrated flows that could cause erosion during active operation of the TMA, and that any related issues would be addressed by conducting repairs during routine operations. The Proponent also indicated that it plans to implement progressive reclamation at the TMA site during operations, including the construction of a final cover following completion of each 5 metre bench of the TMA to reduce side slope area exposed to erosion. TMAC also noted that eroded tailings that may be located within the contact water ponds would be removed and placed on the TMA prior to the construction of the final cover at closure.[162]

As part of its technical presentation during the Final Hearing, KIA noted that it was satisfied with TMAC's response to KIA's final written submission comments regarding the effectiveness the proposed use of filter materials including geotextiles and or natural materials in sections of the Boston-Madrid all-weather road in filtering out sediments from run-off from the overburden pile area, and that it considered the issue resolved.[163]

[162] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[163] J. Roesch, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 801, lines 1-8.

Within its final written submission, the Government of Nunavut (GN) noted that TMAC's proposed criteria and standards for landfill site selection, construction, and operation were not presented consistently in the FEIS. Also, an alternative to the proposal to use only the landfill at the Doris site and not build an additional landfill at the Boston site was not evaluated from an environmental risk standpoint in the FEIS. To address these concerns, the GN recommended that TMAC present proposed criteria and standards for the development of landfill facilities that comply with applicable regulatory requirements; consider an alternative to use only the landfill at the Doris site and not build an additional landfill at the Boston site; and present environmental monitoring to be conducted for the landfill at the Boston site in the Waste Management Plan for the Project. The GN recommended that the NIRB include these recommendations as terms and conditions in any project certificate issued for the Project. In response, TMAC noted that it did not include a description of landfill arrangement in the Non-hazardous Waste Management Plan as it is not required for the operational implementation of the Plan at the current stage of project development. The Proponent further noted that the monitoring of the proposed landfill is adequately covered within the Hope Bay Non-hazardous Waste Management Plan and the Hope Bay Project Boston Water Management Plan. Finally, TMAC noted that it considers site selection and construction information as not appropriate for inclusion in operational management plans, and that once Issue for Construction designs have been prepared, and 60 days prior to operation of the proposed landfill, additional specific operational criteria will be included in the Non-hazardous Waste Management Plan.[164]

The GN also expressed concerns about TMAC's inclusion of disposal of contaminated soils and hazardous incinerator ash within permafrost in the mine underground workings, or underwater in the Tailings Impoundment Area as part of its waste management options for the Project. The GN found that TMAC's proposed waste management options were not appropriate due to the potential for contamination of groundwater. Hence, the GN recommended that the Proponent provide proof that underground disposal of hazardous waste in permafrost or in the tailings area meets applicable federal and territorial regulatory standards and would not cause contamination of ground and surface water. The GN recommended that the NIRB include this recommendation as a term and condition in any project certificate issued for the Project. In response, TMAC stated that it does not propose to dispose of hazardous waste in the Doris Tailings Impoundment Area (TIA), and that this commitment would be reflected in updates to the Hope Bay Project Hazardous Waste Management Plan. TMAC noted further that, as highlighted in the Hope Bay Project Hazardous Waste Management Plan, the only hazardous waste materials proposed for potential disposal within the underground mines are materials which do not meet landfarm discharge criteria (hydrocarbon contaminated materials) and plastic bags from pre-packaged explosives containers, with approval from the mines inspector. Finally, TMAC clarified that, as indicated in the Hope Bay Project Hazardous Waste Management Plan, it does not intend to dispose of bottom ash generated from open burning and incineration in the underground mines.[165]

As part of its technical presentation during the Final Hearing, the GN noted that it was satisfied with TMAC's response to GN's final written submission comments regarding the proposed criteria and standards for landfill site selection, construction, and operation, and the proposed

[164] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[165] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.

measures for the disposal of hazardous waste, including bottom ash generated from open burning and incineration, and that the GN considered these issues resolved.[166]

Within its final written submission, Natural Resources Canada (NRCan) noted that additional site-specific investigations are required to better characterize ground ice conditions and identify sensitive terrain in the project area and recommended that TMAC fulfill its commitment to undertake these additional studies as part of the detailed design phase for the Project, including for the proposed all-weather road. Also, NRCan stated that although the Proponent had conducted adequate thermal analysis for the conceptual design phase of the Tailings Impoundment Area (TIA), including proposed TIA dam infrastructure at the Doris site, the following additional studies would be required to support final design and development of environmental monitoring and management plans for the TIA: (1) site investigations to better characterize foundation conditions for structures required for the TIA; (2) thermal analysis to confirm potential for differential movements that may have an impact on tailings cover integrity; and (3) continuing monitoring of the existing North Dam in the TIA to inform thermal analysis in support of detailed design of proposed additional dam infrastructure in the TIA. In addition, NRCan noted that its concerns about configuration of taliks and permafrost in the project areas were addressed by the Proponent through its approaches to delineating lakes likely to have open taliks within the project area and to characterizing permafrost zones within proposed underground mine workings, including at the Boston site. Finally, NRCan indicated that its concerns about the adequacy of the design of the TMA and associated contact water pond at the Boston site were addressed as TMAC had committed to conducting additional geotechnical site investigations to support final design of the TMA and associated contact water ponds at the Boston site. In response to NRCan's comments regarding the characterization of ground ice and geotechnical conditions at the project site, TMAC indicated that it plans to undertake additional field characterization studies prior to conducting detailed engineering of project infrastructure, and that all engineering analysis would be updated to reflect site specific conditions. TMAC also acknowledged NRCan's conclusions that the Proponent's ongoing characterization of talik configuration and permafrost conditions at the project site was adequate to support project design.[167]

As part of its technical presentation during the Final Hearing, NRCan reiterated its initial concerns regarding the characterization of permafrost and underground ice conditions, and talik configuration in the project area, and confirmed that it considered these issues to be resolved as the Proponent has committed to undertaking additional field characterization studies to inform detailed engineering of project infrastructure.[168]

During the Final Hearing, a Community Representative from Taloyoak requested that regulatory agencies and TMAC clarify whether proposed stockpiles of waste rock and the dry-stack tailings

[166] S. Pinksen, Government of Nunavut, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, pp. 829-830, lines 20-26 and 1-6.
[167] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[168] P. Unger, Natural Resources Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 607-613, lines 15-26, 1-26, 1-26, 1-26, 1-26, 1-26 and 1-15.

would be monitored to assess permafrost thaw and associated impacts related to climate change.[169] See Section 5.2.2 of this Report for more details on this topic.

5.5.3 Views of the Board

The proposed environmental design features and mitigation measures identified by TMAC for minimizing the impacts to geological features, soils, and permafrost are, in the Board's view, satisfactory for this stage of project development. The Board believes that TMAC's commitments during the review, including at the Final Hearing, will be critical in ensuring that the measures proposed are, and will continue to be, effective in achieving the desired objectives and adequately addressing concerns related to the geological features, soils, and permafrost in the project area. Of particular importance to the NIRB were the following commitments: to undertake additional field characterization studies of permafrost, underground ice conditions, and taliks in the project area to inform detailed engineering of project infrastructure; to prevent erosion during all project phases; to implement non-hazardous and hazardous waste management plans and avoid the disposal of bottom ash generated from open burning and incineration in the underground mines; and to implement progressive reclamation at the tailings storage facilities during operations.

During the Final Hearing, the Board requested that the Proponent provide its rationale for the varying thickness of the all-weather road proposed for the Project.[170] In response, TMAC indicated that the road thickness was designed to preserve permafrost, and would range between one (1) metre and two (2) metres, depending on the type of permafrost and the amount of ice in the ground.[171]

The Board has concerns about permafrost degradation and the medium- and long-term stability of land proposed for the establishment of mine-related waste storage and management structures, including the Doris TIA, the Boston TMA, and waste rock piles, and acknowledges TMAC's commitment to mitigate, monitor, and adaptively manage impacts to geological features, soils, and permafrost for the duration of the Project. The Board expects that the Proponent will consult and collaborate with regulators and stakeholders during the project permitting phase as construction designs are finalized and during the construction, operations, and closure phases as project activities are undertaken. As changing climatic conditions have the potential to impact project components, such as the tailings storage facilities, waste rock stockpiles, and the terrestrial environment in unexpected ways, the Board stresses the importance of rigorous monitoring and diligent application of mitigation measures to ensure that all potential effects are forecasted and adaptively managed if unanticipated effects are identified. The Board notes that failure to maintain the integrity of the terrestrial environment throughout the Project lifecycle, including after project closure, could result in significant residual impacts to soil, water, vegetation, and wildlife in the area. For more information on discussions related specifically to climate change see Section 5.2: Climate and Meteorology of this Report.

[169] S. Qingnaqtuq, Hamlet of Taloyoak, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 922, lines 6-10.
[170] H. Ohokannoak, Board Member, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 246, lines 6-11.
[171] M. Rykaart, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 246, lines 15-26.

5.5.4 Conclusions and Recommendations of the Board

Following a review of the material presented by TMAC in the FEIS and a consideration of the views of the Parties, the Board believes that the Project's potential effects to geological features, soils, and permafrost could be appropriately managed through the adherence to commitments provided by the Proponent and the implementation of proposed mitigation measures. The Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- Undertaking additional site-specific geotechnical investigations required to identify sensitive land features and to inform final engineering design prior to the construction of project components;
- Undertaking additional site-specific permafrost monitoring, mapping and thermal analysis to inform final project design and to support the development of adaptive management measures at the construction, operations, closure, and post-closure phased of the Project;
- Updating the Non-hazardous Waste Management Plan to include layout drawings of all mine site landfill facilities prior to operations;
- Updating the Hazardous Waste Management Plan to reflect commitments regarding the disposal of mine-generated hazardous materials;
- Implementing an Erosion Management Plan to prevent or minimize erosion and its resulting effects from project-related land disturbance;
- Implementing a program to progressively reclaim disturbed areas within the project footprint; and
- Exploring the feasibility of topsoil/organic matter salvage as part of project development.

5.6. HYDROGEOLOGY AND GROUNDWATER QUANTITY AND QUALITY

5.6.1 Views of the Proponent

TMAC Resources Inc. (TMAC or the Proponent) presented its baseline and existing information for groundwater quantity and quality in the Project study area in Volume 5, Section 2 of the Final Environmental Impact Statement (FEIS) for the Phase 2 Hope Bay Belt Project (the Project). Volume 5 of the FEIS included a detailed discussion of the regional setting, existing geological context, baseline conditions for hydrogeology and groundwater quantity and quality in the Project area, including methodology for data collection. The assessment of TMAC's potential project-induced impacts on surface water hydrology (quantity), and surface water quality (freshwater) were presented within Volume 5, Sections 1.5 and 4.5 of the FEIS. Proposed management plans to inform monitoring and mitigation measures for potential project effects to surface water quantity and quality are presented in Volume 1, Annex V1-7 and Volume Annexes V8-1 and V8-2. See Section 5.7 of this Report for a summary on TMAC's assessment on surface water quantity and quality.

The Proponent reviewed the *Naonaiyaotit Traditional Knowledge Project* (NTKP)[172] report and noted that there were no direct references relevant to hydrogeology and groundwater.

Hydrogeology

TMAC explained that the project is situated within the zone of continuous permafrost, where groundwater is not expected to flow, except through taliks, where rock is unfrozen. TMAC specifically noted that two (2) types of taliks may occur (open or closed), and provided a description of the environmental factors that may influence talik configuration within the Project area. TMAC identified the two groundwater flow regimes present within the continuous permafrost of the Project area: shallow supra-permafrost flow in the active layer, and a deep regional flow system associated with open taliks and sub-permafrost. TMAC described groundwater in the active layer as fluid during the summer and confined to the thawed area but expected to flow through surface topography and discharge to the surface water drainage network. Sub-permafrost groundwater in the project area was inferred to be controlled by the presence of unfrozen zones in the open-taliks beneath large lakes. TMAC noted that the permafrost located further away from the lakes is widespread, deep, and impermeable. TMAC noted the potential for there to be a connection between the shallow groundwater system in the overburden units and the deeper bedrock groundwater system. TMAC further indicated that that infiltration of water from the lakes to the deeper groundwater system will be affected by hydraulic properties of sediments found on the lake bottom.

Permafrost and Talik Extent

TMAC stated that its assessment of permafrost and talik extent in the Project area was based on thermal data generated from thermistor strings, and the information available from ground water data and geothermal models. TMAC indicated that the geothermal models provided information on where through taliks occurred on a regional scale and predicted the configuration of open taliks on a local scale. TMAC confirmed that the critical lake dimensions required for open taliks to exist were estimated using a one-dimensional (1D) steady state analytical model, while the configuration of the open taliks adjacent to the Boston, Madrid South and Madrid North underground mining areas were estimated based on a two-dimensional (2D) thermal modeling. Based on the results of the thermal analyses conducted at the local scale, TMAC concluded that:

- The Boston mine will be encapsulated by permafrost but will not intercept an open talik or sub-permafrost areas;
- The Madrid North mine will intercept unfrozen grounds at Suluk and Naartok mining zones; and
- The Madrid South mine will intercept unfrozen ground at the edge of the open taliks formed by the Wolverine Lake and Patch Lake.

TMAC stated that the above-mentioned conclusions were conservative and that it recognized that the -2 degrees Celsius (°C) isotherm model fit tended to underestimate the depth of the talik compared to site ground temperatures.

[172] Banci, V. and R. Spicker, (Compilers, Editors & GIS). 2016. *Inuit Traditional Knowledge for TMAC Resources Inc. Proposed Hope Bay Project, Naonaiyaotit Traditional Knowledge Project (NTKP)*. Prepared for TMAC Resources Inc. Kitikmeot Inuit Association: Kugluktuk, NU.

Groundwater Levels

The assessment of groundwater levels in the Project area was based on the measurement of pore pressure (expressed as hydraulic head) for Boston, Madrid South and Madrid North. TMAC clarified that because the hydraulic head measurements collected from the area varied between 1.00 kilogram per cubic metre (kg/m^3) and $1.03kg/m^3$, it concluded that the groundwater table of the Project area was near the lake surface. TMAC noted that the groundwater system present in the open taliks and sub-permafrost is controlled by the lake levels. TMAC described the hydraulic conductivity (K) values of Boston, Doris, Madrid South and Madrid North noting that at the local scale, bedrock K is fracture controlled and tended to be comprised of a low bulk K background system that is intersected by relatively high K fractures. TMAC stated that at the scale of the open-talik fractured rock may exist as a single unit and be characterized by a relatively high K at shallow depth, which will gradually decrease with depth and as confining pressure increases. TMAC could not establish any strong relationship between the hydraulic conductivity and lithology, nor could find any specific association between hydraulic conductivity and the presence of fractures and faults that might likely promote high hydraulic conductivity.

Groundwater Quality

TMAC noted that the groundwater samples collected at Doris and Boston were from select Westbay wells (i.e., 10WBW001, 10WBW002 and 10WBW004) which were analyzed for standard parameters such as conductivity, pH, chloride, sulphate, total and dissolved metals and stable isotopes (oxygen and hydrogen). TMAC inferred that the groundwater that would be encountered during mining, at least initially, will be saline dominated by chloride, and will likely vary with depth. TMAC stated that the results of the groundwater quality were compared to the Canadian Council of Ministers of the Environment (CCME) water quality guidelines and the *Metal Mining Effluent Regulations* (MMER) limits for deleterious substances. TMAC noted that the concentrations of calcium, chloride and sodium were high and showed a trend of elevated concentration with depth. TMAC identified other constituents that have relatively high concentrations, but do not necessarily correlate with depth such as of ammonia, boron, cadmium, chloride, fluoride, iron, manganese, molybdenum, mercury, nickel, selenium, sulfate and zinc that are above the guideline recommendations.

5.6.2 Views and Concerns of Interested Parties

Within its final written submission[173], the Government of Nunavut expressed concern that TMAC's proposed waste management options were not appropriate due to the potential for contamination of groundwater. Further discussion on this topic can be found in Section 5.5.2 of this Report.

Natural Resources Canada (NRCan) noted within its final written submission that there is potential for the project to cause impacts on the configuration of taliks and permafrost, and therefore recommended that the Proponent provide a groundwater management plan that would address all the potential uncertainties regarding the configuration of taliks and permafrost zones in the Boston Mine area.[174] During its technical presentation at the Final Hearing, NRCan

[173] Government of Nunavut Final Written Submission, March 19, 2018.
[174] Natural Resources Canada Final Written Submission, March 19, 2018.

reiterated its concerns with respect to the configuration of taliks and permafrost noting that the taliks can provide a hydraulic connection between the surface and the groundwater and noted that the Proponent has used acceptable methods to delineate lakes likely to have open taliks.[175] NRCan further indicated during its presentation that the Proponent expects the Boston Mine to be entirely within permafrost, and that the Proponent has agreed to develop a groundwater management plan and contingency measures for Boston Mine in the event that Boston underground mine intersect a talik beneath the lake.[176] During the Final Hearing, TMAC in response to a question by a Community Representative[177] on climate change stated that as part of its commitments and as part of water licence conditions, the entire project site would be inspected once a year by a licensed geotechnical engineer experienced in permafrost, and the objective of that inspection would be to ensure that all facilities on site are structurally sound and provide all the necessary environmental containment. TMAC also indicated that part of that inspection would specifically look at permafrost condition including how the permafrost environment changes over time.[178]

NRCan further noted within its final written submission that limited site-specific geotechnical investigations have been conducted particularly along the proposed all weather road and that additional geotechnical investigations including information on ground thermal and ground ice conditions would be required to support detailed engineering. NRCan further recommended that the Proponent conduct additional site specific investigations to better characterize the ground ice conditions and identify sensitive terrain in the project area. TMAC responded to these comments and further outlined its commitment to conduct additional field characterization studies, including updating engineering analysis to reflect site specific conditions around the Project area as well provide a comprehensive groundwater management plan.[179]

Within its final written submission, NRCan further stressed the importance of understanding the nature of the subsurface materials that would be used to underlie the expanded Tailings Impoundment Area (TIA) facility to inform the design and stability assessments, and to ensure impacts on the environment are minimised. During its technical presentation at the Final Hearing, NRCan indicated that the Proponent is proposing to have the tailings freeze which would enhance the performance of the TIA facility and would require an assessment of the thermal evolution of the pile. NRCan noted that it agrees that the Proponent has been conservative in its approach and has conducted an adequate thermal analysis for this stage of the project design; however, NRCan recommended that the Proponent continues to update the thermal analysis and monitoring continues be conducted at the North Dam to support detailed design of the other Phase 2 TIA dams.[180]

[175] P. Unger, Natural Resources Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, pp. 611-612, lines 21-26 and 1-6.
[176] P. Unger, Natural Resources Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, pp. 612-613, lines 7-26 and 1-11.
[177] S. Qingnaqtuq, Taloyoak, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 922, lines 6-25.
[178] M. Rykaart, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, pp. 924-925, lines 21-26 and 1-5.
[179] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[180] P. Unger, Natural Resources Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, pp. 608-609, lines 21-26 and 1-26.

NRCan also noted within its final written submission that the FEIS was lacking information on how groundwater would be managed if mine water chloride concentrations (i.e., salinity) were consistently in excess of the limits for discharge to Roberts Bay via the marine outflow mixing box.[181] In response, TMAC indicated that its primary strategy to address this issue is to pump out saline water to a water truck for transport to the Doris Marine Mixing Box or the Doris TIA if no active discharge to Roberts Bay is taking place. With respect to the design of the Boston Tailing Management Area and associated contact water pond, NRCan stated during the Final Hearing that it is in agreement with the Proponent's proposed approach to conduct additional site investigations that will support detailed design and final closure plans to ensure long-term physical stability of the facility.[182]

Within its final written submission, NRCan also raised concerns about the uncertainty of groundwater flow and salinity predictions from TMAC's groundwater modelling and recommended that the Proponent follow-up with adequate monitoring and development of groundwater management plans (with mitigation measures) to ensure that potentially problematic groundwater conditions can be avoided, promptly identified and addressed. Within its responses to NRCan's final written submission, TMAC acknowledged that the current Groundwater Management Plan (GWMP) does not include Specific Performance Thresholds (SPTs) in the Mine Inflow Management Plan pertaining to inflow chemistry and noted that it plans to update the GWMP to specifically add SPTs. TMAC also included with its responses a table of the proposed additions to the SPTs in the Mine Inflow Management Plans of the GWMP. TMAC also indicated that the GWMP for Boston has been designed as a proactive contingency to ensure safety of mine workers.

During its technical presentation at the Final Hearing, NRCan reiterated the need for specific groundwater management plans to be developed for Madrid North, Madrid South and Boston Mines and noted that the Proponent is committed to the implementation of a groundwater-management plan with the addition of recommendations to the plans by NRCan.[183] NRCan further reiterated its concern during the Final Hearing that several interconnected aspects of water management across the site, including discharge of mine inflow waters to Roberts Bay or the Doris Tailings Impoundment Area, could be affected by the presence of higher salinity groundwater flowing into the mines; NRCan recommended that the Proponent revise its GWMP to address the uncertainty in the groundwater models and address all identified gaps, which the Proponent has agreed to address.[184] Overall, NRCan stated during the Final Hearing that it was generally satisfied with the Proponent's responses and additional commitments made to address concerns related to permafrost and terrain stability as well as the Proponent's approach for monitoring and mitigating saltwater flows, and therefore had no further concerns regarding groundwater management.[185]

[181] Natural Resources Canada Final Written Submission, March 19, 2018.
[182] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[183] P. Unger, Natural Resources Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, pp. 614-618, lines 3-26, 1-26, 1-26, 1-26 and 1-9.
[184] P. Unger, Natural Resources Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, pp. 616-618, lines 5-26, 1-26 and 1-9.
[185] P. Unger, Natural Resources Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p.618, lines 1-9.

5.6.3 Views of the Board

With respect to the hydrogeology and groundwater at the proposed project site, the Board examined the information provided by TMAC and took note of the representations made by intervening parties in their final written submissions and presentations during the Final Hearing and by submissions from the public throughout the Review of the Project. The Board has determined that from a general perspective, most of the relevant issues have been adequately addressed for this stage of assessment, recognizing that the water licensing process administered by the Nunavut Water Board would provide more in-depth consideration of monitoring requirements.

The Board further notes that the Proponent has committed, as indicated in the FEIS and at the Final Hearing, to undertake continued baseline studies and monitoring as well as to implement preventative mitigation measures to reduce the potential project impacts to hydrogeology and groundwater quality and quantity. The Board notes Natural Resources Canada's (NRCan) concern with respect to the uncertainties in the groundwater models and the Board agrees that the Proponent should update the groundwater management plan to address all identified gaps including the potential of encountering saline groundwater in the underground mines. Further, the Board is also concerned with the lack of information on how groundwater would be managed if mine water chloride concentrations (i.e., salinity) were in excess of the limits for discharge to Roberts Bay via the marine outflow mixing box and the Board stresses that regular testing of the tailings effluent from the Doris Tailings Impoundment Area should be conducted to ensure that discharge meets approved water quality criteria/guidelines. The NIRB recognizes that these issues and the need for updated groundwater modelling and possible updated management and monitoring is clearly within the jurisdiction of the Nunavut Water Board and is more appropriately addressed during the subsequent water licensing process. In Section 9.7, the NIRB has identified this data gap and recommended that the Proponent should be required to address these gaps by providing additional updated modelling, management and monitoring information to the Nunavut Water Board.

5.6.4 Conclusions and Recommendations of the Board

Following a review of the material presented by TMAC in the FEIS and a consideration of views of Parties, the Board believes that the Project's potential effects related to hydrogeology and groundwater quantity and quality could be appropriately managed through the adherence to commitments provided by the Proponent and the implementation of proposed mitigation measures. The Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- Implementing a thermal monitoring plan to address potential changes in talik distribution and flow paths that may result from the development of the Project.

5.7. SURFACE WATER HYDROLOGY AND SURFACE WATER QUALITY

5.7.1 Views of the Proponent

TMAC Resources Inc. (TMAC or the Proponent) presented its baseline information and methods for surface water hydrology (quantity) and surface water quality (freshwater) within Volume 5, Sections 1.2 and 4.2 of the Final Environmental Impact Statement (FEIS) for the Phase 2 Hope Bay Belt (the Project). The assessment of TMAC's potential project impacts on surface water hydrology (quantity), and surface water quality (freshwater) were presented within Volume 5, Sections 1.5 and 4.5 of the FEIS. Proposed management plans to inform monitoring and mitigation measures for potential project effects to surface water hydrology (quantity) and surface water quality (freshwater) are presented in Volume 1, Annex V1-7 and Volume 8, Annexes V8-1 and V8-2 of the FEIS. TMAC concluded that the freshwater residual effects will not interact with past, present and likely future industrial projects and will not occur outside of the Nunavut Settlement Area (NSA).

TMAC reviewed available information from the *Naonaiyaotit Traditional Knowledge Project* (NTKP)[186] report for existing environment and baseline information on surface water hydrology and surface water quality, and noted that Inuit have seen changes in hydrology and changes in surface water quality over the past few decades. The NTKP report reflects observations of some hydrologic processes including the ice break-up process in the streams. Further, the report noted that Inuit attribute recent shallower lakes and lower water flows in rivers as affecting the water quality. In general, changes to water quality in coastal areas are greater than changes in inland areas. While no specific causes of contamination have been identified, potential sources have been identified such as dust, mineral exploration and mine development, melting of permafrost, long distance transport of pollutants, too many tourists, and an overpopulation of geese. The NTKP report was reviewed by TMAC to refine the potential valued ecosystemic components (VEC) list for the freshwater environment based on the importance of water sources and fish habitat to Inuit.

TMAC defined the following spatial boundaries for its assessment of surface hydrology and surface water quality, consistent with boundaries used to assess freshwater sediment quality, and freshwater fish and fish habitat:

- Project Development Area (PDA) - The Project footprint plus engineering buffers;
- Local Study Area (LSA) - The area surrounding the PDA within which there is a reasonable potential for immediate effects on the freshwater environment due to interactions with project components or physical activities. The LSA included the watersheds for key waterbodies, such as Aimaokatalok, Windy, Patch and Doris lakes.
- Regional Study Area (RSA) - The PDA, the LSA, and additional areas within which there is the potential for indirect or cumulative effects and included portions of the Angimajuq watershed and sections of the Koignuk River watershed located to the west of the PDA.

[186] Banci, V. and R. Spicker, (Compilers, Editors & GIS). 2016. *Inuit Traditional Knowledge for TMAC Resources Inc. Proposed Hope Bay Project, Naonaiyaotit Traditional Knowledge Project (NTKP)*. Prepared for TMAC Resources Inc. Kitikmeot Inuit Association: Kugluktuk, NU.

Temporally, TMAC's assessment considered the construction, operations, reclamation and closure, post-closure and possible temporary closure phases of the Project.

Surface Hydrology

Baseline studies included monitoring streamflow during the open-water season with manual measurements commencing in 1993 with manual measurements and automated hydrometric monitoring beginning in 1996 and continuing to 2017. TMAC noted within the FEIS that the monitoring network included 17 streamflow monitoring stations and 11 lake elevation monitoring stations within the LSA. In addition, long-term streamflow data from 10 regional stations operated by Water Survey of Canada were available for the model. TMAC noted that a water balance model was developed for the Project to simulate both baseline and project-affected flows. The water balance model accounted for climate change with predicted increases to temperature and precipitation.

TMAC noted within the FEIS that the hydrologic regime of the Project is typical of high latitude regions of the continental Canadian Arctic and is strongly influenced by long cold winters, relatively low precipitation, and low relief topography generally with high watershed storage (i.e., lakes and wetlands). Extremely cold temperatures in the region, combined with permafrost ground conditions result in a short period of runoff that typically occurs from June to October. TMAC further noted that the physiography of the region is dominated by vegetated tundra hillslopes with lakes and scattered wetlands. TMAC indicated that the presence of permafrost is hydrologically significant, as it has very low hydraulic conductivity, and thus acts as a barrier to deep groundwater recharge. Hydrographs for the area are characterized by a steep rising limb leading to a peak flow discharge that occurs during the spring, shortly after air temperature rises above freezing. During freshet, water that is stored in the winter snowpack melts and is released quickly, generating high flows that are typically the annual peak. A second hydrograph peak may occur in the late summer and/or early fall due to precipitation events but these are generally lower in magnitude than the freshet peak.

TMAC indicated that the Project has the potential to interact with surface hydrology and alter baseline streamflows through a number of activities and pathways. In addition, alteration of streamflow was used as an indicator for assessment of the potential effects of the Project on surface hydrology. The activities that have the potential to interact with surface hydrology were grouped by TMAC into three broad categories as follows:

- Water withdrawal from lakes: Water withdrawal from Doris, Windy, and Aimaokatalok lakes for domestic and industrial uses could affect lake outflows by lowering the water level in these lakes. Therefore, streamflows at Doris, Windy, and Aimaokatalok watersheds could be affected.
- Construction and use of underground mines: Doris, Madrid North, and Madrid South mines are expected to intercept taliks. Water levels in lakes can drawdown through taliks and, therefore, streamflows at Doris and Windy watersheds could be affected.
- Modification of natural drainages: Contact water diversion and discharge (e.g., water transfer to, and discharge from, the tailings impoundment area [TIA]), modification of runoff coefficient at disturbed surfaces (e.g., stockpiles), and access roads where crossings are not sized for natural flows could affect drainage pathways. Therefore, these

activities have the potential to alter streamflows at Doris, Windy, and Aimaokatalok watersheds.

TMAC predicted that the maximum flow reductions in all Doris Watershed nodes would occur in the last years of operations with the average annual flow reduction ranging between 2.6% (Ogama Lake Outflow) to 13.7% (Doris Lake Outflow). The maximum change in annual flow is predicted to occur at Wolverine Lake Outflow with a reduction of 55.9%. Annual flow is predicted to return to baseline conditions following closure. TMAC noted within the FEIS that the average annual flow reduction for the Windy Watershed assessment nodes and the Aimaokatalok Watershed nodes under average climate conditions are predicted to be less than 10%, which is generally assumed to be the natural variability of riverine systems.

TMAC noted that the streamflow prediction of the water balance model showed that the effects from the alteration of stream flows in the Doris, Windy and Aimaokatalok watersheds would not be fully eliminated after implementation of mitigation measures and were identified as residual effects and carried forward for additional characterization. TMAC indicated that residual effects on the streamflow for the Doris, Windy and Aimaokatalok watersheds are anticipated during the construction and operations phases, with maximum effects to occur during the last two (2) years of operations. Streamflow reductions are predicted to be 10 to 50% lower than baseline flows within the LSA for the Doris Watershed nodes; therefore, TMAC indicated that the magnitude of the residual effect is moderate for the Doris Watershed. Streamflow reductions compared to baseline are predicted to be less than 10% for the Windy and the Aimaokatalok watersheds and the magnitude of the residual effect is considered low by TMAC. The Proponent further noted that the negative effects beyond natural variability are expected to be local, medium-term, and continuous as water withdrawal from lakes and water loss to taliks are considered to be continuous. TMAC noted that surface hydrology has the capacity to recover and indicated that the effects are expected to be fully reversible. Finally, TMAC predicted that streamflow reduction in Doris Watershed has the potential to affect fish habitat in Doris Lake Outflow and Little Roberts Outflow. TMAC concluded that the residual effects of the Project on surface hydrology would be not significant based on the attributes discussed.

TMAC noted within the FEIS that the following measures would be included in the design of the Project to minimize or eliminate potential effects on the surface hydrology:

- Mine areas would be constructed to minimize contact water. Facilities would be designed with consideration of footprint minimization and would be located, where possible, in areas of reduced runoff. Where necessary, runoff would be diverted upstream of mine areas to further reduce the amount of contact water created.
- Contact water pond storage capacity, freshet flows, and expected storm event volumes would be determined based on site-specific conditions. The sizing and design of these facilities would be such that they can hold water during unusual storm events and contain freshet flows for prescribed periods.
- The Tailings Impoundment Area (TIA) has been designed with substantial additional capacity to store both natural and Project- related inputs in exceedance of routinely expected volumes. The TIA would routinely be operated at a water level that provides availability of contingency capacity.

- Existing infrastructure associated with the Doris North Gold Mine Project would be used to minimize the footprint of the Phase 2 Hope Bay Belt Project.
- Climate change projections for key climatic and hydrologic design details have been considered.
- Routes of roads and pipelines have been minimized, and routing has been designed as far as is practical from stream channel crossings and wet, boggy areas where fish habitat may be disturbed.
- Erosion potential would be reduced by working during periods of low runoff (e.g., winter) as much as possible.
- Water would be recycled and reused where possible.

TMAC noted the following management plans are directly relevant to surface hydrology:

- Doris North Gold Mine Project Domestic Wastewater Treatment Management Plan;
- Hope Bay Project Boston Sewage Treatment operations and Maintenance Management Plan;
- Hope Bay Project Groundwater Management Plan;
- Hope Bay Project Doris-Madrid Water Management Plan;
- Hope Bay Project Boston Water Management Plan;
- Hope Bay Project Doris-Madrid Tailings Impoundment Area operations, Maintenance, and Surveillance Manual;
- Water and Ore/Waste Rock Management Plan;
- Hope Bay Project Aquatic Effects Monitoring Plan;
- Hope Bay Project Boston Conceptual closure and reclamation Plan; and
- Hope Bay Project Doris-Madrid Interim closure and reclamation Plan.

Surface Water Quality

Baseline water quality data from lakes, streams and rivers were collected from 1992 to 2017. TMAC noted that the water of lakes and streams are typical of Arctic surface waters, with low concentrations of suspended material, nutrients, and most metals. Lakes and streams typically had near-neutral pH with soft to moderately hard water. TMAC noted within the FEIS that during the open-water season, lakes tended to be fully mixed and well oxygenated while during the ice-covered season, dissolved oxygen levels in both project area lakes occasionally dropped below the minimum Canadian Council of Ministers of the Environment (CCME) guideline for the protection of aquatic life in bottom waters. TMAC noted that oxygen depletion near lake bottoms is a common phenomenon in Arctic lakes, and is a result of respiration and a lack of exchange with atmospheric oxygen during the long period of ice-cover. The concentrations of total suspended solids (TSS) and turbidity in the lakes, streams and rivers in the LSA and RSA were sporadically elevated and highly variable over time and across waterbodies. Concentrations of chloride and fluoride in both the LSA and RSA lakes occasionally were greater than CCME guidelines. Concentrations of nitrate, nitrite, and ammonia in lakes, streams, and rivers were generally low, and were below CCME guidelines. Total phosphorus concentrations varied seasonally and across lakes and streams, but tended to be highest in North Belt LSA lakes and streams. The trophic status of lakes, streams, and rivers in the project area,

based on total phosphorus concentrations, ranged from ultra-oligotrophic to hyper-eutrophic. Lakes were assigned more than one trophic status because of the seasonal variability of total phosphorus concentrations. Total phosphorus was highly variable among streams but also within streams over time. Metal concentrations were sometimes highest during the ice-covered season. Some metals such as aluminum, chromium, copper, iron, lead, and selenium were naturally elevated in project area lakes and streams, and were higher than CCME guidelines in some samples from all study areas. The highest mean concentrations of these metals tended to occur in Glenn Lake, Glenn Outflow and stream AWRa [*identified as a stream located in the north belt along the all-weather road, identified as stream 'a'*], though concentrations were also relatively high in Trout and P.O. lakes. TMAC further noted that arsenic (Roberts Outflow), cadmium (Doris Lake, Koignuk River and Reference B Outflow), lead (Glenn Outflow, Koignuk River and Aimaokatalok River), mercury (Reference Lake B and Roberts Outflow), and zinc (Doris Lake and Reference Lake B) concentrations were also higher than CCME guidelines in a small subset of samples. Further, concentrations of free cyanide in all lakes, streams and rivers remained below the CCME guideline of 0.005 mg/L.

TMAC noted within the FEIS that the Phase 2 Hope Bay Belt Project (the Project) has the potential to interact with the freshwater environment through a number of activities, pathways, and mechanisms. The interactions between the Project and surface water quality were further refined by TMAC by defining interaction groups which are interaction pathways that share similar modes of interaction with the Project, specific mitigation and management measures, assessment thresholds, and key indicators. The interaction groups for the assessment of effects to freshwater quality were defined by TMAC as:

- Site Preparation, construction, and decommissioning: activities that include the clearing of overburden, earthworks, and construction activities for pads and infrastructure.
- Site and Mine Contact Water: water that contacts site surface infrastructure, mine surfaces (e.g., waste rock piles, ore storage areas, crown pillar recovery trenches) and operations (e.g., water management, drilling water, underground mine water). The site and mine contact water interaction group also includes the operations of the water treatment plant (WTP) and sewage treatment plant (STP) at the Boston site, where the two water sources will be treated, combined, and then discharged into Aimaokatalok Lake through a single pipeline-diffuser system.
- Quarries and Borrow Pits: activities related to the operations of quarries and borrow pits.
- Explosives: project activities related to the transport, manufacture, storage, and use of explosives.
- Fuels, Oils, and Polycyclic Aromatic Hydrocarbons: activities related to the storage of fuels, fueling and maintenance operations, and the combustion of waste.
- Dust Deposition: activities that generate dust, including vehicle traffic, airstrip activity, and quarry and borrow pit activities that can then be deposited in freshwater receiving environment.

Further, TMAC identified the following discrete pathways which describe specific mechanisms of interactions that were useful for specifying the physical relationship between a project component and the freshwater environment, for identifying applicable mitigation measures, and for characterizing the residual effect:

- Runoff: describes the transport of material or compounds from the terrestrial environment into the freshwater environment by precipitation or snowmelt;
- Discharge: the directed input of water into the freshwater environment;
- Water withdrawal: describes the influence that changes in volume and flow may have on freshwater waterbodies;
- Seepage: describes the flow of water through the active layer and taliks;
- Physical: the direct physical interaction between project activities and the freshwater environment; and
- Aerial deposition: the direct input of material and chemical compounds from the air into the freshwater environment.

For the characterization of potential effects to surface water quality, TMAC provided a discussion on each interaction group as listed above. In addition, TMAC predicted that arsenic would be elevated, particularly in Doris Creek, during post-closure, when the natural Tail Lake catchment flow is restored. As such, TMAC proposed a site-specific water quality objective (SSWQO) for use as a threshold for screening in the effects assessment. The SSWQO was developed using standard CCME guidance for the development of long-term guidelines for freshwater environments and a long-term arsenic SSWQO of 0.028 milligram/Litre (mg/L) was subsequently used by TMAC for the characterization of effects for all waterbodies within the project area. Further, as copper is naturally elevated in the project waterbodies and has been observed to be naturally greater than CCME water quality guidelines in many of lakes and streams, a SSWQO of 0.009 mg/L was developed for the Project for copper and for characterization of effects for all waterbodies in the Project area.

Site Preparation, Construction, and Decommissioning

TMAC noted within the FEIS that the activities associated with the construction and potential decommissioning of infrastructure as part of the Project will cause a disturbance to the landscape and could increase the potential for runoff into the freshwater environment. TMAC indicated that a potential residual effect from construction and decommissioning activities on freshwater quality may occur from the transport of suspended material (TSS). This may create localized increases in the concentrations of suspended sediments and sediment-associated metals or nutrients. TMAC further noted that these residual effects are anticipated to occur during or immediately after the construction or decommissioning activities when surface materials are more likely to be disturbed, and have the greatest potential to occur during periods of significant overland flow, such as freshet and rainfall events. Although sediment from runoff has the potential to increase TSS and turbidity in the receiving environment, TMAC predicted that, based on the known effectiveness of current mitigation and management measures being implemented at the existing Doris North Gold Mine, proposed measures would mitigate the potential effects and the changes in suspended sediment concentrations are not expected to be greater than CCME guidelines for the protection of aquatic life.

TMAC indicated that the in-water works required for the installation and eventual decommissioning (the portion of pipe which is buried by rock fill will remain in place) of the discharge pipeline in Aimaokatalok Lake and the freshwater intake pipelines in Windy and Aimaokatalok lakes have also been included in this interaction group, because the installation on the lakebed of infrastructure associated with the pipelines (e.g., cement pipeline anchors, rock

berms, high-density polyethylene (HDPE) pipeline) could temporarily re-suspend sediments into the water column. The potential effects from the in-water construction and ultimate removal of the discharge and intake pipelines (the portions not covered in rock fill) are expected to be highly localized to the lakebed footprint of the infrastructure (i.e., 1,140 m^2 for the discharge pipeline, 1,603 m^2 for the Aimaokatalok Lake intake pipeline, and 88 m^2 for the Windy Lake intake pipeline), and will be short-lived as the re-suspended sediments will re-settle once the pipeline installation or removal is complete. TMAC also noted that the installation of culverts or bridges where the all-weather roads cross streams could also affect water quality by disturbing and re-suspending sediments, which would cause TSS concentrations in the overlying water to increase. Streams in which culverts or bridges could be installed include Glenn, Ogama, Wolverine, Trout, and Stickleback outflows, and Patch, Doris, and Aimaokatalok inflows, as well as Roberts Bay Inflow and Boulder Creek.

Based on its assumptions, TMAC noted that the residual effects are anticipated during the construction phase when water management features are in the process of being constructed and commissioned and that small amounts of runoff are expected to reach the surrounding waterbodies while the water management features are being constructed. TMAC predicted that the potential magnitude of the residual effect from all construction and decommissioning activities to be low and that the effects are expected to be remain within the PDA or restricted to the LSA. Further, TMAC noted within the FEIS that the freshwater environment has the capacity to recover and the effects are expected to be fully reversible. Therefore, TMAC concluded that the residual effect on freshwater quality of Phase 2 Hope Bay Belt Project construction and decommissioning activities (through the disturbance of the landscape due to the construction and reclamation of project infrastructure) to be not significant.

For the Hope Bay Belt Development (i.e., for the existing Doris North Project and the proposed Phase 2 Hope Bay Belt Project), TMAC noted within the FEIS that as a substantial portion of the infrastructure at Roberts Bay and Doris has been completed and therefore any localized, short-term changes in water quality from the construction of existing and permitted infrastructure will not coincide with the proposed Phase 2 Hope Bay Belt Project activities, and there would be minimal potential for cumulative effects across the Hope Bay Belt Development. TMAC did note that the decommissioning activities would include the infrastructure at Roberts Bay and Doris and the potential residual effects from decommissioning activities remains and would be similar to what was predicted for the Project.

Site and Mine Contact Water

TMAC indicated that potential effects were assessed for each major watershed within the project area because the specific interactions between project activities and infrastructure were confined to these drainage networks.

The screening of the water balance model predictions in the Aimaokatalok Watershed identified potential residual effects to freshwater quality in Stickleback and Aimaokatalok lakes. Stickleback Lake would be located close to the proposed infrastructure in the Boston area and would receive runoff during the construction, operations, closure, and post-closure phases from some parts of the Boston infrastructure. Based on the screening of the water balance model, TMAC predicted that several metals and metalloids would be more than 10% greater than the

predicted baseline concentrations based on the water balance model. However, only fluoride is predicted to be slightly over the threshold guideline concentration of 0.12 mg/L during all project phases. TMAC noted that predicted guideline exceedance for fluoride is likely the result of an over-estimated cryo-concentration factor used in the model.

Water quality predictions were generated for two (2) separate parts of Aimaokatalok Lake: (1) the small, eastern arm of Aimaokatalok Lake that is surrounded by infrastructure and connects the inflow of water from Stickleback and Trout lakes to the main lake; and (2) the main basin of Aimaokatalok Lake. The water quality model for both parts predicted concentrations greater than 10% baseline concentrations for several parameters during at least one of the project phases. However, TMAC noted within the FEIS that for antimony, beryllium, boron, cobalt, mercury, molybdenum, silver, ammonia, nitrate and nitrite, the predicted increases in concentrations are modest and lower than applicable thresholds. Further, TMAC indicated that since the water leaving Aimaokatalok will be near baseline levels and there is no infrastructure on the western section of Aimaokatalok Lake or downstream to Hope Bay, no residual effects are predicted in the Koignuk River resulting from mine and site contact water. TMAC noted the results of the effects screening suggests that project effects on water quality in the Aimaokatalok Watershed would generally be minor.

TMAC indicated that as Windy Lake is near the Madrid North site, and would interact with the Project through water withdrawals for industrial use at Madrid North, drinking water for the Doris site, runoff from the decommissioned contact water pond at the Madrid North, and the restoration of groundwater flow from the closure and flooding of the Madrid North mine. The water balance model predicted increases greater than predicted baseline concentrations for the following indicators: antimony, arsenic, beryllium, cadmium, cobalt, copper, lead, manganese, mercury, nickel, thallium, vanadium and sulphate. However, TMAC noted within the FEIS that the maximum predicted increases in concentrations are predicted to be substantially lower than applicable water quality guidelines and thresholds and are predicted to occur during the post-closure phase when natural flows are restored to Windy Lake from the closure of the Madrid North mine.

For the Doris Watershed, TMAC screened the following waterbodies for potential water quality effects based on their proximity to the Madrid North and Madrid South mines: Wolverine Lake, Patch Lake, P.O. Lake, Ogama Lake, Little Roberts Lake, and Doris Creek. TMAC noted within the FEIS that Wolverine Lake would be proximate to the Madrid South site, and could interact with the Project through groundwater flow and runoff from the Madrid South site, including runoff in post-closure from decommissioned pad and stockpile areas. The water balance model predicted increases greater than predicted baseline concentrations for the following indicators: antimony, arsenic, beryllium, cobalt, copper, mercury, thallium, uranium, vanadium and sulphate. However, TMAC noted that the maximum predicted increases are predicted to be substantially lower than applicable assessment thresholds. The largest increase in concentration relative to baseline concentrations is predicted for mercury in post-closure (approximately four times higher than the predicted baseline); however, TMAC noted that the predicted mercury concentrations were well below the CCME guidelines.

TMAC indicated that Patch, P.O., and Ogama lakes are adjacent to and downstream of permitted and proposed project activities at both the Madrid North and Madrid South sites. Potential project effects on water quality are predicted to be primarily upstream effects from runoff and groundwater seepage due to decommissioned underground mines including decommissioning of water management infrastructure. In Patch Lake, TMAC indicated that the concentrations of antimony, arsenic, beryllium, cobalt, and mercury are predicted to be greater than baseline conditions in the post-closure phase while in P.O. Lake, the concentrations of antimony, arsenic, beryllium, cobalt, and mercury are predicted to be greater than baseline conditions in the post-closure phase. Further, mercury concentrations in both Patch and P.O. lakes are predicted to be greater than baseline conditions during the operations, closure and post-closure phases; however, TMAC noted within the FEIS that predicted concentrations for mercury are within two times the baseline concentrations for both lakes. Further downstream in Ogama Lake, arsenic and mercury concentrations are predicted to be greater than baseline conditions during operations and closure (mercury only) and post-closure phases. TMAC indicated that all predicted increases in the concentration of water quality indicators (antimony, arsenic, beryllium, cobalt, copper, mercury, thallium, uranium, vanadium and sulphate) in Patch, P.O., and Ogama lakes would be lower than applicable thresholds.

The water quality model for Doris Creek predicted increases in metals, nutrients and physical parameters relative to the baseline conditions. However, only aluminum concentrations are predicted to be greater than the 0.1 mg/L threshold value (within 10% of the threshold), with this value predicted to occur only once during freshet period of the operations phase (June 2029). Little Roberts Lake which is downstream of the outflow from Doris Lake is also predicted to have increases in metals, nutrients and physical parameters relative to the baseline conditions. TMAC noted that the predicted increases in concentrations in Little Roberts Lake are the result of flow from Doris Creek and cryo-concentration within Little Roberts Lake during the ice-covered season and the concentrations are predicted to be not greater than the assessment thresholds.

For the Hope Bay Belt Development (i.e., for the existing Doris North Project and the proposed Phase 2 Hope Bay Belt Project), TMAC noted within the FEIS that as a whole, the potential effects were included in the site-wide water and load balance model and therefore the potential residual effects from the Doris development have already been assessed within the Phase 2 Hope Bay Belt Project assessment for the operations, closure and post-closure phases. TMAC further noted that no incremental residual effects from the Hope Bay Belt Development from site and mine contact water were identified beyond the effects already described in the water balance model.

Overall, TMAC concluded that the residual effects to freshwater quality from site and mine contact water would be not significant because the predicted effects were moderate in magnitude and localized to the LSA even though the increases in fluoride concentrations predicted to occur within the Aimaokatalok Watershed during post closure was concluded to be long-term in duration and the residual effects from site and contact water were concluded to be irreversible.

Quarries and Borrow Pits

Runoff is the primary pathway for interaction between quarries and the freshwater environment. Runoff from quarries and borrow pits could affect freshwater quality by changing pH (interaction with surficial material), and contributing TSS (erosion), metals, nutrients, and hydrocarbons (mechanical use of fuel, oil, and grease) into the freshwater environment. TMAC noted within the FEIS that by minimizing the volume of water within quarries and collecting water within the quarries, suspended sediments and sediment-associated metals can settle out in the sump and would not contact the freshwater environment. As such, due to the mitigation and management measures, including monitoring and adaptive management of quarry runoff, no residual effects from quarries and borrow pits are predicted for freshwater quality for the Phase 2 Hope Bay Belt Project. Further, no residual effects from the overall Hope Bay Belt Development are predicted.

Explosives

Potential residual effects from explosives may occur from the transport, storage, and use of ANFO explosives for quarry and mine development. TMAC noted within the FEIS that blasting residues on mine workings, waste rock, tailings, and run-of-quarry material would affect water quality through runoff and seepage. The Water and Load Balance model predicted that the concentrations of nitrogenous compounds may increase relative to baseline conditions in Stickleback and Aimaokatalok lakes and in Doris Creek and Little Roberts Lake due to explosive activities. However, TMAC noted that the predicted concentrations would be below the CCME water quality guidelines, suggesting that the elevated concentrations are within the range of natural variability. The predicted increases are, at least partially, attributable to blasting residues in site and mine contact water.

TMAC further noted that the effects from blasting residues on water quality through the aerial deposition pathway was predicted to be negligible as the majority of explosives use would occur underground. Surface blasting for quarrying and construction would be designed to minimize the generation of dust.

With respect to the Hope Bay Belt Development (i.e., for the existing Doris North Project and the proposed Phase 2 Hope Bay Belt Project), TMAC noted that the potential changes in nitrogen compound concentrations resulting from the use of explosives in the overall Hope Bay Belt Development were predicted to be relatively small, based on the observed performance of the mitigation and management measures and the small magnitude of predicted effects in the water balance model.

Overall, TMAC noted that the residual effects from explosives for the Phase 2 Hope Bay Belt Project development are expected to be low in magnitude, medium-term in duration, restricted to the LSA and therefore considered to be not significant.

Fuels, Oils, and PAH

TMAC noted within the FEIS that the fuels, oils, and polycyclic aromatic hydrocarbons (PAHs) project interaction group would interact with the freshwater environment through runoff and aerial deposition but are anticipated to have negligible effects on freshwater quality. The potential effects to freshwater quality from the use of fuels, including refueling and maintenance,

were considered to be fully mitigated by TMAC by the application of best management practices and the mitigation and management measures related to the use and potential spills of fuels and petroleum products. For the aerial deposition of PAHs, TMAC noted that the primary mitigation measure would be the efficient operations of the incinerator as the incinerator will be operated according to the Nunavut guidelines, the *Canada-Wide Standards for Dioxins and Furans* and the *Canada-Wide Standards for Mercury Emissions*, as well as TMAC's own Incinerator Management Plan. As such, TMAC anticipated that there would be no residual effects from fuels, oils, and PAHs on the freshwater quality.

Dust Deposition

TMAC predicted that the Phase 2 Hope Bay Belt Project activities would generate dust that could potentially be deposited into the freshwater environment based on the results of the air quality modeling work. The predicted average daily load of dust deposited into each lake ranged from 0.0006 to 0.0066 mg/L/d for the South Belt LSA lakes (Aimaokatalok, Trout and Stickleback), and from 0.0007 to 0.0059 mg/L/d for the North Belt LSA lakes (Doris, Imniagut, Little Roberts, Ogama, Patch, P.O., Windy, Wolverine). For each lake, the predicted daily loads were similar between the construction and operations phases with the daily loads predicted to be approximately 170 to 5,000 times lower than the average TSS concentrations in the LSA lakes (mean TSS concentration of 3.5 mg/L in the North Belt LSA and 1.1 mg/L in the South Belt LSA). TMAC noted that based on the results, the relative increase in total suspended sediment concentrations, and particle-associated metals, is considered negligible compared to observed water quality conditions and the potential effects from dust deposition were not considered further. Further, TMAC indicated that based on the results of the quantitative air quality modeling and the absence of any evidence of dust-related effects, the potential effects from dust deposition for the Hope Bay Belt Development (i.e., for the existing Doris North Project and the proposed Phase 2 Hope Bay Belt Project) on freshwater quality was concluded to be negligible, and were not considered further.

Mitigation Measures

TMAC noted within the FEIS that the following measures were included in the design of the Project to minimize or eliminate potential effects on the freshwater environment:

- Utilization of existing infrastructure associated with the Doris North Gold Mine Project.
- Inclusion of climate change projections for key climatic and hydrological design details.
- Construction of roads and pipelines as far as is practical from stream channel crossings and wet, boggy areas where fish habitat may be disturbed.
- Planned set-backs and buffer zones from waterways.
- Avoidance, as required and feasible, of sensitive features, including riparian ecosystems and floodplains, esker complexes, fragile or rare wetlands, shallow open water, ponds, marshes, beaches, intertidal areas, and marine backshores.
- Use of geochemically suitable rock quarries and borrows to construct roads, pads, and structures.
- Infrastructure will be located, whenever feasible, on competent bedrock or appropriate base material that will limit permeability and transport of potentially poor quality water into the active layer.

- Appropriate secondary containment systems will be used for petroleum product storage tanks to prevent spills and releases to water. Bulk fuel storage areas, hazardous materials storage areas, and explosives storage facilities will be bermed and lined with impermeable barriers to minimize leaks and spills.

The following management plans were also prepared by TMAC that are directly relevant to surface water quality to minimize potential effects from the Project:

- Oil Pollution Prevention Plan/Oil Pollution Emergency Plan;
- Air Quality Management Plan;
- Hope Bay Project Spill Contingency Plan;
- Doris North Gold Mine Project Domestic Wastewater Treatment Management Plan;
- Hope Bay Project: Boston Sewage Treatment Operations and Maintenance Management Plan;
- Hope Bay Project Groundwater Management Plan;
- Hope Bay Project Doris-Madrid Water Management Plan;
- Hope Bay Project Boston Water Management Plan;
- Hope Bay Project Doris-Madrid Tailings Impoundment Area - Operations, Maintenance, and Surveillance Manual;
- Hope Bay Project Boston Tailings Management Area - Operations, Maintenance, and Surveillance Manual;
- Hope Bay Project Waste Rock and Ore Management Plan;
- Hope Bay Project Water and Ore/Waste Rock Management Plan;
- Hope Bay Project Non-hazardous Waste Management Plan;
- Hope Bay Project Hydrocarbon Contaminated Material Management Plan;
- Hope Bay Project Hazardous Waste Management Plan;
- Hope Bay Project Incinerator Management Plan;
- Hope Bay Quarry Management and Monitoring Plan;
- Hope Bay Project Aquatic Effects Monitoring Plan;
- Hope Bay Project Boston Conceptual closure and reclamation Plan, November 2017; and
- Hope Bay Project Doris-Madrid Interim closure and reclamation Plan, November 2017.

Overall, TMAC noted that infrastructure development, dewatering, and diversion activities would result in alterations of streamflow in the Doris Watershed, alteration of the streamflow at Windy Watershed and alteration of streamflow at Aimaokatalok Watershed which would vary over the site preparation, construction and decommissioning phases. The residual effects for surface hydrology, water quality and sediment quality VEC were assessed as low or moderate in magnitude and the geographical extent of the effects was limited to within the freshwater local study area (LSA). TMAC noted that the freshwater residual effects will not interact with past, present and likely future industrial projects and will not occur outside of the NSA. Further TMAC noted there are no anticipated cumulative or transboundary effects to the freshwater environment resulting from the Project.

5.7.2 Views and Concerns of Interested Parties

Within its final written submission, the Kitikmeot Inuit Association (KIA) noted that the chosen long-term freshwater site-specific water quality objective (SSWQO) for arsenic was incorrectly derived and would not be sufficiently conservative for application to the Hope Bay belt-receiving environment. The arsenic SSWQO was recalculated to account for accepted Canadian Council of Ministers of the Environment (CCME) protocols and was derived to be 0.019 milligrams/litre (mg/L) instead of the proposed SSWQO of 0.028 mg/L for arsenic. The KIA noted that while the recalculated arsenic SSWQO does not alter the conclusions as presented in the FEIS, it highlights a diminished difference between the modeled changes resulting from the Project and a change that would constitute a significant impact to the aquatic environment. The KIA further indicated that this more limited operational flexibility underscores the need for robust environmental monitoring through the Aquatic Effects Monitoring Program (AEMP) and Surveillance Network Program (SNP) to ensure any changes to the aquatic environment are in line with those presented in the FEIS and any divergences are effectively adaptively managed in a timely manner. Overall, the KIA recommended that TMAC adopt a long-term total arsenic SSWQO of 0.019 mg/L for application throughout the freshwater environment of the Hope Bay Belt.[187] Environment and Climate Change Canada (ECCC) noted similar concerns within its final written submissions with respect to the arsenic SSWQO and noted that the arsenic SSWQO of 0.028 mg/L was developed for a different project which underwent further scrutiny and a lower concentration was agreed upon by parties as being more appropriate for that particular site.[188,189] ECCC further noted that the proposed SSWQO is over two (2) times higher than the maximum modelled concentrations of the post-closure upper case in Doris Creek and 77 times higher than the baseline upper case. Based on these values, ECCC stressed that the SSWQO could be reduced to reflect reasonably achievable levels but also questioned the necessity of a site specific water quality objective given that exceedances of CCME are only anticipated in maximum under ice, and upper case predictions. Finally, ECCC indicated that given that the exceedances of the arsenic SSWQO are only anticipated to occur during the post-closure period, the Proponent should investigate additional measures which could be used to reduce releases of arsenic prior to closure, to meet closure objectives and reduce environmental impacts during the post-closure period.

In response to both KIA and ECCC's comments on the selection of an SSWQO for arsenic, TMAC noted that it has re-considered applying an SSWQO for arsenic at this early juncture of the Project and instead indicated that it will monitor potential changes to arsenic in the project area lakes through the AEMP. TMAC further noted that if arsenic levels increase significantly over time in a project area lake relative to the reference condition, or increase to 75% of the CCME (0.00375 mg/L) water guideline, the development of an SSWQO could be considered as a medium or high action level response through the Aquatic Response Framework within the AEMP. TMAC further noted that it is also likely the maximum arsenic concentrations in Doris Creek during post closure are overestimates because in the water quality modelling exercise (Annex V1-7, Package P5-4) conservatively routed Tailings Impoundment Area (TIA) operations overflow directly to Doris Creek instead of northern Doris Lake (which is actual

[187] Kitikmeot Inuit Association Final Written Submission, March 19, 2018.
[188] NIRB File No. 12MN036. Sabina Gold & Silver Corp.'s Back River Gold Mine Project Proposal
[189] Environment and Climate Change Canada Final Written Submission, March 19, 2018.

pathway) where arsenic would be diluted before flowing into Doris Creek. TMAC noted that it will consider the value of 0.0019 mg/L put forth by KIA if an SSWQO is developed as part of the Aquatic Response Framework within the AEMP and the revised AEMP will be provided to parties prior to the Final Hearing. Further, TMAC noted that project-specific information will continue to be collected by TMAC during operations that will confirm if closure objectives for arsenic are on target, and can be used to refine future predictions for post-closure and future mitigation, if necessary.[190]

ECCC also questioned within its final written submission the necessity for a copper SSWQO given that it appears the modelling may be artificially inflating the predicted baseline copper concentrations and potentially the predicted base case predictions. Several lakes in the Project area do have naturally elevated copper concentrations and a Background Procedure approach may be appropriate for those lakes; however, given the abnormally high predicted baseline concentrations in relation to copper in the observed baseline, additional justification for a SSWQO for Stickleback and Wolverine lakes is also required.[191] In response to ECCC's comment with respect to the necessity for a copper SSWQO, TMAC reconsidered its position of adopting a copper SSWQO for the Project as it acknowledges that the modelled baseline copper concentrations were greater than observed concentrations in Wolverine and Stickleback lakes, and likely led to inflated predicted base case concentrations. Instead, TMAC noted that it will monitor potential changes to copper in the project area lakes through the AEMP. If copper levels increase significantly over time in a project area lake relative to the reference condition, and increase to 75% of the hardness-dependent CCME water guideline, the development of an SSWQO could be considered as a medium or high action level response through the Aquatic Response Framework within the AEMP that is currently being revised.[192]

The KIA further indicated within the final written submission that the AEMP sampling frequency as proposed by TMAC is not sufficient to assess predicted changes to water quality associated with effluent discharges into Aimaokatalok Lake as presented in the FEIS. The KIA noted concern that failure to collect samples during freshet would preclude confirmation of seasonally specific modeled changes to the aquatic environment as presented in the FEIS. The KIA indicated that the occurrence of freshet in the Arctic is relatively brief (approximately two [2] weeks); and that the timing of the freshet field event should rely on indicative meteorological data and local flow measurements. The KIA recommended within its final written submission that water quality sampling should be conducted during freshet as well as under ice and in the open water season through the AEMP to align the field program with the predicted effects as presented in the FEIS.[193] In its response to the KIA's recommendation to conduct water quality sampling during the freshet period, TMAC noted that sampling the project area lakes during freshet is not proposed as this has not been done during the historical baseline programs, as part of the former Doris North AEMP, nor the current Doris North AEMP. Additionally, TMAC noted that ice off varies from lake to lake during freshet affecting the timing of sampling, and there are inherent safety risks associated with sampling lakes during the freshet when the lakes are partially ice covered with exposed perimeters. TMAC indicated that water quality sampling

[190] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[191] Environment and Climate Change Canada Final Written Submission, March 19, 2018.
[192] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[193] Kitikmeot Inuit Association Final Written Submission, March 19, 2018.

will be conducted in July in Aimaokatalok Lake and Reference Lake B, however, shortly after ice off and the freshet period. Further, TMAC noted that the sampling approach as proposed is consistent with other Nunavut AEMPs.[194]

Within its final written submission, the KIA further observed that the AEMP does not include any form of cyanide in the monitoring parameter suite and indicated that cyanide is a contaminant of concern associated with the cyanide leach process that will be used as part of gold extraction at the Boston site. The KIA stressed that neglecting to assess cyanide in the freshwater receiving environment will preclude a determination as to whether the cyanide destruction circuit and other management practices have mitigated the risks associated with that parameter to the aquatic environment. The KIA recommended within its final written submission that the AEMP parameter suite should be updated to include: weak acid dissociable cyanide, the form of the compound for which a CCME water quality objective exists, and total cyanide, the form of the compound that will be regulated under the forth coming *Metal and Diamond Mines Effluent Regulation*s (MDMER). Further, the KIA noted that the effluent discharges associated with Madrid North, Madrid South and Boston will all be subject to the updated MDMER, which is expected to come into force in 2018, and under the MDMER, discharges throughout the Hope Bay Belt would be subject to the more stringent discharge criteria. The KIA noted that although the conclusions presented within the FEIS would not alter with the more stringent discharge criteria, there may be operational challenges to comply with the new regulations. The KIA recommended that TMAC update its Water Licence Applications for the Project to reflect the new discharge criteria, and include a discussion on the feasibility of meeting the MDMER criteria in both ongoing and intermittent discharges to the marine and freshwater environments and any operational changes that will be required to ensure compliance.[195] Within its response to the KIA's final written submission, TMAC agreed to add free cyanide and total cyanide to the AEMP parameter suite for Aimaokatalok Lake and Reference Lake B. Further, based on the Phase 2 Hope Bay Belt Project Water and Load Balance, TMAC will be able to meet the current *Metal Mining Effluent Regulations* (MMER) and proposed MDMER regulations for all mine effluents throughout all stages of the mine life. As such, TMAC indicated that it will update the proposed Doris-Madrid and Boston Water Management Plans to include the proposed MDMER regulations prior to the proposed regulations coming into effect.[196]

Further, the KIA noted concern within the final written submission that the AEMP does not include sufficient water quality monitoring to confirm all the modelling results within the water balance and load model. The KIA indicated that the water balance and load model does not use water quality source terms from individual modeled lakes in the Boston, Madrid and Doris areas and recommended that all modeled lakes in which impacts from project activities are predicted should be monitored. Specifically, Windy Lake should be included in the AEMP in addition to the proposed Aimaokatalok, Stickleback, Patch, Doris and Wolverine lakes.[197] In response to the KIA's concern, TMAC indicated that Windy Lake was excluded from the AEMP, as nearly every assessed water quality parameter was within predicted baseline concentrations as a result

[194] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[195] Kitikmeot Inuit Association Final Written Submission, March 19, 2018.
[196] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[197] Kitikmeot Inuit Association Final Written Submission, March 19, 2018.

of the Project until the post-closure period. The exception was mercury, which was predicted to change by a maximum of 25% over the operations phase (0.000001121 mg/L), yet remain 25 times lower than the CCME guideline for inorganic mercury (0.000026 mg/L). The greatest changes to water quality in Windy Lake are predicted more than 20 years into the Project during post-closure. TMAC suggested that mercury could be added as a measurable parameter or indicator to the AEMP prior to this period, when changes due to the Project are expected or if the potential for the Project to affect the lake changes due to updated Project design with potential activities near Windy Lake occurring.[198]

Within its final written submission, ECCC noted that the TMAC is proposing to use the minimal thickness of 0.3 metres (m) to cover the tailings surface with waste rock cover. ECCC noted concern with using this minimal thickness and recommended that the Proponent demonstrate that the 0.3 m will provide adequate protective cover long term (post closure) to ensure that there are no negative impacts on downstream water quality.[199] In response to ECCC's comment, TMAC noted that a detailed water and load balance modeling has confirmed that long term water quality from the Doris TIA has no negative impacts on the downstream environment. Therefore, TMAC indicated that there is no requirement for an infiltration or oxygen reducing cover over the tailings surface and that the 0.3 m run of quarry rock cover as proposed is designed to specifically prevent dust and minimize direct contact by terrestrial life.[200]

ECCC further noted within its final written submission concerns regarding the fact that no post-closure seepage collection is planned or required as the volume of flow through the active layer of the tailings would be limited to what may infiltrate through the low permeability cover and the volume of flow is considered to negligible by TMAC. ECCC was of the view that the impact of climate change on structures like dry-stack tailings is unknown and stressed that it would be prudent to have a contingency plan for the potential increase in seepage as a result of changes to permafrost distribution as a result of climate change.[201] In its response, TMAC recognized that climate change could impact the performance of long-term structures such as the Boston tailings management area (TMA) and as a result, the TMA has been designed taking climate change into account. Based on the design and the water and load balance modeling, TMAC concluded that a High Density Polyethylene (HDPE) liner would be a suitable method to limit infiltration, and subsequently an infiltration analysis was completed, which confirmed that long-term post-closure seepage is not expected to be a concern. TMAC indicated in its response that it considers that the design of the TMA and supporting analyses have conservatively and sufficiently accounted for the potential impacts of climate change on structures like dry-stack tailings post closure and no additional contingency measures are required.[202]

ECCC further disagreed within its final written submission with the order of analyses for the effects determination to characterize potential effects to freshwater quality from the Project and requested that the freshwater quality effects assessment be re-run in such a way that it compares predicted water quality concentrations to observed baseline first, and then proceed with the

[198] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[199] Environment and Climate Change Canada Final Written Submission, March 19, 2018.
[200] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[201] Environment and Climate Change Canada Final Written Submission, March 19, 2018.
[202] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.

effects assessment in order to ensure that parameters with the potential to increase due to the Project are not overlooked as an artifact of the freshwater quality model.[203] TMAC noted within its response that it stands behind the approach to first compare predicted base case water quality modelling results to predicted baseline since the effects of the Project are built off of the predicted baseline values and it is a standard first approach for water quality effects assessments. TMAC indicated that a key flaw comparing base case predictions to observed data is it has the potential to identify parameters of concern that are solely due to model artifacts, such as conservative climate change assumptions that are accounted for by comparing base case to predicted baseline results. TMAC noted that this is particularly important for the FEIS assessment since the predicted baseline and base case water quality modelling results were strongly influenced by climate change inputs. TMAC also observed that for the specific example of mercury, the only predicted increases in mercury concentrations are during the post-closure period and the increase in mercury concentrations are five percent or less compared to the baseline values.[204]

In review of the Conceptual/Interim closure and reclamation Plans, ECCC remarked within its final written submission that TMAC identified that the updating of predictive models would be used as adaptive management to refine closure requirements and that the updates would occur if any of the data collected at the Boston site is found to be indicative of a problematic trend of unforeseen processes. ECCC requested that TMAC reconsider the timing of updating the models and recommended that effluent and water quality audits be completed for Roberts Bay and Aimaokatalok Lake at specific time intervals relating to major milestones in the Project (at a minimum every 3-5 years).[205] In response, TMAC maintained that the updating of predictive models will be used as adaptive management to refine closure requirements. This would include the updating of predictive models for Roberts Bay and Aimaokatalok Lake. Further, TMAC indicated that specific details for the predictive model re-calibration frequency and scope will be determined in the water licensing stage.[206]

Within its final written submission, Indigenous and Northern Affairs Canada (INAC) provided comments on the hydrodynamic modelling of discharge to Aimaokatalok Lake and noted that during the under-ice season, effluent can build up near the diffuser in Aimaokatalok Lake. The three-dimensional hydrodynamic model completed by TMAC predicted that the concentration of chromium in Aimaokatalok Lake can reach 80% of the CCME guideline value (i.e., 0.001 mg/L), up from a background concentration in the lake of around 30% of the criterion. While the predicted concentration of chromium is below the CCME guideline, INAC indicated that uncertainty in the modelling exercise, its inputs, and the background concentration, may mean that chromium concentrations could reach or exceed the guideline value during the under-ice season, specifically April – May. INAC noted that the proposed MMER – Environmental Effects Monitoring (MMER-EEM) water quality monitoring plan may be sufficient to detect such an eventuality. However, the monitoring results should be presented in such a way that they will show the dilution performance of the diffuser in April, the sampling month that is predicted to generate under-ice chromium buildup. INAC recommended that TMAC commit to

[203] Environment and Climate Change Canada Final Written Submission, March 19, 2018.
[204] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[205] Environment and Climate Change Canada Final Written Submission, March 19, 2018.
[206] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.

comparing the field water quality sampling results collected in April for chromium with modelled dilution results and report in terms of effective dilution, taking into account background for chromium and then correcting and updating the background and "dilution required" calculations as the monitoring progresses. Further, INAC recommended that in the event that April chromium concentrations are higher than predicted in the FEIS, the Proponent implement further adaptive management steps such as discharge curtailment until seasonal ice breakup.[207]

In response to INAC's comments with respect to the hydrodynamic modelling of discharge to Aimaokatalok Lake, TMAC indicated that water quality will be evaluated annually during the AEMP, which will include an Aquatic Response Framework with a low action level trigger of 75% of a respective CCME water quality parameter. Therefore, TMAC noted that if chromium concentrations exceed 0.0075 mg/L (or 75% of hexavalent chromium guideline of 0.001 mg/L) in Aimaokatalok Lake at any time of the year (which is lower than the maximum total chromium concentrations predicted in Aimaokatalok Lake using the hydrodynamic model), a low action level response will be triggered to investigate potential causes and recommend adaptive management options, if warranted. Part of the low action response can be reporting the effective dilution as recommended and comparing the results to the corrected 'dilution required' calculations from the modelling exercise. Further, TMAC noted that several water quality parameters, including chromium, will be evaluated annually under the Phase 2 Hope Bay Belt Project AEMP. TMAC noted that at the time of writing the AEMP was currently being revised and will be available to the interested parties prior to the Final Hearing.[208]

As part of its technical presentation during the Final Hearing, INAC noted that, based on the Proponent's responses to INAC's final written submissions, additional concerns identified by INAC in a technical memo to TMAC in April of 2018[209], and follow-up discussions with, and commitments made by TMAC, it considered the outstanding issues related to the hydrodynamic modelling of the effluent discharge at Aimaokatalok Lake resolved as long as TMAC follows its commitment to implement in its aquatic effects monitoring plan a trigger and response method that details actions to be taken when parameter concentrations reach 75 % of the CCME water quality guidelines.[210]

During the Final Hearings, the Nunavut Water Board (NWB) staff requested clarification regarding the location of the one (1) MMER discharge point for the entire belt as identified during the freshwater environment presentation.[211] In response, the Proponent noted that there would be one metal mining effluent regulation discharge into the freshwater environment

[207] Indigenous and Northern Affairs Canada Final Written Submission, March 19, 2018.
[208] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[209] Indigenous and Northern Affairs Canada Technical Memo, *Preparation for Final Hearings for TMAC's Phase 2 Hope Bay Belt Gold Mine Project, INAC Responses to Proponent*, April 11, 2018.
[210] F. Ngwa, Indigenous and Northern Affairs Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 580, lines 3-17.
[211] K. Kharatyan, Nunavut Water Board, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, pp. 287-288, lines 26 and 1-3.

throughout the whole Hope Bay Belt and that it would occur in the western part of Aimaokatalok Lake, probably at about 10 metres of depth.[212]

During the Final Hearing, the NIRB staff requested that TMAC describe "*…a scenario that could trigger the decision to construct or operate an active water-treatment plant…*" in relation to when the mine effluent do not meet discharge criteria.[213] In response, the Proponent noted that the Water and Load Balance model predicts that at the end of the mine life, treatment for arsenic would be required for the water that is being discharged from the tailings impoundment area to Roberts Bay. This is predicted to only occur for the final period of the mine life prior to closure. However, TMAC noted that if the new mining and diamond effluent regulations come into effect, then the source load and the process water would require treatment of the water before discharge.[214] The NIRB staff further asked TMAC's approach to managing cyanide degradation products in the groundwater when TMAC is proposing that detoxified tailings are to be co-disposed with the waste rock underground.[215] In response, TMAC noted that the detoxified tailings would only be put underground with the waste rock within the permafrost zone of the mine and it is expected that there would be no groundwater interaction. TMAC also indicated that as part of the water and load balance modelling, ammonia, which is one of the degradation products associated with the cyanide destruction, has been accounted for as a source load in the balance modelling and carried through into the groundwater that ultimately flows up the mine and which would ultimately be either discharged to the environment during the operational period or that would ultimately re-flood the mine and potentially discharge at a very slow rate into the lakes as part of the post-closure period.[216]

As part of its technical presentation during the Final Hearing, the KIA confirmed that it was satisfied with the Proponent's responses to its recommendations as contained in TMAC's response to parties' final written submissions, and that KIA considered these outstanding issues related to the freshwater aquatic environment resolved. KIA further re-iterated that it made recommendations to develop a conceptual freshwater and marine offsetting plan that includes preliminary gain calculations, to provide a detailed freshwater and marine fisheries offsetting plan for water licence applications prior to the regulatory permitting phase with DFO and that TMAC is required to indicate if additional offsetting will be applied where groundwater sensitivity is likely and habitat losses are greater than reported in the FEIS. KIA noted during its presentation that it was satisfied with the Proponent's responses to its recommendations and the issues have been resolved.[217]

[212] M. Henry, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p 288, lines 5-9.
[213] K. Boa-Antwi, Nunavut Impact Review Board, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 294, lines 11-13.
[214] M. Rykaart, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, pp. 294-295, lines 16-26 and 1-6.
[215] K. Boa-Antwi, Nunavut Impact Review Board, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 295, lines 8-11.
[216] M. Rykaart, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, pp. 295-296, lines 13-26 and 1-3.
[217] J. Roesch, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, pp. 436-437, lines 23-26 and 1-9.

The KIA further reiterated its concern with respect to the arsenic site-specific water quality objective, missing parameters within the AEMP, water quality sampling frequency at the site, water quality monitoring and the model predictions made in relation to water quality during the Final Hearing. KIA confirmed that it was satisfied with the Proponent's responses to its recommendations as contained in TMAC's response to parties' final written submissions.[218]

As part of its technical presentation during the Final Hearing, ECCC noted that based on the Proponent's responses to ECCC's final written submission, it considered the outstanding issues related to the tailings cover thickness for the Doris tailings impoundment area and the potential impacts of climate change on seepage at the Boston dry-stack tailings resolved. ECCC further noted it considered the outstanding issues related to necessity of the proposed copper and arsenic site-specific water quality objectives resolved based on the Proponent's responses to its final written submissions.[219]

A Community Representative from Kugluktuk requested information from the Proponent on how they would keep the streams flowing at the mine site noting:

> *…[d]ue to climate change happening around -- on the mainland, I'm kind of concerned about the streams and whatever where the fish migrates and everything. In the future you guys -- I know a lot of our river systems surrounding Kugluktuk are really drying out and everything. It could happen in the mine site. I was wondering if you guys have a plan to keep the stream flowing all the time. I know streams are real important for the people of Cambridge Bay, Bathurst and Bay Chimo. That's how come I bring this up. I want to know if you can look into that.*[220]

TMAC responded to the question stating that as part of the environmental impact assessment TMAC looked at the water balance for the surface and underground structures and had to ensure that the water flows of for example Doris Creek and into Roberts Bay would not change significantly. Further, TMAC was also required to calculate the potential amount of fish habitat lost and would have to offset or compensate for any lost habitat.[221]

A Community Representative from Taloyoak questioned TMAC on whether it could use other sources of water due to concerns of potentially depositing tailings into Aimaokatalok Lake and requested clarification on where the tailings would end up.[222] TMAC clarified that it would not be depositing tailings into Aimaokatalok Lake and instead would use a dry stacking technique by removing the water from the tailings and stacking the dry tailings in lifts. TMAC further stressed that any water collected from the tailings impoundment area would be treated prior to

[218] J. Roesch, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, pp. 437-438, lines 18-26 and 1-5.
[219] M. Tobin, Environment and Climate Change Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 506, lines 8-24.
[220] P. Taktagon, Kugluktuk, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 732, lines 2-12.
[221] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, pp. 732-73, lines 19-26 and 1-18.
[222] S. Qingnaqtuq, Taloyoak, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, pp. 753-754, lines 26 and 1-5.

going into Aimaokatalok Lake.[223] The Community Representative from Taloyoak further questioned TMAC on where the water following processing of the ore would be released to asking:

> *...in the process plant you have ore, you have rocks going through the plant, and you use water to spray on the rocks. Where is that water drained from the plant? That's my question. Is that water drained into the ocean or into the lake that is used to spray on the rocks in the process plant?* [224]

TMAC responded that all the water used for processing the ore is sourced from Aimaokatalok Lake and following processing, the water from the tailings is treated and returned to the lake. In addition, TMAC clarified that the tailings from Boston would be trucked to the tailings impoundment area at the dry-stack tailings area and the tailings from Madrid North would be piped to the tailings impoundment area. Further, TMAC noted that no tailings would be dumped into the ocean.[225]

5.7.3 Views of the Board

The Board acknowledges that, to date, the Proponent has proposed some measures to mitigate potential impacts to surface water resources. However, notwithstanding these measures, the Board remains concerned with the potential for changes to surface water quality and sediment quality, permafrost/talik distribution, groundwater distribution and flow paths that may be directly or indirectly attributable to project facilities and activities. The Board is aware that these issues will require further consideration and approval by respective regulatory authorities after to the Board's Review is complete, such as the NWB's water licencing process, which will address these issues in much greater detail. The Board also stresses the need for these issues to be assessed and monitored throughout the life of the Project, and recommends to relevant regulatory authorities that a precautionary approach be taken in relation to potential impacts to surface water. In recommending a stringent precautionary approach to these impacts, the Board emphasizes that the potential impacts to surface water could affect, or be perceived to affect, the use of water by anyone travelling through the project area for the life of the Project. Recognizing that the Hope Bay Belt is located within multiple watersheds, including the Doris, Windy, and Aimaokatalok watersheds, any impacts or perceived impacts to nearby surface water could have impacts on people across a broad area.

The Board encourages TMAC to continue to work with the public and other regulatory authorities as it continues to update its modelling, mitigation measures and management plans to ensure that surface water is not only protected, but also that the public is aware of these mitigation actions and the scope of activities potentially affecting surface water bodies that will be conducted throughout the life of the Project. The Board further stresses the need to ensure that appropriate secondary containment systems are in place for the petroleum product storage

[223] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, pp. 754-755, lines 11-26 and 1-3.
[224] S. Qingnaqtuq, Taloyoak, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 760, lines 9-14.
[225] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, pp 760-761, lines 20-26 and 1-6.

tanks, including for the proposed new bulk fuel storage facility, with appropriate management plans to prevent spills and releases to the aquatic environment.

The Board further notes that parties raised concerns with respect to the selection of a site-specific water quality objective (SSWQO) for arsenic, and acknowledges that TMAC has reconsidered applying a SSWQO for arsenic at this time and has instead proposed to monitor potential changes to arsenic in the project area lakes through the implementation of an Aquatic Effects Monitoring Plan (AEMP). The Board acknowledges that TMAC would consider development of an SSWQO in future if arsenic levels increase significantly over time within a project area lake relative to the reference condition. TMAC has also committed to work with the regulatory bodies to ensure that this issue is addressed, and to ensure that a precautionary approach is taken in relation to the potential for effects on surface water. The Board stresses the importance of ongoing monitoring to ensure mitigation measures are implemented where necessary.

The Board stresses the importance of a well-rounded aquatics effects monitoring program with an appropriate number of monitoring stations and reference lakes for assessing the potential impacts of the Phase 2 Hope Bay Belt Project to surface water hydrology, surface water quality and sediment quality in the receiving environment during operations and post-closure. Robust monitoring will enable the identification of trends and ensure additional adaptive management strategies are implemented if required, including strategies required for the management of sediment and erosion control. The Board acknowledges that TMAC has an AEMP in place associated with operations at the Doris North Gold Mine to evaluate impacts in the receiving environments, which it is understood will also be applied to the Phase 2 Hope Bay Belt Project, but the Board stresses that TMAC must incorporate and address the recommendations made by parties during the Board's Review of the Project and as may be directed by the relevant regulators in the subsequent regulatory phase.

During the Final Hearing, the Board requested clarification if there would be a significant increase in discharge into Roberts Bay once the Phase 2 Hope Belt Project structures are in place and in operation.[226] In response, the Proponent stated that during the summer months, discharge into Roberts Bay would increase by about 25% and also emphasized that the models indicate the increased water discharged to the marine environment would not affect marine life.[227]

Following Environment and Climate Change's technical presentation, the Board requested clarification with respect to whether seepage from the tailings impoundment area (TIA) is or can be collected. Further, the Board wanted information on whether this type of diked TIA structure has been used anywhere else within Canada.[228] In response, ECCC noted that the dikes are designed to be impermeable and there is no expectation that seepage would occur from the facility. Further based on the information provided, ECCC believes that the dike is similar to

[226] P. Kadlun, NIRB Board Member, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 296, lines 10-16.
[227] M. Henry, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, pp. 296-297, lines 20-26 and 1-6.
[228] P. Kadlun, NIRB Board Member, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, pp. 522-523, lines 9-16 and 3-8.

other projects.[229] TMAC responded to the concern noting that the collection of surface run-off water from the ore waste piles and the waste stockpiles is collected within collection ponds down-gradient of the stockpiles. In addition, TMAC noted that the type of containment dam for the tailings facility has previously been used as technology at other mine sites for many years, including at the Ekati Diamond and Diavik Diamond mine sites.[230]

The Board acknowledges TMAC's commitment, as indicated in the FEIS and at the Final Hearing, to undertake continued baseline studies and monitoring, as well as to implement preventative mitigation measures to reduce the potential for project impacts to surface water hydrology and surface water quality. The Board expects that the Proponent will consult and collaborate with regulators and stakeholders as construction designs are finalized, and project activities are undertaken. The Board expects that TMAC will use the lessons learned from its existing Doris North Gold Mine operations to mitigate, monitor, and adaptively manage impacts to the surface water environment for the duration of the Project. As changing climatic conditions may change the potential for the Project to impact surface water in unexpected ways, the Board stresses the importance of diligent monitoring and rigorous mitigation to ensure that all potential effects are forecasted and adaptively managed. The NIRB believes that the Proponent's planned updates to its Site Water Monitoring and Management Plan should emphasize the requirement to manage all contact water and discharges to protect local aquatic resources and implement water conservation and recycling to minimize the use of natural waters.

Finally, the NIRB notes that determining the precise parameters for required modelling updates and appropriate management and monitoring is clearly within the jurisdiction of the Nunavut Water Board and is more appropriately addressed during the subsequent water licensing process. In Section 9.7, the NIRB has identified the need for updated information and recommended that the Proponent should be required to address these gaps by providing additional updated modelling, management and monitoring information to the Nunavut Water Board.

5.7.4 Conclusions and Recommendations of the Board

Following a review of the information provided by TMAC in the FEIS, the Board believes that the Project's potential effects related to surface water hydrology and surface water quality could be appropriately managed through the commitments provided by the Proponent and application of the following key mitigation measures. The Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- Monitoring the effects of the Project on surface water quality conditions relative to project infrastructure, and ensure monitoring data is sufficient to compare the impact predictions in the Final Environmental Impact Assessment for the Project with actual monitoring results;

[229] B. Summerfield, Environment and Climate Change Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, pp. 522-523, lines 21-26 and 15-20.
[230] M. Rykaart, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 524, lines 4-26.

- Ensuring that the sampling locations and frequency of monitoring is protective of surface water and is consistent with and reflects the requirements of relevant monitoring programs;
- Maintaining an Aquatic Effects Monitoring Plan and Program designed to determine the short and long-term effects in the aquatic environment resulting from the Project; evaluate the accuracy of project effect predictions; assess the effectiveness of mitigation and management measures on project effects; identify additional mitigation measures to avert or reduce environmental effects due to project activities; reflect site-specific water quality conditions (if incorporated); include details comparing the watershed features in the watersheds for key waterbodies, such as Aimaokatalok, Windy, Patch and Doris lakes to those watersheds used as reference lakes; and
- Including sufficient sampling and monitoring programs to appropriately characterize the receiving environment and to ensure that adequate data is available to assess impact predictions made within the Final Environmental Impact Statement for the Phase 2 Hope Bay Belt Project.

5.8. FRESHWATER SEDIMENT QUALITY

5.8.1 Views of the Proponent

TMAC Resources Inc. (TMAC or the Proponent) presented its baseline information and methods for freshwater sediment quality within Volume 5, Section 5.2 of the Final Environmental Impact Statement (FEIS) for the Phase 2 Hope Bay Belt (the Project). The assessment of TMAC's potential project-induced impacts on sediment quality was presented within Volume 5, Section 5.4 of the FEIS. Proposed management plans to inform monitoring and mitigation measures for potential project effects to sediment quality are presented in Volume 1, Annex V1-7 and Volume 8, Annexes V8-1 and V8-2 of the FEIS. TMAC concluded that there would no significant residual effects from the project on freshwater sediment quality.

TMAC reviewed available information from the *Naonaiyaotit Traditional Knowledge Project* (NTKP)[231] report and noted that there were no direct references relevant to existing freshwater sediment quality. TMAC did note however that Inuit value the integrity of the environment, including water quality, benthic invertebrates, fish communities, and fish habitat, all of which are directly affected by or dependent upon sediment quality.

TMAC defined the following spatial boundaries for its assessment of freshwater sediment quality, consistent with boundaries used to assess surface hydrology, water quality, and freshwater fish and fish habitat:

- Project Development Area (PDA) - The Project footprint plus engineering buffers;
- Local Study Area (LSA) - The area surrounding the PDA within which there is a reasonable potential for immediate effects on the freshwater environment due to

[231] Banci, V. and R. Spicker, (Compilers, Editors & GIS). 2016. *Inuit Traditional Knowledge for TMAC Resources Inc. Proposed Hope Bay Project, Naonaiyaotit Traditional Knowledge Project (NTKP)*. Prepared for TMAC Resources Inc. Kitikmeot Inuit Association: Kugluktuk, NU.

interactions with project components or physical activities. The LSA included the watersheds for key waterbodies, such as Aimaokatalok, Windy, Patch and Doris lakes.

- Regional Study Area (RSA) - The PDA, the LSA, and additional areas within which there is the potential for indirect or cumulative effects and included portions of the Angimajuq watershed and sections of the Koignuk River watershed located to the west of the PDA.

Temporally, TMAC's assessment considered the construction, operations, reclamation and closure, post-closure and possible temporary closure phases of the Project.

Baseline freshwater sediment quality data were collected from lakes, streams, and rivers in the Project area between 1993 and 2017. TMAC noted that lake sediments collected from the Project area consisted mainly of silt- and clay-sized particles, while stream and river sediments were composed mainly of sand. The total organic carbon content of sediments was highly variable among lakes, streams, and rivers of the Project area, ranging from undetectable to 35% of the total sediment by weight corresponding to the proportion of silt-sized particles. TMAC indicated that some metals, such as chromium, arsenic, and copper were naturally elevated in the project area freshwater sediments, and concentrations of these metals were occasionally greater than Canadian Council of Ministers of the Environment (CCME) sediment quality guidelines. TMAC observed that in general, lake sediments contained higher concentrations of metals than stream and river sediments, which was likely the result of the natural deposition of fine sediments in lake basins.

TMAC noted that the Project has the potential to interact with the freshwater environment through a number of activities, pathways, and mechanisms. The interactions between the Project and sediment quality were further refined by TMAC by defining interaction groups which are interaction pathways that share similar modes of interaction with the Project, specific mitigation and management measures, assessment thresholds, and key indicators. The interaction groups for the assessment of effects to sediment quality were defined by TMAC as:

- Site Preparation, construction, and decommissioning: activities that include the clearing of overburden, earthworks, and construction activities for pads and infrastructure.
- Site and Mine Contact Water: water that contacts site surface infrastructure, mine surfaces (e.g., waste rock piles, ore storage areas, crown pillar recovery trenches) and operations (e.g., water management, drilling water, underground mine water). The site and mine contact water interaction group also includes the operations of the water treatment plant (WTP) and sewage treatment plant (STP) at the Boston site, where the two water sources will be treated, combined, and then discharged into Aimaokatalok Lake through a single pipeline-diffuser system.
- Quarries and Borrow Pits: activities related to the operations of quarries and borrow pits.
- Explosives: Project activities related to the transport, manufacture, storage, and use of explosives.
- Fuels, Oils, and PAH: activities related to the storage of fuels, fueling and maintenance operations, and the combustion of waste.
- Dust Deposition: activities that generate dust, including vehicle traffic, airstrip activity, and quarry and borrow pit activities that can then be deposited in freshwater receiving environment.

Further, TMAC identified the following discrete pathways which describe specific mechanisms of interactions that were useful for explaining the physical relationship between a Project component and the freshwater environment, for identifying applicable mitigation measures, and for characterizing the residual effect:

- Runoff: describes the transport of material or compounds from the terrestrial environment into the freshwater environment by precipitation or snowmelt;
- Discharge: the directed input of water into the freshwater environment;
- Water withdrawal: describes the influence that changes in volume and flow may have on freshwater waterbodies;
- Seepage: describes the flow of water through the active layer and taliks;
- Physical: the direct physical interaction between project activities and the freshwater environment; and
- Aerial deposition: the direct input of material and chemical compounds from the air into the freshwater environment.

Site Preparation, Construction, and Decommissioning

TMAC noted within the FEIS that the activities associated with the construction and potential decommissioning of infrastructure as part of the Project would cause a disturbance to the landscape and could affect freshwater sediment quality through physical contact and runoff. TMAC indicated that as runoff is expected to interact primarily with water quality (which in turn interacts with sediment quality) and the residual effect of runoff on water quality is rated as not significant, there is not anticipated to be any potential residual effect of runoff from site preparation, construction, and decommissioning on freshwater sediment quality (see Section 5.7.1 for a summary on the freshwater quality assessment by TMAC).

TMAC indicated that the in-water works required for the installation and eventual decommissioning (the portion of pipe which is buried by rock fill will remain in place) of the discharge pipeline in Aimaokatalok Lake and the freshwater intake pipelines in Windy and Aimaokatalok lakes have also been included in this interaction group, because the installation on the lakebed of infrastructure associated with the pipelines (e.g., cement pipeline anchors, rock berms, high-density polyethylene (HDPE) pipeline) could temporarily disturb and re-suspend sediments. The potential effects from the in-water construction and ultimate removal of the discharge and intake pipelines (the portions not covered in rock fill) are expected to be highly localized to the lakebed footprint of the infrastructure, and would be short-lived as the re-suspended sediments would re-settle once the pipeline installation or removal is complete. TMAC also noted that the installation of culverts or bridges where the all-weather roads cross streams could also affect sediment quality by disturbing and mobilizing sediments and altering the particle size distribution and sedimentation patterns. TMAC concluded that potential residual effects from construction and decommissioning activities on freshwater sediment quality may occur, and that changes to water and sediment quality during construction and decommissioning activities would be monitored to ensure that erosion controls and sedimentation mitigation strategies are effective. TMAC further noted that activities may cause some temporary and localized disturbance and redistribution of sediments and that a change in the particle size distribution of sediments and in sedimentation patterns could represent a

deviation from baseline particle size composition and sediment metal concentrations. TMAC concluded that the probability of occurrence of residual effects from in-water works is considered to be likely but that the overall significance of the effects of physical disturbances associated with in-water works is not significant because of the reversibility of the residual effect.

Site and Mine Contact Water

TMAC noted that water and sediment quality are closely related because metals, nutrients, and organic material are continuously exchanged between the water column and sediments depending on the specific environmental conditions and the properties of the constituents of water or sediments. The potential effects from site and mine contact water on sediment quality were mainly informed by the quantitative predictions from the site-wide Water and Load Balance model as well as near-field and far-field hydrodynamic mixing modeling in Aimaokatalok Lake. The effects to sediment quality were not incorporated into the quantitative model, but were informed by the results of the quantitative water quality assessment.

The assessment of effects of site and mine contact water on freshwater quality predicted that concentrations of some metals and nutrients would increase above baseline concentrations in the waters of Stickleback and Aimaokatalok lakes. Further information can be found in Section 5.7.1 of this Report with respect to TMAC's water quality assessment. TMAC noted that lake, river, and stream sediments in the Boston area are naturally metal-rich, and baseline studies have shown that sediment metal concentrations occasionally exceed CCME sediment quality guidelines for arsenic, chromium, and copper. The Water and Load Balance model predicted a moderate increase in the concentration of sediment arsenic (maximum 2.9-fold increase) in the eastern arm of Aimaokatalok Lake near the inflow from Stickleback Lake in post-closure, and relatively minor increases (ranging from 1.2 to 1.7 times the baseline levels) in the concentrations of sediment cadmium and copper in the eastern arm of Aimaokatalok Lake, and sediment arsenic, copper, and mercury in Stickleback Lake. TMAC predicted that the increases in metal concentrations would remain below CCME water quality guidelines or water quality objectives. Modeling results for the main body of Aimaokatalok Lake did not predict any increases in the concentrations of these metals from baseline levels; therefore, the predicted increases in arsenic, cadmium, and copper relative to baseline concentrations are expected to be localized to the area near the inflow from Stickleback Lake, and would be diluted within Aimaokatalok Lake.

TMAC indicated that Windy Lake sediments are naturally enriched in arsenic, chromium, and copper. The Water and Load Balance model predicted that concentrations of arsenic, copper, lead, and mercury would increase relative to baseline concentrations in Windy Lake. As was the case for the Boston area lakes, arsenic was associated with the largest predicted increase relative to baseline levels (4.2-fold increase during the open-water and under-ice seasons), while the other metals of interest were predicted to increase by a factor of only 1.2 to 2.2 times the baseline median. The predicted concentrations of these metals (including arsenic) remained below CCME guidelines and water quality objectives; however, because there are predicted increases in water quality parameters relative to baseline levels, TMAC noted that there is the potential for residual effects to sediment quality in Windy Lake.

TMAC noted that freshwater sediments in the Doris Watershed are naturally metal-rich, and baseline data showed that concentrations of arsenic, chromium, and copper in sediment samples have frequently been higher than CCME Interim sediment quality guideline guidelines. Metals are continuously exchanged between sediments and overlying waters; therefore, TMAC noted that predicted increases in metal concentrations in the water column may cause residual effects to sediment quality as well.

Overall, TMAC noted that the residual effects analyses undertaken for sediment quality from site and mine contact water concluded not significant effects would result because the predicted effects were moderate in magnitude and localized to the LSA, even though the residual effect of site and mine contact water on sediment quality was characterized as negative in direction, moderate in magnitude, irreversible and predicted to remain throughout the post-closure phase.

Quarries and Borrow Pits

TMAC noted within the FEIS that by minimizing the volume of water within quarries and collecting water within the quarries, suspended sediments and sediment-associated metals can be settled in sumps and would not contact the freshwater environment. As such, due to the mitigation and management measures, including monitoring and adaptive management of quarry runoff, no residual effects from quarries and borrow pits are predicted for freshwater sediment quality for the Project.

Explosives

TMAC noted within the FEIS that blasting residues on mine workings, waste rock, tailings, and run-of-quarry material could affect water quality through runoff and seepage, which in turn could affect sediment quality. Based on the Water and Load Balance model, concentrations of nitrogenous compounds (ammonia, nitrite, and nitrate) may increase relative to baseline conditions in Stickleback and Aimaokatalok lakes and in Doris Creek and Little Roberts Lake due to explosive activities. These increases could affect the concentrations of ammonia, nitrate and nitrate in sediments as well as the concentration of total organic carbon (TOC) in sediments if introduced nutrients stimulate the productivity of freshwater systems. TMAC noted that it does not expect residual effects of explosives on sediment quality as the residual effects of explosives on water quality was rated as not significant. Further, ammonia, nitrite, and nitrate are highly soluble, so these would likely remain in solution and would be expected to affect water quality more than sediment quality. Further, TMAC noted that the effect from blasting residues on sediment quality through the aerial deposition pathway is predicted to be negligible.

Fuels, Oils, and PAH

TMAC noted within the FEIS that Project activities related to fuels and other petroleum hydrocarbons are predicted to have negligible effects on freshwater sediment quality. TMAC indicated that the mitigation and management measures as proposed are considered to be effective at minimizing the potential for effects on the freshwater environment during normal operations. No hydrocarbon compounds or sediments from Project activities at the sites, laydown areas, fuel areas, or waste storage areas are expected to reach the freshwater environment because of the adherence to best management practices for machinery operations, maintenance, and fueling, and the direction of runoff carrying potential compounds to the water management facilities. TMAC further indicated that the incinerator will be operated according

to the Nunavut standards, the *Canada-Wide Standards for Dioxins and Furans*, the *Canada-Wide Standards for Mercury Emissions*), as well as TMAC's own Incinerator Management Plan, which is expected to result in negligible aerial deposition of PAH into the freshwater environment. TMAC concluded that no residual effects from fuels, oils, and PAH are anticipated on freshwater sediment quality from the Project

Dust Deposition

Based on the results of the air quality modeling work that was undertaken to develop the FEIS, TMAC predicted that project activities would generate dust that could potentially be deposited into the freshwater environment. This in turn would cause a potential increase in deposition onto the sediment in the LSA lakes. TMAC noted that, considering a 17 year timeline for the Project, the highest total deposition of dust is expected to amount to less than a 0.3% increase and is considered to be negligible and would be within the margin of error of the sediment quality analyses. Therefore, TMAC concluded that dust deposition is not expected to cause a measurable change in sediment quality in the LSA lakes, and dust deposition was not further assessed as a residual effect.

5.8.2 Views and Concerns of Interested Parties

Within its final written submission, Environment and Climate Change Canada (ECCC) noted that total phosphorus were not included in the parameters listed for sediment quality analysis of effects and recommended that TMAC include it to evaluate changes in total phosphorus that may be released to the overlying waters during periods of low dissolved oxygen. ECCC also requested that this parameter be included in any additional baseline collected prior to mine development as well as in the suite of monitoring undertaken during operations.[232]

In response to ECCC's request, TMAC indicated that there were several reasons that total phosphorus in the lake sediments were not measured and should not be part of the Aquatic Effects Monitoring Plan (AEMP). First, if low under-ice oxygen concentrations resulted in an efflux of phosphate from the sediments to the overlying water column, TMAC noted that this effect would be captured in the deep water total phosphorus measurements during the annual under-ice April sampling period, noting that measuring sediment phosphate levels in summer (when the sediments samples are collected) does not necessarily provide a direct link to under-ice total phosphorus water concentrations, as the sediment flux is influenced by oxygen availability and the natural variation of biophysical and biogeochemical processes. TMAC suggested that there are several other parameters beyond sediment total phosphorus that will evaluate potential changes to lake trophic status including total organic carbon (TOC), total nitrogen, and benthic invertebrate descriptors in the sediments as well as total phosphorus, nitrogenous compounds, TOC, and chlorophyll-a concentrations in the water column.[233]

During its technical presentation at the Final Hearing, ECCC noted that it considered the outstanding issues related to adding total phosphorus to their modelled parameters for sediment quality resolved based on the Proponent's responses to ECCC's final written submissions.[234]

[232] Environment and Climate Change Canada Final Written Submission, March 19, 2018.
[233] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[234] M. Tobin, Environment and Climate Change Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 509, lines 4-19.

5.8.3 Views of the Board

As noted in Section 5.7.3: Surface Water Hydrology and Surface Water Quality of this Report, the Board acknowledges the measures proposed by the Proponent in the FEIS and through discussions at the Final Hearing. The Board is concerned with the potential for changes in sediment quality that may be directly or indirectly attributable to project facilities and activities. The Board recognizes that this issue would require further consideration by the respective regulatory authorities as the Project proceeds to permitting, and expects due consideration will be provided for requiring monitoring of sediment quality be undertaken throughout the life of the Project.

5.8.4 Conclusions and Recommendations of the Board

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board believes that the Project's potential effects to sediment quality will be appropriately managed. The Board has not recommended specific terms and conditions in relation to sediment quality because the Board is satisfied that the potential for project-induced effects has been adequately addressed by the mitigation, management and monitoring measures proposed in Aquatic Effects Monitoring Plan (see Section 5.7: Surface Water Hydrology and Surface Water Quality) and that these issues will be addressed in more detail through the Nunavut Water Board's water licensing process.

5.9. FRESHWATER AQUATIC ENVIRONMENT (FISH AND FISH HABITAT)

5.9.1 Views of the Proponent

TMAC Resources Inc. (TMAC or the Proponent) presented its assessment of potential project-induced impacts on the freshwater aquatic environment within Volume 5, Section 6.5 of the Final Environmental Impact Statement (FEIS). TMAC summarized its baseline data in Volume 5, Section 6.2, and provided supporting baseline information and methods in Volume 5, Appendices V5-3A through V5-3U, and V5-6A through V5-6AB. Proposed management plans to inform monitoring and mitigation measures for potential project effects to freshwater aquatic environment are presented in Volume 1, Annex V1-7 (Packages P4-3 to P4-12 and P4-18). TMAC concluded that as a result of mitigation, fisheries offsetting, and monitoring plans, no residual effects on the freshwater environment are anticipated to result from the Project.

TMAC reviewed available information from the *Naonaiyaotit Traditional Knowledge Project* (NTKP)[235] report and noted that fish were and continue to be an important component of the Inuit seasonal diet. TMAC further noted that in general, Inuit fished wherever they were on land, in conjunction with other harvesting activities and fished for Arctic char (which was the main species targeted by Inuit), lake trout, Arctic cisco, whitefish, and to a lesser degree Arctic grayling and burbot.

[235] Banci, V. and R. Spicker, (Compilers, Editors & GIS). 2016. *Inuit Traditional Knowledge for TMAC Resources Inc. Proposed Hope Bay Project, Naonaiyaotit Traditional Knowledge Project (NTKP)*. Prepared for TMAC Resources Inc. Kitikmeot Inuit Association: Kugluktuk, NU.

TMAC defined the following spatial boundaries for its assessment of fish and fish habitat, consistent with those used to assess hydrology, surface water quality, sediment quality VECs:

- Project Development Area (PDA) - The Project footprint plus engineering buffers;
- Local Study Area (LSA) - The LSA for the North included the PDA and the Koignuk/Aimaokatalok sub-watershed, the Doris Watershed, the Windy Watershed, and the 2 – Roberts Bay Watershed, encompassing an area of 461.1 square kilometres (km^2). The LSA for the South Belt area included the PDA and the Aimaokatalok Watershed and the East Watershed, encompassing an area of 528.5 km^2.
- Regional Study Area (RSA) - Included the LSA and watersheds immediately adjacent to those in the LSA, including the Roberts, Angimajuq, Reference B, Reference C, Upper Koignuk, and Upper Aimaokatalok watersheds, encompassing an area of 4,560 km^2.

Temporally, TMAC's assessment considered the construction, operations, reclamation and closure, post-closure and possible temporary closure phases of the Project.

TMAC collected baseline data on fish habitat and fish communities from 1993 to 2017 within lakes, ponds, and streams of the North Belt LSA, South Belt LSA South, and the RSA. TMAC observed that lakes are the predominant form of fish habitat in the North Belt LSA and supply the greatest amount of perennial fish habitat, while most ponds in the LSA have poor habitat quality and many are non-fish-bearing because of shallow depths. TMAC also observed that most streams in the North Belt LSA are ephemeral and provide temporary habitat for fish during periods of relatively high flow, and larger outflow streams supply relatively high quality habitat. It was further noted that the South Belt LSA is dominated by one large lake (Aimaokatalok Lake).

TMAC's baseline studies indicated that the abundance and density of phytoplankton, periphyton, zooplankton, and benthic invertebrates was highly variable among lakes in the Project area. Nakhaktok, Doris, Ogama, Trout, Boston Reference, Little Roberts, and Pelvic lakes were found to have high abundance and density of phytoplankton. Nakhaktok, Doris, and Ogama lakes were found to have high abundance and density of zooplankton. TMAC also found that benthic invertebrate density was particularly high in Doris Outflow.

TMAC noted within the FEIS that a total of 14 fish species were found during baseline studies in the lakes, ponds, and streams of the LSA and RSA; none of these species are currently considered threatened or endangered by COSEWIC or are listed through the *Species at Risk Act*. Baseline studies indicated that Ninespine Stickleback is the most common of the nine fish species found in lakes, being found in 65% of the 40 surveyed lakes. The other eight species in lakes are, in order of descending incidence across surveyed lakes: lake trout (48%), lake whitefish (35%), cisco (35%), Arctic char (25%), least cisco (20%), Arctic grayling (8%), broad whitefish (8%), and slimy sculpin (8%). TMAC also found that ninespine stickleback and cisco were the only fish species occurring in ponds. TMAC's baseline studies also indicated that ninespine stickleback is the most common species in streams and river, being found in 78% of the 69 surveyed streams and rivers. The other 13 species in streams and rivers are, in order of descending incidence: lake trout (29%), Arctic char (17%), Arctic grayling 17%), slimy sculpin (9%), lake whitefish (12%), cisco (10%), least cisco (6%), burbot (4%), broad whitefish (3%), Arctic flounder (3%), fourhorn sculpin (3%), Greenland cod (1%), and starry flounder (1%).

Based on the information collected during the baseline studies of the lakes and streams within the LSA and the RSA and based on Inuit Qaujimajatuqangit, TMAC identified the following to be included as VECs in the assessment:

- Fish habitat; and
- Fish community: Arctic char, lake trout, Arctic grayling, Cisco, least Cisco, lake whitefish, and broad whitefish.

TMAC identified the following potential effects in the Freshwater Fish assessment:

- Direct loss or alteration of fish habitat by permanent alteration or destruction (PAD);
- Changes to water quality and/or sediment quality through the deposition of deleterious substances affecting fish habitat and fish communities[236]; and
- Direct mortality and changes to population abundance of fish communities.

Within the FEIS TMAC explained that a PAD may be incurred through planned construction for the Project. TMAC specified that certain Project infrastructure is expected to encroach on fish habitat including eight (8) culverts associated with water crossings along the all-weather roads; water intakes and/or discharge pipes in Aimaokatalok and Windy Lakes; and the winter road. It was further noted that unavoidable habitat loss or alteration due to project infrastructure would be restricted to the five (5) watersheds within the LSA.

According to TMAC, the second way in which a PAD may be incurred is through water withdrawal. TMAC specified that water withdrawal would be expected for: domestic and industrial use; due to drawdown of taliks at underground mines; due to modification of natural drainages at the Tailings Impoundment Area (TIA), stockpiles, and so on; for winter road construction and use; and for exploration-related drilling. TMAC indicated that water withdrawal in lakes may decrease the availability of overwintering or spawning habitat for fish, while water withdrawal in streams may reduce suitable fish habitat for migration, rearing, and spawning.

TMAC noted direct mortality of fish or changes to population abundance could arise through construction of in-water infrastructure and other in-water works, through entrainment/impingement in water pumps and intake/discharge pipes, through accidental releases or spills, or through blasting near waterbodies.

It was further noted within the FEIS that direct mortality of fish or changes to population abundance could also arise through water withdrawal. TMAC specified that water withdrawal during the ice-covered period can cause oxygen depletion in the water, which can result in the death of species such as lake trout, Arctic char, cisco and whitefish. Water withdrawal during the ice-covered period was also recognized to potentially decrease water surface elevation under the ice, exposing overwintering eggs of these species to air and resulting in mortality. TMAC

[236] TMAC assessed the effects of the deposition of deleterious substances into water in terms of indicators that have quantitative relationships or thresholds associated with supporting aquatic organisms and biogeochemical processes (e.g., Guidelines for the Protection of Aquatic Life, and Site Specific Water Quality Objectives) in Volume 5, Sections 4 and 5 of the FEIS. TMAC assessed the effects of contaminants on aquatic life in Volume 6, Section 5 of the FEIS. TMAC concluded that no residual effects of indirect mortality or decreased health on fish would result.

also noted that water withdrawal could lower stream flows, potentially impeding movement, migration, and access to overwintering habitat for species such as Arctic char and other anadromous species, and thus survival and productivity. TMAC further noted that a reduction in stream flow could expose incubating eggs of Arctic grayling in spring and added that water withdrawal causing lower stream flows could also result in fish stranding and death.

A variety of mitigative actions were proposed within the FEIS to address the aforementioned potential impacts. TMAC committed to follow relevant regulations and best management practices, including the following guidance materials that include recommendations for screening of water intake pipes and recommendations regarding the design and maintenance of culverts, and that place restrictions on the timing of in-water works, the use of explosives in or near water, and the volume of water that can be withdrawn:

- Measures to Avoid Causing Harm to Fish and Fish Habitat (DFO 2013)
- Nunavut Restricted Activity Timing Windows for the Protection of Fish and Fish Habitat (DFO 2013)
- Protocol for Winter Water Withdrawal from Ice-Covered Waterbodies in the Northwest Territories and Nunavut (DFO 2010).

TMAC also highlighted the following primary mitigation measures:

- Site the majority of project infrastructure, including roads, to avoid fish-bearing water and, wherever possible, applying a minimum 31-m setback from all water features;
- Limit the amount of water withdrawn by recycling water, limiting groundwater inflows to underground workings, and returning compliant effluent to waterbodies from which they were drawn;
- Fisheries offsetting to balance unavoidable habitat loss as deemed necessary by DFO. TMAC has committed to work with DFO and local Inuit to develop a freshwater offsetting plan commensurate with anticipated effects. TMAC also committed to develop a monitoring plan, in conjunction with regulatory agencies, to assess the effectiveness of the offsetting activities. A conceptual Fisheries Offsetting Plan was provided in Volume 5, Appendix V5-6AA of the FEIS.

TMAC has also developed a number of mitigation and monitoring plans to manage potential effects to the freshwater aquatic environment, including the following:

- Hope Bay Project Spill Contingency Plan
- Hope Bay Project Domestic Wastewater Treatment Management Plan
- Hope Bay Project Boston Sewage Treatment Operations and Maintenance Management Plan
- Hope Bay Project Groundwater Management Plan
- Hope Bay Project Doris-Madrid Water Management Plan
- Hope Bay Project Boston Water Management Plan
- Hope Bay Project Phase 2 Doris-Madrid Tailings Impoundment Area Operations, Maintenance, and Surveillance Manual

- Hope Bay Project Boston Tailings Impoundment Area Operations, Maintenance, and Surveillance Manual
- Hope Bay Project Aquatic Effects Monitoring Plan

The Proponent concluded that as a result of planned mitigation, balancing potential fisheries losses with fisheries offsetting, and monitoring plans, no residual effects are anticipated on freshwater fish habitat or fish communities due to: interaction with the infrastructure for the Project or other existing infrastructure across the Hope Bay Belt; due to water withdrawal and use; due to changes in water quality and/or sediment quality resulting from the Project or Hope Bay Belt Development activities; or due to blasting activities associated with the Project or other development activities across the Hope Bay Belt.

Following provision of the final written submissions by parties, TMAC provided an updated *draft* Aquatic Effects Monitoring Plan to include the Project, and to include non-point source sampling stations as well as the *Mining Effluent Regulations* (MMER) – Environmental Effects Monitoring requirements for lakes receiving effluent from the proposed Project.

During the Final Hearing, TMAC summarized the commitments made following receipt of the final written submissions from parties. TMAC noted that it agreed to monitor lake water quality and that site site-specific water quality objectives will be considered under the response framework of the aquatic effects monitoring program. TMAC also noted that it would make the aquatic effects monitoring program a belt-wide plan for Doris, Madrid and Boston and it has built an aquatic response framework within the plan. With respect to the fisheries offsetting and the construction of in-water infrastructure, TMAC has agreed to work with the Kitikmeot Inuit Association, the Inuit Environmental Association Committee, the Hunters and Trappers Organization of Cambridge Bay, and Fisheries and Oceans Canada to develop the offsetting monitoring program with options for developing a community-based program near Cambridge Bay.[237]

5.9.2 Views and Concerns of Interested Parties

Within its final written submission, the Kitikmeot Inuit Association (KIA) noted concern with the minimal detail provided within the Fisheries Offsetting Plan for both freshwater and marine environments with respect to areas of potential habitat gains. The KIA indicated that it would be important to understand the severity of the effects to fisheries productivity and to have supporting documentation to ensure that the proposed mitigation measures would sufficiently counterbalance these losses. Further, the KIA stressed that sufficient details of the offsetting are necessary within the Final Environmental Impact Statement (FEIS), particularly as offsetting is used as a key mitigation measure to reach the conclusion that there are no residual effects to fish and fish habitat. The KIA requested that TMAC commit to develop a Conceptual Freshwater and Marine Offsetting Plan that includes preliminary gain calculations for potential offsetting options, in communication with Fisheries and Oceans Canada (DFO) and the KIA, prior to issuance of a Type A Water Licence during the Nunavut Water Board (NWB) licencing phase. The KIA stressed that this would ensure that there are enough potential offsetting options to

[237] TMAC Resources Inc., *Freshwater Environment, Water Management Presentation*, Exhibit 17, NIRB Final Hearing File No. 12MN001, May 9, 2018.

assess whether offsetting has the potential to counterbalance habitat losses predicted during the FEIS to reach the conclusion of no residual effects.[238]

In response to the KIA's concerns regarding the Fisheries Offsetting Plan, TMAC indicated that it will work with DFO, the KIA and the Inuit Environmental Advisory Committee (IEAC) to identify candidate offsetting options with a preference for developing a community-based offsetting program located near Cambridge Bay. Further TMAC committed to working with DFO, the KIA and the IEAC to develop an offsetting plan that includes offsets commensurate with anticipated fisheries losses as part of regulatory processes that would follow the NIRB's Review. TMAC further explained that it is planning to identify potential offsetting options near Cambridge Bay during spring/summer 2018 which would provide the basis for calculating preliminary fisheries gains. TMAC indicated its preference at this stage is to consider a Cambridge Bay-based project contributing to the overall objectives of the commercial Arctic char fishery through the Arctic Char Integrated Fisheries Management Plan (IFMP) and/or to a subsistence fishery. TMAC noted that it will also consider the implementation of complementary measures (i.e., monetary contributions to existing research programs). TMAC also re-calculated the fish habitat losses based on anticipated project activities and corrected the total habitat losses of P.O. Outflow to 2,046 square metres (m^2) instead of 2,063 m^2 as initially predicted. Based on this correction, TMAC noted that a total freshwater fish habitat area of 151,778 m^2 is predicted to be lost from the Project.[239]

Within its final written submission, the KIA further noted concern that if the potential fish habitat losses (PAD) are calculated based on the "base case" and not the "high groundwater sensitivity case" scenarios within the FEIS than the resulting areas of habitat loss (residual effects) would not take into account a high groundwater sensitivity case. The KIA recommended that adaptive mitigation, including additional offsetting should be indicated as compensating for the high groundwater sensitivity case should monitoring and subsequent habitat loss calculation indicate that the high sensitivity case is likely to be realized.[240] In response to the KIA's recommendation, TMAC noted that it would apply adaptive management processes during monitoring and, should a high groundwater sensitivity case result in habitat losses that exceed those predicted for the base case, TMAC would apply an offsetting plan (as required by DFO) that is commensurate with these losses.[241]

Within its final written submission, Environment and Climate Change Canada (ECCC) expressed concern with a statement within the FEIS that could be interpreted as indicating that elevated metal concentrations of sulphate, chloride, arsenic, nickel and selenium from seepage immediately downgradient of the camp pad and ore stockpiles would be deposited in the terrestrial environment, where they may make their way into the aquatic environment. ECCC stressed that as per s. 36(3) of the *Fisheries Act* the discharge of deleterious substances to waters frequented by fish, or to a place where those substances might enter such waters are prohibited. ECCC noted that, should the Project proceed, at all times TMAC must ensure that deleterious substances are prevented from entering into fish-bearing waters or any tributaries, and

[238] Kitikmeot Inuit Association Final Written Submission, March 19, 2018.
[239] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[240] Kitikmeot Inuit Association Final Written Submission, March 19, 2018.
[241] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.

recommended that the Proponent provide information on how this seepage would impact the aquatic environment.[242] In response to ECCC's concern, TMAC indicated that the objective of the water and load balance was to assess the potential impacts of seepage from ore and waste rock at key locations downstream of the site, including ephemeral streams of the stockpile area and specific areas of Aimaokatalok Lake. The water and load balance concluded that seepage that reports to the lake is effectively diluted and predicted concentrations are close to background levels. Further, ephemeral streams monitoring was initiated in 2009 and is conducted annually with results compared to the water and load balance predictions to assess for changing trends in the context of adaptive management. TMAC noted that to date, monitoring indicates that water quality monitoring data are consistent with the ephemeral streams predictions from the water and load balance predictions and that there are therefore no expected impacts to the receiving environment.[243]

ECCC further stressed within its final written submission that fish tissue testing is required under the *Metal Mining Effluent Regulations* (MMER) if any effluent sample contains greater than 0.0001 mg/L of total mercury. Within the Aquatic Effects Monitoring Plan (AEMP), ECCC noted that no details on potential required fish sampling were provided and ECCC recommended that TMAC complete fish tissue sampling prior to mine development. This information would then be used in future determination of effects to fish and in development of a study design. ECCC also noted that consideration should be made for the selection of sampling locations and a sample species. Key considerations in selection of fish species are the mobility and residence time of that species, as this determines effluent exposure.[244] In response to ECCC's comments, TMAC indicated that fish tissue sampling was conducted in Aimaokatalok Lake and reference lakes as part of freshwater fish and fish habitat baseline studies in 2009 and 2010; and fish community and biology data were collected as part of these surveys. This information may be used in development of a study design should one be triggered under the MMER and may also be useful for the future determination of effects to fish. TMAC further noted under the MMER, the first study design for biological monitoring studies, including fish population and tissue studies, is not required to be submitted until 12 months after the mine becomes subject to Environmental Effects Monitoring (Schedule 5 of MMER); because discharge is not expected to occur for at least another two (2) years, TMAC noted that it would have sufficient time to develop a study design that incorporates fish sampling, as deemed necessary.[245]

Further, ECCC observed within its final written submission that it had identified a number of aspects within the AEMP that would require further clarification as the monitoring of the aquatic effects of the Project must be sufficiently robust to detect changes before they become impacts, to verify FEIS predictions, and to inform adaptive management. ECCC noted that it was not clear why the AEMP and MMER – Environmental Effects Monitoring (MMER-EEM) programs were not fully integrated and recommended that the two monitoring programs should be harmonized to the extent possible, and details provided on the MMER-EEM program. Further, ECCC remarked that it was unclear how the statistical analyses would be done for the MMER-EEM sites in Aimaokatalok Lake and noted that a continuum of sampling stations is needed

[242]Environment and Climate Change Canada Final Written Submission, March 19, 2018.
[243] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[244]Environment and Climate Change Canada Final Written Submission, March 19, 2018.
[245] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.

along the exposure gradient, and that sampling must be done sufficiently close to the discharge to characterize effects in the near field. Further, the sampling effort as proposed by TMAC for sediment and benthic samples from the sites in Aimaokatalok Lake do not appear to meet the guidance provided by the MMER-EEM program and would not be comparable to data collected previously or at other sites. ECCC further indicated concerns with the details on monitoring and sampling methodology associated with the AEMP. ECCC noted that sediment sampling in the lakes did not match the recommended five (5) sediment samples per station and that fish monitoring was omitted from the AEMP and instead deferred to the MMER-EEM. ECCC recommended that fish monitoring should be integrated and presented in both programs. Finally, ECCC stressed that monitoring results should be linked to a response framework which sets thresholds for change to trigger mitigation action.[246]

In response to ECCC's concerns with respect to the aquatic effects monitoring plan development, TMAC indicated that it will update the AEMP with an Aquatic Response Framework similar to the approach taken for the Doris AEMP. Further, TMAC indicated that it will improve the harmonization between the AEMP and MMER programs in the updated AEMP for the Project which will include environmental thresholds that trigger further mitigation/information collecting similar to the approach taken for the Doris North AEMP. For non-MMER water and sediment quality parameters, TMAC noted that the Project's AEMP will take the same approach as the approved Doris North AEMP where CCME parameters and accompanying toxicity modifying factors are statistically evaluated for potential project effects. Several other non-CCME parameters (e.g., calcium, sodium, conductivity, total dissolved solids, sulphate, and other metals) will also be analyzed and will be reported in the appendices of the annual AEMP report, and these parameters could be evaluated under the Aquatic Response Framework if deemed necessary. Finally, TMAC noted that the updated AEMP for the Project will improve the clarity of the statistical approach regarding the MMER design in Aimaokatalok Lake and will revisit the sample sites within gradient design as informed by the hydrodynamic modelling carried out for the FEIS.[247]

Within its final written submission, Fisheries and Oceans Canada (DFO) noted that a total of 21 water crossings are associated with the proposed all-weather roads as part of the Project and have the potential to impact fish, fish habitat and fish passage if they are not designed, sized, installed and maintained properly. DFO acknowledged that TMAC highlighted the use of "DFO Measures to Avoid Causing Harm to Fish and Fish Habitat" design criteria for enabling fish passage and that water crossings would require maintenance and monitoring programs to avoid negative impacts to fish and fish habitat. However, DFO indicated that the provided design criteria, watercourse crossing engineer drawings, and the mitigation and monitoring plan that includes mention of "DFO Measures to Avoid Causing Harm to Fish and Fish Habitat", are conceptual and general in nature. As such, it was unclear to DFO in the absence of detailed engineering designs what the full suite of measures are that TMAC intends to implement to avoid, mitigate or offset serious harm to fish as defined in the *Fisheries Act* as a result of water crossings proposed for the Project. Details of a site-specific, best-practices management plan are required for the construction phase of the Project, including a maintenance plan and monitoring program will be required to be submitted by the Proponent to DFO during the regulatory phase.

[246]Environment and Climate Change Canada Final Written Submission, March 19, 2018.
[247] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.

Further, it was recommended that TMAC work with DFO and the affected community members and organizations including the KIA to develop a site-specific construction work plan during the regulatory phase, should the Project be approved to proceed. For fish bearing streams, DFO noted that it would require site-specific detailed design plans during the regulatory phase to determine the full extent of the potential impacts below the high-water mark and that an appropriate water crossing maintenance and monitoring plan should be developed to ensure that barriers to fish passage do not form over time.[248]

In response to DFO's concerns with respect to water crossings, TMAC noted that it will develop and provide watercourse and site-specific engineering plans to DFO, supported by measured or modelled stream flow data prior to construction, during the regulatory phase, once the Project is approved to proceed. Further, TMAC noted that it will continue to work with DFO, the KIA, and the IEAC during the regulatory phase to develop a construction plan for watercourse crossings that will include mitigation measures to reduce impacts to fish and fish habitat during construction. Finally, TMAC indicated that it will work with DFO and abide by any monitoring and reporting requirements of the authorization if and when granted.[249]

Within its final written submission, DFO further noted the importance of monitoring water levels and flows in watercourses that will be impacted by the Project, to ensure that unauthorized affects to fish and fish habitat are avoided. The effects assessment completed by TMAC for the Project concluded that residual effects will remain after mitigation measures are applied, and that fish habitat will be altered through stream flow and lake water level alteration. Recognizing that those effects had been predicted by the Proponent based on simulated results from the water balance model described within the FEIS, DFO indicated that uncertainty exists for models based on estimates and estimated data variables. With respect to cumulative surface hydrology impacts and the potential for resultant impacts on the fish bearing watercourses, uncertainty with estimated models could result in surface flows that are lower or higher than predicted. In order to address this uncertainty DFO requested a robust monitoring plan be implemented which identifies variation from the predicted ranges in advance of unauthorized serious harm to fish. Further, DFO remarked that it was unclear within the AEMP whether TMAC intended to monitor the water flow and quantities within the fish bearing watercourses where the possible impacts are predicted by the water balance model. Therefore, DFO requested that the Proponent include monitoring stations to monitor water levels and stream flows in the AEMP for all fish bearing lakes and streams that are predicted to be potentially impacted by the Project.[250]

In response to DFO's concerns regarding water and load balance, and predicted fish productivity loss, TMAC noted that to account for potential variations from predicted water quantity modeling results, it intends to monitor water levels and flows in fish bearing lakes and streams that are predicted to be potentially impacted by the Project during mining (e.g., P.O., Ogama, Little Roberts, and Glenn lakes) in addition to lakes and streams in the AEMP. In addition, hydrometric monitoring will be carried out by standard methods appropriate for assessing changes in lake level/stream flow (e.g., suitable combination of pressure sensors, staff gauges, and/or manual flow measurements in lakes and/or streams). TMAC indicated that monitoring

[248] Fisheries and Oceans Canada Final Written Submission, March 19, 2018.
[249] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[250] Fisheries and Oceans Canada Final Written Submission, March 19, 2018.

requirements will be developed and submitted as part of a fisheries offsetting monitoring plan submitted with a Fisheries Authorization application.[251]

The next issued identified by DFO within its final written submission related to the potential for in-water pipeline infrastructure to impact fish and fish habitat. DFO recommended that TMAC work with DFO and the potentially affected community members and organizations including the KIA, to develop a site-specific construction work plan during the regulatory phase, should the Project be approved to proceed. TMAC indicated within its response to the final written submissions that it will work with DFO, the KIA and the IEAC as part of its ongoing consultation processes during the regulatory phase.[252]

Finally, DFO noted concern with TMAC's proposed changes in water flow and water volume as reduced stream flow associated with specific timings may impact fish productivity by impeding fish access to important habitats associated with their biological processes such as spawning, feeding or rearing sites during critical periods of their life cycle. DFO noted that the Draft EIS stated that the predicted changes in timing resulting from a reduction of stream flow were not assessed and accounted for, and it was unclear if the FEIS resolved the expectations established in the DEIS for analysis of water quantity timing impacts on fish habitat access.[253] In response to the final written submission of DFO, TMAC noted that water quantity impacts that may have timing issues were accounted for in Section 6.5.4.2 of the FEIS under the Characterization of Hope Bay Project Potential Effect for Streamflow. Further, Section 6.5.4.2 of the FEIS under the Characterization of Hope Bay Project Potential Effect for Streamflow also includes an analysis of the water quantity timing impacts of fish access to key habitats. In this characterization, an initial assessment considered two timing periods (high and low flow) and a follow up assessment in "higher risk" watercourses further determined periods of highest risk for fish and potential effects on habitat use.[254]

During the Final Hearing, Nunavut Water Board (NWB) staff requested clarification on the difference between the contact water pond and the surge pond.[255] In response, TMAC noted that contact water ponds are event ponds which are constructed downstream of the waste rock piles, the ore stock piles and the tailings management area and are designed to collect surface runoff and snow melt from these facilities. Contact water ponds are unlined frozen foundation dams. In contrast, the surge ponds are fully lined facilities that serve as collection systems for all the different waters from the site and allow the Proponent to contain the water and then immediately pump it for reuse in the processing plant or for to the treatment plant before the water is discharged.[256]

As part of its technical presentation during the Final Hearing, the KIA confirmed that it was satisfied with the Proponent's responses to its recommendations and considered the outstanding

[251] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[252] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[253] Fisheries and Oceans Canada Final Written Submission, March 19, 2018.
[254] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[255] K. Kharatyan, Nunavut Water Board, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 286, lines 3-8.
[256] M. Rykaart, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, pp. 286-287, lines 11-26 and 1-2.

issues related to the freshwater aquatic environment resolved. The KIA further re-iterated that it made recommendations to develop a conceptual freshwater and marine offsetting plan that includes preliminary gain calculations, and to provide a detailed freshwater and marine fisheries offsetting plan for any forthcoming water licence applications prior to the regulatory permitting phase with DFO. The KIA also reminded TMAC that it is required to indicate if additional offsetting will be applied where groundwater sensitivity is likely and habitat losses are greater than reported in the FEIS. The KIA noted during its presentation that it was satisfied with the Proponent's responses to its recommendations and the issues had been resolved.[257]

As part of its technical presentation during the Final Hearing, ECCC confirmed that it was satisfied with the Proponent's responses and the conservatism in its approach used to complete the effects assessment between observed baseline data and the model predicted baseline concentrations. Further, ECCC noted that it was satisfied with the information provided by TMAC on the existing data for fish tissue and how it would be used in an effects assessment should a fish tissue study be required.[258] ECCC also confirmed that it was satisfied with the Proponent's responses to its recommendations related to the AEMP with the submission of an updated version of the AEMP and that the plan would continue to undergo development and would be finalized in the regulatory permitting phase of the Project.[259]

At the Final Hearing, NWB staff requested confirmation that ECCC will be addressing the outstanding issues with respect to the AEMP and the site-wide water quality model during upcoming water licencing meetings which would occur a week following the NIRB Final Hearing.[260] ECCC confirmed that these topics would be part of the presentation to the NWB at the upcoming technical meeting.

During its technical presentation at the Final Hearing, DFO noted that based on the Proponent's responses to its final written submissions, and follow-up discussions with, and commitments made by TMAC, it considered the outstanding issues related to freshwater aquatic environment to be resolved.[261]

A Community Representative from Kugluktuk indicated their support for the Project and support for the Proponent to undertake a Fisheries Protection Program to offset the effects of Project and noted the success of similar efforts at another mine.[262] In response to the comment, the Proponent noted that if the Project was to be approved, its plan is to conduct an offsetting project

[257] J. Roesch, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, pp. 436-437, lines 23-26, and 1-9.
[258] M. Tobin, Environment and Climate Change Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, pp. 507-509, lines 19-26, 1-26 and 1-3.
[259] M. Tobin, Environment and Climate Change Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, pp. 509-510, lines 20-26, and 1-6.
[260] K. Kharatyan, Nunavut Water Board, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 516, lines 19-26.
[261] M. D'Aguiar, Fisheries and Oceans Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, pp. 532- 535, lines 12-26, 1-13, 16-26, and 1-7.
[262] L. Adjun, Kugluktuk, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, pp. 733-734, lines 23-26 and 1-26.

in Cambridge Bay similar to what is done in Kugluktuk in collaboration with Fisheries Protection Program, DFO and the KIA.

During the Final Hearing, a Community Representative from Kugluktuk questioned the KIA on whether an offsetting plan had been put in place for the closure stage of the Project, whether fish have been taken out of any of the lakes to date, and what KIA or TMAC plans to do with respect to the removal of the fish.[263] The KIA replied that TMAC removed fish only from Tail Lake which is being used as the tailings impoundment area for the approved Doris North Mine Site and that the KIA had requested that TMAC develop an offsetting plan. In addition, the KIA noted that it conducted a traditional knowledge study of Inuit among the communities in the Kitikmeot region on the potential offsetting sites and is willing to work with TMAC to either pick an offsetting site within or outside of the project area where development of offsetting could enhance fisheries for Inuit.[264] The Community Representative further questioned the KIA on the likelihood of the tailings ponds being returned to a lake habitable for fish and/or what would happen to the lakes that were converted to tailings facilities.[265] The KIA indicated in response that the local Hunters and Trappers Organization was involved in the plans prior to the fish being removed from the lakes and that Inuit have been involved in the offsetting plans and the implementation of it.[266] TMAC also responded to the question noting that prior the fishout program, the value of the fish within the waterbody was estimated and used to calculate a required payment to the KIA. In addition, TMAC implemented an offsetting project that involved clearing a stream to allow for better passage of char into Roberts Lake; TMAC is currently monitoring the effectiveness of the clearing and how it has enhanced char survival and the size of the stock. For the Project, the Proponent noted that additional potential effects to fish habitat would require further offsetting.[267]

Following a presentation by DFO, a Community Representative from Gjoa Haven noted concern with respect to fish overwintering and accessibility for the fish into the lakes through the streams noting:

> *...I am sort of concerned with the lakes that have fish where fish go to winter. There was a comment when Fisheries and Oceans were doing their presentation. There are fish in streams and in lakes, that there was going to be some kind of better coordination through KIA to ensure that there's going to be plans in place so that the fish can navigate through crossings. I wonder is -- and then there will be bridges made as well so that the transport trucks can cross and travel through these bridges. I think there is -- I wonder if there are terms and conditions as to what height these bridges and crossings have to be...*[268]

[263] U. Puqiqnak, Kugluktuk, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 806, lines 17-21.
[264] J. Roesch, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, pp. 806-807, lines 24-26 and 1-12.
[265] U. Puqiqnak, Kugluktuk, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, pp. 807-808, lines 15-26 and 1.
[266] A. Hadlari, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 808, lines 4-8.
[267] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, pp. 809-810, lines 16-26 and 1-9.
[268] U. Puqiqnak, Gjoa Haven, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 895, lines 1-18.

In response, DFO noted that the *Fisheries Act* requires that fish passage be maintained when water crossings are designed and implemented. TMAC was required to provide preliminary conceptual drawings and designs and would be required to provide detailed drawings to DFO if the Project was to be approved, with rationale for the water crossing designs, the bridges or the culverts also being necessary. In addition, TMAC may be required to offset fish habitat loss as part of the *Fisheries Act* authorization.[269]

5.9.3 Views of the Board

With respect to the freshwater aquatic environment, the Board examined the information provided by TMAC and noted the representations made by intervening parties in their final written submissions and presentations during the Final Hearing and the comments provided by community members throughout the Review of the Project. The Board has determined that most of the relevant issues have been adequately addressed for this stage of assessment, recognizing that the Nunavut Water Board's water licensing and Fisheries and Oceans Canada's regulatory processes will provide more in-depth consideration of many of these issues. The Board's preference would be that all aquatic habitat is protected and maintained; however, the Board recognizes that there will be some local effects during the construction and operation of the Project. TMAC will work with Fisheries and Oceans Canada (DFO) and other regulatory bodies to establish appropriate fish habitat compensation for any habitat that is adversely affected by the Project, and that the proposed compensation measures are well supported by Parties.

The Board is aware that there are a number of issues, such as the offsetting plan, that will require further updating, consideration and approval by the respective regulatory authorities. The Board also acknowledges the commitment by TMAC to work with local communities, DFO, the Kitikmeot Inuit Association (KIA) and the Inuit Environmental Advisory Committee (IEAC) to develop candidate offsetting options with a preference for developing a community-based offsetting program located near Cambridge Bay.

The Board agrees that continued assessment of the potential impacts of the Project on the mortality of a number of fish species (e.g., Arctic char and Arctic grayling) and other freshwater organisms will need to be conducted throughout the life of the Project. The Board is confident that monitoring required for the Project and associated regulatory oversight will mitigate the potential for impacts and ensure continued protection of the freshwater environment.

The Board acknowledges that regulatory approvals will be required to address potential changes to habitat or the loss of habitat resulting from Project-induced alterations and disruption in the flow of water in local watersheds. Further, the Board notes that provision of sufficient compensation to affected communities may need to be determined for fish mortalities directly or indirectly attributable to the Project; it is the Board's understanding that DFO has necessary regulatory oversight to ensure this is appropriately addressed. However, TMAC must also ensure that adequate and continual monitoring and adaptive management strategies are

[269] M. D'Aguiar, Fisheries and Oceans Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, pp. 895-896, lines 3-26 and 1-7.

implemented, and that any potential impacts to the freshwater aquatic environment are prevented or minimized.

Following the KIA's Community Roundtable presentation, the Board requested that the KIA clarify its comment with respect to the missing fish sampling data for char, whitefish and lake trout, and requested information on the duration of the missing data, and also inquired if it would be possible to retrieve the data, as this information is relevant to the Board's assessment of the potential effects of the Project. The Board also requested clarification regarding whether monitoring would continue for the entire project life.[270] The KIA responded that TMAC had sampled three (3) arctic char prior to 2017 which was considered to be too few and that the KIA had requested that 17 additional samples be collected in 2017, for a total of 20 fish samples. The KIA viewed this sample size to be adequate for assessing the baseline conditions of Arctic char collected from Roberts Bay for the analyses of concentrations of contaminants of potential concern in fish tissue samples to be sufficient. With respect to the monitoring period, KIA noted that their request initially related to the collection of baseline data, but that KIA could request further sampling.[271] TMAC also noted that additional monitoring of fish would be triggered based on monitoring of water quality.[272]

The Board would like to highlight the importance of Inuit Qaujimaningit as it relates to fish and fish habitat and the consumption of fish. Completing adequate amounts of tissue sampling to establish an appropriate baseline and to allow the Board to have confidence that potential project effects can be identified as soon as possible is an important component to of ensuring the public remains informed about the safety of consuming fish in the water bodies potentially affected by the Project. The Board recognizes that the project area and surrounding waters have been used historically by Inuit for harvesting fish, and may continue to be used seasonally for this purpose. The importance of maintaining access to uncontaminated country food for to land users in the Project area deserves consideration throughout the life of the Project; therefore the Board encourages regulatory authorities to ensure fish sampling programs are robust enough to achieve their objectives and are not compromised by insufficient baseline data. The Board also encourages TMAC to work with the public as it develops its final designs to ensure that the public are informed and have input into the design and final location of Project infrastructure in a manner that minimizes harm to fish and fish habitat, wherever possible.

The Board expects that the Proponent's Aquatic Effects Monitoring Program (AEMP) for the Project will be designed to:

- Appropriately characterize the receiving environment;
- Ensure that adequate data is available to assess impact predictions made for the Project; and
- Prevent adverse impacts from occurring.

[270] P. Kadlun, NIRB Board Member, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, pp. 810-811, lines 12-21 and 9-11.
[271] J. Roesch, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 810-811, lines 26, 1-7 and 14-19
[272] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 812, lines -19.

Specifically, the Board has identified that additional fish sampling may be necessary as part of the aquatic effects analysis for the Project; however, the Board recognizes that the development of the details of the AEMP falls within the jurisdiction of Environment and Climate Change Canada and Fisheries and Oceans Canada and specific requirements are more appropriately addressed through the subsequent permitting phase for the Project. In Section 9.7, the NIRB has identified the need for additional detail regarding the AEMP to be provided and has recommended that the Proponent should be required to address these gaps by providing additional monitoring information to Environment and Climate Change Canada and Fisheries and Oceans Canada during the regulatory phase.

5.9.4 Conclusions and Recommendations of the Board

After reviewing the information provided by TMAC in the FEIS as well as considering the views of Parties, the Board believes that the Project's potential effects related to the freshwater aquatic environment could be appropriately managed through the commitments provided by the Proponent and application of mitigation measures. The Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- Maintaining appropriate setbacks or mitigation as directed by the Nunavut Water Board between project quarries and fish-bearing or permanent waterbodies to prevent acid rock drainage or metal leaching into such waterbodies;
- Designing project infrastructure in watercourses to reduce barriers to fish movement in fish-bearing streams and rivers, unless otherwise authorized by Fisheries and Oceans Canada;
- Engaging with Fisheries and Oceans Canada to develop project specific thresholds, mitigation and monitoring for any blasting activities that would exceed the requirements of Fisheries and Oceans Canada's *Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters*;
- Implementing best management practices to avoid and mitigate serious harm to fish as a result of the construction, operations, and decommissioning of winter ice roads, and from under ice water withdrawals;
- Implementing best management practices to avoid and mitigate serious harm to fish as a result of water crossing construction, operations, and decommissioning for all fish-bearing water crossings; and
- Including sufficient fish sampling programs to appropriately characterize the receiving environment to ensure that adequate data is available to assess impact predictions made within the Final Environmental Impact Statement for the Phase 2 Hope Bay Belt Project.

5.10. LIMNOLOGY AND BATHYMETRY

5.10.1 Views of the Proponent

TMAC Resources Inc. (TMAC, or the Proponent) addressed limnology and bathymetry as a "Subject of Note" in its Final Environmental Impact Statement (FEIS). As limnology and

bathymetry was considered a Subject of Note, the Proponent did not present a significance determination specific to these environmental components. Potential effects of the Project on limnology and bathymetry were considered by TMAC in Volume 5, Section 3 of the FEIS and assessed for significance within various individual VECs including hydrology, water quality, sediment quality, and freshwater fish (see Sections 5.7, 5.8 and 5.9 of this Report). Supporting baseline information for limnology and bathymetry was provided in Volume 5, Appendices V5-3A through V5-3U.

The Proponent characterized limnology and bathymetry within the local study area (LSA) and Regional Study Area (RSA) defined for its other freshwater VECs; the LSA included the Doris, Windy, and Koignuk-Aimaokatalok sub-watersheds in the northern sections of the project area, and the Aimaokatalok and East watersheds in the south, while the RSA included the watersheds and sub-watersheds immediately adjacent to those watersheds within the LSA (see Section 5.9.1 of this Report for further details).

The Proponent reviewed the *Naonaiyaotit Traditional Knowledge Project* (NTKP)[273] report and noted that there were no direct references relevant to limnology and bathymetry. Based on baseline surveys and measurements within various lakes and streams in the study areas from 1993 to 2017, TMAC observed that lakes in the LSA and RSA are primarily small and shallow, well mixed, and fully ice-covered from October to May.

TMAC concluded in the FEIS that the Project has limited potential to affect limnology, as the physical structure and mixing in Arctic lakes are driven by bathymetry, winds, and temperature, which TMAC noted the Project would not affect. In particular, TMAC stated that discharged water would be near ambient temperatures and thus would not affect lake mixing. TMAC added that maximum discharge volumes from the Boston water treatment plant would occur during freshet when extensive mixing and temperature variation are natural. TMAC also determined that bathymetry would not be altered by project activities, based on monitoring results and proven erosion and sedimentation mitigation and management measures in place at the Doris North Gold Mine Project.

5.10.2 Views and Concerns of Interested Parties

No concerns or comments regarding limnology and bathymetry of the freshwater environment were raised by Parties during the Review period.

5.10.3 Views of the Board

The Board appreciates the importance of baseline data for assessing potential impacts of the Project on the freshwater environment, and acknowledges the Proponent's many years of data collection and characterization of limnology and bathymetry in the project area. The Board is satisfied with the Proponent's assessment and agrees that the proposed plans to manage and monitor water – particularly related to the volume, temperature, and timing of treated water

[273] Banci, V. and R. Spicker, (Compilers, Editors & GIS). 2016. *Inuit Traditional Knowledge for TMAC Resources Inc. Proposed Hope Bay Project, Naonaiyaotit Traditional Knowledge Project (NTKP)*. Prepared for TMAC Resources Inc. Kitikmeot Inuit Association: Kugluktuk, NU.

discharge to the freshwater environment – are adequate to minimize impacts to limnology and bathymetry.

5.10.4 Conclusions and Recommendations of the Board

In considering the views of the Proponent as outlined above, the Board believes that the Project's potential effects to limnology and bathymetry could be appropriately managed. The Board has not recommended specific terms and conditions in relation to limnology and bathymetry because the Board is satisfied that the potential for project-induced effects will be adequately addressed by the measures proposed for Surface Water Hydrology and Surface Water Quality VEC (Section 5.7 of this Report), the Water Management Plan, and through the Nunavut Water Board's water licensing process.

5.11. VEGETATION AND SPECIAL LANDSCAPE FEATURES

5.11.1 Views of the Proponent

TMAC Resources Inc. (TMAC, or the Proponent) presented an assessment of potential impacts to vegetation and special landscape features in Volume 4, Section 8 of the Final Environmental Impact Statement (FEIS). The Proponent does not expect impacts on vegetation and special landscape features resulting from the Project to be significant. TMAC assessed potential project-related effects on vegetation in terms of wildlife habitat in Volume 4, Section 9, while effects on vegetation pertaining to human health were discussed in Volume 6, Section 5. Supporting baseline information from 2010 and 2014 was provided in Volume 4, Appendices V4-8A through V4-8F.

TMAC defined the following spatial boundaries for its assessment of vegetation and special landscape features, and noted the LSA and RSA boundaries were the same as used for the wildlife and wildlife habitat VECs:

- Project Development Area (PDA): the project footprint plus a buffer of 100 metres (m) to capture potential effects such as trampling of vegetation;
- Local Study Area (LSA): extends approximately one (1) kilometre (km) from the boundaries of the project footprint and up to five (5) km in some area, and encompasses an area of 56,340 hectares (ha); and
- Regional Study Area (RSA): extends approximately 30 km from the project footprint, and encompasses an area of 490,404 ha.

TMAC's assessment considered the construction, operations, reclamation and closure, post-closure and possible temporary closure phases of the Project.

The Proponent noted that the project area is largely flat and rolling, with expanses of wetlands/lowlands comprised mostly of sedge meadows, tussock tundra, and heath tundra. Drier upland ecosystems occur on rock outcrops and upper slopes. TMAC noted that a total of 871 plant species were observed during baseline field surveys, including 367 lichen species, 262 vascular plant species, and 242 moss and liverwort species. TMAC observed over 50 plant species tracked by the National General Status Working Group and NatureServe Canada, including eight (8) species at risk, two (2) species that may be at risk, and eleven (11) species

considered to be sensitive. A number of other plant species observed during baseline studies were noted to be tracked but not ranked, or considered rare but not ranked and previously undocumented in Nunavut. TMAC also noted that no invasive plant species were identified during baseline studies, with the potential exception of one species, which was most likely the native variety. TMAC's characterization of the existing conditions also included the collection of lichen, berry plants, and soils to analyze baseline metals concentrations in these tissues. TMAC summarized that most of the tissue samples had concentrations below detection limits, and noted there are no territorial or federal guidelines for metal limits in vegetation.

The Proponent highlighted Inuit Traditional Knowledge from the *Naonaiyaotit Traditional Knowledge Project* (NTKP)[274] report indicating that the project area includes areas where berry plants, mountain sorrel, Labrador tea, and willows have been traditionally harvested. TMAC also summarized that riparian areas and wetlands are valued as sources of wood for starting fires, sources of food (e.g., cloudberries), and/or wildlife habitat. TMAC also noted that during its consultation sessions, Kitikmeot community members raised concerns about project effects on wildlife forage.

The Proponent assessed the following potential project-related effects in the FEIS:

- Loss of vegetation and special landscape features due to land clearing; and
- Alteration of vegetation and special landscape features due to soil disturbance, invasive plant species, fugitive dust, changes in water quality or quantity, and changes in permafrost and snow accumulation.

TMAC measured potential project impacts on vegetation in terms of vegetation community type, primary productivity, and species diversity. For special landscape features, TMAC assessed riparian ecosystems, rare or sensitive wetlands, ecosystems that contain eskers, cliffs, bedrock lichen and outcrop ecosystems, and marine intertidal areas.

TMAC concluded that loss of vegetation and special landscape features would be limited to the PDA and added that total loss (100%) of vegetation and special landscape features was assumed within the PDA. TMAC predicted that Eriophorum Tussock Meadows, Wet Meadows, and Betula-Ledum-Lichen ecosystem types within the PDA would be the most affected. The Eriophorum Tussock Meadow ecosystem was identified as one with relatively high plant species diversity, and TMAC identified the Wet Meadow as an ecosystem type with moderate productivity, and as one of the special landscape features owing to its sensitivity to disturbance, importance as wildlife habitat, and role in carbon cycling.

The Proponent noted that loss and alteration of vegetation and special landscape features would be partially mitigated by minimizing the project footprint, and where possible, locating infrastructure to avoid special landscape features such as riparian vegetation and rare plant species, and by establishing buffers. The Proponent further noted that mitigation to minimize alteration of vegetation and special landscape features would include: dust control measures (see

[274] Banci, V. and R. Spicker, (Compilers, Editors & GIS). 2016. *Inuit Traditional Knowledge for TMAC Resources Inc. Proposed Hope Bay Project, Naonaiyaotit Traditional Knowledge Project (NTKP)*. Prepared for TMAC Resources Inc. Kitikmeot Inuit Association: Kugluktuk, NU.

Section 5.1), measures to prevent and manage fuel spills, inspecting vehicles and equipment brought to the project area for invasive species, establishing erosion control measures, prohibiting off-road driving unless required for monitoring, and ensuring disturbed areas are progressively reclaimed. The Proponent also highlighted that it will implement progressive reclamation of disturbed areas.

TMAC indicated in the FEIS that it will monitor the loss of vegetation and special landscape features and report on this every three (3) years. TMAC also noted that its air quality monitoring program, specifically its dust monitoring, would be used to indicate whether adaptive management would be needed to control impacts from dust on vegetation and special landscape features.

The Proponent noted that vegetation in Arctic ecosystems has an extremely slow recovery process and the predicted losses were thus considered irreversible. The Proponent assessed the residual effect of loss of vegetation and special landscape features as non-significant based on the limited geographic extent of predicted effects.

With respect to alteration of vegetation, TMAC reiterated that total loss was assumed within the PDA, and noted that only effects from dust have the potential to extend beyond the PDA. TMAC noted however that the air modelling results did not predict exceedances of the Canadian Council of Ministers of the Environment (CCME) guidelines for metal concentrations in soils, and referred to the Human Health and Environmental Risk Assessment (FEIS Volume 6, Section 5) which determined that project effects on environmental media quality would be negligible. TMAC concluded that there would be no residual effects related to vegetation degradation.

In its cumulative effects assessment, the Proponent noted that "Roberts/IDA Bay" were silver mines that had operated in the area between 1973 to 1975, but added that less than 4 ha had been affected by these historic activities and the area has since been restored; thus the Proponent concluded that there would be no cumulative effects.

5.11.2 Views and Concerns of Interested Parties

In its final written submission, the Kitikmeot Inuit Association (KIA) expressed concerns regarding the potential impacts of fugitive dust on vegetation.[275] The KIA referenced studies demonstrating that dust from roads and other sources can impact both the composition and productivity of vegetation at distances of 100 m to 1000 m away from roadsides. See Section 5.1 of this Report for further discussion on the issue of dust and dust management.

In its final written submission, the KIA also discussed the issue of vegetation sampling for baseline metals concentrations. The KIA emphasized that the Proponent's baseline sampling focused on lichen species, and the lichen data were used in the food chain modelling within the Human Health and Risk Assessment, even though lichen are not eaten by many wildlife species in the area. The KIA recommended that TMAC complete additional vegetation sampling, adding that both the KIA and TMAC had concluded that available data from nearby projects would not be comparable and could not be used as baseline data. The KIA recommended

[275] Kitikmeot Inuit Association Final Written Submission, March 19, 2018

sampling of sedges in particular, which are consumed by more wildlife species and are prevalent in the area, and further, that TMAC keep this data for later use in before-after comparisons if needed. The KIA also recommended that the Proponent rerun the models using these new data to determine a more accurate risk to humans (see Section 7.2 of this Report for a summary of the Human Health and Risk Assessment). In its response to the KIA's final written submission, TMAC reiterated that emphasis was placed on lichen sampling because vegetation was sampled in conjunction with soils, and that lichens were identified at all sampling sites in contrast to sedges and other plant species. TMAC added that as a result, lichen would likely be the species used for monitoring if future monitoring is required for vegetation. However, TMAC committed to conducting baseline sampling of sedges for metals analysis. Specifically, TMAC committed to collecting 30 samples of sedges at Boston and 30 samples at the TIA and additional samples at reference sites to derive baseline metal concentrations in sedges, and noted it would produce a sampling plan for review by the KIA prior to construction.[276] In its final written submission, TMAC added that that more baseline vegetation data would not alter the conclusions of the risk assessment since it would not affect the percent change in baseline versus project-related risk estimations. During the Final Hearing, the KIA confirmed it considered the issue resolved.[277]

The KIA also expressed concerns in its final written submission regarding the Proponent's proposed invasive plant mitigation and monitoring program. The KIA commented that TMAC's proposed mitigation for invasive plants was based on guidance documents for other geographic regions and ecosystems (i.e., British Columbia) and was reactive in nature. Pointing to observed increases in invasive plant species in the Northwest Territories, including in some Arctic habitats, the KIA requested that TMAC develop an adaptive management plan for invasive plants that incorporates recent information regarding invasive plants in Arctic tundra ecosystems and potential implications of climate change, and that includes a monitoring component focused on early detection. In its response to the KIA's final written submission, the Proponent committed to including an invasive plants section in the Wildlife Mitigation and Monitoring Plan, and to report annually on this. TMAC stated its objectives are to i) detect the presence of invasive plant species within and adjacent to the project footprint through long-term monitoring, and ii) to assess disturbed areas to determine recolonization by plants, invasive or native. TMAC also specified that surveys specific to invasive plant species would be presence/absence based, focused on disturbed areas, and conducted every three (3) to five (5) years. TMAC noted that no invasive plant species have been detected at the approved Doris North Gold Mine site. Should invasive plants be identified, TMAC specified its response would be guided by several plans and programs developed in British Columbia. During the Final Hearing, the KIA confirmed it considered the issue resolved.[278]

The KIA also noted concerns that the Proponent's Interim Closure and Reclamation Plan excluded post-closure vegetation monitoring on the basis that no activities would be occurring to warrant continued monitoring. The KIA commented that post-closure monitoring for invasive

[276] TMAC Resources Inc. List of Commitments Generated in the Proponent's Response to Technical Comments on the Madrid-Boston Final Environmental Impact Statement. Exhibit 84 NIRB Final Hearing File No. 12MN001, May 12, 2018.
[277] J. Roesch. Kitikmeot Inuit Association. NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 434, lines 1-12.
[278] J. Roesch. Kitikmeot Inuit Association. NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 435, lines 12-23.

plant species as well as regrowth in any reclaimed and revegetated areas would be important in order to determine if closure activities were successful and to improve understanding of reclamation in northern environments. The KIA requested that TMAC consider monitoring vegetation during post-closure. In its response to the KIA's final written submission, TMAC noted that proper contouring of substrates would allow for natural revegetation over time, but that revegetation would be considered should opportunities emerge. Should revegetation opportunities emerge, TMAC indicated it would update its Conceptual Closure and Reclamation Plan to include post-closure vegetation monitoring. During the Final Hearing, the KIA confirmed it considered the issue resolved.[279]

In its final written submission, the Government of Nunavut (GN) commented on the Proponent's proposed mitigation for rare plants, which was focused on establishing a buffer zone around known locations of rare plants.[280] The GN observed that in the Proponent's effects assessment for rare plants was incorporated into the Special Landscape Features VEC, and that the number of locations with rare plants that would be avoided and destroyed, and a rationale for the size of the exclusion zone were not provided. The GN requested the Proponent provide specific details on mitigation to avoid destruction of rare plant habitats. The GN proposed a term and condition be applied to the Project if approved requiring TMAC to develop a monitoring and management plan for rare plant habitats. In response to the GN, the Proponent committed to revising the Wildlife Mitigation and Monitoring Plan to include a section on rare plant mitigation, and to report annually on potential rare plant habitat loss in its annual summary of habitat loss due to the project footprint. TMAC highlighted that rare plant mitigation would include, where possible, avoiding ecosystems that support rare plants, avoiding rare plants observed during baseline surveys, and implementing dust control on all-season roads. During the Final Hearing, the GN noted that the issue had been resolved.[281]

In its final written submission, Indigenous and Northern Affairs Canada (INAC) commented that the Proponent was inconsistent in the FEIS regarding its plan to pursue deliberate/active revegetation (e.g., seeding) as a reclamation strategy.[282] INAC noted that including active revegetation strategies as part of a closure plan is common practice even in northern locations and in areas underlain by permafrost, and requested that TMAC commit to pursuing active revegetation strategies in addition to measures that will enhance natural recolonization of disturbed areas. INAC also recommended that the Proponent commit to and initiate the design and implementation of active re-vegetation studies that are applicable to the reclamation of comparable northern developments. In response to INAC, the Proponent clarified that it has not proposed any reclamation activities that would require revegetation, and as such, could not commit to conducting active revegetation. TMAC added that it would consider revegetation should opportunities emerge. TMAC emphasized that revegetation of areas reclaimed with overburden would occur naturally with wind-blown seeds. TMAC added that it would

[279] J. Roesch, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 439, lines 8-22.
[280] Government of Nunavut Final Written Submission, March 19, 2018
[281] S. Pinksen, Government of Nunavut, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 830, lines 7-13.
[282] Indigenous and Northern Affairs Canada Final Written Submission, March 19, 2018

implement appropriate monitoring if and when revegetation is specifically selected as a reclamation strategy.

INAC subsequently indicated that it considered TMAC's response to be unacceptable.[283] INAC noted that proponents are responsible for the development of reclamation plans that include deliberate revegetation as an option, and should include some form of revegetation study. INAC noted that reclamation research at other Northern mining projects (e.g., EKATI, Diavik) has advanced reclamation research, and that designing some form of reclamation trials is a good and responsible practice. INAC re-iterated its recommendation that TMAC commit to the use of deliberate revegetation as a reclamation option, and include the design and implementation of reclamation trials that may include deliberate revegetation of substrates into their reclamation plans. In a supplemental submission,[284] TMAC committed that it will, as part of the next formal update to the project closure and reclamation plan, post issuance of the Water Licenses for the Project, include pertinent information and recommendations from Newmont and KIA's active revegetation trials at Hope Bay, to inform how revegetation can be applied as appropriate at closure. During the Final Hearing, INAC indicated it was satisfied with this commitment, and considered the issue resolved.[285]

During the Final Hearing, a Community Representative from Kugluktuk asked the GN about plans to address habitat loss through "re-turfing" and "replanting."[286] The GN indicated its understanding that there is a preliminary reclamation plan for post-closure that may include revegetation work, but that the question would be better asked of INAC.[287] TMAC subsequently clarified that there is a current reclamation plan for the existing Doris North Gold Mine project that would be updated for the proposed project. TMAC reiterated that the current idea is to include information in the reclamation plan from a current revegetation study being conducted in coordination with the KIA.[288]

Another Community Representative from Kugluktuk described a plant that was traditionally used for mosquito repellent and asked whether it grows in the area of the tailings impoundment.[289] In a deferred response, TMAC noted that according to the traditional knowledge study report provided by the KIA, white heather is the only plant species identified at Hope Bay with insect repellent properties. TMAC added however that white heather is unlikely the species referred to by the Community Representative based on her description, and after a

[283] Tetra Tech Memo to INAC, April 11, 2018. Preparation for Final Hearings for TMAC's Phase 2 Hope Bay Belt Gold Mine Project INAC Responses to Proponent.
[284] TMAC Resources Inc., April 11, 2018. TMAC's Response to Outstanding Comments in Tetra Tech's Memorandum Regarding the Madrid-Boston FEIS.
[285] F. Ngwa, Indigenous and Northern Affairs Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 584, lines 3-4.
[286] P. Taktagon, Kugluktuk, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 848, lines 1-4.
[287] S. Pinksen, Government of Nunavut, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 848, lines 10-15.
[288] O. Curran, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, pp. 848-849, lines 25-26 and 1-10.
[289] M. Tiktalek, Kugluktuk, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 935, lines 1-16.

quick review of the 871 plant species identified during its baseline vegetation studies, TMAC was unable to confirm whether or not the plant species referred to exists at its properties.[290]

A Community Representative from Gjoa Haven remarked "…[w]*e like to forage for berries on the land because that's very essential to our diet. And animals forage also for lichen*."[291] The Representative expressed concern about dust from haul trucks on the vegetation "*and the plants that we eat*" and asked if there would be any research done on the impacts of the dust on the vegetation.[292] In response, TMAC noted that berries were considered as a potential pathway of contamination to humans within the Human Health and Ecological Risk Assessment (HHERA) and it was determined that the risk to people eating traditional foods was low. TMAC went on to state that it is mindful of dust, and will be monitoring the dust from vehicle traffic and other sources as part of its air quality monitoring program.[293] Health Canada added that TMAC has modelled the impacts of the haul trucks and will be taking samples to verify those projections. Health Canada further added that TMAC will report annually on its findings and Health Canada will review these reports and provide comments.[294] See Section 7.2 of this Report for more on the HHERA and Section 5.1 for more on air quality.

5.11.3 Views of the Board

The Board acknowledges the Proponent's effects assessment on vegetation and special landscape features and its incorporation of Inuit Qaujimajatuqangit, and is appreciative of the input of parties throughout the Review process to ensure appropriate mitigation and monitoring programs are developed and implemented for the Project. The Board understands the Project would result in a loss of terrestrial ecosystems but acknowledges the Proponent's proposed mitigation measures to minimize vegetation degradation, including dust control, a consideration for rare plant species, and a commitment to prevent the introduction and establishment of invasive plant species. The Board stresses that disturbed Arctic tundra ecosystems have exceptionally long recovery times, and emphasizes the need for effective monitoring of potential adverse impacts, and a responsive adaptive management approach to mitigate any effects on vegetation identified through monitoring. The Board further stresses the importance of progressive reclamation, and is pleased with the Proponent's commitment to incorporate information from the ongoing revegetation studies at Hope Bay into its closure and reclamation plan. The Board would also encourage the Proponent to incorporate relevant information from other northern mines such as the Meadowbank Gold Mine Project in Nunavut and the Ekati Diamond Mine in the Northwest Territories. Vegetation monitoring throughout the life of the Project and into post-closure will be important to assess vegetation regrowth and to identify any invasive plant species that may have inadvertently been established in the project area.

[290] A. Buchan, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, pp. 979-980, lines 26 and 1-23.
[291] U. Puqiqnak, Gjoa Haven, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 975, lines 19-21.
[292] U. Puqiqnak, Gjoa Haven, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, pp. 975-976, lines 22-26 and 1-10.
[293] A. Buchan, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, pp. 976-977, lines 23-26 and 1-8.
[294] M. Gale, Health Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 977, lines 16-26.

5.11.4 Conclusions and Recommendations of the Board

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board believes that the Project's potential effects to vegetation and special landscape features could be appropriately managed through the commitments provided by the Proponent and the application of key mitigation and monitoring measures. The Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- Mitigation to prevent the introduction and establishment of invasive plant species, and regular monitoring for invasive plant species throughout the life of the Project and into post-closure.
- Rare plant species mitigation and annual reporting on potential rare plant habitat loss.
- Implementing progressive reclamation of disturbed areas to encourage natural recolonization, and active revegetation informed by ongoing revegetation trials in the project area.

5.12. TERRESTRIAL WILDLIFE AND WILDLIFE HABITAT

5.12.1 Views of the Proponent

TMAC Resources Inc. (TMAC or the Proponent) provided its assessment of potential impacts of the proposed Phase 2 Hope Bay Belt Project (the Project) on terrestrial wildlife and wildlife habitat in Volume 4, Section 9 of the Final Environmental Impact Statement (FEIS). Supporting baseline information was provided in Volume 4, Appendices V4-9A, V4-9B, and V4-9C. TMAC provided the Wildlife Mitigation and Monitoring Plan (WMMP) in Volume 8, Annex V8-3.

TMAC's terrestrial wildlife and wildlife habitat assessment considered caribou, muskox, Arctic wolf, grizzly bear, wolf, wolverine, and small mammals. However, TMAC focused its assessment on caribou, stating that effects on other wildlife species would be negligible given their low densities and/or limited evidence of impacts from monitoring studies at the existing Doris North Gold Mine and other mines in Nunavut. TMAC concluded that there would be no significant adverse effects on terrestrial wildlife.

The Proponent defined the following spatial boundaries for its assessment of terrestrial wildlife and wildlife habitat:

- Project Development Area (PDA) – the project footprint plus engineering buffers.
- Local Study Area (LSA) –the PDA as well as a one (1) kilometre (km) buffer covering approximately 56,340 hectares (ha) in total.
- Regional Study Area (RSA) –the LSA and an approximate 30 km buffer (492,000 ha) to include wildlife with larger home ranges that could come in contact with or be affected by the Project.

- TMAC also developed species-specific cumulative effects study areas based on the known home ranges for caribou, muskox, grizzly bear, and furbearers (wolverine and wolves).

TMAC's assessment considered the construction, operations, reclamation and closure, post-closure and possible temporary closure phases of the Project.

TMAC reviewed available information from the *Naonaiyaotit Traditional Knowledge Project* (NTKP)[295] and incorporated Traditional Knowledge (TK) into habitat models through identification of important areas, migration routes, and where species such as grizzly bears, muskox, furbearers, raptors, and migratory birds were harvested. Information drawn from the NTKP report was supplemented with data from public consultation, baseline surveys, and published literature to determine which valued ecosystemic components (VECs) would potentially interact with the Project. TMAC also conducted three (3) caribou workshops between 2016-2017 with the Elders and harvesters in Cambridge Bay and one (1) workshop included a site visit. During these workshops, participants reviewed mitigation and monitoring measures and identified areas where these measures could be improved.

The Proponent's characterization of baseline conditions for terrestrial wildlife and wildlife habitat within the project study areas was based on field surveys including camera and satellite collar data, incidental observations, and habitat suitability mapping. TMAC stated that terrestrial wildlife in the Kitikmeot region has been studied since 1990s as part of baseline studies for the approved Doris North Gold Mine project, and that long-term monitoring studies in the general project area, including through a caribou satellite-collaring program led by the Government of Nunavut – Department of Environment (GN-DoE) are ongoing.

TMAC indicated that two (2) caribou herds have the potential to interact with the Project: (1) the Dolphin and Union caribou herd, with a home range that overlaps the RSA during winter, and (2) the Beverly and Ahiak herds, with a home range that overlaps the RSA in the summer. The Dolphin and Union herd was federally listed as Special Concern on Schedule 1 *Species at Risk Act* (SARA) in 2004 and was classified as Endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in December 2017. TMAC noted that other caribou herds with home ranges that overlap the Kitikmeot Region, including the Bathurst, the Bluenose East, and the Peary caribou herds are not expected to interact with the Project. TMAC also noted that the Beverly and Ahiak caribou herds are harvested by peoples from the communities of Gjoa Haven, Omingmaktok, and Cambridge Bay within the Nunavut Settlement Area; the Lutsel K'e in the Northwest Territories; and other communities in northern Saskatchewan.

The Proponent noted that muskox is another key species in the tundra food chain and is an important food source for wolves and, to a lesser extent, grizzly bears. TMAC indicated that muskoxen are found throughout the RSA in low densities, which fluctuate based on the

[295] Banci, V. and R. Spicker, (Compilers, Editors & GIS). 2016. *Inuit Traditional Knowledge for TMAC Resources Inc. Proposed Hope Bay Project, Naonaiyaotit Traditional Knowledge Project (NTKP)*. Prepared for TMAC Resources Inc. Kitikmeot Inuit Association: Kugluktuk, NU.

availability of food through the winter and on predator numbers. The Proponent also noted that muskoxen are valued by Inuit as a source of food, hides, horns, and wool.

TMAC noted that grizzly bears are found throughout the RSA associated with major river systems, and are designated as a species of special concern by COSEWIC, but are not listed under the SARA. The Proponent also highlighted Inuit respect for grizzly bears, including Inuit legends and/or stories about the species, while noting that grizzly bears are hunted by Inuit for their meat and fat.

Finally, TMAC assessed furbearers, which were defined as any small or medium-sized predators that could be trapped or hunted for their fur. Wolverine and grey wolf were selected as focal species for furbearers as they are sensitive to disturbance and are widespread throughout the western Kitikmeot region. The Proponent noted that the wolverine is ranked as Vulnerable in Nunavut and is designated as a species of Special Concern by COSEWIC.

TMAC identified the following seven (7) potential effects of the Project on terrestrial wildlife and wildlife habitat:

- Habitat loss (including project footprint and adjacent areas of the tundra that may be altered by project effects on air quality, vegetation, and water quality and quantity);
- Disturbance, including visual and auditory stimuli, from vehicles, aircraft, blasting, and so on;
- Disruption of movement (e.g., across the sea ice and from project roads);
- Attraction to the Project from landfill practices and tailings (salt);
- Direct mortality from vehicle traffic or other accidents due to camp infrastructure;
- Increased access and harvest with more roads found within the project footprint; and
- Changes in environmental quality from dust, noise, and traffic.

Caribou

TMAC assessed the effect of habitat loss from the Project footprint and immediate surroundings. Based on the overlap between the proposed PDA and habitat suitability models, TMAC concluded that the Project does not overlap any known calving, or post-calving areas and occupies a small proportion of habitat in the Dolphin and Union winter range (0.07%), Beverly winter range (0.03%) and Ahiak winter range (0.03%). TMAC noted that although the amount of habitat loss was expected to be low, due to the importance of caribou and concern over the population across the Canadian Arctic, habitat loss was considered a residual effect; however, as the Project would proceed in phases, and close to the PDA the cumulative residual effect of habitat was concluded to be not significant.

To determine the potential impact of disturbance, TMAC selected three (3) Zone of Influence (ZOI) scenarios to calculate *indirect* caribou habitat loss and overall determined that it continued to predict a four (4) km ZOI around the Project. TMAC determined that a residual effect would be measurable even when mitigation was applied.

TMAC considered potential disruption movement to caribou on land due to project roads, or on ice due to ice-breaking activity. TMAC emphasized that it would only be shipping in the open

water season and thus did not consider the latter effect further. To assess the potential impact of disruption of movement, TMAC calculated the rate of collared caribou crossing the existing winter road and proposed all-weather road, and found that crossings rates of approximately 1.8%, 9.9%, and 9.7 % of collared caribou from the Beverly, Ahiak, and Dolphin and Union herds, respectively. TMAC concluded that the potential effect of disruption of movement due to the Project would be small, but due to the concern over this potential effect, it was rated as a residual effect.

TMAC noted that caribou could be attracted to the project site as a means of avoiding predators, or attracted to the TIA as a source of salt. Based on feedback from workshop participants, professional judgement, and mitigation and management measures that are currently active in the Doris North Gold Project, TMAC concluded that there was no residual effect of attraction to the Project and the potential effect was not considered further.

The potential for caribou to suffer mortality due to Project-related collisions with both vehicles and aircraft as well as explosions. TMAC considered its current practices with the Doris North Gold project and in discussions with the participants of the workshops determined that the likelihood of these accidents was low, and therefore did not consider direct mortality as a residual effect.

TMAC assessed whether the Project would cause increased access and harvest of caribou, based on the proposed increase of project infrastructure to the area. TMAC noted that the number of hunters coming to site was approximately 10 in 2011 and has fallen to approximately one (1) or two (2) per year as TMAC allows harvesters to access the Doris North Gold project camp as a safety refuge and visit relatives. Caribou workshop participants and TMAC also concluded that if personnel from site were to let persons know of caribou whereabouts at site that it was unlikely that anyone could travel and find the herd as it could take up to a day to become mobile and persons working at site are not allowed to hunt. Therefore, the potential effect of increased access and harvest of caribou was not considered a residual effect and not considered further.

Finally, TMAC assessed the changes to environmental quality as a potential effect on caribou from the Project. During workshops elders and land users discussed maintaining a clean environment especially concerning the land and water. An assessment of the health and ecological risk assessment was conducted and the assessment determined that the planned Project effects on the environment were negligible and proposed no potential increase in the risk of adverse health effects to caribou. Based on current practices, workshop participant feedback and planned mitigation and monitoring measures, TMAC concluded that the effects of environmental contaminants and bioaccumulation were not considered residual effects on caribou.

Based on the caribou workshops it held with Inuit elders and land users, and its experience with the Doris North Gold Mine Project, TMAC adopted the following protection measures:

1) drivers to stop their vehicles and remain in the vehicles to avoid disturbing caribou sighted near the roads when caribou are within 600 m of the road and otherwise maintain posted speed limits;

2) blasting to be halted when caribou are within 2.8 km of quarries or other blasting locations; and
3) active monitoring to ensure that if calving and post-calving areas overlap the Project site, then additional mitigation and management would be required.

TMAC also noted specific project design features to mitigate potential disruption of caribou migration, including establishing low heights in sections of project roads, blading snowbanks down to prevent snow drifts, and installing road crossing structures where caribou are known to regularly cross.

TMAC emphasized that it assessed the Project's impact on caribou based on the precautionary approach and that it considered risk of serious or irreversible harm to caribou herds with ranges that overlap the project area. The Proponent also noted that the risk assessment for caribou was based on conditions observed at its current Doris North site, Inuit Qaujimajatuqangit, and western science. TMAC concluded that residual effects to caribou would not be significant. TMAC also considered the cumulative and transboundary effects of the Project on caribou to be not significant.

Muskox

TMAC used a ZOI of four (4) km around the mine and 1.5 km around roads and determined that approximately 9-15% of good quality muskox habitat in the RSA would be affected by the Project. TMAC rated the effect on muskox to be not significant and determined that residual effects related to disruption of movement and habitat loss are predicted for muskox, but noted that road design features proposed to mitigate disruptions to caribou movement would also be applicable to muskox. TMAC also concluded that muskox are not expected to be attracted to the Project site and direct mortality due to Project activities, no significant changes to hunting practices, and negligible changes to environmental quality were not considered a residual effect.

Grizzly Bear

In TMAC's assessment of grizzly bear, it concluded that approximately 1.5 % of good quality habitat in the regional study area would be affected by the Project, which TMAC classified as a residual effect of low magnitude. TMAC also identified attraction of grizzly bears to the Project site and the disruption of movement by grizzly bear due to high traffic as potential residual effects. After further assessment, the Proponent concluded that these residual effects were determined to be not significant. In consideration of the proposed mitigation and monitoring plans TMAC noted that direct mortality, increased access and harvesting of grizzly bears, and changes in environmental quality were not expected to be residual effects.

Furbearers

As with other wildlife species, TMAC assessed the potential for residual effects on furbearers related to habitat loss, disruption of movement, and attraction to the Project site. The Project's effect on direct mortality, increased hunting, and negligible changes in environmental quality were not considered to be a residual effect. Overall, TMAC concluded that these residual effects on furbearers would not be significant. Additionally, the Proponent noted that cumulative effects were not considered for furbearers as no other substantial past, present or reasonably foreseeable projects occur within the cumulative effects assessment spatial boundary for the Project.

Mitigation and Monitoring plans

TMAC used the following mitigation, management measures, and monitoring programs to develop the Project and also included best management practices at similar mining projects in the Arctic, comments from community members during scoping meetings, scientific literature and professional experience, and feedback from the KIA and the Government of Nunavut-Department of Environment on the existing Doris North Project's Wildlife Mitigation and Monitoring Plan. Mitigation common to all wildlife VECS was included within the following monitoring plans for the Project:

- Air Quality Management Plan;
- Hope Bay Project Noise Abatement Plan;
- Hope Bay Project Aquatic Effects Monitoring Plan;
- Hope Bay Project Non-hazardous Waste Management Plan;
- Hope Bay Project Hazardous Waste Management Plan;
- Hope Bay Project Incinerator Management Plan;
- Doris Project Domestic Wastewater Treatment Management Plan;
- Boston Sewage Treatment Operations and Maintenance Management Plan;
- Hope Bay Project Groundwater Management Plan;
- Hope Bay Project Boston Conceptual closure and Reclamation Plan;
- Oil Pollution Prevention Plan (OPPP)/Oil Pollution Emergency Plan (OPEP); and
- Hope Bay Project Spill Contingency Plan.

In TMAC's closing remarks at the Final Hearing, the Proponent stated that:

> *We are confident that this project will not have a significant impact on terrestrial wildlife. In particular, we are confident that the caribou will be safe and that the project will not affect either their movements or herd populations.*[296]

5.12.2 Views and Concerns of Interested Parties

In its final written submissions, the Kitikmeot Inuit Association (KIA) outlined its concerns regarding effects of Project roads and traffic management on terrestrial wildlife, noting that the proposed vehicle trips on the 9.5 kilometre (km) stretch of the all-weather access road from Doris to Madrid was predicting traffic levels of approximately 196 vehicles per day which is around 9.8-fold higher than the traffic rates assessed within the Draft Environmental Impact Statement for the Project.[297] The KIA noted these proposed traffic rates could disrupt the movement of grizzly bear and wolverine which have a threshold of disruption of approximately 100 vehicles per day. As such, the KIA requested that TMAC reassess road impacts on wolverine using a 60 vehicles per day value; commit to install two (2) traffic counters, one (1)

[296] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2017, p 1028, lines 7-11.
[297] Kitikmeot Inuit Association Final Written Submission, March 19, 2018.

along the Doris to Madrid road and one (1) along the road section between Madrid to Boston; analyze the actual traffic rates seasonally and include results in annual wildlife monitoring reports; and incorporate results into adaptive management applied to the Project.

The Government of Nunavut (GN) also commented on traffic in its final written submission, noting that the Project may disrupt the movements of caribou as it is within the core ranges of the Dolphin and Union as well as the Beverly and Ahiak herds, and the traffic may also effect the movement of muskox and grizzly bears. The GN requested clarification on the vehicle numbers that would be expected to be using the aforementioned roads through the life of the Project and the details of a traffic monitoring and reporting program in order to assess the accuracy of TMAC's predictions.[298]

In its response to final written submissions, TMAC noted that the traffic number that the KIA was requesting be used for the wolverine threshold was not public at the time of the FEIS and would not have been available for use in the analysis and that this research was conducted in a forested area and therefore the observations may not be applicable in the open tundra environment.[299] In response to the GN's submission, TMAC stated it would conduct a traffic level monitoring system using the vehicle traffic numbers it presented in the FEIS as the monitoring threshold. At the Final Hearing, the KIA and the GN stated that issues related to monitoring of traffic were resolved to their satisfaction by the commitment in TMAC's response to final written submissions.[300,301] Further, TMAC committed to quantify road traffic as the number of vehicle passes per day throughout a year on specific segments of road and report this annually. [302] TMAC also committed to consider traffic levels and observed effects on large mammals, and reflect on adaptive management options in consultation with the Inuit Environmental Advisory Committee (IEAC).[303]

The KIA also detailed within its final written submission concerns with TMAC's assessment that most of the habitat in the local study area (LSA) was not suitable for wolverine, and that grey wolf habitat was not assessed in detail by TMAC despite their close relationship with caribou. The KIA requested that TMAC investigate the discrepancies in habitat suitability modelling, provide an explanation for the true results, and re-evaluate the potential effects of habitat loss on wolverine using the corrected results. In its response to final written submissions, TMAC explained the differences observed by the KIA were a result of TMAC having used Terrestrial Ecosystem Mapping in the LSA and Landsat-based mapping in the regional study area (RSA), and that while these different scales and types of analyses led to the difference in numbers, it did

[298] Government of Nunavut Final Written Submission, March 19, 2018.
[299] TMAC Resources Inc. Response to final written submissions, April 5, 2018.
[300] J. Roesch, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2017, pp. 436-437, lines 24-26 and lines 1-10.
[301] Government of Nunavut. *NIRB Final Hearing TMAC Resources' "Phase 2 Hope Bay Belt" project Presentation* Slide 10. Exhibit 61 NIRB Final Hearing File No. 12MN001, May 11, 2018.
[302] TMAC Resources Inc. *List of Commitments Generated in the Proponent's Response to Technical Comments on the Madrid-Boston Final Environmental Impact Statement*. Exhibit 84 NIRB Final Hearing File No. 12MN001, May 12, 2018.
[303] TMAC Resources Inc. *List of Commitments Generated in the Proponent's Response to Technical Comments on the Madrid-Boston Final Environmental Impact Statement*. Exhibit 84 NIRB Final Hearing File No. 12MN001, May 12, 2018.

not make the information presented irrelevant. During the KIA's presentation at the Final Hearing, it noted that this issue was resolved.[304] In addition, TMAC committed to using habitat maps based on Terrestrial Ecosystem Mapping for wildlife management purposes and for reporting habitat loss in the annual Wildlife Mitigation and Monitoring Plan (WMMP) report.[305]

The GN also stated in their final written submissions that permeability for terrestrial wildlife may be affected by a physical structure (e.g., all-weather road), appearance of infrastructure (e.g., wind turbines, snowbanks, buildings), and sensory disturbance such as noise and smells from traffic on haul roads or the operation of heavy equipment at the mine sites. The GN commented on the ZOI TMAC utilized in the FEIS and noted that, while TMAC had used three (3) ZOI in its analysis, the GN did not agree that the ZOI of four (4) kilometres around the mine site and 1.5 km around roads would be the true ZOI for the Project. The GN noted that there was insufficient collar data and additional collar data should be obtained to support analysis of ZOI if the Project proceeds. The GN suggested that TMAC use both regional data (collar data) and motion triggered cameras for estimating ZOI for caribou as there may be some challenges initially regarding the design of the study as it is unclear if the camera program does not take caribou into account and the cameras appear to be more focused on the Boston and Doris sites and not the proposed all-weather access roads. As such the GN recommended that TMAC monitor through two (2) programs (collars and cameras) specifically designed to monitor for caribou and focus on all components of the proposed Project and data analysed to have separate ZOI for the Boston to Doris Road and mines sites to the extent possible. In its response to final written submissions, TMAC reiterated its ZOI monitoring plan using both collar data and camera data that is being conducted at the Doris project site was designed by TMAC, the KIA, and the GN and was the basis of the monitoring plan for the Phase 2 Hope Bay Belt project proposal. TMAC committed to providing ZOI data for the both the Dolphin and Union herd and the Beverly and Ahiak herd during the early operations of the Project and would provide information for project components where sufficient data is available. The GN noted it considered the issue resolved at the Final Hearing.[306]

The GN noted in its final written submission that TMAC had included details regarding the mitigation and monitoring, but it did not feel this would appropriately capture the Project effects on caribou movements as the analysis of collar data was planned to occur only once construction of the Boston road was completed, and this assumed that there was enough collar data collected to support an analysis. Additionally, although height of land surveys were proposed by TMAC they were of unspecified study design and intensity making it difficult to determine whether they would be useful for assessing effects and are focused on roads rather than all components of the Project. As such, the GN recommended that caribou movements be monitored at a regional scale and the collar monitoring program be designed and resourced by the Proponent to ensure it has sufficient statistical power to detect possible Project effects, recognizing that the GN monitors the herds at a regional scale and these programs are not meant to capture Project-specific

[304] J. Roesch, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2017, pp. 436-437, lines 24-26 and lines 1-10.
[305] TMAC Resources Inc. *List of Commitments Generated in the Proponent's Response to Technical Comments on the Madrid-Boston Final Environmental Impact Statement*. Exhibit 84 NIRB Final Hearing File No. 12MN001, May 12, 2018.
[306] Government of Nunavut. *NIRB Final Hearing TMAC Resources' "Phase 2 Hope Bay Belt" project Presentation* Slide 10. Exhibit 61 NIRB Final Hearing File No. 12MN001, May 11, 2018.

effects.[307] TMAC responded that it had a Memorandum of Understanding with the GN for satellite collars for the Doris North Gold project, but committed to update its WMMP with more information to clarify the studies proposed for the Project. Regarding the roads and crossings, TMAC committed to work with the Inuit Environmental Advisory Committee (IEAC) to assess additional areas for the installation of caribou ramps if they are required, and noted that following construction the Proponent would monitor road crossing success through the GIS analysis of satellite collars and camera monitoring.

Related to the determination of the ZOI for caribou, in its final written submission the GN noted concerns related to TMAC using the human standards for noise and not wildlife which could create a weakness in the effects assessment by underestimating the spatial extent of aircraft noise. The GN suggested that TMAC modify the WMMP to include a log for air traffic levels for fixed wing aircrafts and helicopters, request pilots report caribou sightings, and during caribou migration and caribou are within 600 metres (m) of the helicopter it does not move. TMAC agreed to include the air traffic log in its WMMP and noted that the other two requests from TMAC are already a part of the exiting practices at the Doris North Project but it would ensure the practice continued. At the Final Hearing the GN noted the issue was resolved and TMAC submitted commitments in Exhibit 84.[308,309]

The GN also noted in its final written submission that there was limited information on final road design (including caribou crossings) and recommended that TMAC undertake a survey to quantify the structural features of the road once the road was constructed and monitor where the crossings are and if they are being used. The GN also requested that snow heights be recorded and reported annually. TMAC responded that it would be monitoring for this through its caribou collar monitoring, height of land surveys, and camera data and committed to include information regarding snow heights in the WMMP until snow along the proposed all-weather roads was characterized. The GN stated during the Final Hearing that the issue was resolved and TMAC submitted commitments in Exhibit 84.[310,311]

Within its final written submission and during its technical presentations at the Final Hearing, the GN indicated that there were deficiencies with respect to the environmental assessment conducted on the transmission line running alongside the proposed road between the Doris and Boston sites. Further, the GN recommended that consideration be given that this infrastructure be excluded from the current review process as information was not provided.[312] During the

[307] Government of Nunavut Final Written Submission, March 19, 2018.
[308] Government of Nunavut. *NIRB Final Hearing TMAC Resources' "Phase 2 Hope Bay Belt" project Presentation* Slide 10. Exhibit 61 NIRB Final Hearing File No. 12MN001, May 11, 2018.
[309] TMAC Resources Inc. *List of Commitments Generated in the Proponent's Response to Technical Comments on the Madrid-Boston Final Environmental Impact Statement*. Exhibit 84 NIRB Final Hearing File No. 12MN001, May 12, 2018.
[310] Government of Nunavut. *NIRB Final Hearing TMAC Resources' "Phase 2 Hope Bay Belt" project Presentation* Slide 10. Exhibit 61 NIRB Final Hearing File No. 12MN001, May 11, 2018.
[311] TMAC Resources Inc. *List of Commitments Generated in the Proponent's Response to Technical Comments on the Madrid-Boston Final Environmental Impact Statement*. Exhibit 84 NIRB Final Hearing File No. 12MN001, May 12, 2018.
[312] S. Pinksen, Government of Nunavut, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 484, lines 8-18.

closing remarks, the GN noted this is still an outstanding issue that had not been resolved with TMAC.[313]

The GN also commented in its final written submission that it was concerned with the proposed caribou protection measures that are only in place once caribou are within 500 m of roads and this is likely within the ZOI as open terrain moving vehicles could cause caribou to act adversely and move away from the area and this is especially critical during migration periods and roads with the highest traffic. Further, the operation of heavy mobile equipment when caribou are within 250 m except during calving season is too short. As such, the GN recommended that there be a second tier in road traffic management that would be triggered in response to groups of caribou detected within 1.5 km of the roads during migration as well as create group size thresholds. Further operation of heavy mobile equipment should cease when caribou are within 500 m in any season. TMAC responded to this final written submission that it would work with the IEAC to determine the appropriate methods and locations for monitoring as well as update the WMMP with additional detail on the plan for height of land monitoring. TMAC continued to work with the GN throughout the Final Hearing and in Exhibit 88 TMAC provided suggested wording for a term and condition; however, in its closing remarks for the Final Hearing, the GN noted that caribou protection measure related to a 1.2 km setback from roads for migrating caribou herds was unresolved.[314]

Grizzly bear denning was also of concern in the GN's final written submission as it noted that grizzly bears are sensitive to disturbance at their dens but that TMAC focused den surveys to pre-construction and construction and not the full Project lifespan and suggested that surveys for denning bears be continued throughout operations of the Project. Further, in order to capture the movement of grizzly bears and their behaviour during the height of land surveys. TMAC clarified that the height of land surveys would be used for all wildlife observations and behaviour studies for grizzly bears were not required as the main objective of mitigation and monitoring grizzly bears would be to manage the Project site and make it unattractive to bears and monitor bear usage or avoidance and this was in place for the Doris North Gold Mine and would be continued for the Project should it be approved. As for bear den surveys during operation, there would be an overall effort to reduce the number of aircraft overflights to minimize potential disturbance to wildlife. At the Final Hearing the GN stated that this issue was resolved and TMAC submitted a commitment to locate big game dens within one (1) km of the Project in modeled high denning habitat areas and take appropriate steps as outlined in the updated WMMP.[315,316]

Environment and Climate Change Canada (ECCC) wrote in its final written submission that TMAC should revise its WMMP to include a section consolidating the species at risk

[313] S. Pinksen, Government of Nunavut, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 1017, lines 6-7.
[314] S. Pinksen, Government of Nunavut, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 1017, lines 8-10.
[315] Government of Nunavut. *NIRB Final Hearing TMAC Resources' "Phase 2 Hope Bay Belt" project Presentation* Slide 10. Exhibit 61 NIRB Final Hearing File No. 12MN001, May 11, 2018.
[316] TMAC Resources Inc. *List of Commitments Generated in the Proponent's Response to Technical Comments on the Madrid-Boston Final Environmental Impact Statement*. Exhibit 84 NIRB Final Hearing File No. 12MN001, May 12, 2018.

information and this section should include a table of clearly identifies the species potentially interacting with the Project and how the proposed mitigation and monitoring are to address the potential pathways of effects.[317] In its response to final written submissions, TMAC agreed to include a section on species at risk in the 2018 WMMP and TMAC reiterated during its presentation on wildlife during the technical portion of the Final Hearing that the issue had been resolved and included its commitment as part of Exhibit 84.[318,319]

During the Final Hearing, NIRB staff requested clarification regarding the monitoring record overall for the terrestrial environment specifically where care and maintenance occurred and how that impacted the confidence of TMAC's predictions.[320] In response, TMAC stated that data collection started for the Doris project two (2) years prior to construction and the Doris project was in care and maintenance twice each for one (1) year during the period from 2008 to present.[321]

NIRB staff requested information regarding the impact that a road from Doris to Boston could have on the caribou herds and how the higher traffic levels were taken into account through TMAC's analysis and was incorporated into mitigation.[322] TMAC responded that the Roberts Bay to Doris to the Windy camp road is approximately the same distance as the road that is proposed to Boston and with the traffic on the Roberts Bay to Doris road and TMAC can use this experience as an example of operations of a high traffic road.[323]

A Community Representative from Kugluktuk also requested information regarding bridge structures and how high and wide they are as TMAC had noted that caribou migrate around the Project and that there were illustrations during the presentation that indicated that.[324] TMAC responded that the bridges were typically eight (8) metres (m) wide and two (2) to 2.5 m high.[325]

Another Community Representative from Kugluktuk also commented on caribou drinking from the tailings and wondered if TMAC would put a fence around the tailings.[326] In TMAC's response it outlined that the focus at the Doris and Madrid developments would be to maintain the water quality in that tailings impoundment so that even if caribou were to drink the water they would not be in any risk of harm. Further, TMAC was discussing methods to use to dissuade caribou from interacting with the tailings with the Inuit Environmental Advisory

[317] Environment and Climate Change Canada Final Written Submission, March 19, 2018.
[318] TMAC FWS
[319] G. Sharam, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2017, p 88, lines 19-22.
[320] R. Barry, Nunavut Impact Review Board, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2017, p 230, lines 7-16.
[321] G. Sharam, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2017, p 230, lines 230-231.
[322] R. Barry, Nunavut Impact Review Board, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2017, p 230, lines 14-17.
[323] G. Sharam, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2017, pp. 233-234, lines 23-26 and lines 1-9.
[324] M. Tiktalek, Kugluktuk, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2017, p 727, lines 17-24.
[325] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2017, p 728, lines 6-10.
[326] P. Taktagon, Kugluktuk, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2017, p 728, lines 13-22.

Committee such as use of inuksuit to corral or direct caribou away from the general area. The concern with building a fence is that it could lead to other wildlife problems such as increased predatory success rates if they get over the fence.[327]

During the Final Hearing the Board heard from Community Representatives regarding the continued support of collaring data and how industry and government could collaborate where the interests of government can assist each other and that this support should not be limited to just one herd as many are found throughout the area.[328] Further, Community representatives noted that project shipping should be restricted to the open-water period so it would not interfere with caribou crossings and collaring should be an ongoing initiative.[329] In response, TMAC noted its commitment to continue shipping during the open water season and that it hoped to continue the collar work with the Government of Nunavut.[330,331]

During the Final Hearing a Community Representative from Taloyoak had questions regarding the collaring of caribou and what does that do for TMAC and comments related to the flavour of the meet as collared caribou do not taste as good as non-collared caribou and she are not in favour of seeing collars on caribou.[332,333] TMAC responded that the collars record or show its location so that its location over a period of time.[334] A Community Representative from Kugaaruk commented further on caribou and noted to the GN that:

> *Yes, they are radio collared, and there is data that is being collected. A lot of people don't like caribou to be collared. A lot of them are being found with hair falling off around their necks. I think there should be better technology. There are smaller, better technology that's coming out, perhaps, that could maybe be used, if they could put smaller instruments that can be attached to their ears or parts of their body so that something smaller could have a smaller impact on the caribou. It's very valuable that there should be data collected. I understand that that's why they put radio collars on them. And including polar bear. I wonder if perhaps the two governments, territorial and federal, could find some new technology that they could use to collect data and put on caribou and polar bear. That's just an idea.*[335]

[327] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2017, pp 729-730, lines 4-26 and lines 1-7.
[328] L. Adjun, Kugluktuk, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2017, p 734, lines 13-25.
[329] B. Putuguq, Gjoa Haven, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2017, p 736, lines 8-17.
[330] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2017, p 737, lines 5-12.
[331] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2017, p 741, lines 8-11.
[332] B. Uquqtuq, Taloyoak, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2017, p 749, lines 19-22.
[333] B. Uquqtuq, Taloyoak, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2017, p 745, lines 7-12.
[334] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2017, p 749, lines 15-24.
[335] C. Krejunark, Kugaaruk, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2017, p 846, lines 9-25.

The GN responded that technology around collars is constantly improving and collars are becoming smaller, lighter, made out of materials that do not rub as much and have a release mechanism so they fall off at a set time.[336]

A Community Representative from Gjoa Haven shared information on the unhealthy wildlife observed:

> *…Some caribou that are being caught have abscesses on their legs and some are starving, and its very gruesome to see wildlife suffering in that way. I had never thought I would ever see wildlife in that way. I never thought that I would be seeing unhealthy meat, and that's always been an ongoing concern for me.*[337]

A Community Representative from Kugaaruk who stated later reiterated this statement:

> *When I was younger, I was told that the environment -- that the environment is very susceptible to anything, and it's very sensitive to everything. So if we take care of the land that it -- that the environment will take care of us, and I have never forgotten that code. But if I didn't listen that my life would take a turn in an unacceptable way, if I didn't take care of it, and I have been given that -- those wise words from a number of elders… This was mentioned by the representative from Gjoa Haven, but I'm going to add to what he was saying. Yes, I also have heard and seen -- have seen wildlife that have been unhealthy. Once the mining companies started coming up here, we're noticing that wildlife and fish are beginning to be impacted, and sometimes we are unable to eat what we catch because some are unhealthy.*[338]

Also during the Final Hearing a member of the Public noted that with climate and environmental change and ever since mining companies have come that wildlife has been reduced. Hunters are now going further and further out and coming back empty handed. As such, TMAC was asked if they could assist hunters and trappers association either know where caribou are or find a way so local hunters can go hunting for the Elders in the communities.[339] TMAC reiterated that the activities of the Project did not contribute to a decline in caribou and noted support to harvesters at the camps and support to community initiatives and would continue these supports.[340]

5.12.3 Views of the Board

The Board acknowledges that throughout the Review of the Project, concerns and uncertainties regarding potential impacts to terrestrial wildlife – in particular, caribou - were shared by intervening parties and community members. As expressed through technical commenting

[336] S. Pinksen, Government of Nunavut, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2017, p 847, lines 5-17.
[337] J. Qirqqut, Gjoa Haven, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2017, p 913, lines 19-25.
[338] L. Illuitok, Kugaaruk, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2017, p 932, lines 7-26.
[339] J. Evalik, Public Member, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2017, pp. 936-937, lines 10-26 and 1-23.
[340] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2017, p 939, lines 5-16.

periods and throughout the Final Hearing, impacts to terrestrial wildlife, particularly caribou, are of growing concern considering the current population levels of barren-ground caribou herds, and the cumulative influences of development and climate change. The Board has concerns that the proposed levels of traffic on the all-weather access roads could be much higher than predicted and this creates significant uncertainty in terms of the extent to which the proposed roads could have greater potential for adverse impacts on caribou and other wildlife than was predicted in the EIS. Besides the ecological importance of wildlife within natural ecosystems, wildlife are intrinsically linked to the culture, identity, spirituality, and livelihood of Inuit, Nunavummiut, and northern peoples. The Board recognizes this importance, and appreciates the significant contributions made by intervening parties and community members throughout the Review process to ensure that potential impacts from the Project are addressed and that thoughtful consideration is given to whether impacts can be adequately mitigated, monitored, adaptively managed, and finally clearly communicated and tracked in order to achieve the desired results so that cumulative effects of the Project on wildlife would not contribute to stresses currently borne by populations of concern.

The Board noted to TMAC that based on Inuit Traditional knowledge and oral history the Bathurst herd at times have their calving grounds within the vicinity of the proposed activities and TMAC says it covered only the Coronation Gulf part. The Board also noted that Inuit have travelled from sea out into the calving grounds south including the Boston area and further south, and asked if TMAC be studying the movements of the caribou.[341] TMAC clarified that the area it had used was an example of information it collected and that a much larger area was assessed.[342]

TMAC stated that it had engaged traditional knowledge holders in workshops specific to wildlife.[343] These workshops were organized primarily with the Inuit Environmental Advisory Committee (IEAC) which was formed through the 2015 Hope Bay Inuit Impact Benefits Agreement and are made up of knowledgeable Inuit from the region. After receiving questions from a Board Member, TMAC outlined that it consulted with communities to develop a process for selecting committee members who used the Hope Bay area traditionally in the past and present as selected by TMAC and the Kitikmeot Inuit Association (KIA).[344,345,346] These individuals shared ecological knowledge of the Project area and represented the views and values of Inuit harvesters and there was consensus on the protection measures for caribou.[347,348] A

[341] P. Kadlun, Nunavut Impact Review Board, NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2017, pp. 120-121, lines 21-26 and lines 1-10.
[342] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2017, pp. 121-122, lines 20-26 and lines 1-5.
[343] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2017, p 70, lines 8-16.
[344] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2017, pp. 108-109, lines 9-26 and 1-9.
[345] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2017, pp. 108-109, lines 9-26 and 1-9.
[346] H. Ohokannoak, Nunavut Impact Review Board, NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2017, pp. 123-124, lines 23-26 and lines 1-2.
[347] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2017, pp. 108-109, lines 9-26 and 1-9.

Board Member also clarified how often the workshops met with the harvesters and the elders was it just one time.[349] TMAC clarified that the IEAC meet twice (2) a year and also has one (1) site visit; however three (3) separate caribou workshops were conducted to look at wildlife interactions with the proposed Project.[350]

In recognizing that the Proponent has prepared its mitigation programs for the current state of wildlife populations in the area and given the considerable commentary throughout the review period regarding data limitations, the Board highlights that monitoring and adaptive management protocols need to be comprehensive to identify, respond to, and further monitor unexpected variables that deviate from TMAC's existing assessment. Additionally, the Board notes that the data from the Doris North Gold project may continue to have some gaps as construction was suspended in 2009 and recommenced in 2010, was again suspended in 2012 and recommenced in 2015. Therefore, the Board stresses the importance of the Proponent's commitment to continue contributing to and collaborating with the Government of Nunavut's (GN) caribou collaring program and to conduct additional analysis of the data to better understand and mitigate potential effects and potential cumulative effects as simply measuring effectiveness does not fix anything, we need to know what works and what does not work. The Board expects TMAC to continue to develop its Wildlife Mitigation and Monitoring Plan (WMMP) in-line with new research, best practices for management techniques, Traditional Knowledge and Inuit Qaujimaningit to ensure that all impact predictions as presented within the EIS are upheld and monitored throughout the duration of the Project. Should it be revealed that the monitoring and mitigation measures are not effective in limiting impacts to wildlife, specifically caribou, the Board expects that appropriate adaptive management measures will be employed to prevent further impacts.

The Board also noted on several occasions throughout the final written submissions and the Final Hearing that the GN committed to share the caribou data it collects with TMAC and the Memorandum of Understanding includes an agreement to freely share caribou data.

The Board also stresses the important role of the IEAC to ensure that accurate and informative data is collected, analyzed, and considered to supplement the ongoing assessment and refinement of the Project's environmental management measures. The management of caribou is a shared responsibility, and as such, the Board expects comprehensive participation in meetings by the Proponent, relevant government authorities and Parties, stakeholder groups, community participants, and specialists, as required. It will be critically important that all those parties with relevant specialist knowledge are invited to participate and offer perspectives for consideration through this working group, and in turn, that relevant government authorities dedicate sufficient capacity to enable their continued participation through the life of the Project. Although the IEAC will serve a critical oversight function in the monitoring of the WMMP and the Project,

[348] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2017, p 113, lines 1-5.
[349] H. Ohokannoak, Nunavut Impact Review Board, NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2017, p 123, lines 3-5.
[350] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2017, p 123, lines 10-18.

the Board notes that the Proponent is solely responsible for the effective and timely application of adaptive management measures for its Project.

The Board notes that some Community Representatives expressed significant concerns during the Final Hearing with regards to the potential impacts that collars can have on the health and wellbeing of caribou; while outside the scope of this assessment, the Board notes that representatives from the GN and the Proponent took questions and comments on this topic, and may expect to require further discussion with community members on this topic in more appropriate venues.

As noted in the previous section, information regarding the proposed construction and operations of the transmission lines between the Madrid and Boston mine sites was an issue during the Review of the Project and TMAC noted in its closing remarks that the transmission line would reduce potential environmental effects of fuel transfer and storage and would be used to connect all of the facilities by a grid. The transmission lines would also be a significant project enhancement in the efficiency of power production and cost and would reduce the greenhouse gases that would be produced from diesel generators. Further, TMAC indicated that the transmission line project was supported by KIA.[351]

However, the Board notes the outstanding matter with respect to the road design and the lack of information on the design to develop the transmission lines between the Doris North and Boston sites as brought up by the Government of Nunavut during the review of the proposed project (Exhibit 86).[352] As such, the Board wishes to emphasize the need for additional information related to the infrastructure and monitoring and mitigation measures. Wildlife could be affected by the transmission line and its location and it is important to take as many precautions as possible.

5.12.4 Conclusions and Recommendations of the Board

Following a review of the information provided by TMAC in the FEIS, the Board believes that the Project's potential effects related to terrestrial wildlife could be appropriately managed through the commitments provided by the Proponent and application of the following key mitigation measures. The Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- Maintaining a Wildlife Mitigation and Monitoring Plan throughout all phases of the Project that includes monitoring, mitigation, and adaptive management measures for wildlife with: details of thresholds and adaptive management measures for wildlife, consideration for each Project activity predicted to affect wildlife, inclusion of specific triggers for mitigation and adaptive management intervention, and that reflects Inuit

[351] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 1030, lines 9-14.
[352] Government of Nunavut, *Submission to the Nunavut Impact Review Board Regarding the Final Hearing for the Phase 2 Hope Bay Belt Project Proposal (12MN001)*, Exhibit 86, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018.

Qaujimaningit or Traditional Knowledge and significant changes to the Project, wildlife, surrounding environment, etc.;

- Maintaining a Road Management Plan throughout all phases of the Project that includes monitoring of traffic, road design and safe wildlife movement, safety protocols, and snow monitoring practices and analysis of the effectiveness of mitigation for wildlife from road operations;
- Ensuring that specific criteria and procedures are included in the Wildlife Mitigation and Monitoring Plan for wildlife species governing blast zones;
- Requiring clear indication that mitigation measures, trigger distances, and thresholds (to be developed in consultation with the Government of Nunavut) proposed for the protection of caribou and muskox (e.g., blasting, heavy truck traffic, and aircraft) to be included in the Wildlife Mitigation and Monitoring Plan ;
- Ensuring that incident reports are provided to the local wildlife conservation office for any direct wildlife mortalities that occur in association with the Project;
- Developing and implementing measures to prevent the use of water attenuation ponds and tailings storage areas by wildlife, including waterfowl, other migratory birds, and caribou and monitoring to assess the effectiveness of such measures;
- Demonstration that the design for the transmission line joining Doris, Madrid North and South, and Boston does not impact the movement and use of Project areas by caribou, birds, or other wildlife species and outline the mitigation and monitoring measures that would apply to the transmission line.

5.13. BIRDS AND BIRD HABITAT

5.13.1 Views of the Proponent

TMAC Resources Inc. (TMAC, or the Proponent) presented an assessment of potential impacts related to raptors, waterbirds, and upland breeding birds in Volume 4, Section 9 of the Final Environmental Impact Statement (FEIS) and concluded that there would be no significant effects. TMAC assessed potential effects on marine birds within Volume 5, Section 11 of the FEIS, which is summarized in Section 5.15 of this Report. Supporting baseline information from 2010 was used to model wildlife habitat suitability and was provided in Volume 4, Appendix V4-9A. TMAC's Wildlife Mitigation and Monitoring Plan (WMMP) was presented in Volume 8, Annex V8-3.

TMAC's spatial boundaries for its assessment of raptors, waterbirds, and upland breeding birds were the same as were used for its assessment of terrestrial wildlife as well as for vegetation and special landscape features, and were defined as follows:

- Project Development Area (PDA): the Project footprint plus engineering buffers;
- Local Study Area (LSA): extends approximately one (1) kilometre (km) from the boundaries of the project footprint and up to five (5) km in some areas, and encompasses an area of 56,340 hectares (ha); and
- Regional Study Area (RSA): extends approximately 30 km from the project footprint, and encompasses an area of 490,404 ha.

TMAC's temporal boundaries included the construction, operations, reclamation and closure, post closure, and temporary closure phases.

TMAC highlighted Inuit Traditional Knowledge from the *Naonaiyaotit Traditional Knowledge Project* (NTKP)[353] report indicating that waterbirds (including eiders, geese, loons, ducks, mergansers, shorebirds, gulls, and jaegers) and upland birds (especially ptarmigan) were identified as an important source of food for Inuit, while the feathers, meat and eggs of raptors would be used if available.

Within the FEIS, TMAC summarized the results of its baseline surveys for raptors, waterbirds, and upland breeding birds conducted from 2006 to 2015. TMAC observed that four (4) species of cliff-nesting raptors breed in the RSA (peregrine falcon gyrfalcon, rough-legged hawk, and golden eagle) along with common ravens, which are considered to be functional cliff-nesting raptors. In addition, the baseline studies identified that three (3) species of ground-nesting raptors breed within the RSA: snowy owl, short-eared owl, and northern harrier. TMAC's waterbird surveys identified a total of 30 waterbird species breeding and staging within the RSA, while three (3) additional species were detected incidentally in the RSA during other baseline studies. Six (6) of the waterbird species observed by TMAC in the RSA are listed as Sensitive by the Canadian Endangered Species Conservation Council (CESCC): the Arctic tern, glaucous gull, long-tailed duck, northern pintail, common eider and king eider. During the upland breeding bird surveys, a total of 26 upland bird species were detected, while three (3) additional species were recorded incidentally in the RSA. TMAC noted that nine (9) upland bird species listed as Sensitive by CESCC in Nunavut were observed: American golden-plover, American pipit, American tree sparrow, Harris's sparrow, hoary redpoll, least sandpiper, red-necked phalarope, semipalmated sandpiper, and white-crowned sparrow.

In the FEIS, TMAC identified the following potential effects from the Project on raptors, waterbirds, and upland breeding birds:

- Habitat loss;
- Disturbance due to noise and activity;
- Disruption of movement due to infrastructure and lighting;
- Attraction to the Project due to infrastructure, lighting, waste, and prey or roadkill;
- Direct mortality due to collisions with vehicles, aircraft, or project infrastructure;
- Increased access and harvest (waterbirds only); and
- Changes in environmental media quality due to dust and air pollution.

The Proponent listed various mitigative actions to address these potential effects, which in addition to best management practices such as minimizing the Project footprint, implementing proper waste and hazardous waste management, and establishing policies to prohibit wildlife feeding and hunting, included the following:

[353] Banci, V. and R. Spicker, (Compilers, Editors & GIS). 2016. *Inuit Traditional Knowledge for TMAC Resources Inc. Proposed Hope Bay Project, Naonaiyaotit Traditional Knowledge Project (NTKP)*. Prepared for TMAC Resources Inc. Kitikmeot Inuit Association: Kugluktuk, NU.

- Avoid infrastructure development on cliff nesting habitat, waterfowl staging areas and other sensitive habitat where possible;
- Time clearing / construction in sensitive habitats to occur outside of the breeding /nesting period or accompany by pre-clearing surveys;
- Establish buffers to avoid any observed raptor nest until it is no longer actively used;
- Acquire a permit from the Government of Nunavut – Department of Environment before dissuading raptors from nesting on quarry walls or removing an inactive nest;
- Enforce speed limits on roads and maintain minimum flight altitudes with aircraft;
- Monitor water quality and waterbird usage of contact water ponds and exclude waterbirds if required, and do not create sewage ponds;
- Direct lighting into facilities and toward ground when possible;
- Follow the recommended best management guidelines presented by the Edison Electric Institute and the Avian Power Line Interaction Committee to minimize effects of transmission lines and tall structures on birds[354];
- Monitor wind turbines for mortality for two (2) years; and
- Implement the Air Quality Management, Noise Abatement, and Water Management Plans.

Through analyses of long-term monitoring data for the Doris North Gold Mine Project and a review of data and studies from other mines and regions, and in consideration of the aforementioned mitigation and application of the precautionary approach, TMAC determined that there would likely be residual effects from habitat loss, disturbance, and direct mortality for raptors, waterbirds, and upland birds. TMAC noted that with the exception of habitat loss, these effects would be reversible at the end of the Project, and concluded that all effects would be not significant due to the limited area or number of habitats or birds that would be affected, and the general resiliency of the local bird populations.

The Proponent determined that no other substantial past, present, or reasonably foreseeable future projects occur within the RSA and thus no cumulative effects are expected for raptors, waterbirds, or upland birds.

The Proponent noted in the WMMP that monitoring for raptors, waterbirds, and upland birds would occur at the Doris and Boston sites every three (3) years during construction and operations, contingent upon discussions with the Canadian Wildlife Service and the Kitikmeot Inuit Association planned for 2018. In the Final Hearing, TMAC noted that it was in discussions with parties to determine the future of the bird monitoring program given that its ten (10) years of data show little to no effect on birds. TMAC noted that should monitoring results indicate effects beyond those predicted, a review of mitigation measures would be undertaken. TMAC added however that monitoring of wind turbines for mortality would be conducted for two (2) years during operation as per published recommendations by Environment and Climate Change

[354] See also TMAC Resources Inc. List of Commitments Generated in the Proponent's Response to Technical Comments on the Madrid-Boston Final Environmental Impact Statement. Exhibit 84 NIRB Final Hearing File No. 12MN001, May 12, 2018.

Canada and that adaptive management would be triggered if the number of turbine strikes exceeds available guidelines or if any species of conservation concern experiences mortality.

5.13.2 Views and Concerns of Interested Parties

In reference to the Proponent's assessment of potential effects on birds related to the proposed wind turbines, the Kitikmeot Inuit Association (KIA) expressed concern in its final written submission about the methods used by TMAC for baseline migratory standwatch surveys, and about the lack of baseline data collected.[355] Specifically, the KIA identified a disconnect between the preferred turbine locations and locations of standwatch surveys, and also noted that no baseline migratory standwatch surveys were conducted for the Madrid site. The KIA also commented that the timing of TMAC's spring standwatch surveys likely missed the peak migration period, and furthermore, that no spring surveys occurred at one of the Boston survey sites. The KIA requested that TMAC provide clarification on the proposed and preferred wind turbine locations. The KIA also requested that TMAC conduct migration surveys at the proposed Madrid sites, and additional spring migration surveys, at appropriate times to capture peak migration at Boston and Doris sites prior to construction. The KIA further requested that TMAC provide further monitoring details and recommended that TMAC's proposed bird mortality monitoring be timed to also capture peak migration periods. Finally, the KIA questioned why different horizontal distance criteria were used for Boston and Doris sites when assessing whether birds were flying within the potential zone of interaction ("danger zones"), and asked TMAC to provide clarification.

In response to the KIA's final written submission, the Proponent provided a map showing the locations of the standwatch surveys and the preferred locations for the wind turbines[356]. TMAC committed to conducting additional baseline migration surveys at the wind turbine pad locations prior to construction, and during the appropriate survey time period (i.e., earlier in the season) to meet guidance from Environment and Climate Change Canada (ECCC) in order to capture peak migratory activity for raptors, waterbirds, and upland birds. TMAC added that details of the wind turbine raptor mortality monitoring would be finalized in consultation with ECCC and presented in the Wildlife Mitigation and Monitoring Plan (WMMP) prior to construction and the WMMP would be provided to the KIA to review and comment. In reference to the horizontal distance criteria for the migration standwatch surveys, TMAC clarified that these criteria were based on the surveyors proximity to the proposed wind turbine locations, which varied from 750 metres (m) to 5 kilometres (km) to allow the surveyor to have a clear line of site to the turbine locations. TMAC noted that these distance criteria were just one of several criteria used to identify birds within the potential zone of interaction with wind turbines. During the Final Hearing, the KIA confirmed it considered the issue resolved.[357]

In its final written submission, the Government of Nunavut (GN) raised several concerns regarding the Proponent's proposed raptor nest mitigation and monitoring.[358] Firstly, the GN noted that TMAC had not specified the design of its proposed pre-construction raptor nest

[355] Kitikmeot Inuit Association Final Written Submission, March 19, 2018.
[356] TMAC Resources Inc. Response to final written submissions, April 5, 2018.
[357] J. Roesch. Kitikmeot Inuit Association. NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 436, lines 4-10.
[358] Government of Nunavut Final Written Submission, March 19, 2018.

surveys, and recommended that prior to any construction activities during raptor nesting seasons, the Proponent conduct surveys to locate nests within two (2) km of the Project. The GN added that survey design should consider species distribution, density, habitat selection, and timing of nesting. The GN further recommended that if an active nest is located within 1 km of the Project during construction, activities should immediately cease within a specified no-disturbance buffer around the nest. In response to a request for clarification from the Proponent during the Final Hearing,[359] the GN agreed that the work stoppage for active nests found within one (1) km of the Project would not be a definite stoppage but rather a matter of working with the GN to develop a nest protection plan before going ahead with the work.[360]

Within its final written submission, the GN expressed that the proposed no-disturbance buffer of 200 m was too small, and recommended that 1 km be used instead as a general buffer based on monitoring results at the Doris mine and reports from other projects in Nunavut, guidelines from other jurisdictions, and results of several research studies. The GN recommended nest-specific management plans be developed subject to review and approval by the GN, subject matter experts, and other relevant parties. The GN added that a no-disturbance buffer would not apply to the case where a raptor builds a nest on project infrastructure, but that a nest-specific management plan would nonetheless be recommended. The GN further noted in its final written submission that the Proponent's WMMP should be modified to specify that monitoring to identify nests and monitoring of nest occupancy and productivity would continue through construction into operations. The GN recommended that monitoring be conducted to assess the effectiveness of no-disturbance buffers and other mitigation measures, the zone of influence, and as a contribution to regional raptor monitoring. The GN further recommended that the success of nests subject to a management plan should be monitored and compared with those further away from the Project not under a management plan, with the objective of obtaining an 80% level of success. The GN specified that such monitoring need only be conducted for one (1) or two (2) of the most abundance species, excluding ravens.

In response to the GN's final written submission regarding raptor nest monitoring and mitigation, TMAC committed to revise the WMMP to specify that pre-construction surveys of potential cliff-nesting habitat within 2 km of the Project shall occur should construction of new areas occur within the raptor breeding period. TMAC also committed to include site-specific nest mitigation plans for raptor cliff-nest sites within 1 km of the Project footprint, adding that the plans would apply during construction and operations and would be developed in consultation with the GN. TMAC committed to consider a 1 km no blasting or drilling buffer, a 750 m buffer for operation of heavy equipment, and a 250 m buffer for light vehicle traffic around nests.[361] TMAC further noted the other components of monitoring requested by the GN are already a part of the WMMP. TMAC highlighted that the results of the long-term raptor monitoring program for the approved Doris North Gold Mine Project show a 22% difference in nest success within 1.5 km of the project site between years that the project is active and inactive, consistent with the

[359] B. Armstrong, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 10 2018, p. 493, lines 3-12.
[360] S. Pinksen, Government of Nunavut. NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 493, lines 16-20.
[361] TMAC Resources Inc. *List of Commitments Generated in the Proponent's Response to Technical Comments on the Madrid-Boston Final Environmental Impact Statement*. Exhibit 84 NIRB Final Hearing File No. 12MN001, May 12, 2018.

threshold suggested by the GN, and consistent with the Doris North Gold Mine FEIS prediction of a minor effect on raptors within 1 to 10 km^2 of the Project. TMAC noted population level effects with this level of disturbance are unlikely and have not been detected, and reiterated that each raptor territory generally includes multiple nesting sites, and that a raptor choosing to nest adjacent to project infrastructure indicates that raptors and the Project can coexist. TMAC also reiterated a number of key mitigative actions, including design of the Project footprint to avoid known raptor nests, and conducting construction activities outside of the breeding period whenever possible; if not possible, pre-construction surveys would be conducted and buffers applied to any active nests. TMAC noted that it is in ongoing discussions with the GN, the KIA, and ECCC regarding whether monitoring will proceed at the Doris North Gold Mine Project site and as part of the proposed Phase 2 Hope Bay Belt Project given that predictions of the FEIS have already been tested and show little to no effect of the approved project on birds. During the Final Hearing, TMAC added that these discussions will take place once supplemental analysis of monitoring data is conducted, and suggested that future bird monitoring could continue as before, or instead be regional in nature or focused on research.[362]

During the Final Hearing, the GN repeated its recommendation for ongoing monitoring of raptor nests and raptor nesting success at the existing Doris site and expansion of the monitoring program to include raptor nests near the expanded project footprint, for one or two key species.[363]

In its final written submission, ECCC expressed support for the conclusions of the Proponent regarding the potential effects of wind turbines on migratory birds.[364] ECCC reiterated that fog could result in a collision hazard with the turbines, and noted that the number of days of fog considered by the Proponent in the assessment was inconsistent (lower) with that actually observed. ECCC also noted that while the Proponent stated in the FEIS its intent to conduct two (2) years of post-construction bird mortality monitoring, it did not provide any details. ECCC advised that significant survey effort would be required for the monitoring results to be scientifically valid and comparable to other projects. ECCC recommended that the Proponent investigate and consider implementing preventative operational measures to minimize risks to birds during periods of poor visibility at peak bird migration periods. ECCC also indicated that the department and other parties have been engaged by the Proponent to discuss bird monitoring, and recommended that monitoring with regards to wind turbines be added to discussions between the Proponent and interested parties on site-wide bird monitoring objectives and priorities. ECCC's third recommendation was that the Proponent submit all data sets to the centralized *Wind Energy, Bird and Bat Monitoring Database*.

In response to ECCC's comments, TMAC committed to add post-construction monitoring for the proposed wind turbines ongoing discussions with ECCC and other interested parties on site-wide bird monitoring. TMAC also committed to discuss preventive operational mitigation measures for wind turbines during periods of poor visibility at peak bird migration periods. TMAC added

[362] G. Sharam, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2018, pp. 167-168, lines 26 and 1-13.
[363] S. Pinksen, Government of Nunavut. NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, pp. 835-836, lines 9-26 and 1-3.
[364] Environment and Climate Change Canada Final Written Submission, March 19, 2018.

however, that the choice to apply such mitigation measures or to operate the turbines during foggy periods and monitor as planned would depend on the number of foggy days and the extent of monitoring required to meet ECCC guidance. TMAC also noted that it supports regional initiatives aimed at understanding wildlife in the Hope Bay Belt area and committed to submit data sets to the centralized *Wind Energy, Bird and Bat Monitoring Database*. During the Final Hearing, ECCC indicated it considered this issue resolved.[365]

In its final written submission, ECCC also discussed the issue of waterbird attraction to the Tailings Impoundment Area (TIA). ECCC noted that monitoring data from other operating mines in the North suggests that waterbirds can make extensive use of water management ponds, but the Proponent's Human Health and Environmental Risk Assessment (see Section 7.2 of this Report) assumes that most wildlife would be deterred from the TIA. ECCC found the Proponent's FEIS to be lacking a description of the design features of the TIA and other storage areas intended to minimize attraction to and deter birds from using them. ECCC also commented that it was unclear if monitoring and use of deterrence is currently being conducted on site at existing operations (i.e., at the approved Doris North Gold Mine). ECCC recommended that the Proponent revise the WMMP to include monitoring of waterbird and shorebird usage of the TIA and other water storage areas and ensure that it is reported on in the annual WMMP reports. ECCC also recommended that the Proponent clarify whether the use of deterrents would be standard practice, or only if water quality does not meet acceptable standards. ECCC further recommended that the Proponent assess existing design features at the TIA and other water storage areas to determine if additional design measures are feasible to limit exposure times for migratory birds in those areas.

In response to ECCC's comments regarding waterbird attraction to the TIA at the existing Doris North Gold Mine, the Proponent committed to updating the WMMP to include more detail on the existing monitoring and mitigation for waterbirds in the TIA, including:

1. Conduct a baseline survey for waterbirds and shorebirds at the TIA, in consultation with ECCC to characterize the bird community and use of the TIA
2. Monitor water quality in the TIA on a regular basis during operations;
3. If the baseline survey indicates that birds are using the TIA, TMAC will conduct a toxicological risk assessment in consultation with ECCC.
4. If that risk assessment indicates that there is reasonable risk to birds then TMAC will monitor for ongoing bird usage of the TIA and will engage with the Inuit Environmental Advisory Committee (IEAC) and ECCC to select appropriate deterrence methods.

These commitments were also provided as Exhibit 84 during the Final Hearing.[366]

In its response to concerns highlighted in ECCC's final written submission, TMAC stressed that water quality predictions for the TIA have indicated that the water quality will meet guidelines

[365] B. Summerfield. Environment and Climate Change Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 504, lines 1-11.
[366] TMAC Resources Inc. *List of Commitments Generated in the Proponent's Response to Technical Comments on the Madrid-Boston Final Environmental Impact Statement*. Exhibit 84 NIRB Final Hearing File No. 12MN001, May 12, 2018.

required for the protection of wildlife. TMAC also highlighted that monitoring at the TIA for the approved Doris North Gold Mine Project detected some use of the TIA by waterbirds in 2017, but noted that the area of open water here would decrease as more tailings are deposited, thus reducing the probability that waterbirds will use the TIA.

TMAC also noted the following existing design features:

1. Capping the TIA at closure, and allowing the North Dam to breach to return flow to Doris Creek once water has met the required discharge criteria;
2. Designing infrastructure to avoid areas such as wetlands and migratory staging areas;
3. Maintaining contact water ponds in a dry state except during rain events or following snow melt;
4. Not generating any sewage ponds; and
5. Placing a low permeability cover including a geomembrane over the Boston TMA, breaching the water containment berms, and cutting the liner to avoid any water collecting.

During the Final Hearing, ECCC indicated it considered this issue resolved with the commitments made by TMAC.[367]

During the Final Hearing, the NIRB staff noted the Proponent's emphasis on its long-term monitoring data available from the approved Doris North Gold Mine Project, and asked the Proponent to clarify whether there were any gaps in its monitoring data from when the Doris North Project was in care and maintenance, and if so, how were such gaps accounted for, and how did they impact the confidence of predictions.[368] TMAC confirmed that its wildlife monitoring programs at the Doris North Project had begun prior to construction, had continued through care and maintenance, and are still in operation today. However, TMAC noted the exception of the bird monitoring program, which had also begun prior to construction and continued through care and maintenance, but had been discontinued two (2) years ago when TMAC decided to monitor every three (3) years for some bird groups rather than on an annual basis. TMAC reiterated that it is in discussions with ECCC, the KIA, and the GN about what the future of the bird monitoring program should be, given that the ten (10) years of data show little to no effect on birds. TMAC highlighted that its confidence in the effects assessment is high, given it has data from before and during construction of the Doris project, and periods with and without operation of that project.[369]

During the Final Hearing, the NIRB staff also asked the KIA if it anticipates the Inuit Impacts Benefits Agreement (IIBA) under negotiation for the proposed project would be designed to address possible bird strikes and mortalities and associated compensation for the proposed wind

[367] B. Summerfield. Environment and Climate Change Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, pp. 504-505, lines 23-26 and 1-16.
[368] R. Barry, Nunavut Impact Review Board staff. NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p 230, lines 1-16.
[369] G. Sharam, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, pp. 230-232, lines 21-26, 1-26, and 1-3.

mills.[370] In response, the KIA stressed that the IIBA has already been negotiated and was signed March 31, 2015 and noted that the IIBA does not specifically mention windmills as no information about the windmills was available at that time. The KIA added however that there is a wildlife compensation schedule in the agreement, which includes a mechanism to discuss compensation for circumstances such as this.[371] The NIRB staff subsequently asked the KIA whether it plans to update the existing benefits agreement, given the *Nunavut Agreement* requires IIBAs to be consistent with the terms and conditions of project approvals, including project certificates issued by the Board.[372] The KIA noted in response that the agreement may be amended if both parties agree an amendment is warranted.[373]

During the Final Hearing, a Community Representative from Cambridge Bay referred to an incident from the previous summer when many dead birds were found along the shores surrounding the community of Cambridge Bay. The Representative asked ECCC if anyone knew what had happened to the birds and if the community was informed of the results.[374] TMAC noted that it knew of the snow goose die off and believed it was because of overpopulation of the species resulting from the nearby Queen Maud Gulf Bird Sanctuary.[375] In a deferred response, ECCC stated that laboratory analysis had confirmed that the death of the birds was due to natural causes. Specifically, that the snow geese were young and were attempting to cross between Victoria Island and the mainland during a time period when there was an extensive period of high winds and fog, and the birds were not robust enough to survive the migration.[376]

5.13.3 Views of the Board

The Board acknowledges the Proponent's effects assessment of birds and bird habitat, and the commentary that took place throughout the Review process and during the Final Hearing between the Proponent and parties regarding project-related effects on birds and bird habitat. The Board understands the concerns expressed parties regarding potential impacts of the Tailings Impoundment Area (TIA) on waterbirds, with wind turbines on migratory birds, and with the potential for the project to adversely impact raptor populations through impacts on nesting. The Board acknowledges the importance of data completeness and ongoing monitoring, and appreciates TMAC's commitment to conduct additional baseline surveys to improve understanding of bird usage in the areas of the TIA and proposed wind turbines, and a commitment to conduct pre-construction surveys for raptor nests if construction is to occur during the breeding season. The Board believes that a precautionary approach that incorporates

[370] R. Barry, Nunavut Impact Review Board staff, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, pp. 471-472, lines 21-26 and 1-5.
[371] G. Clark, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 472, lines 10-20.
[372] R. Barry, Nunavut Impact Review Board staff, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, pp. 472-473, lines 25-26 and 1-7.
[373] G. Clark, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 473, lines 12-19.
[374] J. Evalik, Cambridge Bay, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 936, lines 13-22.
[375] A. Buchan, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, pp. 938-939, lines 19-26 and 1-4.
[376] B. Summerfield, Environment and Climate Change Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, pp. 944-945, lines 18-26 and 1-7.

local knowledge and scientific guidance should be applied to mitigation, monitoring, and management plans associated with migratory birds.

The Board also understands the Proponent has conducted a bird monitoring program associated with the approved Doris North Gold Mine Project and is presently engaging with parties to determine an appropriate and meaningful bird monitoring program for the Project moving forward. During the Final Hearing, the Board acknowledged TMAC's discussions with Environment and Climate Change Canada (ECCC), the Kitikmeot Inuit Association (KIA), and the Government of Nunavut (GN) regarding the future of the bird monitoring program. The Board asked TMAC to clarify the current status of the program, and when results of those ongoing group discussions would be available.[377] TMAC replied that the discussions will continue this year [2018] and TMAC expects to be able to provide an update on the monitoring program in April of 2019 within its next annual report to the NIRB for the Doris North Gold Mine Project.[378] The Board subsequently asked TMAC if its monitoring report was shared with the GN.[379] TMAC confirmed that the report is submitted to NIRB and circulated to interested parties including the GN, and that TMAC endeavours to hold meetings with parties as required to discuss their comments and to find resolution or a path forward for identified issues.[380]

During the Final Hearing, the Board also asked the Proponent to clarify how it plans to keep birds from using the TIA.[381] In response, TMAC stated that it does have bird deterrent equipment currently available at Hope Bay, and indicated that on occasion, particularly in the springtime, it has used it to deal with the issue of waterfowl landing on airstrips and interfering with flights. TMAC specified that the uses of the bird deterrents at site to deter waterfowl from the tailings impoundment area are subject to approval from ECCC.[382]

The Board reminds the Proponent to ensure that the mitigation and monitoring strategies developed for Species at Risk are updated as necessary to maintain consistency with any applicable status reports, recovery strategies, action plans, and management plans that may become available through the duration of the Project.

5.13.4 Conclusions and Recommendations of the Board

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board believes that the Project's potential effects to birds and bird habitat could be appropriately managed through the commitments provided by the Proponent and the application of key mitigation and monitoring measures. The Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9:

[377] P. Kadlun, Board Member, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018 p. 247, lines 7-16.
[378] O. Curran, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 248, lines 16-26.
[379] P. Kadlun, Board Member, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018 p. 250, lines 11-14.
[380] O. Curran, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, pp. 250-251, lines 17-26 and 1-3.
[381] P. Kadlun, Board Member, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018 p. 934, lines 15-25.
[382] A. Buchan, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 935, lines 4-16.

Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- Assessment of bird usage of the Tailings Impoundment Area (TIA), monitor water quality at the TIA, and if warranted, monitor for ongoing bird usage of the TIA and engage the Inuit Environmental Advisory Committee IEAC and Environment and Climate Change Canada on deterrence methods;
- Conducting pre-construction surveys for raptor nests if construction is to occur in the raptor breeding period; nest-specific management plans to be developed for nests located within one (1) kilometre of project activities;
- Contacting the Government of Nunavut – Department of Environment prior to any removal or deterrence of raptors;
- Conducting additional mitigation to prevent bird mortalities from wind turbines and/or commit to post-construction mortality monitoring at the wind turbines; and
- Continuing site-wide bird monitoring to assess potential impacts on birds, or commit to a regional or research-based monitoring program.

5.14. MARINE ENVIRONMENT (PHYSICAL PROCESSES AND WATER AND SEDIMENT QUALITY)

5.14.1 Views of the Proponent

TMAC Resources Inc. (TMAC, or the Proponent) provided its assessment of potential project effects on the marine physical processes, marine water quality, and marine sediment quality in Volume 5, Sections 6, 7, and 8 of the Final Environmental Impact Statement (FEIS), respectively. Supporting baseline data were presented in Volume 5, Appendices V-7A through V-7E, with TMAC noting that relevant data is also contained with the annual Doris North Gold Mine Project's Aquatic Effects Monitoring Program Reports. Results of TMAC's marine modeling were presented in Volume 5, Appendices V5-8A, V5-8B, and V5-8C. Proposed environmental management plans to inform monitoring and mitigation measures for potential project effects to the marine environment included the Aquatic Effects Monitoring Plan (Volume 1, Annex V1-7, Package P4-18) and the Oil Pollution Prevention Plan (Volume 8, Appendix V8-1). TMAC considered marine physical processes to be a Subject of Note, noting the limited potential for project-related activities to alter the physical structure and mixing processes in Roberts Bay. TMAC concluded that there would be no significant residual effects of the Project on marine water quality nor on marine sediment quality to project activities.

TMAC identified the following spatial boundaries for its assessment of potential project impacts on the marine environment:

- Project Development Area (PDA) – the Project footprint plus engineering buffers.
- Local Study Area (LSA) – includes the Project Development Area (PDA) encompassing land- and marine-based infrastructure in Roberts Bay and near-shore marine waters, seabed, and shoreline around the bay and Melville Sound, for a total assessment area of 1,430 hectares (ha).

- Regional Study Area (RSA) – includes the marine LSA; the proposed shipping lane within Bathurst Inlet and shoreline of Melville Sound, including several islands east of Ida Bay into the northernmost portion of Bathurst Inlet, for a total assessment area of 299,971 ha.

The temporal boundaries identified in TMAC's assessment aligned with all project phases, including construction, operations, reclamation and closure, post-closure and possible temporary closure.

TMAC's summary of Inuit Qaujimajatuqangit from the *Naonaiyaotit Traditional Knowledge Project* (NTKP)[383] report highlighted that local Inuit have observed a decrease in water levels in the ocean and in estuaries, and regard the sea ice as being thinner now with different surface characteristics compared to in the past. In its summary of existing and baseline conditions, TMAC also included quantitative observations showing a decrease in ice concentration in marine waters of the Canadian Arctic in recent years. TMAC's summary of baseline data for marine physical processes also indicated that Roberts Bay has a mean depth of 36 m, good clarity, is typically ice covered from October to June, and has a strongly stratified water column. TMAC also observed that wind drives water levels and water circulation in the bay, and that there is free exchange of water between Roberts Bay and Melville Bay during the open water season. TMAC also presented baseline summary statistics for pH, total suspended solids and turbidity, dissolved oxygen, nutrients, and metals, and demonstrated that metal concentrations in water and sediment were mostly below guidelines from the Canadian Council of Ministers of the Environment (CCME) for the protection of aquatic life.

TMAC identified the following project components and pathways with the potential to interact with the marine environment:

- Sealifts and other vessels (wake and propeller wash, ballast water, sewage, antifouling agents, aerial deposition of airborne emissions);
- Site preparation, construction, and decommissioning activities including in-water construction of the cargo dock, which can have direct physical impacts on the marine environment or lead to runoff;
- Site contact water (possible runoff from the terrestrial environment into the marine environment);
- Storage and use of fuels and oils such as at the Roberts Bay fuel tank farm, and generation of polycyclic aromatic hydrocarbons (PAH) such as through combustion of wastes, and the potential for these substances to enter the marine environment via runoff or aerial deposition;
- Direct discharges from the Tailings Impoundment Area (TIA) and of saline groundwater into Roberts Bay; and
- Aerial deposition of dust into the marine environment from vehicle traffic, airstrip activity, quarry and borrow pit activities.

[383] Banci, V. and R. Spicker, (Compilers, Editors & GIS). 2016. *Inuit Traditional Knowledge for TMAC Resources Inc. Proposed Hope Bay Project, Naonaiyaotit Traditional Knowledge Project (NTKP)*. Prepared for TMAC Resources Inc. Kitikmeot Inuit Association: Kugluktuk, NU.

Water Quality

For its assessment of project effects on marine water quality, TMAC considered eight (8) indicators: pH, total suspended solids (TSS), nutrients, metals, hydrocarbons, dissolved oxygen, salinity, and cyanide. TMAC based its assessment on thresholds from the CCME Water Quality Guidelines for the Protection of Aquatic Life, when available. TMAC indicated that quantitative modelling was used to support the assessment of potential effects from sealifts and the discharge of groundwater and water from the existing tailing impoundment area (TIA) at the approved Doris North Gold Mine Project.

TMAC identified the potential for residual effects on marine water quality from sealift activities (physical disturbances from propeller wash). TMAC noted that wash from propellers could disturb marine sediments in and around Roberts Bay and Melville Sound, which could increase total suspended solids in the water column and cause an exchange of nutrients and metals between media. TMAC rated the magnitude of this effect as low because predicted concentrations of water quality indicators would be within baseline ranges and below CCME thresholds. TMAC predicted that propeller wash disturbance would be restricted to the LSA and would be infrequent due to the limited number of vessels anticipated to visit the area each shipping season but could occur from construction through closure. TMAC concluded the residual effect of propeller wash on the marine water quality VEC would not be significant.

TMAC also identified the potential for residual effects on marine water quality from site preparation, construction and decommission activities. TMAC noted that the construction of infrastructure, in particular the in-water construction of the cargo dock but also on-land activities, could cause negative residual effects to marine water quality as the physical disturbance of surfaces and associated runoff can mobilize and transport sediments, which in turn can alter concentrations of suspended sediments, metals, organic carbon, and hydrocarbons in the marine environment. TMAC considered this potential residual effect to be of moderate magnitude, highlighting that it would use geochemically suitable materials for construction and would install erosion and sedimentation control measures such as a silt curtain during construction. TMAC added that the silt curtain would ensure the effects are confined to the marine PDA in the waters immediately surrounding the dock. TMAC concluded that potential residual effects from in-water construction works would not be significant.

TMAC also identified the potential for residual effects on marine water quality from runoff of site contact water into the marine environment. TMAC noted that runoff from roads, pads, and laydown areas can mobilize and transport sediments and sediment-associated metals, nutrients, organic matter, and hydrocarbons, but reiterated that it would use geochemically suitable materials for construction, and would implement erosion and sedimentation control measures. The Proponent predicted that runoff would be expected to occur mainly during snowmelt and freshet in the spring, or following rainfall events in the summer and fall. TMAC concluded that potential residual effects from run-off of site contact water would not be significant.

The fourth and last potential residual effect on marine water quality identified by TMAC was through direct discharges into Roberts Bay of groundwater and TIA water. TMAC noted that its modelling predicted that discharge would lead to modest increases in the concentrations of some metals and nutrients in the water, but rated the magnitude of the effect as moderate given that

concentrations are expected to remain substantially below applicable CCME water quality thresholds and to be limited to within 15 m of the diffuser. TMAC concluded that potential residual effects on marine water quality from discharges would not be significant.

Sediment Quality

For its assessment of project effects on marine sediment quality, TMAC considered four (4) indicators: Particle size; nutrients and Organic Carbon; metals; and hydrocarbons. TMAC based its assessment on thresholds from the CCME Water Sediment Guidelines for the Protection of Aquatic Life, when available.

TMAC identified the potential for residual effects on marine sediment quality from sealift and shipping activities (physical disturbances from propeller wash). TMAC noted that vessel traffic could mobilize sediments even after mitigation measure such as reduced speeds are implemented. TMAC described that this mobilization and redistribution of sediments could mean a redistribution of metals, noting that finer sediments tend to have higher concentrations of metals than coarser sediments. However, TMAC noted that this effect also occurs naturally during storm events, and given that only five to seven ships are expected each year in Roberts Bay, TMAC considered the effect to be of low magnitude and infrequent, and concluded that the effect would not be significant.

TMAC identified the potential for residual effects on marine sediment quality from in-water construction of the marine dock in Roberts Bay, which could mobilize and redistribute sediments. TMAC considered this potential residual effect to be of low magnitude, highlighting that it would use geochemically suitable materials for construction and would install erosion and sedimentation control measures such as a silt curtain during construction. TMAC added that the silt curtain would ensure the effects are confined to the marine PDA in the waters immediately surrounding the dock. TMAC concluded that potential residual effects on marine sediment quality from in-water construction of the dock at Roberts Bay would not be significant.

5.14.2 Views and Concerns of Interested Parties

Within its final written submission, Indigenous and Northern Affairs Canada (INAC) expressed concerns regarding the Proponent's inconsistent and conditional statement regarding the discretionary use of silt curtains during marine construction to reduce turbidity from in-water works.[384] INAC specifically recommended that the Proponent commit to install and use silt/turbidity curtains during all in-water construction. In response, TMAC noted that it expected that the construction of the cargo dock will require an authorization from Fisheries and Oceans Canada (DFO), which would include provisions for construction methods, monitoring and reporting.[385] During the Final Hearing, INAC expressed that TMAC's initial response on the discretionary use of silt curtains during marine construction was unsatisfactory, but with TMAC subsequently committing to install and use silt curtains during in-water construction unless otherwise directed by DFO,[386] INAC concluded that the issue has been resolved.[387]

[384] Indigenous and Northern Affairs Canada Final Written Submission, March 19, 2018.
[385] TMAC Resources Inc. Response to final written submissions, April 5, 2018.
[386] TMAC Resources Inc., List of Commitments Generated in the Proponent's Response to Technical Comments on the Madrid-Boston Final Environmental Impact Statement. Exhibit 84, NIRB Final Hearing File No. 12MN001, May 12, 2018.

Within its final written submission, Transport Canada (TC) noted that the recommendations it made in 2017 during the technical review period remain unchanged, and that TMAC has agreed to adhere to the recommendations and to provide any outstanding information prior to construction.[388] During the Final Hearing, TC summarized these recommendations and TMAC's commitments, which included obtaining approval from TC prior to construction of any physical works in Roberts Bay, determining whether it will opt in for any works on non-scheduled water ways, updating its oil pollution emergency plan (OPEP), and obtaining an amended letter of compliance regarding marine security.[389] In its final written submission, TC added one additional recommendation concerning wording in the FEIS. Specifically, TC noted that the *Transportation of Dangerous Goods Act* and associated regulations are not applicable to onsite storage of reagents at the Doris North Site and Boston Site, and recommended that TMAC amend the wording in the FEIS to state that hazardous materials (including reagents) will be handled, offered for transport, or transported in accordance with the requirements of the *Transportation of Dangerous Goods Act* and associated regulations. In its response, TMAC agreed to use the correct wording in future documentation. TMAC concluded during the Final Hearing that it has no outstanding concerns.[390]

During the Final Hearing, a Community Representative from Taloyoak asked TMAC how many ships would be transporting fuel and wondered if the cargo dock and offloading site would be large enough to accommodate the expected number of ships.[391] TMAC responded noting that the number of ships for its proposed project would depend on the size of the ships to be used, and the year and how construction activities on site are sequenced. TMAC specified that it expects three (3) to four (4) per year cargo ships and two (2) to three (3) fuel ships each year. TMAC also clarified that it has taken into consideration how long it takes to unload vessels in the cargo dock.[392]

During the Final Hearing, a Community Representative from Kugluktuk asked whether TC would be revamping its shipping corridor to accommodate more repeater stations for the VHF radios in some communities to allow communities to respond to search and rescue incidents.[393] TC responded that it is unable to confirm whether there will be changes or improvement to the repeater stations in the communities, but that it is aware of the Government of Canada's initiative, under the Oceans Protection Plan, to improve safety and security and environmental protection related to marine shipping in Canada including the Arctic.[394]

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[387] F. Ngwa, Indigenous and Northern Affairs Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10 2018, pp. 581-582, lines 14-26, and 1-6.
[388] Transport Canada Final Written Submission, March 19, 2018.
[389] A. Gudmundson, Transport Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10 2018, pp. 512-515, lines 13-26, 1-26, 1-26, and 1-2.
[390] A. Gudmundson, Transport Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10 2018, p. 515, line 2.
[391] S. Qingnaqtuq, Taloyoak. NIRB Final Hearing File No. 12MN001 Transcript, May 11 2018, p. 755, lines 5-21.
[392] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 11 2018, pp. 756-757, lines 1-26 and 1-21.
[393] L. Adjun, Kugluktuk, NIRB Final Hearing File No. 12MN001 Transcript, May 12 2018, p. 886, lines 7-19.
[394] A. Gudmundson, Transport Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 12 2018, pp. 886-227, lines 24-26 and 1-18.

During the Final Hearing, a Community Representative from Kugluktuk asked Transport Canada to clarify whether the shipping route from east to west would be updated so that tankers travelling through the shipping route would not run aground.[395] In response to this question, TC indicated that it does not have shipping routes or provide any specific updates to any shipping route, but clarified that it is up to the captain of a ship to determine which route to take to ensure that it can transit safely with their vessel.[396]

During the Final Hearing, NIRB staff asked TMAC to describe why it elected not to provide or develop a shipping management plan as part of its environmental management system.[397] In response, TMAC stated that the stringent regulatory regime that exists for shipping in Canada and in the Canadian Arctic is such that there are management plans already in place or regulated for shipping companies, such as a Shipboard Oil Pollution Emergency Plan (SOPEP). TMAC also reiterated that its Oil Pollution Emergency Plan (OPEP) is approved and in place for fuel offloading at Roberts Bay. TMAC added that under the existing Doris North Project Certificate, shipping companies must stay away from areas of importance for marine mammals and higher densities of birds.[398] NIRB staff subsequently asked TMAC how it ensures its environmental management system - including incorporation of Inuit participation and knowledge – is implemented by its contracted shipping companies.[399] In response, TMAC pointed again to the existing regulations as a sufficient mechanism to address concerns from community members regarding fuel spills, and also noted that the Inuit Impact Benefit Agreement (IIBA) requires TMAC to use Kitikmeot-owned businesses and companies for shipping to the extent possible.

A Community Representative from Gjoa Haven expressed the desire for pristine marine waters in the area, and noted that there is much to be discovered. The Representative asked TMAC to clarify why its discharge pipe would be installed in the ocean rather than into a lake, and whether or not it would be permanent.[400] TMAC replied that it has studied Roberts Bay over a number of years and know it well. TMAC indicated that the discharge into Roberts Bay will be saline water from underground workings at the Doris North project, and it would not be appropriate to discharge saline water into the freshwater environment. TMAC stressed that water would not be discharged into the ocean unless it meets water quality criteria. TMAC added that the discharge pipe is necessary for the Doris North Gold Mine Project but it would be used for longer if the Project is approved. TMAC noted that the pipe will ultimately be removed.[401]

[395] P. Taktagon, Kugluktuk, NIRB Final Hearing File No. 12MN001 Transcript, May 12 2018, p. 888, lines 24-26.
[396] A. Gudmundson, Transport Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 12 2018, p. 889, lines 6-23.
[397] R. Barry, Nunavut Impact Review Board staff, NIRB Final Hearing File No. 12MN001 Transcript, May 9 2018, p. 399, lines 9-16.
[398] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 9 2018, pp. 399-401, lines 22-26, 1-26 and 1-4.
[399] R. Barry, Nunavut Impact Review Board staff, NIRB Final Hearing File No. 12MN001 Transcript, May 9 2018, p. 401-402, lines 12-26 and 1-11.
[400] U. Puqiqnak, Gjoa Haven, NIRB Final Hearing File No. 12MN001 Transcript, May 11 2018, pp. 739-740, lines 11-26 and 1.
[401] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 11 2018, pp. 741-744, lines 12-26, 1-26, 1-5, 19-26, and 1-18.

A Community Representative Taloyoak asked TMAC whether tailings would be deposited in the ocean.[402] TMAC clarified that tailings are not directly deposited into a lake nor into the ocean, but rather into the TIA at the Doris North site or the dry-stack TMA at Boston, and that water from the TIA will be discharged into Roberts Bay.[403]

A Community Representative from Kugaaruk asked TMAC whether there would be filters on the discharge pipe into Roberts Bay to prevent contaminants from entering into the ocean, noting concern for marine wildlife. [404] In response, TMAC stressed that the water to be discharged into Roberts Bay is saline and comes from the reclaimed pond at the Doris North TIA, and that the quality of the water will be monitored and treated if necessary prior to discharge. TMAC emphasized that the discharge pipeline into Roberts Bay is already approved and TMAC will be monitoring the performance of its water management system whether or not the proposed project is approved. TMAC described the water sampling and other biological sampling it is required to conduct to ensure only safe water is being discharged.[405]

The Representative from Kugaaruk later reiterated the importance of keeping the oceans pristine, and asked ECCC if any additional mitigative measures could be applied to ensure there are no adverse impacts from TMAC's discharge of water into Roberts Bay.[406] ECCC replied that under the *Fisheries Act*, the *Metal Mining Effluent Regulations* set very protective limits for water quality that the Proponent must meet before discharging any water and that ECCC oversees a monitoring program to ensure the Proponent continues to meet these criteria.[407] In response to a request from a Community Representative from Taloyoak to clarify its monitoring and reporting role,[408] ECCC noted that TMAC produces a report that goes directly to ECCC for review, and a second report that goes to the Nunavut Water Board which also gets reviewed by ECCC.[409] TMAC reiterated that it would meet the necessary criteria before discharging to the marine environment, using filters or applying appropriate treatment if required,[410] and highlighted that in addition to taking water samples, it monitors sediments and invertebrates in Roberts Bay. TMAC added that it ECCC does site inspections as well.[411]

[402] S. Qingnaqtuq, Taloyoak, NIRB Final Hearing File No. 12MN001 Transcript, May 11 2018, p. 758, lines 1-4.
[403] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 11 2018, pp. 759-760, lines 1-26 and 1-4.
[404] C. Krejunark, Kugaaruk, NIRB Final Hearing File No. 12MN001 Transcript, May 11 2018, pp. 765-766, lines 22-26 and 1-2.
[405] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 11 2018, p. 766, lines 12-26 and pp. 768-769 lines 1-26 and 1-6.
[406] C. Krejunark, Kugaaruk, NIRB Final Hearing File No. 12MN001 Transcript, May 12 2018, p. 916, lines 10-23.
[407] B. Summerfield, Environment and Climate Change Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 12 2018, p. 917, lines 3-15.
[408] S. Qingnaqtuq, Taloyoak, NIRB Final Hearing File No. 12MN001 Transcript, May 12 2018, p. 918, lines 17-22.
[409] B. Summerfield, Environment and Climate Change Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 12 2018, p. 919, lines 3-12.
[410] M. Rykaart, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 12 2018, pp. 917-918, lines 19-26 and 1-10.
[411] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 12 2018, pp. 921-922, lines 5-26 and 1.

5.14.3 Views of the Board

The Board acknowledges the information provided by TMAC on the marine environment in the FEIS and noted the comments and concerns made by intervening parties throughout the Review of the Project. The Board acknowledges TMAC's commitment to install silt curtains during in-water construction works, unless directed otherwise by DFO during the regulatory phase.

The Board understands the importance of the marine environment to Nunavummiut and appreciates the Proponent's incorporation of Inuit Qaujimajatuqangit into its assessment. The Board encourages the Proponent to continue engaging with local Inuit when finalizing its management and monitoring plans as there is a wealth of local and traditional knowledge regarding the marine environment in Roberts Bay and Melville Sound. In this context, during the Final Hearing, the Board asked TMAC whether it had considered the currents in Melville Sound and Roberts Bay – not just in the open-water seasons, but throughout the year - noting that the whole Bathurst Inlet area has a very strong current.[412] The Board also remarked that it is known that there are places within Elu Inlet and Bathurst Inlet that do not freeze completely during winter, and asked TMAC to clarify its statement that water from Roberts Bay mixes with water in the rest of the Inlet several times each year.[413] In its responses, TMAC noted that water is continuously exchanging from Roberts Bay into Melville Sound and acknowledged that this continuous through the winter, but stated that most exchange occurs when the water is open because the process is driven by winds. TMAC added that during the open water season, Roberts Bay is completely flushed every few weeks.[414, 415]

The Board remains concerned about the potential long-term impacts of effluent discharge into Roberts Bay. The Board acknowledges the role of regulatory authorities, namely INAC and ECCC, in ensuring the pipeline and associated effluent do not adversely impact the marine environment, and stresses the importance of frequent monitoring to ensure the effluent continues to meets water quality requirements over time. The Board continues to recommend, as per the Doris North Gold Mine Project Certificate, that the pipeline and diffuser are ultimately removed when no longer in use.

The Board also understands the concerns raised Parties regarding potential ship grounding and marine fuel spills. The Board recognizes TMAC's commitments to work with Transport Canada to obtain the required approvals regarding marine safety and security and to update its Oil Pollution Emergency Plan (OPEP) / Oil Pollution Prevention Plan (OPPP). The Board is also aware that the Proponent has agreed to comply with relevant regulations including the *Canada Shipping Act* and the *Transportation of Dangerous Goods Act* and associated regulations to ensure marine safety and security. The NIRB also encourages TMAC to work with the communities to communicate information regarding its shipping schedules in order to ensure that

[412] A. Maghagak, Chair, NIRB Final Hearing File No. 12MN001 Transcript, May 9 2018, pp. 321-322 and 323, lines 22-26, 1-5 and 4-9.
[413] P. Kadlun, Nunavut Impact Review Board member, NIRB Final Hearing File No. 12MN001 Transcript, May 11 2018, pp. 773-774 and 775, lines 16-26, 1-3 and 12-17.
[414] M. Henry, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 9 2018, p. 322, lines 8-26.
[415] M. Henry, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 11 2018, pp. 774-775, lines 8-26 and 1-8.

shipping activities associated with the Project do not interfere with the recreational and/or traditional activities for local residents.

5.14.4 Conclusions and Recommendations of the Board

After reviewing the information provided by TMAC in the EIS as well as considering the views of Parties, the Board believes that the Project's potential effects related to the marine environment could be appropriately managed through the commitments provided by the Proponent and application of mitigation measures. The Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- Maintaining a publically-available standalone Shipping Management Plan that includes
  - Applicable legislation, regulations, guidelines, and the Proponent's commitments and non-confidential contracting provisions to address potential adverse ecosystem effects of shipping activities;
  - Procedures for providing advance notice of Project-related shipping activities to potentially-affected communities; and
  - Updates to Project shipping activities implemented to address concerns identified through the Proponent's public engagement efforts
- Contracting only Transport Canada certified vessels to carry cargo for the Project, and ensure shippers are informed of the applicable operational plans and commitments.

5.15. MARINE WILDLIFE (INCLUDING FISH AND FISH HABITAT)

5.15.1 Views of the Proponent

TMAC Resources Inc. (TMAC, or the Proponent) provided its assessment of potential project effects on marine fish and fish habitat in Volume 5, Section 10 of the Final Environmental Impact Statement (FEIS), and its assessment of potential project effects on marine wildlife in Volume 5, Section 11 of the FEIS. TMAC identified marine fish and habitat, marine mammals, and marine birds as Valued Ecosystem Components (VECs) and as focus areas for its assessment of potential effects on marine wildlife. Supporting marine baseline information, including marine fish habitat studies, and proposed environmental management plans include the conceptual marine fisheries offsetting approach were presented in Volume 5, Appendices V5-10A through V5-10G, and V5-11A including Volume 8, Appendix V8-3. TMAC predicted that project effects on marine fish and wildlife, after mitigation, would not be significant. The Proponent established the spatial boundaries for the assessment of project effects on marine wildlife, including fish and fish habitat, to encompass the following:

- Project Development Area (PDA): the Project footprint, plus engineering buffers.
- Local study area (LSA): the area surrounding the PDA within which there is a reasonable potential for immediate effects on a VEC due to an interaction with a Project component(s) or physical activity. The LSA for marine wildlife is set to encompass Roberts Bay and is bounded by the shoreline around the bay and where it exchanges

water with Melville Sound. The marine LSA used for the assessment of effects on marine fish VECs has an area of approximately 14.3 km^2 and includes the PDA of the cargo dock and its near-shore marine waters, seabed, and shorelines.

- Regional study area (RSA): the broader spatial area representing the maximum limit where potential direct or indirect effects may occur. The RSA encompasses the PDA and LSA, and is bounded by the shoreline of Melville Sound from the chain of islands just east of Ida Bay into the northern portion of Bathurst Inlet. The marine wildlife RSA includes the proposed sealift lane within Bathurst Inlet and Melville Sound that will bring sealifts and fuel into the Roberts Bay LSA.

TMAC defined the temporal study boundaries over project phases to include the construction, operations, reclamation and closure, and post-closure phases and temporary closure phases of the Project.

TMAC's summary of Inuit Qaujimajatuqangit from the *Naonaiyaotit Traditional Knowledge Project* (NTKP)[416] report included the following:

- Ringed seals were identified as the most important marine mammal to the local Inuit as they are hunted for food, and their fur used for boot soles, kayaks, and tents;
- Bearded seal, harp seal, hooded seal, and killer whales are not commonly observed in the MRSA; Walrus and Polar Bear were historically rare in the MRSA.
- Inuit value a suite of marine fish species, mainly cod and Arctic Char as food fish and as key attributes of marine aquatic systems.
- Locations where valued animal species are more abundant and hunted, environmental components, and traditional land use activities in marine areas that overlap the marine shipping corridor proposed for the Project.
- Information on the location of potential marine wildlife receptors and the spatial and temporal overlap with the Project in these areas such as timing and location of sea bird staging and ringed seal congregations.

TMAC's summary of baseline conditions for marine fish and fish habitat mentioned that phytoplankton biomass and diversity in the marine LSA and RSA was generally low, zooplankton diversity was moderate, and benthic invertebrate richness and diversity was highly variable. TMAC also observed that 25 fish species were captured in Roberts Bay from 2002 to 2017, half of the number of fish species known to be present within the Queen Maude Gulf marine ecozone. TMAC added that one (1) species found in Roberts Bay, Bering wolffish, is classified as *data deficient* by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and as a species of *Special Concern* under the *Species at Risk Act* (SARA). TMAC noted that saffron cod and capelin were the most commonly caught fish species during baseline studies, although catch variability suggested these species are migratory; TMAC further noted its baseline studies indicated that species such as Arctic char and Arctic flounder reside for longer time periods in Roberts Bay.

[416] Banci, V. and R. Spicker, (Compilers, Editors & GIS). 2016. *Inuit Traditional Knowledge for TMAC Resources Inc. Proposed Hope Bay Project, Naonaiyaotit Traditional Knowledge Project (NTKP)*. Prepared for TMAC Resources Inc. Kitikmeot Inuit Association: Kugluktuk, NU.

TMAC's summary of baseline conditions for marine wildlife noted that several species of marine mammals likely occur along the shipping routes, including walrus, narwhal, beluga whale, bowhead whale, polar bear, and ringed seals. TMAC indicated that the potential project-related effects on ringed seals were considered for the locations where they may interact with ringed seals, particularly shipping within the MRSA and activities at the Roberts Bay facility. TMAC noted that several other species that may occur on a small proportion of the commercial shipping routes include bearded seals, harp seal, hooded seal and killer whale.

With respect to marine birds, TMAC noted that many areas of the coastal areas and islands as well as polynyas along the commercial shipping route are important habitat for seabirds and seaducks. TMAC highlighted the Queen Maud Migratory Bird Sanctuary and Prince Leopold Island as large breeding areas with many species of nesters. TMAC listed a variety of species found throughout the region including large concentrations of thick-billed murres, northern fulmar, black-legged kittiwakes, common eider, and several species of goose and gulls. TMAC's baseline studies did not identify any seabird colonies within Melville Sound and Roberts Bay, but seabirds were found nesting on the beach and ground surface at low densities. The greatest density of seabird nests in Melville Sound and Roberts Bay were on small islands (< 20 ha). TMAC also noted that no marine staging areas were observed during baseline surveys and ongoing waterfowl monitoring for the Doris North Gold Mine Project.

The Proponent selected the following as VECs for the marine environment and marine environment:

- Marine Fish habitat (water quality, sediment quality, available area, phytoplankton, zooplankton and benthic invertebrates);
- Marine Fish community (Arctic char and Saffron Cod);
- Marine wildlife (ringed seal); and
- Marine Birds.

Marine Fish Habitat VEC

TMAC identified that marine fish habitat may be affected by project activities through a direct loss or alteration of fish habitat by permanent alteration or destruction (PAD). TMAC explained that a PAD may be incurred through encroachment of infrastructure such as the cargo dock, or through physical damage from sealift activities (wake effects and propeller wash) or from spills, accidents and malfunctions. TMAC specified that the construction of the cargo dock would result in a direct loss of up to 9,675 m^2 or approximately <0.07% of the habitat available to fish utilizing Roberts Bay.

TMAC also identified the introduction of deleterious substances into the marine environment as a pathway for impacts on marine fish habitat, explaining that marine water and sediment quality could be impact by effluent discharged from site; sewage effluent from sealifts; dust from blasting, quarrying and pile driving; or accidental releases and spills from the mine site. TMAC noted that introduction of deleterious substances into water could have direct effects on fish habitat as well as indirect effects (i.e., through trophic interactions), and noted that indirect effects were assessed through the marine water quality and marine sediment quality sections of the FEIS (see Section 5.14 of this Report).

TMAC highlighted mitigation by project design such as careful site selection and design of the proposed cargo dock, and described best management practices it would follow such as timing restrictions on construction activities, and erosion and sediment control. TMAC also noted that unavoidable losses of fish habitat would be mitigated through a fisheries offsetting program.

TMAC predicted that as a result of the mitigation and monitoring plans, and due to balancing potential fisheries losses with fisheries offsetting, there would be no residual effects anticipated on marine fish habitat due to interaction with the cargo dock footprint or with shipping activities in terms of a PAD, and no residual effects on marine fish habitat due to changes in water quality and/or sediment quality through surface drainage, effluent, discharge, dust and infrastructure development associated with project activities.

Marine Fish Community VECs

TMAC stated that the marine fish community may be potentially affected by project activities along two general pathways: through direct mortality and effects to population abundance, or through decreased health and indirect mortality resulting from changes to water quality and/or sediment quality. In regards to the latter potential effect, TMAC noted that project-related impacts to marine water quality and marine sediment quality were assessed separately (see Section 5.14 of this report); as no significant residual effects were expected, TMAC concluded no indirect impacts on marine fish through impacts to marine water quality and marine sediment quality are expected.

TMAC explained that direct mortality and changes to the population abundance may potentially occur due to: the placement of in-water infrastructure on top of fish and their eggs; underwater noise and pressure from pile driving during construction of the cargo dock; underwater pressure and vibrations from blasting during quarry development; underwater noise from shipping; and through the introduction of exotics and pathogens in ballast water from sealifts.

TMAC's planned mitigation to avoid direct mortality to marine fish included the following:

- Avoiding blasting and in-water construction works during sensitive time periods such as spawning and rearing periods;
- Using the vibratory rather than impact pile driving technique to build the cargo dock;
- Using bubble curtains to reduce noise during pile driving;
- Establishing noise thresholds, conducting acoustic monitoring, and implementing adaptive management measures if required; and
- Following regulations and best management practices such as DFO's "Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters" and "Measures to Avoid Causing Harm to Fish and Fish Habitat."

TMAC emphasized the few number of ships anticipated in Roberts Bay (up to seven (7) for the Project and the Doris North Gold Mine Project combined), their transitory nature, and the low levels of noise they emit (less than 70 decibels at approximately 200 m from the vessel). TMAC also noted that it is not expected that vessels would be discharging ballast water in Roberts Bay since they will be arriving loaded and therefore have no need to carry ballast water. TMAC also

highlighted the *Canada Shipping Act* and the *Arctic Waters Pollution Act* as mechanisms to minimize risk to the marine environment. TMAC concluded that direct mortality of marine fish communities is not anticipated to be a residual effect.

Marine Mammals (Ringed Seal)

TMAC's review of potential Project interactions with ringed seal identified three (3) potential effects: habitat loss, disturbance, and direct mortality.

In its assessment of habitat loss, TMAC indicated that the expansion of the Roberts Bay facility may result in some loss of beach habitat used by ringed seals for hauling-out or foraging, as well as cause disturbance of seals. TMAC stated that ringed seals could also interact with the Project and suffer mortality or injury from shipping vessel strikes, entanglement, or other factors. TMAC predicted that no high-quality habitat would be lost for marine mammals, particularly for ringed seals because they are not expected to use the exposed rock at the cargo dock site as a haul out area. TMAC stated that because the mitigation it has proposed to minimize the footprint of the cargo dock, habitat loss for ringed seal was not rated as a residual effect.

For its analysis of ringed seals disturbance due to shipping activities, TMAC noted that existing scientific studies have indicated that seals are not disturbed by shipping, except when vessels are in close proximity. TMAC also predicted the potential for project-induced noise from construction of the new dock structure at Roberts Bay, including sheet pile vibratory driving and quarry blasts activities and onsite road at the laydown area at Roberts Bay to result in some physical disturbance to seals in the MRSA. TMAC specifically noted that disturbances in Roberts Bay area may trigger visual and auditory stimuli, which could cause marine mammals to alter their regular behavioural patterns, avoiding the disturbance and resulting in indirect habitat loss. TMAC's modeling of the disturbance period for ringed seals indicated that shipping activities have the potential to disturb ringed seals within 200 metres (m) of the shipping route for approximately 20 minutes per year. TMAC clarified that it did not consider this disturbance as a residual effect for ringed seal.

TMAC predicted that shipping or the Roberts Bay facility would not result in disruption of movement or attraction to the Project site for marine wildlife because of limited and infrequent ship traffic, and unlikelihood of moving vessels to form a barrier to marine mammal movement. In its analysis of direct mortality, TMAC indicated that collisions of vessels with ringed seals are rare, and that it unlikely for project-related shipping activities to affect seal population in the area; as such it did not consider direct mortality as a residual effect for ringed seals.

Measures proposed by TMAC to mitigate potential impacts to marine mammals included:

- Have wildlife monitors survey for seals and birds and cease pile driving if wildlife are within 200 m;
- Use of vibratory pile driving instead of impact pile driving to minimize underwater noise;
- Use of a "soft start" procedure (i.e., use of bubble curtains and slowly increasing activities) to allow marine wildlife to avoid the area;
- Underwater acoustic monitoring to determine if additional mitigation measures are required, and stopping work when sound levels breach a certain sound level threshold;

- Siting project infrastructure to minimize the marine footprint, and to avoid sensitive habitat such as marine mammal haul-outs;
- Shipping during the open-water season outside of the sensitive periods for ringed seals and for Dolphin and Union (island) caribou;
- Ships will avoid groups of marine mammals;
- Ships will maintain slower speeds in Roberts Bay;
- Best management practices such as avoiding construction during sensitive wildlife temporal periods;
- The Hope Bay Spill Contingency Plan, Oil Pollution Prevention Plan / Oil Pollution Emergency Plan, and Shipboard Oil Pollution Emergency Plan will ensure proper fuel management and rapid clean-up in the event of any spill.

TMAC determined, based on the application of mitigation measures, that no residual, cumulative, or transboundary effects would be expected for ringed seals.

During the Final Hearing, TMAC committed to collection of additional data on marine mammals and verify assessment predictions in the FEIS, and conduct shipboard, community-based surveys of marine mammals over a 2-year period in the Kitikmeot region.[417]

Marine Birds

TMAC's review of potential project interactions with marine birds identified three (3) potential effects: habitat loss; disturbance, and direct mortality. To assess the potential impact of habitat loss, TMAC compared the area of potential nesting habitat lost due to the new Roberts Bay Project Development Area (PDA) to the shoreline area available for nesting in the LSA and RSA, and concluded that a low amount of nesting habitat would be removed. Considering the low densities of seabirds found to use the mainland coast in Roberts Bay and lack of migratory staging areas in Roberts Bay, TMAC concluded that marine bird habitat loss would not be a residual effect.

In terms of disturbance, TMAC noted that construction of the cargo dock could disturb marine birds. TMAC noted that the nearest congregation of marine birds is approximately 800 m from the proposed location of the dock, and the nearest colony of nesting birds is more than 25 km away. TMAC highlighted its proposed mitigation measures such as halting pile driving if large aggregations of marine birds are within 200 m of the dock, and, applying additional mitigation in the event that acoustic monitoring indicates noise levels are not meeting guidelines. TMAC also noted that ground clearing for construction of the cargo dock would occur outside of the nesting period, and that pre-construction surveys and setbacks from nests would be used if construction must occur in the summer season. TMAC concluded that construction activities at Roberts Bay are not anticipated to result in a residual effect to marine birds. TMAC further predicted that the combination of the existing and proposed project activities are not likely to have an effect on marine birds because the existing use of the lightering barges and the lightering barge landing site will be discontinued and replaced with the dock for the Phase 2 Hope Bay Belt Project.

[417] TMAC Resources Inc., TMAC Proposal for DFO-3.2.2, Point#1 of the Revised Recommendation, Exhibit 87, NIRB Final Hearing File No. 12MN001, May 12, 2018.

TMAC also identified that vessel traffic could disturb marine birds. TMAC noted that project-related ships would not pass near any known large colonies of seabirds, or through any known or designated moulting areas, and would avoid any observed aggregations of seabirds when safe to do so. TMAC concluded that disturbance of marine birds from vessel traffic would not be a residual effect.

In terms of direct mortality, TMAC identified that vessel strikes could result in direct mortality, but reiterated that ships would avoid known colonies of seabirds, or through any known or designated moulting areas, and would avoid any observed aggregations of seabirds when safe to do so. TMAC concluded that direct mortality of marine birds from vessel traffic would not be a residual effect.

TMAC predicted, based on the application of management and standard mitigation measures, that the potential residual effects for marine birds due to construction activities would not be significant. TMAC stated that because the cargo dock site is unlikely to be used as a nesting site, and that various mitigation measures to minimize the footprint of the cargo dock and manage risk to active nests would be implemented, habitat loss was not rated as a residual effect for marine birds.

In summary, the measures proposed by TMAC to mitigate potential impacts to marine birds included the following:

- Have wildlife monitors survey for seals and birds and cease pile driving if wildlife are within 200 m;
- Ships will avoid the large marine bird colony on Prince Leopold Island by 25 km, except where safety of the ship dictates otherwise;
- Ships will avoid aggregations of marine birds and any known large colonies or designated moulting areas by 500 m;
- Project infrastructure will be sited to minimize the marine footprint, and to avoid sensitive habitat such as marine bird rookeries;
- Aircraft (helicopters) will avoid marine bird colonies by given setback distances;
- Airstrips will be monitored prior to take-off and landing to ensure marine birds on not present on the landing strip;
- A speed limit will be set and enforced on all project roads;
- Wildlife will be given the right-of-way on roads at all times;
- The Hope Bay Spill Contingency Plan, Oil Pollution Prevention Plan / Oil Pollution Emergency Plan, and Shipboard Oil Pollution Emergency Plan will ensure proper fuel management and rapid clean-up in the event of any spill.

TMAC stated that with this mitigation in place, both disturbance and direct mortality were not considered as a residual effect for marine birds.

5.15.2 Views and Concerns of Interested Parties

Within their final written submissions, the Kitikmeot Inuit Association (KIA) and Fisheries and Oceans Canada (DFO) raised concerns regarding TMAC's fisheries offsetting plan. Specifically,

DFO noted that the marine conceptual offsetting plan did not outline whether losses can be adequately compensated.[418] DFO specifically expressed concerns that the conceptual Marine Fisheries Offsetting Plan only accounted for two (2) fish species (i.e. Arctic char and saffron cod) out of the 25 fish species identified by the Proponent's baseline survey in Roberts Bay and considered part of and/or supporting the productivity of a CRA fishery. DFO indicated that the Proponent should re-evaluate the assumptions of valued fishery components to include representation of all fish species in the proposed marine offsetting plan and re-calculate habitat loss. The KIA requested that the Proponent develop a Conceptual Freshwater and Marine Offsetting Plan that includes preliminary gain calculations for potential offsetting options, in consultation with DFO and KIA.[419] The KIA also indicated in its comments that the FEIS was missing raw data set for 2017 fish sampling for Arctic Char. TMAC noted in response that it is committed to work with the DFO Fisheries Protection Program (FPP), the KIA and the Inuit Environmental Advisory Committee (IEAC) to develop and finalize a marine fisheries offsetting plan and refine models for habitat loss/gain predictions to ensure that all serious harm to fish and fish habitat as a result of the project are accounted for and adequately offset. [420]

DFO noted in its final written submission that the Proponent had not provided sufficient evidence in the FEIS that marine mammals would not likely come into close contact with vessels and that whales are found only in low numbers. DFO referenced research studies describing the distribution of species such as beluga whales in the Northwest Passage. DFO also noted that the Proponent had provided insufficient analysis regarding the potential for ship strikes to species other than ringed seals. DFO also expressed concerns that TMAC's assessment did not consider the potential for low altitude flights to affect safety of marine mammals, nor did it sufficiently assess the potential impacts of diesel spills on seals from ships. In its response to DFO, TMAC emphasized that ringed seals were chosen as a representative species for the assessment because of their abundance and because Inuit Traditional Knowledge identified ringed seals as an important species, adding that most other marine mammals are observed only sporadically in the area. TMAC emphasized that the DFO's cited studies of distribution of species such as narwhal and beluga whales were regarding areas in the Northwest Passage, outside the MRSA. TMAC also reiterated the requirements of the Canada Shipping Act, and its Oil Pollution Prevention / Oil Pollution Emergency Plan (OPEP), and Shipboard Oil Pollution Emergency Plan (SOPEP) to minimize impacts of diesel spills. TMAC also referenced studies indicating that relatively few collisions between ships and seals have been reported and reiterated that the risk to seals is low.

During the Final Hearing, DFO indicated that it remained concerned about the potential for shipping conflicts with marine mammals, and provided revised recommendations[421] that it indicated were specific mitigation and monitoring measures that could be put in place to minimize risk in the absence of additional assessment(s).[422] DFO's first revised recommendation was that TMAC should develop ship-based marine mammal monitoring programs and protocols that require the utilization of full-time, dedicated trained observer, aided by technology where

[418] Fisheries and Oceans Canada Final Written Submission, March 20, 2018
[419] Kitikmeot Inuit Association Final Written Submission, March 19, 2018
[420] TMAC Resources Inc. Response to final written submissions, April 5, 2018.
[421] Fisheries and Oceans Canada. *Phase 2 Hope Bay Belt Project Presentation*. Exhibit 43 NIRB Final Hearing File No. 12MN001, May 10, 2018.
[422] B. Ross, Fisheries and Oceans Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 10 2018, pp. 562-569, lines 2-26, 1.

appropriate, who would be expected to follow established data collection and recording protocols, during both shipping and fuel transfer activities. [423] During the Final Hearing, TMAC expressed reservations regarding this recommendation. TMAC noted that not only would the shipping companies have to agree to the presence of ship-board observers,[424] there is still a high degree of uncertainty in the implementation and success of the ship-based marine mammal monitoring programs in the arctic and in the context of other active mines in the territory. Specifically, TMAC indicated that it does not believe that the proposed use of on-board marine mammal observers would be effective to achieve the required level of monitoring to prevent marine mammal disturbance along the shipping route. [425]

DFO's second revised recommendation was that TMAC minimize underwater noise to the degree practicable, and also undertake modeling with respect to monitoring noise levels from ships and other sources in other to inform potential adaptable management measures regarding impacts of noise to marine mammals. TMAC confirmed that its marine wildlife effects assessment took into account underwater noise due to dock construction.[426] TMAC also noted that its effects assessment evaluated the potential for marine mammals to be disturbed by vessel noise by using a standard noise profile for a commercial shipping vessel and speed of that vessel, and TMAC determined that over the course of a year, marine mammals could be expected to be disturbed by that noise for an extremely small period of time.[427] TMAC argued that underwater noise is the responsibility of shipping companies,[428] while DFO noted that TMAC could make recommendations to the shippers, and also suggested that the Proponent could apply the recommendation to its activities in Roberts Bay.[429] TMAC also reiterated the conclusions of its FEIS indicating that underwater noise would not impact seals 200 m away.[430] DFO noted that in the FEIS TMAC had used 70 decibels as the noise threshold for response for seals and argued that this threshold was based on a report that was published in 1997, and newer studies do not lead the department to the same conclusion as the Proponent.[431]

[423] M. D'Aguiar, Fisheries and Oceans Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 10 2018, pp. 538-539, lines 5-26, 1-10.
[424] B. Armstrong, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 10 2018, pp. 550-551, lines 24-26, 1-12 and 20-24.
[425] B. Armstrong, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 10 2018, pp. 551, 552, 558, lines 25-26, 1-14, 10-16.
[426] G. Sharam, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 9 2018, p. 315, lines 8-11.
[427] G. Sharam, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 12 2018, p. 316, lines 15-24.
[428] B. Armstrong, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 10 2018, p. 561, lines 21-23 and p. 563, lines 13-25.
[429] B. Ross, Fisheries and Oceans Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 10 2018, p. 564, lines 12-19.
[430] B. Armstrong, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 10 2018, pp. 544-545, lines 23-26, 1-18.
[431] M. Marcoux, Fisheries and Oceans Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 10 2018, p. 566, lines 18-26.

DFO's third revised recommendation was resolved quickly at the Final Hearing, with TMAC confirming that its Oil Pollution Emergency Plan (OPEP) includes reference to marine mammals.[432]

Throughout the exchange between TMAC and DFO at the Final Hearing, DFO noted it was data deficient and argued for the precautionary approach, especially given concerns over cumulative impacts of increased shipping in the Canadian Arctic.[433] In its closing remarks, DFO indicated that its recommendations for addressing project-related impacts have generally been committed to by the Proponent, with the exception of outstanding issues pertaining to the sufficiency of information regarding the distribution of marine mammals and the potential for cumulative impacts of shipping and noise on marine mammals.[434] See Section 7.6 for additional discussion on cumulative effects.

Within its final written submission, Environment Canada and Climate Change (ECCC) identified two (2) main issues pertaining to effects on marine wildlife: cumulative impacts of shipping in Bathurst/Elu Inlet key habitat site on migratory birds; and in-water works (cargo dock construction).[435] ECCC indicated that because there are still uncertainties regarding the magnitude of direct and cumulative effects of shipping through the Bathurst and Elu Inlets key habitat sites on marine birds, it stated that its concern mainly relate to potential disturbance and pollution events affecting the distribution and abundance of common eiders within the Bathurst and Elu Inlets key habitat sites and marine RSA due to shipping activities. ECCC specifically recommended that the Proponent commit to work or consult with ECCC on any monitoring study of common eiders and work to share any associated data. During the Final Hearing, ECCC indicated that TMAC has committed to work with ECCC on any future monitoring studies of marine birds, such as common eider in order to ensure these birds are not impacted by project activities.[436]

ECCC also commented on the cargo dock construction, in its final written submission, noting that the FEIS did not include details of potential impacts, monitoring, and the mitigation measures to be implemented to mitigate potential impacts to Roberts Bay. ECCC specifically recommended that TMAC provide details on the construction timeline of the cargo dock in Roberts Bay including length of time for in-water construction and information on the proposed monitoring locations, including proposed methods for monitoring TSS and turbidity levels to ensure that the marine environment is protected. TMAC responded that it will develop a monitoring program for TSS to the satisfaction of DFO, should DFO require the program as part of any DFO authorization that may be issued post project approval. TMAC further stated that it expected the in-water construction of the cargo dock to take approximately two (2) months and that construction would be completed in the open water period. ECCC indicated during the Final

[432] B. Armstrong, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 10 2018, p. 565, lines 9-22.
[433] B. Ross, Fisheries and Oceans Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018 pp. 542-543 lines 26, 1-8, and pp. 547-548 lines 25-26, 1-6.
[434] M. D'Aguiar, Fisheries and Oceans Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 12 2018, pp. 1019-1020, lines 6-26, 1-4.
[435] Environment and Climate Change Canada Final Written Submission, March 19, 2018
[436] B. Summerfield, Environment and Climate Change Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 12 2018, p. 911, lines 9-12.

Hearing, that it had worked with TMAC and had received a commitment to ensure that during the construction of the proposed cargo dock, water quality will not be negatively impacted in the marine environment.[437]

During the Final Hearing, a Community Representative from Gjoa Haven expressed concern about ships running aground and impacts this could have on caribou crossing the ocean.[438] Another Community Representative from Gjoa Haven indicated that he was not concerned about the effects from shipping noise on seals and suggested that seals are attracted to noise, however the Representative did express concerns about the potential for ships to run aground and the impact this could have on wildlife.[439] In response, TMAC highlighted the availability of navigational charts in the Arctic and the regular updates on ice coverage provided by the Canadian Ice Service, and stressed that ships must abide by the *Canada Shipping Act* and that fuel ships in the Arctic are required to be double hulled. TMAC further noted that because the project would be undertaking shipping activities during the open water period when there is no ice, the proposed project will not interfere with caribou crossing between the islands and movements back and forth from mainland Canada to Victoria Island.[440] TMAC also referred to its Oil Pollution Emergency Plan (OPEP) and the requirements to have spill equipment at its oil-handling facility, and further noted that the fuel used would evaporate quickly in the event of a spill, facilitating clean-up. [441]

5.15.3 Views of the Board

The Board acknowledges TMAC's assessment of potential project-related effects on marine wildlife and its incorporation of Inuit Qaujimajatuqangit. The Board is appreciative of the input of regulatory authorities and Community Representatives throughout the Review period, and the Board understands the concerns highlighted during the Final Hearing regarding the potential for impacts to marine wildlife from project activities including construction of the cark dock, effluent discharge into Roberts Bay, and shipping.

The Board acknowledges that TMAC has committed to providing and updating guidance materials for vessel operators to ensure they avoid key bird habitats and sensitive marine mammal habitats in the Northwest Passage. The Board also acknowledges that TMAC has committed to discussing with DFO mitigation measures common to all vessels in Arctic waters for marine mammals in the Northwest Passage. The Board notes that the Proponent stopped short of agreeing to all of DFO's recommendations, in particular related to ship-based marine mammal monitoring programs. The Board understands that concerns of DFO and other Parties about the impacts of shipping on marine wildlife are heightened by concern regarding the increase in Arctic shipping in general, and the considerable uncertainty related to cumulative

[437] B. Summerfield, Environment and Climate Change Canada. NIRB Final Hearing File No. 12MN001 Transcript, May 12 2018, p. 912, lines 4-8.
[438] B. Putuguq, Gjoa Haven, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 736, lines 8-15.
[439] U. Puqiqnak, Gjoa Haven, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, pp. 745-746, lines 16-26, 1-18
[440] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, pp. 737-738, lines ,1-26, 1-16
[441] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, pp. 747-748, lines 24-26, 1-26

effects (see Section 7.6 for further discussion on cumulative effects). The Board shares DFO's concern about the lack of data related to the effects of shipping on marine mammals in the Arctic and certainly understands the value of data acquisition and ongoing monitoring. However, the Board is of the view that it would be most appropriate for the Government of Canada to establish and implement standardized requirements that would pertain to all certified vessels transiting through Arctic waters. See Section 7.8 of this Report for additional details. The Board is recommending that the Proponent work with DFO to develop a monitoring protocol for assessing disturbance to marine wildlife in Roberts Bay resulting from project-specific underwater noise, as well as adaptive management measures to mitigate adverse impacts of project-related noise.

5.15.4 Conclusions and Recommendations of the Board

In considering the views of the Proponent and those parties throughout the assessment of the Project and as outlined above, the Board believes that the Project's potential effects to marine wildlife and habitats could be appropriately managed through the commitments provided by the Proponent and application of key mitigation measures. The Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- Providing its contracted vessel operators with maps and descriptions of key marine bird and marine mammal habitats in the Northwest Passage, and specify that that, subject to vessel safety requirements, these key habitats shall be avoided by a distance of at least 500 metres, and wildlife are to be given the right of way;
- Working with Fisheries and Oceans Canada to ensure that marine mammal mitigation measures common for all vessels in the Northwest Passage are applied to project-contracted vessels;
- Reporting on accidental collisions between project vessels and marine mammals or seabirds, and investigating the circumstances of any incidents to determine if additional mitigative measures are required; and
- Developing a monitoring protocol to confirm predictions in the FEIS with respect to disturbance effects from underwater noise on marine wildlife, and to facilitate assessment of the potential short term, long term, and cumulative effects of vessel noise on marine mammals and marine mammal populations. The Proponent is expected to work with Fisheries and Oceans Canada to determine appropriate indicators and thresholds that can be used to determine if negative impacts on marine mammals as a result of vessel noise are occurring. Adaptive management practices shall be developed to restrict negative impacts as a result of noise.

6. SOCIO-ECONOMIC EFFECTS

TMAC Resources Inc. (TMAC or the Proponent) described its approach to analyzing potential effects, identifying mitigation measures for potential effects, and classifying and determining the significance of impacts from the Phase 2 Hope Bay Belt Project (the Project) on the biophysical and socio-economic environments, in Volume 3 of the Final Environmental Impact Statement

(FEIS). Further discussion on TMAC's approach used in its assessment of potential effects of the Project can be found in Section 5 of this Report.

The following valued socio-economic components were assessed by TMAC as part of its assessment of potential effects on the human environment from the Project:

- Archaeology
- Non-traditional Land and Resources Use
- Socio-economics
- Health, Safety, and Community Well-being
- Subsistence Economy and Land Use
- Country Foods/Human Health

In addition, selected components of the socio-economic environment, not considered by TMAC as VCs, were discussed as Subjects of Note in the FEIS, including paleontology, migration and population demographics.

6.1. Economic Development and Business Opportunities (Including Contracting Opportunities)

6.1.1 Views of the Proponent

TMAC Resources Inc. (TMAC, or the Proponent) presented an assessment of potential impacts to economic development and business opportunities in Volume 6, Section 3 of the Final Environmental Impact Statement (FEIS). The Proponent considered potential impacts to economic development as it relates to traditional activities in the Land Use Effects Assessment (Volume 6, Section 4 of the FEIS, and summarized in Section 6.5 of this Report). Supporting baseline information from 2011 and 2017 was provided in Volume 6, Appendices V6-3A and V6-3B, respectively, and the Economic Impact Model Report was provided in Appendix V6-3C. TMAC noted that the Socio-Economic Monitoring Program (SEMP) in place at the Doris North Project would apply to the proposed Phase 2 Project. Volume 8, Annex V8-5 is TMAC's Community Involvement Plan, which outlines its policies and commitments for involving local communities in the Project and which TMAC noted would be continuously revised and improved. The Proponent expects the Project to have beneficial effects on both economic development and business opportunities, with no negative residual effects. TMAC indicated that measures to enhance the benefits of the Project on economic development are further described in the Human Resources Plan (Volume 8, Annex V8-7 of the FEIS).

TMAC defined the following spatial boundaries for its assessment of economic development and business opportunities:

- Local Study Area (LSA): includes the communities of Cambridge Bay and Kugluktuk
- Regional Study Area (RSA): includes all permanently settled communities within the Kitikmeot region of Nunavut (Cambridge Bay, Kugluktuk, Gjoa Haven, Taloyoak, and Kugaaruk).

TMAC's temporal assessment included the construction, operations, and reclamation and closure, and possible temporary closure phases of the Project.

The Proponent noted its assessment drew upon key informant interviews in communities within the Kitikmeot region, as well as desk-based research and literature review including information from Statistics Canada, the Nunavut Bureau of Statistics, and the Government of Nunavut. TMAC demonstrated in the FEIS that Nunavut's Gross Domestic Product (GDP) grew between 2010 and 2013, decreased slightly in 2014 and 2015, and then grew again in 2016. TMAC noted that Nunavut imports two (2) to three (3) times as much as it exports, with mining products (e.g., from the Mary River mine and the Meadowbank Gold Mine) being a major export. TMAC identified the major contributors to the Territory's GDP as being: the public sector; mining, quarrying and oil and gas extraction; construction; and real estate, rental and leasing. TMAC noted that private businesses, the retail industry, and economic growth as a whole are hindered in Nunavut by many factors including geographic remoteness, small populations, limited infrastructure and transportation networks, and high start-up costs. TMAC noted that co-operatives are a popular business model in Nunavut. TMAC indicated that private construction firms are supported by government spending on housing and infrastructure, and that mining service businesses including expediting and logistical services, catering, and janitorial services have also been established.

TMAC identified Economic Development as a valued socio-economic component (VSEC) and indicated that the VSEC was selected to guide the discussion of the Project's anticipated beneficial effects on regional, territorial, and national economic production (Gross Domestic Product, or GDP) and revenues (taxes, royalties and other fees paid to governments and Inuit organizations). TMAC further noted in the FEIS that Business Opportunities was selected as a VSEC in order to guide the discussion of the Project's anticipated effects on existing Inuit and northern businesses and viability of new or additional business ventures in the region and territory. The discussion considered Project contract and sub-contract opportunities and focused on the procurement of goods and services from local suppliers.

The Proponent assessed the following potential project-related effects in the FEIS:

- Changes to economic growth; and
- Changes to local business growth.

TMAC described the economic impact modelling it used to estimate direct, indirect, and induced impacts of the Project as well as of the existing and approved projects (the Doris North Gold Mine and other exploration programs) on local, regional, territorial, and national economic development, mainly during the construction and operations phases, with a reduction or removal of these benefits during reclamation and closure. Specifically, TMAC noted that Project expenditures are estimated to contribute to the territorial GDP as well as the federal and territorial government tax revenue. TMAC noted it would also be making payments to the Kitikmeot Inuit Association (KIA) and Nunavut Tunngavik Incorporated (NTI) including royalties, exploration and production lease rents, land tenure payments, water compensation, and the Inuit Impact Benefits Agreement (IIBA). TMAC also added that it would be required to make direct payments to the Government of Nunavut (GN) in the form of Payroll Tax, Petroleum Tax, and Property Tax.

During the Final Hearing, TMAC highlighted that the Project is expected to contribute:[442]

- Almost $4 billion to the national GDP, over $300 million to the territorial GDP, and approximately $240 million to the regional (Kitikmeot) GDP;
- Approximately $733 million in federal government tax revenues, $43 million in territorial tax revenue, and $35 million in regional (Kitikmeot) tax revenue;
- Approximately $144 million in direct payments to the KIA and NTI;
- Approximately $257 million in direct corporate tax payments and $33 million in non-production based royalties; and
- Approximately $34 million in Payroll Tax and $14 million in Petroleum Tax.

With respect to local business growth, TMAC noted in the FEIS that Project construction is expected to provide contracting business opportunities, with local or regional businesses possibly sourced for construction of features such as the all-weather road and the camp at Boston. TMAC further noted that its economic model predicts increased indirect and induced sales in the LSA and RSA associated with suppliers and workers spending their incomes on goods and services in Nunavut.

TMAC indicated that it will enhance economic development and business development through:

- Maximizing business and employment opportunities,
- Capacity building,
- Monetary contributions to Inuit associations through the Framework Agreement IIBA;
- Providing assistance, feedback, information and lead time to contractors from the Kitikmeot communities on bids and bidding policies;
- Requiring and monitoring local content plans on major bids;
- Waiving bond provisions at tender for Inuit owned businesses;
- Providing annual business opportunities forecast;
- Promoting awareness of procurement opportunities within the Kitikmeot region; and
- Regular communication of the Project's schedule with local and regional governments and businesses.

6.1.2 Views and Concerns of Interested Parties

In its final written submission, the Government of Nunavut (GN) noted that between the *Draft* EIS and the FEIS, the Proponent had updated the estimated territorial tax revenues (namely petroleum tax and payroll tax) that would be generated for each phase of the Project.[443] The GN concluded these updated estimates were reasonable, and requested that TMAC communicate changes regarding territorial tax estimates generated by the project on an ongoing basis. In responses,[444,445] TMAC committed to communicating with the GN if major changes to the

[442] TMAC Resources Inc. Human Environment Assessment Presentation. Exhibit 23 NIRB Final Hearing File No. 12MN001, May 12, 2018.
[443] Government of Nunavut Final Written Submission, March 19, 2018
[444] TMAC Resources Inc. Response to final written submissions, April 5, 2018.

project-related tax revenues occur, or as needed, noting that this communication commitment would not preclude either party from contacting the other to request an updated estimate of territorial taxes throughout the Project. Further, TMAC also noted that it had been approached by the GN Department of Economic Development and Transportation to enter into a Memorandum of Understanding (MOU) with the GN to promote cooperation, coordination and implementation of joint activities. TMAC indicated it is willing to consider entering into this MOU and is conducting consultation with the Kitikmeot Inuit Association (KIA) to discuss how such an MOU could be structured to support the efforts of the Hope Bay Inuit Impact and Benefit Agreement (IIBA) Implementation Committee. During the Final Hearing, the GN noted it considered the issue resolved.[446]

In its final written submission, Indigenous and Northern Affairs Canada (INAC) commented that the issue of whether TMAC's demand for goods and services could exceed local and regional capacity had not been addressed in the FEIS.[447] INAC raised the possibility that local and regional businesses would shift their focus to serving the Proponent, leaving existing customers without access to necessary goods and services. INAC requested that the Proponent provide further information regarding business capacity trends, and also that the Proponent monitor competition with other business needs as part of its participation in the regional Kitikmeot Socio-Economic Monitoring Committee, and seek any necessary and appropriate solutions in coordination with regional organizations.

In its response to INAC, TMAC emphasized that the 2015 Hope Bay Inuit Impact and Benefit Agreement (IIBA) provides procurement preference to local Kitikmeot-based businesses providing specific types of services, and not to commodities. As a result, competition for access to local business services as a result of the Project would be constrained. TMAC also demonstrated that the number of registered Inuit firms, and the value of contracts it has awarded to Inuit-owned firms in the Kitikmeot region have both increased in the past several years. In particular, TMAC highlighted that in 2016 the average contract value with Inuit-owned and Kitikmeot Qualified Businesses (many of which were in construction, expediting, heavy equipment and mine development) was $2.6 million and the median value was $892,000, and in 2017, the average contract value with Inuit-owned businesses was $3 million, and the median value was $1.2 million. TMAC indicated there is no evidence that this increase in work for Kitikmeot business has adversely affected the ability of local business to continue to serve Kitikmeot communities, and noted that Kitikmeot Corp., one of the major businesses in the region providing mining services, has made advances into a variety of other services and sectors. TMAC also reiterated that the Public Service, the major employer in the region, is not expected to be negatively impacted by the Project. TMAC also confirmed its commitment to work with the Hope Bay Socio-Economic Monitoring Working Group and the Kitikmeot Socio-Economic Monitoring Committee to develop and monitor economic and business indicators to track and report on the extent to which the Project procures from Kitikmeot businesses and the extent to

[445] TMAC Resources Inc. *List of Commitments Generated in the Proponent's Response to Technical Comments on the Madrid-Boston Final Environmental Impact Statement*. Exhibit 84 NIRB Final Hearing File No. 12MN001, May 12, 2018.
[446] S. Pinksen, Government of Nunavut, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018 p. 826, lines 15-21.
[447] Indigenous and Northern Affairs Canada Final Written Submission, March 19, 2018

which existing customers may be unable to access goods and services as a result.[448] During the Final Hearing, INAC indicated if this commitment were to be accepted by the Board, the department would consider the issue resolved.[449] In response to follow-up questioning from the KIA during the Final Hearing regarding this issue,[450] INAC confirmed that the specific indicators to be tracked and monitored would be collaboratively selected by and reported on by the socio-economic working group.[451]

During the Final Hearing, a Community Representative from Kugaaruk asked the Proponent how much it estimates KIA would receive in royalties.[452] TMAC responded that over the course of the mine production at Madrid and Boston, the KIA and Nunavut Tunngavik Inc. (NTI) would be paid around $144 million in royalties; direct corporate tax payments would be $257 million; and other non-production-based royalties will be around $33 million. NTI would receive approximately seven (7) to eight (8) times more in royalties than the KIA.[453] The Community Representative later asked the KIA if it would be sharing some of the benefits and royalties to the rest of the communities so that the communities can also prosper.[454] The KIA replied that the use of the royalties it receives is determined by the KIA Board. The KIA added that it represents and answers to Kitikmeot Inuit, and encouraged the Community Representative from Kugaaruk to take his enquiry directly to the KIA Board representatives and make his wishes known.[455] During closing statements at the Final Hearing, the Community Representative from Kugaaruk confirmed its support of the Project, stating *"…the way I see it, it's going to help our economy and Canada as a whole.*"[456]

A Community Representative from Cambridge Bay shared that some companies had started up specifically to service Hope Bay and the mine industry, and that when the project went into care and maintenance, those companies diversified and found new avenues to generate revenue and income. The Representative added that the Hamlet of Cambridge Bay supports local entrepreneurs to grow their businesses, and does not view the issue of businesses servicing the

[448] TMAC Resources Inc. *List of Commitments Generated in the Proponent's Response to Technical Comments on the Madrid-Boston Final Environmental Impact Statement*. Exhibit 84 NIRB Final Hearing File No. 12MN001, May 12, 2018.
[449] D. Abernethy, Indigenous and Northern Affairs Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, pp. 585-586, lines 22-26 and lines 1-8.
[450] See for example, J. Abouchar, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018 p. 355, lines 21-26, pp. 356-357, lines 23-26 and lines 1-2, and p. 357, lines 21-26.
[451] D. Abernethy, Indigenous and Northern Affairs Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018 p. 587, lines 15-21.
[452] C. Krejunark, Kugaaruk, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018 p. 764, lines 11-22.
[453] A. Buchan, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018 p. 765, lines 2-15.
[454] C. Krejunark, Kugaaruk, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018 p. 808, lines 18-22.
[455] J. Roesch, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018 pp. 808-809, lines 25-26 and 1-8.
[456] C. Krejunark, Kugaaruk, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018 p. 1001, lines 24-26.

mine as a negative issue.[457] INAC agreed and noted monitoring will provide a better understanding of any potential impacts.[458]

6.1.3 Views of the Board

The Board acknowledges that the Proponent has been operating the Doris North Gold Mine Project and understands the contributions of that project to economic growth and business opportunities in the region. The Board agrees with TMAC's conclusions that the Project could likewise result in economic growth and additional business opportunities for Kitikmeot communities, but acknowledges the potential for businesses to stop serving existing customers in the local communities. The Board appreciates the input of parties throughout the Review process, which no doubt served to improve proposed mitigation and monitoring, and notes the Proponent's commitment to collaboratively develop and track indicators to measure the extent to which existing customers are unable to access goods and services. The Board also acknowledges the commitment of the Proponent to communicate to the Government of Nunavut available information on major changes to Project-related tax. The Board encourages the continuation of the working relationships with Regulatory Authorities (e.g., Government of Nunavut and the Kitikmeot Inuit Association) that have been established through the Hope Bay Socio-Economic Monitoring Working Group and the Kitikmeot Socio-Economic Monitoring Committee.

6.1.4 Conclusions and Recommendations of the Board

In considering the views of the Proponent and those of parties throughout the assessment of the Project as outlined above, the Board believes that the Project's potential effects to economic development and opportunity could be appropriately managed through the commitments provided by the Proponent and the application of key mitigation measures. As expressed in previous decisions, the Board believes that continued participation in the Kitikmeot Socio-Economic Monitoring Committee, and a project-specific socio-economic working group – in this case, the Hope Bay Socio-Economic Working Group - will be useful for the monitoring and mitigation of several socio-economic factors, not only those related to economic development and business opportunities. The Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- As part of the Hope Bay Socio-Economic Monitoring Program, work with the Hope Bay Socio-Economic Working Group to develop and track indicators measuring the extent to which the Project procures from Kitikmeot businesses and the extent to which existing customers are unable to access goods and services.

In addition, the Board has recommended bringing forward parallel terms and condition from the Doris North Project Certificate into the Project Certificate for the Project to ensure that this Project is included in the Proponent's existing requirements to:

[457] J. MacEachern, Cambridge Bay, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018 pp. 972-973, lines 14-26 and lines 1-11.
[458] S. Dewar, Indigenous and Northern Affairs Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018 p. 973, lines 20-24.

- Maintain a Hope Bay Socio-Economic Monitoring Plan, and participate in the Hope Bay Socio-Economic Working Group, whose central focus shall be to ensure that the Hope Bay Socio-Economic Monitoring Plan provides for appropriate Project-specific socio-economic effects monitoring for both the Doris North Gold Mine Project and the Phase 2 Hope Bay Belt Project (*Terms and conditions 28 and 40 from the Doris North Gold Mine Project Certificate*).
- Update the Socio-Economic Management Plan to include defined measures to address the risks and mitigate the potential effects of temporary and permanent closure (*Terms and conditions 41 through 44 from the Doris North Gold Mine Project Certificate)*.

6.2. EMPLOYMENT

6.2.1 Views of the Proponent

TMAC Resources Inc.'s (TMAC or the Proponent) assessment of employment was provided in Volume 6, Section 3 of the Final Environmental Impact Statement (FEIS) and supporting information was provided in Appendices V6-3A, V6-3B, and V6-3C. TMAC observed that Nunavummiut are engaged in both wage-based employment and traditional (or subsistence) economy and predicted that an increase in employment opportunities and subsequent personal income through the hiring of personnel from the Kitikmeot region during all phases of the Phase 2 Hope Bay Belt Project (the Project) would be a positive effect of the Project. Overall, TMAC concluded that the Project would have a positive and beneficial effect and where negative residual effects are anticipated, mitigation and management measures have been established to reduce or eliminate these effects.

TMAC considered the following two (2) spatial assessment boundaries for its effects assessment on employment:

- Local Study Area (LSA) - Kugluktuk and Cambridge Bay as they are the two closest major population centres in the Kitikmeot region.
- Regional Study Area (RSA) - Included all five (5) permanent communities in the Kitikmeot region - Gjoa Haven, Taloyoak, Kugaaruk, Cambridge Bay, and Kugluktuk.

TMAC noted that it did not include the seasonal communities of Kingaok (Bathurst Inlet) and Omingmaktok (Bay Chimo) in the spatial assessment boundaries for employment as there was no socio-economic data specific to these seasonal communities. TMAC noted that individuals from Kingaok and Omingmaktok typically reside in Cambridge Bay and Kugluktuk and were considered in the assessment of potential effects on of the Project on these two permanent communities.

The Proponent set the temporal assessment boundaries to include the construction, operations, and reclamation and closure, and possible temporary closure phases of the Project.

The primary source of Inuit Qaujimajatuqangit was the *Naonaiyaotit Traditional Knowledge Project*,[459] which assisted TMAC in contextualizing past and present trends in the socio-economic environment. Further, TMAC conducted consultations with individuals and open house and evening meetings to discuss the Project with all potentially affected communities. The information collected was incorporated into the FEIS as appropriate and used to develop social and culturally-appropriate mitigation and benefit enhancement measures, including design of meaningful adaptive management processes.

In the FEIS, TMAC documented that traditional economic activities are of great importance in the Kitikmeot communities, particularly among Inuit residents; however, Nunavummiut are also engaged in wage-based employment concentrated within three (3) sectors: education, law and social services, community and government; sales and services; and trades, transport and heavy equipment operations. The Proponent noted that, in 2016, the potential active labour force within the Kitikmeot region 15 years of age and older was 4,325 individuals with approximately 2,855 individuals looking for work. Cambridge Bay and Kugluktuk had higher participation rates in labour at 74% and 66% respectively with Gjoa Haven, Taloyoak, and Kugaaruk with 64% 61%, and 60% respectively. Unemployment rates were 17% and 28% in Cambridge Bay and Kugluktuk and ranged from 2% to 13% in the other Kitikmeot communities. TMAC noted that the Government of Nunavut (GN) is a prominent employer and a major economic driver in the Kitikmeot region and that the hamlets, local services, and private sector make up the primary employment opportunities in the Region. The Proponent indicated that Inuit make up approximately 90% of the labour force in the Kitikmeot region with an average annual income of $18,740 per individual.

TMAC selected employment (direct, indirect, and induced Project employment) as a valued socio-economic component (VSEC) and identified the following potential project effects related to employment and income:

- Changes to employment opportunities and income – as a direct result of project employment and procurement and the resulting project benefits accruing at the regional, territorial, and national levels. This effect also considered the contributions of taxable personal incomes associated with the Project at the regional, territorial, and national levels;
- Competition for local labour – the potential for currently employed residents of the Kitikmeot region to leave their employment for mine-related employment. The higher-wages offered for mine-related work may entice those currently employed in the Kitikmeot region or may change existing salary and compensation expectations. Assessment of this effect also considered the ability of local employers to retain their employees (e.g., hamlet, GN employees); and
- Changes to labour force capacity – the potential for changes to the skills and experience of the regional labour force as a result of the requirements of project employment (i.e. increases in education levels, skills, and labour force experience).

[459] Banci, V. and R. Spicker, (Compilers, Editors & GIS). 2016. *Inuit Traditional Knowledge for TMAC Resources Inc. Proposed Hope Bay Project, Naonaiyaotit Traditional Knowledge Project (NTKP)*. Prepared for TMAC Resources Inc. Kitikmeot Inuit Association: Kugluktuk, NU.

Changes to employment opportunities and income

TMAC predicted that the Project would have the potential to increase employment and personal income through direct, indirect, and induced employment opportunities during the construction and operations phases. Specifically, the Proponent predicted that, during the construction phase, the Project would create approximately 2,276 person-years in direct employment of which the Kitikmeot region would benefit from 23 person-years of employment in 2019, 69 person-years in 2020, 102 person-years in 2021, and 94 person-years in 2022. TMAC estimated that across Canada approximately 3,003 person-years in indirect jobs would be created by the Project, with 1,734 person-years in induced employment opportunities. The operations phase was estimated to have a positive effect on employment, averaging an estimated 72 jobs for workers from the Kitikmeot region throughout the construction phase and a total of 1,100 workers being required at site. Indirect employment during operations would be 10,380 person-years and 6,649 person-years of induced employment. Overall, TMAC predicted that the changes to employment opportunities and income and changes to labour force capacity during the construction and operations phases would result in regional, territorial, and national benefits through increases to employment and personal income, and positive contributions to the skill levels and experience of the local and regional labour force.

The Proponent noted that during reclamation and closure there would be a decrease in employment opportunities and personal income that would continue throughout the post-closure phase and that this project reduction in project-related employment may result adverse effects to the socio-economic environment. In addition, TMAC noted that any situation that resulted in temporary closure of the Project may result in a decrease in employment opportunities and income which could cause adverse impacts.

TMAC predicted a positive residual effect on employment during the construction and operations phases, but a negative residual effect during the reclamation and closure phases due to a decrease in employment opportunities and income. Similarly, a negative residual effect was predicted for any temporary closure phases during the Project.

Changes to labour force capacity

TMAC observed within the FEIS that the Project had the potential to change the skills and experience of the territorial and regional labour force and contribute to building labour force capacity. During construction, the Project would provide an estimated 567 person-years of direct, indirect, and induced employment within Nunavut, including 390 person-years within the Kitikmeot region. However, TMAC noted that Kitikmeot residents face a number of barriers to employment including gaps in education and a lack of work-related experience.

If the Project proceeded, the estimated 1,100 workers that would be required at site during operations would have different skill levels and areas of expertise, and this workforce would be utilized for a longer period of time. As such, the Proponent undertook analysis of the workforce at a high and low hiring scenario. In the low hiring scenario TMAC assumed the total workforce would be approximately 12% at all skill levels and would be comprised of Nunavummiut. For the high hiring scenario TMAC assumed 35% of the total workforce would be Nunavummiut. The high and low hiring scenarios were designed to only consider the skill levels of unemployed workers. TMAC predicted that in both the high and low hiring scenarios 90% of the workforce

would be from the Kitikmeot region. These numbers were predicted to build on the 444 person-years of total employment benefits associated with the Doris Gold Mine of which Kitikmeot region workers make up 180 person-years (approximately 36 workers per year) between 2017 and 2021.

As noted above, TMAC's high and low hiring scenarios were designed to only consider the skill levels of unemployed workers. However, TMAC concluded within the FEIS that the Kitikmeot region had the potential to meet Project labour demands; noting that if the Project is to achieve employment levels projected in the higher hiring level, a strong emphasis on supporting appropriate training opportunities for trade occupations would be required. TMAC observed that achievement of the high hiring scenario was possible and referred to the Meadowbank Gold mine that is reported to have Inuit representation of 31% as a result of extensive training and support programs in the region. However, TMC noted that to achieve this level of Inuit employment, the barriers would need to be overcome through enhancement measures such as the Inuit Impacts Benefits Agreement, proposed monitoring plans and adaptive management to maximize employment of Inuit from the LSA and RSA. TMAC further stated that based on the high hiring scenario an estimation of 386 workers would benefit from direct employment and related training opportunities and on-the-job experience. TMAC also noted that this would also have an effect on previously discouraged job seekers re-entering the labour pool as jobs would be available through direct and indirect employment opportunities.

TMAC predicted within the FEIS that the effect of an increase in the labour force capacity as a result of direct, indirect, and induced employment opportunities created over the operations phase of the Project was a positive effect. If the reclamation and closure phases were also considered, the decrease in labour force capacity would be considered as an adverse effect similar to changes to employment. However, as there would be opportunities for work-related experience and an increased capacity gained through the operations phase, and workers would be able to obtain new employment during the closure and reclamation phases.

TMAC noted that the increased capacity of the labour force is anticipated to have a positive residual effect on the Employment VSEC during construction and operations. During the reclamation and closure phases, the Project's contributions to increasing labour force capacity would no longer continue, but no negative residual effect is predicted by TMAC.

Competition for local labour

TMAC indicated that the Project was expected to offer relatively well-paying jobs and would require workers with skills and experience that are also required by other employers in the LSA and RSA. This competition for local labour would primarily take place during the construction phase and the operations phase, as there is not expected to be competition for labour during the reclamation and closure and post-closure phases of the Project. While it is predicted that some of these jobs would be filled by those not currently participating in the wage economy, other positions would be filled by workers holding other occupations in the region such as trades; transportation; heavy equipment operation; natural resources; construction, maintenance, and repair; and janitorial and kitchen services. TMAC predicted that the construction phase of the Project would attract fewer people than the operations phase due to the fact that personnel with trades and skills that would be required for this phase. As a result, TMAC predicted a negative

residual effect of on employment due to competition for labour for the construction and operations phases.

Mitigation and Monitoring Measures

TMAC outlined following measures to monitor and mitigate potential negative effects of the Project to for employment:

- Provide Kitikmeot Inuit and other Nunavut Inuit residents in the Kitikmeot region, followed by all other Kitikmeot and Nunavut Inuit, first opportunity for employment;
- Build cultural awareness and enforce policies to address workplace harassment; and
- Promote awareness of employment opportunities within Kitikmeot communities.

TMAC further noted that education and training initiatives would allow a greater portion of Nunavummiut to meet the requirements for employment with the Project. Other mitigation measures proposed by TMAC include initiatives for training with the Nunavut Arctic College and collaboration with the Kitikmeot Inuit Association. TMAC noted that its recent community-based initiatives, such as participation on the Cambridge Bay Community Readiness Committee, support community preparations for future employment opportunities associated with the development of the Project.

TMAC highlighted the following measures to support the enhancement of skills of the regional labour force in support of the Project:

- A Human Resource Strategy that addresses training and education;
- Specified areas of training;
- Career Development Plans for Inuit employees;
- Inuit Training Targets that are subject to review and adjustment in collaboration with the Inuit Impact Benefits Agreement Implementation Committee for the Project;
- Community Information and Career Awareness Sessions in the Kitikmeot; and
- Kitikmeot Secondary School achievement awards.

Further discussion on Education and Training can be found in Section 6.3 of this Report.

To mitigate potential adverse effects to employment as a result of the reclamation, closure, and post-closure phases of the Project, TMAC noted that it would develop and implement a Workforce Transition Plan to help employees transition to new employment. The plan would include:

- Support for training and career development opportunities prior to reclamation and closure, including worker training programs as part of worker recruitment and on the job training to enhance worker job expertise;
- Implementation of measures prior to reclamation and closure to assist employees to identify opportunities for career succession planning and employment, including providing job search assistance to workers to maximize the number of workers that find alternative suitable employment;
- Identification of skills acquired during employment with the Project and matching the identified skills to similar positions available at reclamation, closure, and post-closure, as well as alternative industries; and

- Assisting employees in identifying ongoing employment and training opportunities in the LSA and RSA that will require existing or complementary skills, including assisting workers in identifying available external resources.

TMAC indicated that the proposed mitigation measures support the transitioning of project employees to other employment once operations end, and that the Workforce Transition Plan would also be implemented to mitigate potential adverse effects associated with any temporary closure phases.

Overall, TMAC predicted that the residual project effects to employment opportunities and income and competition for labour would not be significant.

6.2.2 Views and Concerns of Interested Parties

In its final written submission, the Government of Nunavut (GN) commented on the local labour force and how it would be entry-level and semi-skilled positions.[460] The GN requested that TMAC make efforts towards maximizing the local labour forces' ability to align with necessary skill-sets needed to work at the mine and asked TMAC to provide the most up-to-date estimates of what types of employment would be available through the life of the Project and what skills are required for those jobs. The GN recommended that TMAC provide this type of information in the form of a detailed staff schedule that accounts for each of the project phases and positions, presented by department and division, with each position listed with its associated National Occupational Classification (NOC) code.

TMAC responded by committing to maximizing employment benefits in the local study area (LSA) and regional study area (RSA) and outlining the Proponent's plan for identifying recruitment strategies that would maximize Inuit employment at the Project.[461] With respect to GN's request for collaboration regarding hiring and recruitment, TMAC stated in its response that it would be transparent about procedures and policies; however, TMAC is not in agreement with the request for collaboration on policies or procedures. That said, TMAC noted that TMAC and the GN are working on a memorandum of understanding (MOU) in order to promote cooperation, coordination and implementation of joint activities and TMAC is currently conducting consultations with the Kitikmeot Inuit Association to discuss how such an MOU could be structured to support the efforts of the Hope Bay Inuit Impact Benefits Agreements (IIBA) Implementation Committee. TMAC stated that if an MOU could be concluded to the satisfaction of TMAC, the Kitikmeot Inuit Association (KIA), and the GN, this engagement tool would be included in the Community Involvement Plan.[462] Further, at the Final Hearing TMAC included in Exhibit 84, the List of Commitments Generated in the Proponent's Response to Technical Comments on the Phase 2 Hope Bay Belt Project Final Environmental Impact Statement, [463] wording for a commitment that would require TMAC to submit a staff schedule to the NIRB and the GN at least six (6) months prior to each phase of the Project.

[460] Government of Nunavut Final Written Submission, March 19, 2018
[461] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[462] Government of Nunavut Final Written Submission, March 19, 2018.
[463] TMAC Resources Inc., Exhibit 84, NIRB Final Hearing File No. 12MN001, May 12, 2018.
Final May 12, 2018

Within its final written submissions, Indigenous and Northern Affairs Canada (INAC) commented on TMAC's assessment of potential effects on labour competition.[464] INAC recommended that TMAC provide further clarification and/or evidence in support of TMAC's assertions and conclusion regarding labour competition. INAC requested that TMAC provide literature references, interview data, assumptions made, and/or other inputs underlying its conclusions. INAC also recommended the following:

1) During the hiring for construction and operations, TMAC should identify the former employers of new recruits and report these data quarterly to the Kitikmeot Socio-Economic Monitoring Committee (Kitikmeot SEMC);
2) TMAC should identify a list of potentially vulnerable private and public employers, based on former employers of new recruits but also including other plausible employers, engage with these employers on the subject of labour competition, and provide an annual report on the results of this engagement to the NIRB and Kitikmeot SEMC; and
3) TMAC explore additional mitigation measures that it might take to address the project's competition for labour.

Within its response to the final written submissions, TMAC stated that although efforts are made to maximize Inuit and Nunavummiut employment, the majority of workers were expected to be sourced from outside of the Kitikmeot region and Nunavut.[465] TMAC maintains that the Project's Socio-Economic Monitoring Program (SEMP) and the Project IIBA should be the primary mechanisms used to share and discuss Project-specific socio-economic performance information with stakeholders. TMAC committed to continue its involvement in the Project Socio-economic Monitoring Working Group and the Kitikmeot SEMC, and would remain open to considering additional mitigation measures should Project impacts of competition for local labour emerge as a significant concern.

During the Final Hearing, the KIA questioned TMAC regarding the low and high hiring scenarios for Kitikmeot workers during the life of the Project.[466] TMAC outlined that it arrived at the two (2) scenarios by looking at the unutilized labour force (essentially people that were employable but were not currently employed). The number was then compared with the level of education the Project would require for different positions at the Project and this data was used to establish the low hiring estimate of how many Kitikmeot workers the Project could be expected to hire. The high scenario was arrived at by also looking at the unutilized labour force and considering the highest number of individuals that could reasonably be hired if there were limited and/or no barriers to hiring those individuals. The high number was also selected based on Inuit employment numbers attained by other mining projects in the North (i.e., Meadowbank and the experience in the Northwest Territories). TMAC noted that some barriers are easy to address (e.g., someone needs glasses) but others such as rotational work (2 weeks in/2 weeks out) can be challenging for some families.[467]

[464] Indigenous and Northern Affairs Canada Final Written Submission, March 19, 2018.
[465] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[466] J. Abouchar, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 342, lines 18-20.
[467] Dr. Gustavson, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 342-345, lines 23-26, lines 1-26, lines 1-26, lines 1-23.

KIA then requested TMAC to adopt the high-hiring scenario as the best socio-economic outcome for the Inuit and residents of the Kitikmeot region and that TMAC should commit to making best efforts to reach the high-hiring scenario set out in the FEIS, recognizing that the IIBA currently has annual targets, but no overarching long-term targets.[468,469,470] TMAC responded by explaining that the high and low scenarios were developed for the purposes of the assessment, but were not a target that TMAC would specifically strive for, as the focus of TMAC's Inuit employment efforts would be directed towards meeting the Inuit employment targets developed as primary mitigation measures under the 2015 Hope Bay Belt Project IIBA.[471] [472]

During Indigenous and Northern Affairs Canada's (INAC) presentation to the Board at technical portion of the Final Hearing, noted that TMAC and INAC have agreed upon the wording of a commitment that would resolve the issue of monitoring the Project's influence on local labour. The proposed commitment stated:

> *TMAC shall collaborate with the Hope Bay socioeconomic working group to ensure that the Hope Bay socioeconomic monitoring program provides for appropriate project-specific socioeconomic effects monitoring of the potential effect of competition for labour. Specific indicators will be developed as agreed to by the socioeconomic working group and considering the input of the Kitikmeot socioeconomic monitoring committee to track and report on the extent to which project-related competition for labour may impact Kitikmeot communities. Activities related to monitoring and development of mitigation, including use and disclosure of information and data, will adhere to the Hope Bay socioeconomic working group terms of reference.*[473]

During the Final Hearing, Community Representatives noted their support for the Project on the basis of economic and employment opportunities, and expressed their support as follows:

> *We are in support of the mine. We would like to see the company given the green light. The way I see it, its's going to help our economy and Canada as a whole…we want to see our children complete their education so they can become a part of the economy for the benefit of all Canadians and for the benefit of the Government of Nunavut and for the benefit of – for all Kitikmeot.*[474]

[468] J. Abouchar, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 348, lines 1-5.
[469] J. Abouchar, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 348, lines 17-20.
[470] J. Abouchar, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 349, lines 12-19.
[471] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 348-349, lines 22-26 and lines 1-11.
[472] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 349-350, lines 21-26 and lines 1-10.
[473] D. Abernethy, Indigenous and Northern Affairs Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 587, lines 9-26.
[474] C. Krejunark, Community Representative for Kugaaruk, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 1001-1002, lines 22-26 and lines 6-12.

> *We've seen positive job creation, positive economic development opportunities…we fully support this project advancing…we would like to encourage TMAC to…to maximize Inuit hiring and maximize Inuit wages to try to close the gap between southern wages and wages for local Inuit.*[475]

Further, as part of the community roundtable, a community member from Cambridge Bay commented on the local labour concerns and they noted that in their experience, the shortage of local labour was not a negative issue, as it allowed staff to advance in their careers and gave an opportunity to build capacity within the community.[476] The hamlets noted that while labour shortages are a concern in large project development, the hamlets are there to assist residents wishing to advance their futures.[477]

The KIA made recommendations to the Board to ensure that TMAC is required to strive for the highest possible scenario of Kitikmeot Inuit employment at the Project.[478] At the Final Hearing KIA stated that the KIA and TMAC have agreements in place that apply to this project: the Framework Agreement, the Inuit Impact Benefits Agreement, the Wildlife and Water Compensation Agreement, land tenure agreements, and land use licences [479] The KIA stated that the KIA and TMAC had an excellent working relationship and had entered into a satisfactory Inuit Impact Benefit Agreement three (3) years ago. The KIA also noted that the information that the Proponent included in the FEIS was not available at the time the IIBA was signed, and therefore only annual targets or short term employment targets were included in the IIBA, and no long-term predictions or targets were included in the agreement.[480] Based on the information that was presented in the high and low employment scenarios, in concert with TMAC's average salary predictions ($40,000 and $148,000) the KIA identified that the differences in the potential Inuit earnings were significant, and the effects of the Project on Inuit employment and income varied considerably. Consequently, the KIA urged TMAC to focus on achieving the high hiring scenario.[481] This concern about the significant discrepancy between the benefits to Inuit under the low employment scenario when compared to the high employment scenarios was the basis for the KIA requesting that if the NIRB recommends the Project be allowed to proceed, that the NIRB include the following socio-economic term and condition:

> *TMAC would monitor and report annually to the socioeconomic working group Inuit employment levels at the project, monitor and report on the barriers and the*

[475] J. MacEachern, Community Representative for Cambridge Bay, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 1008, lines 13-23.
[476] J. MacEachern, Community Representative for Cambridge Bay, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 972, lines 14-26.
[477] J. MacEachern, Community Representative for Cambridge Bay, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 973, lines 7-11.
[478] A. Hadlari, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 429-430, lines 26 and lines 1-3.
[479] G. Clark, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 429-430, lines 16-20.
[480] J. Abouchar, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 442-443, lines 13-19 and line 1.
[481] J. Abouchar, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 443-444, lines 9-13 and line 7-10.

opportunities to reach the high Inuit hiring scenario predictions in the final environmental impact statement Table 3-5-11.[482]

TMAC rebutted the KIA's concern regarding employment and income discrepancies by indicating that the existing IIBA has provisions for setting employment targets through an Implementation Committee and noting that this committee could also develop strategies to achieve employment targets. TMAC indicated that the current process was appropriate to fully address this issue.[483] TMAC also went on to note that the approved Doris North Project is already governed by the requirements of Project Certificate No. 003, and that the existing Term and Condition 40 related to socio-economic effects already requires monitoring of employment levels, requiring "*that the company will submit an updated socio economic monitoring plan for the review of the socioeconomic working group*."[484]

During closing remarks, KIA noted that in 2017, TMAC had surpassed the 10% low hiring scenario for Kitikmeot Inuit and also indicated that the latest numbers for the existing Doris North Project indicated that 14% of TMAC's employees were Kitikmeot Inuit. Although the KIA celebrated and applauded that the current statistics, the KIA also wanted to ensure that Inuit hiring levels continue to be monitored throughout the live of the Project and urged that these employment statistics should also be compared to the high-hiring estimates produced by TMAC, and if high hiring scenario is not being met, TMAC should also be required to identify barriers to achieving the high hiring scenario.[485] In their closing statement, the Government of Nunavut supported the continued annual reporting of Inuit employment levels through the socio-economic monitoring program and believes that maximizing opportunities for Inuit employment, using all available avenues is in the best interest of all parties.[486]

In Indigenous and Northern Affairs Canada's closing statement, INAC indicated the KIA and GN proposals to monitor Inuit employment sounded reasonable, noting that increased Inuit employment was a positive thing, but INAC also observed and that Inuit employment could only be enhanced through collaborative discussions with the Kitikmeot Inuit Association, TMAC, the Government of Nunavut and the Government of Canada.[487]

In its closing remarks, TMAC noted the KIA's recommended term and condition in respect of the use of TMAC's high hiring scenarios as an Inuit employment target and indicated that TMAC did not agree with the adoption of the high hiring scenario as a target. TMAC did, however, acknowledge the importance of socio-economic monitoring, including monitoring Inuit

[482] J. Abouchar, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 444, lines 13-18.
[483] B. Armstrong, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 444, lines 12-18.
[484] B. Armstrong, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 468, lines 21-25.
[485] J. Abouchar, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 1012-1013, lines 17-26 and lines 1-10.
[486] S. Pinksen, Government of Nunavut, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 1017, lines 11-18.
[487] S. Dewer, Indigenous and Northern Affairs Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 1022, lines 12-23.

employment associated with the Project and TMAC expressed a willingness to address these issues in detail with the KIA and the socio-economic working group.[488]

6.2.3 Views of the Board

The Board recognizes TMAC's considerable activity in the region and accepts that the Phase 2 Hope Bay Belt Project (the Project) will provide new employment opportunities as well as continued opportunities for employees from its approved Doris North Gold Mine project. This Project is unique in that the Board expects the Proponent to apply the lessons learned during its construction and operation of the Doris North Mine to the Project, including TMAC applying its experience with temporary closures and care and maintenance to develop appropriate mitigation measures for the potential effects of temporary closures and periods of care and maintenance that may occur during the Project.

The Board understands that the identification of barriers to Inuit employment and the development of plans to address such barriers remain an outstanding item from the Final Hearing, identified as an unresolved concern by the KIA in particular. The Board notes that project-specific and regional cumulative effects on employment, labour pool needs and capacity, workforce and family well-being and quality of life issues must be monitored carefully to ensure opportunities are maximized and the potential for adverse effects is minimized. The Board appreciates the commitments of the Proponent to engage with the Kitikmeot Socio-Economic Monitoring Committee, the Government of Nunavut (GN), and the Kitikmeot Inuit Association to identify indicators, share data, opportunities, concerns, and develop solutions. It appears to the Board that the structure established under the IIBA is the most appropriate venue for establishing Inuit employment targets, but acknowledges, as did the KIA, the GN and INAC that is important that TMAC monitor and report on Kitikmeot Inuit employments levels.

The Board notes TMAC's prediction in the FEIS that the Project could result in competition for local labour with regional businesses and organizations, as well as traditional harvesting activities. The Board appreciates that the assessment as presented in the FEIS included a list with detailed description of sectors expected to be most affected. The Board further acknowledges TMAC's proposed mitigation measures, such as informing local businesses, organizations, and hamlets of its hiring requirements.

The Board acknowledges TMAC's commitment to establish multiple points of hire for the Project in the Kitikmeot region, including in the eastern Kitikmeot communities, and to make arrangements for pick up and drop off employees from these communities, and notes TMAC's commitment to establish and implement programs, including counselling, for Inuit employees and their families to assist in the adjustment to fly-in/fly-out rotation work associated with the Project. In addition, the Board acknowledges the Proponent's commitment to collaborate with the Hope Bay Socio-Economic Working Group and the IIBA Implementation Committee to endeavour to meet mutually agreed annual Inuit employment targets for the Project.

[488] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 1035, lines 16-26.

Further, the Board recognizes the contributions of the Proponent to local and regional education and training programs throughout its construction and operations of the approved Doris North Gold Mine Project and acknowledges the commitments by the Proponent to continue these contributions for the Phase 2 Hope Bay Belt Project. The Board notes the GN's role in developing and providing access to various training programs and opportunities, recognizes the importance of institutions receiving applicable updated information for planning purposes, and acknowledges commitments made by TMAC for further communication with the GN.

Lastly, the Board acknowledges comments and closing remarks by numerous Community Representatives of the Kitikmeot communities during the Final Hearings who noted their support of the Project due to the potential employment opportunities. The Board greatly appreciates the time that parties took to express their opinions and to effectively engage in the NIRB's Review of the Project.

6.2.4 Conclusions and Recommendations of the Board

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board recognizes the Project's potential opportunities for employment. The Board recommends the following terms and conditions, which in conjunction with commitments made by the Proponent, will ensure appropriate planning, management, and monitoring (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- Prepare and submit to the Nunavut Impact Review Board and the Government of Nunavut detailed staff schedule information (e.g., type and quantity of positions for each Phase of the Project and skills required for or gained by each position); and
- Keep the Government of Nunavut and other stakeholders, such as the Kitikmeot Inuit Association, informed of hiring procedures and policies, opportunities for advancement, training, and issues regarding employee recruitment and retention.
- Ensure that the levels of Kitikmeot Inuit employment for the Project, including any mutually agreed annual Inuit employment targets are monitored and reported in accordance with TMAC's socio-economic monitoring program.

6.3. EDUCATION AND TRAINING

6.3.1 Views of the Proponent

TMAC Resources Inc. (TMAC or the Proponent) presented its assessment and proposed mitigation and benefits enhancement measures with respect to education and training in Volume 8, Section 3 of its Final Environmental Impact Statement (FEIS). Supporting baseline information from 2011 and 2017 was provided in Volume 6, Appendices V6-3A and V6-3B, respectively. TMAC noted that the Socio-Economic Monitoring Program (SEMP) in place at the Doris North Project would apply to the proposed Phase 2 Hope Bay Belt Project. Volume 8, Annex V8-5 is TMAC's Community Involvement Plan, which outlines its policies and commitments for involving local communities in the Project and which TMAC noted would be continuously revised and improved. TMAC indicated that measures to identify barriers to

employment and advancement at the Project were further described in the Human Resources Plan (Volume 8, Annex V8-7 of the FEIS).

TMAC considered the following two spatial assessment boundaries for its effects assessment on education and training:

- Local Study Area (LSA) – the west Kitikmeot region, including the communities of Cambridge Bay and Kugluktuk
- Regional Study Area (RSA) – the west Kitikmeot region and the eastern Kitikmeot region including Gjoa Haven, Taloyoak, and Kugaaruk.

TMAC predicted within the FEIS that any project-induced effects to education and training would predominantly occur during the construction and operations phases with potential changes anticipated to occur during reclamation and closure, as well as post-closure monitoring. TMAC considered the following indicators in its analysis of the potential effects of the project on education and training: number of certificate programs and courses available to Kitikmeot residents; number of Kitikmeot residents enrolled in programs and courses; public school truancy rate; public school enrollment; and secondary school graduates. TMAC predicted that the Phase 2 Hope Bay Belt Project would result in overall positive residual effects at the local regional scale by increasing demand for education and training and through changes in perceptions of education and employment.

Increased demand for Education and Training

TMAC predicted that during the construction and operations phases, and to a lesser extent during the reclamation and closure phase, the Project would have the potential to increase the demand for education and training programs among residents of the Kitikmeot interested in securing employment at the Phase 2 Hope Bay Belt Project. TMAC projected that the demand for education and training programs would be expected to be greatest before and during the construction phase as local residents prepare to obtain long-term employment during the operations phase of the Project. TMAC noted that as a result of the longer duration of the operations phase (approximately ten [10] years), and the on-the-job training that will be provided by TMAC, demand for local and education and training programs would be expected to increase. TMAC also stated within the FEIS that the partnerships that have been established between industry, the Kitikmeot Inuit Association (KIA), the Government of Nunavut (GN) and institutions to provide education and training programs to ensure that training provided is tailored to meet the requirements of the Project.

TMAC predicted that the Project is expected to support employment in the following areas: management, supervisory and administrative; health, safety and first aid; mining (engineers, technicians, miners, heavy equipment operators, drillers, bolters); geology (geologists, technicians, helpers); milling (metallurgists, technicians, operators); environment (coordinators, technicians); and maintenance and surface operations (electricians, mechanics, plant operators, millwrights, maintenance clerks, warehousemen, and other tradesmen and labourers). TMAC indicated that the potential increased demand for education and training may result in a greater utilization, availability, and diversity of training programs in the Kitikmeot region (e.g., pre-trades, camp cook etc.) and is not anticipated to affect education infrastructure or administration in the region.

TMAC further noted that some workers from the operations phase would also be retained for the Project's reclamation and closure phases, although TMAC specifically noted that some job descriptions and the skill sets required may be different in each phase. TMAC further predicted that during its reclamation and closure phases, it expected that there would be a decrease in the demand for education and training programs within the Kitikmeot region, which would correspond to the decrease in employment opportunities available when compared to the operations phase. Overall, TMAC concluded that with the Hope Bay Project, including the Phase 2 Hope Bay Belt Project, the demand for education and training programs is expected to be higher and of longer duration, and would be expected to result in an increase in the capacity of the local labour force and employment benefits realized as part of the longer-term benefits represented by the additional development of the Hope Bay Greenstone Belt.

Change in Perceptions of Education and Employment

TMAC anticipated that the development of the Phase 2 Hope Bay Belt Project would have the potential to influence changes in perceptions of education and employment. TMAC noted within the FEIS that during the construction phase, it expected that the Project would have positive impacts on the perception of education and employment among Inuit, through the following:

- Increased understanding and experience of the connection between formal education and employment;
- Potential increased school attendance and graduation rates (particularly at the high school level); and
- Increased interest in education and training programs.

TMAC projected that during the operations phase it expected that local youth would experience the benefits of education through the availability of longer-term, permanent employment at the Project. TMAC further stated that as awareness of the skills required to become gainfully employed by the Project increases, through sponsored education programs, youth would become more aware of the link between education and employment. TMAC also predicted that youth perception of education and employment will be positively changed by the presence of parents or other adults in the community who are employed by the Project. During the reclamation and closure phases, TMAC predicted that the number of jobs that would be available will be substantially lower than during operations; however, even this lower level of employment was still likely to have a long-term positive effect on the perceptions of the value of formal education in relation to employment in the region. TMAC further indicated that this positive perception would be expected to persist as many workers continue to be employed by the Project, and as employment and training shifts focus to those skills required for the reclamation and closure phases. A positive residual effect of change in perceptions of education and employment is predicted by TMAC on the valued socio-economic component Education and Training.

TMAC detailed its proposed mitigation and enhancement measures, which included the development of a Human Resources Plan that would identify barriers to employment and career advancement at the Project, and would include talent management initiatives such as training, career planning, and advancement. TMAC also noted that its training will include on-the-job training and skills development across a range of work areas and that career development plans will be developed for all Inuit employees.

6.3.2 Views and Concerns of Interested Parties

Within its final written submission, the Government of Nunavut (GN) noted that the training of local residents would alleviate the local labour shortage by creating a more skilled local workforce. Further, the GN indicated that in order for the local workforce to better meet human resource demands of the Project, the Proponent should commit to apprenticeships from the construction phase onward and provide accredited Project-related training for employees. The GN recommended that TMAC consult with the GN's Department of Family Services regarding accredited Project-related training that future Project employees may potentially access. The GN also requested the Proponent commit to establishing a working group comprised of the Proponent, and the GN-Department of Family Services (and other necessary GN departments) to discuss and address training required to address the skills-gap of the Kitikmeot workforce on an ongoing basis.[489] TMAC responded that it remains supportive of ongoing communication and discussions with the GN-Department of Family Services and other stakeholders, such as Nunavut Arctic College, regarding training opportunities and requirements to fill the skill-gaps of the Kitikmeot workforce.[490]

Within its final written submission, the GN also noted the need for TMAC to deliver programs on financial literacy, financial planning and personal budgeting. TMAC responded that it will reach out to third parties, such as financial institutions to deliver these programs. TMAC also indicated that it will share relevant quantitative and qualitative data concerning the implementation and success of training and education programs, with other socio-economic monitoring initiatives. During the Final Hearing, a Community Representative from Kugluktuk requested information on the availability of training opportunities for youth, including unemployed graduate student from local communities.[491] TMAC remarked that it will set-up an Inuit training on an annual basis as part of its Inuit impact and benefit agreement commitments with the Kitikmeot Inuit Association.[492] The Kitikmeot Inuit Association also noted that it has worked with TMAC to set-up Inuit training programs.[493] During its technical presentation at the Final Hearing, the GN indicated that the GN and the Proponent have been able to establish mutually proposed commitments regarding training required to fill the skills gaps of the local workforce during the life of the project, and that the issue surrounding this matter has been resolved.[494]

Within its final written submission, Environment and Climate Change Canada (ECCC) recommended that the Proponent provide employee training on the use of the equipment especially on minimizing off-road equipment idling.[495]

[489] Government of Nunavut Final Written Submission, March 19, 2018.
[490] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[491] P. Taktagon, Kugluktuk, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 730, lines 12-17.
[492] A. Buchan, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, pp. 730-731, lines 25-26 and 1-22.
[493] A. Hadlari, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, pp. 1014-1015, lines 21-26 and 1-3.
[494] Government of Nunavut, *TMAC Resources' "Phase 2 Hope Bay Belt" Project*, Exhibit 36, NIRB Final Hearing File No. 12MN001, May 10, 2018.
[495] Environment and Climate Change Canada Final Written Submission, March 19, 2018.

During ECCC's technical presentation at the Final Hearing, ECCC indicated that TMAC responded to this request and that maintenance programs and employee training would be outlined in the management plans. As a result, ECCC noted that it was satisfied with the information provided by TMAC.[496]

In response to a Community Representative's comment during the Final Hearing regarding Inuit employment,[497] TMAC noted that it has cross-cultural awareness training that is in place for everyone at the site (Hope Bay) and that it supports young people to complete their education.[498]

Several community representatives noted support for on-the-job training especially for youth and the need to ensure youth continue to go to school with the potential for employment with TMAC and the potential for on-the-job training at the Project site:

> *I would like to say something proactive: I'd like to see young people employed, because sometimes they go on the wayside and become involved in some things that are not very desirable in our communities. It's very good to be able to do labour work and learn on the -- do some training on the job,...*[499]

> *So I was on-the-job training and even with TMAC and -- you know, there is a lot of things happening in our Kitikmeot Region. I know there's a lot of young people are suffering for jobs, and they're trying their best to, you know, stay on their feet. And, you know, we have to -- you know, I want to say this: It's very important for us, for the Kitikmeot Region, especially for the young people*[500]

Another Community Representative requested clarification on how the on-job training would work and whether income support is provided stating: *...I just want to get an idea of how this job training starts, because the young people have to go out of town for training on the job and they don't have income to support their -- for their tickets to train to the jobsite for trainings. I just wanted to get a clarification.*[501] Finally, a Community Representative from Kugaaruk noted support for the Project during closing remarks indicating that they would like to see Inuit employed and would like to see their children complete their education so that they can become part of the economy.[502]

6.3.3 Views of the Board

The Board finds that comments and questions throughout the Final Hearing emphasized the importance of education and training opportunities for Nunavummiut, especially youth and unemployed graduates in Kitikmeot communities. The Board also heard that TMAC noted

[496] K. Wells, Environment and Climate Change Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, pp. 502-503, lines 18-26 and lines 1-4.
[497] B. Uquqtuq, Taloyoak, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 750, lines 17-19.
[498] A. Buchan, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, pp.751-752, lines 17-26 and 1-5.
[499] L. Illuitok, Kugaaruk, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 770, lines 11-16.
[500] J. Avalak, Public Member from Cambridge Bay, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 786, lines 1-20.
[501] M. Tiktalek, Kugluktuk, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 844, lines 1-11.
[502] C. Krejunark, Kugaaruk, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 1002, lines 6-12.

during the Final Hearing that the Inuit Impact and Benefit Agreement has already set annual targets for employment and that it will work with the Kitikmeot Inuit Association (KIA) and the local communities towards meeting the annual employment targets. The Board acknowledges that the Government of Nunavut (GN) is satisfied that the Proponent has committed to addressing the training required to fill the skills gap of the local workforce during the life of the project.

The Board finds that TMAC demonstrated willingness for adaptive management through discussions on youth engagement and communication. The Board further acknowledges and appreciates TMAC's stated intentions with respect to implementing training opportunities and agrees that these would be an essential factor toward development of the local labour force. The Board notes the GN's role in developing and providing access to various training programs and opportunities and acknowledges commitments made by TMAC for further communication with the GN on the subject of education and training. In addition, the Board wishes to stress that, in addition to the need for training for mine-related opportunities, there is the need for the Proponent, the GN, the KIA, and other stakeholders to inform potential candidates about job opportunities available for the Project. The Board acknowledges the GN's role in offering and facilitating such relevant training for Nunavummiut.

The Board also recognizes comments raised by agencies and members of the communities during the Review of this Project in terms of ensuring that there is a "fit" between educational opportunities provided in the region and the skills and requirements for employment at the Project. Accordingly, the Board encourages the Proponent to collaborate with potential stakeholders in the Socio-Economic Monitoring Working Group and with the Kitikmeot Socio-Economic Monitoring Committee to review and monitor education utilization rate trends for Project employees throughout the Project to identify whether or not the Project's employees are accessing educational opportunities available to them in the Kitikmeot region.

6.3.4 Conclusions and Recommendations of the Board

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board believes that the Project's potential effects to education and training could be appropriately managed through the commitments provided by the Proponent and application of key mitigation measures. The Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- Prepare and submit to the Nunavut Impact Review Board and the Government of Nunavut a list of all trades, occupations, journeypersons, and apprentices working with the Project; and
- Develop and maintain an easily referenced listing of formal certificates and licences that may be acquired via on-site training or training during project employment that can be transferred.
- Encouraging collaboration between the Proponent and training organizations and/or government departments offering mine-related or other training to ensure that Project-

specific training for employees provides additional opportunities for residents and employees to gain meaningful and transferable skills and certifications.

6.4. POPULATION DEMOGRAPHICS

6.4.1 Views of the Proponent

TMAC Resources Inc. (TMAC, or the Proponent) discussed local and regional community demographics in Volume 6, Section 3 of the Final Environmental Impact Statement (FEIS) with supporting baseline information from 2011 provided in Volume 6, Appendix V6-3A. TMAC did not include community demographics as a VSEC, but considered it as part of the migration, housing, and infrastructure and services VSEC found within the same section of the FEIS. The Proponent anticipates negligible changes to migration due to having multiple points of hire and transporting workers to/from their home community. See Section 6.9 of this Report for further details on TMAC's assessment with respect to migration, housing, and infrastructure and services.

6.4.2 Views and Concerns of Interested Parties

In response to a Community Representative's comment during the Final Hearing regarding Inuit employment,[503] TMAC noted that as per the Inuit Impact Benefit Agreement, Kitikmeot Inuit have the first priority for jobs at Hope Bay; Inuit from outside of the Kitikmeot region have the next priority for hiring, followed by other Kitikmeot (non-Inuit) residents, and finally, anyone else in Canada.[504]

6.4.3 Views of the Board

The Board recognizes that, as per the Inuit Impact Benefit Agreement, Project employees will be preferentially from within the Kitikmeot Region, and that the Proponent has committed to transport workers to/from their home community. The Board acknowledges TMAC's commitment to ongoing participation in the regional Kitikmeot Socio-Economic Monitoring Committee and the commitment of TMAC to update and continue implementing the Hope Bay Socio-Economic Monitoring Plan through the Hope Bay Socio-Economic Working Group. The Board recognizes that through its Hope Bay Socio-Economic Monitoring Plan, the Proponent has been reporting on regional migration and population demographics in relation to the Doris North Gold Project. The Board sees these as appropriate venues to monitor and address potential issues related to migration and changes in population demographics, and looks forward to the continuation of a collaborative approach to monitoring and reporting.

6.4.4 Conclusions and Recommendations of the Board

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board believes that the Project's potential effects to population demographics could be appropriately managed through the commitments provided by the Proponent and application of key mitigation measures associated with the participation in the

[503] B. Uquqtuq, Taloyoak, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 750, lines 17-19.
[504] A. Buchan, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p.751, lines 6-16.

Kitikmeot Socio-Economic Monitoring Committee, Hope Bay Socio-Economic Wokring Group, and the Inuit Impact Benefits Agreement. The Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- Encourage the collection and sharing of project-specific information concerning the home community of employees and the number of employees that may have relocated to work at the mine, to the extent that this information is acquired voluntarily from employees and that sharing this information is consistent with, and not limited by any Inuit Impact Benefit Agreement with the Kitikmeot Inuit Association.

6.5. TRADITIONAL ACTIVITY AND KNOWLEDGE

6.5.1 Views of the Proponent

TMAC Resources Inc. (TMAC or the Proponent) discussed its assessment of Traditional Knowledge (TK) in Volume 2, Section 2 in the Final Environmental Impact Statement (FEIS) for the Phase 2 Hope Bay Belt Project (the Project). With respect to Traditional Land Use, TMAC provided its assessment and proposed mitigation measures within Volume 6, Section 4 of the FEIS for the Project. Supporting methods and baseline data were provided in Volume 6, Appendices V6-3A and V6-3B. TMAC's assessment of Traditional Activities and Knowledge concluded that the proposed project could potentially lead to changes in access to land and resources, change in harvesting success and changes to the quality of experience of nature for commercial harvesters, sport hunters and recreational users based on the potential for noise and visual effects. TMAC concluded that: "After the application of mitigation measures, the assessment identified one residual effect for the Traditional Activities and Knowledge VSECs".[505] TMAC identified that the lone residual effects for this VSEC was a change in harvesting success/harvesting practice for fishing due to the avoidance of Aimaokatalok, an area frequently used for harvesting. Based on TMAC's assessment, this residual effect was determined to be not significant.

TMAC defined the spatial boundaries for the assessment of potential effects of the Project on traditional activities and land use as follows:

- Project Development Area (PDA) - The area which has the potential for infrastructure to be developed as part of the Project, plus engineering buffers to allow for final refinement of the footprint.
- Local Study Area (LSA) – Includes the PDA and extends beyond to a distance of approximately five (5) kilometres, encompassing 105,200 hectares.
- Regional Study Area (RSA) – Includes the LSA and extends beyond to encompass approximately 534, 000 hectares. Chosen to be consistent with the RSA for terrestrial wildlife and wildlife habitat because of the strong link between terrestrial and wildlife components and land use activities.

505 FEIS, Volume 6, Section 4, at p. 4-116.

Temporally, the Proponent's considered the construction, operations, reclamation and closure, post-closure and possible temporary closure phases of the Project.

TMAC noted that a significant amount of TK collected for the Project has been sourced from the *Naonaiyaotit Traditional Knowledge Project* (NTKP) database.[506] The NTKP is the foundation for recorded and geo-referenced Inuit TK in the western Kitikmeot Region. Data from three (3) other regional and site-specific studies were integrated into the NTKP. These included the 1970s Inuit Land Use and Occupancy Study (ILUOP) that provided spatial data at land-scales of 1:500,000. The remaining work involved linking the text and map data for Kugluktuk and Cambridge Bay. Both communities have information for the TMAC study area. Two (2) more studies came from focused workshops held in Kugluktuk and Cambridge Bay by the Kitikmeot Inuit Association (KIA). The workshops addressed a number of data gaps including those rated to marine environment. Community level research was carried out in 2011 and 2017 by TMAC to provide a summary of the land use baseline information for the Hope Bay Project. In addition, desk-based research was carried out by TMAC in 2015 and in 2017. TMAC summarized how it incorporated this TK information in the Phase 2 Hope Bay Belt Project design, baseline studies and assessment of Valued Ecosystem Components (VECs) and Valued Socio-Economic Components (VSECs), and mitigation and management plans. TMAC noted within the FEIS that TK is treated as an inseparable part of Inuit Qaujimajatuqangit, which refers to "the traditional, current and evolving body of Inuit values, beliefs, experience, perceptions and knowledge regarding the environment, including land, water, wildlife and people, to the extent that people are part of the environment" For the purposes of the Project, TMAC noted that traditional activity and traditional knowledge is inclusive of land use, food security, cultural activities, and commercial harvesting.

The Proponent noted that the Project is located in an area that has seen considerable historic use by Inuit, as demonstrated by the large number of gathering places and travel routes identified in the Regional Study Area (RSA). The Proponent suggested this is likely due to the abundance of terrestrial, freshwater, and marine wildlife resources that have traditionally been found in the region and harvested by Inuit.

TMAC summarized that historical and current land use typically consists of hunting, trapping, fishing, camping, and travelling, and is guided by traditional knowledge and a longstanding relationship of reciprocity and respect between Inuit and their environments. Species of focus included caribou, muskox, wolverine, grey wolf, fox, and to a lesser extent, seals and grizzly and Polar Bears. The introduction of snow machines further influenced how Inuit hunted, allowing greater distances to be covered in shorter times. Further, the introduction of mining in the region has provided for paid employment which has resulted in changes to traditional lifestyles. A caribou workshop held by the Proponent in 2016 identified caribou hunting areas (summer and winter) in and around Kent Peninsula, Elu Inlet and Melville Sound. Baseline studies also indicated that individuals from Cambridge Bay, Kingaok (Bathurst Inlet), and Omingmaktok (Bay Chimo) are active harvesters within the land use RSA as portions of their larger hunting areas. Overall, TMAC concluded that land use within the RSA reflects current land use patterns

[506] Banci, V. and R. Spicker, (Compilers, Editors & GIS). 2016. *Inuit Traditional Knowledge for TMAC Resources Inc. Proposed Hope Bay Project, Naonaiyaotit Traditional Knowledge Project (NTKP)*. Prepared for TMAC Resources Inc. Kitikmeot Inuit Association: Kugluktuk, NU.

throughout the western Kitikmeot region. While some land users have frequented to use other areas, land use activities have continued within the land use LSA despite the presence of Project camps and other infrastructure. Further, TMAC noted that the Hope Bay Project's facilities are commonly used by land users as a rest stop while in the area.

TMAC assessed the following potential effects in the FEIS:

- Changes in access to land and resources
- Changes to harvesting success and/or harvesting practices
- Changes to the quality of the experience of nature

TMAC noted that a number of best management practice and site policies would be put in place, which would reduce impacts on land use VSECs. These include:

- Orientation for all personnel in their responsibilities to protect wildlife and their habitat;
- A no feeding or harassing of wildlife policy;
- A no littering policy;
- A no firearms policy for all Project staff and contractors while on site;
- A speed limit on all Project roads for safety reasons, with the result of reducing dust generation, and reducing potential vehicle collisions with wildlife;
- Giving wildlife the right of way on all roads at all times; and
- Operating helicopters and fixed-wing aircraft at minimum elevations or using horizontal offsets (where safety permits and at the discretion of the pilot) to avoid disturbing wildlife and sensitive wildlife habitats such as bird colonies.

Hunting and Trapping

TMAC noted that accessing land and resources within the land use RSA involves navigating natural features including lakes, mountains and streams. Construction and operations activities may cause minor or temporary delays in certain locations on the Hope Bay Belt, but TMAC indicated that Project-related activities that may affect access would be avoidable at the local scale. Further, TMAC noted that construction activities would be sequential, thereby reducing the extent of construction activities during any given time period in locations along the Hope Bay Belt. TMAC concluded that there is potential for temporary and site-specific interaction between the Project and access to land use areas; however, Project components are not expected to result in a change in effort to access harvesting areas for local land users. Overall, TMAC noted that the Project is not expected to reduce or delay access or result in a change in effort to access hunting and trapping areas, throughout construction, operations, and reclamation and closure.

TMAC indicated within the FEIS that hunting activities are closely interconnected to the presence of wildlife in an area and that local land users hunt in areas where wildlife may be affected by the Project, including areas within and adjacent to the mine sites, all weather road, (AWR), mine access roads, and airstrips. TMAC noted that during construction and operations, there is potential for intermittent disruption of caribou movement due to Project-traffic on the road, but TMAC does not expect these disruptions to change caribou movement in the land use RSA. Further as there is a 'no hunting' policy within 2 km of the Project, change in caribou

movement within range of the road would not affect harvesting practices, as no hunting will occur in proximity to the road. Finally, the Project would not provide new access to new hunting areas as the area is currently already accessible by snow-machine. Overall, TMAC concluded within the FEIS that the Phase 2 Hope Bay Belt Project is not expected to cause an increase in wildlife mortality and effects to wildlife would be limited to the local scale (see Section 5.12.1 for further discussion on the potential impacts to wildlife from the proposed project). Although caribou movement may be affected intermittently due to traffic on the AWR during construction and operations, overall TMAC concluded that wildlife are expected to continue to use the land use RSA and LSA, and as such, TMAC does not anticipate that the Project would change local land users' harvesting success/harvesting practice.

TMAC also noted that there would be potential for change in the quality of experience while hunting and trapping in areas where Project components and activities caused by noise and visual effects, or as a result of changes to other sensory perceptions. TMAC acknowledged that noise disturbance may occur during construction, operations and reclamation and closure phases at the Doris, Madrid and Boston mine sites, along transportation corridors, and near the Doris North and Boston airstrips (see Section 5.3.1 for further discussion on potential impacts from noise). TMAC indicated that harvesters may experience a change in the natural soundscape (e.g., sounds of wind, water, wildlife) that could affect their experience of nature in the land use LSA, particularly during winter months, as sound travels faster and farther in cold temperatures. Further, TMAC stated that project infrastructure may be visible to land users, resulting in a change in the visual quality of the natural landscape. New infrastructure would include the Boston and Madrid site facilities and camp, wind turbines, AWR between Madrid and Boston, expansion of the Doris North TIA, and cargo dock infrastructure at Roberts Bay. Due to the topography of the area that includes coastal ridges, cliffs, and rock outcroppings, and rolling hills, TMAC concluded that overall, land users would not experience a change in the visual landscape unless they are within close proximity to Project infrastructure.

With respect to residual effects, TMAC noted that in consideration of the mitigation measures and best management practices put in place, the Phase 2 Hope Bay Belt Project would not result in a residual effect to access for local land users, and no further assessment was undertaken by TMAC. Further, data gaps regarding harvest success rates and specific hunting sites prevent quantification of Project effects on hunting success, but overall, no residual effect to harvesting success/harvesting practice for local land users was anticipated, and no further assessment was undertaken. Finally, visual and noise effects are anticipated within close proximity of the Project, but overall no residual effect was anticipated for the quality of experience of nature while hunting and no further assessment was undertaken by TMAC.

Fishing

With respect to fishing, local land users have noted that fishing in the area is often opportunistic, while undertaking other land use activities. However even though TMAC has concluded that there would be no adverse effects to water quality and no indirect effects of water quality on fish (see Section 5.7 and Section 5.9 for discussion on potential impacts to the freshwater environment from the Project), TMAC noted that there is potential that local users may perceive environmental effects of the Project, including due to water discharge activities, and local land users may avoid fishing at Doris Lake, Roberts Lake and Aimaokatalok. Avoidance of a

frequented harvesting area may affect harvesting practice; however, as fishing in this area is generally opportunistic, TMAC does not expect that levels of subsistence fishing would be affected (i.e., most fishing happens within the vicinity of communities and camps). TMAC indicated that potential change to fishing practices may affect land use knowledge transfer; however, TMAC concluded that as there is ongoing use of the land use RSA for harvesting and fishing, and because the Project would be shorter than one generation it is likely that land use knowledge transfer related to fishing in the area would continue. Overall, using a conservative approach, TMAC noted that there is potential for a change in fishing practice due to avoidance, but the magnitude of the change is anticipated to be low in consideration that it relates to one of many fishing locations in the area and because it is based on potential for perceived effects as the Project is not anticipated to result in residual effects to fish or fish habitat.

With respect to residual effects, TMAC expects that construction and operations activities may cause minor or temporary delays in certain locations on the Hope Bay Belt, but overall, no changes in access to frequented fishing areas at Roberts Lake or Aimaokatalok are anticipated. No residual effect was identified by TMAC for access to fishing areas and resources for local land users and no further assessment was undertaken by TMAC within the FEIS.

With the implementation of mitigation measures including TMAC's Conceptual Marine Fisheries Offsetting Approach for Phase 2, TMAC indicated that the Project is not anticipated to result in significant residual effects to fish habitat or fish. However, land users may reduce opportunistic fishing activities at Aimaokatalok due to its proximity with Project components and activities, and because this lake is within the receiving environment of the Project. TMAC noted that while no residual effects are anticipated to environmental components, land users may perceive effects. Land users have indicated that generally, subsistence fishing occurs at waterbodies close to camps or communities; therefore, avoidance of fishing within the Land Use RSA is not anticipated to result in a detectible change to overall fish harvest levels (i.e., no residual effect to fishing success). However, harvest practices may at one frequented harvesting location (Aimaokatalok) be negatively affected due to possible avoidance of the area. Further, TMAC indicated that the probability is rated as moderate to unlikely that the Project will affect fishing practice, but there was evidence that fishing at Roberts Lake, near the existing Doris North site, has experienced reduced use. In consideration of the low magnitude rating and limited geographic extent (LSA), within range of other frequented fishing areas, the residual effect to fishing practice was determined to be Not Significant. The confidence rating is low, however, as there was no data regarding perceptions about fishing in areas adjacent to the Phase 2 Hope Bay Belt Project and no information about current harvest levels in this area.

Cultural Sites and Routes

TMAC noted that land users may have a reduced quality of experience of nature at seasonal camps or while travelling on preferred routes where Project components and activities are anticipated to cause noise and visual effects. Currently, use of the seasonal camp at Roberts Lake is minimal in part due its proximity to the Doris North Gold Mine Project; limited use may reflect perceived or real change in the experience of nature at this location. Throughout construction, operations, and reclamation and closure, aircraft noise from the Doris North airstrip may be heard at this camp, although general construction and operations noise would not likely

be audible (see Section 5.3.1 for further discussion on noise). TMAC concluded that land users may experience a change in the natural soundscape (e.g., sounds of wind, water, wildlife).

As indicated in the FEIS, there are no cultural sites within visual range of Project components. TMAC noted that Project infrastructure (e.g., raised TIA, wind turbine, surface site infrastructure) may change the visual aesthetic of the existing landscape along travel routes. Project components at Roberts Bay may be visible to land users travelling through this area, and similarly new infrastructure at Madrid and Boston and the AWR may be visible to land users travelling within close proximity of these sites. The presence of workers during construction, operations, and reclamation and closure would result in increased presence of people at the Project sites, and has potential to change land users' quality of experience of nature while travelling within proximity to project infrastructure and or activities. TMAC indicated within the FEIS that there is limited perceptual data available regarding the current quality of experience of nature, particularly in areas with the land use RSA.

TMAC has committed to allow land users to cross roads and navigate around infrastructure. TMAC concluded that overall there would be no residual effect related to changes in access of cultural sites or travel routes and no residual effect to the quality of experience of nature for cultural sites and travel routes, and therefore no further assessment was undertaken.

During the Final Hearing, TMAC further noted the use of an established Inuit Environmental Advisory Committee to assist in the traditional knowledge collection. The Inuit Environmental Advisory Committee consists of knowledgeable Inuit who have used the Hope Bay area as part of their traditional land use in the past and also currently and TMAC noted that it is a mechanism that is designed to take advantage of traditional knowledge on a regular and continual basis throughout the life of the Project.[507] During the Final Hearing, TMAC also stressed that traditional knowledge collected during workshops to inform the environmental assessment was treated as fact and was used to fill the gaps and uncertainty that science could not address.[508] In addition, TMAC stressed throughout the Final Hearing that traditional knowledge is treated as fact and that, in general, the traditional knowledge collected during the assessment agreed with the scientific data, especially related to land use and caribou.[509,510,511]

6.5.2 Views and Concerns of Interested Parties

Within its final written submission, the Kitikmeot Inuit Association (KIA) commented on the continued concern with respect to soil ingestion rates given the unique considerations of land users. The KIA recommended that the soil ingestion rates recommended by Health Canada be used in the assessment, as these rates would result in more conservative and descriptive estimates

[507] TMAC Resources Inc., *Traditional Knowledge and Public Participation Presentation*, Exhibit 06, NIRB Final Hearing File No. 12MN001, May 8, 2018.
[508] TMAC Resources Inc., *Terrestrial Environment, Wildlife and Wildlife Habitat Presentation*, Exhibit 12, NIRB Final Hearing File No. 12MN001, May 8, 2018.
[509] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2018, pp. 154-155, lines 22-26 and 9-13.
[510] G. Sharam, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2018, p. 174, lines 7-11.
[511] G. Sharam, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, pp. 222, 224, lines 6-7, 20-26.

that better reflect the rural situation of the Project and the specific land users concerned.[512] Within its final written submission, Health Canada provided similar concerns with respect to the soil ingestion rates used by TMAC.[513] For further details on this discussion, please refer to Section 7.2.2 of this Report.

The KIA further re-iterated within the final written submission its request for clarification on the timeframe used to calculate incremental lifetime cancer risk (ILCR) for land users.[514] Health Canada requested clarification within its final written submission with respect to the ILCR from arsenic to adult land user receptors.[515] For further details on this discussion, please refer to Section 7.2.2 of this Report.

During the Final Hearing, NIRB staff requested clarification on how frequently Inuit harvesters and/or support hunters currently interact with the approved Doris North site facilities, whether the development of the Doris North mine has had any influence on the local harvesting in the area, and whether TMAC believes that the proposed Project might influence wildlife harvesting patterns in the area, based on TMAC's experience to date.[516] In reply, TMAC noted that they have enumerated site visitation to the Doris North Gold Mine Project over the last several years, and on average, the site receives about 25 visits per year by individual harvesters or groups of harvesters, and occasional visits from sport hunters. TMAC noted that they have not seen an increase in the use of the site since the opening of the Doris North Gold Mine and do not anticipate any increases in site visitation with the addition of the Phase 2 Hope Bay Belt Project.[517]

An Elder from Cambridge Bay noted that as part of the Elders Committee in Cambridge Bay that they provided traditional knowledge to the mining company and that Elders want to ensure that it is recorded and not lost. The Elder further noted that with the new technology available today and incorporation of Inuit traditional knowledge, the concerns with respect to the environmental impacts from the mining projects are addressed. In addition, the Elder stressed that the mining company is respectful of Elder's concerns.[518]

A Community Representative from Kugaaruk indicated that traditional knowledge was passed on to him when he was young and that the environment is sensitive and that by taking care of the environment, it would take care of the people. The Representative stressed that "...[o]*nce the mining companies started coming up here, we're noticing that wildlife and fish are beginning to be impacted, and sometimes we are unable to eat what we catch because some are unhealthy.*"[519]

[512] Kitikmeot Inuit Association Final Written Submission, March 19, 2018
[513] Health Canada Final Written Submission, March 19, 2018
[514] Kitikmeot Inuit Association Final Written Submission, March 19, 2018
[515] Health Canada Final Written Submission, March 19, 2018
[516] R. Barry, Nunavut Impact Review Board, NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2018, p 118, lines 15-24.
[517] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2018, pp. 118-119, lines 3-26 and 1-6.
[518] J. Haniliak, Public Member from Cambridge Bay, NIRB Final Hearing File No. 12MN001 Transcript, Transcript, May 11, 2018, pp. 780-784, lines 14-26, 1-26, 1-26, 1-26 and 1-6.
[519] L. Illuitok, Kugaaruk, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p 932, lines 7-26.

6.5.3 Views of the Board

During the Final Hearing, the Board requested clarification on the Proponent's presentation with respect to the collection of traditional knowledge noting that Inuit have travelled through this area to the calving grounds to the south of the project area and the area has been used a great deal in the past.[520] In response, the Proponent noted that the studies have collected information from a wide area and included historic and present day information on caribou.[521]

The Board also requested clarification on how many traditional knowledge workshops were held by the Proponent and requested clarification on who sits on the Inuit Environmental Advisory Committee.[522] In response, the Proponent noted that they meet with the Inuit Environmental Advisory Committee at least two (2) times per year and include at least one (1) site visit per year. Further, for the proposed Phase 2 Project, TMAC has held three (3) separate caribou workshops to look at wildlife interactions with the Project. With respect to the members on the committee, the Proponent stated that members include Elders, active harvesters, and young hunters that have grown up and/or are familiar with the Hope Bay area.[523]

During the Final Hearing, the Board requested clarification on how TMAC used knowledge from Inuit Elders and Inuit hunters in the assessment process, especially with their expertise related to how the caribou migrates and how they roads may affect the migration routes. In addition, the Board stressed that TMAC needs to be careful on the use of terminology as the definition for Inuit Qaujimaningit is different compared to Inuit traditional knowledge.[524] In response, the Proponent noted that the maps showing caribou migration routes included information from Naonaiyaotit traditional knowledge studies and stressed that TMAC treated traditional knowledge as fact and that the Inuit agreed with the scientific knowledge. Further, the Proponent noted that traditional knowledge was used in the design of the project, especially related to the crossings structures of the roads.[525]

The Board also requested clarification from the Proponent on where traditional knowledge was collected from and whether traditional knowledge was collected from the Kent Peninsula and how far south was it collected from Inuit from the area.[526] TMAC responded that the scale of traditional knowledge collected was based on the subject. As an example, TMAC noted that information collected on camping spots would be localized to the area around the proposed development while traditional knowledge information on caribou would draw from a larger

[520] P. Kadlun, Board Member, NIRB Final Hearing File No. 12MN001 Transcript, Transcript, May 8, 2018, pp. 120-121, lines 22-26 and 1-10.
[521] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, Transcript, May 8, 2018, pp. 121-122, lines 24-26 and 1-5.
[522] H. Ohokannoak, Board Member, NIRB Final Hearing File No. 12MN001 Transcript, Transcript, May 8, 2018, p. 123, lines 2-5.
[523] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, Transcript, May 8, 2018, p. 123, lines 10-22.
[524] A. Maghagak, Board Member, NIRB Final Hearing File No. 12MN001 Transcript, Transcript, May 9, 2018, pp. 252-253, lines 20-26, 1-18, pp. 256-257, lines 23-26 and 1-2.
[525] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, Transcript, May 9, 2018, p. 254-256, lines 1-26, 1-26, and 1-16.
[526] H. Ohokannoak, Board Member, NIRB Final Hearing File No. 12MN001 Transcript, Transcript, May 11, 2018, p. 777, lines 1-6.

geographic area to obtain an understanding of the significance of the project. TMAC did note that when information was requested from the Kitikmeot Inuit Association from the *Naonaiyaotit Traditional Knowledge Project* (NTKP) database the search parameters included looking at information all the way up to Victoria Island, all the way to the east as far as Queen Maud Gulf, all the way down to the Northwest Territories border and to west side of Bathurst Inlet.[527]

During the Final Hearing, the Board, based on a response by TMAC on water movement/exchange between Roberts Bay and Melville Sound, noted that the community members are familiar with the area and the movement of the water noting:

> *…people know that area very, very well. They know there are places where it doesn't completely freeze, even with winter. There are many areas within Elu Inlet and also Bathurst, in that area -- there are many, many places where the ice doesn't get very, very thick or it may be open in some places.*[528]

The Board notes TMAC's assessment of traditional land use and use of Inuit Qaujimajatuqangit and the inclusion of lessons learned from the Doris North Gold Mine in the assessment of the Project and the use of the Inuit Environmental Advisory Committee to obtain traditional knowledge. The Board also understands the challenges or uncertainty in assessing traditional land use which includes the incorporation of assessment results of other valued components and that currently there are no established thresholds or standards for most measurement indicators.

The Board stresses the importance of the incorporation of Inuit Qaujimaningit into all phases of project development (predevelopment to closure) and has discussed issues in each of the valued components and provided comments on monitoring in some sections (e.g. Terrestrial Wildlife, Vegetation, Marine Mammals).

The Board acknowledges the importance of incorporation of Inuit Qaujimaningit into monitoring as identified in comments raised by Community Representatives and during the Board's review of the Project. The Board appreciates TMAC's commitment to cooperate with the Kitikmeot Inuit Association, Inuit stakeholders, and local Hunters and Trappers Organizations to continue incorporating Inuit Qaujimaningit into each version of the monitoring documents. The Board encourages the selection of indicators and/or thresholds into monitoring frameworks to ensure that the Proponent can identify project-induced disturbances or changes to preferred hunting/fishing/plant harvesting areas as well as the enjoyment of the land and cultural areas. Further, if there are project-induced changes acknowledged by TMAC to the traditional lifestyle of Inuit, triggers and adaptive management measures should be identified to ensure that TMAC can minimize the potential for adverse effects on the participation of Inuit in traditional land and resource use activities.

[527] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, Transcript, May 11, 2018, pp. 777-778, lines 12-26 and 1-16.
[528] P. Kadlun, Board Member, NIRB Final Hearing File No. 12MN001 Transcript, Transcript, May 11, 2018, p. 775, lines 12-17.

6.5.4 Conclusions and Recommendations of the Board

The Board acknowledges that TMAC has worked hard with a number of agencies including the Kitikmeot Inuit Association (KIA), the local Hunters and Trappers Associations, as well as Elders and community members at various meetings held throughout the Kitikmeot region to collect and incorporate Inuit Qaujimaningit from land users into the planning of the Project, as well as the use of Inuit Environmental Advisory Committee to collect traditional knowledge. The Board encourages the Proponent to continue the involvement of Elders and community members in the further revision of its monitoring and mitigative plans, and urges the parties to ensure that this consultation is ongoing and consistent. The Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- Ensuring that the development of all project monitoring plans and associated reporting and updates are undertaken with active engagement of Kitikmeot communities, land users, and harvesters. The Proponent should work with the Kitikmeot Inuit Association and the Kitikmeot Socio-Economic Monitoring Committee to report on the collection and integration of Inuit Qaujimaningit through its monitoring programs for the Project.

In addition, the Board heard multiple concerns that the Project could result in negative socio-economic impacts, specifically with regards to food security from potential negative project effects to caribou herds in the Region. In addition to the terms and conditions recommended by the Board to address the potential for impacts to caribou under Section 5.12.4: Terrestrial Wildlife and Wildlife Habitat of this Report, the Board recommends the adoption of the Proponent's commitments made during the NIRB's Review to cooperate with various Regulatory agencies to select relevant indicators to monitor and report on the potential for these effects.

6.6. NON-TRADITIONAL LAND AND RESOURCE USE

6.6.1 Views of the Proponent

TMAC Resources Inc.'s (TMAC or the Proponent) assessment of commercial (non-traditional) land use activities (and resource use) was provided in Volume 6, Section 4 of the Final Environmental Impact Statement (FEIS) and supporting baseline information was provided in Volume 6, Appendix V6-3B. TMAC defined non-traditional land use to include commercial food harvesting, sport hunting, guide outfitting and lodges, and nature tourism. TMAC concluded that after the application of mitigation measures, there would be no residual effects for Commercial Land and Resource Use.

TMAC considered the following assessment boundaries for its effects assessment on non-traditional land and resource use, consistent with the boundaries used to assess Traditional Activity and Knowledge (see Section 6.5 of this Report):

- Project Development Area (PDA) - The area which has the potential for infrastructure to be developed as part of the Project, plus engineering buffers to allow for final refinement of the footprint.
- Local Study Area (LSA) – Includes the PDA and extends beyond to a distance of approximately five (5) kilometres, encompassing 105, 200 hectares.
- Regional Study Area (RSA) – Includes the LSA and extends beyond to encompass approximately 534, 000 hectares. Chosen to be consistent with the RSA for terrestrial wildlife and wildlife habitat because of the strong link between terrestrial and wildlife components and land use activities.

Temporally, the Proponent considered the construction, operations, reclamation and closure, post-closure and possible temporary closure phases of the Project in the assessment of this Valued Socio-Economic Component (VSEC).

As was discussed in Section 6.5.1 of this Report, a significant amount of Traditional Knowledge (TK) collected for the Project was sourced from the *Naonaiyaotit Traditional Knowledge Project* (NTKP) database and was incorporated into the FEIS by TMAC.[529] The NTKP is the foundation for recorded and geo-referenced Inuit TK in the western Kitikmeot Region. Data from three (3) other regional and site-specific studies was integrated into the NTKP. These included the 1970s Inuit Land Use and Occupancy Study (ILUOP) that provided spatial data at land-scales of 1:500,000. The remaining work involved linking the text and map data for Kugluktuk and Cambridge Bay. Both communities have information for the TMAC study area. Two (2) more studies came from focused workshops held in Kugluktuk and Cambridge Bay by the Kitikmeot Inuit Association (KIA). The workshops addressed a number of data gaps including those related to the marine environment. Community level research was carried out in 2011 and 2017 by TMAC to provide a summary of the land use baseline information for the Hope Bay Project. In addition, desk-based research was carried out by TMAC in 2015 and in 2017. TMAC summarized how it incorporated this TK information in the Phase 2 Hope Bay Belt Project design, baseline studies and assessment of Valued Ecosystem Components (VECs) and VSECs, and mitigation and management plans. TMAC noted within the FEIS that TK is treated as an inseparable part of Inuit Qaujimajatuqangit, which refers to "the traditional, current and evolving body of Inuit values, beliefs, experience, perceptions and knowledge regarding the environment, including land, water, wildlife and people, to the extent that people are part of the environment." For the purposes of the Project, TMAC noted that traditional activity and traditional knowledge is inclusive of land use, food security, cultural activities, and commercial harvesting.

TMAC outlined the exploration and mining activities in Nunavut and specifically the Kitikmeot region and noted that the potential for mine development in the west Kitikmeot is high and mining and mineral exploration activities have contributed substantially to local and regional economies and employment. Past-producing mines include the Lupin Gold Mine and the Jericho Diamond Mine and the Roberts Bay and Ida Bay Silver Mines. In 2016 there were 124 permits, 3,335 claim, and 477 leases in Nunavut in good standing and active mineral tenures in the Kitikmeot region have increased by three (3) Inuit owned lands parcel Exploration Agreements,

[529] Banci, V. and R. Spicker, (Compilers, Editors & GIS). 2016. *Inuit Traditional Knowledge for TMAC Resources Inc. Proposed Hope Bay Project, Naonaiyaotit Traditional Knowledge Project (NTKP)*. Prepared for TMAC Resources Inc. Kitikmeot Inuit Association: Kugluktuk, NU.

eight (8) prospecting permit applications and more than 100 newly staked claims. The Kitikmeot Region has one (1) operating mine, which is the Doris North Gold Mine and advanced exploration projects include the Hood River (WPC Resources), Izok Corridor (MMG), and the Phase 2 Hope Bay Belt, with the Back River Project (Sabina Gold & Silver Corp.) approved to proceed in early 2018. TMAC noted that the southern Kitikmeot Region is not recognized as having oil and gas potential. In addition, the Region has two (2) sites which are decommissioned, Roberts Bay and Ida Bay Solver Mines which were active in the 1960 and 1970s, ceasing operation in 1975, and while decommissioning was completed in 2010, the monitoring of these sites will occur for the next 25 years.

Non-commercial land use activities in the Kitikmeot Region were defined by TMAC to include commercial food harvesting, sport hunting, guide outfitting and lodges, nature tourism, commercial recreation, and other tourism activities. TMAC detailed the following non-commercial land use activities in the Region:

- Projects or hunts organized by, or through Burnside Hunters and Trappers Organization (HTO) which is a combination of the Omingmaktok and Bathurst Inlet HTOs and Ikaluktutiak HTO;
- Kitikmeot Foods Ltd. which is a food processing facility owned by the Nunavut Development Corporation and the Ikaluktutiak HTO;
- Muskox management through the West Kitikmeot Muskox Management Plan;
- Licensed Outfitters and Sport Hunting for grizzly bear, wolf, caribou, and muskox;
- Fisheries Licenses overseen by Fisheries and Oceans Canada through one exploratory licence for an Arctic char fishery;
- Ecotourism Lodges (Bathurst Inlet Lodge, Elu Inlet Lodge, B&J Flyfishing Adventures, High Arctic Lodge and Sport Fishing Camps, and Plummer's Arctic Lodge); and
- Outdoor Tourism and Recreation Activities (Nahanni River Adventures, Bathurst Arctic Services, and various cruise ships).

TMAC identified the following potential project-related effects related to Commercial Land and Resource Use:

- Change in access to land and resources (i.e., change in access);
- Change in harvesting success/ harvesting practice; and
- Change in the quality of experiences of nature.

Change in Land and Access to Recourses

TMAC outlined that this potential effect is defined as a reduction or loss of use of an area of land and its resources because of the physical displacement by or in close proximity to the Project and included disruption to travel routes or access to harvesting areas. TMAC predicted that construction and operations activities could cause minor or temporary delays in certain locations along the Hope Bay Belt, but these activities would be avoidable at a local scale and construction activities would occur sequentially.

Commercial land users may use alternate routes to or from Kent Peninsula to avoid construction at Roberts Bay, although overall access throughout the coastal area would be possible during all

seasons. The ongoing presence of facilities at the Madrid and Boston sites would not be expected to result in delays or restricted access to hunting or fishing areas and commercial land users would not experience any changes to access following decommissioning of the all-weather road (AWR) in Year 17. There is potential for temporary and site-specific interaction between the Project and access to land use areas for commercial harvesters as a result of the Project, primarily during the construction and operations of the AWR.

TMAC's commitment to allow land users to cross roads and navigate around infrastructure would allow for ongoing and broad use of the land in the RSA and TMAC's commitment to allow hunters to stay at Hope Bay site would also support continued land use by commercial land users. Recognizing these mitigation measures, TMAC stated that the Project would not result in a residual effect in access to land and resources for commercial hunters, Elu Inlet Lodge, or other commercial land users and no further assessment was undertaken as a result.

Change in Harvesting Success/Harvesting Practice

TMAC defined the potential for this effect as changes to the abundance, and distribution of wildlife and birds (including their eggs) and fish and including changes to the availability of animals for harvesters due to a reduction in habitat or population size and changes to movement or migration patterns. During construction and operations, TMAC noted that there was potential for intermittent disruption of caribou movement due to Project-traffic on the road; however, these disruptions are not expected to change caribou movement in the land use RSA. Further, TMAC stated that hunting in the RSA occurs primarily in the spring and summer months and in accordance with the *Mines Health and Safety Act* (1994), (which requires that no firearms are to be discharged within two (2) km of the Project site for safety reasons). The Doris North project currently has a 'no hunting' policy which prohibits harvesting animals within this two (2) km radius and this would be expected to be continued for the Phase 2 Hope Bay Belt Project.

In TMAC's assessment it was noted that there would be no significant residual effect on wildlife during any phase of the Project, because: Project components would remove only a very limited amount of habitat available to wildlife regionally; sensory disturbances were not anticipated to result in changes to movement patterns; no increased predation was expected; and traffic controls were expected to limit any wildlife-vehicle collisions for larger animals. Overall, TMAC stated that effects to wildlife were limited to the local scale and commercial land use activities would not experience a reduction in harvesting success/harvesting practice as a result of the Project. Consequently, no further assessment was undertaken.

Change in the Quality of the Experience of Nature

TMAC noted that there was a potential for change in the quality of experience of nature for those that use the area such as commercial harvesters, sport hunters and recreational/tourism users as Project components and activities are expected to cause noise and visual effects for anyone in close proximity to the Project. However, TMAC noted that due to the undulating topography of the area, views of the Project are obstructed by natural landforms, and as such, a change in visual aesthetics is not anticipated for commercial land users unless they are within close proximity of the PDA. As previously stated, TMAC does not anticipated that wildlife would change their movement patterns at a regional level or that loss of habitat or disturbance would reduce the presence of wildlife in the land use RSA. Therefore, TMAC predicted no change in

opportunities for viewing wildlife (e.g., for eco-lodges and associated outdoor recreation activities) were anticipated and no further assessment was undertaken.

TMAC stated it had several environmental management plans from the exiting Doris North project that would be updated to reflect the additional scope of the Phase 2 Hope Bay Belt Project (e.g., Air Quality Management Plan, Hope Bay Project Wildlife Mitigation and Monitoring Plan, Hope Bay Project Aquatic Effects Monitoring Plan, Hope Bay Heritage Resources Protection Plan, Conceptual Marine Fisheries Offsetting Approach, and Hope Bay Project, Boston Conceptual Closure and Reclamation Plan). TMAC also indicated it would work to develop mitigation and adaptive management strategies that would be applied to the Project such as mitigation by project design including the following:

- Design infrastructure to minimize the PDA to reduce habitat loss for wildlife (both for terrestrial and marine species);
- Locate infrastructure close to deposits to keep activities confined to specific areas, and to confine noise-generating activities;
- Design infrastructure to avoid, where possible, identified wildlife sensitive areas and wetlands;
- Construct roads, where safety permits, without continuous berms to minimize bank heights of roads to allow for the easier passage of people and wildlife; and
- Use and maintain wildlife-proof waste management facilities and buildings.

TMAC also outlined its existing Best Management Practices that would be in place to reduce the potential for impacts to commercial land users. These included:

- Orientation for all personnel in their responsibilities to protect wildlife and their habitat;
- A speed limit on all Project roads for safety reasons, with the result of reducing dust generation and reducing potential vehicle collisions with wildlife;
- Giving wildlife the right of way on all roads at all times; and
- Operating helicopters and fixed-wing aircraft at minimum elevation or using horizontal offsets (where safety permits and at the discretion of the pilot) to avoid disturbing wildlife and sensitive wildlife habitats such as bird colonies.

In addition to these plans, the Inuit Impact Benefit Agreement (IIBA) with the Kitikmeot Inuit Association also applies to the Project and has established an Inuit Environmental Advisory Committee for the Doris North project which is also anticipated to give advice on the Phase 2 Hope Bay Belt project. This IIBA structures how community involvement would occur and how best to notify hunters and other land users regarding the activities around the Project, as well as communicate safety measures, such as no hunting around Project infrastructure for safety reasons.

TMAC stated that after the application of mitigation measures changes in access for commercial users would be to minimize or avoidance, and therefore no residual effect was identified for the Commercial Land and Resource Use VSEC.

6.6.2 Views and Concerns of Interested Parties

During the Final Hearing, NIRB staff requested clarification regarding the frequency of Inuit harvesters and/or sport hunters currently interacting with the approved Doris North Gold Mine site and facilities, in order to identify whether the existing Doris North mine has had any influence on local harvesting in the area and if TMAC's experience to date would identify that the Project might influence wildlife harvesting patterns in the Project area.[530] TMAC responded by noting that on average there are around 25 site visits per year by individual harvesters or groups of harvesters that are harvesting for themselves. Occasionally guided sport hunts travel through the Project area destined for Umingmaktok Hunters and Trappers Organization's cabin located approximately 12 kilometres north of Roberts Bay and would stop at the mine site. The guided sport hunts are primarily for muskox and grizzly bear guided hunts. At the Doris North Gold Mine, TMAC noted that it has not experienced an increase in the number of people coming to site. Further, as there are no longer any permanent residents in the Bathurst/Melville Sound area of Nunavut, TMAC noted that these might be the reason why the numbers of people travelling in the area of the mine have decreased in recent years compared to 20 years ago. Finally, TMAC noted that they do not anticipate an increase in site visitation to the proposed facilities as it would be located further south.[531]

While the Government of Nunavut noted that, as per its mandate, it is charged with ensuring the responsible development of the territory's renewable and non-renewable resources so as to benefit all Nunavummiut,[532] and Environment and Climate Change Canada noted that, as per its mandate, it is charged to conserve Canada's renewable resources,[533] no additional party raised concerns regarding the potential for project-induced effects on non-traditional land use and resource use.

6.6.3 Views of the Board

The Board acknowledges TMAC's proposed plans to mitigate and monitor potential effects to non-traditional land and resource use. However, the Board is concerned about a lack of information regarding plans to monitor impacts on the quality of the experiences in the natural environment for non-traditional land users. The Board would like to stress the importance of monitoring and continued engagement with local land users, specifically with respect to maintaining ongoing communication with local individuals and communities who may be seasonally using the area. The Board encourages the Proponent to consult with outfitting and guiding businesses that operate in the regional study area regarding their planned use of the land and marine areas in proximity to project infrastructures or activities and any noted project effects, particularly for effects on these users' experiences in the natural environment.

[530] R. Barry, NIRB Staff, NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2018, p. 118, lines 15-24.
[531] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2018, pp. 119-120, lines 3-26 and lines 1-6.
[532] S. Pinksen, Government of Nunavut, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, pp. 480-481, lines 22-26 and lines 1-11.
[533] B. Summerfield, Environment and Climate Change Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 499, lines 1-8.

6.6.4 Conclusions and Recommendations of the Board

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board believes that the Project's potential effects to non-traditional land use and resource use could be appropriately managed through the commitments provided by the Proponent and application of key mitigation measures associated with engagement with potentially-impacted businesses and organizations. The Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- Consultation with outfitting and guiding businesses that operate in or travel through the regional study area regarding whether project infrastructure or activities is adversely affecting their use and experience of the surrounding environment.

6.7. HERITAGE RESOURCES

6.7.1 Views of the Proponent

TMAC Resources Inc. (TMAC or the Proponent) provided its assessment of the effects of the Phase 2 Hope Bay Belt Project (the Project) on heritage resources in Volume 6, Section 1 (palaeontology) and Volume 6, Section 2 (archaeology) of the Final Environmental Impact Statement (FEIS). Proposed management plans to inform monitoring and mitigation measures for potential project effects to heritage resources are presented in Volume 8, Annex V8-6 of the FEIS. TMAC indicated that residual effects identified on the archaeological sites were determined to be not significant; however archaeological sites are only mitigated when it is clear that they would be impacted, either directly or indirectly and TMAC had no options for avoidance or adequate protection.

TMAC reviewed available information from the *Naonaiyaotit Traditional Knowledge Project* (NTKP)[534] report and noted that there were no direct references relevant to existing paleontological resources. Traditional knowledge for archaeological resources was obtained by TMAC from the NTKP report as well as other reports containing traditional knowledge and based on information from several information meetings with Elders. Based on the information sources, TMAC identified archaeological remains as a valued socio-economic component (VSEC) that would serve as the appropriate VSEC to analyze Project interactions with heritage resources.

TMAC defined the following spatial boundaries for its assessment of heritage resources:

- Project Development Area (PDA) - The area which has the potential for infrastructure to be developed as part of the Phase 2 Hope Bay Belt Project, plus engineering buffers to allow for future refinement of the footprint.

[534] Banci, V. and R. Spicker, (Compilers, Editors & GIS). 2016. *Inuit Traditional Knowledge for TMAC Resources Inc. Proposed Hope Bay Project, Naonaiyaotit Traditional Knowledge Project (NTKP)*. Prepared for TMAC Resources Inc. Kitikmeot Inuit Association: Kugluktuk, NU.

- Local Study Area (LSA) - The PDA and the area surrounding the PDA within which there is a reasonable potential for immediate effects. The LSA comprised the proposed Project infrastructure with an approximate five (5) kilometre buffer and is considered the area within which sites may be subject to indirect Project-related effects.
- Regional Study Area (RSA) - The area traditionally used by the semi-nomadic Copper Inuit and used only for the cumulative effects assessment.

Temporally, the Proponent considered the construction, operations, reclamation and closure, post-closure and possible temporary closure phases of the Project.

TMAC noted that the characterization of baseline conditions for paleontological resources is inferred from the geology of the Project area and the general literature from the region. TMAC summarized that the rocks within the Project area are composed of the Hope Bay volcanic belt and surrounding Archean granitoid and gneissic rocks. Based on available published information, TMAC indicated that no fossils have been reported associated with the rocks of the Hope Bay volcanic belt and fossils from the Archean are limited to single-celled organisms that thrived in low-energy shallow marine environments, which are not expressed in the rock types in the Project area. TMAC noted that paleontological effects were scoped out of its effects assessment as there are no known paleontological sites protected by legislation that may be affected by development of the Project.

For archaeological sites, TMAC surmised that this region appears to have been well used seasonally throughout the known period of human occupation of approximately the past 3,500 years and representation of all cultural phases known in the central Arctic have been found in the Hope Bay Belt. The earliest archaeological sites, probably relating to the Pre-Dorset culture, have been found some distance inland, as have several sites suspected, on the basis of structural elements, to be from the early Thule period. TMAC noted that these early sites, particularly those exhibiting evidence of stone tool making, are more frequent in the southern half of the study area, predominantly around Aimaokatalok Lake. The several Taltheilei sites have also been recorded along the arms of Aimaokatalok. TMAC stated that the sites along the Roberts Bay shoreline generally appear to be more recent, with a number of them containing historic artifacts. Historic period sites are also found around Aimaokatalok, indicative of that location's ongoing resource importance. Traps are more frequent in the north half of the study area, particularly near Roberts Bay, suggesting later fur trade period use. TMAC noted that the 19 seasons of field studies completed in the Hope Bay Belt to 2017 have resulted in the recording of 306 archaeological sites with most identified as tent rings, hearths, clusters representing traps or storage, and marker stones, with no human remains identified to date (i.e., graves). Out of the 306 sites recorded to date, 29 sites have already been mitigated, two (2) have been partly mitigated and two (2) recorded features were recommended for removal; which leaves 273 recorded sites that are intact. Out of these 273 sites, TMAC indicated that there are 258 known sites within the LSA that could be vulnerable to direct or indirect effects. The Phase 2 Hope Bay Belt Project PDA contains 51 sites that may be subject to potential direct impacts due to construction activities. Of these sites, 21 are near the edge of the PDA and may be avoidable during detailed design. TMAC concluded on the basis of the impact analysis that 30 of the recorded sites are potentially subject to direct impacts with implementation of avoidance measures. TMAC discussed uncertainties in its assessment of project effects on heritage

resources by noting that that some quarry sites and some of the all-weather road route have not been fully surveyed therefore it is highly probable that unrecorded sites are still present and that it is reasonable to expect additional sites may be found by future reconnaissance.

TMAC identified that the three (3) stages of mitigation for archaeological sites are: 1) avoidance by implementation of one of several management strategies; 2) protection and monitoring, which involves installation of a barrier; and 3) systematic data recovery which involves careful mapping, recording and excavation of a site that cannot be avoided or protected. TMAC provided a Heritage Resource Protection Plan (Volume 8, Annex V8-6) as part of the FEIS which provided more details concerning general and site-specific mitigation measures.

As part of its residual effects assessment, TMAC noted that the loss of 30 archaeological sites without any mitigation would by itself be considered a significant effect. However, TMAC indicated that all sites to be affected will be fully mitigated by site data recovery prior to disturbance and that the types of sites that would be affected by the Project are not rare, and the Project area has similar examples that are not expected to be affected. TMAC reasoned that while the loss of the resource is considered significant, the residual effect of this loss is considered not significant due to systematic data recovery that ensures that knowledge gained by documenting those sites is preserved. Further, TMAC noted though it has been estimated that between 12% and 19% of known sites within the LSA may be directly affected, this would be balanced by the positive effect of the content of those sites being carefully mapped and recorded and pertinent cultural information extracted by scientific excavation. All information and items collected by TMAC during site investigations would be deposited in a museum designated by the Government of Nunavut and would be available for future generations. Finally, TMAC stated the effects on unrecorded archaeological sites are similar to recorded sites as TMAC has a procedure in place in the event that any unrecorded remains are found during Project activities that require all work to stop and ensures that the sites are appropriately dealt with. Therefore, TMAC concluded that the overall residual effect of the Project on heritage resources is considered to not be significant.

6.7.2 Views and Concerns of Interested Parties

Within its final written submission, the Government of Nunavut (GN) requested that TMAC contact the Territorial Archaeology office and the RCMP immediately if and where human remains are encountered during the course of its land use operation to seek appropriate assistance and advice in order to determine the correct course of action.[535] In response to the GN's comment, TMAC noted that the GN identified an error in TMAC's procedure and that the paragraph within the referenced document should have included contact with the Territorial Archaeologist to consult about any cultural or human remains issues that may arise during construction or operations.[536]

The GN further noted within its final written submission that with regard to site type classification (typology), the Proponent has agreed to revise the FEIS to include information that was provided in the site forms submitted to the GN for all sites recorded on the Hope Bay

[535] Government of Nunavut Final Written Submission, March 19, 2018
[536] TMAC Resources Inc. Response to final written submissions, April 5, 2018.

Project. However, the GN noted during review of the FEIS that not all the tables in the relevant sections within Volume 6 were revised, specifically Table 2.2-1 of Volume 6. The GN requested that the Proponent commit to updating that table to align with the date as listed in Table 4.1 of Annex 8-6 of the FEIS.[537] In response to the final written submission, TMAC noted that the comment is editorial in nature and is focussed on semantics and revising the table as suggested would not change the results of the impact assessment. TMAC further stressed that sites would be mitigated (if required and only after regulatory approvals) based on the site content and physical evidence present, not based on the typology.[538]

Following the presentation by the Kitikmeot Inuit Association during the Final Hearing, a Community Representative from Kugaaruk noted that she is pleased that the artifacts and archaeological sites would be protected in accordance with the Inuit Impacts Benefit Agreement that is in place with TMAC.[539]

6.7.3 Views of the Board

During the Final Hearing, the Board requested clarification on the archaeological sites within the whole area of the project and the incorporation of "*...Inuit traditional knowledge and oral history…*" when identifying heritage sites. The Board stressed that Inuit have travelled through this area to the calving grounds to the south of the project area and the area has been used a great deal in the past.[540] In response, the Proponent noted that the studies have collected information from a wide area and included historic and present day information on travel through the area and included consulting the Inuit Environmental Advisory Committee.[541]

During the Final Hearing, the Board requested information on whether or not archaeological studies are ongoing even in areas where ongoing exploration activities are occurring outside of the immediate local study area.[542] In response, the Proponent noted that as part of the assessment process there are different study areas and TMAC did not include activities that are not part of the assessment for the Phase 2 Hope Bay Belt Project. TMAC also noted that archaeological damage that could be associated with exploration work would be very minimal. In addition, the Proponent noted that a heritage protection plan is in place and is used as part of standard practice including for exploration activities.[543]

The Board acknowledges TMAC's commitment to mitigate, monitor, and adaptively manage impacts to heritage resources for the duration of the Project, and expects that the Proponent will consult and collaborate with regulators and stakeholders, including potentially impacted

[537] Government of Nunavut Final Written Submission, March 19, 2018
[538] TMAC Resources Inc. Response to final written submissions, April 5, 2018.
[539] C. Krejunark, Kugaaruk, NIRB Final Hearing File No. 12MN001 Transcript, Transcript, May 11, 2018, p. 808, lines 15-17.
[540] P. Kadlun, Board Member, NIRB Final Hearing File No. 12MN001 Transcript, Transcript, May 8, 2018, p. 120, lines 21-24.
[541] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, Transcript, May 8, 2018, pp. 121-122, lines 24-26 and 1-5.
[542] P. Kadlun, Board Member, NIRB Final Hearing File No. 12MN001 Transcript, Transcript, May 9, 2018, p. 365, lines 4-21.
[543] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, Transcript, May 9, 2018, pp. 366-367, lines 1-26 and 1-10.

Kitikmeot communities, as construction designs are finalized and project activities associated with land disturbance are undertaken. As changes to the proposed project footprint have the potential to impact identified and unidentified heritage resources, the Board stresses the importance of pre-construction archaeological surveys, diligent mitigation and rigorous monitoring to ensure that all potential effects to heritage resources are forecasted and adaptively managed. The Board notes that failure to prevent, or adequately mitigate, disturbance to cultural and archaeological sites within or in proximity to the project site could result in significant residual impacts to heritage resources in the area.

6.7.4 Conclusions and Recommendations of the Board

Following a review of the material presented by TMAC in the FEIS and a consideration of views of Parties, the Board believes that the Project's potential effects related to heritage resources could be appropriately managed through the adherence to commitments provided by the Proponent and the implementation of proposed mitigation measures. The Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- Conducting archaeological surveys prior to land disturbance related to the Project;
- Reporting of any archaeological site discovered during the construction, operations, and closure phases to the Government of Nunavut – Department of Culture and Heritage and the Kitikmeot Inuit Association; and
- Providing periodic inspection reports related to the status of archaeological sites within or in proximity to the Project footprint to the Government of Nunavut – Department of Culture and Heritage.

6.8. HEALTH AND WELLBEING (INCLUDING WORKER AND PUBLIC SAFETY)

6.8.1 Views of the Proponent

TMAC Resources Inc. (TMAC, or the Proponent) presented an assessment of potential impacts to Community Health and Wellbeing in Volume 6, Section 3 of the Final Environmental Impact Statement (FEIS). Supporting baseline information from 2011 and 2017 was provided in Volume 6, Appendices V6-3A and V6-3B, respectively. TMAC noted that the Socio-Economic Monitoring Program (SEMP) in place at the Doris North Gold Mine Project would apply to the proposed Phase 2 Hope Bay Belt Project (the Project). Volume 8, Annex V8-5 is TMAC's Community Involvement Plan which outlines its policies and commitments for involving local communities in the Project and which TMAC noted would be continuously revised and improved. TMAC assessed the potential environmental impacts on human health and safety as part of the Human Health Risk Assessment (Volume 6, Section 5). TMAC noted that on-duty worker health and safety was not assessed because TMAC must adhere to occupational health and safety requirements to ensure provision of a safe working environment. TMAC's Health and Safety Management Plan was presented in Volume 8, Annex V8-4. The Proponent does not expect any significant effects of the Project on Community Health and Wellbeing.

TMAC defined the following spatial boundaries for its assessment of community health and wellbeing:

- Local Study Area (LSA): includes the communities of Cambridge Bay and Kugluktuk
- Regional Study Area (RSA): includes all permanently settled communities within the Kitikmeot region of Nunavut (Cambridge Bay, Kugluktuk, Gjoa Haven, Taloyoak, and Kugaaruk).

TMAC's assessment included the construction, operations, and reclamation and closure, and possible temporary closure phases of the Project.

The Proponent assessed the following potential project-related effects on community health and wellbeing in the FEIS:

- Changes to family stability as a result of the fly-in/fly-out rotational work associated with project employment;
- Changes to family spending as a result of mine-related employment; and
- Changes to food security and the cost of living.

The Proponent noted its assessment drew upon key informant interviews in communities within the Kitikmeot region, as well as desk-based research and literature review including information from Statistics Canada, the Nunavut Bureau of Statistics, and the Government of Nunavut.

TMAC acknowledged that with one or more family members away at work, family members at home (typically women) would have an increased burden, and that there can be implications for children and childcare, spousal relationships, and mental and physical health. TMAC noted that loneliness, jealously, distrust, and anger can result. TMAC also pointed out that during an employee's time off, they would have additional time with family members, income to support the purchase of equipment for land-based activities with family, and to obtain country foods. TMAC noted that individuals may also use their higher incomes on drugs, alcohol, and gambling, and also recognized that employees would experience a gradual decline in rental subsidies as a result of their greater wealth and financial independence. TMAC also considered that higher incomes and extended periods of free time would lead to greater food security for families.

To mitigate potential effects on health and well-being, TMAC noted it would:

- Provide direct transportation to/from the project site to reduce transit time and avoid time spent in other communities and larger centres such as Yellowknife;
- Introduce an Employee and Family Assistance Program (EFAP);
- Serve country foods (depending on demand, needs, and availability) and provide country food kitchens on-site;
- Offer various cultural activities on-site;
- Maintain an on-site "zero-tolerance" drug and alcohol policy;
- Provide communication facilities on-site to allow employees to keep in touch with their families;

- Have third-parties deliver financial management programs;
- Provide on-site access to contraceptives and include sexual health awareness as part of employee/contractor orientation; and
- Support community wellness initiatives.

TMAC concluded overall that the potential for effects of the Project on community health and well-being would be of moderate magnitude, medium-term, and reversible, and therefore not significant.

The Proponent also noted that TMAC has an existing Socio-Economic Monitoring Plan (SEMP) for the Hope Bay Project and noted this plan would be applied to the Phase 2 Hope Bay Belt Project, with any required modifications made in collaboration with the existing Hope Bay Project Socio-economic Monitoring Working Group. TMAC has also committed to participating in the regional Kitikmeot Socio-Economic Monitoring Committee (SEMC).

The Proponent identified potential residual cumulative effects on community health and well-being but concluded that these would be not significant. See Section 7.6 for additional discussion on cumulative effects.

6.8.2 Views and Concerns of Interested Parties

In its final written submission, the Government of Nunavut (GN) noted anecdotal evidence of sexual interactions occurring between employees at mining projects in Nunavut. The GN acknowledged that within the FEIS and during the Draft Environmental Impact Statement (DEIS) review period, the Proponent had committed to engage with the GN on the topic of sexual health. The GN proposed a term and condition that would require TMAC to include sexual health and well-being information in its employee orientation programming, to make screening for sexually transmitted infections available at the Project site, to inform workers of the health services available on site, and to participate regularly in discussions with GN Department of Health regarding project activities, policies, or project-induced public health issues that may affect health and social services facilities, programs, and services.

In response to the GN's concerns regarding sexual health,[544] TMAC emphasized its commitment to the health, safety, and well-being of all employees, contractors, visitors, and local communities. TMAC committed to regularly participate in discussions and dialogue with the GN Department of Health in connection with project policies, or project-induced public health issues which may have effects on health and social services facilities, programs and services.[545] TMAC confirmed it will provide on-site access to contraceptives and will provide sexual health information to workers throughout the life of the Project through the on-site medics, and that this source of information will be communicated to employees during new worker orientation and throughout the life of the Project. TMAC welcomed receiving information and/or materials from the GN to provide orientation-level sexual health and well-being information to workers.

[544] TMAC Resources Inc. Response to final written submissions, April 5, 2018.
[545] TMAC Resources Inc. *List of Commitments Generated in the Proponent's Response to Technical Comments on the Madrid-Boston Final Environmental Impact Statement*. Exhibit 84 NIRB Final Hearing File No. 12MN001, May 12, 2018.

However, TMAC disagreed with the GN that screening for sexually transmitted infections should be readily available at the Project site. TMAC stressed that such screening requires specific training, including in the area of counselling related to sexuality and with sensitivity to gender and human rights dimensions. TMAC described these qualifications as beyond those of its on-site first aid attendants and medical care personnel, whose focus is on occupational health and safety. TMAC concluded that sexually transmitted infection screening is more appropriately addressed by community health centres by trained health service providers. TMAC added that no specific systemic issues or concerns related to sexual health have been reported at the existing project over the past 10 years, and as such, TMAC does not expect sexual health issues to emerge for the Phase 2 Hope Bay Belt Project. TMAC committed to report all diseases as per existing regulations and to develop capacity to reduce public health related diseases that are demonstrated to be linked to camp populations when data is presented regarding regional increases in related diseases.[546] During the Final Hearing, the GN noted it would cooperate with the Proponent to provide data and statistics, and concluded the issue was resolved.[547]

Regarding the Proponent's Community Involvement Plan, the GN agreed with the Proponent that this Plan should be a living document, and recommended that it be updated on a regular basis so that it reflects current and relevant stakeholders and means of communication to ensure effective and continued engagement with all stakeholders throughout the life of the Project. In response, TMAC committed to periodically reviewing the Community Involvement Plan and update it as required. During the Final Hearing, the GN noted it considered the issue resolved.[548]
In the final written submission, the GN acknowledged the Proponent's commitment to apply the Socio-Economic Monitoring Program (SEMP) in place for the Doris North Gold Mine Project to the Phase 2 Hope Bay Belt Project, and noted this commitment and approach to socio-economic monitoring is consistent with GN expectations. The GN recommended that the existing Hope Bay Socio-Economic Working Group oversee the Project SEMP and monitor project-specific socio-economic indicators. The GN requested the Proponent, reflecting the input of this Working Group, produce an annual Hope Bay SEMP report. In response, TMAC confirmed that it remains committed to the Hope Bay SEMP and would continue to engage with the Hope Bay Socio-Economic Working Group. TMAC also noted that an updated SEMP accounting for the Doris North Gold Mine Project amendment and the Phase 2 Hope Bay Belt Project has been provided to the working group for review and input, and that additional revisions will be considered based on the Final Hearing Report. TMAC committed to submit an updated SEMP to the working group for review within one (1) year of the issuance of a Project Certificate and also

[546] TMAC Resources Inc. *List of Commitments Generated in the Proponent's Response to Technical Comments on the Madrid-Boston Final Environmental Impact Statement*. Exhibit 84 NIRB Final Hearing File No. 12MN001, May 12, 2018.
[547] S. Pinksen, Government of Nunavut, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018 p. 826, lines 1-14.
[548] S. Pinksen, Government of Nunavut, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018 p. 826, lines 22-26.

committed to producing an annual Hope Bay Socio-Economic Monitoring Plan report.[549] During the Final Hearing, the GN noted it considered the issue resolved.[550]

During the Final Hearing, a member of the public asked the KIA how alcohol and the legalization of cannabis would be addressed by TMAC.[551] The KIA replied that it is TMAC's policy to not have any alcohol and cannabis on site, and that although it is unclear how cannabis will be tested for, that all employees are currently tested for alcohol use prior to arriving on site with a breathalyzer.[552] TMAC added that it is currently evaluating the impact of legalization of marijuana, but emphasized that even when it is legal, marijuana, like alcohol, would not be permitted on site due to significant concerns about the safety implications on fitness for work, and also because the KIA has a policy that no drugs or alcohol be used on Inuit-owned land.[553] A member of the public subsequently commented that there are ways to test for cannabis use, and stressed that the KIA and TMAC have to work together on the issue for everyone working at the mine.[554] The KIA responded that it does meet with Inuit on site to discuss and investigate issues and concerns.[555]

6.8.3 Views of the Board

The Board understands that the Project has the potential to result in positive impacts to individuals and families due to employment and increased incomes, but that there are considerable concerns for negative impacts, in particular because of the two (2) week on / two (2) week off rotational work schedules. The Board understands the challenges faced by families left at home when workers are on-site, and the possibility that employees could be tempted to spend their income in unhealthy manners. The Board acknowledges TMAC's commitment to have pick-up points for all communities in the Kitikmeot region, which will minimize the amount of travel time for employees as well as remove opportunities to spend incomes on drugs, alcohol, or gambling in larger centres such as Yellowknife. The Board also stresses the importance of ensuring the mine site is a positive environment for Inuit employees, with opportunities for cultural practices to continue (e.g., provision of country food kitchens) and for cross-cultural learning, and ensuring Inuit employees are in no way discriminated against.

The Board appreciates the dialogue between the Proponent and parties throughout the review period and during the Final Hearing, and acknowledges TMAC's commitments to provide

[549] TMAC Resources Inc. List of Commitments Generated in the Proponent's Response to Technical Comments on the Madrid-Boston Final Environmental Impact Statement. Exhibit 84 NIRB Final Hearing File No. 12MN001, May 12, 2018.
[550] S. Pinksen, Government of Nunavut, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018 p. 827, lines 2-7.
[551] J. Avalak, Public Member from Cambridge Bay, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018 p. 812-813, lines 23-26 and line 1.
[552] J. Roesch, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018 p.813, lines 3-14.
[553] A. Buchan, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018 p. 813, lines 17-25.
[554] J. Hanilak, Cambridge Bay, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018 p. 815, lines 16-21.
[555] J. Roesch, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018 p. 816, lines 7-20.

workers with access to sexual health information and to discuss and share data with the Government of Nunavut regarding any project impacts on public health and social services. The Board also acknowledges TMAC's commitment to participation in a project-specific socio-economic working groups and regional socio-economic monitoring committee, and believes that this multi-scale and collaborative approach to monitoring is essential to improve long-term understanding of potential socio-economic impacts to communities from the Project and to develop solutions.

6.8.4 Conclusions and Recommendations of the Board

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board believes that the Project's potential effects to health and wellbeing could be appropriately managed through the commitments provided by the Proponent and the application of key mitigation and monitoring measures. The Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- Providing workers access to sexual health information;
- Informing workers of the range of health and wellness services available on site;
- Working with the Government of Nunavut regarding project-related health issues that may affect health and social services facilities, programs and services; and
- Promoting consideration for Inuit culture and Inuit Qaujimaningit on site through the provision of cross-cultural training.

6.9. COMMUNITY INFRASTRUCTURE AND PUBLIC SERVICES (INCLUDING HOUSING)

6.9.1 Views of the Proponent

TMAC Resources Inc. (TMAC, or the Proponent) presented a summary of its assessment of the effects of the Phase 2 Hope Bay Belt Project (the Project) on community infrastructure, public services, and housing as part of its assessment of the socio-economic environment in Volume 6, Section 3 of the Final Environmental Impact Statement (FEIS). A detailed discussion on the baseline conditions of the socio-economic environment in the project area is presented in Volume 6, Appendices V6-3A and V6-3B of the FEIS, and proposed mitigation measures are presented in Volume 8, Annex V8-5 of the FEIS. The Proponent did not identify community infrastructure and services as a valued component (VC) for the assessment, and predicted that, with the implementation of its proposed mitigation measures, no negative residual effects were predicted in relation to project-induced changes to the demand for housing and community services.

The Proponent set the spatial boundaries for the assessment of project effects on socio-economic components, including community housing, infrastructure and public services, to include the Local Study Area, encompassing the western Kitikmeot region communities of Cambridge Bay and Kugluktuk, and the Regional Study Area, encompassing the eastern Kitikmeot communities

of Gjoa Haven, Taloyoak, and Kugaaruk. TMAC also set the temporal study boundaries to include the construction, operations, closure, and post-closure phases of the Project.

The Proponent noted that all five (5) permanent communities in the Kitikmeot region have facilities and infrastructure for utilities, communications, waste management, emergency response, law enforcement, regional transportation and shipping such as air terminals and marine ports, and health and recreation, including community wellness centres. TMAC highlighted that the regional hub, Cambridge Bay, experiences comparatively large capital investment in community infrastructure and facilities compared to the other communities in the Kitikmeot region, and noted that between 2012 and 2017, approximately $480 million in capital investments were made in Cambridge Bay. The Proponent noted that health centres in Kitikmeot communities are generally managed and staffed by nurses, with support from non-resident health practitioners (doctors, psychiatrists, dentists etc.) who periodically fly into the communities from health care institutions, such as the Stanton Hospital in Yellowknife, Northwest Territories, to provide health care. TMAC also indicated that health facilities in the region continue to face challenges in filling vacant health delivery positions with qualified personnel.

TMAC indicated that most residents in communities in the Kitikmeot region live in public, government-subsidized rental units maintained by the Nunavut Housing Corporation, and that private market rental units do not constitute a substantial proportion of the housing stock in communities in the region, with the exception of Cambridge Bay where a fledging private sector housing market is developing. The Proponent stated that as of the 2016 census, there were 430 occupied public and private houses in Kugluktuk, 540 in Cambridge Bay, 285 in Gjoa Haven, 230 in Taloyoak, and 175 in Kugaaruk. However, the Proponent noted that public housing shortages, overcrowding in existing dwellings, and lengthy public housing waitlists persist in all communities in the Kitikmeot region as a result of constraints such as limited funding, seasonal transportation of building supplies (annual sealift in the open water season only), shortage of undeveloped lots, and the short construction season.

The Proponent indicated that primary and secondary data used to inform its understanding of baseline socio-economic conditions and its assessment of potential project impacts on socio-economic components, including community housing, infrastructure and public services, was acquired from informant interviews with stakeholders and from desktop research and literature review. TMAC also noted that it addressed limitations in its baseline information, such as potential biases from perception-based information gathering, by employing standard qualitative research methodology and by triangulating information among sources, where feasible.

The Proponent did not identify community infrastructure, public services, and housing as valued socio-economic components (VSECs) in the FEIS for the Project, as the potential project interactions with these components were assessed in relation to other VSECs including migration. In this way, TMAC assessed the potential for increased demands on housing and community services to occur as a result of a project-related population influx.

TMAC indicated that it would address potential impacts to housing and community services in the region from project-related migration through a number of mitigation measures including the following:

- Implementation of a Community Involvement Plan,
- Updating and implementation of an Inuit Impact and Benefit Agreement for the Project; and
- Implementation of the existing Socio-economic Monitoring Program developed for its mining operations in the Hope Bay Greenstone Belt.

The Proponent stated that with the implementation of its proposed project-specific mitigation measures, no negative residual effects of changes to housing and community services was predicted (see Section 6.4: Population Demographics of this Report).

6.9.2 Views and Concerns of Interested Parties

In its final written submission, the Government of Nunavut (GN) noted that with the higher incomes earned by employees working at the Project, employees may seek to leave potentially overcrowded housing situations in favour of owning their own homes. The GN recommended that the Proponent pursue collaboration with the GN, Nunavut Housing Corporation (NHC), and other agencies and interested groups to: i) identify measures to enhance access to a range of housing, such as homeownership programs; and ii) improve employee access to housing options. The GN proposed a term and condition requiring TMAC to explore implementation of a proponent-driven employee-support program to encourage homeownership, such as a savings matching program. The GN also recommended that the Proponent expand the voluntary employee survey to determine interest in financial literacy programming and to NHC homeownership programs.[556]

In response to the GN, TMAC noted that it disagreed with the GN's proposed term and condition. However, TMAC noted that it is open to ongoing engagement with the GN, NHC, and other parties to identify measures to enhance access to housing, should there be the potential for a meaningful supporting role for TMAC. TMAC also noted it would reach out to third parties such as financial institutions to delivery financial management programs and will support communication to Project workers of education and training materials developed by the NHC. TMAC stressed that part of the Core Business of the NHC is to provide homeownership education, counselling, finance, and technical assistance.[557]

Within its final written submission, the Government of Nunavut (GN) indicated that the Proponent's proposed mitigation measures for socio-economic impacts, as presented in the Community Involvement Plan (CIP) and other sections of the Final Environmental Impact Statement (FEIS), were inadequate to deal with project-related pressures on housing in the potentially impacted communities in the Kitikmeot region. To address this issue, the GN recommended that the Proponent establish a monitoring and reporting mechanism to identify migration trends and effects as a result of the Project, and that TMAC work with the NHC to mitigate possible project-related housing demands; implement a voluntary employee survey to evaluate the housing situation of employees to inform mitigation measures for project-related impacts to housing demands in the communities; pursue collaboration with the GN, NHC, and other agencies and interested groups to identify measures to enhance employee access to a range

[556] Government of Nunavut Final Written Submission, March 19, 2018.
[557] TMAC Resources Inc. Response to final written submissions, April 5, 2018.

of housing options; and provide financial literacy, financial planning, and personal budgeting training to employees in support of housing access, including homeownership. Finally, the GN recommended that the NIRB include these requirements as terms and conditions any project certificate issued for the Project.

In response to GN's recommendations related to housing, TMAC indicated that, as reflected in terms and conditions for the current project certificate for the approved Doris North Gold Mine Project, if the GN and NHC develop an anonymous voluntary housing survey, TMAC will make the survey available to Nunavummiut site personnel and TMAC will return any completed surveys to the Government of Nunavut. In addition, the Proponent noted that the current Hope Bay Socio-economic Monitoring Program would be updated to take into account the results of the FEIS for the Phase 2 Hope Bay Belt Project, and that TMAC will continue to rely on the Socio-economic Monitoring Working Group and the Kitikmeot Socio-economic Monitoring Committee as important mechanisms to identify and discuss any Project-related housing issues that may arise.

During the Final Hearing, GN noted that it was satisfied with TMAC's response to GN's final written submission comments regarding measures to monitor the Project's effects on housing, and acknowledged the Proponents' commitment to continue dialogue with GN on conducting a voluntary housing survey of project employees. The GN, therefore, considered these issues to be resolved.[558]

6.9.3 Views of the Board

The Board acknowledges TMAC's commitment to mitigate, monitor, and adaptively manage impacts to community infrastructure and public services for the duration of the Project, including dialogue with GN and NHC on approaches to monitoring project impacts on community housing, and participation in the Socio-economic Monitoring Working Group and the Kitikmeot Socio-economic Monitoring Committee to identify and discuss any Project-related housing issues that may arise. The Board expects that the Proponent would consult and collaborate with regulators and stakeholders, including Inuit, territorial, and federal governments to ensure that any community concerns related to community infrastructure and housing are addressed in the execution of the Project. The Board also notes that failure to establish and implement measures throughout the Project to limit project-related pressures on existing facilities and public services in Kitikmeot communities could result in significant residual impacts to community infrastructure and public services.

6.9.4 Conclusions and Recommendations of the Board

Following a review of the material presented by TMAC in the FEIS and a consideration of views of Parties, the Board believes that the Project's potential effects related to community infrastructure and public services could be appropriately managed through the adherence to commitments provided by the Proponent and the implementation of proposed mitigation measures. The Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of

[558] S. Pinksen, Government of Nunavut, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 828, lines 9-16.

reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- In collaboration with stakeholders, conduct a voluntary housing survey of mine site employees, including Nunavummiut site personnel; and
- Collaboration with stakeholders to investigate measures and programs designed to assist Project employees with pursuing home ownership or accessing affordable housing options in the Kitikmeot region.

7. OTHER MATTERS TAKEN INTO ACCOUNT

7.1. COMMUNITY CONSULTATION

7.1.1 Views of the Proponent

TMAC Resources Inc. (TMAC or the Proponent) presented a summary of the consultation it conducted with communities in the Kitikmeot region for the Phase 2 Hope Bay Belt Project proposal (the Project) in Section to, Volume 1, and Section 3, Volume 2 of the *Final* Environmental Impact Statement (FEIS).

TMAC discussed methods it used to disseminate information about the Project and seek input from communities in Kitikmeot region. The Proponent noted that Inuit Qaujimajatuqangit provided by community members during community consultations informed selection of valued components (VCs), baseline studies, assessment of project-VC interactions and potential impacts, development of mitigation measures, and conclusions about significance of impacts.

Methods used by TMAC in its community consultation include the following:

- Community meetings;
- One-on-one meetings;
- VC-focused workshops;
- Dissemination of outreach materials, including booklets and storyboards (non-technical project information in local languages); and
- Social media (TMAC's Facebook™ page).

7.1.2 Views and Concerns of Interested Parties

Within its final written submission, the Government of Nunavut (GN) recommended that TMAC update the Community Involvement Plan (CIP) regularly to ensure that the plan includes all relevant stakeholders and incorporates effective communication and continued engagement with all stakeholders throughout the life of the Project. In response to GN's comments regarding updates to the CIP, TMAC stated that it will periodically review the CIP and, as required, update the Plan to ensure that it reflects current and relevant stakeholders, as well as effective communication and engagement methods. Further, TMAC indicated that it would consider entering into a memorandum of understanding with the Kitikmeot Inuit Association and the GN

to promote cooperation, coordination and implementation of joint activities, and that this engagement tool would be included in the CIP.[559]

7.1.3 Views of the Board

The Board acknowledges TMAC's commitment to working in partnership with stakeholders, including with Inuit, throughout the life of the Project to provide a platform for the sharing of concerns and the development of measures to address concerns. The Board recommends that the Proponent ensure that its Community Involvement Plan provides opportunity for the continued incorporation of Inuit Qaujimaningit into project planning and execution (see Section 6.5) on an on-going basis throughout the Project's development and includes appropriate protocols for addressing any community concerns that may arise due to the Project. Further, the Board has heard in previous assessments that regulators of projects have also not ensured that communities are informed as to how approved projects are regulated and how regulators have conducted compliance-assurance activities throughout the life of projects. The Board strongly encourages regulators to take steps to engage more proactively with community members regarding how regulators exercise regulatory oversight in respect of development projects in Nunavut, through forums that provide opportunities to meaningfully provide information and solicit feedback from potentially impacted communities.

7.1.4 Conclusions and Recommendations of the Board

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board acknowledges the evidence presented in the Proponent's Final Environmental Impact Assessment (FEIS) that the results of community consultations were adequately captured or that the concerns raised by community members were meaningfully addressed within TMAC's plans for the Phase 2 Hope Bay Belt Project development. The Board strongly encourages the Proponent to continue to consult and engage potentially impacted communities and demonstrate the integration of measures to address community concerns through its monitoring programs for the Project. The Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- Updating the Community Involvement Plan to ensure that it reflects current and relevant stakeholders with respect to the Project.

The Board has also made some recommendations to regulators regarding their on-going engagement with communities in their roles as regulators of the Project in Section 9.7.

7.2. HUMAN HEALTH AND ENVIRONMENTAL RISK ASSESSMENT

7.2.1 Views of the Proponent

TMAC Resources Inc. (TMAC or the Proponent) presented the results of its Human Health Risk Assessment (HHRA) and Environmental Risk Assessment (ERA) in Volume 6, Section 5 of the

[559] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.

Final Environmental Impact Statement (FEIS) for the Phase 2 Hope Bay Belt Project (the Project). TMAC conducted a risk assessment of potential project-induced contaminants of potential concern (COPCs) to environmental and/or human health through the HHRA and ERA, respectively. TMAC determined that the Phase 2 Hope Bay Belt Project would not contribute negatively to overall environmental and human health. It was further anticipated that potential effects would not be significant and that there would be no anticipated project-induced residual, cumulative, or transboundary effects.

TMAC noted that risk assessment was used to characterize the nature and estimated magnitude of potentially adverse environmental and health effects from project-related contaminant emissions that could be present at concentrations exceeding guidelines, standards, or site-specific baseline conditions. The FEIS outlined that the following three (3) criteria that must be present for a COPC to pose a potential risk to the health of ecological or human receptors:

- There must be potential for emissions or release of COPCs at sufficiently high concentrations to cause toxicological effects.
- Receptor(s) must be present.
- There must be existing pathway(s) for COPC exposure by receptor(s), and the receptor must be able to take up the COPC.

TMAC noted within the FEIS that it had undertaken a five (5) step process when conducting the HHRA and ERA as follows:

- Problem formulation;
- Exposure assessment;
- Toxicity assessment;
- Risk characterization; and
- Uncertainty analysis and data gaps.

Three (3) general spatial boundaries were used in the HHRAs and ERAs as follows:

- Project development area (PDA) – includes all physical structures and activities that comprise the Project as specified in the Project Description
- Local study area (LSA) – includes the Project footprint and is the area where there is a reasonable expectation of immediate direct and indirect effects on human and ecological health due to an interaction with Project components or activities.
- Regional study area (RSA) – a broader area where there is a potential for direct, indirect interaction and/or cumulative effects to occur, including lands, waters, and potentially affected communities.

The temporal boundaries defined by each Project phase included: mobilization and construction, operations, reclamation and closure, post-closure monitoring, and potentially temporary closure, and care and maintenance phases. TMAC indicated that because the operations phase was considered to have the highest potential for project related air emissions and potential effects on human health, TMAC focused the analysis of potential human health effects related to air quality, drinking water quality, and quality of country foods on this phase. TMAC noted that for the purpose of the HHRA and ERA, mitigation measures and management strategies were

considered to have been successfully implemented to minimize and eliminate potential effects. TMAC also indicated that its assessment did not consider other contaminants such as persistent organic pollutants and radionuclides as these are not associated with metal mining and are unlikely to be generated by Project-related activities. TMAC further noted that noise was also assessed and included in the HHRA following Health Canada guidance. For the purposes of the HHRA and ERA, TMAC indicated that only the phases with the greatest potential for effects to human or ecological health were considered in the assessment and that TMAC assessed effects using "worst-case" scenarios.

TMAC outlined proposed mitigation and management measures for non-metal COPC, including fuels, other petroleum products, and hazardous substances within the FEIS. Details, including storage, handling, and clean-up of potential spills, were provided within the Oil Pollution Prevention Plan and the Hope Bay Air Quality Management Plan, available in Volume 8 (Environmental Management System), of the FEIS and associated appendices. TMAC identified two (2) main pathways for contaminants to enter the environment: airborne emissions (e.g., dust, particulates, and gases) and liquid emissions (e.g., effluent discharge). TMAC noted that the construction and operations phases were the focus of the assessment due to their high potential for Project-related air emissions and liquid emissions compared to the other phases of the Project. TMAC indicated that atmospheric emissions (e.g., criteria air contaminants (CAC) emissions and dust) have the potential to enter the atmosphere, travel some distance, and be inhaled by receptors (for CACs and particulate matter with a diameter of less than ten (10) micrometers [PM_{10}]-bound metals) or settle where the particles can reside in different media such as soil, vegetation, and country foods (for dust). Liquid effluent has the potential to enter the marine and freshwater environments (water and sediment) through runoff from the terrestrial environment.

Human Health Risk Assessment (HHRA)

For its HHRA, TMAC identified potential human receptors, characteristics, and the relevant life stages that may be in the area, including the relevant COPCs within the human health study areas; as well as the relevant human exposure pathways within the human health study areas. This assessment evaluated potential human health risks associated with the summed exposure to COPCs from several exposure pathways: inhalation, ingestion of soil, dermal contact with soil, ingestion of drinking water, and ingestion of country foods. The human receptors selected in the health study areas were toddlers (between 12 months and 47 months) and adults (greater than 20 years of age). TMAC noted within the FEIS that radiological effects and electromagnetic fields (EMF) effects were excluded from the HHRAs because the Project–related activities and associated infrastructure are not likely to generate radioactivity or EMFs with the potential to affect human health. TMAC indicated that on-duty worker health and safety was also excluded from this aspect of the assessment in the FEIS.

TMAC noted within the FEIS that two (2) types of land users may access areas near to the Project: commercial land and resource users (e.g., sport hunters, licenced outfitters, tourism operators); and local Inuit land users participating in traditional land use activities (e.g., hunting, trapping, gathering). TMAC clarified that for human receptors considered to be land users, it was assumed they could be present in the human health LSA for three months of the year. TMAC also indicated that for human receptors considered being off-duty workers, it was

assumed they could be present in the LSA for half the year (26 weeks) due to a two week on and two week off shift rotation. TMAC noted that screening for COPCs was defined for the construction and operations phases and was based on a predictive model. TMAC indicated that the concentrations of existing-conditions COPCs in soil (i.e., chromium, copper, and nickel) and surface water (i.e., manganese) were predicted to remain within the range of natural variability similar to existing conditions. TMAC further indicated that the only COPC identified during the construction and operations phases in the screening of fish tissue was mercury, and further noted that lake trout tissue concentrations of mercury (assumed to be entirely methylmercury) were predicted to exceed consumption guidelines during the construction and operations phases, as they did under existing conditions.

TMAC indicated that several metals/metalloids were considered bio-accumulative, including arsenic, cadmium, lead, mercury, nickel, selenium, thallium, and zinc, and were therefore included in the assessment of risks for land users and off-duty workers. TMAC indicated that health risks to adult and toddler land users and off-duty workers were quantified by calculating a hazard quotient (HQ) for both the construction and operations phases using the results of the exposure assessment and toxicological reference values (TRV). TMAC indicated that the HQ is the ratio between the estimated daily intake (EDI) and the TRV and provides a measure of risk due to exposure to a COPC through the various exposure pathways. TMAC further noted that for non-carcinogenic COPCs, Health Canada suggests that an HQ of less than 0.2 indicates that the exposure does not pose a significant health risk to human receptors. TMAC further indicated that an HQ of 0.2 is used (instead of 1.0) because the assessment does not consider intake of contaminants from all potential exposure routes such as from retail foods consumed by all receptors or exposures from outside of the study area for land users. TMAC noted that an HQ value greater than 0.2 does not necessarily indicate that adverse health effects would occur since the TRVs are conservative and include additional uncertainty factors. TMAC also noted that an HQ of greater than 0.2 suggests that the potential risk to human health may require a more detailed evaluation.

Within its air quality risk assessment, TMAC predicted that the concentrations of certain CACs (i.e., NO_2, PM_{10}, and $PM_{2.5}$) during the construction and operations phases at four (4) off-duty worker camps and two (2) land user locations would result in HQs that exceeded the threshold of 1.0. TMAC further noted that the risks to off-duty workers and land users due to inhalation of nitrogen dioxide (NO_2), suspended particulate matter with diameter less than ten (10) micrometers (PM_{10}), and suspended particulate matter with diameter less than 2.5 micrometers ($PM_{2.5}$) are likely to have been overestimated because the air quality model used worst-case predictions during the construction and operations phases. Further, TMAC assumed that off-duty workers will likely be spending time indoors during rest periods (off-time) where concentrations of CACs in air will be much lower than those predicted outdoors. TMAC further predicted that nickel bound to PM_{10} would be expected to exceed applicable guidelines for metals in air at the Boston operational camp where off-duty workers would reside during the construction and operations phases; however, TMAC indicated that off-duty workers will likely be spending time indoors during rest, where concentrations of nickel in the air would be much lower than those predicted outdoors. For land users, the locations used to determine the air quality risk assessment also represented the "worst-case" scenario as the locations were located

close to the Project infrastructure and TMAC predicted that land users are not likely to spend much time at these two (2) locations while travelling, hunting and fishing in these areas.

TMAC did not identify any unacceptable risks for off-duty workers for non-carcinogenic health effects from exposure to COPCs via inhalation of air, ingestion of soil, dermal contact with soil, and ingestion of water, as all HQs were below the HQ value of 0.2. For toddlers, TMAC reported that health risks from non-carcinogenic effects of COPCs, based on the summed HQs from all exposure pathways (inhalation of air, ingestion of soil, dermal contact with soil, and ingestion of water and country foods) exceeded the threshold of 0.2 during the construction and operational phases for arsenic, chromium, methylmercury, nickel, selenium, and thallium. TMAC inferred that when the HQs calculated for the construction and operations phases were compared to those for the existing conditions, the percent change in the risk was less than 10% and concluded that a change in toddler health due to the Project is unlikely to occur. For adult land users (for both the general adult population and sensitive populations), health risks from non-carcinogenic effects of COPCs, based on the summed HQs from all exposure pathways (inhalation of air, ingestion of soil, dermal contact with soil, and ingestion of water and country foods) was predicted to exceed the threshold of 0.2 during the construction and operations phases for arsenic, chromium, and methylmercury. TMAC indicated that when the HQs calculated for the construction and operations phases were compared to those for the existing conditions, the percent change in the risk was less than 10% and concluded that a change in health of adult land users due to the Project is unlikely to occur.

Environmental Risk Assessment (ERA)

TMAC indicated within the FEIS that the ERA considered the potential ecological receptor health risks associated with the summed exposure to COPCs from several exposure pathways: ingestion of soil or sediment, ingestion of fresh or marine water, and ingestion of vegetation or prey items. TMAC further noted that the potential sources of Project-related COPCs could originate from fuel, mining and milling process chemicals, explosives, inert chemical fire suppression systems, and other chemicals that may be used around the Project site. TMAC indicated that these chemicals and materials are likely to reach the terrestrial or freshwater environments only in the event of unusual circumstances such as spills or malfunctions. TMAC's conceptual model for the Project-related ERA described how COPCs released from the Project could enter the environment (i.e., air, surface water, vegetation, and soil) and move into ecological receptors via ingestion and gill uptake. Specifically, TMAC identified two general sources of emissions from the Project: atmospheric emissions (e.g., fugitive dust with associated COPCs) and liquid effluent (e.g., effluent discharge and treated wastewater).

TMAC noted that fugitive dust and emission particulates have the potential to enter the atmosphere, travel some distance, and settle, where they can reside in different media such as soil and vegetation and be taken up by wildlife through the ingestion exposure route. TMAC indicated that through the estimation of the HQ for its Project-related ERA it further identified the following COPCs that were considered to potentially pose a risk to aquatic, mammalian, or avian ecological receptors using or foraging in the freshwater, marine, or terrestrial environments of the aquatic or terrestrial LSAs during the construction and operational phases:

- Aluminum for aquatic life receptors, including primary producers such as phytoplankton, periphyton, and plant/algae communities.
- Pelagic and benthic invertebrate communities; and fish such as Ninespine Stickleback, Lake Whitefish, and Lake Trout.
- Copper for least sandpiper.
- Methylmercury for red-breasted merganser and least sandpiper.

TMAC suggested that there could be risk to the health of ecological receptors due to the COPCs identified above, but that it is likely that the risk has been overestimated and adverse effects may not occur. TMAC further indicated that the same data and assumptions utilized in the existing conditions ERA was also used in the models for predicting environmental quality during the Project phases in order to enable direct comparison of existing conditions and predicted environmental quality and to determine incremental changes due to the Project. TMAC concluded that the risks identified during the construction and operational phases would be very similar to those during existing conditions and that for all other ecological receptors (e.g., terrestrial plant and invertebrate ecological receptors, and other avian and mammalian wildlife species), there is negligible potential risk to health from the Project.

TMAC's assessment also considered the potential for exposure of caribou to COPCs in tailings or water contained within the tailings impoundment area (TIA). Although a number of COPCs were identified in both floatation tailings and in water within the TIA, TMAC indicated that the EDI for these COPCs was calculated and compared to TRVs for mammals. TMAC concluded that the calculated HQs for caribou through ingestion of floatation tailings and water from the TIA were well below 0.2 for all COPCs, and that the risks and potential for effects to caribou from exposure to TIA tailings and water are expected to be negligible.

7.2.2 Views and Concerns of Interested Parties

Within its final written submission, the Kitikmeot Inuit Association (KIA) indicated that various values used in the exposure assessment (i.e., surface area of hands for toddlers, surface area of hands for adults, soil ingestion rate for toddlers, soil ingestion rate for adults, and body weights) are incorrect and were orders of magnitude lower than Health Canada's recommendation. The KIA specifically recommended that the Proponent correct all values associated with dermal exposure to soils to either the Richardson and Stantec Consulting Ltd. guidelines[560] or Health Canada guidelines.[561] Further, the KIA recommended that TMAC recalculate estimated daily exposure for each metal in the existing and project cases, and reassess the human health risk as needed and update the human health risk assessment and discuss any changes, if additional risks to human health are identified.[562] Health Canada within its final written submission also noted concern with respect to soil ingestion rates and noted that the Proponent may have utilized soil ingestion rates that are not applicable to the chosen receptors in the Human Health Risk

[560] Richardson, G. M., & Stantec Consulting Ltd. (2013). *Canadian Exposure Factors Handbook*. Toxicology Centre, University of Saskatchewan: Saskatoon, SK.
[561] Health Canada. 2010. *Federal Contaminated Site Risk Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA)*. Version 2.0. Revised 2012. Contaminated Sites Division, Safe Environments Directorate: Ottawa, ON.
[562] Kitikmeot Inuit Association Final Written Submission, March 19, 2018.

Assessment (HHRA) and recommended that TMAC provide additional rationale and an uncertainty analysis for the justification of using the soil ingestion rates based on Wilson *et. al.*'s report,[563] or, as an alternative, TMAC should use the Canadian Council of Ministers of the Environment (CCME) soil ingestion rates of 20 milligrams per day (mg/d) and 80 mg/d for adults and toddlers respectively.[564]

TMAC responded to both the KIA's and Health Canada's concerns noting that an adjustment to the estimated daily intake values has been made using the dermal surface areas as reported in the Richardson and Stantec guidelines.[565] TMAC clarified that it has adjusted estimated daily intake (EDI) values using the soil ingestion rates recommended by Health Canada in response to the concern raised by the KIA regarding the selection of ingestion rates in the HHRA. Finally, TMAC adjusted the hazard quotients (HQ) based on the adjusted EDI and presented the adjusted HQ within its response. TMAC noted that the adjusted HQs were either equal to or greater than the Final Environmental Statement (FEIS) values and noted that the Project-induced incremental change in risk does not change from the FEIS when the dermal surface areas and soil ingestion rates were updated to the Richardson and Stantec, and Health Canada values, respectively.[566]

The KIA also expressed concerns within its final written submission that the current data used as input for the food chain model to inform the assessment of human health risk does not represent the correct vegetation types consumed by the species in the model and as a result, the outputs of the model are highly uncertain. KIA recommended additional sampling to provide the needed certainty in the modelled results.[567] TMAC responded to the final written submission noting that the collection of more baseline vegetation data would not likely change the conclusions of the risk assessment since it would not affect the percent change in baseline conditions relative to Project-related risk estimations. However, TMAC committed to conduct baseline sampling of sedges for metal analysis.[568] Please see Section 5.11.2 of this report for further discussion on this topic. During the Final Hearing, a Community Representative from Gjoa Haven requested information as to whether TMAC would be conducting any studies on dust levels in edible vegetation, as a result of the influence of truck transportation, and the potential for humans visiting the vicinity of the Project area to forage on vegetation during the summer time.[569] TMAC responded by noting that its human health assessment considered vegetation, including berries, as a potential pathway of contamination to humans and that dust emissions would be monitored from vehicle traffic and other sources as part of the air quality monitoring program for the proposed project.[570]

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[563] Wilson, R., Jones-Otazo, H., Petrovic, S., Mitchell, I., Bonvalot, Y., Williams, D.,& Richardson, G. M., (2012) Revisiting Dust and Soil Ingestion Rates Based on Hand-to-Mouth Transfer, Human and Ecological Risk Assessment: *An International Journal*, 19:1, 158-188, DOI: 10.1080/10807039.2012.685807
[564] Health Canada Final Written Submission, March 19, 2018
[565] Richardson, G. M. and Stantec Consulting Ltd. (2013). *Canadian Exposure Factors Handbook*. Toxicology Centre, University of Saskatchewan: Saskatoon, SK.
[566] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[567] Kitikmeot Inuit Association Final Written Submission, March 19, 2018.
[568] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[569] U. Puqiqnak, Gjoa Haven, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, pp. 975-976, lines 21-26 and lines 1-20.
[570] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, pp. 976-977, lines 23-26 and lines 1-8.

The KIA further expressed concern within its final written submission that without the inclusion of more conservative factors to estimate inorganic arsenic from total arsenic, human health risk may be significantly underestimated. The KIA indicated that fair estimation of inorganic arsenic is needed to allow a more accurate estimation of arsenic exposure under baseline conditions, for the existing conditions HHRA, and under the predicted project conditions. The KIA also recommended that the Proponent acknowledge the uncertainty associated with arsenic metabolites in the FEIS and provide rationale as to how they have been considered.[571] In response to KIA's comments, TMAC argued that the assumption of 100% inorganic arsenic in meat (i.e., mammalian and avian meat) does not materially increase the level of Project-related risk relative to existing conditions. As such, TMAC concluded that there is no significant incremental change in risk to the fraction of inorganic arsenic ingested by wildlife and humans.[572]

Within its final written submission, Health Canada noted concern that the air quality assessment incorrectly stated that non-threshold contaminants such as nitrogen dioxide (NO_2), suspended particulate matter with diameter less than ten (10) micrometers (PM_{10}), suspended particulate matter with diameter less than 2.5 micrometers ($PM_{2.5}$) and ozone (O_3) are only harmful at high concentrations. Health Canada recommended the inclusion of three (3) additional mitigation measures that can help reduce the air pollutant emissions from the project: 1) covered transport trucks and conveyors to reduce dust generation; 2) dust collectors and other pollution control devices at the crushing and processing plants; and 3) stringent (Tier III/IV) vehicle and fuel standards for on-road and off-road equipment.[573] In response, TMAC acknowledged that NO_2, $PM_{2.5}$, PM_{10} and O_3 are non-threshold air contaminants and that health risks exist below the ambient air quality guidelines, at any level of exposure. TMAC noted that it would consider the implementation of additional mitigation measures such as minimizing discharge height from the crushers onto conveyors and including crushing and ore processing in enclosed buildings to minimize particulate emissions to the environment.[574]

Within its final written submission, Health Canada indicated that the criteria and thresholds for determining when continuous monitoring and additional dust suppression activities will be implemented were not provided in the FEIS. Health Canada specifically recommended that the Proponent provide the criteria for upgrading to continuous monitoring of criteria air contaminants, as well as provide the criteria or thresholds that will determine when increased dust suppression activities will be implemented.[575] TMAC responded to Health Canada's concern noting that continuous monitoring of TSP, PM_{10} or $PM_{2.5}$ would be considered if frequent exceedances of their relevant air quality guidelines or standards are measured by the non-continuous monitors. TMAC further indicated that its adaptive management methodology has specified that, in the event that an evaluation of the data generated by the monitoring program indicates an exceedance of dustfall guidelines or predictions, an investigation will be conducted and the mitigation/ management measures will be reviewed or revised.[576]

[571] Kitikmeot Inuit Association Final Written Submission, March 19, 2018.
[572] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[573] Health Canada Final Written Submission, March 19, 2018.
[574] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[575] Health Canada Final Written Submission, March 19, 2018
[576] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.

Health Canada further noted within its final written submission that the NO_2 ambient air quality criteria in the HHRA are outdated, and recommended that the Proponent revise the tabulated NO_2 ambient air quality criteria of the HHRA to the Canadian Ambient Air Quality Standards (CAAQS) for NO_2.[577] In response to this comment, TMAC indicated an updated CAAQs for NO_2 was submitted, but that the outcome of TMAC's assessment and prediction did not change based on the updated to NO_2 ambient air quality criteria in the HHRA.[578] During the Final Hearing, TMAC indicated that Environment and Climate Change Canada and Health Canada have made specific recommendations for mitigating nitrogen dioxide levels to meet new CAAQs, but because the guidelines are not yet legal requirements, until the Government of Nunavut decides to adopt the CAAQS, there might be some challenges with implementing this requirement. TMAC further indicated during the Final Hearing that it has committed to monitor nitrogen dioxide and comply with any requirements of the Government of Nunavut should the CAAQs be implemented as regulatory limits.[579]

Health Canada also noted within its final written submission that the Proponent did not provide sufficient rationale to exclude inhalation from criteria air contaminants in the HHRA, and therefore recommended that this pathway be included in the HHRA, or alternatively, that TMAC provide sufficient rationale for the exclusion of this pathway, and provide the mitigation measures that would reduce exposure from contaminants via this pathway.[580] TMAC provided its responses noting that because none of the CACs were classified as contaminants of potential concern (COPCs), and there are no other routes of exposure to CACs, the CACs were not carried forward in the Project-related HHRA. TMAC further clarified that because hazard quotients (HQs) for CACs are calculated as the predicted air contaminant concentration divided by the ambient air quality criteria, EDI calculations are not required. With respect to mitigation to reduce exposure from these contaminants, TMAC stated that its mitigation measures for air quality are described in the Project's Air Quality Management Plan (Annex V8-2 of the FEIS), and that its Air Quality Management Plan will reduce exposure to CACs.[581]

Within its final written submission, Health Canada also noted concern that the human health risk assessment (HHRA) did not assess off-duty workers that may hunt/consume country foods within the local study area (LSA) or RSA. As a result, Health Canada recommended that the Proponent include an additional receptor in the HHRA of an off-duty worker that hunts/consumes country foods within the LSA or RSA, or provide additional rationale why this receptor has not been included in the assessment. In response, TMAC argued that because harvesting country food while off-duty is not permitted for off-duty workers, it did not consider the ingestion of country food harvested near the Project site as a complete exposure pathway for off-duty workers.

[577] Health Canada Final Written Submission, March 19, 2018.
[578] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[579] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, pp. 1027-1028, lines 20-26 and lines 1-6.
[580] Health Canada Final Written Submission, March 19, 2018.
[581] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.

Health Canada noted within its final written submission that the HHRA used the aesthetic objective for manganese and conservatively included it as a COPC. However, Health Canada noted that it currently has a health based objective for manganese of 0.1 milligram/litre (mg/L) in drinking water and recommended that the Proponent assess manganese in light of the health based objective instead. TMAC responded by indicating that it used Health Canada's *Guidelines for Canadian Drinking Water Quality* from 2017 and that the aesthetic objective for manganese was 0.05 mg/L and requested confirmation whether Health Canada has adopted a new health-based drinking water quality guidelines. Further, TMAC indicated that the aesthetic objective for manganese of 0.05 mg/L was exceeded in surface water existing conditions and predicted during construction and operational phases; therefore, TMAC carried manganese forward in both the existing conditions HHRA and the project-related HHRA as manganese can cause adverse health effects at high enough concentrations. Finally, TMAC noted that the screening assessment would remain unchanged in light of the health-based objective for manganese in drinking water. Health Canada noted during its technical presentation, at the Final Hearing, that it had no outstanding concerns with respect to this issue.[582]

Health Canada noted within its final written submission that the assessment of chronic health effects by dose-averaging (or dose amortization) may have underestimated chronic health risks of the off-duty workers and therefore recommended that the Proponent assess the risks associated with short- and/or intermittent- duration exposure scenarios as outlined in Health Canada's specific guidance[583], or alternatively that TMAC conduct an uncertainty analysis to determine how representative the risk assessment is of actual site conditions. In response to this comment, TMAC stated that the carcinogenic and non-carcinogenic risk to off duty-workers calculated in the *Draft* EIS (DEIS) followed Health Canada's guidance and that no comments from regulatory agencies were received on the dose-averaging methodology used to estimate health risks for off-duty workers from Health Canada or any other reviewing agencies. TMAC further indicated that it was unable to locate Health Canada's guidance document as referenced in the final written submission and requested that this document be provided for review.[584]

The KIA and Health Canada provided comments within their final written submission regarding the Proponent's calculation of incremental lifetime cancer risk (ILCR). Specifically, the KIA recommended that the Proponent include an estimate of the total ILCR for the entire length of the project (21 years) combining the current ILCR predictions and the additional risk from the reclamation and closure and post-closure phases (total exposure over 80 years). The additional years of exposure is considered to be more conservative and the KIA indicated that it would ensure that human cancer risk due to the Project would be more accurately described.[585] Health Canada noted within its comments that the ILCR from arsenic to the adult land user receptor showed a greater than 100% increase in ILCR as a result of the Project and requested that the Proponent clarify whether the ILCR is from a project alone scenario or from project plus existing conditions scenario. Health Canada also recommended that the Proponent provide the

[582] G. Irvine, Health Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, pp. 599-600, lines 17-26 and lines 1.
[583] Health Canada. 2016. Memorandum: A primer for evaluating human health risk at contaminated sites for chronic and less-than chronic exposures to chemicals.
[584] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[585] Kitikmeot Inuit Association Final Written Submission, March 19, 2018.

monitoring and mitigation measures that will be put in place to ensure the project does not increase the ILCR to land user receptors.[586]

TMAC provided a response to both the KIA and Health Canada's concerns by providing updated information with respect to the ILCR, extending the exposure period from the 14 years to 21 years in its calculations, and concluded that the adjusted ILCR values presented did not change the conclusions of the HHERA in the FEIS. The adjustments resulted in increased Project-related ILCR values but TMAC concluded that these increased values were proportional to and off-set by corresponding increased ILCR values under Existing Conditions. TMAC further clarified that the ingestion exposures calculated for the Project-related scenario took into account baseline concentrations of COPCs in environmental media plus the incremental increase in COPC concentrations due to the Project, as such; additional monitoring and mitigation measures are not necessary.[587]

During the Final Hearing, the Government of Nunavut noted it has resolved the outstanding technical issues pertaining to the Proponent's assessment of hourly average nitrogen dioxide impacts on human health, including noise management and monitoring plan for blasting activities.[588]

7.2.3 Views of the Board

During the Final Hearing, the Board sought clarification from the Kitikmeot Inuit Association (KIA) regarding the KIA's comment on the potential for missing fish sampling data for char, whitefish and lake trout to affect the human health risk assessments conducted by TMAC.[589] TMAC and the KIA noted that additional data were required to allow for a larger fish sampling program which was conducted by TMAC in 2017 and the KIA was satisfied with the sampling size.[590,591] Further details on this discussion can be found in Section 5.9.3 of this Report.

The Board notes concerns by Health Canada, Government of Nunavut and Community Representatives regarding the potential for health risks associated with consumption of country foods that could potentially be impacted by mining development, including human exposure to noise and criteria air contaminants. Based on the input provided by parties, Community Representatives, and the Proponent throughout the Review of the Project the Board is confident that the potential risk from project operations on human health, particularly dust deposition, noise exposure, metals in fish and edible vegetation and associated impacts to human health and wildlife can be mitigated, provided that the Proponent fully implements the mitigation and monitoring measures proposed in various management plans, including its commitments.

[586] Health Canada Final Written Submission, March 19, 2018.
[587] TMAC Resources Inc. Response to Final Written Submissions, April 5, 2018.
[588] S. Pinksen, Government of Nunavut, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 829, lines 6-13.
[589] P. Kadlun, NIRB Board Member, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, pp. 810-811, lines 12-21 and 9-11.
[590] J. Roesch, Kitikmeot Inuit Association, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 810-811, lines 26, 1-7 and 14-19.
[591] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 812, lines -19.

7.2.4 Conclusions and Recommendations of the Board

In considering the views of the Proponent and those of parties throughout the assessment of the Project and as outlined above, the Board is satisfied with the Proponent's effects assessment related to human health and environmental risk assessment, and the mitigation and monitoring measures proposed during the NIRB's Review process, within the FEIS and committed to during the Final Hearing. The Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- Conducting soil sampling to determine metal levels of soils in areas with berry-producing plants near any of the potential development areas; and
- Conducting additional studies as part of its marine and freshwater aquatic effects analyses to ensure that concentrations of toxic trace elements anticipated to increase are monitored during operations in the aquatic and marine environments.

7.3. ACCIDENTS AND MALFUNCTIONS

7.3.1 Views of the Proponent

TMAC Resources Inc. (TMAC or the Proponent) presented its discussion on accidents and malfunctions for the Phase 2 Hope Bay Belt Project (the Project) in Volume 7, Section 1 of the Final Environmental Impact Statement (FEIS).

TMAC indicated that accidents and malfunctions may occur during any phase of the Project and that the primary environmental concern from accidents and malfunctions is the possibility for spills, release of chemicals, reagents, petroleum products or process materials onto the land or water (freshwater and marine). Fire presents another risk from vehicle accidents, damage to electrical systems or accidental explosions. Lastly, TMAC indicated that explosives are kept onsite and have the potential to cause an accidental blast.

TMAC stated within the FEIS that management of risks and contingency planning are integral to TMAC's approach to project execution, and that a comprehensive evaluation of the potential risks would be essential in order to meet regulations, as well as TMAC's health, safety, and environmental objectives. While the possibility of accidents and malfunctions exists, TMAC's objective, as stated within the FEIS, is to minimize the likelihood of such incidents and the associated consequences that might affect people and the environment. Further, management systems that incorporate effective adaptive management practices are designed to mitigate risks and limit consequences. These strategies include personnel training, education, regular inspections, monitoring and maintenance of equipment, and learning from incidents to improve performance. TMAC summarized its approach to assessment of accidents and malfunctions within the FEIS as follows:

- Defining the risk assessment and potential residual effects methodologies;
- Identification of accidents and malfunctions;
- Assessment of the risk;

- Assessment of potential environmental effects;
- Implementation of additional controls, if required; and
- Monitoring and reporting.

TMAC identified 18 potential accidents and malfunctions as part of its risk analysis assessment (ranging from failure of cyanide destruction process to terrestrial/freshwater spill of fuels, other hydrocarbons, and hazardous materials). The risk analysis indicated that seven (7) accidents and malfunctions are considered to pose very low environmental risk and included: failure of cyanide destruction process; ground support failure in underground mine; underground equipment fire; underground mine flooding; waste rock dump and ore stockpile instability; winter ice road collapse over water crossing; and primary power outage. The risk analysis indicated that six (6) accidents and malfunctions are considered to pose low environmental risk and included: aircraft incidents; failure of wastewater treatment plant; freight loss during ship-to-shore transfer; contact water pond failure; surface fire; and vehicle incidents. Five (5) potential accidents and malfunctions are considered to pose moderate risk to the environment and include: fuel spill during ship-to-shore transfer; all-weather road embankment failure and/or collapse of a water crossing; explosives accidents; pipeline leak or rupture and terrestrial/freshwater spill of fuels, other hydrocarbons, and hazardous materials. No environmentally-related potential accidents and malfunctions were considered to be high or extreme risk. TMAC stressed that regardless of the level of risk associated with an accident and malfunction, the Emergency Response Plan would be applicable to all accidents and malfunctions as found in Volume 8 of the FEIS.

As part of its residual effects analyses, TMAC considered the significance of the potential residual effects on valued ecosystemic components (VECs) from moderate risk accidents and malfunctions. TMAC concluded that the residual effects to marine birds and marine wildlife from fuel spills during ship-to-shore transfers are not anticipated to impact population numbers for either groups and are considered to not be significant. Residual effects of all-weather road (AWR) embankment failure, and/or collapse of a water crossing, are expected to not be significant. The level of confidence was considered moderate as the circumstances and locations where an AWR road embankment failure and/or collapse of a water crossing could occur can vary. An explosives accident would result in an explosion entailing a single, high magnitude release of gases, debris, fumes, and noise. TMAC predicted these to dissipate within 24 hours and therefore the effects are characterized as short duration and reversible. TMAC concluded that residual effects of an explosives accident on air quality or noise VECs are therefore anticipated to not be significant. TMAC concluded that the residual effects of a pipeline leak or rupture are anticipated to not be significant and the probability of occurrence is considered moderate to unlikely depending on the type of effluent discharged, the volume discharged, and characteristics of the receiving environment.

TMAC noted that a worst-case scenario would be a spill of fuel or other materials (including hazardous materials) on the AWR and into the freshwater environment. Potentially affected VECs include air quality, surface water quality, sediment quality, fish habitat, freshwater fish, soils, and vegetation. TMAC further indicated that the magnitude of the effect may vary from low to moderate depending on amount of fuel spilled and the characteristics of the specific receiving environment. The geographic extent would vary from site-specific to local because fuels can be spread by flowing waters. Potential residual effects are likely to have a short

duration as detection would be immediate and mitigation would be initiated immediately. TMAC further noted that the effects to VECs are anticipated to be reversible with containment and remediation of soils and waters, if required. TMAC concluded that residual effects of a spill of fuel, hydrocarbon products, or hazardous materials on terrestrial and/or freshwater VECs are anticipated to not be significant. The probability of occurrence is considered moderate.

7.3.2 Views and Concerns of Interested Parties

During the Final Hearing, the Nunavut Water Board (NWB) requested that TMAC provide statistics about industrial site accidents or major spills that have occurred in the last three (3) years at the Doris North Gold Mine site.[592] In response, the Proponent noted that it can provide the specific numbers after the meeting but indicated that under regulations, TMAC is required to report spills to regulators within 24 hours depending on the substance that is spilled and the volume.[593]

The Government of Nunavut during the Final Hearing requested clarification on whether tankers or fuel carrying vessels hired by TMAC to transport fuel for the Project are required to have arrangements with regional response agencies to respond to spills occurring along the shipping route.[594] TMAC confirmed that this is a requirement. However, Transport Canada stated that certified response ships are not located in the North and therefore it is not a Transport Canada requirement in the Arctic that shippers have an arrangement with a response organization under the *Canada Shipping Act*. Transport Canada also noted that it would be supportive if the Proponent engaged in a voluntary arrangement with a response organization.[595]

During the Final Hearing, NIRB staff requested clarification on whether there would be mechanisms in place for the proposed Project to learn from and improve operations from any accidents or malfunctions that could occur.[596] In response, the Proponent stated that all spills or incidents are reported to ensure that proper actions are taken and lessons are learned to prevent future incidents.[597]

NIRB staff further requested general information on TMAC's coordination with other organizations, operators and/or communities with respect to emergency preparedness.[598] In response, the Proponent noted that "*…to date, the interaction that [TMAC] have with the Nunavut emergency management officials has been limited to support for search and rescue in*

[592] K. Kharatyan, Nunavut Water Board, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 412, lines 14-16 and 25-26.
[593] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 413, lines 7-16.
[594] S. Pinksen, Government of Nunavut, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 414, lines 2-6.
[595] A. Gudmundson, Transport Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 414, lines 19-25.
[596] R. Barry, Nunavut Impact Review Board, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, 401-402 and 417 lines 12-26, 1-11 and 8-13.
[597] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, pp. 402 and 417-418, lines 17-6 and 19-26, 1-13.
[598] R. Barry, Nunavut Impact Review Board, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 418, lines 17-25.

the region on the mainland and including Victoria Island. The most direct involvement [TMAC] had was to release one of [its] helicopters to rescue people stranded on the land."[599]

A Community Representative from Gjoa Haven noted concern with potential shipping accidents and requested that more studies should be done by stating:

> *"... believe that in the best interest that there's going to be more studies or reviews done -- because our transportation corridor and the -- where we travel by boat, it's getting more and more shallow. And we want to see more visitors come. And if TMAC were to be given the green light that there may be more ships going through this transportation corridor -- yes, like I said, I'm going to repeat it again: There has been three ships that ran aground.*"[600]

7.3.3 Views of the Board

The Board appreciates TMAC's commitments to ensuring safe Arctic shipping, transportation of fuel and equipment, safe practices on the access roads and a safe environment at the mine sites. However, the Board expects TMAC to implement a precautionary approach by continuously reviewing and improving management plans and procedures to ensure potential risks are identified, prevented and, if required, mitigated.

During the Final Hearing, the Board noted multiple questions by parties and Community Representatives regarding TMAC's management plans and emergency preparedness for both shipping fuel and supplies through Arctic waters, as well as responding to potential emergencies such as fuel spills. TMAC responded to a question raised by the Board and clarified that when spills are reported to the spill line, that reporting is a notification of the incident, but is not a request for assistance. TMAC acknowledged that it would be TMAC's responsibility to respond, clean-up the spills and provide the necessary actions to prevent the spills from spreading or entering into the environment.[601]

The Board also questioned TMAC on scenarios when accidents may occur within the transportation corridor and requested clarification on how the Proponent would respond to spills during transits of fuel barges.[602] TMAC noted in response that every ship has to demonstrate the ability to respond to spills within its control. TMAC also indicated that it has an Oil Pollution Emergency Plan in place at the site to respond to, or assist in managing spills if necessary. TMAC confirmed that spill response equipment and clean-up materials are available at Roberts Bay in the event of an incident. TMAC also stated that it has two (2) boats at site that can be used to deploy booms and skimmers to isolate a spill in the marine environment. Finally, if a

[599] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 419, lines 3-13.
[600] U. Puqiqnak, Gjoa Have, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 893, lines 12-21.
[601] A. Buchan, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 420, lines 7-25.
[602] P. Kadlun, NIRB Board Member, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 421, lines 2-10.

spill was beyond the ship's capability or the Project site's capability to respond, TMAC would contact the Mackenzie Delta Response Agency for assistance with the larger spills.[603]

The Board further questioned TMAC the level of confidence TMAC has with respect to the adequacy of its spill response equipment, especially during high winds.[604] In response, the Proponent stated that fuel transfers would not occur during high wind situations, that there are safety protocols in place that have to be followed to ensure safe ship to shore transfer of the fuel and that if a spill were to occur, proper procedures are in place to ensure immediate response. Further, the Proponent noted that the reason for proposing a cargo dock at Roberts Bay as part of the Project is to allow cargo ships to come directly into the bay to dock, which would allow fuel to be transferred/pumped directly from the ship to shore, reducing the risks of spills compared to transferring the fuel from the ship to a barge and the barge coming to shore where the fuel is then transferred into storage tanks on land.[605]

7.3.4 Conclusions and Recommendations of the Board

Following a review of the information provided by TMAC in the FEIS, as well as the views of Parties, and based on TMAC's commitments, the Board believes that the Project's potential effects related to Accidents and Malfunctions could be appropriately managed through the commitments provided by the Proponent and application of mitigation measures. The Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- Maintain an Oil Pollution Emergency Plan to ensure accurate and adequate spill response and emergency preparedness are in place to prevent fuel and chemical spills to the terrestrial and marine environment.

The Board shares the concerns of Community Representatives and Intervenors that TMAC must take steps to prevent vessels engaged in Project shipping from running aground. The NIRB has not prescribed specific measures, with the expectation that some of these measures for maintaining and updating bathymetry data to reflect the construction of works within Roberts Bay may be prescribed by Fisheries and Oceans Canada and Transport Canada when the Project proceeds to the permitting phase.

7.4. EFFECTS OF THE ENVIRONMENT ON THE PROJECT

7.4.1 Views of the Proponent

TMAC Resources Inc. (TMAC or the Proponent) presented a summary of its assessment of the effects of the environment on the Phase 2 Hope Bay Belt Project (the Project) in Volume 8 of the

[603] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, pp. 421-422, lines 15-26 and 1-23.
[604] P. Kadlun, NIRB Board Member, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, p. 423, lines 1-6.
[605] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, pp. 423-424, lines 12-26 and 1-26.

Final Environmental Impact Statement (FEIS). The Proponent's project design considerations to mitigate potential effects of the environment on the Project are presented in Volume 3 of the FEIS. The Proponent stated that it will apply the conservative approach to the design and construction of project infrastructure to mitigate the potential impacts of the environment on the Project.

TMAC assessed the potential effects of the following environmental factors on the Project:

- Extreme temperature
- Extreme rainfall
- Floods
- Whiteout conditions
- Changes in patterns of snow accumulation and snowmelt
- Permafrost degradation
- Extreme ocean water levels and storm surges
- Changes in ice formation timing in the marine environment
- Geotechnical hazards
- Seismic activity
- Climate change

The Proponent noted that it considered the potential effects of these environmental factors in the design of the Project, including project infrastructure and identified mitigation measures including the following:

- Enhancement of thermal protection of waste rock and ore pile stability by directing run-off from the piles to contact water ponds.
- Installation of thermistors in the ground to monitor the thermal performance of project infrastructure.
- Prevention of snow accumulation along project roadways by implementing snow clearance and by flattening road side slopes in sections of roadways with greater than 3 metres of fill material.
- Design and construction of the Doris North and Boston tailings storage facilities to withstand a 1-in-2,475 year seismic event, a 1-in-1,000 flood event, and a 24-hour storm event.
- Design and construction of contact water ponds to contain at a minimum the contact water from a 1:100 year rainfall event, 24-hour storm event, and the maximum daily snowmelt of 18 millimetres.
- Design and construction of project site roads, including the Madrid-Boston all-weather road, and the airstrip at Boston site to appropriate fill thickness to prevent permafrost thaw.
- Design and construction of marine dock at Roberts Bay to protect against ice ride-up and pile-up.
- Design of project infrastructure with consideration to predicted climate change trends from 2011 to 2040.

- Regular inspection and maintenance of project infrastructure.

TMAC noted that it plans to conduct additional site-specific studies, including geotechnical investigations, at the detailed design phase of the Project to assist in the identification of areas of concern related to permafrost and potential geo-hazards within the project footprint. The Proponent stated that it will apply a conservative approach to the design and construction of project infrastructure to mitigate the potential impacts of the environment on the Project (see Section 5.2: Climate and Meteorology of this Report).

During the Final Hearing, TMAC discussed its commitment to considering climate change projections in the design and construction of proposed project site infrastructure.[606]

7.4.2 Views and Concerns of Interested Parties

Within its final written submission, Environment and Climate Change Canada (ECCC) recommended that the Proponent develop a contingency plan to account for the potential impacts of climate change on structures like dry-stack tailings (Tailings Management Area) post closure, and the increase to seepage that may occur should permafrost distribution be reduced in the long-term.[607] See Section 5.7.2 for more details on this topic.

Additional discussion on potential implications of climate change on project infrastructure and activities is discussed in Section 5.2: Climate and Meteorology of this Report.

7.4.3 Views of the Board

During the Final Hearing, the Board requested that TMAC discuss proposed measures to respond to a fuel spill in the marine environment during fuel transfers at Roberts Bay during periods of high winds in summer and fall.[608] In response, the Proponent noted it has in place safety protocols to ensure that, in conditions of high winds and rough waters, fuel transfers do not proceed.[609]

In addition, the Board requested that TMAC and Transport Canada provide detail on measures which would ensure that the proposed new cargo dock at Roberts Bay would be designed, constructed and operated to withstand high winds and associated rough currents, and to ensure that offloaded shipping containers stacked on the dock are not affected by high winds.[610] In response, Transport Canada noted that its review of the Proponent's cargo dock design would focus on determining its impact to navigation.[611] TMAC, in response to the Board's request,

[606] M. Rykaart, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2018, pp. 89-90, lines 24-26 and 1-3.
[607] Environment and Climate Change Canada Final Written Submission, March 19, 2018
[608] P. Kadlun, Board Member, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, pp. 422-423, lines 24-26 and 1-6.
[609] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, pp. 423-424, lines 10-26 and 1-26.
[610] P. Kadlun, Board Member, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, pp. 898-899, lines 24-26 and 1-18.
[611] A. Gudmundson, Transport Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, pp. 899-900, lines 21-26 and 1-7.

TMAC noted that the entire dock structure would be encased in a closed-cell sheet pile structure that is driven into the seabed, interlocked, and filled with construction rock to create a stable foundation to withstand the impacts of natural forces such as winds and waves. TMAC also indicated that storage of shipping containers on the dock would be temporary as they would immediately be moved to an onshore loading area for long-term storage.[612]

The Board has concerns about potential for permafrost degradation within the footprint of the proposed tailings pipeline from the Madrid North processing plant to the Doris Tailings Impoundment Area, the risk of damage to the pipeline and the resulting spillage of tailings that could impact the receiving environment. To address this concern, the Board recommends that the Proponent implement comprehensive monitoring protocols for the pipeline infrastructure during the operations phase. The Board is reasonably satisfied with the degree to which the Proponent accounted for the potential effects of environmental factors in the design and planning of project infrastructure and activities. The Board also acknowledges TMAC's commitments to continually monitor, analyze, and report on the integrity and performance of project structures and interactions with the natural environment. The Board acknowledges that Inuit Qaujimaningit was considered along with scientific knowledge and climate data trends to inform components of TMAC's assessment of potential effects of the environment on the Project, and would like to encourage the Proponent to continue to apply Inuit Qaujimaningit, climate change projections, and the best available science and technology to inform detailed project design and closure strategies (see Section 5.2 and Section 5.5).

7.4.4 Conclusions and Recommendations of the Board

Following a review of the material presented by TMAC in the FEIS and a consideration of the views of the Parties, the Board believes that the potential effects of the environment on the Project could be appropriately managed through the adherence to commitments provided by the Proponent, the implementation of proposed mitigation measures and the terms and conditions recommended for valued environmental and socio-economic components throughout this report. In addition, the Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- Implementation of a monitoring program for tailings pipelines to ensure the continued integrity of the infrastructure and to protect permafrost and other sensitive environmental features, such as freshwater bodies, for the life of the Project.

7.5. ALTERNATIVE ANALYSIS

7.5.1 Views of the Proponent

TMAC Resources Inc. (TMAC or the Proponent) provided the alternative analysis and conclusions for the Phase 2 Hope Bay Belt Project (the Project) in Volume 3, Section 7 of the

[612] M. Rykaart, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, pp. 900-901, lines 10-26 and 1-22.

Final Environmental Impact Statement (FEIS). For each alternative investigated, the following criteria were considered by TMAC in evaluating their overall feasibility, respectively:

- Technical feasibility;
- Economic feasibility;
- Environmental acceptability;
- Amenability to reclamation;
- Community acceptability or preference; and
- Socio-economic effects and benefits.

Health and safety considerations also formed part of the evaluation of alternatives where these were most applicable to distinguish between alternatives.

With respect to the analysis of alternatives within the FEIS, the Proponent considered both alternatives to the development of the Project, as well as alternative methods of carrying out the Project. In this analysis of the "Go/No-Go" alternatives, the Proponent concluded that the no-go alternative would result in the mineral resource not being developed, and the potential effects and benefits predicted in this FEIS would not be realized. Similarly, socio-economic effects and benefits would not accrue. Further, TMAC noted that the predicted benefits of the Project to local communities include the support of both traditional lifestyles and pursuits, and lifestyles that integrate wage-based employment in local communities.

With respect to alternatives to the development of the Project, the Proponent concluded the physical location of the deposits somewhat reduces the number of potential alternatives for the development of project components. The development of each site requires a minimum amount of infrastructure such as mine portal, laydown areas, power supplies, fuel supplies, and, supporting facilities. The design for each site focuses on an efficient layout of infrastructure with a minimal footprint at each of the Project sites where mining occurs, and therefore, a wide range of options have been considered during the conceptual design phase to achieve an optimal layout of facilities at each sites.

Alternative means of executing the Project deal with the larger development of the Hope Bay Belt. Alternatives have been evaluated for the location of the cargo dock, access to the Boston Site via all-weather road (AWR) and airstrip, surface mining methods such as open pits, underground mining methods and crown pillar recovery, number and location of processing facilities, options for tailings management, and means by which to generate and supply power.

Cargo Dock at Roberts Bay

A detailed assessment of the cargo dock location alternatives and construction alternatives was carried out in 2012 with four different locations of the cargo dock considered as part of the assessment. Further discussion regarding the various alternatives was provided in the technical memorandum P5-10.[613] Location C2 (located approximately 2 km northwest of the existing Roberts Bay jetty) was selected as the preferred location as it provides suitable large vessel

[613] TMAC Resources Inc., Final Environmental Impact Statement, Volume 1, Annex V1-7, Package P5-10, Hope Bay Project: Roberts Bay Cargo Dock Preliminary Design.

maneuverability, requires the least amount of fill to construct the dock, has a relatively short access road, and does not interfere with any other planned infrastructure at Roberts Bay.

Access to Boston Site

TMAC considered several alternative methods to access the Boston mining area. The alternatives considered included winter road access, air access and an all-weather access road. Further discussion regarding the various alternatives was provided in the technical memorandum P5-11.[614] Development of an all-weather road was selected as the preferred option due to its flexibility compared to the other alternatives.

A larger and more reliable airstrip was determined to also be required for the Boston site. A total of seven airstrip locations were previously identified and these options were described in technical memorandum P5-29.[615]

Mining Methods

For each ore deposit, an assessment was conducted by TMAC on the feasibility of underground mining versus open pit mining. TMAC indicated that underground mining is generally preferable where high grade veins of ore can be mined with minimal removal of waste rock. By contrast, open pit mining involves a large stripping ratio of waste rock to ore depending on the configuration of the ore body. For the Madrid North and South deposits, as well as the Boston deposits, the Preliminary Feasibility Study completed by a consultant for TMAC in 2015 established that underground mining methods were economically feasible. Further evaluation of the ore body identified areas of Madrid North and Boston which would be amenable for crown pillar recovery as part of the underground mining plans. Therefore, TMAC concluded that the Project would include crown pillar recovery as part of the underground mining plan as the preferred strategy. Ongoing exploration and economic evaluations would continue to inform determinations of the feasibility of surface mining methods, crown pillar recovery, open pits or a combination of surface and underground methods.

Number and Location of Processing Facilities

The alternatives considered for the processing facilities by TMAC included the expansion of the Doris North processing facility; and the construction of processing facilities at Madrid North and at Boston.

TMAC noted that the short life of mine of Madrid South does not justify the construction of a processing facility at that location. However, both the Madrid North and the Boston ore bodies are considered by the Proponent to be large deposits with significant upside potential in terms of ore resources. TMAC anticipates that ongoing exploration activities will significantly increase the ore reserves and thus increase the life of mine for both of these sites. On the basis of existing reserves, resources and significant upside potential, TMAC indicated that the preferred alternative for the Project is to construct a processing facility at Madrid North and a processing facility at Boston.

[614] TMAC Resources Inc., Final Environmental Impact Statement, Volume 1 Annex V1-7, Package P5-11 Hope Bay Project: Madrid-Boston All-Weather Road Preliminary Design.
[615] TMAC Resources Inc., Final Environmental Impact Statement, Volume 1 Annex V1-7, Package P5-29, Hope Bay Project: Boston Airstrip Preliminary Design.

Options for Disposal of Tailings

The alternatives for tailings disposal by TMAC included optimizing the use of the Doris North tailings impoundment area (TIA), and construct and operate tailings impoundment areas for each processing facility. TMAC decided to adopt a hybrid of these two alternatives for the Project which maximizes the use of the Doris North TIA which can readily be expanded to accept additional tailings produced from the Madrid processing facility, thus eliminating the need for a dedicated TIA for Madrid. Tailings produced at Madrid would be pumped to the Doris North TIA (distance of 6 kilometres).

For the Boston site, TMAC concluded that due the physical distance separating the Boston site from the Doris North mine (over 55 kilometres), transportation of tailings generated at Boston to the Doris North TIA would result in increased traffic on the AWR, and associated increased greenhouse gas emissions. Instead, TMAC designed the Project such that the dry-stack tailings produced by the Boston processing plant would eliminate the need for a tailings impoundment area, as the tailings could be dry-stacked on a prepared pad and would not require containment structures. The complete assessment of the alternatives for the tailings disposal were described by TMAC in technical memorandum P5-27.[616]

Power Generation and Distribution for the Hope Bay Belt

The alternatives considered by TMAC for power generation included: stand-alone generation at each mine site; centralized power plant with transmission lines; and wind turbines to supplement diesel power generation belt wide with transmission lines.

Given that the Doris North and Roberts Bay sites are integral to the development and electrical power requirements for the Project, TMAC indicated that it will continue to develop strategies for power generation and supply of the entire Hope Bay Belt. TMAC's long-term strategy includes integration of wind turbines for power generation and the potential construction of a power distribution grid for the entire Hope Bay Belt.

TMAC concluded that the preferred alternative for the Project is to build stand-alone diesel power generation facilities at Madrid North, Madrid South and Boston sites to maintain a consistent and dependable power source at each operating site, while at the same time offsetting diesel costs and emissions with the construction and use of six (6) wind turbines in proximity to the Doris North, Madrid and Boston sites. The two (2) wind turbines between Doris North and Madrid are a part of the current development proposal given that that the Project would be extending the life of the Doris North and Roberts Bay facilities by approximately 13 years.

TMAC indicated that the various alternatives were evaluated on the basis of technical and economic feasibility, environmental effects, reclamation potential, community acceptability, and socio-economic effects and benefits.

[616] TMAC Resources Inc., Final Environmental Impact Statement, Volume 1, Annex V1-7, Package P5-27, Boston Tailings Disposal Alternatives Assessment, Hope Bay Project

7.5.2 Views and Concerns of Interested Parties

Within its final written submission, the Government of Nunavut (GN) noted that an alternative to use only the Doris North Landfill and not build the Boston Landfill was not discussed within the Final Environmental Impact Statement (FEIS). The GN indicated that the avoidance of potential environmental impacts from constructing and operating the Boston Landfill may offset some safety risks and environmental concerns related to waste transportation from the Boston site to the Doris North Landfill, and recommended that the Proponent consider an alternative to use only the Doris North Landfill and not build the Boston Landfill.[617] For further details on the discussion of landfills and waste management, please refer to Section 5.5 of this Report.

Within its final written submission, Indigenous and Northern Affairs Canada (INAC) noted that the analysis of project design alternatives should take public input into consideration, and should describe the process that TMAC used to determine interactions between alternatives and excluded valued socio-economic components (VSEC). INAC indicated that the FEIS did not provide this information and requested clarification from TMAC on these specific points. INAC further recommended that TMAC monitor for potential impacts as part of its participation in the Kitikmeot Socio-Economic Monitoring Committee (Kitikmeot SEMC) and that it not scope-out those excluded VSECs from future discussions with the Kitikmeot SEMC; should the Kitikmeot SEMC decide they need to be addressed. If problems are found, INAC requested that solutions should be sought in coordination with regional organizations and discussed with the NIRB so that appropriate actions may be taken.[618]

Within its response to INAC's comments, TMAC indicated that the FEIS described the results of public consultation within Volume 2, Section 3 and included input received through a range of engagement methods undertaken by TMAC between 2010 and 2017. TMAC noted that consultation in 2017 in relation to project design/alternatives included comments on avoidance of archaeological sites and artifacts, inquiry about the use of green technologies, fate of infrastructure at mine closure, treatment and storage of tailings, extent of road development, removal of permafrost, and storage of waste rock. With regard to feedback on project design, TMAC identified design and mitigation measures including but not limited to:

- Avoiding archaeological sites by relocation or redesign where possible;
- Removing and/or reclaiming structures and facilities at closure, with consideration of discussion with KIA regarding right of refusal for any Hope Bay Surplus Asset;
- Implementing a tailings management system including intercepting and preventing contact water from contacting the freshwater receiving environment;
- Implementing of cyanide and hazardous chemicals management to prevent their entry into the environment (e.g., cyanide will be used in a closed circuit in the process plant at Doris North and will be destroyed in tailings prior to leaving the process plant);
- Implementing an Oil Pollution Prevention/ Oil Pollution Emergency Plan (OPEP) that includes measures to respond to oil spill scenarios at the Roberts Bay facility, in accordance with requirements of the Canada Shipping Act (2001);

[617] Government of Nunavut Final Written Submission, March 19, 2018.
[618] Indigenous and Northern Affairs Canada Final Written Submission, March 19, 2018.

- Prohibiting excavation of permafrost soils, wherever possible; should excavation be required, any excavated areas will be immediately backfilled with geochemically suitable rock to act as a thermal blanket;
- Sourcing quarry materials from within approximately 5 km to minimize haul distance; therefore, quarries are approximately 10 km apart along the road alignment;
- Using the existing canteen on site, and consideration for additional canteens as required, as the Project becomes more established; and
- Designing roads to include crossing structures for wildlife (developed with consideration for input from Inuit elders at wildlife workshops in Cambridge Bay and at the Hope Bay site).

TMAC further noted that it will continue to consult with the public regarding the Project. Public consultation and engagement was also used in baseline and existing environmental studies, effects assessment and impact prediction, and the development of mitigation and monitoring programs.

With respect to INAC's request to provide a detailed explanation of the process that was used to determine that there were no interactions between project design alternatives and excluded VSECs, TMAC noted that as described in the alternatives assessment (see Volume 3, Section 7.3 of the FEIS) for each alternative investigated, the evaluation considered technical feasibility, economic feasibility, environmental acceptability, amenability to reclamation, community acceptability or preference, and, socio-economic effects and benefits. Criteria were only considered and explicitly discussed in the alternatives assessment as appropriate and where applicable. Consistent the established impact assessment methodology, the alternatives assessment did not consider the Valued Environmental Components (VECs) or VSECs since it is not the purpose of an FEIS to contemplate potential effects for every scenario of a project not under consideration by the proponent. Identification of potential interactions between the Project and VECs/VSECs is only completed for the preferred design/alternative as described in the Project Description. Based on the preferred Project design, interaction tables (see Volume 3 - Table 2.5-1, Table 3.5-1, and Table 4.5-3 of the FEIS) describe interactions between Project components or activities and VSECS. TMAC noted that this method is in keeping with accepted standard practice.

During its technical presentation during the Final Hearing, INAC noted that, based on the Proponent's responses to INAC's final written submissions, it considered the outstanding issues related to how public input and valued components identified in the FEIS were considered as part of the alternatives assessment resolved.[619]

With respect to INAC's recommendation regarding monitoring for potential impacts as part of its participation in the Kitikmeot SEMC, TMAC noted within its response that the Hope Bay Socio-economic Monitoring Program (SEMP) is designed using VSECs and identified potential effects from the completed impact assessment as the framework from which monitoring indicators are identified. TMAC further indicated that the establishment of a real, potential cause effect link

[619] D. Abernethy, Indigenous and Northern Affairs Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 584, lines 11-19.

between the Project and a valued component is essential to the design of a meaningful monitoring program. If no potential interactions between the Project and a VSEC are identified, then inclusion of that VSEC in the monitoring program is not warranted, nor advisable. However, TMAC noted that this does not preclude the potential for addition of a VSEC and associated monitoring indicators should, at a later date, an interaction be identified as a viable concern.

TMAC further indicated that it does and will consider the input of the Hope Bay Socio-economic Monitoring Working Group and the Kitikmeot Socio-economic Monitoring Committee to help ensure that the Hope Bay SEMP remains valid and robust. TMAC also noted that the Hope Bay SEMP is currently being updated and that the draft updated monitoring program (March 2018) would be based on the outcomes of the socio-economic impact assessment presented in the FEIS for the Project; it has been constructed with reference to the existing monitoring program established for the Doris North Gold Mine Project (2007), to broader socio economic monitoring activities in the Kitikmeot and across Nunavut, and to the results of the Territorial Socio economic Monitoring initiative led by the GN Department of Economic Development and Transportation.[620]

During the Final Hearing, a Community Representative from Cambridge Bay noted a preference for the use of berms instead of using lakes as tailings facilities stating:

> *...killing, harming, harassing, capturing, or taking of a listed species; destruction of habitat. I know the species aren't listed under Risk, but my concern is, with the tailings, to avoid this in the future, I'd like to see berms built rather than lakes cleaned out.*[621]

In response, Fisheries and Oceans Canada (DFO) noted that as part of the process, the Proponent is required to undertake a detailed alternatives analysis which would require them to consider other ways of disposing of their tailings. DFO noted that it would be their department's responsibility to review any plans related to the offsetting that could be done for fish and fish habitat. DFO also noted that the tailings impoundment areas are subject to the *Metal Mining Effluent Regulations* under the *Fisheries Act*.[622] TMAC added that, prior to the current tailings impoundment area at the Doris North site being selected and approved, various alternatives were evaluated, with the Kitikmeot Inuit Association indicating that they preferred the current location that is currently being used. For the current proposal, TMAC is proposing to continue to use the existing facility at Doris North, while TMAC determined based on the alternatives analyses that the best facility for some of the tailings would be the dry-stack tailings facility which would utilize an area on the tundra and not disturb local lakes.[623]

[620] TMAC Resources Inc. Response to Final Written Submissionss, April 5, 2018.
[621] D. Klengenberg, Cambridge Bay, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 902, lines 3-8.
[622] B. Ross, Fisheries and Oceans Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 903, lines 9-20.
[623] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018, p. 904, lines 4-23.

7.5.3 Views of the Board

The Board notes that during the assessment of the Project, TMAC has worked with the potentially affected communities, the Kitikmeot Inuit Association and other Intervenors to significantly improve the Project design and associated mitigation, management and monitoring measures. The Board appreciates that its public review process provided a forum for these efforts and that the Proponent was responsive and willing to adopt better alternatives to reflect the concerns and issues raised by the Board, the Intervenors, and Community Representatives.

The Board notes that many of the preferred means of carrying out the Project chosen by TMAC such as the development of the proposed road[624], the tailings disposal and impoundment measures[625] are based on methods and technologies widely used in other northern mines. The use of known technology increased the confidence of the parties and the Board with TMAC's chosen alternatives and TMAC's predictions about the effects associated with these preferred alternatives. However, the Board notes the outstanding matter with respect to the road design and the lack of information on the design to develop a power line between the Doris North and Boston sites as brought up by the Government of Nunavut during the review of the proposed project (Exhibit 86) and is further discussed under Section 5.12 of this Report.[626]

With respect to the fundamental question of alternatives to the Project, the Board recognizes that the Project has the potential to deliver lasting positive economic benefits in the Kitikmeot region and in Nunavut, but that these potential effects must be balanced against the potential for adverse ecosystemic and socio-economic effects in these areas as well. As detailed in several sections of the report, the Board has now concluded that the potential for the Project to have significant adverse ecosystemic and socio-economic effects can be addressed through the Proponent's compliance with the commitments made throughout the Board's review, as well as compliance with the Board's recommended terms and conditions.

7.5.4 Conclusions and Recommendations of the Board

In considering this issue, the NIRB acknowledges that TMAC's preferred means of developing the Project is appropriate, as the no-go alternative would result in lost opportunity. On the assumption that the Project is carried out in compliance with TMAC's commitments and the Board's recommended terms and conditions, the Board does not have any recommendations regarding alternative means of carrying out the Project or any of the specific Project components. The Board further encourages TMAC to continue to investigate new technologies and alternative means of carrying out the Project while further minimizing adverse impacts to the environment and communities.

[624] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018, pp. 239-240, lines 21-26 and 1-6.
[625] M. Rykaart, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 8, 2018, pp. 85-86, lines 16-26 and 1-5.
[626] Government of Nunavut, Submission to the Nunavut Impact Review Board Regarding the Final Hearing for the Phase 2 Hope Bay Belt Project Proposal (12MN001), Exhibit 86, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018.

7.6. CUMULATIVE EFFECTS

An assessment of the potential for the Phase 2 Hope Bay Belt Project (the Project) to result in cumulative effects is required by Article 12, Section 12.5.2 of the *Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada* (*Nunavut Agreement*). For this Review specifically, the Nunavut Impact Review Board (NIRB) noted within its February 24, 2012 Screening Decision Report that the potential for cumulative effects should factor prominently in the assessment of the Project given the number of amount of mineral exploration and development occurring in the region and the concerns to caribou. In correspondence confirming that the Project should undergo a review by the NIRB, the Minister agreed that the issue of cumulative effects was an important one to consider.

Reflecting these requirements, the NIRB ensured that the Final Environmental Impact Statement (FEIS) that was submitted to the Board in December 2017 included an assessment of the potential for cumulative effects to occur when the residual effects of the Project overlap and interact with the ecosystemic or socio-economic effects of other past, existing or reasonable foreseeable projects or activities prior to accepting the FEIS.

7.6.1 Views of the Proponent

TMAC Resources Inc. (TMAC, or the Proponent) described its approach to cumulative effects within Volume 2, Section 4 of the Final Environmental Impact Statement (FEIS) and presented its cumulative effects assessment for each VEC/VSEC within the individual sections of Volumes 4, 5, and 6 of the FEIS.

The Proponent's noted methodology involved identifying potential interactions among Project-related residual effects, residual effects from the existing and approved Projects within the Hope Bay Greenstone Belt (i.e., the Doris North Gold Mine Project, the Hope Bay Regional Exploration Project, the Madrid Advanced Exploration Program, and the Boston Advanced Exploration Project), and other past, existing, and reasonably foreseeable human activities and projects.

For the vast majority of VECs and VSECs for which project-related residual effects were predicted, TMAC concluded that there was no potential for cumulative effects because no other past, present, or reasonably foreseeable projects occur within the assessment boundaries or within the area within which project-related residual effects were predicted. However, TMAC identified potential residual cumulative effects for caribou, employment, and community health and well-being.

TMAC predicted three (3) residual cumulative effects for caribou: habitat loss (e.g., from multiple project footprints); disturbance (zones of influence surrounding projects within which there is reduced habitat quality due to traffic, blasting, aircraft, etc.); and disruption of movement (proportion of collared caribou found to cross roads across the region, and number of crossings). TMAC calculated that relative to the total habitat available to the assessed herds, cumulative habitat loss and the cumulative area within which caribou could be subject to disturbance would be very low. TMAC also predicted that rates of road crossings by caribou would not

significantly increase with the addition of the Hope Bay Project. TMAC concluded that all residual cumulative effects on caribou would be not significant.

TMAC predicted two (2) residual cumulative effects for employment: changes to employment opportunities and income; and changes to competition for local labour. Regarding the former, TMAC identified the possibility that the current closure dates for the Project may correspond with closure dates of other projects in the Kitikmeot region, resulting in an increased level of unemployment, but noted that the effect would be short-term and reversible as those who lose jobs would be expected to obtain employment elsewhere. In terms of the competition for local labour, TMAC noted that the magnitude of this effect would depend on the actual schedule of the different projects, and also on the success of training and education initiatives in the region and at the different projects. TMAC concluded both residual cumulative effects on employment would be not significant.

TMAC predicted two (2) residual cumulative effects for community health and well-being: changes to family stability; and changes to family spending. TMAC noted that with multiple projects operating in the Kitikmeot region simultaneously, more family members could be away from home at any one time and/or a greater number of households within a community would be affected. TMAC considered the residual cumulative effect of changes to family stability to be of moderate magnitude, while the negative impacts to family spending were considered to be of low magnitude as it expects a limited number of individuals and households would make poor spending choices. TMAC concluded that residual cumulative effects to community health and well-being would be not significant. TMAC noted the importance of its participation in the regional Kitikmeot Socio-Economic Monitoring Committee in helping to mitigate cumulative socio-economic effects.

7.6.2 Views and Concerns of Interested Parties

During the Final Hearing, Nunavut Impact Review Board (NIRB) staff asked TMAC whether the proposed road could potentially contribute to cumulative effects of disturbance on the caribou herds in this region.[627] TMAC replied that it had taken caribou collar data for each of the three (3) herds in the project area, including data from surrounding the proposed road and the area surrounding other mining projects, and used this data in an energetics model to indicate if females might have fewer calves due to the presence of the road, thus impacting the population as a whole. TMAC confirmed that the model indicated that there was an indistinguishable effect of the Project.[628]

Concern about cumulative impacts to wildlife was also raised during the Final Hearing by a Community Representative from Gjoa Haven. The Representative commented

> *…sometimes when we go out hunting, our catches are not healthy, birds, fish. It's very obvious. Sometimes when people catch these fish and other wildlife they have been found to be unhealthy. When I was younger, this never occurred, but today I think they have*

[627] R. Barry, Nunavut Impact Review Board staff, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018 p. 235, lines 14-19.
[628] G. Sharam, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018 pp. 235-237, lines 24-26, 1-26, and 1-7.

been impacted by cumulative impacts…. They are probably eating contaminants, and that's a concern to me today.[629]

In response to this comment, Environment and Climate Change Canada (ECCC) noted that TMAC is required to meet strict limits regarding air and water quality, and added that the objective of the department's review of the Project, its recommendations, and TMACs commitments have been to ensure that the Project does not significantly contribute to the loading of contaminants in the receiving environment.[630]

Still, a Community Representative from Kugaaruk echoed the Representative from Gjoa Haven's concern of impacts to wildlife, saying that "…[o]*nce the mining companies started coming up here, we're noticing that wildlife and fish are beginning to be impacted, and sometimes we are unable to eat what we catch because some are unhealthy*."[631]

During the Final Hearing, NIRB staff also raised the potential for cumulative effects from shipping in the region, and asked how its mitigation measures for protecting the marine environment are communicated to shipping companies.[632] In reply, TMAC noted that shipping companies must follow applicable laws and regulations, and also noted that for the Doris North project TMAC has stipulated requirements within its contract with the shipping companies such as the need to avoid particular areas like King Leopold Island with high marine life or bird densities.[633]

Further regarding cumulative shipping in the region, NIRB staff also asked whether TMAC had received assurances from shipping companies that its needs could still be met given the growing demand for shipping services in the region.[634] TMAC stated it had met with one shipping company in Cambridge Bay and no concerns were identified. [635]

In its final written submission, Fisheries and Oceans Canada (DFO) noted concern with TMAC's assessment of and proposed mitigation for potential impacts of shipping on marine mammals. DFO recommended that the Proponent assess the potential and cumulative effects of shipping on all marine mammals located within the MRSA and along the shipping route. During the Final Hearing, DFO indicated it remained concerned about the potential for shipping conflicts with marine mammals and provided revised recommendations[636], indicating that its key concern was

[629] J. Qirqqut, Gjoa Haven, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018 pp. 913-914, lines 9-26 and 1-3.
[630] B. Summerfield, Environment and Climate Change Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018 p. 914, lines 9-21.
[631] L. Illuitok, Kugaaruk, NIRB Final Hearing File No. 12MN001 Transcript, May 12, 2018 pp. 932, lines 21-26.
[632] R. Barry, Nunavut Impact Review Board staff, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018 p. 318, lines 3-10.
[633] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018 pp. 318-319, lines 16-26 and 1-7.
[634] R. Barry, Nunavut Impact Review Board staff, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018 pp. 319-320, lines 11-26 and 1-3.
[635] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018 pp. 320-321, lines 9-26 and 1-3.
[636] Fisheries and Oceans Canada. *Phase 2 Hope Bay Belt Project Presentation*. Exhibit 43 NIRB Final Hearing File No. 12MN001, May 10, 2018.

cumulative effects.[637] In response, TMAC repeatedly stressed that project-related shipping would amount to approximately two (2) extra vessels per year, which it considered a small number relative to existing shipping traffic throughout the region.[638] TMAC later clarified that that two (2) ships per year is estimated above and beyond what is already approved for the Doris North project, and so the total would be between four (4) and seven (7) vessels per year.[639] DFO countered that there is a lack of data related to the cumulative impacts of shipping on marine mammals in the North and no clear evidence of what the impacts of two (2) additional ships may be, but as shipping as a whole is increasing in the north and any additional ship could surpass a threshold, the department took a precautionary approach and recommended measures to minimize risk.[640] See Section 5.15 for additional discussion on the marine wildlife effects assessment.

In the context of understanding potential cumulative effects, NIRB staff asked DFO if it was aware of any evidence that annual marine resupply activities in the Canadian Arctic have been demonstrated to adversely impact marine mammals to date.[641] In response, DFO noted there are some studies that indicate marine mammals are disturbed by noise and there is a possibility for ship strikes, but DFO reiterated that it there is a lack of information about the overall impact.[642] In follow-up, NIRB staff asked if DFO has any ongoing or planned initiatives to address concerns regarding the potential for cumulative effects from marine shipping in the Canadian Arctic.[643] DFO noted that the Oceans Protection Plan includes studies to look at the impacts of shipping on marine resources[644]. Transport Canada then confirmed that the Government of Canada is undertaking a Canada-wide, cumulative effects assessment related to marine shipping and the impacts on marine mammals, with one (1) study location in the Arctic, near Cambridge Bay. Transport Canada added that the study is planned to take place through 2022.[645]

7.6.3 Views of the Board

The Board understands the potential for cumulative socio-economic and biophysical effects to arise due to increasing development across the North, and the challenge of assessing and addressing these potential impacts. During the Final Hearing, the Board noted that there is uncertainty regarding the potential for cumulative effects given the Proponent's ongoing

[637] B. Ross, Fisheries and Oceans Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018 pp. 543-544, lines 26 and 1.
[638] B. Armstrong, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018 pp. 543-544, lines 23-26 and 1-5.
[639] O. Curran, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018 pp. 569-570, lines 13-26 and 1-2.
[640] B. Ross, Fisheries and Oceans Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018 p. 543, lines 2-8.
[641] R. Barry, Nunavut Impact Review Board staff, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018 p. 570, lines 6-16.
[642] B. Ross, Fisheries and Oceans Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018 pp. 570-571, lines 21-26 and 1-10.
[643] R. Barry, Nunavut Impact Review Board staff, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018 p. 571, lines 16-23.
[644] B. Ross, Fisheries and Oceans Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018 p. 572, lines 1-10.
[645] A. Gudmundson, Transport Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018 pp. 572-573, lines 19-26 and 1-12.

exploration activities in the area and the possibility that the Proponent could develop another discovery in the future. The Board noted that additional development in the area could lead to increased traffic, dust, noise, and other potential impacts of a mine.[646] In response, TMAC noted that exploration along the Hope Bay belt has been ongoing since the 1960s, emphasized that TMAC's exploration activities for the foreseeable future will be focused on the Doris, Madrid, and Boston deposits, and reiterated that the Madrid area is very prospective and TMAC expects it to grow. TMAC added that if in the future it identified a new discovery, or wanted to expand its operations at the Boston site for example, an environmental review would be required.[647]

The Board is keenly aware of the concerns of Parties that increasing development and shipping in Nunavut and across the Arctic may lead to adverse cumulative impacts on the biophysical environment and on caribou and marine mammals in particular. The Board would like to emphasize that Inuit Qaujimaningit has an important role in understanding cumulative effects over time and over space. The Board understands that DFO remained unsatisfied at the close of the Final Hearing in terms of ship-board marine mammal observers. However, with respect to potential cumulative effects on marine mammals, the Board is of the view that it would be most appropriate for the Government of Canada to establish and implement standardized requirements that would pertain to all certified vessels transiting through Arctic waters, rather than placing the onus on proponents. See Section 7.8 of this Report for additional details. The Board is encouraged by the Government of Canada's new, ongoing study on the cumulative impacts of shipping on marine mammals, and believes that the future results of this study and those of other research and monitoring studies can be used to improve mitigation for marine wildlife across Nunavut. The Board would also encourage the Proponent to work with regulatory authorities and other Parties to stay abreast of these types of studies to ensure its mitigation is as effective and protective as possible.

The Board generally accepts that the potential for cumulative effects arising from the Project can be effectively managed by implementing the mitigation, monitoring and adaptive management measures proposed by the Proponent, including ongoing participation in the Hope Bay Socio-Economic Working Group and the Kitikmeot Socio-Economic Monitoring Committee.

7.6.4 Conclusions and Recommendations of the Board

The Board is reasonably satisfied that the potential for cumulative effects can be effectively managed through the commitments provided by the Proponent and the application of key mitigation and monitoring measures for each VEC and VSEC assessed. The Board recommends terms and conditions requiring the following (a brief summary of the Board's recommended terms and conditions is provided below for ease of reference only; see Section 9: Recommended Project Specific Terms and Conditions for the complete wording of the recommended terms and conditions for this section):

- In recognition of the challenges that phased development can create in terms of ensuring all potential cumulative effects associated with ongoing exploration and possible future

[646] P. Kadlun, Board Member, NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018 pp. 247-248, lines 17-26,1-13.
[647] O. Curran, TMAC Resources Inc. NIRB Final Hearing File No. 12MN001 Transcript, May 9, 2018 pp. 249-250, lines 1-26, and 1-9.

phases of development are adequately and fully assessed, the Proponent shall provide detailed updates to the Board on the status of ongoing exploration programs associated with the Property.

7.7. TRANSBOUNDARY EFFECTS

As set out in the minimum requirements for an Environmental Impact Statement (EIS) established by the NIRB and appended to the NIRB's Final EIS Guidelines for the Project,[648] TMAC was required to include an assessment of the potential for project-induced ecosystemic and/or socio-economic transboundary effects. In this assessment, although the Project in its entirety would be conducted within the Nunavut Settlement Area (NSA), the Board required TMAC to assess whether any effects linked directly to the activities of the Project had the potential to extend to jurisdictions outside of the NSA. As set out in the EIS Guidelines, and also as presented by the Proponent in the FEIS, the assessment and mitigation of potential transboundary effects is often linked to the assessment and mitigation of potential cumulative effects as well.

7.7.1 Views of the Proponent

TMAC Resources Inc. (TMAC, or the Proponent) described its approach to transboundary effects within Volume 2, Section 4 of the Final Environmental Impact Statement (FEIS) and presented the transboundary effects assessment for each VEC/VSEC within the individual sections of Volumes 4, 5, and 6 of the FEIS. Although the Proponent noted that the Project would be located entirely within the NSA, the Proponent recognized that transboundary effects could occur when terrestrial or marine wildlife moves across jurisdictional boundaries or when project activities themselves, or their zone of influence, crosses jurisdictional boundaries.

The Proponent's FEIS considered transboundary effects for all VECs and VSECs identified for the Project-related effects assessment, with specific consideration given to the potential for transboundary impacts associated with marine shipping on marine mammals, migratory birds and seabirds, and their habitat; and impacts on the large migration range of land mammals such as caribou. In addition, any residual effects that had the potential to occur outside of the Nunavut Settlement Area (NSA) were also considered and included in the evaluation of transboundary impacts.

Applying this approach, TMAC identified the following VECs as posing the potential for transboundary effects in the FEIS:

- Climate and Meteorology – considered whether the Project's contribution to global greenhouse gas (GHG) emissions may have an effect on climate change trends;
- Air Quality – considered whether air quality exceedances would extend beyond the Local or Regional Study Areas (LSA and RSA) and into areas outside the Nunavut Settlement Area, and also whether the air emissions from shipping vessels and aircraft could outside the LSA or RSA;

[648] NIRB Guidelines for the Preparation of an Environmental Impact Statement for Hope Bay Mining Ltd.'s Phase 2 Hope Bay Belt Project, NIRB File No. 12MN001, December 14, 2012.

- Caribou – assessed the potential for transboundary effects on caribou habitat, disturbance and disruption of movement of the Dolphin and Union and Beverly/Ahiak caribou herds;
- Freshwater Environment – evaluated the potential for residual effects on surface hydrology, water quality and sediment quality; and
- Marine Environment – evaluated the potential for surface water quality and sediment quality.

With respect to the identified VECs, TMAC concluded that **none** of the identified residual effects would result in significant transboundary effects, in summary, finding the following:

- All air contaminant levels would attenuate to baseline levels either within the LSA or relatively close to emission points, and therefore there would be no anticipated transboundary effects on ambient air quality associated with the Project;
- The caribou habitat loss caused by the Project represents approximately 0.02% of seasonal and annual herd ranges, and therefore, the areas impacted are small and unlikely to be measurable at the herd level;
- When mitigation measures are implemented, the magnitude of the potential disturbance to caribou from project activities such as quarry blasting, helicopters and vehicles is low and would end with closure of the Project;
- When mitigation measures are implemented to allow caribou to cross the 53 km all weather road to the Boston site, the disruption of caribou movement is predicted to not be significant;
- The geographical extent of any residual effects on freshwater quality would be limited to within the LSA and will not occur outside the NSA; and
- Similarly the geographical extent of any residual effects on the marine environment would be limited to within the LSA and will not occur outside the NSA.

The Proponent also assessed the potential for transboundary effects on Valued Socio-Economic Components (VSECs) to identify where residual effects with the potential to interact with projects and activities outside of the Nunavut Settlement Area (NSA) were predicted.

TMAC identified the potential for transboundary effects in respect of the following VSECs:

- Employment – considered the potential for transboundary effects resulting from changes to employment and income at mine closure on regions outside of the Kitikmeot Region and also the potential for transboundary effects associated with competition for labour;
- Human Health and Well-being – assessed the potential for transboundary effects associated with changes to family stability associated with the rotational nature of the fly in/fly out work at the Project and changes to family income; and
- Traditional Activities and Knowledge – evaluated potential transboundary effects on traditional wildlife harvesting (particularly caribou) attributable to changes in population or distribution.

With respect to the identified VSECs, TMAC concluded that **none** of the identified residual effects would result in significant transboundary effects, concluding the following:

- Although the Project will employ workers from other areas of Canada, including the Kitikmeot, as there are likely more opportunities for employment outside the Kitikmeot, the potential for the loss of employment at closure is unlikely to have a significant transboundary effect;
- With respect to competition for labour, the Proponent has concluded this effect will be confined to the Kitikmeot, with no residual effects outside the NSA; and
- As noted in Section 7.6: Cumulative Effects and Section 5.12: Terrestrial Wildlife and Wildlife Habitat, with mitigations, the Proponent concluded that there would be no cumulative effects to caribou due to a change in distribution or abundance of caribou; as a result, TMAC predicted that harvesters outside the Kitikmeot Region would not experience project-induced changes to harvesting practices.

7.7.2 Views and Concerns of Interested Parties

As discussed in more detail in Section 5.12: Terrestrial Wildlife and Wildlife Habitat, Section 5.14: Marine Environment (Physical Processes and Water and Sediment Quality), Section 5.15: Marine Wildlife (Including Fish and Fish Habitat) and Section 7.6: Cumulative Effects the parties' concerns about the potential for transboundary impacts focused on:

- The potential for transboundary effects on caribou, including habitat loss, abundance, distribution and disruption and associated effects on traditional harvests and commercial guiding/hunting activities in the Northwest Territories;
- The potential for transboundary effects on marine mammals, fish and the marine environment associated with project shipping; and
- The potential for effects on employment resulting from workers being hired from outside the Kitikmeot Region.

7.7.3 Views of the Board

The Board, having concluded in Sections Section 5.12: Terrestrial Wildlife and Wildlife Habitat, Section 5.14: Marine Environment (Physical Processes and Water and Sediment Quality), Section 5.15: Marine Wildlife (Including Fish and Fish Habitat) and Section 7.6: Cumulative Effects that the Project, if conducted in accordance with the mitigations proposed and the Board's recommended terms and conditions is unlikely to have significant adverse effects, the Board has similarly concluded that the Project is unlikely to result in significant transboundary effects. The Board has not included terms and conditions directed at mitigating the potential for transboundary effects specifically, but rather highlights that the terms and conditions in the Sections of this Report cited above contain recommendations about mitigation and monitoring measures that will also function to limit the potential for transboundary effects.

7.7.4 Conclusions and Recommendations of the Board

The Board recommends that if the Project complies with the Terms and Conditions outlined in Section 5.12: Terrestrial Wildlife and Wildlife Habitat, Section 5.14: Marine Environment (Physical Processes and Water and Sediment Quality), Section 5.15: Marine Wildlife (Including Fish and Fish Habitat) and Section 7.6: Cumulative Effects the potential for transboundary effects can be successfully mitigated.

7.8. REGULATORY CAPACITY AND CO-OPERATION

7.8.1 Views of the Proponent

TMAC Resources Inc. (TMAC or the Proponent) did not express views or raise concerns regarding regulatory capacity and co-operation in the Final Environmental Impact Statement and at the Final Hearing for the proposed Phase 2 Hope Bay Belt Project (the Project).

7.8.2 Views and Concerns of Interested Parties

During the Final Hearing, a member of the Community of Kugaaruk requested clarification regarding the agency that would be responsible for authorizing the Project.[649] In response, the Proponent clarified that the Project would require a number of approvals from various regulatory agencies and the Kitikmeot Inuit Association before it could proceed with proposed project activities.[650]

7.8.3 Views of the Board

In several recent assessments,[651] the Board has noted concern about the regulatory capacity to meet specific regulatory obligations. Specifically, the Board has noted concerns regarding the capacity of regulators to participate fully on project working groups responsible for the development and implementation of effects monitoring, mitigation, and management functions, as well as ensuring sufficient capacity to provide an appropriate level of regulatory oversight for a project once it has been approved to proceed and once the initial permitting phase is completed.[652] In this regard the Board notes that several of the important mitigation, management and monitoring requirements recommended by the Board require the active participation of other parties in addition to the Proponent. The Board has concerns that the failure of any of the central regulatory agencies, landowners, Inuit, community members, and/or researchers involved to fulfill their roles could jeopardize these vital efforts and, in a case where compliance with the objective of the term and condition can no longer be fulfilled, could trigger the NIRB to reconsider the applicable term and condition.

In addition, during a discussion at the Final Hearing regarding the extent to which the Project's increase of two ships per year to existing marine shipping could have cumulative effects, the Board heard that general (not project-specific) data deficiencies may be limiting the extent to which regulators can have confidence in the assessment of cumulative effects:

[649] C. Krejunark, Hamlet of Kugaaruk, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 761, lines 16-20.
[650] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, pp. 762-763, lines 1-26 and 1-13.
[651] NIRB Final Hearing Report for the Meliadine Gold Project, Agnico Eagle Mines Limited, NIRB File No. 11MN034, October 10, 2014 and NIRB Revised Final Hearing Report for the Back River Gold Mine Project, Sabina Gold and Silver Corp., NIRB File No. 12MN036, July 18, 2017.
[652] See for example the Board's discussion of this issue as included in Section 6.4 Regulatory Capacity in NIRB File No. 08MN053, Final Hearing Report for the Mary River Project, Baffinland Iron Mines Corporation, September 14, 2012, pp. 227-229.

> *What I was saying was that taken as a whole, we don't know what the threshold is, and I guess that's maybe where I'll come back to it as well. We're pretty data deficient right now when it comes to the cumulative impacts of shipping on marine mammals in the North.*[653]

In the Board's view, the effective assessment of and monitoring for cumulative effects associated with increases in marine shipping is an important and increasingly pressing issue in Nunavut, but, as many contributors to the substantial increases in marine traffic (such as community resupply and cruise ships) may not be assessed by the NIRB's project-specific assessments, such Board reviews do not provide an appropriate venue for addressing these more general data deficiencies. In this assessment, the Board has also concluded that it is not reasonable for individual Proponents to be wholly responsible for attempting to meet general data deficiencies.

7.8.4 Conclusions and Recommendations of the Board

The Board notes with interest that it appears that Fisheries and Oceans Canada's participation through specific marine-related cumulative effects initiatives associated with the Oceans Protection Plan recently introduced by the Government of Canada may be the more appropriate vehicle for addressing existing data deficiencies and determining whether additional regulations may be required for shipping in the Canadian Arctic, such as for marine wildlife monitoring and avoidance procedures. The Board would hope that these planning activities could include collecting vital baseline data to evaluate the potential for effects occurring due to existing levels of Arctic shipping. The Board would support this work and would welcome any additional measures that Intervenors can take to generally reduce uncertainty and improve the Board's ability to assess the potential for cumulative effects.

In addition, the Board wishes to recognize the considerable collaboration, data-sharing, and co-operation among parties, including regulatory agencies, through this Review. The Board encourages all parties to maintain this collaborative approach throughout the subsequent regulatory processes that follow and the Board's on-going monitoring of the Project.

7.9. PERFORMANCE BONDING

As established under Article 12, Section 12.5.5 (f), of the *Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada* (*Nunavut Agreement*) the NIRB shall, when reviewing any project proposal, take into account all matters that are relevant to its mandate, including whether the Board should require the posting of performance bonds. In assessing the extent to which performance bonding is required, the Board considers the Proponent's current financial capacity, prior mine development, and in the case of TMAC Resources Inc. (TMAC or the Proponent), prior mine operating experience at the existing Doris North Gold Mine, the costs of developing and reclaiming the Project under review and the jurisdiction and requirements of regulatory authorities, mineral tenure holders and landowners involved in the subsequent permitting phase of project development to secure an amount

[653] B. Ross, Fisheries and Oceans Canada, NIRB Final Hearing File No. 12MN001 Transcript, May 10, 2018, p. 543, lines 14-19.

(through various instruments such as the water licence, offsetting plans, land and production leases) to cover the ultimate costs of reclaiming the Project.

Although the Board typically expects that the detailed assessment of the Proponent's reclamation security estimates would be conducted sometime after the NIRB Review is completed and the Project, if approved to proceed, is being considered by the Nunavut Water Board (NWB) during the water licensing process, under the coordinated process applicable to this Project, there was more detailed financial and reclamation security information available during the NIRB process than is normally the case, which is outlined by the Board in the sections that follow.

7.9.1 Views of the Proponent

As part of the Type "A" Water Licence Application, TMAC provided the Board and parties information regarding the financial capacity of the Proponent in the form of audited Financial Statements for TMAC for the periods ending December 2015 and December 2016.[654] In general, TMAC was incorporated on October 30, 2012, in the Province of Ontario, Canada, and is involved in the exploration, evaluation and development of the Hope Bay mineral property in the Kitikmeot Region of Nunavut, Canada ("Hope Bay"). TMAC's efforts currently are devoted to the exploration, evaluation and development of the Hope Bay property, which includes much of the Hope Bay greenstone belt. On July 7, 2015, the Company completed an initial public offering (the "IPO") of Common Shares which began trading on the TSX. Additionally, on July 23, 2015, TMAC entered into a Credit Agreement with respect to a senior secured term loan facility for an aggregate principal amount of up to US$120 million maturing on December 31, 2018 (the "Debt Facility").[655]

TMAC also provided a discussion on its financial responsibility and security in Volume 2 of the Final Environmental Impact Statement (FEIS) noting that the Hope Bay Property is the Company's prime holding and the sole focus of the Company's resources with all rights title, interests, liabilities and obligations for the Hope Bay Greenstone Belt resting with TMAC. TMAC estimated that royalties, mineral taxes and payments of approximately $400 million over the life of the Project. The construction workforce is expected to be up to 200 people per year and the average operational workforce would be 650 persons (rotational work basis with approximately 50% on site at any given time).[656]

With respect to cost of the developing the Project, TMAC indicated within the FEIS that it is fully funded and well positioned for exploring, permitting, constructing, operating, and closing known and future gold deposits of the Hope Bay Project. The Proponent's estimate contained in the FEIS with the capital expenditures required to develop the Project predicted to be approximately $3.953 billion as follows:

[654] TMAC Resources Inc., Final Environmental Impact Statement, Volume 1 Annex V1-7, Package P6-1, Financial Statements
[655] TMAC Resources Inc., Final Environmental Impact Statement, Volume 1 Annex V1-7, Package P6-1 Financial Statements.
[656] TMAC Resources Inc., Final Environmental Impact Statement, Volume 1 Annex V1-7, Package P6-1, Financial Statements.

> During the Construction phase of the Project, capital expenditures (CAPEX) are estimated at $419.1 million….In addition to CAPEX, from 2019 to 2022 there will be operating expenditures (OPEX) incurred as mining at Madrid begins. Total expenditures for the Construction phase are estimated at $861.4 million, including $419.1 million in CAPEX and $442.3 million in OPEX….The operations phase, as defined for the FEIS, is set to start in 2023 (Year 5) and end in 2032 (Year 14). The total OPEX for the operations phase is estimated at $2,723.0 million. In addition, CAPEX during this phase is estimated to be $368.6 million, mainly for sustaining capital (capital investments required to sustain production). All expenditures during the operations phase total $3,091.6 million.[657]

TMAC submitted a Hope Bay Project Doris-Madrid Interim Closure and Reclamation Plan and a Hope Bay Project Boston Conceptual Closure and Reclamation Plan as part of the FEIS. Both plans have been developed to address components on the proposed Project and included thresholds for monitoring and identified adaptive management responses. In addition, an updated Hope Bay Project Doris-Madrid Interim Closure and Reclamation Plan Detailed Cost Estimate and Boston Conceptual Closure and Reclamation Plan Detailed Cost Estimate was provided as part of this submission with the FEIS. These cost estimates provided a detailed description of the costing assumptions and associated closure and reclamation cost for the Phase 2 Hope Bay Belt Project. The initial direct cost associated with reclamation and closure was estimated to be approximately $62.7 million and the initial indirect cost associated with reclamation and closure was estimated to be approximately $31.8 million; for a total closure cost estimated to be approximately $94.4 million.[658,659]

7.9.2 Views and Concerns of Interested Parties

During the Final Hearing, a Community Representative from Cambridge Bay requested clarification whether TMAC had investors in place for the mine and if TMAC can confirm whether funds would be set aside for the mine closure phase.[660] In response, TMAC noted that security for mine closure was part of its closure and reclamation plans for the Project, and that funds to be set aside by the Proponent for mine closure would be part of Nunavut Water Board's water licencing process for the Project.[661]

7.9.3 Views of the Board

As with all Reviews, the Board shares the expectation of all participants that TMAC will have in place at the outset of project development the financial capacity to meet all of the obligations and

[657] TMAC Resources Inc., Final Environmental Impact Statement, Volume 1 Annex V1-7, Package P6-1, Financial Statements.
[658] TMAC Resources Inc., Final Environmental Impact Statement, Volume 1 Annex V1-7, Package P4-20, Hope Bay Project Boston Conceptual Closure and Reclamation Plan, Detailed Cost Estimate, p. 3.
[659] TMAC Resources Inc., Final Environmental Impact Statement, Volume 1 Annex V1-7, Package P4-22, Hope Bay Project Doris-Madrid Interim Closure and Reclamation Plan, Detailed Cost Estimate, p. 3.
[660] D. Klengenberg, Cambridge Bay Hunters and Trappers Organization, NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, p. 723, lines 1-4 and 12-15.
[661] O. Curran, TMAC Resources Inc., NIRB Final Hearing File No. 12MN001 Transcript, May 11, 2018, pp. 723-724, lines 7-11, 17-26 and 1-2.

commitments made by the Proponent during this Review. In addition, the Board also expects that this financial capacity will be maintained beyond the active operational period of the mind and will extend over the entire course of the Project's lifecycle, including not only ensuring current financial capacity, but also ensuring that adequate security is in place during all phases of the Project to ensure full reclamation of all project works, undertakings and activities when operations cease.

Based on the updated publicly available information and the confidential information provided by the Proponent, the Board is now confident that the Proponent not only has the intention, but also the financial capacity to bring the Project forward in a manner that reflects all commitments TMAC has made as well as fulfilling the mitigation, monitoring, and adaptive management that will be required to carry out the Project. In coming to this conclusion, the Board also notes the tangible progress identified by both the Kitikmeot Inuit Association (KIA) and TMAC in terms of the land tenure and Inuit Impact Benefit Agreement negotiations.

The Board also expects that in addition to the KIA's land tenure negotiations, the Nunavut Water Board's water licensing process will engage in the detailed assessment of the amount of reclamation security that would need to be in place to secure proper closure and reclamation of the Project.

7.9.4 Conclusions and Recommendations of the Board

Having duly considered the Proponent's current financial capacity, the general estimate included in the preliminary closure and reclamation planning conducted to date and recognizing that these global estimates will be further refined by the Proponent and examined further by interested parties in much greater detail if the Project were to proceed to subsequent licensing and permitting processes, the Board does not have any recommendations regarding performance bonding requirements for the Project.

7.10. PHASED DEVELOPMENT AND THE NEED FOR OPERATIONAL FLEXIBILITY

The Board notes that, as is the case in respect of this Project, increasingly mining projects are developed in stages as "Phased Developments." As a result, it is becoming the norm that once approved, projects will be under almost constant modification, with on-going exploration, construction, operations and even progressive reclamation taking place at the same time, while several deposits in the same area advance through various stages of mine development. This creates a very dynamic and difficult backdrop for the conduct of meaningful and timely assessments of each phased development in the context of the larger whole. For example, establishing the scope of the assessment of subsequent phases while recognizing the interplay and interconnections between existing and already-approved projects is sometimes very difficult.

In several of the Board's recent assessments involving significant modifications to already-approved projects it has become apparent that care must be taken in the development of the Board's recommended terms and conditions to ensure that the terms and conditions, while sufficiently specific to provide guidance, are not so prescriptive that a Proponent has no operational flexibility to carry out an approved project without constantly requiring

reassessment/reconsideration of terms and conditions by the Board. To that end, the NIRB has recommended terms and conditions for this Project that focus on defining the objective of the recommended term and condition, with less prescriptive detail on how the Proponent may develop and operate the Project. In doing so, the Board has balanced both the need for clarity in terms of the scope of the Project assessed and the specific mitigation, management and monitoring measures the Board considers necessary to maintain the ecosystemic integrity of the Region with the Proponent's need for flexibility in determining how best to develop the Project in the context of already-approved projects and projects planned for the future.

The Board also recognizes that in addition to the challenges posed by phased development, this approach also means that the Board and all parties have an opportunity to revisit the predictions in the previously filed Environmental Impact Statements and compare previous effects predictions against actual monitoring data generated during the operation of the already-approved projects. This truly makes the EIS a "living document". Phased development also heightens the Board's focus on cumulative effects assessment, as ideally the availability of actual monitoring data from existing operations enhances the Board's ability to assess, with increased confidence, the potential for cumulative effects.

During this Review, the Board has considered the Project and developed the Board's associated recommendations with an awareness of the challenges and opportunities posed by the phased development approach.

8. RECOMMENDATION TO THE MINISTER

The NIRB provides this Final Report to the Responsible Ministers as required under Article 12, Sections 12.5.6 and 12.5.7 of the *Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada* (*Nunavut Agreement*). Following the NIRB's assessment of the potential ecosystemic and socio-economic effects of TMAC Resources Inc.'s (TMAC or the Proponent) Phase 2 Hope Bay Belt Project proposal (the Project), the NIRB has concluded that:

After due consideration of all information provided throughout the Board's assessment of the Project, and in accordance with the process and primary objectives of the *Nunavut Agreement*, the Board has recommended that the Project should be allowed to proceed in accordance with this Final Hearing Report and the associated recommendations.

9. RECOMMENDED PROJECT SPECIFIC TERMS AND CONDITIONS

9.1. THE EFFECT OF TERMS AND CONDITIONS OF THE DORIS NORTH GOLD MINE PROJECT CERTIFICATE APPLYING TO THE PHASE 2 HOPE BAY BELT PROJECT

The NIRB recognizes that the Phase 2 Hope Bay Belt Project proposal (the Project) describes a continued phased development approach for the Hope Bay Greenstone Belt, with the planned development of the Madrid North, Madrid South and Boston deposits being coordinated with the ongoing development associated with the approved Doris North Gold Mine. As the Proponent,

TMAC Resources Inc., plans to use some of the existing infrastructure at the Doris North Gold Mine site to support development of the three additional deposits, , as identified at the Final Hearing, the Board expects that there will be some terms and conditions in the existing Doris North NIRB Project Certificate (No. 003, as amended) that will continue to apply to that infrastructure after the Doris North Gold Mine itself may cease operations, but while this infrastructure continues to be used by the operations for the Project.

Specifically, the Board has identified that aspects of the following existing terms and conditions in the amended Project Certificate No. 003[662] will continue to apply to the Project infrastructure associated with the Doris North Gold Mine site, even after the closure and reclamation of the mine at the Doris North Gold Mine site:

- Wildlife and Terrestrial Environment, Terms and Conditions 22-27;
- Socio-Economics, Terms and Conditions 28, 40-49

If the responsible Minister(s) approve the Project proceeding and the NIRB convenes a Project Certificate workshop for the Project, the Proponent and parties will be expected to discuss the continued applicability of these existing terms and conditions in the Doris North Project Certificate (No.: 003 as amended), including whether updates to the existing terms and conditions may be necessary when the Doris North Mine ceases operations and the Project requires that these terms and conditions extend beyond the end of operations at the Doris North Mine.

In addition, the Board acknowledges that for some of the recommended terms and conditions involving mitigation, monitoring and reporting, TMAC may wish to conduct mitigation planning, monitoring and reporting on an integrated belt-wide basis in order to meet both the responsibilities under the Doris North Project Certificate No.: 003 (as amended) and the responsibilities under a new Project Certificate for this Project. The Board is willing to entertain this belt-wide approach where it is appropriate, but for the ease of reference of the NIRB and reviewers would require that the Proponent clearly link the contents in belt-wide documentation to the relevant project-specific terms and conditions. This clear linkage to Project Certificate requirements will greatly assist the assessment of the Proponent's compliance with the applicable Project Certificates.

9.2. THE NIRB'S MONITORING PROGRAM

As set out in Article 12, Sections 12.7.1 and 12.7.2 of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada (Nunavut Agreement)*, the Nunavut Impact Review Board (NIRB) has the jurisdiction to establish a project-specific monitoring program to: measure the ecosystemic and socioeconomic effects of a project; assess whether the project is in compliance with the prescribed project terms and conditions; share information with regulatory agencies to support the enforcement of land, water or resource use approvals and agreements; and to assess the accuracy of predictions contained in the environmental impact statements. Given the Board's application of the precautionary approach

[662] The NIRB issued the amendment 001 of the Project Certificate No. 003 to TMAC Resources Inc. on April 11, 2013 following the approval by the Minister of Indigenous and Northern Affairs.

to several aspects of this Project, in the Board's view project-specific monitoring will play a crucial role in addressing the uncertainty regarding project effects and enabling all parties to adapt mitigation measures on an ongoing basis to ensure the Project's negative effects are prevented or limited to the extent possible.

The role of the Board with respect to the establishment of monitoring programs is to focus the terms and conditions in relation to the Project. With respect to existing or future general regional and territorial monitoring programs that may include some of the same monitoring parameters/indicators as the project-specific monitoring program, the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada (Nunavut Agreement)* also directs the NIRB to avoid duplication but facilitate co-ordination and integration between the project-specific monitoring programs required by the NIRB and more general programs such as the Nunavut General Monitoring Program. Where the requirements of regional or territorial programs are more extensive or substantively different than those established through the project certificate, at all times the Proponent must ensure compliance with the project certificate terms and conditions.

In order to co-ordinate, integrate and avoid duplication with other monitoring programs, but also to ensure that the NIRB's project-specific monitoring program yields the information required to measure effects and adequately assess compliance with terms, conditions, regulatory instruments and agreements, the NIRB's monitoring program is developed after consultation with responsible authorities, the resource and land owners and the proponent following a Regulators' Meeting that typically occurs within several weeks after the responsible Minister has issued a decision that the Project can proceed to obtain regulatory authorizations and providing the Minister's direction regarding recommended terms and conditions. A short time after the Regulators' Meeting, the NIRB issues the project certificate, but the project-specific monitoring program, which is usually issued as an Appendix to the project certificate may not be issued in final form until some months after key regulatory authorizations, including land use permits, water licences, mineral leases, etc. are issued so that the monitoring program supplements and supports, and does not duplicate, the monitoring requirements in regulatory and land use instruments.

It is important to remember that the NIRB's monitoring program will have varying requirements over the course of the Project lifecycle, and that monitoring requirements will apply from construction to eventual abandonment and reclamation. In areas where there may be a need for flexibility in relation to the terms and conditions of the project certificate or their application, the NIRB has endeavoured to reflect this in the associated language and/or acknowledge that objectives may be achieved through various means. In addition, in the event that the monitoring program needs to be modified to better achieve its purpose, the Board, the Proponent, the Designated Inuit Organization or other interested parties may cause the Board, under Section 12.8.2 of the *Nunavut Agreement* to revisit the monitoring program, or any other terms and conditions in the NIRB project certificate. However, the NIRB wishes to clearly state that the Board has every expectation that TMAC Resources Inc. will fulfill all commitments made during the both the Final Hearing, within its *Final* Environmental Impact Statement and supporting documentation submitted during the Review, not just those commitments that have been incorporated into the Terms and Conditions recommended by the Board in this Report.

9.3. FORMAT OF RECOMMENDATIONS

In advance of, and during the Final Hearing for the Project, TMAC Resources Inc. and several of the intervenors worked to provide the NIRB with agreed upon wording for various suggested terms and conditions.[663] The Board appreciates the considerable efforts of all parties to provide this very useful guidance. In some cases, the Board has accepted the suggestions of the parties. In other cases, to maintain consistency with the Board's existing approaches to Project Certificate terms and conditions the NIRB has modified, added or deleted suggested terms and conditions as the Board considered necessary. The format of the recommended terms and conditions is intended to provide all parties with clear direction on the intended application, objectives and reporting requirements associated with each term and condition.

9.3.1 General Provisions

The NIRB retains the ability to give additional clarification or direction, on an ongoing basis through its Monitoring Officer, with respect to compliance requirements for the Project. Upon request by the Proponent or other parties, the NIRB can provide additional clarification or direction regarding implementation of project certificate terms and conditions.

Where the objective of a project certificate term or condition can be achieved through more efficient alternate means, the Proponent is encouraged to consult with the NIRB (and other parties as required) to seek acceptance of proposed alternatives.

Where not specified, the NIRB recognizes and respects the role of other licensing and permitting processes yet to be completed. The NIRB strongly encourages the coordination of monitoring and reporting requirements in order to reduce duplication.

9.4. ECOSYSTEMIC TERMS AND CONDITIONS

9.4.1 Air Quality

Term and Condition No.	**1.**
Category:	Air Quality – Air Quality Management Plan
Responsible Parties:	The Proponent, Environment and Climate Change Canada
Project Phase:	All Phases
Objective:	To ensure that impacts of the Project on air quality are identified, effectively mitigated and adaptively managed.
Term or Condition:	The Proponent shall maintain an Air Quality Management Plan that addresses the following areas/issues: a) regular stack testing of incinerators to demonstrate emissions are within levels predicted or within applicable guidelines or standards;

[663] See for example Exhibits 83 and 86, NIRB Final Hearing File No. 12MN001, May 8-12, 2018.

	b) continuous NO2 monitoring and demonstration that NO2 emissions do not exceed levels impact predictions nor relevant guidelines; and c) implementation of dust suppression measures and demonstration that dustfall and concentrations of suspended particulate matter are within levels predicted or committed to, and within levels or limits established by applicable guidelines and regulations.
Reporting Requirements:	The Plan should be submitted to the Nunavut Impact Review Board (NIRB) prior to the start of construction, and reported on annually (or more frequently for monitoring results that may already be required under Project Certificate No. 003, such as Term and Condition #30). For years when stack testing has been conducted, the stack testing results must also be reported to Environment and Climate Change Canada (ECCC) as ECCC directs.

9.4.2 Climate and Meteorology

Term and Condition No.	**2.**
Category:	Climate and Meteorology – Greenhouse Gas Reduction Plan
Responsible Parties:	The Proponent
Project Phase:	Construction and Operations
Objective:	To monitor and reduce greenhouse gas emissions produced by the Project.
Term or Condition:	The Proponent shall maintain a Greenhouse Gas Emissions (GHG) Reduction Plan which includes: a) an estimate of the Project's GHG baseline emissions; b) a description of monitoring measures to be undertaken, including the methods, frequency, parameters, and a description the analysis that will be carried out on the monitoring data generated; and c) a description of mitigative and adaptive strategies to reduce project-related greenhouse gas emissions over the Project lifecycle.
Reporting Requirements:	The Plan should be submitted to the Nunavut Impact Review Board (NIRB) prior to the start of construction, with subsequent updates or revisions to the Plan submitted annually thereafter or as may otherwise be required by the NIRB.

Term and Condition No.	**3.**
Category:	Climate and Meteorology – Mine Closure and Reclamation Plan

Responsible Parties:	The Proponent
Project Phase:	Temporary Closure/Care and Maintenance, Closure and Post-Closure
Objective:	To ensure mitigation, monitoring, and adaptive management measures are in place for the long-term stability, containment, and integrity of project components and the protection of environmental features.
Term or Condition:	The Proponent shall maintain a Mine Closure and Reclamation Plan that addresses the following areas/issues: a) adaptive management approaches for monitoring and mitigation measures to ensure long-term containment of the Tailings Storage Facility and Waste Rock Storage Areas; b) measures to maintain the integrity of the groundwater quality within and adjacent to the Project; and c) estimates of the approximate fill time for the mine pits.
Reporting Requirements:	The Plan should be submitted to the Nunavut Impact Review Board (NIRB) prior to the start of construction, with subsequent updates or revisions to the Plan submitted annually thereafter or as may otherwise be required by the NIRB.

9.4.3 Noise and Vibration

Term and Condition No.	**4.**
Category:	Noise and Vibration – Noise Abatement and Monitoring
Responsible Parties:	The Proponent, Government of Nunavut-Department of Environment, Environment and Climate Change Canada, Health Canada, Fisheries and Oceans Canada
Project Phase:	All Phases
Objective:	To minimize sensory disturbance to humans and wildlife
Term or Condition:	The Proponent shall, in consultation with the Government of Nunavut-Department of Environment, Environment and Climate Change Canada, and Health Canada, maintain a Noise Abatement Monitoring Plan that addresses the following areas/issues: a) measures to protect people, fish, and wildlife, from mine activity noise and vibration, including blasting, drilling, equipment, vehicles and aircraft; b) monitoring of noise at least once during each phase of the Project and following quarry blasts to demonstrate that noise levels remain within predicted levels and below applicable guidelines and standards; and c) adaptive management and monitoring measures to be implemented should monitoring identify an exceedance; and d) the procedure employees should follow if they have any noise complaints.

Reporting Requirements:	The Plan should be submitted to the Nunavut Impact Review Board (NIRB) prior to the start of construction, and reported on annually (or more frequently for monitoring results that may already be required under Project Certificate No. 003, such as Term and Condition #29).

9.4.4 Terrestrial Environment (Geology and Geochemistry)

Term and Condition No.	**5.**
Category:	Acid Rock Drainage and Metal Leaching Management
Responsible Parties:	The Proponent
Project Phase:	All Phases
Objective:	To mitigate potential impacts from acid rock drainage and metal leaching.
Term or Condition:	The Proponent shall maintain a stand-alone Acid Rock Drainage and Metal Leaching Management Plan (or equivalent as may be specified under the Type "A" Water Licence) that includes the following information: a) procedures for inspection and sampling/testing of waste rock, ore, tailings storage facilities, and quarry source material; b) thermal monitoring of waste rock and tailings storage facilities, including tailings management areas; c) seepage management and monitoring; d) a schedule for reporting of results and periodic updating of predictions for seepage water quality; e) planning for optimal cover conditions above-ground mine- and quarry-related material storage facilities; f) contingency measures that may be implemented if required, including measures to address the potential for leaching of arsenic from waste rock and ore stockpiles, and tailings under neutral pH conditions; g) plans for comparing monitoring results from receiving waters to model predictions; and h) identification of thresholds that will trigger specific management actions, including active water treatment, if trends analyses indicate water quality objectives may be exceeded.
Reporting Requirements:	The Plan should be submitted to the Nunavut Impact Review Board (NIRB) prior to the start of construction, with subsequent updates or revisions to the Plan submitted annually thereafter or as may otherwise be required by the NIRB.

9.4.5 Geological Features, Soils and Permafrost

Term and Condition No.	**6.**
Category:	Site-specific Geotechnical Studies, Permafrost Monitoring, Mapping and Thermal Analysis
Responsible Parties:	The Proponent
Project Phase:	Pre-construction
Objective:	To prevent potential impacts to sensitive land features and to ensure the integrity of site infrastructure is maintained through better characterization and monitoring of ground ice conditions and identification of sensitive terrain in the project area.
Term or Condition:	In consultation with applicable regulatory agencies and experts such as Natural Resources Canada, the Proponent shall undertake additional site-specific geotechnical investigations, permafrost monitoring, mapping and thermal analysis to: a) document permafrost conditions, including seasonal thaw, amount of ground ice; b) inform the detailed design of project infrastructure, including foundations, such as water management structures, mine site and haul roads, waste rock storage facilities, and tailings storage facilities, including dam structures associated with the Doris North Tailings Impoundment Area; c) inform updates/revisions to management plans related to waste rock, ore, and tailings storage facilities, including adaptive management strategies with clear thresholds for implementation to minimize the potential for impacts from these facilities; and d) ensure the integrity of project infrastructure and components, including tailings cover, is maintained post-closure.
Reporting Requirements:	Results from these studies and updated/revised plans should be submitted to the Nunavut Impact Review Board prior to the start of construction of applicable project components or facilities, with results or updates submitted annually thereafter as when necessary.

Term and Condition No.	**7.**
Category:	Erosion Management Plan
Responsible Parties:	The Proponent
Project Phase:	All Phases
Objective:	To ensure management of erosion from land disturbance.
Term or Condition:	The Proponent shall maintain an Erosion Management Plan designed to prevent or minimize erosion and its resulting effects from project-

	related land disturbance. The Plan shall include the following: a) identification of specific project activities that require erosion control; b) description of associated erosion issues; and c) specific measures to prevent or minimize erosion.
Reporting Requirements:	The Plan should be submitted to the Nunavut Impact Review Board (NIRB) prior to the start of construction, with subsequent updates or revisions to the Plan submitted annually thereafter or as may otherwise be required by the NIRB.

Term and Condition No.	**8.**
Category:	Mine Closure and Reclamation Plan – Progressive Reclamation and Restoration Reflecting Natural Aesthetics and Community Aesthetic Values
Responsible Parties:	The Proponent
Project Phase:	All Phases
Objective:	To ensure that disturbed land parcels no longer required for operations are progressively reclaimed with the natural aesthetics restored to the extent practicable.
Term or Condition:	As part of the Mine Closure and Reclamation Plan (or equivalent), the Proponent shall develop and implement a program to progressively reclaim disturbed areas within the project footprint, with an emphasis on restoring the natural aesthetics of the area through re-contouring to the extent practicable. Acceptability of reclamation efforts should confirmed through the Proponent's public engagement with local communities and discussion of local aesthetic values (e.g. acceptability of the topography and landscape of the project areas following progressive reclamation efforts). Progressive reclamation efforts should also demonstrate consideration for the feasibility of topsoil/organic matter salvage to promote revegetation.
Reporting Requirements:	The Plan should be submitted to the Nunavut Impact Review Board (NIRB) prior to the start of construction, with subsequent updates or revisions to the Plan submitted annually thereafter or as may otherwise be required by the NIRB.

9.4.6 Hydrogeology and Groundwater Quantity and Quality

Term and Condition No.	**9.**
Category:	Talik Distribution and Flow
Responsible Parties:	The Proponent
Project Phase:	All phases

Objective:	To provide information on potential project impacts on talik distribution and flow.
Term or Condition:	The Proponent shall implement a Thermal Monitoring Plan to identify potential changes in talik distribution and flow paths that may result from the development of project infrastructure, including underground workings, tailings storage facilities, and water impoundment areas.
Reporting Requirements:	The Plan should be submitted to the Nunavut Impact Review Board (NIRB) prior to the start of construction, with subsequent updates submitted annually thereafter or as may otherwise be required by the NIRB.

9.4.7 Surface Water Hydrology, Surface Water Quality and Sediment Quality

Term and Condition No.	**10.**
Category:	Surface Water Hydrology, Surface Water Quality, Sediment Quality and Freshwater Aquatic Environment – Aquatic Effects Monitoring Plan, and Water Management Plan
Responsible Parties:	The Proponent
Project Phase:	All Phases
Objective:	To mitigate potential impacts to surface waters.
Term or Condition:	Subject to potential receipt of more detailed direction from the Nunavut Water Board, the Proponent shall: a) monitor the effects of project activities and infrastructure on surface water quality conditions; b) ensure the monitoring data is sufficient to compare the impact predictions made for the Project with actual monitoring results; c) ensure that the sampling locations and frequency of monitoring is consistent with and reflects the requirements of the Aquatic Effects Monitoring Plan, and Water Management Plan; and d) on an annual basis, compare monitoring results with the impact assessment predictions in the FEIS and will identify any significant discrepancies between impact predictions and monitoring results.
Reporting Requirements:	The Plan should be submitted to the Nunavut Impact Review Board (NIRB) prior to the start of construction, with subsequent updates or revisions to the Plan submitted annually thereafter or as may otherwise be required by the NIRB.

Term and Condition No.	**11.**
Category:	Groundwater and Surface Water Quality, Sediment Quality and Freshwater Aquatic Environment – Aquatic Effects Monitoring Plan
Responsible Parties:	The Proponent, Nunavut Water Board, Environment and Climate Change Canada, and Fisheries and Oceans Canada
Project Phase:	All Phases
Objective:	To mitigate potential impacts to groundwater, surface waters and freshwater aquatic environment.
Term or Condition:	The Proponent shall, reflecting any direction from responsible authorities, maintain an Aquatic Effects Monitoring Program (AEMP) designed to appropriately characterize the receiving environment and ensure that adequate data is available to assess impact predictions made for the Project and prevent adverse impacts from occurring. The AEMP should include measures to: a) determine the short and long-term effects in the aquatic environment resulting from the Project; b) evaluate the accuracy of Project effect predictions; c) assess the effectiveness of mitigation and management measures on Project effects; d) identify additional mitigation measures to avert or reduce environmental effects due to Project activities; e) comply with *Metal Mining Effluent Regulations* requirements, should an Environmental Effects Monitoring program be triggered; f) reflect site-specific water quality conditions; g) include details comparing the watershed features from the Aimaokatalok, Windy, and Doris watersheds to the reference watersheds (Reference A, Reference B, Reference C and Reference D lakes and streams); and h) evaluate the mixing and non-mixing portion of the pit.
Reporting Requirements:	The Plan should be submitted to the Nunavut Impact Review Board (NIRB) prior to the start of construction, with subsequent updates or revisions to the Plan submitted annually thereafter or as may otherwise be required by the NIRB.

9.4.8 Freshwater Aquatic Environment

Term and Condition No.	**12.**
Category:	Freshwater Aquatic Environment – Setbacks
Responsible Parties:	The Proponent
Project Phase:	All Phases

Objective:	To mitigate impacts of runoff/sedimentation from project quarries and borrow pits into freshwater aquatic habitat.
Term or Condition:	Unless otherwise authorized, the Proponent shall maintain an appropriate setback distance between project quarries and borrow pits from fish-bearing or permanent waterbodies as required to prevent acid rock drainage or metal leaching into such waterbodies and to mitigate the potential for impacts from runoff/sedimentation associated with project quarries and borrow pits.
Reporting Requirements:	The Proponent shall provide information regarding quarry setback distances maintained and/or mitigation measures implemented in fulfillment of this Term and Condition in the Proponent's annual report to the Nunavut Impact Review Board.

Term and Condition No.	**13.**
Category:	Freshwater Aquatic Environment – Watercourses
Responsible Parties:	The Proponent, Fisheries and Oceans Canada
Project Phase:	All Phases
Objective:	To prevent blockages or restrictions to fish passages.
Term or Condition:	The Proponent shall ensure that all project infrastructure in watercourses are designed and constructed in such a manner that they do not unduly prevent or limit the movement of water or fish species in fish bearing streams and rivers, unless otherwise authorized by Fisheries and Oceans Canada.
Reporting Requirements:	The Proponent shall report on how it has maintained and/or implemented mitigation measures in fulfillment of this Term and Condition in the Proponent's annual report to the Nunavut Impact Review Board.

Term and Condition No.	**14.**
Category:	Freshwater Aquatic Environment – Blasting
Responsible Parties:	The Proponent, Fisheries and Oceans Canada
Project Phase:	All Phases
Objective:	To mitigate impacts of explosives use on fish and fish habitat.
Term or Condition:	The Proponent shall engage with Fisheries and Oceans Canada to develop project specific thresholds, mitigation and monitoring for any blasting activities that would exceed the requirements of Fisheries and Oceans Canada's *Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters*.
Reporting Requirements:	If project-specific thresholds, mitigation and monitoring requirements are developed, the Proponent shall identify these requirements in the annual report provided to the Nunavut Impact Review Board.

Term and Condition No.	**15.**
Category:	Freshwater Aquatic Environment – Winter Ice Road
Responsible Parties:	The Proponent
Project Phase:	All Phases
Objective:	To mitigate impacts to fish and fish habitat.
Term or Condition:	The Proponent shall implement all applicable Fisheries and Oceans Canada best management practices to avoid and mitigate serious harm to fish as a result of the construction, operations, and decommissioning of winter ice roads, and from under ice water withdrawals. This includes adequately screening the water intake pipes to prevent impingement and entrainment of fish.
Reporting Requirements:	Information regarding best management practices and/or mitigation measures implemented by the Proponent in fulfillment of this Term and Condition shall be provided in the Proponent's annual report to the Nunavut Impact Review Board.

Term and Condition No.	**16.**
Category:	Freshwater Aquatic Environment – Water Crossings
Responsible Parties:	The Proponent
Project Phase:	All Phases
Objective:	To mitigate impacts to fish and fish habitat.
Term or Condition:	The Proponent shall implement all applicable Fisheries and Oceans Canada best management practices to avoid and mitigate serious harm to fish as a result of water crossing construction, operations, and decommissioning for all fish-bearing water crossings.
Reporting Requirements:	Information regarding best management practices and/or mitigation measures implemented by the Proponent in fulfillment of this Term and Condition shall be provided in the Proponent's annual report to the Nunavut Impact Review Board.

9.4.9 Vegetation

Term and Condition No.	**17.**
Category:	Vegetation – invasive and rare plant species
Responsible Parties:	The Proponent, Government of Nunavut
Project Phase:	All Phases
Objective:	To prevent the introduction of invasive plant species and protect rare plant species.
Term or Condition:	The Proponent shall maintain a section in the Wildlife Mitigation and Monitoring Plan (WMMP) on invasive plant species and rare plant species with details on the following:

	a) mitigation to prevent the introduction of invasive plant species, for example, via inspection of vehicles and equipment brought to site; b) protocols for monitoring for invasive plant species, with reference to geographic scope and frequency, and commitment to monitor through post-closure; c) measures to ensure that any introductions of non-indigenous plant species are promptly reported to the Government of Nunavut – Department of Environment; d) mitigation to prevent the successful establishment of invasive species that may be introduced to the project area as a result of project activities. e) summary of loss of potential rare plan habitat when construction occurs in new areas
Reporting Requirements:	A description of monitoring and mitigation undertaken and a summary of related results related to introduction of invasive plan and protection of rare plants shall be provided in the Proponent's annual report to the Nunavut Impact Review Board.

Term and Condition No.	**18.**
Category:	Vegetation - revegetation
Responsible Parties:	The Proponent
Project Phase:	All Phases
Objective:	To encourage re-establishment of native plant species in disturbed areas.
Term or Condition:	The Proponent shall ensure that the progressive reclamation efforts outlined in its Mine Closure and Reclamation Plan or equivalent encourage recolonization by native plant species. These efforts are expected to be informed by revegetation trials in the Project area, and must include monitoring protocols over sufficient timeframes to measure success and ensure invasive plant species have not established.
Reporting Requirements:	The extent of progressive reclamation activities undertaken and measures of their success shall be summarized within the Proponent's annual reports submitted to the NIRB.

9.4.10 Terrestrial Wildlife and Wildlife Habitat

Term and Condition No.	**19.**
Category:	Wildlife and Wildlife Habitat – Wildlife Mitigation and Monitoring Plan

Responsible Parties:	The Proponent
Project Phase:	All Phases
Objective:	To ensure a holistic and comprehensive approach to mitigate, monitor, and adaptively manage potential impacts to wildlife.
Term or Condition:	The Proponent shall maintain either a Project-specific Wildlife Mitigation and Monitoring Plan (WMMP) or include the Project-specific details in a belt-wide plan (integrated with the similar plans required in Project Certificate No. 003 for the Doris North Gold Mine Project). The WMMP must include detailed monitoring, mitigation, and adaptive management measures for wildlife (including identification of any enhanced mitigation associated with Species At Risk), with consideration for each Project activity predicted to affect wildlife, with specific triggers for mitigation and adaptive management intervention. Other wildlife-specific management plans required by the Project Certificate may also be incorporated into the WMMP as appropriate, provided they are clearly identified within the document. The WMMP should highlight the Proponent's efforts to align its Project-specific wildlife monitoring with broader regional initiatives for wildlife monitoring and addressing cumulative effects. The Proponent is expected to develop an audit process with relevant parties to identify updates to the WMMP that may be required, particularly to address significant changes in Project development plans, monitoring results indicating biologically-meaningful changes, significant updates to the understanding of best management practices, Inuit Qaujimaningit or Traditional Knowledge which is shared with the Proponent, changes in climatic conditions that might subject wildlife to unexpected impacts, or as otherwise necessary.
Reporting Requirement	The Proponent shall submit a revised Plan to the Nunavut Impact Review Board (NIRB) within one (1) year of issuance of the Project Certificate. The Proponent shall provide summaries of its implementation in respect to the requirements of the Plan within its annual reporting to the NIRB, with required updates identified through its audit process highlighted.

Term and Condition No.	**20.**
Category:	Wildlife and Wildlife Habitat – Road Traffic Management
Responsible Parties:	The Proponent
Project Phase:	All Phases
Objective:	To minimize impacts to terrestrial wildlife from road traffic.
Term or Condition:	The Proponent shall maintain a Road Management Plan which includes: a) maintenance of traffic logs and traffic counters along the all-weather road between the Doris-Madrid mine sites and Madrid-

	Boston mine sites. Where traffic levels exceed levels predicted for the Project, the Proponent shall develop and implement appropriate enhancements to its wildlife protection measures; b) information regarding the road design, safety barriers, berms and features designed to ensure safe wildlife movement; c) description of safety protocols and enforcement by the Proponent, including restrictions imposed during periods of low visibility, and training provided to road users; and d) program to monitor snow bank heights along Project roads to ensure they do not pose a barrier to movement of wildlife or other land users.
Reporting Requirements:	The Plan shall be provided to the Nunavut Impact Review Board (NIRB) prior to the commencement of construction. An annual summary of the monthly maximum, minimum, and average traffic levels shall be provided to the NIRB in the Proponent's annual report, with an analysis of the effectiveness of mitigation for adverse impacts to wildlife from road operations.

Term and Condition No.	**21.**
Category:	Wildlife and Wildlife Habitat – Wildlife Mitigation Measures
Responsible Parties:	The Proponent, the Government of Nunavut
Project Phase:	All Phases
Objective:	To ensure that specific criteria and procedures are developed should wildlife be deemed project-tolerant.
Term or Condition:	In consultation with the Government of Nunavut and other relevant authorities, the Proponent shall include criteria and procedures within its Wildlife Mitigation and Monitoring Plan (WMMP) governing the deterrence of wildlife from blast zones and the relaxation of mitigation measures for animals deemed Project-tolerant.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this Term and Condition to the Nunavut Impact Review Board (NIRB) through the Proponent's annual monitoring report.

Term and Condition No.	**22.**
Category:	Wildlife and Wildlife Habitat – Caribou and Muskox Mitigation Measures
Responsible Parties:	The Proponent, the Government of Nunavut
Project Phase:	All Phases
Objective:	To mitigate potential impacts to caribou and muskox from project activities.

Term or Condition:	In collaboration with the Government of Nunavut, the Proponent shall specify within its Wildlife Mitigation and Monitoring Plan specific mitigation measures, trigger distances, and group size thresholds for the protection of caribou and muskox in proximity to project activities (e.g., blasting, heavy truck traffic, and aircraft).
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this Term and Condition to the Nunavut Impact Review Board (NIRB) through the Proponent's annual monitoring report.

Term and Condition No.	**23.**
Category:	Wildlife and Wildlife Habitat – Wildlife Monitoring and Adaptive Management Measures
Responsible Parties:	The Proponent
Project Phase:	All Phases
Objective:	To ensure that all direct wildlife mortalities are reported and considered in the development of adaptive management protocols.
Term or Condition:	The Proponent shall file an incident report with the local wildlife conservation office for all direct wildlife mortalities that occur in association with the Project. Incident reports should include sufficient detail to demonstrate how monitoring and mitigation measures failed to prevent the mortality, as well as information pertaining to what measures would be put in place to prevent the incident from reoccurring.
Reporting Requirements:	A summary regarding incidents reported in fulfillment of this Term and Condition shall be included in the Proponent's annual report to the Nunavut Impact Review Board.

Term and Condition No.	**24.**
Category:	Wildlife and Wildlife Habitat – Wildlife Mitigation and Monitoring Measures
Responsible Parties:	The Proponent
Project Phase:	All Phases
Objective:	To mitigate potential impacts to wildlife through interaction with water attenuation ponds and/or tailings storage areas.
Term or Condition:	The Proponent shall implement measures to prevent the use of water attenuation ponds and tailings storage areas by wildlife, including waterfowl, other migratory birds, and caribou, with sufficient monitoring to assess whether these measures are effective or whether further deterrents may be required.
Reporting Requirements:	The Proponent shall provide a summary discussion of its implementation of this Term and Condition to the Nunavut Impact

	Review Board (NIRB) through the Proponent's annual monitoring report.

Term and Condition No.	**25.**
Category:	Wildlife and Wildlife Habitat – Transmission Lines
Responsible Parties:	The Proponent
Project Phase:	Pre-construction
Objective:	To ensure wildlife movement and use of project areas is not adversely affected by transmission lines.
Term or Condition:	The Proponent shall conduct an assessment of the potential for its planned transmission lines to impact the movement and use of project areas by caribou, birds and other wildlife species, as well as other land users. The Proponent will demonstrate how its assessment has informed the selection of a final design for this infrastructure, its siting, operation and decommissioning, and any associated updates to its Wildlife Mitigation and Monitoring Plan to evaluate the effectiveness of planned mitigation.
Reporting Requirements:	The Proponent shall provide the Nunavut Impact Review Board with the outcomes of its assessment and associated updates to its Plan in support of the implementation of this Term and Condition at least 90 days prior to construction of transmission lines for the Project.

9.4.11 Birds and Bird Habitat

Term and Condition No.	**26.**
Category:	Birds and Bird Habitat – Tailings Impoundment Area
Responsible Parties:	The Proponent, Environment and Climate Change Canada, Inuit Environmental Advisory Committee
Project Phase:	All Phases
Objective:	To mitigate potential impacts to birds from the Tailings Impoundment Area and contact water ponds.
Term or Condition:	The Proponent shall monitor usage of contact water ponds by waterbirds and shorebirds, and shall conduct a baseline survey for waterbirds and shorebirds at the Tailings Impoundment Area (TIA) to characterize the bird community and use of the TIA. Survey methodology shall be determined in consultation with Environment and Climate Change Canada (ECCC). If surveys indicate that birds are using the TIA or other contact water ponds, the Proponent shall conduct a toxicological risk assessment in consultation with ECCC; and if that risk assessment indicates that there is a reasonable risk to birds from the TIA, the Proponent shall monitor for ongoing bird usage of the TIA and shall engage with the

	Inuit Environmental Advisory Committee and ECCC to establish appropriate methods for deterrence of waterbirds.
Reporting Requirements:	A summary of the results of baseline surveys, risk assessment, engagement with the Inuit Environmental Advisory Committee (IEAC) and Environment and Climate Change Canada (ECCC), and follow-up monitoring shall be provided in the Proponent's annual report submitted to the NIRB (or more frequently for monitoring results that may already be required under Project Certificate No. 003, such as Term and Condition #26).

Term and Condition No.	**27.**
Category:	Birds and Bird Habitat – Raptor Mitigation Measures
Responsible Parties:	The Proponent
Project Phase:	Construction
Objective:	To mitigate potential impacts to raptors from project construction.
Term or Condition:	Should it be necessary to undertake Project-related construction within the raptor-breeding period, the Proponent shall conduct a pre-construction survey of potential cliff-nesting habitat within two (2) kilometres (km) of the construction area to ensure all nesting sites have been accounted for in advance of construction commencing. If an active cliff nest is located within one (1) km of the planned construction areas, construction activities shall not commence until a nest-site protection plan has been developed in consultation with the Government of Nunavut – Department of Environment (GN-DoE) to address: a) inclusion of appropriate setbacks and buffers, with exceptions potentially requiring formal authorization from the Government of Nunavut; b) measures for instances where raptors build a nest on project infrastructure such as a service building and cessation of construction activities would not apply; and c) monitoring and mitigation measures for all potential nest sites within one (1) km of project activities.
Reporting Requirements:	The Proponent shall report on its implementation of this Term and Condition and provide a summary of the results of pre-construction raptor nest surveys undertaken and nest-specific management plans developed within the Proponent's annual report submitted to the Nunavut Impact Review Board.

Term and Condition No.	**28.**
Category:	Birds and Bird Habitat – Site-wide and wind-turbine monitoring
Responsible Parties:	The Proponent
Project Phase:	Operations
Objective:	To prevent adverse impacts to birds from project activities and infrastructure including wind turbines.
Term or Condition:	The Proponent shall maintain in either a separate Migratory Birds Protection Plan or with these contents clearly identified, as an addition to the Wildlife Mitigation and Monitoring Plan, a plan which: a) specifies measures designed for the protection of birds from operation of wind turbines, with additional preventative measures to be implemented during periods of poor visibility within peak bird migration periods; b) includes protocols for bird mortality monitoring within the general area of the wind turbines, and for contribution of data to regional bird research / monitoring programs; and c) includes adaptive management measures - including those that may be in place at other sites in northern Canada - that may be implemented should mortalities be greater than expected.
Reporting Requirements:	The Plan described above shall be provided to the Nunavut Impact Review Board (NIRB) prior to installation of wind turbines for the Project, with a summary of monitoring results included in the Proponent's annual report to the NIRB.

9.4.12 Marine Environment including Marine Wildlife and Habitat

Term and Condition No.	**29.**
Category:	Marine Environment - Shipping Management Plan
Responsible Parties:	Proponent
Project Phase:	All Phases
Objective:	To ensure that the general public can access information on how potential impacts from project-related shipping activities will be mitigated.
Term or Condition:	The Proponent shall maintain a standalone Shipping Management Plan which provides an overview of: a) applicable legislation, regulations, guidelines, and commitments designed to address potential adverse ecosystemic effects of shipping activities to the marine

	environment; b) non-confidential contracting provisions imposed by the Proponent on contractors used for project-related marine shipping that are designed to address potential adverse ecosystemic effects of shipping activities to the marine environment; c) procedures for providing advance notice of Project-related shipping activities to potentially-affected communities; and d) updates to Project shipping activities implemented to address concerns identified through the Proponent's public engagement efforts.
Reporting Requirements:	The Plan should be submitted to the Nunavut Impact Review Board prior to the start of shipping activities, with subsequent updates or revisions to the Plan submitted annually thereafter.

Term and Condition No.	**30.**
Category:	Marine Environment - Shipping Contractors
Responsible Parties:	The Proponent
Project Phase:	All Phases
Objective:	To ensure that marine shipping contractors meet all applicable regulatory requirements.
Term or Condition:	The Proponent shall contract only Transport Canada certified vessels to carry cargo or fuel for the Project, and shall ensure shippers are informed of the Proponent's applicable management plans and commitments designed to address potential adverse ecosystemic effects of shipping activities to the marine environment.
Reporting Requirements:	The Proponent shall demonstrate its compliance with this Term and Condition within its Plan and associated annual reporting to the Nunavut Impact Review Board.

Term and Condition No.	**31.**
Category:	Marine Environment – Marine Wildlife Mitigation
Responsible Parties:	Proponent, Fisheries and Oceans Canada
Project Phase:	All Phases
Objective:	To ensure that marine shipping activities avoid adversely impacting seabirds and marine mammals.
Term or Condition:	The Proponent shall provide its contracted vessel operators with maps and descriptions of key marine bird habitats as well as information on sensitive marine mammal habitats in the Northwest Passage, updated annually to include newly published information as it becomes

	available. The guidance package shall specify that, subject to vessel safety requirements, key wildlife habitats shall be avoided by a distance of at least 500 metres, and wildlife are to be given the right of way. The Proponent shall work with Fisheries and Oceans Canada to ensure that marine mammal mitigation measures common for all vessels in the Canadian Arctic are applied to project-contracted vessels as appropriate.
Reporting Requirements:	The Proponent shall demonstrate its compliance with this Term and Condition within its Plan and shall comment on the effectiveness of these measures within its associated annual reporting to the Nunavut Impact Review Board.

Term and Condition No.	**32.**
Category:	Marine Shipping – Vessel strikes
Responsible Parties:	Proponent
Project Phase:	All Phases
Objective:	To ensure that marine shipping activities avoid seabirds and marine mammals.
Term or Condition:	The Proponent shall ensure that shippers retained for project related shipping immediately report any accidental contact by project vessels with marine mammals or seabird colonies to Fisheries and Oceans Canada and Environment and Climate Change Canada respectively. The Proponent shall also ensure that the circumstances of the incident are investigated to determine if additional mitigative measures are required.
Reporting Requirements:	A summary of any vessel strikes, and any adaptive management steps undertaken, shall be included in the Proponent's annual report to the Nunavut Impact Review Board.

Term and Condition No.	**33.**
Category:	Marine Environment - Noise Monitoring
Responsible Parties:	The Proponent
Project Phase:	All Phases
Objective:	To ensure that project activities and project-related marine shipping do not cause unacceptable noise exposure to marine wildlife.
Term or Condition:	The Proponent shall develop a monitoring protocol for assessing disturbance to marine wildlife resulting from project-related underwater noise in Roberts Bay, and to facilitate assessment of the potential short term, long term, and cumulative effects of project-related noise (including vessel noise in Roberts Bay) on marine wildlife. The Proponent is expected to work with Fisheries and

	Oceans Canada to determine appropriate indicators and thresholds that can be used to determine if negative impacts on marine wildlife are occurring, and adaptive management measures to mitigate adverse impacts of project-related noise.
Reporting Requirements:	The monitoring protocol should be incorproated into an appropriate management plan and shall be provided to the Nunavut Impact Review Board (NIRB) prior to commencement of construction and project-related shipping, with summary discussion of associated implementation included within annual reporting to the NIRB.

9.5. SOCIO-ECONOMIC TERMS AND CONDITIONS

9.5.1 Economic Development and Business Opportunities

Term and Condition No.	**34.**
Category:	Economic Development and Opportunities – Socio-Economic Monitoring
Responsible Parties:	The Proponent, the Kitikmeot Inuit Association, Government of Nunavut, Indigenous and Northern Affairs Canada, and Kitikmeot communities
Project Phase:	All Phases
Objective:	To assess the socio-economic impact of the Project on affected communities of Nunavut.
Term or Condition:	The Proponent shall continue to be an active member in the Hope Bay Socio-Economic Working Group. Invited members of this Working Group shall include the Proponent, the Government of Nunavut, Indigenous and Northern Affairs Canada, and the Kitikmeot Inuit Association. Working Group members may invite new participants on an as needed basis. The central focus of the Hope Bay Socio-Economic Working Group shall be on collaborating to ensure that the Hope Bay Socio-Economic Monitoring Plan provides for appropriate Project-specific socio-economic effects monitoring as required throughout the life of the Project. The Hope Bay Socio-Economic Monitoring Plan shall apply to the Project as described in the Final Environmental Impact Statement (FEIS) for the Project. The Proponent shall submit an updated Hope Bay Socio-Economic Monitoring Plan to the Hope Bay Socio-Economic Working Group for review within one (1) year of the issuance of a Project Certificate.
Reporting Requirements:	The Proponent shall, reflecting the input of the Hope Bay Socio-Economic Working Group, report annually to the Nunavut Impact Review Board (NIRB) on implementation of the Hope Bay Socio-Economic Monitoring Plan. The NIRB strongly suggests the use of a

	standardized reporting template to ensure consistent data collection and tracking of data trends in a comparable form to be shared upon request at the regional level and to minimize the duplication of efforts.
Related Terms and Conditions in PC No. 003 (as amended)	Terms and Conditions No. 28 and 40

Term and Condition No.	**35.**
Category:	Economic Development and Opportunities – Temporary or Final Closure
Responsible Parties:	The Proponent, Hope Bay Socio-Economic Working Group, and the Kitikmeot Socio-Economic Monitoring Committee
Project Phase:	Temporary Closure/Care and Maintenance, Closure and Post-Closure
Objective:	To prepare for, monitor and mitigate the potential socio-economic effects of temporary or permanent mine closure on the affected communities of Nunavut.
Term or Condition:	Within six (6) months following an unanticipated temporary or final closure, and at least two (2) years prior to the planned Final Closure of the Project, the Proponent shall, in collaboration with the Hope Bay Socio-Economic Working Group submit an updated Hope Bay Socio-Economic Monitoring Plan to the Kitikmeot Socio-Economic Monitoring Committee that will also include detail regarding specific measures that may mitigate the potential for negative effects as a result of the Project's temporary or permanent closure.
Reporting Requirements:	The Proponent shall submit the updated Hope Bay Socio-Economic Monitoring Plan to the Nunavut Impact Review Board (NIRB) at the same time as to the Kitikmeot Socio-Economic Monitoring Committee.
Related Terms and Conditions in PC No. 003 (as amended)	Terms and Conditions No. 41 and 42

Term and Condition No.	**36.**
Category:	Economic Development and Opportunities – Temporary or Final Closure
Responsible Parties:	The Proponent, Hope Bay Socio-Economic Working Group, and the Kitikmeot Socio-Economic Monitoring Committee
Project Phase:	Temporary Closure/Care and Maintenance, Closure and Post-Closure
Objective:	To prepare for, monitor and mitigate the potential socio-economic effects of temporary or permanent mine closure on the affected communities of Nunavut.
Term or Condition:	Within six (6) months following an unanticipated temporary or final closure, and at least two (2) years prior to the planned Final Closure of

	the Project (regardless of whether the Project has, at that time, already ceased operations, is being maintained in a temporarily closed phase or has already entered the final closure phase), the Proponent shall, submit an updated Human Resources Plan and Wellness Strategy for the Project that includes a Workforce Transition Strategy designed to mitigate the potential negative effects of Project closure on the affected communities of Nunavut.
Reporting Requirements:	The Proponent shall submit the updated plans to the Nunavut Impact Review Board (NIRB) in accordance with the timelines prescribed.
Related Terms and Conditions in PC No. 003 (as amended)	Terms and Conditions No. 43 and 44

Term and Condition No.	**37.**
Category:	Economic Development and Business Opportunities – Impacts on Existing Customers
Responsible Parties:	The Proponent
Project Phase:	All Phases
Objective:	To monitor the extent to which businesses shift their businesses to become dependent on exclusively providing goods and services to the Proponent, resulting in existing customers losing access to necessary goods and services.
Term or Condition:	The Proponent shall track and report on project procurement of local and regional businesses and competition for access to local and regional businesses by existing customers. Specific indicator(s) to assess the potential for these effects shall be chosen and developed as agreed to by the Hope Bay Socio-Economic Working Group (SEWG). Activities related to monitoring and development of mitigation, including use and disclosure of information and data, will adhere to the SEWG Terms of Reference.
Reporting Requirements:	Summaries of Socio-Economic Working Group activities, list of indicators, and results of indicator monitoring shall be provided in the Proponent's Socio Economic Monitoring Program reports as part of the Proponent's annual reports to the Nunavut Impact Review Board.

9.5.2 Employment

Term and Condition No.	**38.**
Category:	Employment – Staff Schedule
Responsible Parties:	The Proponent
Project Phase:	All Phases
Objective:	To produce accurate labour market information regarding available

	Project employment and skill requirements for the Project to support economic and employment forecasting.
Term or Condition:	The Proponent is strongly encouraged to submit staff schedule forecasts that, at a minimum, include the following: a) Title of positions required by department and division; b) Quantity of positions available by project phase and year; c) Transferable skills, both certified and uncertified which may be required for, or gained during, employment within each position; d) The National Occupational Classification code for each individual position.
Reporting Requirements:	The staff schedule forecasts should be provided on an annual basis to the Kitikmeot Socio-Economic Monitoring Committee, with a summary of forecasting provided in the annual reports to the Nunavut Impact Review Board.

Term and Condition No.	**39.**
Category:	Socio-Economic Impacts - Employment
Responsible Parties:	The Proponent, Hope Bay Socio-Economic Working Group
Project Phase:	All phases
Objective:	To monitor the socio-economic effects of the Project, including employment, on affected communities of Nunavut and compare these effects to the impact predictions made for the Project.
Term or Condition:	The Proponent should collaborate with the Hope Bay Socio-Economic Working Group and the Inuit Impact Benefit Agreement Implementation Committee to monitor efforts, by stakeholders, including the Proponent, to meet mutually agreed annual Inuit employment targets for the Project.
Reporting Requirements:	Summary information addressing the Proponent's fulfillment of this Term and Condition shall be included in the Proponent's annual report to the Nunavut Impact Review Board.
Related Terms and Conditions in PC No. 003 (as amended)	Terms and Conditions No. 28 and 40

9.5.3 Education and Training

Term and Condition No.	**40.**
Category:	Education and Training– Registration of Trades Workers
Responsible Parties:	The Proponent, Government of Nunavut
Project Phase:	All Phases
Objective:	To ensure that the Government of Nunavut has accurate information to

	assist in its role as overseer of the apprenticeship program in Nunavut and in providing access to training initiatives and programs.
Term or Condition:	The Proponent is encouraged to identify and register all trades occupations, journeypersons, and apprentices working with the Project and make this information available to the Government of Nunavut to assist in delivery of training initiatives and programs.
Reporting Requirements:	Summary information addressing the Proponent's fulfillment of this Term and Condition shall be included in the Proponent's annual report to the Nunavut Impact Review Board.

Term and Condition No.	**41.**
Category:	Education and Training—Training Opportunities and Transferrable Skills
Responsible Parties:	The Proponent, Government of Nunavut, Training Organizations
Project Phase:	All Phases
Objective:	To ensure that the local, regional, and territorial training opportunities associated with the Project maximize opportunities for the regional workforce to obtain transferable skills and certifications.
Term or Condition:	The Proponent is encouraged to work with training organizations and/or government departments offering mine-related or other training to ensure that Project-specific training programs can yield additional opportunities for residents and employees to gain meaningful and transferable skills and certifications. The Proponent shall maintain an easily referenced listing of formal certificates and licences that may be acquired via on-site training or training during project employment. The listing should indicate which of these certifications and licences would be transferable to a similar job site within Nunavut.
Reporting Requirements:	The Proponent should summarize the results of these efforts in the annual Hope Bay socio-economic monitoring reports submitted to the Nunavut Impact Review Board and shared with the wider Kitikmeot Socio-Economic Monitoring Committee throughout the life of the Project.

9.5.4 Population Demographics

Term and Condition No.	**42.**
Category:	Population Demographics – Monitoring Demographic Changes
Responsible Parties:	The Proponent and the Kitikmeot Socio-Economic Monitoring Committee
Project Phase:	Pre-Construction, Construction, Operation, Temporary Closure/Care and Maintenance, Closure, and Post-Closure Monitoring
Objective:	Monitoring demographic changes affecting the Kitikmeot communities and the territory as a whole is important to understand and evaluate the

	Proponent's predictions with regards to population demographics and whether any trends are identified which may be correlated with the Project.
Term or Condition:	Provided the collection and sharing of such information is consistent with and not limited by any Inuit Impact and Benefit Agreement with the Kitikmeot Inuit Association and that employees are willing to voluntarily provide this information, the Proponent should collect and provide project-specific data concerning employee community of residence and number of employees that relocated from the year prior (where available, to and from, for Cambridge Bay, Kugluktuk, Gjoa Haven, Taloyoak, Kugaaruk). The details of this process will be captured in the terms of reference for the project specific Phase 2 Hope Bay Belt Socio-Economic Monitoring Committee.
Reporting Requirements:	Summaries of this information should be included in the annual Phase 2 Hope Bay Belt socio-economic monitoring reports submitted to the Nunavut Impact Review Board and shared with the wider Kitikmeot Socio-Economic Monitoring Committee throughout the life of the Project.

9.5.5 Traditional Activity and Knowledge

Term and Condition No.	**43.**
Category:	Traditional Activity and Knowledge
Responsible Parties:	The Proponent
Project Phase:	All Phases
Objective:	To demonstrate the incorporation of Inuit Qaujimaningit through monitoring plans developed for the Project.
Term or Condition:	The Proponent should ensure that the development of all project monitoring plans, associated reporting and updates are undertaken with active engagement of Kitikmeot communities, land users, and harvesters. The Proponent should work with the Kitikmeot Inuit Association, the local Hunters and Trappers Organizations and the Kitikmeot Socio-Economic Monitoring Committee to report on the collection and integration of Inuit Qaujimaningit through its monitoring programs for the Project.
Reporting Requirements:	To the extent that the sharing of such information is consistent with, and not limited by, confidentiality or other agreements, summaries addressing the Proponent's fulfillment of this Term and Condition should be included in the Proponent's annual report to the Nunavut Impact Review Board.

9.5.6 Non-traditional Land Use and Resource Use

Term and Condition No.	**44.**
Category:	Non-Traditional Activity and Resource Use
Responsible Parties:	The Proponent
Project Phase:	All Phases
Objective:	To assess and monitor potential project effects on non-traditional activity and knowledge.
Term or Condition:	The Proponent is strongly encouraged to consult with outfitting and guiding businesses that operate in or travel through the regional study area regarding whether project infrastructure or activities is adversely affecting their use and experience of the surrounding environment.
Reporting Requirements:	Summaries of consultation and monitoring undertaken by the Propnent in fulfullment of this Term and Condition should be provided within the Proponent's annual report to the Nunavut Impact Review Board.

9.5.7 Heritage Resources

Term and Condition No.	**45.**
Category:	Heritage Resources – Archaeological and Palaeontological Resources Surveys
Responsible Parties:	The Proponent
Project Phase:	Pre-construction, Construction, Operations
Objective:	To prevent adverse impacts to heritage resources and provide parties with updated information on the status of heritage resources in the project footprint.
Term or Condition:	The Proponent shall conduct archaeological and palaeontological surveys prior to land disturbance related to the Project and report survey results to applicable parties, including the Government of Nunavut – Department of Culture and Heritage.
Reporting Requirements:	Evidence of meeting the requirements of this Term and Condition shall be submitted as part of the Proponent's annual reporting to the Nunavut Impact Review Board.

Term and Condition No.	**46.**
Category:	Heritage Resources – Archaeological and Palaeontological Discoveries
Responsible Parties:	The Proponent
Project Phase:	All Phases
Objective:	To ensure that any heritage resources encountered are reported to appropriate regulatory authorities.

Term or Condition:	The Proponent shall report any archaeological or palaeontological sites discovered during the construction, operation, and closure phases to the Government of Nunavut – Department of Culture and Heritage and the Kitikmeot Inuit Association. Upon discovering a heritage resources site, the Proponent shall: a) Take all reasonable precautions necessary to protect the site until further direction is received from the Government of Nunavut – Department of Culture and Heritage; and b) If it becomes necessary to disturb a heritage resources site, the Proponent shall consult with the Government of Nunavut – Department of Culture and Heritage, the Kitikmeot Inuit Association, and potential impacted communities to establish a site specific mitigation plan, and obtain all necessary authorizations.
Reporting Requirements:	Evidence of meeting the requirements of this Term and Condition shall be submitted as part of the Proponent's annual reporting to the Nunavut Impact Review Board.

9.5.8 Individual and Community Wellness

Term and Condition No.	**47.**
Category:	Individual and Community Wellness – Health and Wellness
Responsible Parties:	The Proponent, the Government of Nunavut
Project Phase:	Operations
Objective:	To promote employee health and well-being.
Term or Condition:	The Proponent shall a) provide workers access to sexual health information throughout the life of the Project; b) inform workers of the range of health and wellness services available on site throughout the life of the Project; and c) participate in discussions and dialogue with the Government of Nunavut Department of Health in connection with project activities, policies, or project-induced health issues that may affect health and social services facilities, programs and services.
Reporting Requirements:	Evidence of meeting the requirements of this Term and Condition, including outcomes from the Proponent's engagement with the Government of Nunavut regarding public health and social services issues of relevance to the Project and communities of the Kitikmeot Region shall be submitted as part of the Proponent's annual reporting to the Nunavut Impact Review Board.

Term and Condition No.	**48.**
Category:	Individual and Community Wellness – Cross-cultural awareness
Responsible Parties:	The Proponent
Project Phase:	Operations
Objective:	To support the elimination of cultural barriers and promote recognition for Inuit Qaujimaningit to establish a healthy workplace for all Project employees
Term or Condition:	The Proponent is encouraged to promote consideration for Inuit culture and Inuit Qaujimaningit through the establishment of cross-cultural training initiatives, for all Project employees and on-site sub-contractors. The Proponent should actively monitor the implementation of these initiatives throughout the life of the Project.
Reporting Requirements:	Evidence of meeting the requirements of this Term and Condition shall be submitted as part of the Proponent's annual reporting to the Nunavut Impact Review Board.

9.6. OTHER TERMS AND CONDITIONS

9.6.1 Community Consultation

Term and Condition No.	**49.**
Category:	Community Involvement Plan
Responsible Parties:	The Proponent
Project Phase:	All Phases
Objective:	To ensure appropriate stakeholders are included in ongoing consultation and engagement.
Term or Condition:	The Proponent shall maintain a current Community Involvement Plan which reflects relevant stakeholders with respect to the Project. a) Records of communication and engagement undertaken by the Proponent with stakeholders, including potentially impacted communities, are to be maintained throughout the life of the Project with outcomes reflected in this Plan.
Reporting Requirements:	The Proponent shall provide summaries of any significant community engagment undertaken and resultant updates to the Community Involvement Plan within its annual reports to the Nunavut Impact Review Board.

9.6.2 Human Health and Ecological Risk Assessment

Term and Condition No.	**50.**
Category:	Human Health and Ecological Risk Assessment – Assessment of Risks from Consumption of Berries near Project Area
Responsible Parties:	The Proponent
Project Phase:	Construction and Operation
Objective:	To minimize the potential risks from consumption of berries containing potential toxic metals.
Term or Condition:	The Proponent shall conduct soil sampling to determine metal levels of soils in areas with berry-producing plants near any of the potential development areas, prior to commencing operations.
Reporting Requirements:	A summary of the results of these additional studies shall be included in the Proponent's annual report to the Nunavut Impact Review Board.

Term and Condition No.	**51.**
Category:	Human Health and Ecological Risk Assessment – Assessment of Risks from Consumption of Fish from Marine/Freshwater Aquatic Environment
Responsible Parties:	The Proponent
Project Phase:	All Phases
Objective:	To minimize the potential risks from consumption of fish containing toxic metals including metalloids
Term or Condition:	The Proponent shall conduct additional studies prior to and during operations as part of its freshwater and marine aquatic effects analyses to ensure that toxic trace elements concentrations anticipated to increase in the aquatic and marine environments during operation (and potentially accumulating in fish tissue) do not exceed regulatory requirements. The results of these studies should inform the Proponent's assessment of potential risks from consumption of fish, using Health Canada's hazard quotients as a descriptive tool.
Reporting Requirements:	A summary of the results of these studies and associated assessment of potential risks to human health shall be included in the Proponent's annual reports to the Nunavut Impact Review Board.

9.6.3 Accidents and Malfunctions

Term and Condition No.	**52.**
Category:	Accidents and Malfunctions – Spills Response and Emergency Preparedness
Responsible Parties:	The Proponent, Transport Canada

Project Phase:	All Phases
Objective:	To ensure adequate spill response and emergency preparedness is in place to prevent fuel and chemical spills to the terrestrial and marine environment.
Term or Condition:	The Proponent shall ensure that areas used to store fuel or hazardous materials include sufficient secondary containment and that all oil handling facilities have the required Oil Pollution Emergency Plan (OPEP) in place. The OPEP or other emergency response plans applicable to fuel or hazardous material storage areas are expected to include, as a minimum, the following: a) information on the placement of spill prevention and response equipment as necessary to initiate rapid response during an emergency; b) an up to date listing of critical TMAC and government spill response contacts, and a list of authorised emergency response personnel; c) an up to date listing of emergency response training conducted by TMAC's emergency response personnel; d) easily accessible and up to date spill report forms; and e) a listing of community organizations that would be contacted to inform traditional land users of any spills or response actions implemented to ensure continued public safety. The Proponent shall also demonstrate that the provisions of the OPEP or other applicable emergency response plans associated with the fuel tank farm at Roberts Bay are coordinated with the individual shipboard OPEPs required for vessels servicing the Project, and that the Shipping Management Plan addresses how response procedures between ship and shore will be coordinated.
Reporting Requirements:	The Oil Pollution Emergency Response Plan (OPEP) and any other applicable emergency response plans should be provided to the Nunavut Impact Review Board (NIRB) prior to construction of the Project. Within its annual reporting to the NIRB, the Proponent shall include a discussion of any pollution incidents associated with the Project and identify any required plan updates.
Related Terms and Conditons in PC No. 003 (as amended)	Terms and Conditions No. 20 and 33

9.6.4 Effects of the Environment on the Project

Term and Condition No.	**53.**
Category:	Tailings Pipeline Monitoring – land-based infrastructure

Responsible Parties:	The Proponent
Project Phase:	All phases
Objective:	To prevent potential impacts to permafrost and sensitive land features, including the freshwater environment, by maintaining the integrity of the tailings pipeline infrastructure.
Term or Condition:	The Proponent shall implement a monitoring and mitigation program for the tailings pipelines that includes the following: a) regular inspections to assess the stability of the tailings pipeline and land within the footprint of this infrastructure; b) early warning system(s) to identify a pipeline breach; c) measures to respond to and mitigate any accidental spills of tailings from the pipeline; and d) adaptive management to address unanticipated changes to land within the footprint of the tailings pipeline to ensure that the integrity of this infrastructure is maintained for the life of the Project.
Reporting Requirements:	Details regarding the monitoring and mitigation program shall be submitted to the Nunavut Impact Review Board (NIRB) prior to the installation of tailings pipeline infrastructure, with subsequent updates on the implementation of the Program submitted annually thereafter or as may otherwise be required by the NIRB for the life of the Project.

9.6.5 Alternative Analysis

In considering this issue, the NIRB is not recommending any specific terms and conditions with respect to Alternative Analysis.

9.6.6 Cumulative Effects

Term and Condition No.	**54.**
Category:	Cumulative effects – activities in the Hope Bay Belt Property
Responsible Parties:	The Proponent
Project Phase:	All Phases
Objective:	To ensure all potential cumulative effects associated with ongoing exploration and possible future phases of development are adequately and fully assessed.
Term or Condition:	The Proponent shall provide detailed updates to the Board on the status of ongoing exploration programs and other related physical activities associated with the Hope Bay Belt Property.
Reporting Requirements:	Evidence of meeting the requirements of this Term and Condition should be submitted as part of the Proponent's annual reporting to the Nunavut Impact Review Board.

9.6.7 Transboundary Effects

In considering this issue, the NIRB is not recommending any specific terms and conditions with respect to Transboundary Effects.

9.6.8 Performance Bonding

In considering this issue, the NIRB is not recommending any specific terms and conditions with respect to Performance Bonding.

9.7. RECOMMENDATIONS FOR REGULATORY AGENCIES AND LANDOWNERS

In the course of the Board's review of the Project, Elders and Community Representatives from the Kitikmeot communities potentially affected by the Project shared not only their perspectives with respect to the Project, but also their views regarding the essential role of regulatory agencies and landowners (Nunavut Tunngavik Inc. and the Kitikmeot Inuit Association for Inuit-Owned Lands and Indigenous and Northern Affairs Canada for Crown lands) in determining how the Project should be regulated. Although referenced in the discussions of specific topics throughout this report, the Board wishes to provide specific recommendations to these parties in respect of four key areas.

As noted in Section 5.6.3, Natural Resources Canada (NRCan) and the NIRB have identified that there are currently gaps in terms of TMAC's groundwater modelling, management and monitoring. Specifically, it is unclear how TMAC plans to respond if groundwater is encountered during the development of the underground mine at the Boston site. The NIRB recognizes that addressing these issues is clearly within the jurisdiction of the Nunavut Water Board (NWB) and is more appropriately addressed during the subsequent water licensing process. While respecting the NWB's jurisdiction to determine the information required during water licensing, the NIRB recommends that the Proponent should be required to address these gaps by providing additional updated modelling, management and monitoring for the NWB's further consideration during water licensing. Specifically, the NIRB has identified the following gaps within TMAC's current groundwater monitoring plan that should subsequently be addressed by the Proponent during the regulatory phase:

- Collection of additional site-specific hydraulic data (e.g., from new monitoring wells) in key areas during the pre-development, construction and operations phases;
- Definition of vertical and horizontal groundwater flows in the project development areas;
- Delineation of monitoring plans for both vertical and horizontal groundwater; and
- Identification of adaptive management strategies that address what happens if conditions encountered at the project site are not as predicted in the FEIS.

Further, as discussed in Section 5.7.3, the NIRB has identified that there are gaps in TMAC's site water monitoring, management and monitoring with respect to how TMAC would manage contact water and discharges to the local aquatic resources and natural waters. The NIRB recognizes that addressing these issues is also clearly within the jurisdiction of the NWB and this issue is more appropriately addressed in-depth during the subsequent water licensing process than during project assessment. While respecting the NWB's jurisdiction to identify the

information required during water licensing, the NIRB has identified the following data gaps that should be addressed in detail within the more developed Site Water Monitoring and Management Plan discussed during the regulatory phase:

- Information about how TMAC proposes to minimize the amount of water that contacts mine ore and wastes;
- Plans for how TMAB proposes to manage all contact water and discharges to protect local aquatic resources;
- Information about TMAC's implementation of water conservation and recycling to maximize water reuse and minimize the use of natural waters; and
- TMAC's plans for monitoring to demonstrate that contact water (runoff and shallow groundwater) from the ore storage and waste rock storage areas is captured and managed, as per the Waste Rock Ore and Mine Backfill Management Plan and Water and Ore Waste Rock Management Plan for Boston Site.

As noted in Section 5.9.3, the NIRB has also recommended that additional fish sampling be considered as part of TMAC's aquatic effects analyses. In the Board's view, this additional information is required to properly characterize the receiving environment and ensure that adequate data is available to assess impact predictions made in the FEIS and to prevent adverse impacts from occurring. The NIRB recognizes that addressing these issues is clearly within the jurisdiction of Environment and Climate Change Canada (under the *Metal Mining and Effluent Regulations*) and Fisheries and Oceans Canada (under the *Fisheries Act*) during the subsequent permitting process. Reflecting the jurisdiction of both agencies, the NIRB recommends that the Proponent should be required to address these issues by providing additional monitoring information to Environment and Climate Change Canada and DFO during the permitting phase. Specifically, the NIRB identified the following additional detail that should be included within the Aquatic Effects Monitoring Program (AEMP) during the regulatory phase:

- How the AEMP is designed to appropriately characterize the receiving environment and is maintained so that adequate data is available to assess impact predictions in the FEIS and to prevent adverse impacts from occurring; and
- Additional fish tissue sampling that will be included as part of TMAC's aquatic effects analyses in lakes identified to be subject to the *Metal Mining Effluent Regulations*, and in reference lakes, prior to the commencement of the Project to ensure that sufficient baseline information is available so that project monitoring can be compared to baseline and effects predictions to enable early detection of impacts on fish resulting from the Project.

Further, the Board expects that when these issues are addressed during DFO's permitting process, a summary of the outcomes of these discussions will be shared publically.

Finally, as discussed in Section 7.1, the Board has observed in past reviews that when communities do not have ready access to information regarding the actions taken by regulators to exercise regulatory oversight of the Project, they may question whether Proponents are truly being held accountable for meeting the requirements of their project approvals, or whether approvals are simply "rubber stamps". While the Board has no doubt that the proponents and regulators in Nunavut's regulatory system are committed to ensuring compliance with project

development approvals, and to implementing the commitments they provide during project assessment and approval processes, without access to follow up information it is difficult for the public to gauge the extent to which the promises and commitments of all parties are actually being fulfilled. Consequently, the Board recommends that regulatory agencies with responsibility for the Project consider conducting follow-up meetings with community members during subsequent permitting processes, and also consider making community visits a priority to communicate the results of regulatory inspections, monitoring activities, and enforcement actions.

Appendix A: Record of Proceedings

Project Proponent:	TMAC Resources Inc. 95 Wellington Street West Suite 101, P.O Box 44 Toronto, ON M5J 2N7
Date Project Description Received:	December 12, 2011
Project Proposal referral received from the Kitikmeot Inuit Association:	January 12, 2012
Dates of Hearings:	Day 1: May 8, 2018, Cambridge Bay, NU Day 2: May 9, 2018, Cambridge Bay, NU Day 3: May 10, 2018, Cambridge Bay, NU Day 4: May 11, 2018, Cambridge Bay, NU Day 5: May 12, 2018, Cambridge Bay NU
Board Members Present:	Allen Maghagak, Chairperson Philip (Omingmakyok) Kadlun, Member Henry Ohokannoak, Member
NIRB Board Staff:	R. Barry, Executive Director K. Gillard, Acting Director, Technical Services K. Boa-Antwi, Technical Advisor II S. Taptuna, Manager, Communications J. Tucktoo, Interpreter/Translator M. Taylor, Human Resources Officer W. Nicoll, Environmental Technologist J. Klengenberg, Outreach Coordinator K. Morrison, Technical Advisor II S. Amuno, Technical Advisor II S. Thompson, Technical Advisor II J. Ohokannoak, Technical Advisor II M. Otokiak, Junior Technical Advisor T. Maksagak, Junior Technical Advisor C. Kapolak, Environmental Administrator A. Omilgoitok, Environmental Administrator

Appendix A: Record of Proceedings

NWB Board Staff:	S. Autut, Executive Director K. Kharatyan, Director, Technical Services D. Donald, Technical Advisor
Assistant to Board Staff:	E. Kitigon
Board Legal Counsel:	T. Meadows, Meadows Law
Interpreters:	J. Tucktoo, Interpreter/Translator (NIRB) J. Panioyak
Court Reporters:	S. Dormer, CSR(A), Dicta Court Reporting E. Royal, CSR(A), Dicta Court Reporting
Sound Technician:	W. Nicoll, Environmental Technologist (NIRB)
PARTIES: ***Proponent:*** TMAC Resources Inc.	L. Aglukkaq, Member, Board of Directors O. Curran, Vice President, Environment Affairs A. Buchan, Director, External and Community Relations S. Potter, Manager, Environment A. Grzegorczyk, Manager, Land Tenure and Reclamation I. Avalik, IIBA Coordinator G. Sharam, Consultant (ERM) M. Henry, Consultant (ERM) N. Bishop, Consultant (ERM) K. Gustavson, Consultant (ERM) M. Setterington, Consultant (EDI) C. Hore, Consultant (SRK Consulting) A. Bowie, Consultant (SRK Consulting) M. E. Rykaart, Consultant (SRK Consulting) G. Crooks, Consultant (Stantec) G. Morinville, Consultant (ERM) B. Armstrong, Legal Counsel (Lawson Lundell) C. Kowbel, Legal Counsel (Lawson Lundell)

Appendix A: Record of Proceedings

Interveners:

Kitikmeot Inuit Association:	S. Anablak, President A. Hadlari, Vice President, Wildlife & Environment P. Emingak, Executive Director G. Clark, Director, Lands, Environment & Resources J. Roesch, Senior Project Officer, Hope Bay H. Bears, Wildlife Biologist Consultant J. Abouchar, Legal Counsel
Government of Nunavut:	S. Pinksen, Assistant Deputy Minister, Department of Environment E. Zell, Avatiliriniq Coordinator L. Perrin, Project Manager, Impact Assessment, Department of Environment A. Chaikine, Environmental Assessment Specialist, Department of Environment K. Johnson, Environmental Assessment Coordinator, Department of Economic Development and Transportation G. Thibeault, Environmental Assessment Coordinator, Department of Health S. Atkinson, Wildlife Technical Consultant S. Chari, Legal Counsel
Department of Justice (Canada):	K. Landa, Legal counsel
Environment and Climate Change Canada:	B. Summerfield, Senior Environmental Assessment Coordinator M. Tobin, Water Quality Project Officer K. Wells, Physical Scientist, Research

Fisheries and Oceans Canada:	B. Ross, Regional Manager, Regulatory Reviews M. D'Aguiar, Senior Fisheries Protection Program Biologist A. McLellan, Fisheries Protection Program Biologist M. Marcoux, Marine Mammal Biologist
Indigenous and Northern Affairs Canada:	S. Dewar, Director, Resource Management K. Pawley, Manager of Environmental Assessment, Land Use Planning and Conservation D. Abernethy, Socioeconomic Monitoring Analyst S. Forte, Water Management Specialist A. Roy, Environmental Assessment Coordinator F. Ngwa, Sr. Environmental Assessment Specialist
Natural Resources Canada:	P. Unger, Senior Environmental Assessment Officer
Transport Canada:	A. Gudmundson, Regional Manager of Environmental Services
Health Canada:	G. Irvine, Regional Environmental Assessment Specialist M. Gale, Regional Environmental Assessment Specialist
Canadian Northern Economic Development Agency:	T. Simmons, Senior Project Manager

Community Representatives:

Cambridge Bay	E. Kaosoni D. Klengenberg J. MacEachern

Appendix A: Record of Proceedings

Bathurst Inlet (Kingoak)	T. Akoluk
	Y. Angohiatok
	A. Roach
Bay Chimo (Umingmaktok)	N. Haniliak
	W. Kakolak
	M. Kaniak
Kugaaruk	T. Apsaktaun
	L. Illuitok
	R. Kakkianian
	C. Krejunark
Kugluktuk	L. Adjun
	D. Alonak
	T. Novoligak
	P. Taktagon
	M. Tiktalek
Gjoa Haven (Uqsuqtuuq)	C. Aaluk
	U. Puqiqnak
	B. Putuguq
	J. Qirqqut
Taloyoak	A. Paniloo
	S. Qingnaqtuq
	J. Tucktoo
	B. Uquqtuq

Appendix B: Table of Commitments from the Final Hearing

The following table provides a listing of commitments confirmed by the parties at the Phase 2 Hope Bay Belt Project Final Hearing. Although some of these commitments have provided the basis for the Board's recommended terms and conditions, others, due to various reasons, such as limits on the Board's jurisdiction, are not expressly included as terms and conditions or recommendations to the parties. However, even for those commitments that have not become recommendations or recommended terms and conditions, it is the Board's expectation that all parties will make best efforts to fulfill all commitments included in the attached Table of Commitments. The Board notes the reliance of the parties and the Board on the commitments provided to come to resolution of outstanding issues during the technical review of the Phase 2 Hope Bay Belt Project and at the Final Hearing. Consequently, the Board recognizes the importance of honouring commitments to the credibility of the Board's assessment process and expects that these commitments will be fulfilled by the Proponent.

No.	Subject	Commitment	Issue Raised by (Date of Commitment)	Project Phase/Timing
Terrestrial Environment Commitments				
1	Vegetation sampling for food chain model	TMAC will speak with the KIA prior to the hearings to come to agreement as to where sedge samples can be collected for baseline purposes. Based on a meeting on April 30, 2018 it was agreed to collect a baseline of 30 samples at Boston and 30 samples at the Tailings Impoundment Area and additional samples at reference sites. TMAC will produce a sampling plan for review by the KIA prior to construction.	Kitikmeot Inuit Association (May 12, 2018)	▪ Prior to Construction.
2	Noise Effects Significance	TMAC will abide by occupational health and safety regulations, and provide our workers with a safe work environment, including work camp accommodation areas.	Kitikmeot Inuit Association (May 12, 2018)	▪ All phases
3	Effects of road dust on vegetation communities	TMAC commits to conduct vegetation monitoring if the results of dust fall monitoring indicate that there is the potential for effects on tundra vegetation beyond that predicted in the PDA.	Kitikmeot Inuit Association (May 12, 2018)	▪ All phases
4	Invasive Plant Management	TMAC commits to including a section in the Wildlife Mitigation and Monitoring Plan (WMMP) on invasive plant species detection and management, and report in the annual compliance report.	Kitikmeot Inuit Association (May 12, 2018)	▪ Prior to Project Commencement ▪ Annually thereafter
5	Road effects and	TMAC will quantify road traffic as a number of vehicle passes per	Kitikmeot Inuit	▪ All phases

No.	Subject	Commitment	Issue Raised by (Date of Commitment)	Project Phase/Timing
	traffic management for wildlife VECs	day throughout a year on the two main segments of the road (Doris to Madrid and Madrid to Boston) and report annually in the WMMP compliance report.	Association (May 12, 2018)	▪ Year-round
6	Road effects and traffic management for wildlife VECs	TMAC will consider the traffic levels, observed effects to large mammals, and reflect on adaptive management options in consultation with the IEAC.	Kitikmeot Inuit Association (May 12, 2018)	▪ All phases ▪ Year-round
7	Migratory stand watch methods and results	TMAC commits to conducting additional migration surveys at the proposed wind turbine pad locations prior to construction (for baseline purposes), and during the appropriate survey time period to meet ECCC (2017) guidance and to capture peak migratory activity for raptors, waterbirds, and upland birds.	Kitikmeot Inuit Association (May 12, 2018)	▪ Prior to Construction
8	Migratory stand watch methods and results	TMAC commits to designing the transmission line to meet the Edison Institute guidelines for reducing bird mortalities and line strikes.	Kitikmeot Inuit Association (May 12, 2018)	▪ Prior to Construction
9	Habitat suitability mapping for furbearers (wolverine)	TMAC commits to using the habitat maps that use Terrestrial Ecosystem Mapping for wildlife management purposes and when reporting habitat loss in the annual WMMP report.	Kitikmeot Inuit Association (May 12, 2018)	▪ All phases ▪ Annually
10	Fisheries Offsetting	TMAC will work with DFO, the KIA, and Inuit Environmental Advisory Committee to identify candidate offsetting options with a preference for developing a community-based offsetting program located near Cambridge Bay.	Kitikmeot Inuit Association (May 12, 2018)	▪ Prior to Construction
11	Fisheries Offsetting	TMAC will undertake field surveys in summer 2018 to ground-truth preliminary offsetting site options, and refine objectives, constraints, and opportunities associated with each site. These activities will contribute to preliminary gain calculations in support of the development of a Fisheries Offsetting Plan	Kitikmeot Inuit Association (May 12, 2018)	▪ Prior to Construction
12	Water withdrawal PAD calculations	TMAC will apply adaptive management processes during monitoring. Should a high groundwater sensitivity case result in habitat losses that exceed those predicted for the base case, TMAC	Kitikmeot Inuit Association (May 12, 2018)	▪ All phases

No.	Subject	Commitment	Issue Raised by (Date of Commitment)	Project Phase/Timing
		would apply an offsetting plan (as required by DFO) that is commensurate with these losses.		
13	Arsenic Site-Specific Water Quality Objective (SSWQO)	TMAC has reconsidered applying an SSWQO for arsenic at this early juncture of the Phase 2 Hope Bay Belt Project. Instead, it will monitor potential changes to arsenic in the Project lakes through the AEMP.	Kitikmeot Inuit Association (May 12, 2018)	▪ All phases
14	AEMP Parameter Suite	TMAC agrees to add free cyanide which has a CCME water quality guideline of 0.005 mg/L and total cyanide to the AEMP parameter suite for Aimaokatalok Lake and Reference Lake B.	Kitikmeot Inuit Association (May 12, 2018)	▪ All phases
15	Water Crossings	TMAC will develop and provide watercourse and site-specific engineering plans to Fisheries and Oceans Canada (DFO), supported by measured or modelled stream flow date prior to construction.	Fisheries and Oceans Canada (May 12, 2018)	▪ Prior to Construction
16	Water Crossings	TMAC will work with DFO, the KIA, and the Inuit Environmental Advisory Committee during the regulatory phase to develop a construction plan for watercourse crossings that will include mitigation measures to reduce impacts to fish and fish habitat during construction.	Fisheries and Oceans Canada (May 12, 2018)	▪ Prior to Construction
17	Water Crossings	TMAC will work with DFO and abide by any monitoring and reporting requirements for the authorization if and when granted.	Fisheries and Oceans Canada (May 12, 2018)	▪ All phases
18	Water and Load Balance and predicted fish productivity loss	TMAC will monitor water levels and flows in fish bearing lakes and streams that are predicted to be potentially impacted by the Project during mining.	Fisheries and Oceans Canada (May 12, 2018)	▪ All phases
19	Water Intake and Discharge Pipes	TMAC will work with DFO, the KIA, and the Inuit Environmental Advisory Committee during the regulatory phase to gain consensus on acceptable construction monitoring and reporting for freshwater pipeline infrastructure that will include the mitigation measures to be implemented to reduce impacts to fish and fish habitat during construction. TMAC anticipates that these	Fisheries and Oceans Canada (May 12, 2018)	▪ Prior to Construction

No.	Subject	Commitment	Issue Raised by (Date of Commitment)	Project Phase/Timing
		requirements would be included in an authorization from DFO issued prior to construction.		
20	Conceptual Marine Fisheries Offsetting Approach	Should the Phase 2 Hope Bay Belt Project be approved, during the regulatory phase TMAC will work with DFO-FPP, KIA, and IEAC to develop and finalize a marine offsetting plan which is acceptable to all parties, and complies with the Fisheries Protection Policy Statement (2013) and the Fisheries Productivity Policy: A Proponent's Guide to Offsetting (November 2013). Representative fish species of each trophic level and their habitat utilization will be analyzed to ensure that all potential residual serious harm to fish and fish habitat that are part of or support commercial, recreational or Aboriginal fisheries as a result of the project are accounted for and adequately offset.	Fisheries and Oceans Canada (May 12, 2018)	▪ Prior to Construction
21	Potential Impacts to Marine Mammals	As part of the WMMP, TMAC will be preparing maps and descriptions of key bird habitats such as large marine bird colonies and Prince Leopold Island for supply vessel operators. TMAC commits to updating the guidance package for vessel operators to include information on sensitive marine mammal habitats in the Northwest Passage, as described in FEIS Figures 11.2.1 and 11.2.2, and Table 11.2.1. This information will be updated to include data published since the FEIS or provided by DFO.	Fisheries and Oceans Canada (May 12, 2018)	▪ Prior to Project Commencement
22	Potential Impacts to Marine Mammals	TMAC also commits to discussing mitigation measures for marine mammals in the Northwest Passage that are common to all vessels in Arctic waters, or as provided in a DFO guidance document for Arctic waters. All mitigation is contingent on vessel safety.	Fisheries and Oceans Canada (May 12, 2018)	▪ Prior to Project Commencement
23	Incinerator Stack Testing	TMAC commits that new incinerators will be tested within 6 months of installation. A representative stack test on existing incinerators will be conducted after a significant change to site activities with the potential to change the waste stream or every 3 years, whatever is more frequent.	Environment and Climate Change Canada (May 12, 2018)	▪ Within 6 (six) months of Operations ▪ Every 3 (three) years or less thereafter
24	Incinerator Stack	In the event TMAC has emission exceedances related to	Environment	▪ All phases

No.	Subject	Commitment	Issue Raised by (Date of Commitment)	Project Phase/Timing
	Testing	incineration, TMAC will investigate to determine the possible source(s) and potential impacts of the exceedances and adaptive management options will be assessed and applied based on the identified contributing factors.	and Climate Change Canada (May 12, 2018)	
25	Nitrogen Dioxide Monitoring Passive Sampling vs Continuous Monitoring	TMAC commits to implementing continuous NO_2 monitoring during peak construction and during a time in operations that designates lead up to and during peak operations. Monitoring results will be compared to the Canadian Ambient Air Quality Standards (CAAQS). The results of the monitoring program will be included in the air quality portion of the Nunavut Impact Review Board Annual Report. The monitoring plan will be adjusted based on the results and effectiveness of adaptive management with consideration given to the CAAQS. In the event that emissions increase due to a change in operations, TMAC commits to additional NO_2 monitoring.	Environment and Climate Change Canada (May 12, 2018)	▪ Construction and Operations
26	Dust Suppression	TMAC commits to update the Air Quality Management plans to provide description of process undertaken to achieve 75% dust management efficiency.	Environment and Climate Change Canada (May 12, 2018)	▪ Prior to Project Commencement
27	Species at Risk	TMAC agrees to include a section in the 2018 WMMP listing the species at risk, and relevant mitigation.	Environment and Climate Change Canada (May 12, 2018)	▪ Prior to Project Commencement
28	Wind Turbines – Potential Impacts to Migratory Birds	TMAC agrees to add the post-construction monitoring for the proposed wind turbine to the existing discussions with ECCC and interested parties on site-wide bird monitoring.	Environment and Climate Change Canada (May 12, 2018)	▪ Prior to Project Commencement
29	Wind Turbines – Potential Impacts to Migratory Birds	TMAC agrees to investigate and discuss preventative operational mitigation measures for wind turbines during periods of poor visibility at peak bird migration periods.	Environment and Climate Change Canada (May 12, 2018)	▪ Operations
30	Wind Turbines –	TMAC agrees to submit data sets to the centralized bird/bat	Environment	▪ Operations

No.	Subject	Commitment	Issue Raised by (Date of Commitment)	Project Phase/Timing
	Potential Impacts to Migratory Birds	monitoring database known as the "Wind Energy, Bird and Bat Monitoring Database".	and Climate Change Canada (May 12, 2018)	
31	Wildlife Use of Tailings Impoundment Area and Water Storage	TMAC commits to updating the WMMP to include more detail on the existing monitoring and mitigation for waterbirds in the TIA, including: 1) TMAC will conduct a baseline survey for waterbirds and shorebirds at the TIA, in consultation with ECCC, to characterize the bird community and use of the TIA. 2) TMAC will monitor water quality in the TIA on a regular basis during operations of the Project as per our existing water licence requirements. 3) If the baseline survey indicates that birds are using the TIA, TMAC will conduct a toxicological risk assessment in consultation with ECCC. 4) If that risk assessment indicates that there is a reasonable risk to birds due to living in the TIA above baseline conditions then TMAC will monitor for ongoing usage of the TIA by birds and will engage with the IEAC and ECCC on methods for deterrence of waterbirds.	Environment and Climate Change Canada (May 12, 2018)	▪ All phases
32	Cumulative Impacts of shipping in Bathurst/Elu Inlet Key Habitat Site on Migratory Birds	TMAC is open to having dialogue with ECCC on collaboration for common eiders in the Bathurst ad Elu Inlets Key Marine Habitat Sites.	Environment and Climate Change Canada (May 12, 2018)	▪ All phases
33	Necessity of the Site Specific Water Quality Objective for Copper	TMAC has re-considered its position of adopting a copper SSWQO for the Phase 2 Hope Bay Belt Project, and will instead monitor potential changes to copper in the Project lakes through the AEMP.	Environment and Climate Change Canada (May 12, 2018)	▪ All phases

No.	Subject	Commitment	Issue Raised by (Date of Commitment)	Project Phase/Timing
34	Arsenic Site Specific Water Quality Objective	TMAC has re-considered applying an SSWQO for arsenic at this early juncture of the Phase 2 Hope Bay Belt Project. Instead, it will monitor potential changes to arsenic in the Project lakes through the AEMP.	Environment and Climate Change Canada (May 12, 2018)	▪ All phases
35	Aquatic Effects Monitoring Plan Development	TMAC will update the Phase 2 Hope Bay Belt Project AEMP with an Aquatic Response Framework similar to the approach taken for the Doris AEMP. The updated AEMP will be provided to the interested parties prior to the May Final Hearing in Cambridge Bay.	Environment and Climate Change Canada (May 12, 2018)	▪ Prior to commencement of Project activities
36	Aquatic Effects Monitoring Plan Development	TMAC will improve the harmonization between the AEMP and MMER programs in the updated Phase 2 Hope Bay Belt AEMP.	Environment and Climate Change Canada (May 12, 2018)	▪ Prior to commencement of Project activities
37	Aquatic Effects Monitoring Plan Development	TMAC will update the Phase 2 Hope Bay Belt AEMP with an Aquatic Response Framework with environmental thresholds that trigger further mitigation/information collecting similar to the approach taken for the Doris AEMP.	Environment and Climate Change Canada (May 12, 2018)	▪ Prior to commencement of Project activities
38	In-Water Works – Cargo Dock Construction	TMAC will develop an Environmental Management Plan (EMP) prior to the initiation of cargo dock construction activities. The EMP will include, though not exclusively, mitigation measures for managing total suspended solids and turbidity, monitoring procedures, detailing sampling locations and frequency, as well as proposed limits and trigger values, in order to satisfy all applicable requirements during construction activities.	Environment and Climate Change Canada (May 12, 2018)	▪ Prior to Construction
39	Post-Audit of Water Quality Modelling	TMAC maintains that the updating of predictive models will be used as adaptive management to refine closure requirements or substantial changes to the Project design. TMAC will update near-field mixing modelling and water quality predictions in the receiving environment of Roberts Bay if substantial changes are predicted to the effluent water quality following the re-calibration of the broader Project predictive models. The specific details for the site-wide predictive model re-calibration frequency will be	Environment and Climate Change Canada (May 12, 2018)	▪ Prior to Project Commencement

No.	Subject	Commitment	Issue Raised by (Date of Commitment)	Project Phase/Timing
		determined in the water licencing phase.		
40	Ambient Air Quality	TMAC has already compared updated modelling results against the CCME CAAQS. The GN suggested commitment is note required. If GN accepts the NO_2 CAAQS, TMAC will implement a program of continuous NO_2 monitoring to ensure adequate follow up of the proposed mitigation to meet the hourly average CAAQS for NO_2.	Government of Nunavut (May 12, 2018)	▪ All phases
41	Noise	a) TMAC will conduct noise measurements during quarry blasts at 2.8 and 4 km to confirm predictions. b) TMAC will confirm that the overpressure value of 96 Lpeak dBZ will not exceed at 2,800 m from the location of the blast. c) TMAC will conduct a behaviour monitoring program during blasts if caribou are observed beyond 2.8 km to evaluate how caribou respond to blasts. d) TMAC will include methods in WMMP to determine potential calving ground overlap with the Project.	Government of Nunavut (May 12, 2018)	▪ All phases
42	Waste Management	TMAC commits to update the Non-hazardous Waste Management Plan to include appropriate layout drawings of landfill facilities once issue for Construction designs have been prepared, and 60 days prior to operation of the proposed landfill.	Government of Nunavut (May 12, 2018)	▪ 60 days prior to Operations
43	Waste Management	TMAC commits to update the Hazardous Waste Management Plan to: ▪ Remove reference to disposal of hazardous waste within the Doris Tailings Impoundment Area; and ▪ Remove reference to disposal of bottom ash generated from open burning and incineration in the underground mines. TMAC also clarifies that the disposal of hydrocarbon contaminated material and plastic bags from prepackaged explosives containers within the underground mines is currently	Government of Nunavut (May 12, 2018)	▪ All phases

No.	Subject	Commitment	Issue Raised by (Date of Commitment)	Project Phase/Timing
		an approved practice under the existing Doris License and TMAC does not intend to change this. This disposal strategy will therefore remain in the Hazardous Waste Management Plan.		
44	Vegetation – Rare Plants	The Wildlife Mitigation and Monitoring Plan (WMMP) will be revised to include rare plant mitigation and an annual summary of potential habitat loss when construction occurs in hew areas.	Government of Nunavut (May 12, 2018)	▪ All phases
45	Disruption of caribou movements	The Proponent shall conduct analyses of collar data to quantify the zone-of-influence of the Project components on caribou and Project effects on caribou movement during the operating phase of the Project. The study area of these analyses shall encompass the existing Doris North mining operation, Madrid North and South sites, Boston site, and all connecting roads. The Proponent shall collect such additional caribou collar data, over and above those made available to the Proponent by the Government of Nunavut, as are necessary to operationalize this term and condition with reasonable statistical power. This may be achieved through collaboration with the GN or other parties.	Government of Nunavut (May 12, 2018)	▪ All phases
46	Disruption of caribou movements	The Wildlife Mitigation and Monitoring Plan (WMMP) will be revised to include the following: ▪ The Project's effects on caribou movements will be monitored at a local scale using behavioral observations from height-of-land surveys and snow track study. ▪ The design of these monitoring programs will be developed in consultation with the Government of Nunavut and the Inuit Environmental Advisory Committee, will use methods supported by peer reviewed literature and will consider statistical power. ▪ The snow track study will be designed to estimate the index of permeability of Project roads to caribou. These programs may be discontinued after definitive results are obtained or if statistical power cannot be achieved by	Government of Nunavut (May 12, 2018)	▪ All phases

No.	Subject	Commitment	Issue Raised by (Date of Commitment)	Project Phase/Timing
		means of reasonable sampling design and effort, as determined by NIRB.		
47	Road Design – permeability of caribou	Following construction, the Proponent shall undertake a survey to create a geospatial model of the final structural attributes, including height and slope, of the Project's roads along the length of each road segment. The data from this survey should be used to generate maps showing road heights and shoulder slopes for inclusion in the annual report. This model should also be made available for all intervenors for further assessment of potential road effects and for wildlife effects monitoring.	Government of Nunavut (May 12, 2018)	▪ Prior to Operations
48	Road Design – permeability of caribou	The Wildlife Mitigation and Monitoring Plan (WMMP) will be revised to include the following: Periodically during the Project, analyses of caribou road crossing behaviour will be conducted to examine crossing locations in relation to wildlife crossing structures. These analyses will use available data from collars, snow track surveys, and height-of-land monitoring. Results will be presented in annual reports.	Government of Nunavut (May 12, 2018)	▪ All phases
49	Road Design – permeability of caribou	The Wildlife Mitigation and Monitoring Plan (WMMP) will be revised to include the following: TMAC will implement a program to monitor and report snow bank heights along Project roads. This program will allow estimation of mean height and variance at a series of designated monitoring locations that are representative of snow conditions along the roads. This program will continue until operational snow management is characterized.	Government of Nunavut (May 12, 2018)	▪ All phases
50	Road Design – permeability of caribou	The power transmission line remains an outstanding issue between TMAC and the Government of Nunavut.	Government of Nunavut (May 12, 2018)	▪ N/A
51	Traffic monitoring and	The Wildlife Mitigation and Monitoring Plan (WMMP) will be revised to include the following:	Government of Nunavut (May	▪ Prior to Project Commencement

No.	Subject	Commitment	Issue Raised by (Date of Commitment)	Project Phase/Timing
	management	A traffic monitoring and reporting program will be implanted to accurately estimate the rates and composition of all traffic using each of the Project's road segments (as identified in FEIS Vol. 3, table 4.5-1) annually and seasonally. This information shall be used for comparison with the traffic rates predicted in the FEIS and to support Project monitoring for wildlife effects.	12, 2018)	▪ Annually and seasonally
52	Traffic monitoring and management	The peak traffic rates as presented in table 4.5-1 in FEIS Vol. 3 (or those identified by the Proponent, during the Project's NIRB review) shall be established as Project monitoring thresholds. If the annual or season traffic rates estimated from Project monitoring exceed the established thresholds by greater than 25% in two (2) consecutive monitoring periods, TMAC shall conduct a revised assessment of the potential impacts of this excess traffic on wildlife. The monitoring data, analysis of effects shall be submitted in the annual WMMP compliance report for NIRB consideration.	Government of Nunavut (May 12, 2018)	▪ All phases ▪ Annually and seasonally
53	Caribou Effects – Zone of Influence monitoring	The Proponent shall conduct analyses of collar data to quantify the zone-of-influence of Project components on caribou and Project effects on caribou movements during the operating phase of the Project. The study area of these analyses shall encompass the existing Doris North mining operation, Madrid North and South sites, Boston site and all connecting roads. The Proponent shall collect such additional caribou collar data, over and above those made available to the Proponent by the Government of Nunavut, as are necessary to operationalize this term and condition with reasonable statistical power. This may be achieved through collaboration with the GN or other parties	Government of Nunavut (May 12, 2018)	▪ All phases
54	Caribou Protection Measures	The caribou-protection measure of a 1.5 km setback remains an outstanding issue between TMAC and the Government of Nunavut	Government of Nunavut (May 12, 2018)	▪ N/A
55	Mitigation for	The Wildlife Mitigation and Monitoring Plan (WMMP) will be	Government of	▪ Prior to Project

No.	Subject	Commitment	Issue Raised by (Date of Commitment)	Project Phase/Timing
	grizzly bear	revised to include the following: ▪ Prior to construction activities during denning season, surveys will be conducted to locate active big game dens within 1 (one) km of the Project. Survey design will be informed by maps of high quality denning habitat that were included within the FEIS. ▪ If an active big game den is located within 1 (one) km of construction activities, construction activities shall not begin until a den-site protection plan is developed in consultation with a Government of Nunavut Regional Manager of Wildlife. The plan will consider a 1 (one) km no blasting or drilling buffer, 750 m for operation of heavy equipment, and 250 m for light vehicle traffic. Exceptions to these minimums may be implemented as part of a den-specific management plan and may require a permit from the Government of Nunavut under section 74 of the *Nunavut Wildlife Act*. ▪ During construction and operations, regular ground-based observations will be conducted regularly during the denning season to identify active big game den sites within 1 (one) km of the Project that may require mitigation. ▪ All active big game dens within 1 (one) km shall have a den-specific management plan, developed in consultation with the GN Department of Environment (FEIS Annex Vol. 8-3, s.2.4, Table 2.4.1). ▪ A den-specific management plan for big game may include mitigation measures such as increased monitoring (to assess responses to disturbance and den success), speed limit reductions and posting of signs in proximity to the den, driver notifications, and avoidance during denning or den emergence.	Nunavut (May 12, 2018)	Commencement

No.	Subject	Commitment	Issue Raised by (Date of Commitment)	Project Phase/Timing
56	Raptor Nests	The Wildlife Mitigation and Monitoring Plan (WMMP) will be revised to include the following: Should construction of new areas occur in the raptor breeding period, TMAC will conduct a pre-construction survey of potential cliff-nesting habitat within 2 km of the Proposed Phase 2 Hope Bay Belt Project development prior to construction to ensure sites have been accounted for from previous surveys.	Government of Nunavut (May 12, 2018)	▪ Prior to Project Commencement
57	Raptor Nests	The Wildlife Mitigation and Monitoring Plan (WMMP) will be revised to include the following: a) If an active cliff nest is located within 1 (one) km of construction activities, construction activities shall not begin until a nest-site protection plan is developed in consultation with the Regional Manager of Wildlife (Government of Nunavut, Department of Environment). The plan will consider a 1 (one) km no blasting or drilling buffer, 750 m for operation of heavy equipment, and 250 m for light vehicle traffic. Exceptions to these minimums may be implemented as part of a nest-specific management plan and may require a permit from the Government of Nunavut under sections 72 and 74 of the *Nunavut Wildlife Act*. b) Where a raptor builds a nest on project infrastructure such as a service building, the recommended cessation of construction activities within a no-disturbance buffer does not apply but development of a nest-specific management plan is recommended.	Government of Nunavut (May 12, 2018)	▪ Prior to Project Commencement
58	Raptor Nests	The Wildlife Mitigation and Monitoring Plan (WMMP) will be revised to include the following:	Government of Nunavut (May 12, 2018)	▪ Prior to Project Commencement

No.	Subject	Commitment	Issue Raised by (Date of Commitment)	Project Phase/Timing
		Throughout the life of the Project, all potential nest sites within 1 (one) km of project activities will have a nest-specific management plan, developed in consultation with the GN Department of Environment.		
59	Air Traffic	The Wildlife Mitigation and Monitoring Plan (WMMP) will be revised to include the following: Fixed-wing landings/take-offs at Project airstrips will be recorded. These data will be reported in the annual WMMP compliance report. The reported information will be used to verify EIS predictions regarding flight frequency.	Government of Nunavut (May 12, 2018)	▪ Prior to Project Commencement
60	Air Traffic	The Wildlife Mitigation and Monitoring Plan (WMMP) will be revised to include the following: Helicopter flight logs will be collected and will be reported in the annual WMMP compliance report. The reported information will be used to (1) verify the accuracy of EIS predictions about the frequency and distribution of helicopter traffic; (2) verify assumptions about helicopter traffic that were made in the noise modeling study; and (3) facilitate other Project effects monitoring programs such as wildlife ZOI and movement studies.	Government of Nunavut (May 12, 2018)	▪ Prior to Project Commencement
61	Air Traffic	The Project's Wildlife Mitigation and Monitoring Plan shall be revised to clarify the following: That the 600 m horizontal avoidance buffer for operation of helicopters near caribou also applies to helicopters on the ground such that engine starts and takeoffs of helicopters will be suspended when caribou are observed within the buffer distance, subject to the operational safety discretion of the pilot.	Government of Nunavut (May 12, 2018)	▪ Prior to Project Commencement
62	Muskoxen Mitigation	The WMMP will be revised to clarify that driver rules used for caribou (as detailed in the WMMP; Figure 2.2-1 Driver Mitigation	Government of Nunavut (May	▪ Prior to Project Commencement

No.	Subject	Commitment	Issue Raised by (Date of Commitment)	Project Phase/Timing
		for Caribou) will be applied to muskoxen.	12, 2018)	
63	Exceedances of Criteria Air Contaminants	NO_2 mitigation: Wind power generation may be pursued, which would be expected to reduce NOx emissions due to reduced power plant operation.	Health Canada (May 12, 2018)	▪ No timeline provided
64	Exceedances of Criteria Air Contaminants	NO_2 mitigation: Consideration of taller stacks at the Madrid North and Boston power plants to promote greater dispersion.	Health Canada (May 12, 2018)	▪ No timeline provided
65	Exceedances of Criteria Air Contaminants	NO_2 mitigation: Consideration for additional NOx emissions reductions during detailed Project design. These may include energy efficiency methodologies	Health Canada (May 12, 2018)	▪ No timeline provided
66	Aviation Safety	TMAC will comply with the regulations under Subpart 7 (307.01) of the Canadian Aviation Regulations (CAR).	Health Canada (May 12, 2018)	▪ All phases
67	Use of Silt Curtains in Construction of Roberts Bay Cargo Dock	TMAC will install and use silt curtains during in-water construction of the cargo dock as stipulated in the FEIS Volume 5, Section 10.5.3.2 unless directed otherwise by DFO during the regulatory phase	Indigenous and Northern Affairs Canada (May 12, 2018)	▪ Construction
68	Use of Revegetation as a Reclamation Option	TMAC will, as part of the next formal update to the project closure and reclamation plan, post issuance of the Water Licences, include pertinent information and recommendations from Newmont and KIA's active revegetation trials at Hope Bay. This site specific information will inform how revegetation can be applied, as appropriate, at closure.	Indigenous and Northern Affairs Canada (May 12, 2018)	▪ Post-regulatory phase
Socio-Economic Commitments				
69	Employee Sexual Health	TMAC will continue to support sexual health awareness and education by providing workers access to sexual health information throughout the life of the Project.	Government of Nunavut (May 12, 2018)	▪ All phases
70	Employee Sexual Health	The Proponent shall ensure that all reportable diseases are reported as per the existing regulations. Further, the Proponent will develop capacity to reduce public health related diseases that are demonstrated to be linked to camp populations when date is	Government of Nunavut (May 12, 2018)	▪ All phases

No.	Subject	Commitment	Issue Raised by (Date of Commitment)	Project Phase/Timing
		presented to the Proponent regarding regional increases in related diseases.		
71	Employee Sexual Health	TMAC will continue to inform workers of the range of health services available on-site throughout the life of the Project.	Government of Nunavut (May 12, 2018)	▪ All phases
72	Employee Sexual Health	The Proponent shall, on a regular and on-going basis, participate in discussions and dialogue with the GN Department of Health in connection with Project activities, policies, or Project-induced public health issues which may have effect on health and social services facilities, programs and services.	Government of Nunavut (May 12, 2018)	▪ All phases
73	Economic Impact Report Model Summary	The Proponent will communicate to the GN available information on major changes to Project-related tax and in the case that any major change occurs, or as needed. This communication will not preclude either party from contracting the other to request an updated estimate of territorial taxes.	Government of Nunavut (May 12, 2018)	▪ All phases
74	Community Involvement Plan	The Proponent will periodically review the Community Involvement Plan (CIP) and, as required, shall update the CIP to ensure that it reflects current and relevant stakeholders, as well as effective communication and engagement methods with stakeholders throughout the life of the Project.	Government of Nunavut (May 12, 2018)	▪ All phases
75	Socio-Economic Monitoring	The Proponent continues to be an active member in the Hope Bay Socio-Economic Working Group. Invited members of this Working Group shall include the Proponent, the Government of Nunavut, Indigenous and Northern Affairs Canada, and the Kitikmeot Inuit Association. Working Group members may invite new participants to participate, on an as-needed basis. The central focus of the Hope Bay Socio-Economic Working Group shall be on collaborating to ensure that the Hope Bay Socio-Economic Monitoring Plan provides for appropriate Project-specific socio-economic effects monitoring as required throughout the life of the Project. The Hope Bay Socio-Economic	Government of Nunavut (May 12, 2018)	▪ All phases

No.	Subject	Commitment	Issue Raised by (Date of Commitment)	Project Phase/Timing
		Monitoring Plan shall apply to the Project as described in the FEIS. The Proponent, reflecting the input of the Hope Bay Socio-Economic Working Group, shall produce an annual Hope Bay Socio-Economic Monitoring Plan report.		
76	Socio-Economic Monitoring	Within one (1) year of the issuance of a Project Certificate, the Proponent shall submit an updated Hope Bay Socio-Economic Monitoring Plan (SEMP) to the Hope Bay Socio-Economic Working Group for review. The SEMP shall identify updates, changes, and any amendments made to the Terms of Reference for the Hope Bay Socio-Economic Working Group. Updates to the SEMP shall reflect the changing circumstances as outlined in the Hope Bay Final Environmental Impact Statement and Final Hearing Report. Any changes as agreed to by the Hope Bay Socio-Economic Working Group shall be submitted to the Nunavut Impact Review Board.	Government of Nunavut (May 12, 2018)	▪ Within 1 (one) year of the issuance of a project certificate
77	Financial Literacy and Employment-Induced Migration and Relocation	The Proponent shall reach out to third parties to deliver financial management programs such as financial literacy, financial planning, and personal budgeting. TMAC will approach Nunavut Housing Corporation and GN Department of Family Services (or other GN departments as appropriate) to solicit input and/or participate in the delivery of programming to Project workers.	Government of Nunavut (May 12, 2018)	▪ All phases
78	Financial Literacy	The Proponent will track statistics regarding the delivery of the financial management programming. The Proponent will share relevant data concerning the implementation and success of training and education programs during the Kitikmeot SEMC annual meeting, so long as these data are consistent with and not limited by obligations under the Hope Bay IIBA.	Government of Nunavut (May 12, 2018)	▪ All phases
79	Labour Force Analysis	The Proponent is strongly encouraged to submit staff schedule forecasts to the Nunavut Impact Review Board and to the Government of Nunavut six (6) months prior to each phase of the	Government of Nunavut (May 12, 2018)	▪ All phases

No.	Subject	Commitment	Issue Raised by (Date of Commitment)	Project Phase/Timing
		Project (construction, operations, closure). Staff schedule forecasts should be inclusive of: ▪ Title and number of positions required by department or work area; ▪ Potential start dates; ▪ The level of education required (with reference to the specific positions); and ▪ Whether on-the-job or other forms of training and certification will be required (with reference to specific positions).		
80	Labour Force Analysis	In order to ensure alignment with necessary skill-sets needed to work at the Project, the Proponent will consult the Government of Nunavut's Career Development Division during the development of staff schedule forecasts. A new schedule shall be submitted following any significant deviation from original predictions.	Government of Nunavut (May 12, 2018)	▪ All phases
81	Labour Force Analysis	The Proponent's Human Resources shall make best efforts to collaborate with the Government of Nunavut's Career Development Officer, Regional Manager of Career Development, and Director of Career Development. Semi-annual calls, at a minimum, should be initiated by the Proponent with these Government of Nunavut representatives regarding: ▪ Employee recruitment and retention issues; ▪ Internal and/or partnered training and development of employees; and ▪ Long-term labour market plans to facilitate training in communities.	Government of Nunavut (May 12, 2018)	▪ All phases
82	Accredited Project-Related Training for Employees	The Proponent commits to ongoing discussion with eth GN Department of Family Services and other stakeholders regarding training opportunities and requirements to fill the skills-gap of the Kitikmeot workforce.	Government of Nunavut (May 12, 2018)	▪ All phases
83	Reporting Mechanisms -	If the Government of Nunavut and the Nunavut Housing Corporation develop an anonymous voluntary housing survey, the	Government of Nunavut (May	▪ All phases

No.	Subject	Commitment	Issue Raised by (Date of Commitment)	Project Phase/Timing
	Housing	Proponent shall make the survey available to Nunavummiut site personnel and the Proponent will return any completed surveys to the Government of Nunavut.	12, 2018)	
84	Employment-Induced Migration and Relocation	The Proponent will support the communication to Project workers of education, training materials, and programs (i.e. homeownership) developed by the Nunavut Housing Corporations that focuses on enhancing employee understanding and access to housing options in the Project LSA The Proponent shall reach out to third parties to deliver financial management programs such as financial literacy, financial planning, and personal budgeting. TMAC will approach Nunavut Housing Corporation and GN Department of Family Services (or other GN departments as appropriate) to solicit input and/or participate in the delivery of programming to Project workers.	Government of Nunavut (May 12, 2018)	▪ All phases
85	Impact Prediction – Competition for Local Labour	TMAC shall collaborate with the Hope Bay Socio-Economic Working Group (SEWG) to ensure that the Hope Bay Socio-Economic Monitoring Program provides for appropriate Project-specific socio-economic effects monitoring of the potential effect of competition for labour. Specific indictor(s) will be developed as agreed to by the SEWG, and considering the input of the Kitikmeot Socio-economic Monitoring Committee, to track and report on the extent to which the Project-related competition for labour may impact Kitikmeot communities. Activities related to monitoring and development of mitigation, including use and disclosure of information and data, will adhere to the SEWG Terms of Reference.	Indigenous and Northern Affairs Canada (May 12, 2018)	▪ All phases
86	Impact Prediction – Competition for Access to Local and Regional	TMAC shall collaborate with the Hope Bay Socio-Economic Working Group (SEWG) to ensure that the Hope Bay Socio-Economic Monitoring Program provides for appropriate Project-specific socio-economic effects monitoring of Project procurement of local regional businesses and competition for access to local	Indigenous and Northern Affairs Canada (May 12, 2018)	▪ All phases

No.	Subject	Commitment	Issue Raised by (Date of Commitment)	Project Phase/Timing
	Businesses	and regional businesses by existing customers. Specific indictor(s) will be developed as agreed to by the SEWG, and considering the input of the Kitikmeot Socio-economic Monitoring Committee, to track and report on the extent to which the Project procures from Kitikmeot businesses and the extent to which existing customers are unable to access goods and services, consistent with provisions of the Hope Bay Impact and Benefit Agreement (IIBA). Activities related to monitoring and development of mitigation, including use and disclosure of information and data, will adhere to the SEWG Terms of Reference.		

Appendix C: List of Exhibits from TMAC Resources Inc. Phase 2 Hope Bay Belt Project Final Hearing

Exhibit	Date of Receipt	Exhibit Description	Party Tendering Exhibit
1.	May 8, 2018	Hard Copy Book of Project Maps *(English, with some in Inuinnaqtun)*	TMAC Resources Inc.
2.	May 8, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Introduction and Overview of Project (*English*)	TMAC Resources Inc.
3.	May 8, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Introduction and Overview of Project (*Inuktitut*)	TMAC Resources Inc.
4.	May 8, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Introduction and Overview of Project (*Inuinnaqtun*)	TMAC Resources Inc.
5.	May 8, 2018	Hard Copy TMAC Resources Inc. Experts' Curriculum Vitae Package: (*English only*)	TMAC Resources Inc.
		a. Dr. Gregory Sharam	
		b. Dr. Michael Henry	
		c. Nicole Bishop	
		d. Dr. Kent Gustavson	
		e. Mike Setterington	
		f. Cameron Hore	
		g. Andrea Bowie	
		h. Dr. Maritz Rykaart	
		i. Gregory Crooks	
		j. Dr. Geneviève Morinville	

Exhibit	Date of Receipt	Exhibit Description	Party Tendering Exhibit
6.	May 8, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Traditional Knowledge and Public Participation (*English*)	TMAC Resources Inc.
7.	May 8, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Traditional Knowledge and Public Participation (*Inuktitut*)	TMAC Resources Inc.
8.	May 8, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Traditional Knowledge and Public Participation (*Inuinnaqtun*)	TMAC Resources Inc.
9.	May 8, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Atmospheric and Terrestrial Environment (*English*)	TMAC Resources Inc.
10.	May 8, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Atmospheric and Terrestrial Environment (*Inuktitut*)	TMAC Resources Inc.
11.	May 8, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Atmospheric and Terrestrial Environment (*Inuinnaqtun*)	TMAC Resources Inc.
12.	May 8, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Terrestrial Environment, Wildlife and Wildlife Habitat (*English*)	TMAC Resources Inc.

Exhibit	Date of Receipt	Exhibit Description	Party Tendering Exhibit
13.	May 8, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Terrestrial Environment, Wildlife and Wildlife Habitat (*Inuktitut*)	TMAC Resources Inc.
14.	May 8, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Terrestrial Environment, Wildlife and Wildlife Habitat (*Inuinnaqtun*)	TMAC Resources Inc.
15.	May 8, 2018	Hard Copy Wildlife Mitigation and Monitoring Plan December 2017 (*English only*)	TMAC Resources Inc.
16.	May 8, 2018	Hard Copy Doris Project: 2017 Wildlife Mitigation and Monitoring Plan Compliance Report (*English only*)	TMAC Resources Inc.
17.	May 9, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Freshwater Environment, Water Management (*English*)	TMAC Resources Inc.
18.	May 9, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Freshwater Environment, Water Management (*Inuktitut*)	TMAC Resources Inc.
19.	May 9, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Freshwater Environment, Water Management (*Inuinnaqtun*)	TMAC Resources Inc.

Exhibit	Date of Receipt	Exhibit Description	Party Tendering Exhibit
20.	May 9, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Marine Environment (*English*)	TMAC Resources Inc.
21.	May 9, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Marine Environment (*Inuktitut*)	TMAC Resources Inc.
22.	May 9, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Marine Environment (*Inuinnaqtun*)	TMAC Resources Inc.
23.	May 9, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Human Environment Assessment (*English*)	TMAC Resources Inc.
24.	May 9, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Human Environment Assessment (*Inuktitut*)	TMAC Resources Inc.
25.	May 9, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Human Environment Assessment (*Inuinnaqtun*)	TMAC Resources Inc.
26.	May 9, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Human Health Risk Assessment (*English*)	TMAC Resources Inc.

Exhibit	Date of Receipt	Exhibit Description	Party Tendering Exhibit
27.	May 9, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Human Health Risk Assessment (*Inuktitut*)	TMAC Resources Inc.
28.	May 9, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Human Health Risk Assessment (*Inuinnaqtun*)	TMAC Resources Inc.
29.	May 9, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Management Plans and Monitoring Programs (*English*)	TMAC Resources Inc.
30.	May 9, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Management Plans and Monitoring Programs (*Inuktitut*)	TMAC Resources Inc.
31.	May 9, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Management Plans and Monitoring Programs (*Inuinnaqtun*)	TMAC Resources Inc.
32.	May 9, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Evaluating and Preventing Accidents and Malfunctions (*English*)	TMAC Resources Inc.

Exhibit	Date of Receipt	Exhibit Description	Party Tendering Exhibit
33.	May 9, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Evaluating and Preventing Accidents and Malfunctions (*Inuktitut*)	TMAC Resources Inc.
34.	May 9, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Evaluating and Preventing Accidents and Malfunctions (*Inuinnaqtun*)	TMAC Resources Inc.
35.	May 9, 2018	Hard Copy PowerPoint Presentation Kitikmeot Inuit Association Summary of Technical Issues Hope Bay Project Phase 2 FEIS (*English*)	Kitikmeot Inuit Association
36.	May 10, 2018	Hard Copy PowerPoint Presentation TMAC Resources' "Phase 2 Hope Bay Belt Project" Government of Nunavut (*English/Inuktitut*)	Government of Nunavut
37.	May 10, 2018	Hard Copy PowerPoint Presentation TMAC Resources' "Phase 2 Hope Bay Belt Project" Government of Nunavut (*Inuinnaqtun/French*)	Government of Nunavut
38.	May 10, 2018	Hard Copy PowerPoint Presentation Environment and Climate Change Canada's Presentation to the Nunavut Impact Review Board Respecting the Phase 2 Hope Bay Belt Final Environmental Impact Statement (*English/Inuktitut*)	Environment and Climate Change Canada

Exhibit	Date of Receipt	Exhibit Description	Party Tendering Exhibit
39.	May 10, 2018	Hard Copy PowerPoint Presentation Transport Canada Recommendations and Advice TMAC's Phase 2 Hope Bay Belt Project (*English*)	Transport Canada
40.	May 10, 2018	Hard Copy PowerPoint Presentation Transport Canada Recommendations and Advice TMAC's Phase 2 Hope Bay Belt Project (*Inuktitut*)	Transport Canada
41.	May 10, 2018	Hard Copy PowerPoint Presentation Transport Canada Recommendations and Advice TMAC's Phase 2 Hope Bay Belt Project (*Inuinnaqtun*)	Transport Canada
42.	May 10, 2018	Hard Copy PowerPoint Presentation Transport Canada Recommendations and Advice TMAC's Phase 2 Hope Bay Belt Project (*French*)	Transport Canada
43.	May 10, 2018	Hard Copy PowerPoint Presentation Fisheries and Oceans Canada Phase 2 Hope Bay Belt Project (*English*)	Fisheries and Oceans Canada
44.	May 10, 2018	Hard Copy PowerPoint Presentation Fisheries and Oceans Canada Phase 2 Hope Bay Belt Project (*Inuktitut*)	Fisheries and Oceans Canada
45.	May 10, 2018	Hard Copy PowerPoint Presentation Fisheries and Oceans Canada Phase 2 Hope Bay Belt Project (*Inuinnaqtun*)	Fisheries and Oceans Canada

Exhibit	Date of Receipt	Exhibit Description	Party Tendering Exhibit
46.	May 10, 2018	Hard Copy PowerPoint Presentation Fisheries and Oceans Canada Phase 2 Hope Bay Belt Project (*French*)	Fisheries and Oceans Canada
47.	May 10, 2018	Hard Copy PowerPoint Presentation TMAC Resources Inc.'s Phase 2 Hope Bay Project Indigenous and Northern Affairs Canada (*English*)	Indigenous and Northern Affairs Canada
48.	May 10, 2018	Hard Copy PowerPoint Presentation TMAC Resources Inc.'s Phase 2 Hope Bay Project Indigenous and Northern Affairs Canada (*French*)	Indigenous and Northern Affairs Canada
49.	May 10, 2018	Hard Copy PowerPoint Presentation Phase 2 Hope Bay Project Final Hearing Presentation – Technical Meetings Health Canada (*English*)	Health Canada
50.	May 10, 2018	Hard Copy PowerPoint Presentation Phase 2 Hope Bay Project Final Hearing Presentation – Technical Meetings Health Canada (*Inuktitut*)	Health Canada
51.	May 10, 2018	Hard Copy PowerPoint Presentation Phase 2 Hope Bay Project Final Hearing Presentation – Technical Meetings Health Canada (*Inuinnaqtun*)	Health Canada

Exhibit	Date of Receipt	Exhibit Description	Party Tendering Exhibit
52.	May 10, 2018	Hard Copy PowerPoint Presentation Phase 2 Hope Bay Project Final Hearing Presentation – Technical Meetings Health Canada (*French*)	Health Canada
53.	May 10, 2018	Hard Copy PowerPoint Presentation Natural Resources Canada's Final Hearing Presentation: TMAC Resources Inc.'s Phase 2 Hope Bay Project (*English*)	Natural Resources Canada
54.	May 10, 2018	Hard Copy PowerPoint Presentation Natural Resources Canada's Final Hearing Presentation: TMAC Resources Inc.'s Phase 2 Hope Bay Project (*Inuktitut*)	Natural Resources Canada
55.	May 10, 2018	Hard Copy PowerPoint Presentation Natural Resources Canada's Final Hearing Presentation: TMAC Resources Inc.'s Phase 2 Hope Bay Project (*Inuinnaqtun*)	Natural Resources Canada
56.	May 10, 2018	Hard Copy PowerPoint Presentation Natural Resources Canada's Final Hearing Presentation: TMAC Resources Inc.'s Phase 2 Hope Bay Project (*French*)	Natural Resources Canada
57.	May 11, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Community Presentation (*English*)	TMAC Resources Inc.
58.	May 11, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Community Presentation (*Inuktitut*)	TMAC Resources Inc.

Exhibit	Date of Receipt	Exhibit Description	Party Tendering Exhibit
59.	May 11, 2018	Hard Copy PowerPoint Presentation Madrid-Boston Proposal Phase 2 of the Hope Bay Project Community Presentation (*Inuinnaqtun*)	TMAC Resources Inc.
60.	May 11, 2018	Hard Copy PowerPoint Presentation Kitikmeot Inuit Association KIA Technical Review of Hope Bay Project Phase 2 FEIS (*English*)	Kitikmeot Inuit Association
61.	May 11, 2018	Hard Copy PowerPoint Presentation TMAC Resources' "Phase 2 Hope Bay Belt Project" Government of Nunavut (*English/Inuktitut*)	Government of Nunavut
62.	May 11, 2018	Hard Copy PowerPoint Presentation TMAC Resources' "Phase 2 Hope Bay Belt Project" Government of Nunavut (*Inuinnaqtun/French*)	Government of Nunavut
63.	May 12, 2018	Hard Copy PowerPoint Presentation Transport Canada Recommendations and Advice TMAC's Phase 2 Hope Bay Belt Project Community Session (*English*)	Transport Canada
64.	May 12, 2018	Hard Copy PowerPoint Presentation Transport Canada Recommendations and Advice TMAC's Phase 2 Hope Bay Belt Project Community Session (*Inuktitut*)	Transport Canada

Exhibit	Date of Receipt	Exhibit Description	Party Tendering Exhibit
65.	May 12, 2018	Hard Copy PowerPoint Presentation Transport Canada Recommendations and Advice TMAC's Phase 2 Hope Bay Belt Project Community Session (*Inuinnaqtun*)	Transport Canada
66.	May 12, 2018	Hard Copy PowerPoint Presentation Transport Canada Recommendations and Advice TMAC's Phase 2 Hope Bay Belt Project Community Session (*French*)	Transport Canada
67.	May 12, 2018	Hard Copy PowerPoint Presentation Environment and Climate Change Canada's Presentation to the Nunavut Impact Review Board Respecting the Phase 2 Hope Bay Belt Final Environmental Impact Statement Community Roundtable (*English/Inuktitut*)	Environment and Climate Change Canada
68.	May 12, 2018	Hard Copy PowerPoint Presentation Environment and Climate Change Canada's Presentation to the Nunavut Impact Review Board Respecting the Phase 2 Hope Bay Belt Final Environmental Impact Statement Community Roundtable (*Inuinnaqtun*)	Environment and Climate Change Canada
69.	May 12, 2018	Hard Copy PowerPoint Presentation TMAC Resources Inc.'s Phase 2 Hope Bay Project Indigenous and Northern Affairs Canada Final Hearing: Community Session (*English/Inuktitut*)	Indigenous and Northern Affairs Canada

Exhibit	Date of Receipt	Exhibit Description	Party Tendering Exhibit
70.	May 12, 2018	Hard Copy PowerPoint Presentation TMAC Resources Inc.'s Phase 2 Hope Bay Project Indigenous and Northern Affairs Canada Final Hearing: Community Session (*Inuktitut*)	Indigenous and Northern Affairs Canada
71.	May 12, 2018	Hard Copy PowerPoint Presentation TMAC Resources Inc.'s Phase 2 Hope Bay Project Indigenous and Northern Affairs Canada Final Hearing: Community Session (*Inuinnaqtun*)	Indigenous and Northern Affairs Canada
72.	May 12, 2018	Hard Copy PowerPoint Presentation TMAC Resources Inc.'s Phase 2 Hope Bay Project Indigenous and Northern Affairs Canada Final Hearing: Community Session (*French*)	Indigenous and Northern Affairs Canada
73.	May 12, 2018	Hard Copy PowerPoint Presentation Phase 2 Hope Bay Project Final Hearing Presentation – Community Meetings Health Canada (*English*)	Health Canada
74.	May 12, 2018	Hard Copy PowerPoint Presentation Phase 2 Hope Bay Project Final Hearing Presentation – Community Meetings Health Canada (*Inuktitut*)	Health Canada
75.	May 12, 2018	Hard Copy PowerPoint Presentation Phase 2 Hope Bay Project Final Hearing Presentation – Community Meetings Health Canada (*Inuinnaqtun*)	Health Canada

Exhibit	Date of Receipt	Exhibit Description	Party Tendering Exhibit
76.	May 12, 2018	Hard Copy PowerPoint Presentation Phase 2 Hope Bay Project Final Hearing Presentation – Community Meetings Health Canada (*French*)	Health Canada
77.	May 12, 2018	Hard Copy PowerPoint Presentation Natural Resources Canada's Final Hearing Presentation: TMAC Resources Inc.'s Phase 2 Hope Bay Project (*English*)	Natural Resources Canada
78.	May 12, 2018	Hard Copy PowerPoint Presentation Natural Resources Canada's Final Hearing Presentation: TMAC Resources Inc.'s Phase 2 Hope Bay Project (*Inuktitut*)	Natural Resources Canada
79.	May 12, 2018	Hard Copy PowerPoint Presentation Natural Resources Canada's Final Hearing Presentation: TMAC Resources Inc.'s Phase 2 Hope Bay Project (*Inuinnaqtun*)	Natural Resources Canada
80.	May 12, 2018	Hard Copy PowerPoint Presentation Natural Resources Canada's Final Hearing Presentation: TMAC Resources Inc.'s Phase 2 Hope Bay Project (*French*)	Natural Resources Canada
81.	May 12, 2018	Hard Copy Hope Bay Project 2017 Socio-Economic Monitoring Program Report (Prepared by ERM for TMAC Resources Inc.) April 2018 (*English*)	Kitikmeot Inuit Association and TMAC Resources Inc.

Exhibit	Date of Receipt	Exhibit Description	Party Tendering Exhibit
82.	May 12, 2018	Hard Copy Hope Bay Belt Inuit Impact and Benefit Agreement (IIBA) Dated March 30, 2015 (*English*)	TMAC Resources Inc. and Kitikmeot Inuit Association
83.	May 12, 2018	Electronic Copy (only) KIA Submission on suggested term and condition in respect of KIA Comment Submission KIA-28 (*English*)	Kitikmeot Inuit Association
84.	May 12, 2018	Hard Copy List of Commitments Generated in the Proponent's Response to Technical Comments on the Madrid-Boston Final Environmental Impact Statement Final May 12, 2018 (*English*)	TMAC Resources Inc.
85.	May 12, 2018	Hard Copy Management Plan for the Barren-Ground Caribou, Dolphin and Union population in Canada: Adoption of the Management Plan for the Dolphin and Union Caribou in the Northwest Territories and Nunavut (*English*)	TMAC Resources Inc.
86.	May 12, 2018	Electronic Copy Only Government of Nunavut's Unresolved Items (*English*)	Government of Nunavut
87.	May 12, 2018	Hard Copy TMAC's Proposal for DFO-3.3.3, Point #1 of the Revised Recommendation (*English*)	TMAC Resources Inc.
88.	May 12, 2018	Hard Copy TMAC Proposal to Address Unresolved GN 22(i) (*English*)	TMAC Resources Inc.

Appendix D: List of Acronyms and Abbreviations

AANDC	Aboriginal Affairs and Northern Development Canada
AEMP	Aquatic Effects Monitoring Plan
ANFO	Ammonium nitrate/fuel oil
ARD	Acid Rock Drainage
AWR	All-weather road
CAAQS	Canadian Ambient Air Quality Standards
CCME	Canadian Council of Ministers of the Environment
CESCC	Canadian Endangered Species Conservation Council
CH_4	Methane
CIP	Community Involvement Plan
CIRNA	Crown-Indigenous Relations and Northern Affairs
CO	Carbon monoxide
CO_2; CO_{2eq}	Carbon dioxide; carbon dioxide equivalent
COPC	Chemicals of Potential Concern
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DFO	Fisheries and Oceans Canada
DFO-FPP	Fisheries and Oceans Canada – Fisheries Protection Program
EC	Environment Canada
ECCC	Environment and Climate Change Canada
EDI	Estimated daily intake
EEM	Environmental Effects Monitoring
EIS	Environmental Impact Statement
ERA	Environmental risk assessment
FEIS	Final Environmental Impact Statement
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIS	Geographic information system
GN	Government of Nunavut
GWMP	Groundwater Management Plan
HBML	Hope Bay Mining Ltd.
HDPE	High density polyethylene
HHERA	Human Health and Ecological Risk Assessment
HQ	Hazard quotient
IEAC	Inuit Environmental Advisory Committee
IIBA	Inuit Impact and Benefit Agreement
ILCR	Incremental Lifetime Cancer Risk
INAC	Indigenous and Northern Affairs Canada
IR	Information Request
KIA	Kitikmeot Inuit Association
LSA	Local Study Area
ML*	Metal Leaching (also used to abbreviate million litres)
MMER	Metal Mining Effluent Regulations
MOU	Memorandum of understanding
N_2O	Nitrous Oxide

NEF	Noise Exposure Forecast
NHC	Nunavut Housing Corporation
NIRB	Nunavut Impact Review Board
NLCA	Nunavut Land Claims Agreement
NO_x	Nitrogen oxides
NO_2	Nitrogen dioxide
NRCan	Natural Resources Canada
NSA	Nunavut Settlement Area
NTKP	Naonaiyaotit Traditional Knowledge Project
NTI	Nunavut Tunngavik Incorporated
Nunavut Agreement	*Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada*
NWB	Nunavut Water Board
O_3	Ozone
OPEP	Oil Pollution Emergency Plan
OPEX	Operating expenditures
PAD	Permanent alteration or destruction (a direct loss or alteration of fish habitat)
PAG	Potentially Acid Generating
PAH	Polycyclic Aromatic Hydrocarbon
PB	Property Boundary
PDA	Project Development Area
PHC	Pre-hearing Conference
PM_{10}	Particulate matter with a diameter less than 10 micrometres (μm)
$PM_{2.5}$	Particulate matter with a diameter less than 2.5 micrometres (μm)
RSA	Regional Study Area
SEMC	Socio-Economic Monitoring Committee
SEMP	Socio-Economic Monitoring Program
SO_2	Sulphur dioxide
SPT	Specific Performance Threshold
SSWQO	site-specific water quality objective
STP	sewage treatment plant
TC	Transport Canada
TIA	Tailings Impoundment Area (for Doris)
TK	Traditional knowledge
TMA	Tailings Management Area (for Boston)
TMAC	TMAC Resources Inc.
TOC	Total organic carbon
TSP	Total Suspended Particulate
VC	Valued Component
VEC	Valued Ecosystem Component
VOC	Volatile organic compound
VSEC	Valued Socio-economic Component
WMMP	Wildlife Mitigation and Monitoring Plan
WTP	Water treatment plant

Units of Measurement

°C	degree Celsius
µg	microgram
%HA	Percent of population that would be highly annoyed by noise
dB	decibel
dBZ	unweighted decibels
ha	hectares
K	hydraulic conductivity
kg	kilogram
km; km/h	kilometre; kilometres per hour
L_{AMAX}	The maximum equivalent sound level within a 24-hour period
L_{dn}	The 24-hour L_{eq}, with a 10 dBA weighting applied to the nighttime hours to account for increased sensitivity to noise at night.
L_{eq}	Continuous equivalent of A-weighted sound pressure level in decibels (dBA) over a specified time period
L_{peak}	Peak blast overpressure sound level used to assess annoyance due to blasting.
mg	milligram
m; mm	metre; millimetre
ML*	million litres (also used to abbreviate metal leaching)
Mt	Million tonnes (megatonne)